

# HOW TO CHOOSE A CABLE TIE

## How to choose the right cable tie

The most important characteristics of a cable tie are:

- the raw material, for specific applications and environmental conditions (weather, chemicals and heat resistance, flammability rating);
- the tensile strength they can stand (tear strength);
- the min and max diameter they can bundle;
- the shape of the tie in case of particular applications.

## Resistance to chemical agents

- Chemical agents as powders, liquids or gases can deteriorate the raw material cable tie are made of: in this case, the mechanical properties of the cable tie, the performance of the product could not meet the required standards (see the table: Resistance to chemical agents).

## UV and weather resistance

All polymers, including the polyamides used for the production of cable ties, are sensitive to UV radiation. The most common additive used for protecting polyamides from UV radiation is carbon powder generally known as "carbon black".

**Natural cable ties (Elematic codes 52xx)** have low resistance to UV radiation and therefore are not suggested for outdoor applications.

**Black cable ties (Elematic codes 53xx)** are added with carbon black and they have a good weather and UV resistance; they are recommended for outdoor applications compared with the natural one. Test on black cable ties have showed an UV resistance of about 3 years in outdoor applications and to exposition to the typical environment of a South-European country.

**Weather Resistant Cable Ties (Elematic codes 53xx UV)** are made of a special added compound to provide an extra weather resistance so that they are suitable for outdoor applications. They are tested according to the norm CEI EN 62275 and the test method used, according to ISO 4892-2, simulates a condition equivalent to an exposition to solar radiance of at least 10 years in a region of South European Countries. The UV resistant cable ties meet all the tests defined by the norm and maintain, after the test conditions, the 100% of the declared tensile strength (type 2 classification - point 6.2.2 of the standard).

**Belturing Plus (Elematic codes 64xx)** are produced with materials resistant to UV rays and they are recommended for heavy-duty applications. In fact, as the UV resistant cable ties, these cable ties are tested according to the norm CEI EN 62275; Belturing Plus cable ties meet all the tests defined by the norm and maintain, after the test conditions, the 50 % of the declared tensile strength (type 1 classification - point 6.2.1 of the norm CEI EN 62275).

## Temperature resistance

All polymers, including polyamides used for the production of cable ties, are sensitive to high temperatures, becoming therefore fragile and sensitive to vibrations.

The max suggested installation temperature for standard cable ties is 60°C, while the max service temperature for continuous use is 85°C.

The min suggested installation temperature for standard cable ties in Polyamide 6.6 is -10°C, while the min service temperature for continuous use is -40°C.

**Heat Resistance cable ties (Elematic codes 53xx T)** are made of a specially added compound to provide an extra heat resistance (max service temperature for continuous use up to 125°C)

These cable ties are available in black and natural colour (the natural is more similar to aquamarine green colour due to the special polymer used).

**Belturing Plus (Elematic codes 64xx)** ensure a greater resistance in installations at low temperatures (up to a minimum temperature of -30 ° C).

**2-LOCK™ cable ties (Elematic codes 12xx and 13xx)** ensure an exceptional resistance in installations at low temperatures (up to a minimum temperature of -40 ° C)

## Tear resistance

Elematic cable ties are tested according International standard for cable ties CEI EN 62275. Strength tests are made at constant speed of 25mm/min and the maximum force declared is kept steady for 60 sec.

The standard conditions defined for the tensile test are referred to an ambient temperature of 23°C and a relative humidity of 50%.

It is important to underline that the values arising from those laboratory tests may not be representative of the resistance to the loads of real installations, due to the presence of external factors (high humidity, vibrations, high temperatures, etc.).

### General indications for cable ties installation (width 2,2 ÷ 4,8 mm)

Cable tie width (mm)	Tool setting (daN)
2,2	0<daN<3
2,5÷2,6	3<daN<6
3,5	6<daN<10
4,5÷4,8	10<daN<13

\*1 daN ≈ 1 Kg

For further technical information, please contact our technical department.

