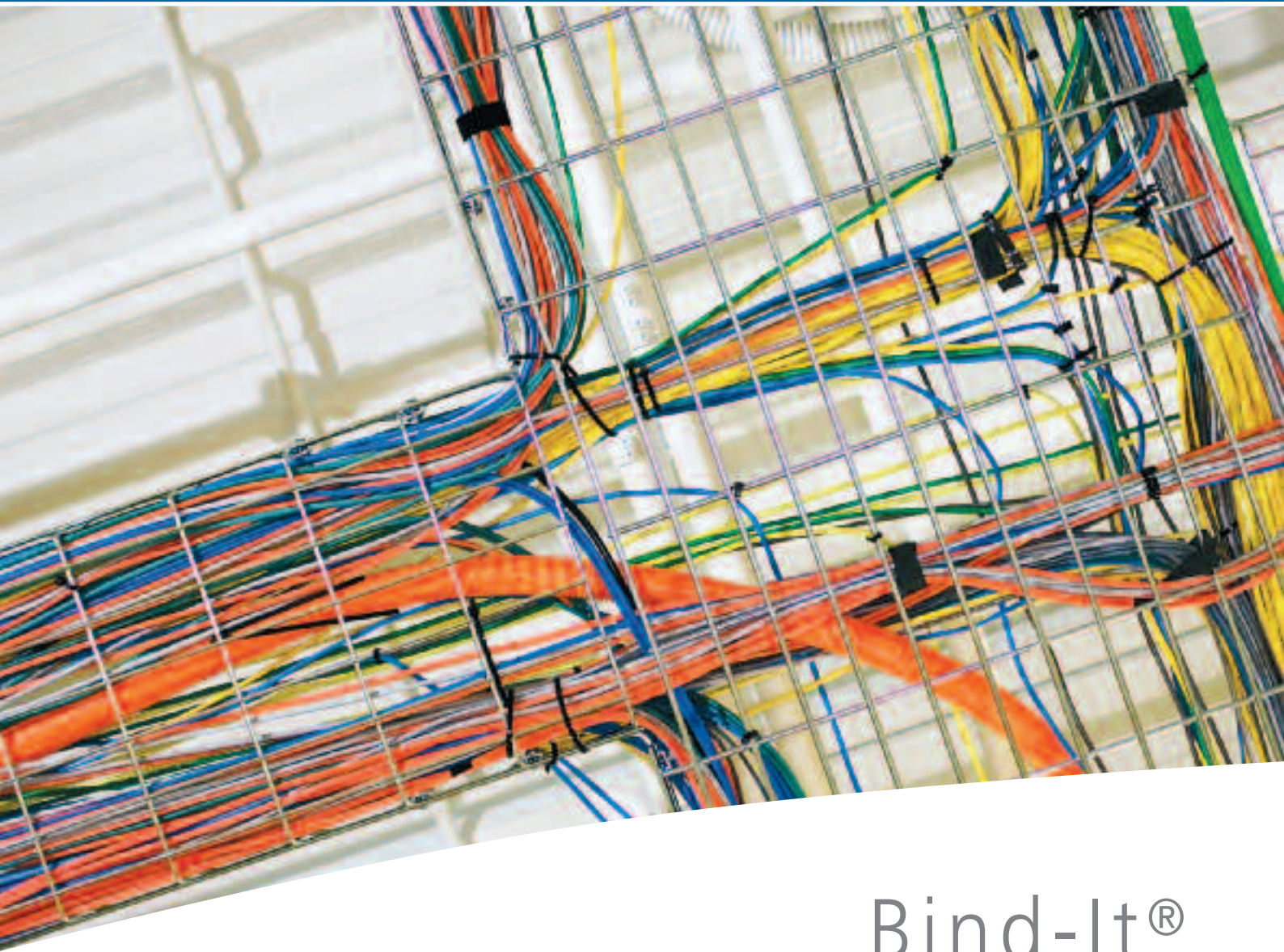


Bind-It® Cable Protection Systems

1.1 PREMIUM CABLE TIES WITH STEEL LOCKING BARB	4
1.2 ALL-PLASTIC CABLE TIES	44
1.3 STAINLESS STEEL CABLE TIES	64
1.4 MOUNTING BASES & ACCESSORIES	74
1.5 CABLE PROTECTION SYSTEMS	112
Wrap-around woven sleeving	116
Wrap-around woven sleeving - Flame retardant	117
Braided sleeving	118
Braided sleeving - Flame retardant	119
Spiral wrap	120
Extruded grommeting	121
1.6 CABLE TIE TOOLING	122
1.7 MATERIAL SPECIFICATIONS	134



Bind-It® Cable Protection Systems

The Cable Protection Systems (CPS) from Thomas & Betts captures different products:

- **Wrap-around woven sleeving**
- **Braided sleeving**
- **Spiral wrap**
- **Extruded grommeting**

The wrap-around sleeving – better known under the name Bind-It® - is a tough but lightweight sleeve used to bundle and protect wires and cables from abrasion, sharp edges and chafing. Bind-It® is a self-wrapping sleeve that is very quick and easy to install and remove. Bind-It® is also available in a flame retardant version. No heat is necessary to seal the ends of this product. The ends can be secured by using Ty-Rap® cable ties.



