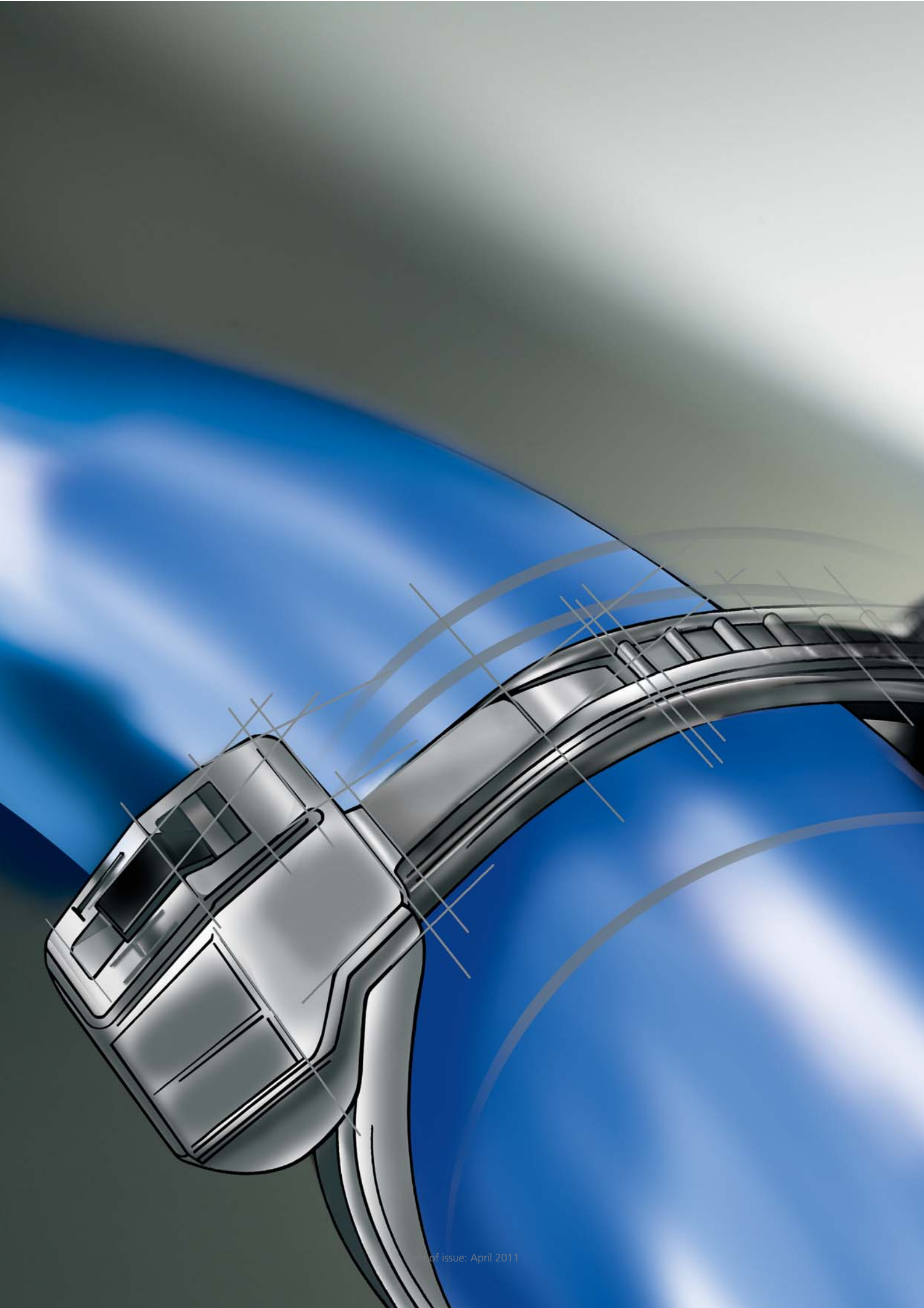

Date of issue: April 2011

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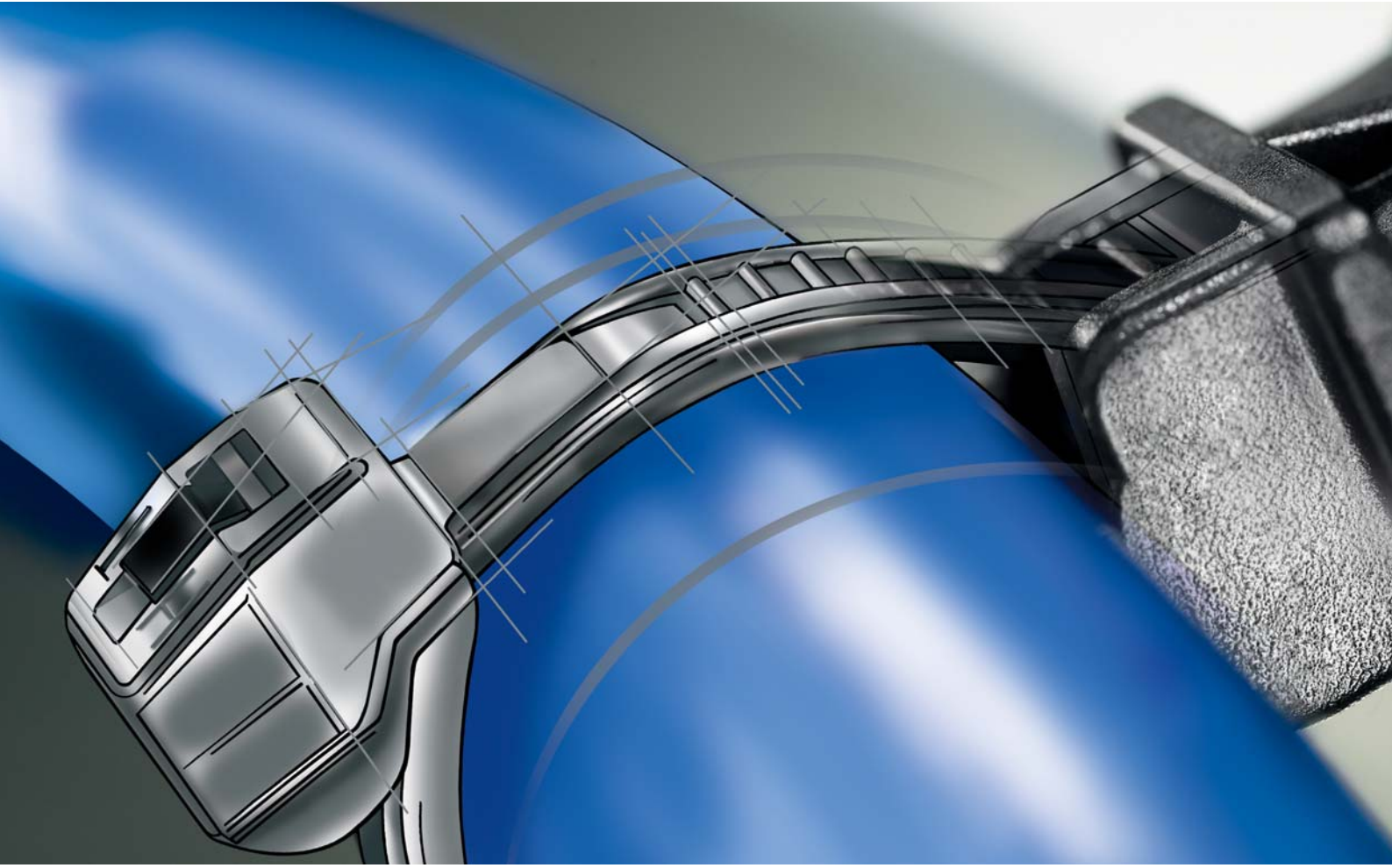
Cable Ties and Fixings

Date of issue: April 2011

HellermannTyton



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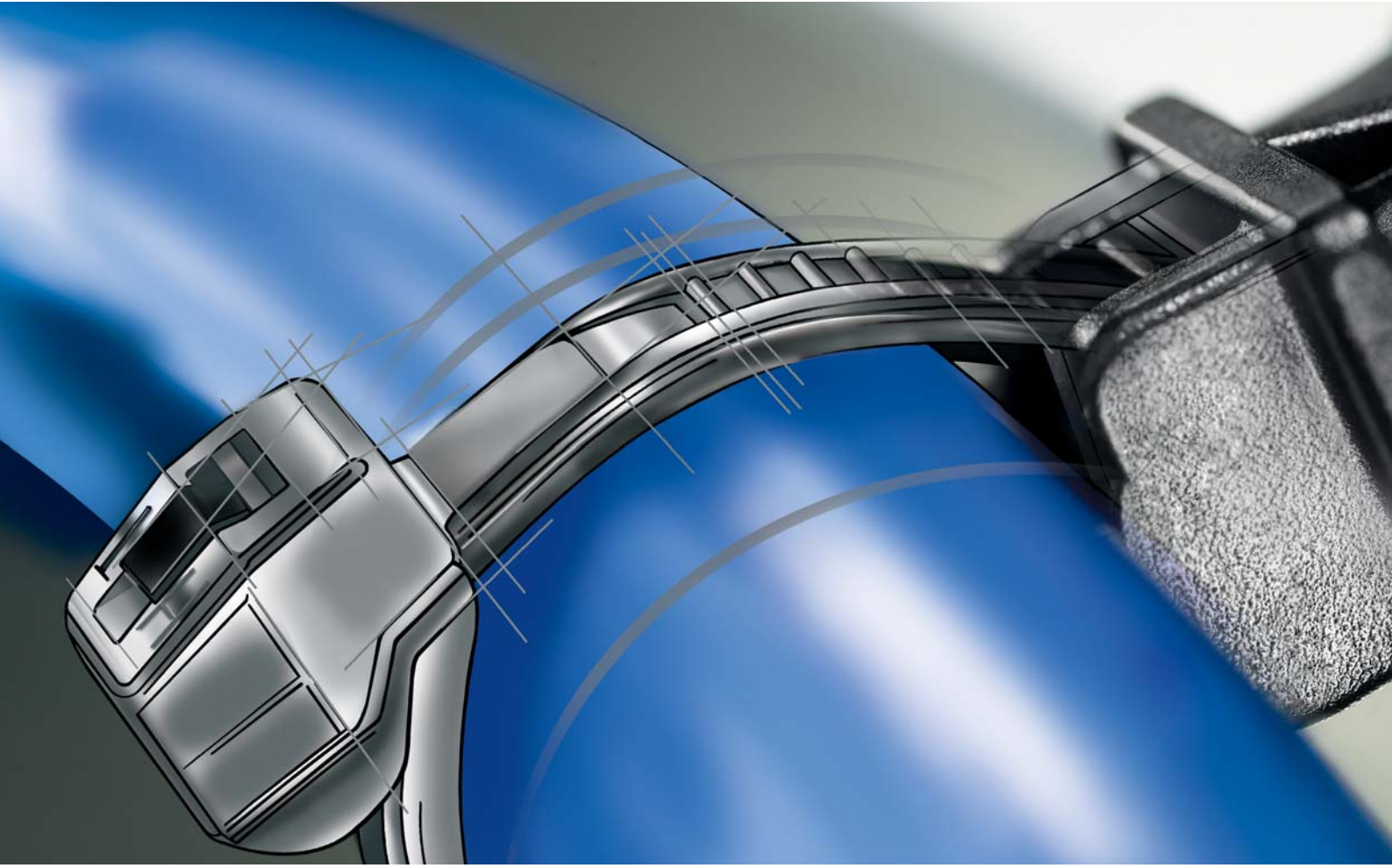
Cable Ties and Fixings



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Cable Ties and Fixings

Date of issue: April 2011

HellermannTyton

Properties of polyamide PA66

Polyamides are among the most important thermoplastic synthetic materials. Thermoplastics can be reshaped by heating as often as required without undergoing chemical decomposition or other negative changes. This makes polyamide ideal for processing via injection moulding into high quality products. About 90% of cable ties and fixings from HellermannTyton are made from this material. Polyamide is also known under the brand name of Nylon®, which was introduced by the Dupont company.