## Flammability rating

Fire resistance of polymers (also called flammability) is tested in laboratory on standard specimens with sizes  $125 \pm 5 \times 13 \pm 0.5$  mm and different thickness (0.8; 1.6; 3.2; 6 mm). The most used standard for this evaluation is the UL94 classification (Underwriters laboratories). These tests classify materials according to flame propagation speed on the specimen, to allow the auto-extinguishing of the flame and to the risk of flame propagation by drops. The lower rate is HB, that identifies a material with low combustion speed, then we find, in order, classes V2, V1 and V0, with a growing capacity of flame extinguishing.

Herewith please find a list of the categories of UL 94 classification:

**HB (Horizontal Burning) – Test description:** According to the UL 94, the material is classified HB when the burn rate of the specimen with thickness 3,2 mm doesn't exceed the max speed of 38,1 mm/min and the specimen with minimum thickness doesn't exceed 63,5 mm/min.

**V0 – V1 – V2 (Vertical Burning):** in vertical tests same specimens as HB tests are used. Combustion time is measured, presence of drops or burning of the below cotton are registered and, according to UL 94, materials are classified as follow:

- V0 if the flame extinguishes within 10 seconds;
- V1 if the flame extinguishes within 30 seconds without drops;
- V2 if the flame extinguishes within 30 seconds with drops;

**Self-extinguishing cable ties (Elematic codes 52xx V0)** are made of a specially added compound and they can be used where the auto extinguishing performance is required (UL94-V0). They are available in milky white colour that depend on the physical characteristics of the material.

## Other materials

**Coloured cable ties (Elematic codes 52xx G-V-R-B)** are made with coloured masters without lead, chromium or cadmium; for this reason, the colour of the products might slightly change according to the moulding conditions.

**Detectable cable ties (Elematic codes 52xx DT)** are produced with copolymer material added with iron oxide, providing magnetic properties throughout, allow identification by metal detector or X-ray inspection equipment to meet food, beverage and pharmaceutical safety standard on reducing product contaminations. They are produced in blue colour for visual identification; product not suitable for food contact.

## Storage conditions of cable ties



For the correct conservation of the cable ties, it is recommended to store them at room temperature between 10 and 40 °C and relative humidity between 30% and 70%.



After opening the bag, use the cable ties as soon as possible; close the bag after use in order to maintain the correct humidity of the product.



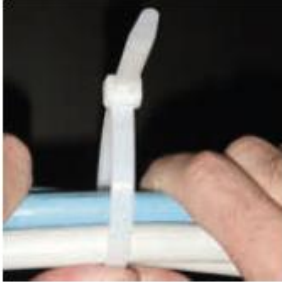
Avoid storing the product near heat sources, which could reduce the humidity of the cable ties decreasing their mechanical properties.



Do not store the cable ties in a sunny place: the direct action of UV rays can damage their structure, making them brittle and weak.

# HOW TO INSTALL AND USE A CABLE TIE

## Manual installation of standard cable ties



Insert the tip of the tie.



Tighten manually the tie till the complete fixing of the cables.



Avoid sharp bending of the tie: it will not improve the fixing strength.



Cut the exceeding part of the tie with the tool, leaving a few mm length as safety.

## Tool installation of standard cable ties



Set the max tension of the tool depending on the size of the tie.



Grip the cable tie with the tool.



Tighten the tie till the complete fixing of the cables.



Cut the exceeding part of the cable tie, properly adjusting the setting of the tool.

## Tool installation of belturing cable ties



Insert the tip of the tie and tighten a short segment.



Use the tool for tightening the tie around the cables.



Tighten the tie till the complete fixing.



Cut the exceeding part of the tie with the tool, leaving a few mm length as safety.