*Cable Protection Systems,
to protect and bundle wires
and cables.*

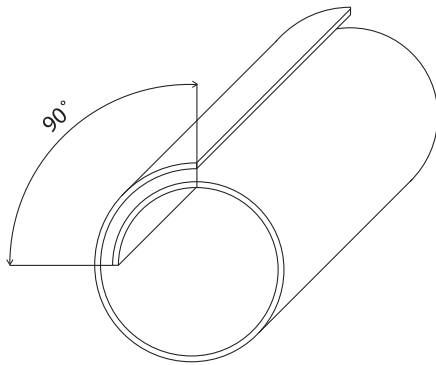
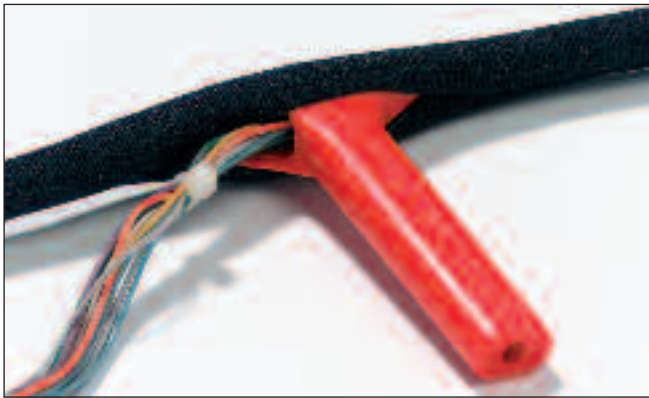
The braided sleeving of Thomas & Betts is used for bundling and protecting cables. The braided sleeving is a closed sleeve available in a flame and a non-flame retardant version. This product is mainly used inside cabinets and enclosures. To stop the end of the sleeving fraying it is necessary to heat seal the ends using a "hotwire" device.

Spiral wrap is mainly used for protection of bundles. This product is available in a natural and UV-resistant version and supplied in a Euroslot bag, ideal for the distribution market.

Finally the extruded grommeting of Thomas & Betts is used to line panel edges and knock-outs where the chafing of passing wires is a concern. In most applications, grommeting will grip tightly by itself.

Wrap-around woven sleeving

Cable protection systems



* Nominal size is determined by wrapping the product around a mandrel of a given size to obtain 90 degrees of overlap (average value).

- Offers excellent protection for cable assemblies against abrasion
- No heat is required to seal the ends of this product as with traditional braided sleeving
- With its wrap-around design, it can be installed on assemblies where the wires are already terminated or wires need to be broken-out
- Bind-It® is available in nominal sizes from 5 mm to 38 mm
- A professional assembly tool is supplied for the 5 mm, 8 mm and 13 mm nominal sizes
- Product is supplied black as standard with a white version available on request

Technical Information

Material	Mono and multifilaments of polyester
Temperature range	-70°C to +125°C
Melt temperature	+256°C (ASTM D-2117)
Colour	Black
Flammability rating	Self-extinguishing, type B (FMVSS-302 Test method D45 1333)

Product Ref.	Nominal Size* [mm]	Length per mini-reel [m]
CPS05W-150	5	150
CPS08W-100	8	100
CPS13W-50	13	50
CPS19W-25	19	25
CPS25W-25	25	25
CPS29W-25	29	25
CPS32W-15	32	15
CPS38W-15	38	15

Material Specification

Property	Test method	Typical performance
Low temperature flexibility	MIL-DTL-23053E	-70°C
Smoke density	ASTM E-1354	Pending
Hard Vacuum	ASTM E-595	
• TML (Mass)		0.63 %
• CVCM (Condensation)		0.16 %
• WVR (Steam)		0.06 %
Corrosivity	MIL-I-23053	No corrosive smoke
Fluid resistance	MIL-I-23053	Tensile retention
• Jet fuel: JP-41		100 %
• Hydraulic fluid: (MIL-H-5606)		100 %
• Lube oil: (MIL-I-7808)		100 %
• De-icing fluid: (MIL-A-8243)		100 %
• Salt Water: (O-S-1926)		100 %

Wrap-around woven sleeving - Flame retardant

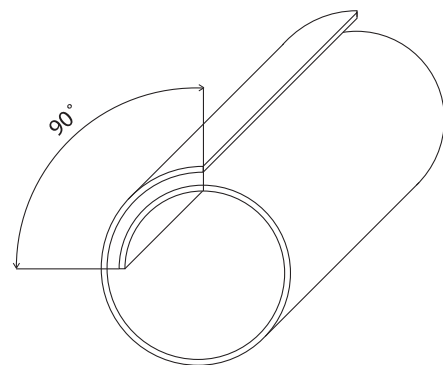
Cable protection systems

- Wrap-around sleeving manufactured from flame-retardant polyester monofilaments and multifilaments
- Designed for mechanical protection and maintenance of wire and cable bundles
- Its construction with 100% covering ratio provides excellent cut-through and abrasion resistance
- Bind-It® has many applications in the marine, railway and electronic industries
- No heat is required to seal the ends of this product as with traditional braided sleeving
- With its wrap-around design, it can be installed on assemblies where the wires are already terminated or wires need to be broken-out
- Bind-It® is available in nominal sizes from 5 mm to 50 mm
- A professional assembly tool is supplied for the 5 mm, 8 mm and 13 mm nominal sizes
- For a UL version please contact your Sales Office



Technical Information

Material	Mono and multifilaments of polyester
Temperature range	-50°C to +125°C
Melt temperature	+250°C (ASTM D-2117)
Colour	Black
Flammability rating	Flame retardant (I3-F2) according to NF16 101 & NF16 102
Other properties	Halogen free, Silicone free



Product Ref.	Nominal Size* [mm]	Length per mini-reel [m]
CPS05W-150-FR	5	150
CPS08W-100-FR	8	100
CPS13W-50-FR	13	50
CPS19W-25-FR	19	25
CPS25W-25-FR	25	25
CPS29W-25-FR	29	25
CPS32W-25-FR	32	25
CPS38W-25-FR	38	25
CPS50W-25-FR	50	25

* Nominal size is determined by wrapping the product around a mandrel of a given size to obtain 90 degrees of overlap (average value).