The inner structure of polyamide displays a partial order of polymer chains, i.e. polyamides are partially crystalline. Due to the tighter packing of the individual molecular chains polyamide only has limited transparency to light. The plastic is therefore described as translucent.

The molecular chains of PA66 are made from two base units:

[-NH(CH2)6NH-CO(CH2)4CO]

1st base unit with 6 C atoms — 2nd base unit with 6 C atoms

Each base unit contains 6 carbon atoms (C). Hence the name PA66.

The polyamide PA66 has many properties which are highly advantageous for HellermannTyton cable ties and fixings, such as:

- High strength, rigidity and hardness
- High dimensional stability, even under the effect of heat
- High abrasion resistance

Having a wide range of polyamides and additives allows for an optimum adaptation of the properties of the finished product to suit the respective requirements.

The following PA66 variants are used for HellermannTyton products:

- Polyamide 6.6 standard (PA66) for temperature conditions of up to +85°C
- Polyamide 6.6 Heat Stabilised (PA66HS) for temperature conditions of up to +105°C
- Polyamide 6.6 UV Stabilised (PA66W) for exterior use
- Polyamide 6.6 Heat Stabilised and UV Stabilised (PA66HSW) for exterior use up to +105°C
- Polyamide 6.6 Impact Resistant (PA66HIR) for high elasticity requirements
- Polyamide 6.6 impact Resistant and Heat Stabilised (PA66HIRHS) for high elasticity requirements and temperatures up to +105°C
- Polyamide 6.6 V0 for high standards of fire protection.

Water content in polyamide

Polyamide is a hygroscopic material - this means that it absorbs and releases water. The mechanical properties are significantly affected by the water content – especially flexibility and minimum tensile strength. In a standard atmosphere of 23°C and 50% relative humidity, the degree of water saturation of polyamide is around 2.5%. For optimal processing of cable ties it is therefore important that the polyamide has a water content of approximately 2.5% in a state of equilibrium.

The quality and functionality of the products are thus affected by the water content, therefore the correct storage of our products is crucial. Please read our separate instructions on storage.

Since humidity is so critical to the quality of the tie, the question arises: What happens if the tie is installed and the water content in the tie alters?

The water content determines the flexibility and strength of a tie. At a water content of approximately 2.5% the tie has the ideal flexibility for installation. When the strap is being threaded through the head of the tie, the pawl must be flexible enough to "see-saw" over the serration of the strap without breaking. On the other hand, there must also be adequate material rigidity for the serrations of the pawl to engage with the serrations of the strap during the tying process so that a 'positive locking' action is achieved. After achieving the positive locking action the tie is in a static condition. Changes in the mechanical properties of the tie as a function of water content are insignificant during this status.

For more details on the materials, see page 64.

Properties of UV-stabilised polyamide (PA66W)

The question constantly arises as to whether a black cable tie is suitable for use outside. This is dependant on the application of the tie, but in general the following statements can be made:

A black cable tie made of polyamide 6.6 standard (PA66) is only coloured black with a low proportion of carbon black. This is not sufficient to protect the material from damage caused by UV-radiation in the long term.

Products made from UV-stabilised polyamide PA66W are produced in accordance with ASTM standard D6779 with a higher carbon black percentage of approx. 2%. So they resist UV-radiation in the European area for a considerably longer period than standard PA66.

This is clearly illustrated by the comparison of the two images on the right:

After 500 hours of UV- radiation exposure

Polyamide 6.6 standard (PA66) dyed black:

The joint has been damaged throughout by UV-radiation.

Polyamide 6.6 UV-stabilised (PA66W) with approx. 2% carbon black:

The joint has only been altered at isolated points by the UV-radiation.

For outdoor use, therefore, we recommend our range of products made from UV-stabilised polyamide (PA66W).

A simple practical test: "the hammer test"

You can quickly determine whether or not a cable tie is UV stabilised. Strike with a hammer the tail of the strap on the tie. Hold up this flattened end to the light. Cable ties with a carbon black content of about 2% allow no light through and look black throughout. Standard black ties, however, are transparent on the flattened end.

Properties of polyamide PA12

Apart from PA66, there are polyamides which are less hygroscopic. These include PA12, which has a molecular chain made of a base unit with 12 carbon atoms:

[-NH(CH2)11CO-]

PA12 has the following advantages over PA66:

- Less hygroscopic - saturation at 23°C and 50% relative humidity is approximately 1%.
- Better impact performance.
- Good weather resistance, even without a special additive.

These three properties make PA12 ideal for use outdoors, in particularly when requirements may include impact resistance.

The water absorption of PA12 is not only less than that of PA66 but also slower. This is the requirement where the mechanical properties need to remain relatively unaffected by changing environmental conditions.

Properties of polyamide PA46

Polyamide PA66, despite the use of additives, is not suitable for long-term use in temperatures of +105°C. Due to considerably better heat resistance, polyamide PA46 is more suitable for temperatures of up to and exceeding 150°C (depending on the length of time of operation).

The molecular chain of PA46 is composed of two base units:

[NH-(CH2)4NH-CO-(CH2)4-CO-]

1st base unit with 4 C atoms | 2nd base unit with 6 C atoms

Advantages of PA46 over PA66:

- Greater rigidity, even at higher temperatres.
- Higher operating temperature ranges of up to +150°C (5,000 hours).
- Greater form stability at higher temperatures.
- Excellent chemical resistance.

Properties of Polyetheretherketone PEEK

PEEK, a linear aromatic polymer is semi-crystalline and is widely regarded as the highest performance thermoplastic material currently available. A summary of key physical properties is as follows:

High temperature performance

- Melting temperature of 343 °C (649 °F).
- Continuous Use Temperature of 260 °C (500 °F) (UL 746B).

Wear resistance

- Outstanding wear resistance over wide ranges of pressure, velocity, temperature and counter facial roughness.

Chemical resistance

- Excellent resistance to a wide range of chemical environments, even at elevated temperatures.
- The only common environment that dissolves it is concentrated sulfuric acid.

Fire, smoke and toxicity

- Highly stable and requires no flame-retardant additives to achieve a V-0 rating at 1.45 mm thickness.
- The composition and inherent purity of the material results in extremely low smoke and toxic gas emission in fire situations.

Hydrolysis resistance

- PEEK is not attacked by water or pressurized steam.
- Components that are constructed from these materials retain a high level of mechanical properties when continuously conditioned in water at elevated temperatures and pressures.

Purity

- PEEK materials are inherently pure with exceptionally low levels of ionic extractables.
- Excellent out gassing characteristics.

This makes PEEK the right choice for any high performance application in any industry with a clearly outstanding continuous use temperature of 260 °C.

Radiation Resistance

- Excellent Radiation Resistance due to the energetically stable chemical structure of PEEK.

Properties of Ethylenterafluorine-ethylen (E/TFE)

E/TFE can be best described as a rugged thermoplastic with an outstanding balance of properties.
Mechanically, it is tough, has medium stiffness, impact and abrasion resistance.

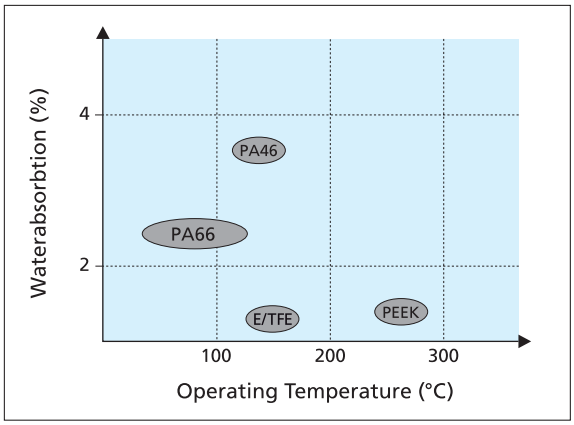
Summary of key properties:

- No load continuous use temperature of 150 °C.
- Weather resistant
- Inert to most solvents and chemicals
- Hydrolytically stable
- Substantially better resistance to radiation than other plastic materials.

E/TFE can perform successfully in applications where other materials are lacking in mechanical toughness, broad thermal capability, ability to meet severe environmental conditions.

General linguistic usage for cable ties made from raw material E/TFE is Tefzel-Tie. In additon to Tefzel from DuPont HellermannTyton is also using equivalent E/TFE raw material from other suppliers.

Tefzel® is a registered trademark of DuPont.



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What does Flammability UL94 mean?

UL is the shortcut for Underwriters Laboratories. This is an independent organisation in the United States to control and certificate product safety.

Beside a lot of product standards UL also specified the flammability test UL94 for plastic materials. UL94 is a material burning test done on defined specimen of the raw material but not a test on final products.

UL94 differs between a horizontal burning test UL94 HB (picture 1) and a vertical burning test UL94 V (picture 2). For the vertical test UL94 V there are three flame ratings defined: UL94 V0, UL94 V1 and UL94 V2.

UL94 HB:

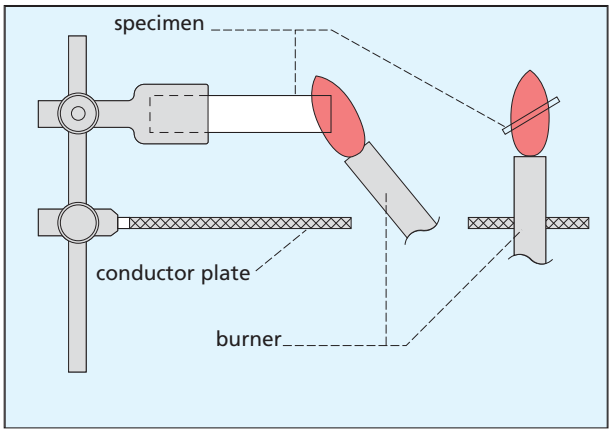
horizontal burning test

Test criteria:

- burning rate of specimen in mm/min.