## Resistance to chemical agents of polyamide 6.6

Chemical agent	Conc	Res.
	%	
Acetaldehyde - aqueous solution	40	D
Acetamide - aqueous solution	50	B
Amyl acetate	100	B
Butyl acetate	100	B
Methyl acetate	100	B
Lead acetate - water solution	10	D
Acetone	100	B
Acetic acid - concentrated		P
Acetic acid - water solution	10	P
Benzoic acid - a saturated aqueous solution		D
Boric acid - water solution	10	D
Butyric acid	100	D
Citric acid - water solution	10	L
Hydrochloric acid - water solution	2	L
Hydrochloric acid - water solution	10	P
Hydrochloric acid - water solution	36	S
Chromic acid - water solution	1	D
Chromic acid - water solution	10	P
Formic acid - water solution	10	P
Formic acid - water solution	85	S
Phthalic acid - water solution	10	P
Phthalic acid - solution acuosasatura		D
Lactic acid - water solution	10	D
Lactic acid - water solution	90	P
Nitric acid		P
Oleic acid	100	B
Oxalic acid - water solution	10	D
Salicylic acid	100	B
Sulfuric acid - concentrated	98	S
Sulfuric acid - aqueous solution	2	L
Sulfuric acid - aqueous solution	10	P
Tartaric acid		D
Tartaric acid - water solution	10	B
Water (sea, river, drinking distilled)		B
Chlorine water		D
Acrylonitrile	100	B
Amyl alcohol	100	B
Butyl alcohol	100	D
Benzyl alcohol	100	L
Ethyl alcohol	96	D
Isopropyl alcohol		D
Methyl alcohol	100	D
Propyl alcohol		D
Ammonia	10	B
Ammonia - gaseous		L
Acetic anhydride - concentrated		S
Aniline	100	D
Benzaldehyde	100	L
Benzene	100	B
Dichloride of mercury - aqueous solution	6	P
Chrome - aqueous solution	5	D
Sodium bisulfate - aqueous solution	10	B
Bitumen		D
Potassium bromide - water solution	10	D
Sodium Bromide - aqueous solution	10	D
Butane		B
Butyl phthalate		B
Camphor	100	B
Potassium carbonate	100	B
Sodium carbonate - aqueous solution	10	B
Cyclohexane	100	B
Cyclohexanol	100	B
Gaseous Chlorine	100	P
Chlorobenzene		B
Chlorobromometano		D
Chloroform	100	P

Chemical agent	Conc	Res.
	%	
Aluminium chloride - water solution	10	B
Barium chloride - water solution	10	B
Calcium chloride - water solution	10	B
Calcium chloride - water solution	20	S
Ethyl chloride	100	D
Methyl chloride	100	L
Magnesium chloride - water solution	10	B
Sodium chloride - water solution	10	B
Thionyl chloride		P
Vinyl chloride	100	B
Zinc chloride	10	D
Ferric chloride - water solution	10	B
Decalino		B
Diacetone alcohol		B
Ethylene dichloride		B
Diethanolamine		B
Dimethylformamide	100	B
Acetic ether	100	B
Ethyl ether	100	B
Glycol ether		B
Heptane		B
Hexane		D
Phenol - aqueous solution		S
Formaldehyde - aqueous solution	30	B
Formamide		D
Sodium phosphate - aqueous solution	10	B
Glycol butyl	100	D
Ammonium hydroxide - aqueous solution	10	B
Magnesium hydroxide	10	B
Potassium hydroxide - aqueous solution	5	B
Potassium hydroxide - aqueous solution	10	B
Potassium hydroxide - aqueous solution	50	D
Sodium hypochlorite - aqueous solution		B
Isooctane		B
Mercury		B
Methyl ethyl ketone		B
Methyl isobutyl ketone		B
Naphthene		B
Potassium nitrate - aqueous solution	10	B
Sodium nitrate - aqueous solution	5	P
Sodium nitrate - aqueous solution	10	B
Nitrobenzene	100	D
Nitromethane	100	D
Mineral oil		B
Zinc oxide		B
Octyl-phthalate		B
Ozone		P
Perchloroethylene		P
Hydrogen peroxide - aqueous solution	0,5	L
Hydrogen peroxide - aqueous solution	1	P
Hydrogen peroxide - aqueous solution	3	P
Hydrogen peroxide - aqueous solution	30	P
Petrol		B
Magnesium salts - aqueous solution	10	B
Copper salts - aqueous solution	10	B
Caustic Soda - aqueous solution	5	B
Caustic Soda - aqueous solution	10	B
Caustic Soda - aqueous solution	50	D
Aluminium sulphate - aqueous solution	10	B
Copper sulphate - aqueous solution	10	B
Sodium sulfate - aqueous solution	10	B
Carbon disulphide	100	B
Hydrogen sulphide - saturated aqueous solution		P
Lead stearate	100	B
Carbon tetrachloride		B
Trichloroethylene (Trichloroethylene)		D

B = Good resistance without significant variations in weight and/or volume.