Material Specification

Property	Test method	Typical performance
Low temperature flexibility	MIL-DTL-23053E	-50°C
Fluid resistance	MIL-I-23053	Tensile retention
• Jet fuel: JP-41		100 %
• Hydraulic fluid: (MIL-H-5606)		100 %
• Lube oil: (MIL-I-7808)		100 %
• De-icing fluid: (MIL-A-8243)		100 %
• Salt Water: (O-S-1926)		100 %

1.5 Braided Sleeving

Braided sleeving Cable protection systems



- Standard colour – black or grey
- Non-flame retardant Polyester rated at UL 94 V-2
- Available in nominal diameters from 3 to 50 mm to cover bundle diameters of 1 to 66 mm, giving flexibility when adding to or removing cables from wire looms
- For use in temperature ranges from -50°C to +150°C
- Good chemical resistance
- Halogen free
- For protecting and bundling cables and wires inside cabinets and enclosures

To stop the ends of the sleeving fraying it is necessary to heat seal the ends using a "hotwire" device. (see Product Ref. WT-HSG)

Technical Information

Material	Polyester
Temperature range	-50°C to +150°C
Colour	Black or grey
Flammability rating	UL 94 V-2
Other properties	Good chemical resistance, Halogen free



Product Ref. Black	Product Ref. Grey	Nominal Diameter as supplied [mm]	Expandable Diameter Range [mm]	Length per mini-reel [m]
CPS3B-100	CPS3G-100	3	1 - 5	100
CPS4B-100	CPS4G-100	4	2 - 7	100
CPS5B-100	CPS5G-100	5	3 - 9	100
CPS6B-100	CPS6G-100	6	4 - 11	100
CPS8B-100	CPS8G-100	8	5 - 12	100
CPS10B-100	CPS10G-100	10	7 - 15	100
CPS12B-50	CPS12G-50	12	8 - 17	50
CPS15B-50	CPS15G-50	15	10 - 20	50
CPS20B-25	CPS20G-25	20	14 - 26	25
CPS25B-25	CPS25G-25	25	18 - 34	25
CPS30B-25	CPS30G-25	30	20 - 40	25
CPS40B-25	CPS40G-25	40	30 - 50	25
CPS50B-25	CPS50G-25	50	40 - 66	25

Braided sleeving - Flame retardant Cable protection systems

- Standard colour – black with grey identification yarn
- Flame-retardant polyester, rated at UL 94 V-0
- Available in nominal diameters from 3 mm to 50 mm to cover bundle diameters of 2 mm to 60 mm, giving flexibility when adding to or removing cables from wire looms
- For use in temperature ranges from -50°C to +150°C
- Good chemical resistance
- Excellent abrasion resistance
- For protecting and bundling cables and wires inside cabinets and enclosures

To stop the ends of the sleeving fraying it is necessary to heat seal the ends using a "hotwire" device. (see Product Ref. WT-HSG)

Technical Information

Material	Flame-retardant polyester
Temperature range	-50°C to +150°C
Colour	Black with grey identification yarn
Flammability rating	UL 94 V-0
Other properties	Good chemical resistance, excellent abrasion resistance

1:2



Product Ref. WT-HSG

Product Ref.	Nominal Diameter as supplied [mm]	Expandable Diameter Range [mm]	Length per mini-reel [m]
CPS3B-100-V0	3	2 - 5	100
CPS4B-100-V0	4	3 - 7	100
CPS5B-100-V0	5	4 - 9	100
CPS6B-100-V0	6	5 - 11	100
CPS8B-100-V0	8	7 - 13	100
CPS10B-50-V0	10	9 - 15	50
CPS12B-50-V0	12	11 - 17	50
CPS15B-50-V0	15	13 - 20	50
CPS20B-50-V0	20	18 - 25	50
CPS25B-50-V0	25	22 - 30	50
CPS30B-50-V0	30	27 - 40	50
CPS40B-50-V0	40	35 - 50	50
CPS50B-50-V0	50	45 - 60	50

Grey sleeving and other lengths available to special order, please contact your Sales Office



Spiral wrap Cable protection systems

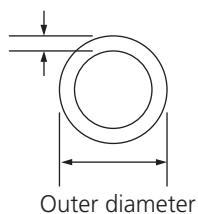


- For protection of bundles from 4 mm to 130 mm
- Install gapped for greater flexibility or butted for maximum abrasion resistance, insulation and rigidity
- Counter-clockwise cut
- Delivered in bags with Euroslot
- Available in natural and UV-resistant black Polyethylene

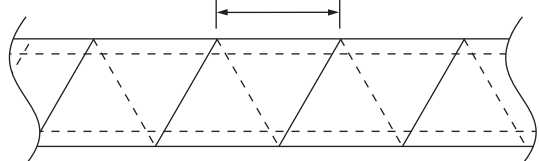
Technical Information

Material	Polyethylene
Temperature range	-40°C to +100°C
Colour	Natural and UV-resistant black
Flammability rating	UL 94 HB
Other properties	UV-resistant (black), Halogen free, Silicone free