Classification:

- according to HB



UL94 V:

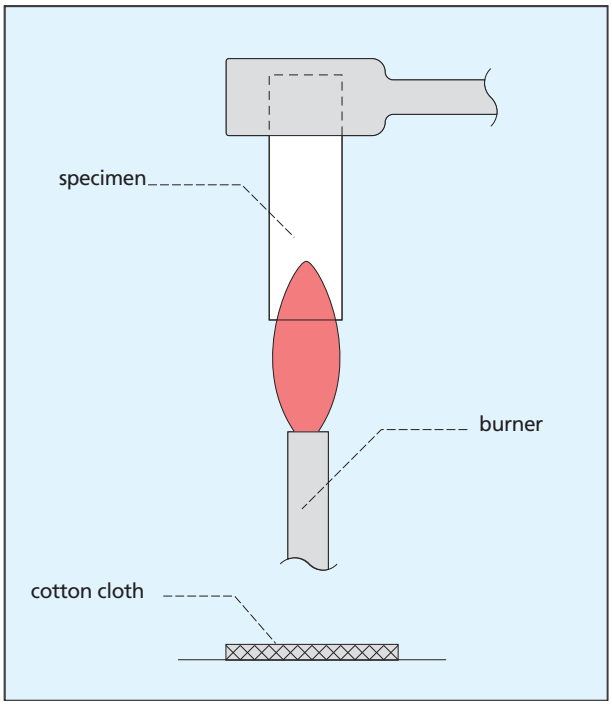
Vertical burning test

Test criteria:

- afterflame time of specimen
- drip of flaming particles

Classification:

- according to V0, V1 or V2



In all these burning test s an open flame is applied for a certain time to the specimen. As the burning behaviour also depends on the thickness of the material it is important to classify the material not only according to HB, V0, V1 or V2 but also to mention the thickness of specimen.

Following table is a summary of test procedures and requirements of the above four UL94 classification.

	Horizontal Test UL94		Vertical Test UL94		
Classification	**HB**		**V0**	**V1**	**V2**
Number of specimen	3	3	5	5	5
Thickness of specimen	< 3 mm	3 to 13 mm		up to max. 13 mm	
1st flame application	30 sec.	30 sec.	10 sec.	10 sec.	10 sec.
2nd flame application	-	-	10 sec.	10 sec.	10 sec.
Burning rate	max. 75 mm/min	max. 40 mm/min	-	-	-
Afterflame time after 1st flame application for each individual specimen	-	-	max. 10 sec.	max. 30 sec.	max. 30 sec.
Afterflame time after 2nd flame application for each individual specimen	-	-	max. 30 sec.	max. 60 sec.	max. 60 sec.
Total afterflame time for all 5 specimen after 1st and 2nd flame application	-	-	max. 50 sec.	max. 250 sec.	max. 250 sec.
Afterflame or afterglow of any specimen up to its end allowed	yes	yes	no	no	no
Cotton indicator ignited by flaming particles or drops allowed	-	-	no	no	yes

Flammability behaviour on the following product pages are always related to the raw material burning rate according to UL94. Most commonly used raw materials for cable ties and fixing elements are Polyamide 6.6 standard, Polyamide 6.6 weather resistant and Polyamide 6.6 heat stabilised. These materials normally fulfill UL94 V2 requirement.

Chemical resistances of various plastics

+ = resistant
o = partly resistant
- = not resistant

These values are only rough guides. They should be regarded as a material specification and are no substitute for a suitability test. Please see our technical datasheets for further details.

Medium	Conc. [%]	Temp. [°C]	PA66	PA46	PA12	POM	PP	TPU	E/TFE (Tefzel®)	PEEK
Acetaldehyde, liquid	100	23	+	-		+	o	-	+	+
Acetone	100	23	+	+	+	+	+	-	+	+
Allyl chloride	100	23					+	-		
Formic acid	98	23	-		-	-	+	-	+	o
Aniline	100	23	+	o	o	o	+	-	+	+
Aromatic compounds						+	-		+	+
Benzaldehyde	any	23	+	o		+	+	-	+	+
Benzine/Benzol mix		23	+	+	+	+	o	o	+	+
Benzol	100	23	+		+	o	o	-	+	+
Bromine		23		-	-		-	-		
Chlorine, gaesous	100	23					-	o	+	
Chlorine, liquefied	100	23		-			-			
Chlorobenzene	100	23			-	o	+			
Chloroform	100	23		-	-	-	o			
Chromic acid	10	20	o	-		o	+		+	+
Chromic acid	20	23	-	-		-	+		+	+
Chromic acid	50	20	-	-		-	+		+	
CFC							o			
Cyclohexane	100	23	+			+	+	+	+	+
Cyclohexanone	100	23	+			+	+		+	+
Decahydronaphthlene	100	23	+			+	o		+	+
Diethyl ether	100	23	+			+	o		+	+
Di-isopropyl ether	100	23					o			
Dimethyl formamide	100	23	+	+		+	+		+	+
Dioctyl phthalate		23	+	+		+	+	-	+	+
Ethanonic acid	10	20	-	o	o	+	+		+	
Ethanonic acid	25	20	-			o	+		+	
Ethanonic acid	50	20	-			o	+		+	
Ethanonic acid	100	23	-	-		o	+		+	
Ethyl acetate	tech.pure	23		+	+	o	o			+
Freon		23					+			+
Heptane	100	23	+	+	+	+	+		+	+
Potass. Permanganate	<= 6	23	-	-	-	+	+		+	+
Ketone			+	+		+	+		+	+
Methylethylketone	100	23	+	+		o	+	-	+	+
Methyisobutylketone	100	23	+			+	+		+	+
Engine oil	100	23			+	+	+			+
Nitrobenzene	100	23	+	o		+	+	-	+	+
Ordinary petrol		23		+		+	+			+
Paraffin oil		23	+	+	+	+	+		+	+
Perchloroethylene		23	+		+	+	o	-	+	+
Petroleum		23	+	+	+	+	+		+	+
Phenol	approx. 70	23	-	-	-	-	+	-	+	
Nitric acid	10	20	-		-	-	+	-	+	+
Nitric acid	50	23	-		-	-	-	-	+	-
Carbon bisulphide	100	23	+	-	+	+	-	-	+	+
Sulphuric acid	10	20	-		o	-	+	+	+	o
Sulphuric acid	50	20	-			-	+	+	+	-
Sulphuric acid	96	23	-	-		-	-	+	+	-
Silicon oil		23	+	+	+	+	+	+	+	+
Salad oil		23		o			+			+
Carbon tetrachloride	100	23	+	+	o	+	o	-	+	+
Toluol	100	23	+		+	+	o	-	+	+
Trichlorethylene	100	23	+	o	o	o	o	-	+	+
Water, cold			+		+	+				+
Water, hot							+			+
Hydrogen peroxide	10	20	o			+	+		+	
Hydrogen peroxide	30	23	-	-		+	+	+	+	
Xylene	100	23	+	+	+	+	o	-	+	+

Tefzel® is a registered trademark of DuPont.

General linguistic usage for cable ties made from raw material E/TFE is Tefzel-Tie. In additon to Tefzel from DuPont HellermannTyton is also using equivalent E/TFE raw material from other suppliers.

Introduction to the main locking technologies used for cable ties

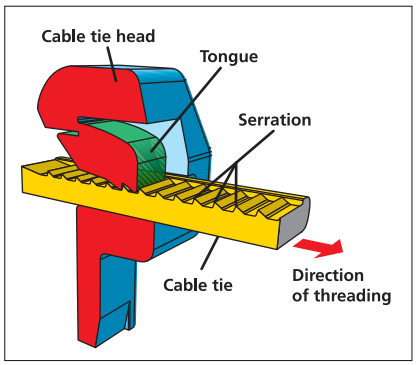
HellermannTyton offers a wide range of cable ties for use in different applications. By constantly refining our products and satisfying the ever-changing demands of the market, various locking technologies have been developed. Below you will find a brief overview of three most common locking technologies and their characteristics.

Cable ties with plastic pawls

This technology is used in 90% of all polyamide (PA) cable ties applied by HellermannTyton. In order to cover a variety of applications, there are different variants of this system, for example: releasable versions, in-line versions, open head versions.These are one-piece cable ties, that is the pawl is moulded as an integral part of the cable tie, thereby building in inherent strengths.

Locking technology

Positive locking is achieved by engaging the pawl with the strap serrations. This allows the cable tie to perform to the published minimum tensile strength, that is the loading that the cable tie can hold under application (see page 35).

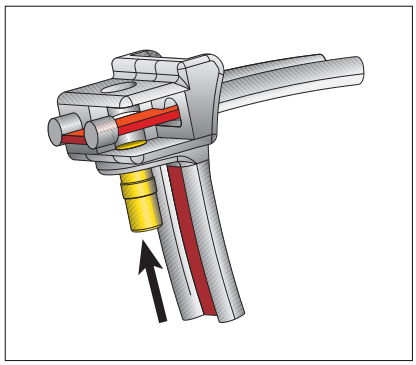


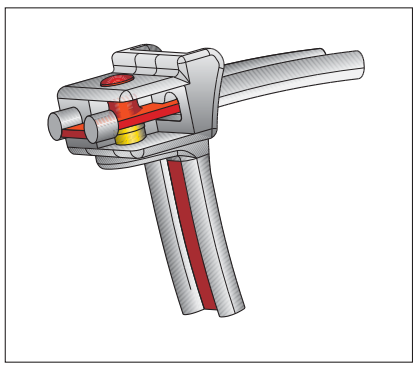
KR series cable ties

This cable tie is distinguished by its smooth strap and unique locking mechanism. With the KR series the chamfered head achieves an especially firm fit around the bundled material.

Locking technology

This patented lock technology takes advantage of the excellent deformation properties of polyamide (PA). Here, the glass fibre-reinforced (GRP) locking pin (yellow) is forced into the strap by the use of an application tool - either the KR6/8 or KR8PNSE (see page 105). The strap is deformed into the head of the tie by the application of the pin, thereby locking the cable tie in position and allowing for the bundling of heavy loads.





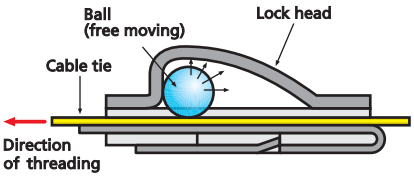
MBT series of cable ties

Made of stainless steel grades 304 or 316, the MBT range of cable ties have no serrations on the strap and are threaded parallel through the head, gliding under a metal ball-bearing locking mechanism. By using the MK9SST (see page 569) application tool the cable tie is tensioned and the strap cut to a flush finish.