D = Discrete resistance with significant variations in weight and/or volume resulting from prolonged contact.

L = Limited resistance: it is possible to use the material in case of short contact.

P = Poor resistance; the material is strongly attacked.

S = Soluble.

## Technical characteristics of raw materials

Materials	Operating temperature		Flammability rating	Humidity absorption		Main characteristics
				23°C 50% U.R.*	Saturation	
<b>Polyamide 6.6 standard</b>	-40°C÷85°C		UL94-V2	2,7%	8,5%	Polyamide 6.6 injection moulding grade. Good resistance to bases, oils, greases, fuel, oil derivate.
<b>Polyamide 6.6 heat stabilized</b>	-40°C÷125°C		UL94-V2	2,7%	8,5%	Polyamide 6.6 heat-stabilized for heat stabilized 6.6 endurance applications to high temperatures.
<b>Polyamide 6.6 UV stabilized</b>	-40°C÷105°C		UL94-V2	2,7%	8,5%	Polyamide 6.6 UV stabilized for improved weather resistance.
<b>Polyamide 6.6 self-extinguishing V0</b>	-40°C÷85°C		UL94-V0	2,7%	8,5%	Polyamide 6.6 self-extinguishing (halogen-free).
<b>Technopolymer (Belturing Plus)</b>	-45°C÷85°C		UL94-HB	0,6%	1,2%	Good resistance to UV rays and weather. Improved shock resistance. Reduced moisture absorption.
<b>Polyethylene HD</b>	-40°C÷100°C		UL94-HB	-	-	High-density polyethylene. Good shock resistance, to bases and weak acids.
<b>Polyethylene LD</b>	-50°C÷85°C		UL94-HB (nat, black) UL94-V2 (white)	-	-	Low-density polyethylene. Good shock resistance, to bases and weak acids.
<b>Polyamide 6</b>	-10°C÷65°C		UL94-HB	3%	9,5%	Polyamide 6 injection moulding grade. Good resistance to bases, oils, greases, fuel, oil derivate.
<b>Polypropylene</b>	-10°C÷105°C		UL94-HB	-	-	Good resistance to high temperatures, bases and weak acids. Any absorption of humidity.
<b>ABS</b>	-10°C÷60°C		UL94-HB	0,3%	-	ABS injection moulding grade. Good mechanical resistance, to bases and weak acids, oils and greases. Good resistance to seawater and corrosive atmosphere. Any absorption of humidity.
<b>PVC (rigid)</b>	-10°C÷70°C		UL94-V0	-	-	Low resistance to acids and solvents. Good aging resistance. No moisture absorption.
<b>PVC (flexible)</b>	-40°C÷70°C		UL94-V1	-	-	Low resistance to acids and solvents. Good aging resistance. No moisture absorption.
<b>Polycarbonate</b>	-5°C÷85°C		UL94-V0	-	-	Low resistance to chemical agents. Good UV resistance.

\*U.R. = relative humidity

# CERTIFICATIONS

## Products' type approvals through International Approval Societies



### UL - FILE E86244

Elematic cable ties are recognized by UL (Underwriters Laboratories Inc.) following the norm UL 62275 - Cable Management Systems - Cable Ties for Electrical Installation.



### DNV - FILE E-11541

DNV certification guarantees that Elematic cable ties comply the "Det Norske Veritas" standards for the fixing of cables in the naval constructions and offshore, for indoor and outdoor installations.