Nominal thickness



Pitch



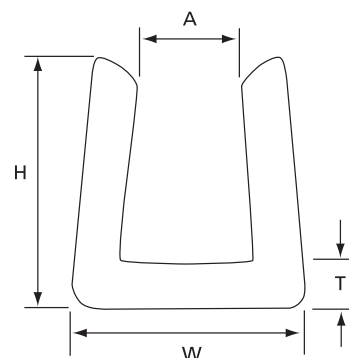
Product Ref.	Colour	Outer diameter [mm]	Pitch [mm]	Nominal thickness [mm]	Min. - max. bundle ϕ [mm]	Length [m]
SRPE-6-9	natural	6.0	7.0	0.5	4 - 50	10
SRPE-8-9	natural	8.0	10.8	0.5	6 - 60	10
SRPE-10-9	natural	10.0	11.4	0.8	7.5 - 60	10
SRPE-12-9	natural	12.0	13.9	0.9	9 - 65	10
SRPE-15-9	natural	15.0	15.0	1.0	12 - 70	10
SRPE-19-9	natural	19.0	18.2	1.3	15 - 100	10
SRPE-24-9	natural	24.0	19.6	1.5	20 - 130	10
SRPE-6-0	UV-resistant black	6.0	7.0	0.5	4 - 50	10
SRPE-8-0	UV-resistant black	8.0	10.8	0.5	6 - 60	10
SRPE-10-0	UV-resistant black	10.0	11.4	0.8	7.5 - 60	10
SRPE-12-0	UV-resistant black	12.0	13.9	0.9	9 - 65	10
SRPE-15-0	UV-resistant black	15.0	15.0	1.0	12 - 70	10
SRPE-19-0	UV-resistant black	19.0	18.2	1.3	15 - 100	10
SRPE-24-0	UV-resistant black	24.0	19.6	1.5	20 - 130	10

Extruded grommets Cable protection systems

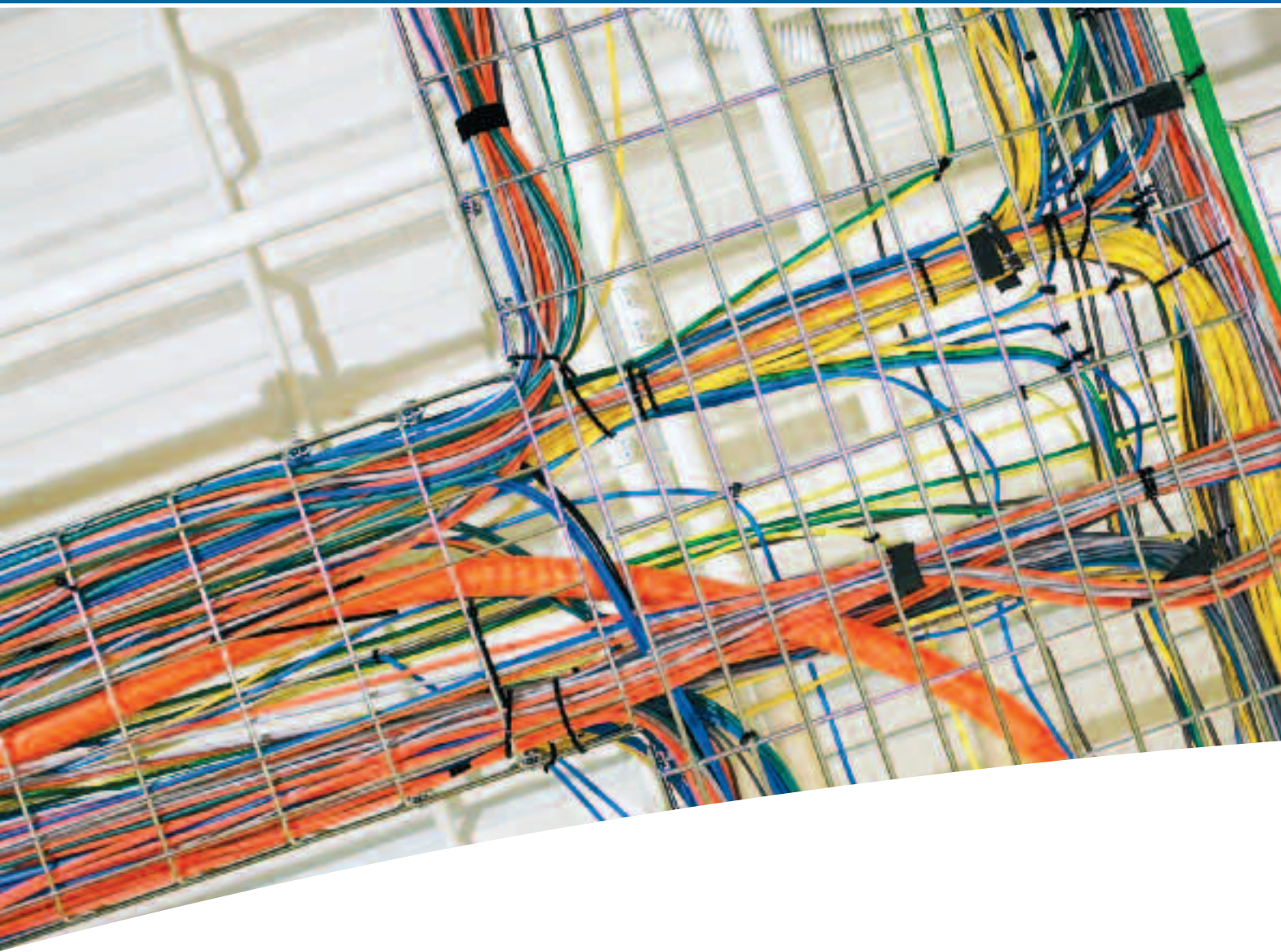
- Used to line panel edges and knock-outs where the chafing of passing wires is a concern
- Available in 8 stock sizes in 30.5 m lengths for panels from 1 mm to 6.35 mm
- In most applications, grommets will grip tightly by itself, if not, a touch of Epoxy will keep it in place

Technical Information

Material	Polyamide 6.6
Temperature range	-40°C to +85°C
Colour	Natural or black
Flammability rating	UL 94 V-2
Other properties	Halogen free, Silicone free