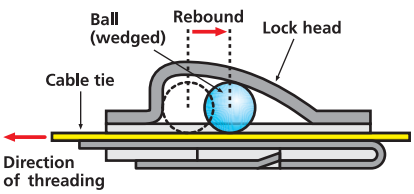
Locking technology

The strap is locked into the head by means of the small ball-bearing. The ball locks into the small end of the wedged shaped housing, forming a positive locking with the strap. This cable tie is not suitable for rigid objects. Retraction of the ball-bearing (see drawing) is required into the small end of the wedged shaped housing to allow for a positive locking of the strap and also to make a flush cut of the end of the strap. Retraction, therefore, cannot take place with the bundling of inflexible materials. To bundle rigid objects LFPC channel (see page 120) should be laid as buffer between strap and bundled material to compensate for this retraction. This locking technology allows for minimum tensile strengths of up to 5400 Newton.

1. Initial position



2. Ball locks cable tie by wedging.



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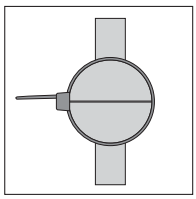
Determination of minimum tensile strength

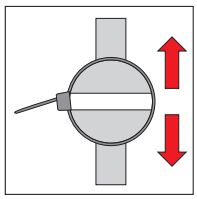
The minimum tensile strength is a critical selection criteria for cable ties. It expresses how much loading a cable tie can bear. This minimum tensile strength is determined in accordance with the Military Specification and Standards of the USA. Test conditions being laid down precisely in MIL-S-23190E:

- Conditioning of the test pieces
- Construction of the test apparatus
- Application of the tie on a split test probe
- Test speed

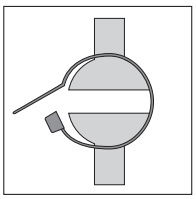
The test procedure to determine minimum tensile strength



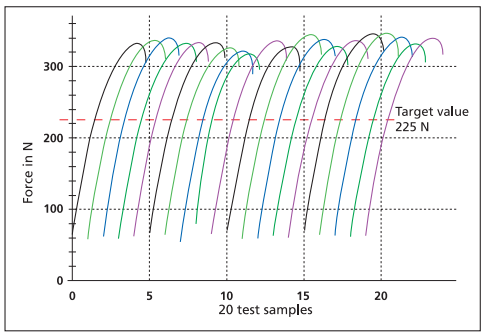
The cable tie is fixed onto a split mandrel test probe with the suitable cable tie application tool.



The mandrel is opened at a defined speed.



The loading at which the cable tie fails is determined. This value is stated in Newtons (N) and is recorded through a computer programme reading the tests. This programme produces graphs as outlined below.



Typical measurement protocol of a T50R made of PA66 with a minimum tensile strength of 225 N.

Explanation of minimum tensile strengths

What does a minimum tensile strength of 225 N (50LBS) mean?

To explain what this value means, the **mass** with which the tie can be loaded is calculated. The unit of measurement of the mass is stated in **kg**. To do so, the unit Newton (N) is shown in the following way:

[N] = [kg * m/s²]

The formula for calculating the mass is:

Mass = minimum tensile strength/ acceleration due to gravity

The acceleration due to gravity is 9.81 m/s²:

Mass = minimum tensile strength/ [kg * m/s²] /9.81 [m/s²]

At a minimum tensile strength of 225 N 50LBS) the mass is:

Mass = 225 [kg * m/s²] /9.81 [m/s²]

The units m/s² cancel each other out, leaving the unit [kg] for the mass. Thus:

Mass = 225/9.81 kg = 22.9 kg

Therefore, a T50R cable tie with a minimum tensile strength of 225 N (50LBS) can be loaded with 22.9 kg.

Conversely, with the required loading capacity the minimum tensile strength can be calculated by a mass:

Min. tensile strength = mass * 9.81[m/s²]

If the tie is to be loaded with, for example, 53 kg this produces:

Minimum tensile strength = [53 kg] * 9.81 [m/s²] = 520 N

In order to withstand a load of 53 kg, the tie must therefore have a minimum tensile strength of 520 N. In this case, select our T120R with a minimum tensile strength of 535 N (120LBS).

225 N/9,81 = 22,9 kg

53 kg * 9.81 = 520 N

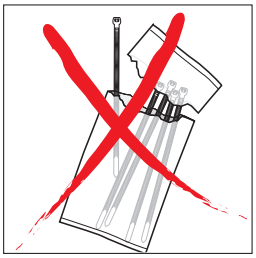
Optimum storage conditions for cable ties made of polyamide (PA)

HellermannTyton cable ties, fastenings and fixings are manufactured from high-quality polyamide (PA). This industrial synthetic material is mainly processed using injection moulding, but can also be extruded.

Polyamide is a hygroscopic material. This means that the material absorbs and loses moisture. For optimum handling of cable ties it is important that the material is in a condition of equilibrium with a water content of approximately 2.5%.

The packaging used by HellermannTyton ensures that the water content in the material remains constant. Therefore, it is important to store the products in their original packaging to preserve the quality of the ties.

Always store ties in the sealed plastic bag made of polyethylene!

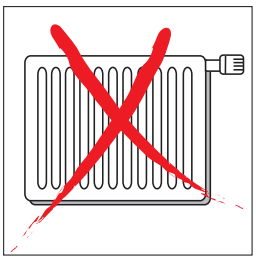


Once opened you should use the ties as quickly as possible!

Do not expose the product to direct sunlight!

Do not store the product in sunlight; for example, on the windowsill!

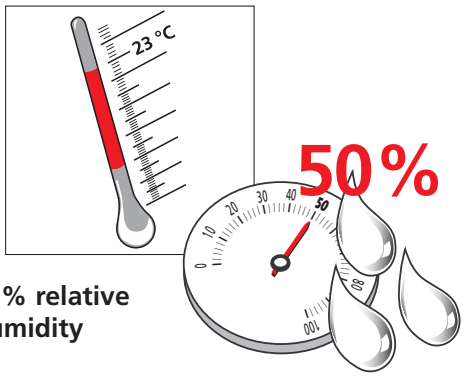
Store the product away from direct sources of heat!



Avoid contact with heat: for example, do not place on the radiators!

The ideal storage conditions are those of the central European standard climate:

23 °C



50% relative humidity

Date of issue: April 2011

HellermannTyton cable ties conform to DIN EN 50146 standard

HellermannTyton are a supplier of high-quality solutions for the routing, oganising and securing of cables, hoses and pipes. The level of quality has been inspected by the VDE (Verband der Elektrotechnik, Elektronik, Informationstechnik e.V) [German Association for Electrical, Electronic and Information Technologies].

Cable ties from the inside-serrated T-Series and the outside-serrated OS-Series have been tested in accordance to the cable tie standard DIN EN 50146 (VDE 0604 PART 201):2000-12; EN 50146:1999-08. The result of this independent testing is complete compliance:

These cable ties therefore qualify to bear the VDE symbol.

In addition to cable ties made of the standard material polyamide 6.6 (PA66), ties made from heat-stabilised (PA66H) and UV-stabilised polyamide 6.6 (PA66W) have been successfully tested and approved.

HellermannTyton is the only manufacturer to offer cable ties with inside and outside serration with DIN approval. So all current applications in the field of electrical installation are covered.

The standard includes the following tests:

- Test of minimum installation temperature
- Test of minimum application temperature
- Minimum tensile strength (in the standard this is described as the looping test)
- Load test and heat ageing test
- Temperature cycle test
- Contribution to the spread of fire
- Corrosion resistance

The following HellermannTyton cable ties have been tested and certified:
T-Series inside-serrated cable ties
(see page 67-73) in the qualities:

Polyamide 6.6 (all colours) 38 types x 11 colours	=	418 cable ties
Polyamide 6.6 heat-stabilised (all colours) 38 types x 11 colours	=	418 cable ties
Polyamide 6.6 UV-stabilised (black) 38 types in black	=	38 cable ties
Total number of cable ties in T-Series to DIN standard		**874 cable ties**

OS-series outside-serrated cable ties
(see page 91-92)

Polyamide 6.6 heat-stabilised (all colours) 7 types x 11 colours	=	77 cable ties
Total number of cable ties in OS series to DIN standard	=	77 cable ties
Total number of HellermannTyton cable ties to DIN standard		**951 cable ties**

For further information on materials, see page 64.

Material overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited
These details are only rough guide values. They should be regarded as a material specification and are no substitute for a suitability test. Please see our datasheets for further details.

		Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Cable Ties Inside Serrated														
T-Series PA66, natural	68	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
T-Series PA66W, black	69	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■	□	■
T-Series PA66, black	70	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
T-Series PA66, coloured	71	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
T-Series PA66HS, natur	72	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
T-Series PA66HS, black	73	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
T-Series PA66HIR(S)	74	PA66HIR(S)	-40 °C to +80 °C, Intermittent up to +105 °C (500h)	o	++	+	++	o	■	■	■	■	□	■
T-Series PA66V0	75	PA66V0	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	++	■	■	■	■	□	■
T-Series PA46	75	PA46	-40 °C to +150 °C für 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
T-Series E/TFE	76	E/TFE	-80 °C to +150 °C	++	++	++	++	++	■	■	■	■	□	■
T-Series PP	76	PP	-40 °C up to +85 °C, Intermittent up to +105 °C (500h)	1) ++	++	+	++	o	■	■	■	■	□	■
MCT-Series	77	PA66MP	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+		■	□	□	■	
LK-Series	78	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
LK-Series	78	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■	□	■
LK-Series	78	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
LK-Series	78	PA66HIR(S)	-40 °C to +80 °C, Intermittent up to +105 °C (500h)	o	++	+	++	o	■	■	■	■	□	■
Q-ties, coloured	84	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	□
Q-ties, black	82	PA66W	-40 °C to +85 °C Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■	□	□
Q-ties, natural	83	PA66HS	-40 °C to +105 °C Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	□
Q-ties, black	83	PA66HS	-40 °C to +105 °C Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	□
Wide Strap Cable Ties	87	PA66HIRHS	-40 °C to +110 °C	o	++	+	++	+	■	■	■	■	□	■
CTT-Series up to 265 N loop tensile strengh	88	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
CTT-Series up to 265 N loop tensile strengh	88	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
CTT-Series up to 265 N loop tensile strengh	88	PA66HSW	-40 °C to +105 °C	++	++	+	++	+	■	■	■	■	□	■
HT-Series up to 535 N loop tensile strengh	88	PA66HS	-40 °C up to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
DH-Series	89	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■	□	■
DH-Series	89	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
DH-Series	89	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
DH-Series	89	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■	■	□	■

* Only valid for Central European Climate 1) only PP black

Possible applications								Sample applications																			
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Bundling of cables and wires	Bundling of optical cables	Bundling of hoses	Sensitive insulation	For restricted space	Fastening bellows	Cable tray	Cable routing on catenary & carrier	Harnessmakers	Identification	Post-installation fastening	Parallel Wires	Switch cabinet installation	Hose fixture	Heavy duty application	Securing packaging	Temporary fastening	Transformer	Turbines and engines
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Material Overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited

These details are only rough guide values. They should be regarded as a material specification and are no substitute for a suitability test. Please see our datasheets for further details.