### DNV-GL - FILE E-13898

DNV-GL certification guarantees that Elematic cable ties comply the "Det Norske Veritas" and "Germanischer Lloyd standards for the fixing of cables in the naval constructions and offshore, for indoor and outdoor installations.



### LLOYD'S REGISTER - CERTIFICATE N° 09/00025

The English Lloyd's Register Homologation certifies the mechanical properties and the flame resistance of Elematic cable ties in the shipbuilding and offshore applications.



### BUREAU VERITAS - CERTIFICATE N° 13190/C0 BV

This homologation, according to IEC 60092-IEC 62275 normative, assures that Elematic cable ties are made in accordance to "Bureau Veritas" standards for the fixing cables in shipbuilding.



### GL GERMANISCHER LLOYD CERTIFICATE N° 99 332 - 97 HH

Certifies the mechanical properties and the flame resistance of Elematic cable ties for applications on maritime and energy sector.



### R.I.N.A. CERTIFICATE N° ELE040812CS

Italian Naval Register Homologation following the norm IEC EN 60092-101 "Electrical Installations in Ship" for the flame test in shipbuilding and offshore applications.

## Self declarations



### CE Marking

Elematic certifies the conformity of its cable ties to the norm L.V. 2006/95/EC.

### CEI EN 62275

Elematic cable ties are internally tested following the European Norm "Cable ties for Electrical Installation". The results are in accordance with the requirements of the regulation.

### WEEE - ELV - REACH (REGULATION EC 1907/2006)

Materials used for Elematic cable ties & accessories are compliant to European directives regarding WEEE (waste of Electrical and Electronic Equipment - 2012/19/UE), ELV (life vehicles - 2000/53/CE), REACH (the materials used for the production of our articles do not contain the substances listed in the "Candidate List of Authorization" or in the attachment XIV of the EC 1906/2007).

## Quality system

### ISO 9001:2008

The company is certified ISO 9001:2008 for the design and manufacturing of cable ties and fixing systems with engineering polymers and trading of fixing and cabling accessories. This certification guarantees that all the steps of our company processes, from development to delivery, are controlled following detailed procedures.

### ISO 14001:2004

Aware of the importance of our impact on the environment, we developed a certified environmental management system that leads us to reduce as much as possible this impact. All our Italian sites are certified according ISO 14001:2004 standard with the aim of design and manufacturing of cable ties and fixing systems through injection molding, design and manufacturing of our molds and, trading of cabling and fixing accessories.



CABLE TIES // STANDARD //

# STANDARD CABLE TIES



The standard cable ties are produced exclusively in Polyamide 6.6 to avoid problems with separation of material (e.g., metals) during recycling or interference with electronic equipment.

The black cable ties are added with carbon black that gives an UV resistance for outside applications.

## TECHNICAL DATA

Raw material:	polyamide 6.6.
Halogen-free:	
Humidity absorption:	2,7% (50% relative humidity).
Working temperature:	-40°C ÷ 85°C.
Installation temperature:	-10°C ÷ 60°C.
Flammability rating:	UL 94 class V2.
Resistance to external agents:	high resistance to aromatic solvents, oils, greases, oil derivatives, good resistance to bases, limited resistance to acids; not resistant to phenols and to chloride solvents.

## APPROVALS/CERTIFICATIONS

Compliant with norm CEI EN 62275.

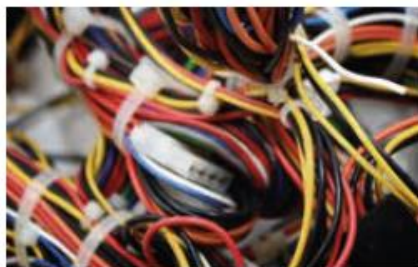


## APPLICATIONS

- ▶ Electrical installations.
- ▶ Industrial wiring.
- ▶ Automotive.
- ▶ Panel building.

## BENEFITS

- ▶ Bent rounded tip for an easier insertion through the head of the cable ties.
- ▶ Rounded edges for the safest application.
- ▶ Low friction coefficient of the material.