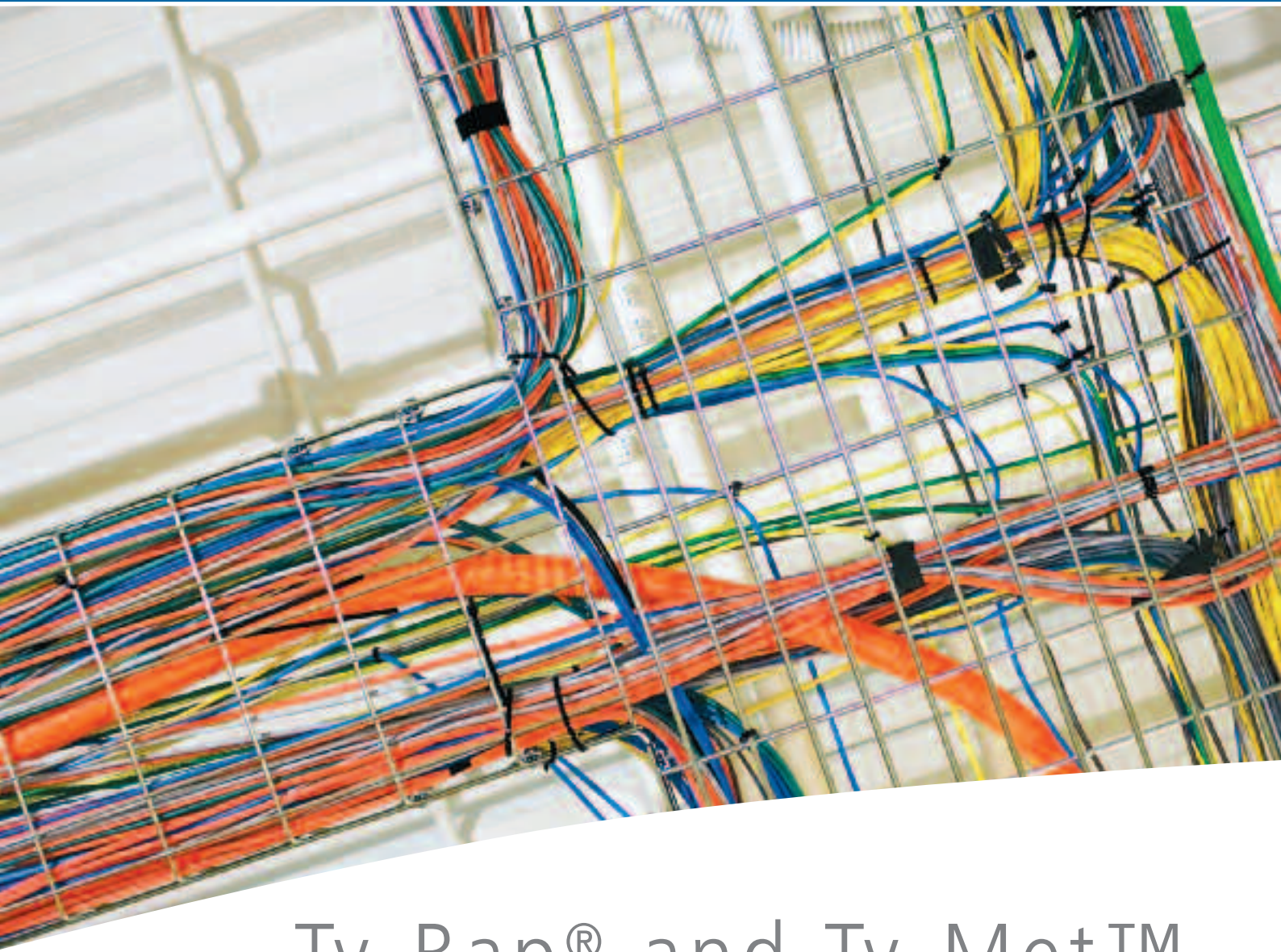


Product Ref.	Colour	Internal width A [mm]	Thickness T [mm]	H [mm]	W [mm]	Length per reel [m]
GRNY-040-9-C	natural	1.01	1.01	4.82	3.17	30.5
GRNY-052-9-C	natural	1.32	1.01	4.82	3.17	30.5
GRNY-062-9-C	natural	1.57	1.14	5.08	4.32	30.5
GRNY-085-9-C	natural	2.15	1.14	5.08	4.32	30.5
GRNY-100-9-C	natural	2.54	1.14	5.58	5.33	30.5
GRNY-125-9-C	natural	3.17	1.27	5.58	5.23	30.5
GRNY-187-9-C	natural	4.74	1.27	6.85	6.98	30.5
GRNY-250-9-C	natural	6.35	1.27	7.11	9.39	30.5
GRNY-040-0-C	black	1.01	1.01	4.82	3.17	30.5
GRNY-052-0-C	black	1.32	1.01	4.82	3.17	30.5
GRNY-062-0-C	black	1.57	1.14	5.08	4.32	30.5
GRNY-085-0-C	black	2.15	1.14	5.08	4.32	30.5
GRNY-100-0-C	black	2.54	1.14	5.58	5.33	30.5
GRNY-125-0-C	black	3.17	1.27	5.58	5.23	30.5
GRNY-187-0-C	black	4.74	1.27	6.85	6.85	30.5
GRNY-250-0-C	black	6.35	1.27	7.11	9.39	30.5



Ty-Rap® and Ty-Met™ Tooling

1.1	PREMIUM CABLE TIES WITH STEEL LOCKING BARB	4
1.2	ALL-PLASTIC CABLE TIES	44
1.3	STAINLESS STEEL CABLE TIES	64
1.4	MOUNTING BASES & ACCESSORIES	74
1.5	CABLE PROTECTION SYSTEMS	112
1.6	CABLE TIE TOOLING	122
	Selection chart	126
	Tools for plastic cable ties	127
	Tools for stainless steel ties	131
1.7	MATERIAL SPECIFICATIONS	134



Ty-Rap[®] and Ty-Met[™] Tooling

Thomas & Betts offers a comprehensive range of tooling to complement the full range of cable ties.