		Material Data		Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Cable Ties Inside Serrated														
OS-Series	91	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
OS-Series	91	-HOI PA66V0	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	++	■	■	■	■	□	■
OS-Series	91	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
PEEK Ties	93	PEEK	-55 °C to +240 °C	++	++	++	++	++	■	■	□	■	□	■
V-Series	94	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
V-Series	94	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
PE-Series E.D.F. approved	95	PA66HSW	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■	□	□
PE-Serie E.D.F. approved	95	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	□
RPE-Series releaseable E.D.F. approved	95	PA66HSW	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■	□	□
LPH-Series	96	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	□
Releasable Cable Ties														
RELK-Series up to 200 N loop tensile strengh	97	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■		
RLT-Series up to 670 N loop tensile strengh	97	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■		
RLT-Series up to 670 N loop tensile strengh	97	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■		■
RLT-Series up to 670 N loop tensile strengh	97	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■		
RT250-Series	98	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■		■
RT250-Series	98	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■		■
REL-Series	99	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■		
REL-Series	99	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■	■		
REL-Series	99	PA66HIR(S)	-40 °C to +80 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■		
LR55-Series	100	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	□
LR55-Series	100	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■	■	□	■
SOFTFIX-Family	101	TPU	-40 °C to +85 °C	++	+	o	o	+	□	■	■	■		■
SRT-Series	101	TPU	-40 °C to +85 °C	++	+	o	o	+	□	■	■	■		■
REZ-Series	102	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	□	
SpeedyTie	103	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	□	■			□	□
SpeedyTie	103	PA66HIR(S)	-40 °C to +80 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	□	■				□
TEXTIE-Series	104	PA, PP	-20 °C to +75 °C	o	++	o	o	o	■	□	■	■	□	□

* Only valid for Central European Climate

Date of issue: April 2011

Possible applications								Sample applications																			
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Bundling of cables and wires	Bundling of optical cables	Bundling of hoses	Sensitive insulation	For restricted space	Fastening bellows	Cable tray	Cable routing on catenary & carrier	Harnessmakers	Identification	Post-installation fastening	Parallel Wires	Switch cabinet installation	Hose fixture	Heavy duty application	Securing packaging	Temporary fastening	Transformer	Turbines and engines
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Material Overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited
These details are only rough guide values. They should be regarded as a material specification and are no substitute for a suitability test. Please see our datasheets for further details.

	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Material Data				**Resistant properties**					**Possible applications**					
Cable Ties without serration														
KR-Series	105	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	□		□		□
KR-Series	105	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■		□		■
KR-Series	105	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■		□		□
KR-Series	106	PA12	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	+	++	+	+	+	■	■		□		□
KR-Series	106	PA46	-40 °C to +150 °C für 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■		□		■
EL-TY-Series	108	POM	-40 °C to +85 °C	++	++	++	++	+	□	■		□		□
Cable Ties for direct fixation														
TAS-Series	109	PA66HIRHS, PPW	-40 °C to +110 °C, -40 °C to +115 °C	o	+	+	+	o	□	■		■		
CTF-Series	110	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+		■	■	■	□	
BHT-Series, with round head	111	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	□				■
CT-Series, with square head	111	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	□				■
DE 863220, with square head	111	PA66HS	-40 °C to +105 °C Intermittent up to +145 °C (500h)	o	++	+	++	+	■	□				■
Stainless Steel Cable Ties														
AMT-Series, Metal Banding for Heavy Duty Application	113	SS316	-80 °C to +538 °C	++	++	++	++	++	■	■	□	■	■	■
MBT-Series with Ball-Lock	114	SS304	-80 °C to +538 °C	++	++	++	++	++	■	■	□	■	■	■
MBT-Series with Ball-Lock	115	SS316	-80 °C to +538 °C	++	++	++	++	++	■	■	□	■	■	■
MBTXHD- / MBTUHD-Series, Double Band Cable Ties with Ball-Lock	116	SS316	-80 °C to +538 °C	++	++	++	++	++	■	■	□	■	■	■
MBT-FC-Series, Cable Ties with Ball-Lock and Coating	117	SS316, SP	-80 °C to +538 °C, -50 °C to +150 °C	+	+	+	+	++	■		□	■		■
MLT-Series, Cable Ties with Folt Locking	118	SS316	-80 °C to +538 °C	++	++	++	++	++	■	■	□	■	■	■
MLT-C-Series, Cable Ties with Folt Locking	118	SS316, SP	-80 °C to +538 °C, -50 °C to +150 °C	+	+	+	+	++	■		□	■		■
MAT-Series, Cable Ties with Raster Locking	119	SS316	-80 °C to +538 °C	++	++	++	++	++	■	■	□	■	■	■
MAT-C-Series, Cable Ties with Raster Locking	119	SS316, SP	-80 °C to +538 °C, -50 °C to +150 °C	+	+	+	+	++	■		□	■		■
LFPC Protective Channel	120	PO	-40 °C to +90 °C	+	+	+	+	++				■		■

* Only valid for Central European Climate

Possible applications									Sample applications																				
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Bundling of cables and wires	Bundling of optical cables	Bundling of hoses	Sensitive insulation	For restricted space	Fastening bellows	Cable tray	Cable routing on catenary & carrier	Harnessmakers	Identification	Post-installation fastening	Parallel Wires	Switch cabinet installation	Hose fixture	Heavy duty application	Securing packaging	Temporary fastening	Transformer	Turbines and engines
	■	■	■	□		■	□	■		■			■			□		■			□	□	■			
	■	■	■	□		■	□	■		■			■			□		■			□	□	■		■	■
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Material Overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited

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	Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Electronics	Aerospace industries	Military industry	Public Buildings
Fixing Ties														
1-Piece fixing ties with arrowhead														
• with Disc	123	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc	123	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc, releasable	123	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc, releasable, for oval Holes	123	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc in the strap	125	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc in the strap	125	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings	126	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings	126	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■			
• with Wings	126	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings	126	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	o	■	■	■			
• with Wings	127	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■	■	■			
• with Wings, releasable	128	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings, releasable, for Oval Holes	127	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings, releasable, for Oval Holes	127	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings in the strap T80RSF6.5F/W	129	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Wings in the strap T80RSF6.5F	129	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• T30RSF(U), T50RSF(E)	130	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• T30RSF(U)	130	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
2-Piece fixing ties with arrowhead														
• with Disc	131	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc, sealed	131	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc, for Oval Holes	132	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• for parallel routing	132	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• with Disc, for high temperature applications (T50ROSP1/2SFT65)	133	PA46, PEEK	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			

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Possible applications					Sample applications																					
Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	Wind energy	Edge Fastening on steel plate	Fixing with self adhesive base	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	Bundling of optical cables	Fastening bellows	For thin, sensitive insulation	For restricted space	Harnessmakers	Identification of packaging	Post-installation fastening	Parallel Wires	Switch cabinets	Welded or threaded studs	Blind hole with thread	Securing packaging	Underwater use	Temporary fastening	Turbines and Engines	Strain relief
■	■							■	■	■					■				■							
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Material Overview

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	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Electronics	Aerospace industries	Military industry	Public Buildings
		Material Data		Resistant properties					Possible applications				
Fixing Ties													
1-Piece fixing ties with Fir Tree Mount													
• with Disc	134	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc	134	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc	135	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■	■	■		
• with Disc	135	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc, releasable	135	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc, for Oval Holes	135	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■	■	■		
• with Disc, for Oval Holes	135	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■		
2 Pieces Fixing Ties with Fir Tree													
• with Disc	136	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc	136	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc	136	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• with Disc	137	PA66HIR(S)	-40 °C to +80 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■			
• with Fir Tree, with Disc, for oval Holes	137	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h), -40 °C to +105 °C	o	++	+	++	+	■	■	■		
1-Piece Fixing Ties for Weld Studs													
• with plate to fix isolation material T50SOSSBH5E	138	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• for cable routing above the stud T50SOSSBS5OTE	138	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• for cable routing alongside the stud, T50SOSSBS5E	139	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• moveable, T50SOSSB5-High-E-C-CC	139	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• moveable T50SOSSB6HE	139	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• moveable, WSP- Series	139	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• for routing close to the stud, LFC Series	140	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• for routing close to the stud, LFC Series	140	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• for Heavy Duty Applications, WS-Series for 6 mm studs	141	PA66HIRHS	-40 °C to +110 °C	o	++	+	++	+	■	■	■		
• for Heavy Duty Applications, WSI380 for 9 mm studs	141	PA66HIRHS	-40 °C to +110 °C	o	++	+	++	+	■	■	■		

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	Possible applications					Sample applications																					
	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	Wind energy	Edge Fastening on steel plate	Fixing with self adhesive base	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	Bundling of optical cables	Fastening bellows	For thin, sensitive insulation	For restricted space	Harnessmakers	Identification of packaging	Post-installation fastening	Parallel Wires	Switch cabinets	Welded or threaded studs	Blind hole with thread	Securing packaging	Underwater use	Temporary fastening	Turbines and Engines	Strain relief
	■	■							■	■	■					■		■		■		■					
	■	■			■				■	■	■					■				■		■				■	
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Material Overview

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	Page	Material	Operating Temperature [°C]	Material Data / Resistant properties: UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Possible applications: Automotive industries	Electronics	Aerospace industries	Military industry	Public Buildings
Fixing Ties													
• for Heavy Duty Applications, for parallel routing DCT-series	142	PA66HIR	-40 °C to +80 °C, Intermittent up to +110 °C (500h)	o	++	+	++	+	■	■	■		
• for Heavy Duty Applications, for parallel routing, SDCTR312 for 8.0 mm studs	143	PA66HIRHSW	-40 °C to +110 °C	++	++	+	++	+	■	■	■		
• in the strap	144	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• in the strap, releasable RT50RS5	144	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• releasable, with flexible strap	145	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■		
• releasable, Hard Push	145	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• releasable, Hard Push	145	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■		
2-Piece Fixing Ties for Weld Studs	146	PA66HS, PA66	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• with Plate (for isolation material)	147	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• moveable	146	PA66HS, POM	-40 °C to +105 °C, Intermittent up to +145 °C (500h), -40 °C to +90 °C, Intermittent up to +110 °C (500h)	o	++	+	++	+	■	■	■		
• moveable	146	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■		
• for parallel routing, T50SDSBS5	148	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	o	■	■	■		
• for parallel routing, T50ROSDSBS5	148	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
Fixing Ties for Edges • 1-Piece, 1.0 - 3.0 mm, Edge Clip	149	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h), -40 °C to +105 °C	o	++	+	++	o	■	■	■	■	
• 2-Piece, 1.0 - 3.0 mm, Edge Clip	151	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h), -40 °C to +105 °C	o	++	+	++	o	■	■	■	■	
• 2-Piece, 1.0 - 3.0 mm, Edge Clip 1.0 - 3.0 mm	151	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■		
• 2-Piece, 3.0 - 6.0 mm, Edge Clip	152	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	o	■	■	■	■	
• 2-Piece, twistable, CBT30MR, rotatable 360°	153	PA66HS, POM	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• 2-Piece, twistable, CBTO50R, rotatable 90°	153	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		
• 2-Piece, twistable, CBTOS50RStud5, for parallel routing	153	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■		