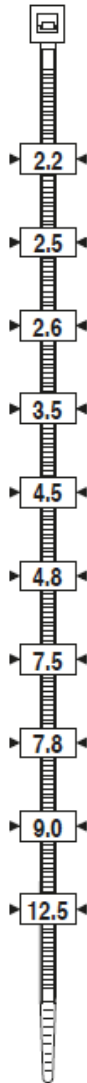


## LINKED PRODUCTS:

Tools for cable ties, see pages 88






**STANDARD CABLE TIES**

Code	Code	Dimensions*	Ø Bundle max	Tensile strength		Pack	Carton
				(kg)	(N)		
Natural	Black	(mm)	(mm)			pcs.	pcs.
5201/CE	5301/CE	2,2x75	15	6,12	60	100	20.000
5201E	5301E	2,2x75	15	6,12	60	1.000	80.000
5203/CE	5303/CE	2,5x98	21	8,16	80	100	15.000
5203E	5303E	2,5x98	21	8,16	80	1.000	40.000
5203/B2	5303/B2	2,5x98	21	8,16	80	20.000	20.000
5205/CE	5305/CE	2,5x135	32	8,16	80	100	12.000
5205E	5305E	2,5x135	32	8,16	80	1.000	30.000
5206/CE	5306/CE	2,6x160	40	8,16	80	100	10.000
5206E	5306E	2,6x160	40	8,16	80	1.000	25.000
5207/CE	5307/CE	2,6x200	52	8,16	80	100	8.000
5207E	5307E	2,6x200	52	8,16	80	1.000	25.000
5209/CE	5309/CE	3,5x140	35	18,36	180	100	7.000
5209E	5309E	3,5x140	35	18,36	180	1.000	20.000
5214/CE	5314/CE	3,5x200	50	18,36	180	100	7.000
5214E	5314E	3,5x200	50	18,36	180	1.000	15.000
5210/CE	5310/CE	3,5x290	80	18,36	180	100	4.500
5210E	5310E	3,5x290	80	18,36	180	500	10.000
5208E	5308E	3,5x370	103	18,36	180	100	4.000
5212/CE	5312/CE	4,5x120	24	22,44	220	100	8.000
5212E	5312E	4,5x120	24	22,44	220	1.000	20.000
5211/CE	5311/CE	4,5x160	40	22,44	220	100	6.000
5211E	5311E	4,5x160	40	22,44	220	1.000	15.000
5213/CE	5313/CE	4,8x178	45	22,44	220	100	5.000
5213E	5313E	4,8x178	45	22,44	220	1.000	12.000
5215/CE	5315/CE	4,8x200	50	22,44	220	100	4.000
5215E	5315E	4,8x200	50	22,44	220	1.000	10.000
5216/CE	5316/CE	4,8x250	68	22,44	220	100	4.500
5217E	5317E	4,5x290	79	22,44	220	100	3.500
5219E	5319E	4,5x360	100	22,44	220	100	3.000
5218E	5318E	4,8x390	106	22,44	220	100	5.000
5220E	5320E	4,5x430	115	22,44	220	100	5.000
5221E	5321E	7,8x120	25	55,08	540	100	4.000
5223E	5323E	7,8x180	45	55,08	540	100	2.500
5225E	5325E	7,8x240	63	55,08	540	100	2.000
5226E	5326E	7,8x300	80	55,08	540	100	1.500
5227E	5327E	7,5x365	100	55,08	540	100	1.500
5229E	5329E	7,5x450	130	55,08	540	100	2.500
5231E	5331E	7,5x540	158	55,08	540	100	2.000
5233E	5333E	7,5x750	220	55,08	540	100	1.200
5234E	5334E	9,0x780	233	71,4	700	100	1.000
5235E	5335E	12,5x225	57	110	1.080	50	2.000
5237E	5337E	12,5x500	143	110	1.080	50	1.000
5239E	5339E	12,5x720	213	110	1.080	50	600
5241E	5341E	12,5x850	255	110	1.080	50	600
5243E	5343E	12,5x1.000	302	110	1.080	50	500

\* The nominal dimensions can slightly change according to the utilized mould