The range includes low-cost tools for maintenance and small batch requirements, as well as robust and ergonomic tools with tension setting and automatic cutting.

In particular, the new ERG50 and ERG120 tools provide a superior level of reliability and performance, combined with enhanced ergonomics and comfort of use.

These ergonomic tools, with adjustable tension and automatic cutting, are ideally suited for efficiently installing all kinds of plastic cable ties in industrial (Original Equipment Manufacturers, Maintenance and Repair Organisations, etc) and construction applications.



*Cable tie fastening tools to install,
tension and cut
plastic and metal ties*

ERG50 & ERG120

Superior reliability and performance

- Developed to meet the market needs for a more rugged and longer lasting tool
- Designed to integrate the greatest number of features in the market

Enhanced ergonomics and comfort of use


















- First class design and materials, for maximum convenience
- As a result, the operator is subject to less stress, less fatigue and less risk of trauma due to long term use (such as Carpal Tunnel Syndrome)

Increased efficiency

- Exclusive features for quick set-up and fast installation
- Confidence to achieve a highly professional result, installation after installation

Selection guide

Fastening tools

Tooling Ref.	Features	Tensioning	Cutting	For cable ties	Page
TOOLING FOR PLASTIC TIES					
 ERG50	Ergonomic hand tool with superior level of reliability and performance	adjustable	automatic	2.4 mm - 4.8 mm	127
 WT199	Semi-automatic MIL specified hand tool (MIL. Nr. MS-90387-1)	adjustable	automatic	2.4 mm - 4.8 mm	128
 WT193A	Robust construction, ideal for industrial mass finishing applications like cable-tree assemblies	adjustable	automatic	2.4 mm - 4.8 mm	128
 WT1-TB	Basic tensioning tool, intended for maintenance and small batch use	basic	twist cut	2.4 mm - 4.8 mm	130
 ERG120	Ergonomic hand tool with superior level of reliability and performance	adjustable	automatic	4.8 mm - 7.6 mm	127
 WT197	Semi-automatic MIL specified hand tool (MIL. Nr. MS-90387-2)	adjustable	automatic	4.8 mm - 7.6 mm	128
 WT2-TB	Basic tensioning tool, intended for maintenance and small batch use	basic	twist cut	4.8 mm - 7.6 mm	130
 L300-FR	Rugged construction with field proven durability	basic	manual	7.6 mm - 9 mm	129
 WT3D	Robust metal body with plastic hand-grips, designed for tensioning and cutting heavy-duty cable ties	basic	twist cut	7.6 mm - 12.7 mm	129
 L-500-EU	Rugged metallic construction	adjustable	automatic	4.7 mm - 13.3 mm	129
TOOLING FOR TY-MET™ STAINLESS STEEL TIES					
 CT1-TB	Tensioning hook provides extra-leverage for tensioning the ties by hand	basic	no cutting	Releasable & Ladder Type	133
 CT2-TB	Basic hand tool	basic	no cutting	Releasable & Ladder Type	132
 CT4-TB	Bantam tool, unique 3-way handle can be used in various positions. Especially useful in tight areas with minimal access	basic	manual	Releasable & Ladder Type	133
 WT3S	A robust metallic hand tool with rubber grips	basic	no cutting	Ladder Type	132
 CT3	Economic tensioning tool	basic	manual	Ladder & Ball-Lock Type	131
 CT5	Adjustable tension setting tool with automatic cutting	adjustable	automatic	Ladder Type	131
 CT6	Adjustable tension setting tool with automatic cutting	adjustable	automatic	Ball-Lock Type	131

Tools for plastic cable ties

Fastening tools

The new ERG50 and ERG120 tools from Thomas & Betts provide a superior level of reliability and performance, combined with enhanced ergonomics and comfort of use.

These ergonomic tools, with adjustable tension and automatic cutting, are ideally suited for efficiently installing all kinds of plastic cable ties in industrial (Original Equipment Manufacturers, Maintenance and Repair Organisations, etc) and construction applications.

Developed to meet the market needs for a more rugged and longer lasting tool, and to integrate the greatest number of features in the market:

- **360° rotating nose (patented)**, allows the tool to be used in any position
- **Tension adjustment lock**, for constant tension setting
- **Quick tension-adjustment wheel** located towards the front for easy access and fast changes
- **Adjustable handle span** fits large and small hands.
- **Anti-recoil mechanism (patented)** reduces vibration shock
- **First class design and materials:** ergonomic shape with rounded edges, soft rubber handles, well balanced center of gravity
- **Longest stroke length on the market (25.4 mm)**, meaning less tensioning cycles, for time and cost saving
- **High / low force setting (patent pending)**, for a selection between "high force & long stroke" or "low force & short stroke"
- **The cable tie is cut flush to the head**, with no remaining protrusion, and the cut tail remains captive in the tool for a cleaner installation
- **Easy access to spare blade nest**, always a spare blade at hand (each tool is supplied with a spare blade)

Technical Information ERG50

Tool type	Ergonomic hand tool
Nose colour	Black
For type of cable tie	Plastic ties
For tie width	2.4 mm - 4.8 mm
Features	Adjustable tension setting, automatic cutting, retraction of the strap end after application of Ty-Rap® cable ties
Weight	260 g
Dimensions [L x W x H]	178 x 127 x 38 mm
Replacement blades	Product Ref. ERG50B

Technical Information ERG120

Tool type	Ergonomic hand tool
Nose colour	Orange
For type of cable tie	Plastic ties
For tie width	4.8 mm - 7.6 mm
Features	Adjustable tension setting, automatic cutting, retraction of the strap end after application of Ty-Rap® cable ties
Weight	278 g
Dimensions [L x W x H]	178 x 127 x 38 mm
Replacement blades	Product Ref. ERG120B