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Possible applications					Sample applications																						
Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	Wind energy	Edge Fastening on steel plate	Fixing with self adhesive base	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	Bundling of optical cables	Fastening bellows	For thin, sensitive insulation	For restricted space	Harnessmakers	Identification of packaging	Post-installation fastening	Parallel Wires	Switch cabinets	Welded or threaded studs	Blind hole with thread	Securing packaging	Underwater use	Temporary fastening	Turbines and Engines	Strain relief
■	■								■	■					■			■	■	■					■	
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	Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Electronics	Aerospace industries	Military industry	Public Buildings	
Fixing Ties														
• 2-Piece, for Holes T50ROSEC2.5A for routing parallel to an edge	154	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• 2-Piece, for Holes T50REC2.5B, for routing horizontal to an edge	154	PA66HS PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
2-Piece Fixing Ties with Pipe Clip	155	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• twistable 90°	155	PA66HS, PA66HIRHS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• twistable 360°	156	PA66HS, PP	-40 °C to +105 °C, Intermittent up to +145 °C (500h),	o	++	+	++	+	■	■	■			
• twistable 360°	156	PA66HS, PA66HIRHS	-40 °C to +105 °C Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• twistable 360°	156	PA66HS	-40 °C to +105 °C, Intermittent up to +145 °C (500h)	o	++	+	++	+	■	■	■			
• twistable 360°	156	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
2-Piece Fixing Ties for Heavy Duty Applications, for Screws														
• HDM6-Series for M6 screws	157	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• HDM6-Series for M6 screws	157	PA66HIRHS	-40 °C to +105 °C -40 °C to +150 °C for 5.000 h,	o	++	+	++	+	■	■	■			
• HDM8-Series for M8 screws	157	PA46	Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• HDM8-Series for M8 screws	157	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■	■	■			
1-Piece Fixing Ties • with Mounting Head for Screws	158	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with Mounting Head for Screws	158	PA66W	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	++	++	+	++	+	■	■	■			
• with flexible strap, releasable	159	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■			
• with flexible strap, releasable	159	PA12	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	+	++	+	+	+	■	■	■			
• with peg, WPT230	160	PA66HIR	-40 °C to +80 °C, Intermittent up to +105 °C (500h)	o	+	+	+	o		■			■	
• with Self Adhesive Socket, T18RSA	160	PA66	-40 °C to +85 °C, Intermittent up to +105 °C (500h)	o	++	+	++	+	■	■	■	■	■	
2-Piece Fixing Ties • for parallel separation, T50RCoupler	161	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■	■	■			
• for parallel separation, T50RCoupler	161	PA46	-40 °C to +150 °C for 5.000 h, Intermittent up to +195 °C (500h)	o	++	+	++	+	■	■	■			
• for parallel separation, T120RCoupler	161	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■	■	■			

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Possible applications					Sample applications																							
Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	Wind energy	Edge Fastening on steel plate	Fixing with self adhesive base	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	Bundling of optical cables	Fastening bellows	For thin, sensitive insulation	For restricted space	Harnessmakers	Identification of packaging	Post-installation fastening	Parallel Wires	Switch cabinets	Welded or threaded studs	Blind hole with thread	Securing packaging	Underwater use	Temporary fastening	Turbines and Engines	Strain relief
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Material Overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited

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	Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Cable Tie Mounts														
Fixing Parts with Special Adhesive														
• SolidTack-Series	163	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• SolidTack-Series	163	PA66HIR	-40 °C to +80 °C, interm. up to +105 °C (500h)	o	+	+	+	o	□		■	■		■
Screw Fixing Cable Tie Mounts														
• MB-Series Square-Cut	164	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• TY-Series longish design	165	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• TY-Series longish design	165	PA66W	-40 °C to +85 °C, interm. up to +105 °C (500h)	++	++	+	++	+	■		■	■		■
• Q-Mounts Series QM, natural	166	PA66	-40 °C to +85 °C, Interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• Q-Mounts Series QM, black	166	PA66	-40 °C to +85 °C, Interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
Paste Adhesive Mount														
• PMB5	167	PA66HS	-40 °C to +105 °C, interm. up to +145 °C (500h)	o	++	+	++	o	■			■		
Screw Fixing Mounts														
• LKC with overlapping curved design	168	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• NY with curved design	168	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• KR with curved design for KR-Ties	169	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• KR with curved design for KR-Ties	169	PA66W	-40 °C to +85 °C, interm. up to +105 °C (500h)	++	++	+	++	+	■		■	■		■
• KR with curved design for KR-Ties	169	PA66HS	-40 °C to +105 °C, interm. up to +145 °C (500h)	o	++	+	++	+	■		■	■		■
• KR-E/TFE for a broad temperature range	169	E-TFE	-80 °C to +170 °C	++	++	++	++	++	■	■	■	■		■
• CTM with curved design for big bundle diameters	171	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• CTQM with curved design for Q-ties	170	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+			■	■		
• CTAM with small space requirement	172	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• CTAM-PEEK for high temperature applications up to +240 °C	172	PEEK	-55 °C to +240 °C	+	++	++	++	++	■	■	■	■		■
• MB with flat design	173	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• TY with compact curved design	173	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• LKM / CL with curved design for sideways fixing	174	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• LKM / CL with curved design for sideways fixing	174	PA66W	-40 °C to +85 °C, interm. up to +105 °C (500h)	++	++	+	++	+	■		■	■		■
• FH for sideways fixing	174	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■	■		■

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	Possible applications								Sample applications																		
	Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Edge Fastening on steel plate	Fixing on uneven surfaces	Fixing with self adhesive base	Fixing of Flat Ribbon Cables	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	For restricted space	Harnessmakers	Adhesive bonding on low energy surfaces	Post-installation fastening	Parallel Wires	Blind hole with thread	Switch cabinets	Hose Connector	Welded or threaded studs	Heavy Duty Application	Turbines and engines
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Material Overview

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			Material Data		Resistant properties					Possible applications						
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Cable Tie Mounts																
Harness Clip for Heavy Duty Applications, for Screws or Studs																
• Standard Torque Mounts	175	PA66HIR	-40 °C to +80 °C, interm. up to +105 °C (500h)	o	++	+	++	+	■		■					
• Medium Torque Mounts	175	PA66HIR	interm. up to +105 °C (500h)	o	++	+	++	+	■		■					
• High Torque Mounts	176	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■					
• High Torque Double Mounts	176	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■					
• for parallel separation	177	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■					
• for Edges	178	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■					
Mounting Plates for Screw Fixing																
• MP-Series for M3 screws	179	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+			■	■		■		
• MSMP-Series for M5 screws	179	PA66	-40 °C to +85 °C, interm. up to +105 °C (500h)	o	++	+	++	+			■	■		■		

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Possible applications									Sample applications																		
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Edge Fastening on steel plate	Fixing on uneven surfaces	Fixing with self adhesive base	Fixing of Flat Ribbon Cables	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	For restricted space	Harnessmakers	Adhesive bonding on low energy surfaces	Post-installation fastening	Parallel Wires	Blind hole with thread	Switch cabinets	Hose Connector	Welded or threaded studs	Heavy Duty Application	Turbines and engines
		■	■		■				■				■	■	■									■	■	
		■	■		■				■				■	■	■									■	■	
		■	■		■				■				■	■	■									■	■	
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■	■	■	■		■				■			■	■	■	■				■	■		■				

Material Overview

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	Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Fixing Elements														
Cable Fixing Cradle			-40 °C to +85 °C											
• TM1SF for cable ties width up to 5,2 mm	180	PA66	interm. to +105 °C (500h)	o	++	+	++	+	■		□			
Arrowhead Cradle			-40 °C to +85 °C,											
• SFC	181	PA66	interm. to +105 °C (500h)	o	++	+	++	+	■		■			■
Bundling Clips with Arrowhead	182	PA6	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			■
• Bundling Clips with Arrowhead	182	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• sealed	183	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• with Harness Clip	183	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• moveable, CHA 1	184	PA66HS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+	■		■			■
• moveable, TCSFT6.5CHAMD with foam	184	PA66HS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+	■		■			■
• moveable, CHA 2	184	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			■
• for Distance Routing, SOC for 31.0 mm	185	PA46	-40 °C to +150 °C, interm. to +195 °C (500h)	o	++	+	++	+	■		■			■
• for Distance Routing, SOC for 31.0 mm	185	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• for Distance Routing, SOC2 for 25.0 mm	185	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
Bundling Clips with Fir Tree	186	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• Bundling Clips with Fir Tree	186	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			■
• for Oval Holes	186	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• for Distance Routing	187	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			■
• for Distance Routing	187	PA66HS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+	■		■			■
• for Distance Routing	187	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
Bundling Clips for Weld Studs														
• movable	189	PA66HS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• movable, for Connectors	189	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• movable, with Harness Clip	189	POM	-40 °C to +90 °C, interm. to +110 °C (500h)	o	++	+	++	+	■		■			■
• Bundling Clips for Weld Studs	189	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• movable, BC2212 for distance routing 12.0 and 22.0 mm	190	PA66HIRHS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+	■		■			■
• movable, BC30 for distance 30.0 mm	190	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• Bundling Clips for Screws BC-SCR6	190	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■