ERG50



ERG120



Tools for plastic cable ties

Fastening tools



Product Ref.: WT193A

- High quality hand tool, to bind, tension and cut in one operation
- Solid lightweight metal body
- Tension setting to ensure product consistency
- Robust construction, ideal for industrial mass finishing applications like cable-tree assemblies

Technical Information

Tool type	Heavy-duty hand tool
For type of cable tie	Plastic ties
For tie width	2.4 mm - 4.8 mm
Features	Adjustable tension setting, automatic cutting
Weight	300 g
Dimensions [L x W x H]	182 x 135 x 19.5 mm
Replacement blades	Product Ref. R464201



Product Ref.: WT199

- Semi-automatic hand tool
- MIL. Nr. MS-90387-1
- Tension setting to ensure product consistency
- Robust metal construction
- Ideal for industrial mass finishing applications like cable tree assemblies, for example in the military industry

Technical Information

Tool type	Semi-automatic hand tool
For type of cable tie	Plastic ties
For tie width	2.4 mm - 4.8 mm
Features	Adjustable tension setting, automatic cutting, MIL specified (MS-90387-1)
Weight	410 g
Dimensions [L x W x H]	163 x 134 x 24 mm



Product Ref.: WT197

- Semi-automatic hand tool
- MIL. Nr. MS-90387-2
- Tension setting to ensure product consistency
- Robust metal construction
- Ideal for industrial mass finishing applications like cable tree assemblies, for example in the military industry

Technical Information

Tool type	Semi-automatic hand tool
For type of cable tie	Plastic ties
For tie width	4.8 mm - 7.6 mm
Features	Adjustable tension setting, automatic cutting, MIL specified (MS-90387-2)
Weight	420 g
Dimensions [L x W x H]	165 x 135 x 29 mm

Tools for plastic cable ties

Fastening tools

Product Ref.: WT3D

- Designed for tensioning and cutting heavy-duty cable ties
- Robust metal body with plastic hand-grips

Technical Information

Tool type	Hand tool for Deltec ties, Col-Ty™ installation ties and other wide cable ties
For type of cable tie	Plastic ties
For tie width	7.6 mm - 12.7 mm
Features	Tensioning, manual cutting (by twisting the tool)
Weight	225 g
Dimensions [L x W x H]	178 x 112 x 20 mm

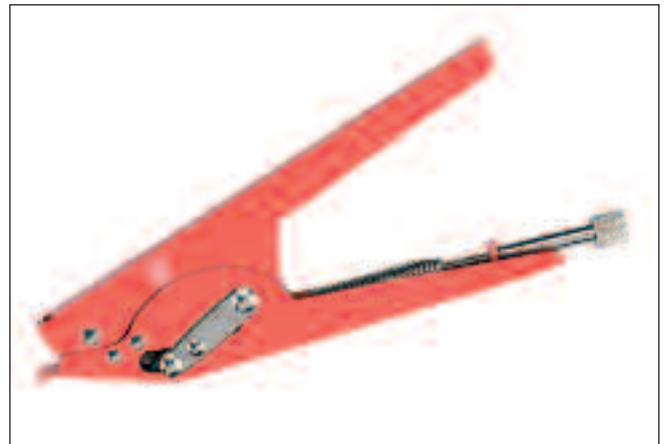


Product Ref.: L-500-EU

- Rugged metallic construction makes this tool ideal for use with our 4.7 mm to 13.3 mm wide ties
- Set tension adjuster to give desired tie tightness
- Pull trigger and tie is automatically tensioned and cut

Technical Information

Tool type	Hand tool
For type of cable tie	Plastic ties
For tie width	4.7 mm - 13.3 mm
Features	Tensioning, automatic cutting



Product Ref.: L300-FR

- Rugged construction makes this tool ideal for use with our 7.6 mm to 9 mm wide ties
- Pull tie to desired tension and pull trigger to cut excess flush at cable tie head
- Field proven durability

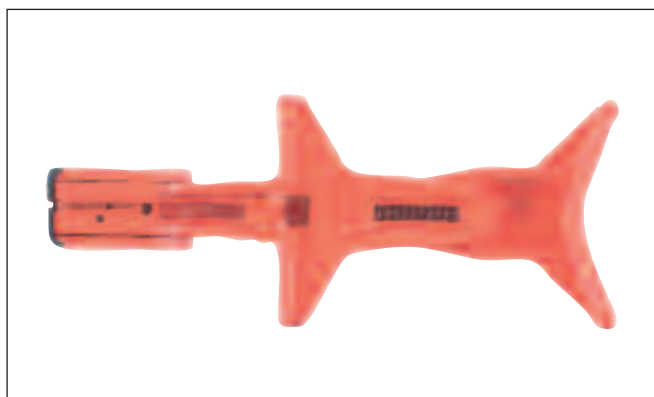
Technical Information

Tool type	Hand tool for Col-Ty™ installation ties and other wide cable ties
Colour	White
For type of cable tie	Plastic ties
For tie width	7.6 mm - 9 mm
Features	Tensioning, manual cutting
Weight	330 g
Dimensions [L x W x H]	195 x 100 x 25 mm