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Possible applications								Sample applications																						
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Edge Fastening on steel plate	Fixing on uneven surfaces	Fixing with self adhesive base	Fixing of Flat Ribbon Cables	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	For restricted space	Harnessmakers	Adhesive bonding on low energy surfaces	Post-installation fastening	Parallel Wires	Blind hole with thread	Switch cabinets	Hose Connector	Welded or threaded studs	Heavy Duty Application	Turbines and engines
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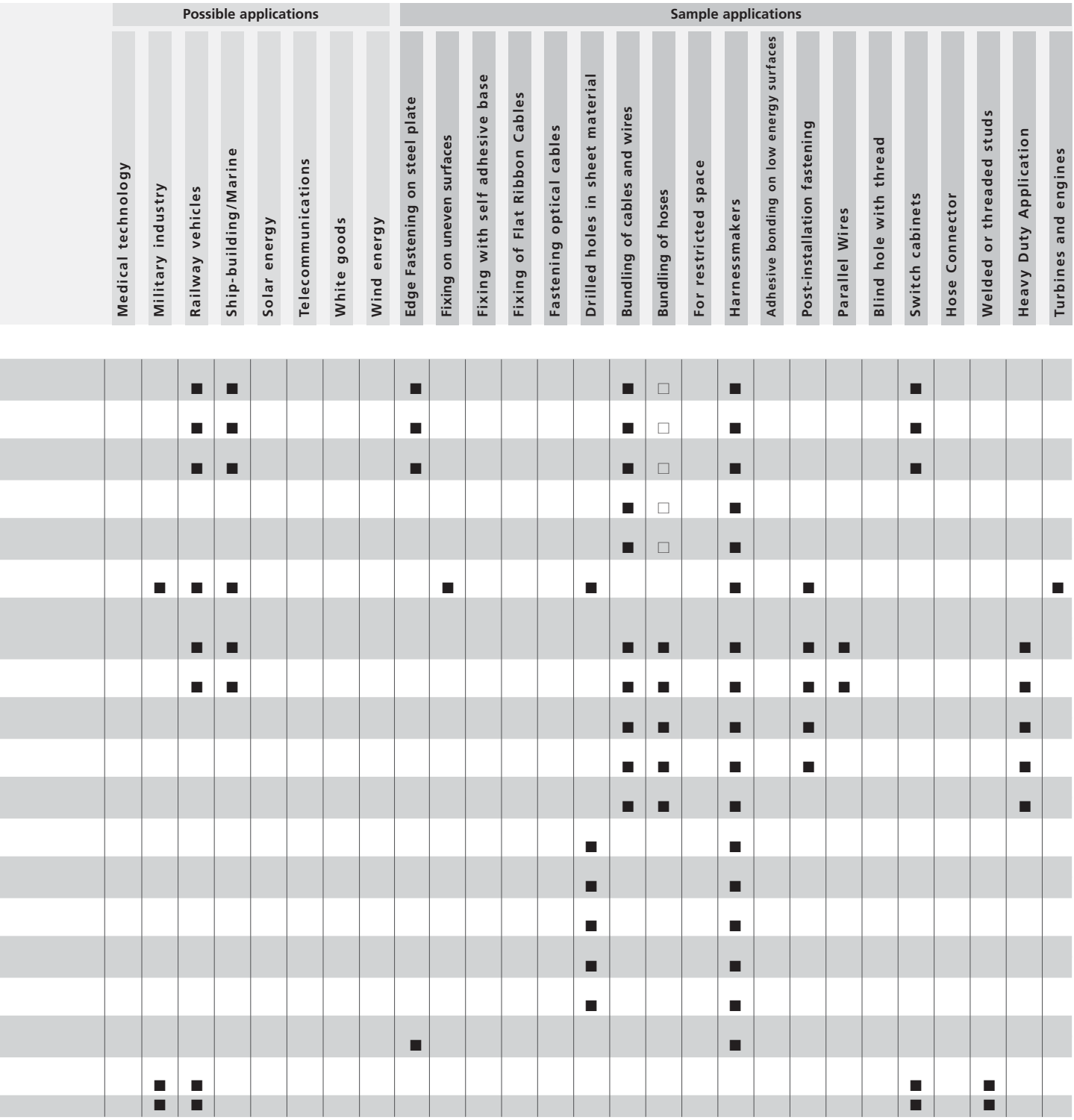
	Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Fixing Elements														
Bundling Clips for Edges														
• 1,0 - 3,0 mm, Edge Clip	191	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
• 1,0 - 3,0 mm, Edge Clip	191	PA46	-40 °C to +150 °C, interm. to +195 °C (500h)	o	++	+	++	+	■		■			■
• 1,0 - 3,0 mm, for Distance Routing, Edge Clip	191	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			■
Bundling Clips for Connectors														
• Yaz-Conn-Tape-Clip	192	PA66HS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+	■		■			
• ConnectorClip movable	192	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• Rivet Mount, TY5-Series	193	PA66HS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+			■			■
Fixing elements														
• for Parallel Routing, twistable, DSWS4 with seperation 17.8 mm	194	PA66HS, POM	-40 °C to +105 °C -40 °C to +85 °C	o	++	+	++	+	■		■			
• for Parallel Routing, twistable DSWS5 with separation 23.6 mm	194	PA66HS	-40 °C to +105 °C, interm. to +145 °C (500h)	o	++	+	++	+	■		■			
• for BHT-Ties for Distance Routing, MSBT120 usable with max. 3 cable ties	195	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• with Fir Tree, for Distance Routing, S3STM50	196	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• BHT-Ties, for Distance Routing, CGS1	197	PA66HIRHSW	-40 °C to +105 °C	o	++	+	++	+	■		■			
Connector Clips														
• with Fir Tree, round hole	198	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• with Fir Tree, round hole	198	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			
• with Fir Tree, round hole	199	PA66HIR	-40 °C to +80 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			
• with Fir Tree, for Oval Holes	200	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• with Fir Tree, for Oval Holes	200	PA66HIR	-40 °C to +80 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			
• for Edges, Edge Clip	201	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
Plastic Nuts														
• KM	202	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■					
• KM	202	PA66	-40 °C to +85 °C	o	++	+	++	+	■					

* Only valid for Central European Climate


Possible applications
Sample applications
Medical technology
Military industry
Railway vehicles
Ship-building/Marine
Solar energy
Telecommunications
White goods
Wind energy
Edge Fastening on steel plate
Fixing on uneven surfaces
Fixing with self adhesive base
Fixing of Flat Ribbon Cables
Fastening optical cables
Drilled holes in sheet material
Bundling of cables and wires
Bundling of hoses
For restricted space
Harnessmakers
Adhesive bonding on low energy surfaces
Post-installation fastening
Parallel Wires
Blind hole with thread
Switch cabinets
Hose Connector
Welded or threaded studs
Heavy Duty Application
Turbines and engines

Material Overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited

These details are only rough guide values. They should be regarded as a material specification and are no substitute for a suitability test. Please see our datasheets for further details.

	Material Data			Resistant properties					Possible applications					
	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
Climps and Clamps														
Screw Clips														
• TY8H1 with flat design	203	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• ASI-Clip	203	PA66HIR	-40 °C to +80 °C, interm. to +105 °C (500h)	o	++	+	++	+						
Self Adhesive Clips														
• RA-Series with round design	204	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• RB-Series with flat design	204	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■	■		■
• SAC with flexible flat design	205	ST	-40 °C to +70 °C	o	++	+	++	+	■		■	■		■
• 130100 for Flat Ribbon Cables	205	PVC	-25 °C to +65 °C	o	++	+	++	o			■	□		
Flat Ribbon Cables Self Adhesive/Screw Fixing,														
• FKH-Series	206	PA66HIR	-40 °C to +80 °C	o	++	+	++	+	□		■	■		■
Wire Push In Clips														
• WPC	207	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	□		■	■		■
Screw Mount														
• D-Clip Series	208	POM	-40 °C to +90 °C, interm. to +110 °C (500h)	o	++	+	++	+		□	■	□		
Fixing Elements for Tubes and Harnesses														
• PC-Series with Arrowhead	209	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	□		■	□		
• PC-Series with Firtree	209	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	□		■	□		
• PC-Series with Firtree	209	PA46	-40 °C to +150 °C, interm. to +195 °C (500h)	o	++	+	++	+	□		■	□		
• PC-Series with Firtree	209	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	□		■	□		
• interconnectable, IPC-Series	210	PA66	-40 °C to +85 °C, interm. to +105 °C (500h)	o	++	+	++	+	□		■	□		
• interconnectable, IPC-Series	210	PA66HIR	-40 °C to +80 °C, interm. to +105 °C (500h)	o	++	+	++	+	□		■	□		
• KSFT6.5OC1-3 with Arrowhead for bundle diameter 1.0 - 3.0 mm	211	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■	□		
• KSFT6.5OC7-9 with Arrowhead for bundle diameter 7.0 - 9.0 mm	211	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■	□		
• HC48FT6 with Firtree or bundle diameter 4.8 mm	211	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■	□		
• with Automatic Locking Feature, AHC, IAH	212	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• with Automatic Locking Feature, AHC, IAH	212	PA6HIR	-40 °C to +80 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			
• for Edges, Edge Clip	213	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		■			
• for Edges, Edge Clip	213	PA66HIR	-40 °C to +80 °C, interm. to +105 °C (500h)	o	++	+	++	+	■		■			

* Only valid for Central European Climate

Possible applications									Sample applications																				
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Edge Fastening on steel plate	Fixing on uneven surfaces	Fixing with self adhesive base	Fixing of Flat Ribbon Cables	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	For restricted space	Harnessmakers	Adhesive bonding on low energy surfaces	Post-installation fastening	Parallel Wires	Blind hole with thread	Switch cabinets	Hose Connector	Welded or threaded studs	Heavy Duty Application	Turbines and engines
□	□	■	■		■				□	■	■	□	■	□	□	□			■	□		■				
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		■	■		■					■				□	□	■			■	□		■				
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Material Overview

■ suitable
□ of limited suitability
++ very good
+ good
o limited
These details are only rough guide values. They should be regarded as a material specification and are no substitute for a suitability test. Please see our datasheets for further details.

	Page	Material	Operating Temperature [°C]	UV-light/ozone*	Oils and greases	Solvents	Petrol	Flammability	Automotive industries	Chemical industry	Electrical installation	Building Sector	Food and pharmaceutical industry	Aerospace industries
				Material Data					**Resistant properties**				**Possible applications**	
Climps and Clamps														
Fixing Elements for Corrugated Tubing														
• with Fir Tree, CTC-Series	214	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		□			
• with Arrowhead	215	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		□			
• for Weld Studs, CTC-Series	216	PA66HIRHS	-40 °C to +105 °C	o	++	+	++	+	■		□			
Fixing Base			-40 °C to +85 °C,											
• LOK-Series	217	PA66	interm. to +105 °C (500h)	o	++	+	++	+				■		
• LOK-Series	217	PA6HIR	-40 °C to +80 °C	o	+	+	++	+				■		
Fixing Elements for Weld Studs			-40 °C to +85 °C,											
• SBH, SBF, CTMS	218	PA66	interm. to +105 °C (500h)	o	++	+	++	+	■					
Plastic Rivets		PA66	-40 °C to +85 °C,											
• TY	219		interm. to +105 °C (500h)	o	++	+	++	+						
Clips														
• Aluminium "P-Clips"	220	ALU	-40 °C to +180 °C	++	++	++	++	++		□	□	■		
• Aluminium "P-Clips", with a Rubber Insert	221	ALU, CR	-20 °C to +80 °C	o	++	+	++	+			□	■		
• AFCS Fixing Clip, Plated Steel and PVC Liner	222	GS, PVC	-20 °C to +105 °C	o	++	++	++	++			□	■		
• AFCSS Fixing Clip Stainless Steel	222	SS316	-100 °C to +400 °C	++	++	++	++	++		□	□	■		
			-40 °C to +85 °C,											
• Plastic P-Clips, HP-Series	223	PA66	interm. to +105 °C (500h)	o	++	+	++	+		□	□	■		■
			-40 °C to +105 °C,											
• Plastic P-Clips, HP-Series	224	PA66HS	interm. to +145 °C (500h)	o	++	+	++	+		□	□	■		■
Snapper Hose Clips for Tubes and Harnesses														
• SNP-Series	225	POM	-40 °C to +85 °C	o	++	+	++	+	■	□				■
• SNP-Series	226	PA66GF13	-30 °C to +105 °C	o	+	+	+	o	■	□				■
		PA66	-40 °C to +85 °C,											
Clips with elasicticated loop			interm. to +105 °C (500h)											
• Cradle Clip	227	PVC	-35 °C to +85 °C	o	++	+	++	+			□	■		
Strain Relief Clips														
• Klam-Klip (KK)	228	PA6HIR	-40 °C to +80 °C	o	+	+	++	+			■	■		

* Only valid for Central European Climate

Possible applications								Sample applications																					
Medical technology	Military industry	Railway vehicles	Ship-building/Marine	Solar energy	Telecommunications	White goods	Wind energy	Edge Fastening on steel plate	Fixing on uneven surfaces	Fixing with self adhesive base	Fixing of Flat Ribbon Cables	Fastening optical cables	Drilled holes in sheet material	Bundling of cables and wires	Bundling of hoses	For restricted space	Harnessmakers	Adhesive bonding on low energy surfaces	Post-installation fastening	Parallel Wires	Blind hole with thread	Switch cabinets	Hose Connector	Welded or threaded studs	Heavy Duty Application	Turbines and engines
■								■	■				■	□	■		■		■		□	□				
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													■	□					■								

Material specifications

Material	Operating Temperature	Colour	Flammability	Material Properties*
Ethylenterafluorine-ethylen - E/TFE (Tefzel®)	-80 °C to +150 °C continuous	Blue (BU)	UL94 V0	• Resistance to radioactivity • UV- resistant, not moisture sentitive • Good chemical resistance to: acids, bases, oxidizing agents
Polyamide 6.6 High Impact Modified (PA66HIR)	-40 °C to +80 °C Continuous, (+105 °C for 500 h)	Black (BK)	UL94 HB	• Limited brittlenes sensitivity • Good at low temperature
Polyamide 6.6 High Imp. Mod., Heat Stab. (PA66HIRHS)	-40 °C to +105 °C	Black (BK)	UL94 HB	• Limited brittlenes sensitivity • Good at low temperature • Modified elevated max. temperature
Polyacetal (POM)	-40 °C to +90 °C Continuous, (+110 °C for 500 h)	Natural (NA)	UL94 HB	• Limited brittlenes sensitivity • Flexible at low temperature • Not moisture sensitive • Robust on impacts

Material specifications, Halogen Free

Material	Operating Temperature	Colour	Flammability	Material Properties*
Polyamide 12 (PA12)	-40 °C to +85 °C Continuous, (+105 °C for 500 h)	Black (BK)	UL94 HB	• Good chemical resistance to: acids, bases, oxidizing agents • UV- resistant
Polyamide 6.6 (PA66)	-40 °C to +85 °C Continuous, (+105 °C for 500 h)	Natural (NA), Black (BK)**	UL94 V2	• High yield strength
Polyamide 6.6 Heat Stabilised (PA66HS)	-40 °C to +105 °C Continuous, (+145 °C for 500 h)	Natural (NA), Black (BK)**	UL94 V2	• High yield strength • Modified elevated max. temperature
Polyamide 6.6 UV Resistant (PA66W)	-40 °C to +85 °C Continuous, (+105 °C for 500 h)	Black (BK)	UL94 V2	• High yield strength, UV-resistant
Polypropylene (PP)	-40 °C to +85 °C Continuous, (+105 °C for 500 h)	Natural (NA), Black (BK)**	UL94 HB	• Good chemical resistance to: organic acids • Floats in water, moderate yield strength
Thermoplastic Polyurethane (TPU)	-40 °C to +85 °C	Black (BK)	UL94 HB	• High elastic, UV-resistant • Good chemical resistance to: acids, bases, oxidizing agents
Polyamide 6.6 with metal particles	-40 °C to +85 °C Continuous, (+105 °C for 500 h)	Blue (BU)	UL94 HB	• High yield strength

Material specifications, Limited Fire Hazard

Material	Operating Temperature	Colour	Flammability	Material Properties*
Polyamide 4.6 (PA46)	-40 °C to +150 °C for 5000 h, (+195 °C for 500 h)	Natural (NA), Grey (GY)**	UL94 V2	• Resistant to high temperatures • Very moisture sensitive, low smoke sensitive
Polyamide 6.6 V0 (PA66V0)	-40 °C to +85 °C	White (WH)	UL94 V0	• High yield strength, low smoke emissions
Polyolefin (PO)	-40 °C to +90 °C	Black (BK)	UL94 V0	• Low smoke emissions
Polyetheretherketone (PEEK)	-55 °C to +240 °C	Beige (BGE)	UL94 V0	• Resistance to radioactivity • UV- resistant • Good chemical resistance to: acids, bases, oxidizing agents • Not moisture sentitive
Stainless Steel Type SS304, Type SS316	-80 °C to +538 °C	Metal (ML)	–	• Corrosion resistant • Antimagnetic

Tefzel® is a registered trademark of DuPont.

General linguistic usage for cable ties made from raw material E/TFE is Tefzel-Tie. In additon to Tefzel from DuPont HellermannTyton is also using equivalent E/TFE raw material from other suppliers.

* These details are only rough guide values. They should be regarded as a material specification and are no substitute for a suitability test. Please see our datasheets for further details.

** Other colours on request.

Manual Processing Tools for Cable Ties

MK10-SB
see page 561.

MK20, MK21
see page 561.

MK3SP
see page 562.

MK7
see page 562.

MK7HT
see page 563.

MK6
see page 563.

MK9
see page 564.

MK9HT
see page 564.

Pneumatic Tensioning Tools for Cable Ties

MK3PNSP2
see page 565.

MK7P
see page 566.

MK9P
see page 567.

Processing Tools for Cable Ties KR-Series

KR6/8
see page 568.

KR8PNSE
see page 568.

Application Tool	Registration Numbers
MK3SP	1
MK3PNSP2, MK7P	2
MK7	3
MK7HT	4
MK20	5
MK6	6
MK9P	7
MK9	8
MK9HT	9
MK21	10

For detailed information on Application Tools please refer to page 561.

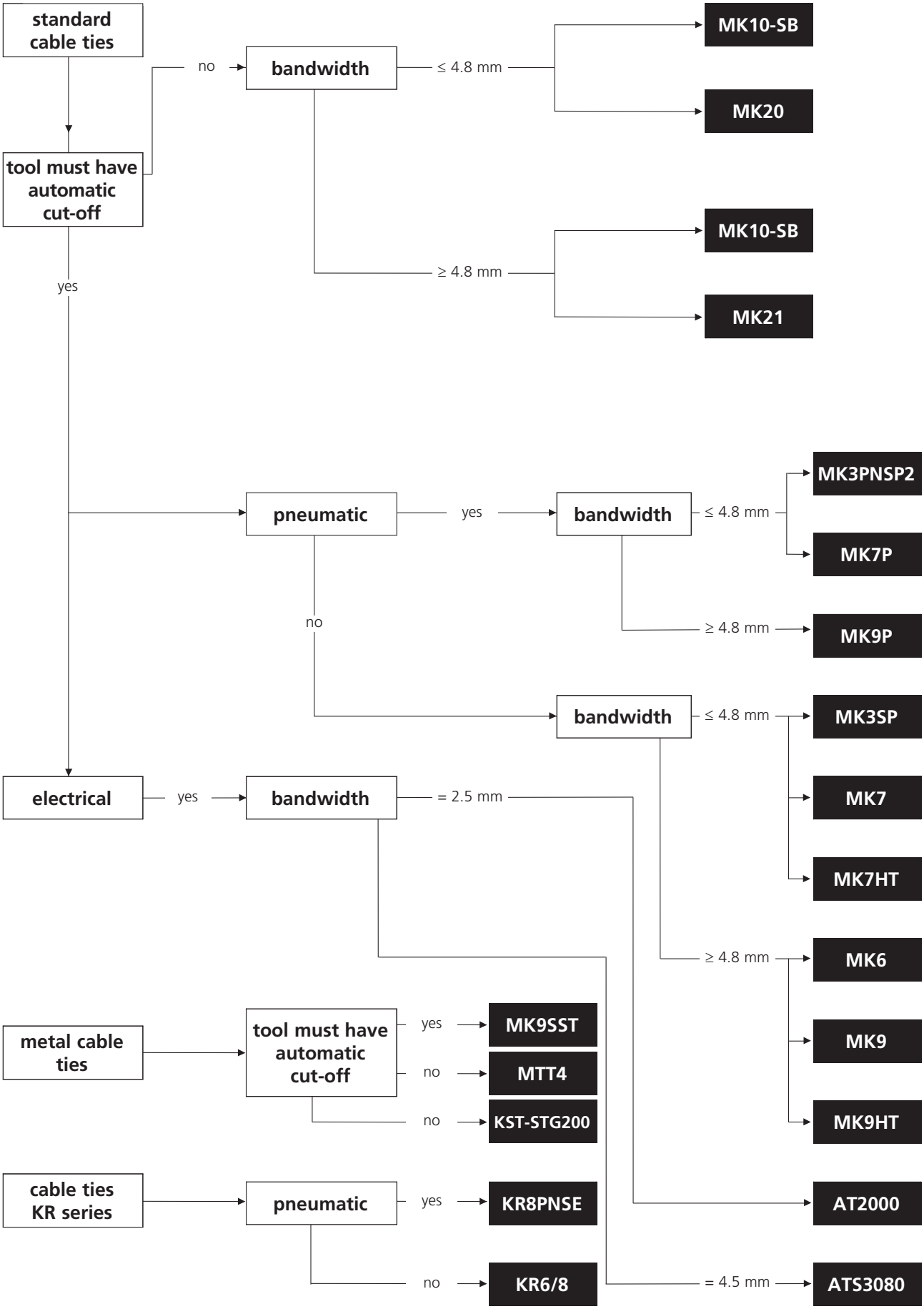
Processing Tools for Metal Ties

MK9SST
see page 569.

MTT4
see page 569.

KST-STG200
see page 569.

Flowchart for optimum tool selection



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