Tools for plastic cable ties

Fastening tools

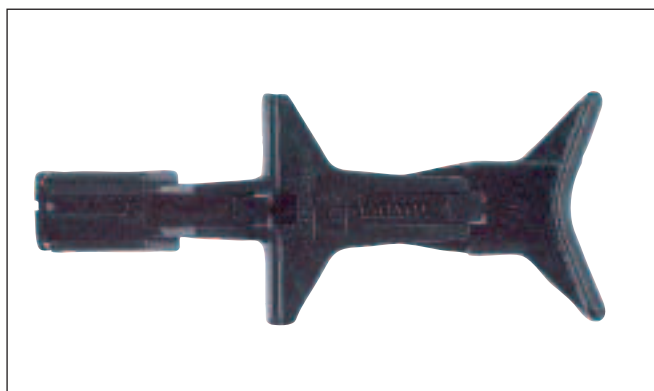


Product Ref.: WT1-TB

- Twist-and-cut tensiing tool in plastic, intended for maintenance and small batch use

Technical Information

Tool type	Low-cost hand tool
Colour	Orange
For type of cable tie	Plastic ties
For tie width	2.4 mm - 4.8 mm
Features	Basic tensioning, twist cut
Weight	28.4 g
Dimensions [L x W x H]	134 x 55 x 27 mm



Product Ref.: WT2-TB

- Twist-and-cut tensiing tool in plastic, intended for maintenance and small batch use

Technical Information

Tool type	Low-cost hand tool
Colour	Black
For type of cable tie	Plastic ties
For tie width	4.8 mm - 7.6 mm
Features	Basic tensioning, twist cut
Weight	28.4 g
Dimensions [L x W x H]	134 x 55 x 27 mm

Tools for stainless steel ties

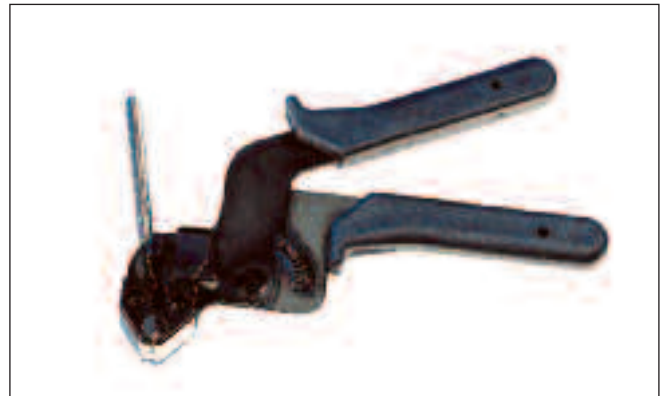
Fastening tools

Product Ref.: CT3

- Cost-effective tensioning tool
- Cut-off by hand-activated lever

Technical Information

Tool type	Hand tool
For type of cable tie	Ladder Type & Ball-Lock Type stainless steel ties, coated and uncoated
Features	Tensioning, manual cutting
Weight	550 g
Dimensions [L x W x H]	210 x 155 x 35 mm



Product Ref.: CT5

- Suitable for coated and uncoated Ladder Type stainless steel ties
- Adjustable tension settings
- Automatic cutting once desired tension has been reached

Technical Information

Tool type	Tension setting hand tool
For type of cable tie	Ladder Type stainless steel ties
Features	Adjustable tension setting, automatic cutting
Weight	430 g
Dimensions [L x W x H]	173 x 158 x 22 mm



Product Ref.: CT6

- Suitable for coated and uncoated Ball-Lock Type stainless steel ties
- Adjustable tension settings
- Automatic cutting once desired tension has been reached

Technical Information

Tool type	Tension setting hand tool
For type of cable tie	Ball-Lock Type stainless steel ties, coated and uncoated
Features	Adjustable tension setting, automatic cutting
Weight	430 g
Dimensions [L x W x H]	173 x 158 x 22 mm



Tools for stainless steel ties

Fastening tools



Product Ref.: WT3S

- A robust metallic hand tool with rubber grips designed for tensioning Ladder Type stainless steel ties
- After tensioning, the stainless steel ties can easily be cut with side-cutters

Technical Information

Tool type	Hand tool
For type of cable tie	Ladder Type stainless steel ties
Features	Tensioning, no cutting
Weight	225 g
Dimensions [L x W x H]	178 x 112 x 20 mm



Product Ref.: CT2-TB

- Cable tie tensioner suitable for Releasable Type and Ladder Type stainless steel ties
- Tensions the ties to their optimum holding power with a simple squeeze: a flick of the wrist and they're locked tight

Technical Information

Tool type	Hand tool
For type of cable tie	Releasable Type and Ladder Type stainless steel ties
Features	Tensioning, no cutting
Weight	300 g
Dimensions [L x W x H]	195 x 90 x 30 mm

Tools for stainless steel ties

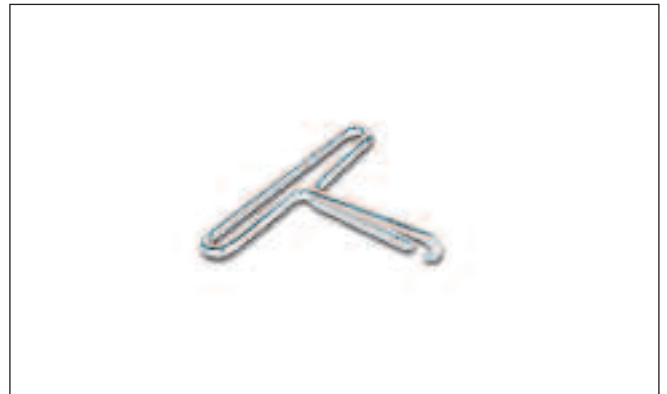
Fastening tools

Product Ref.: CT1-TB

- Tensioning hook suitable for Releasable Type and Ladder Type stainless steel ties
- Provides extra-leverage for tensioning the ties by hand

Technical Information

Tool type	Hand tool
For type of cable tie	Releasable Type and Ladder Type stainless steel ties
Features	Tensioning, no cutting
Weight	50 g
Dimensions [L x W x H]	85 x 106 x 15 mm



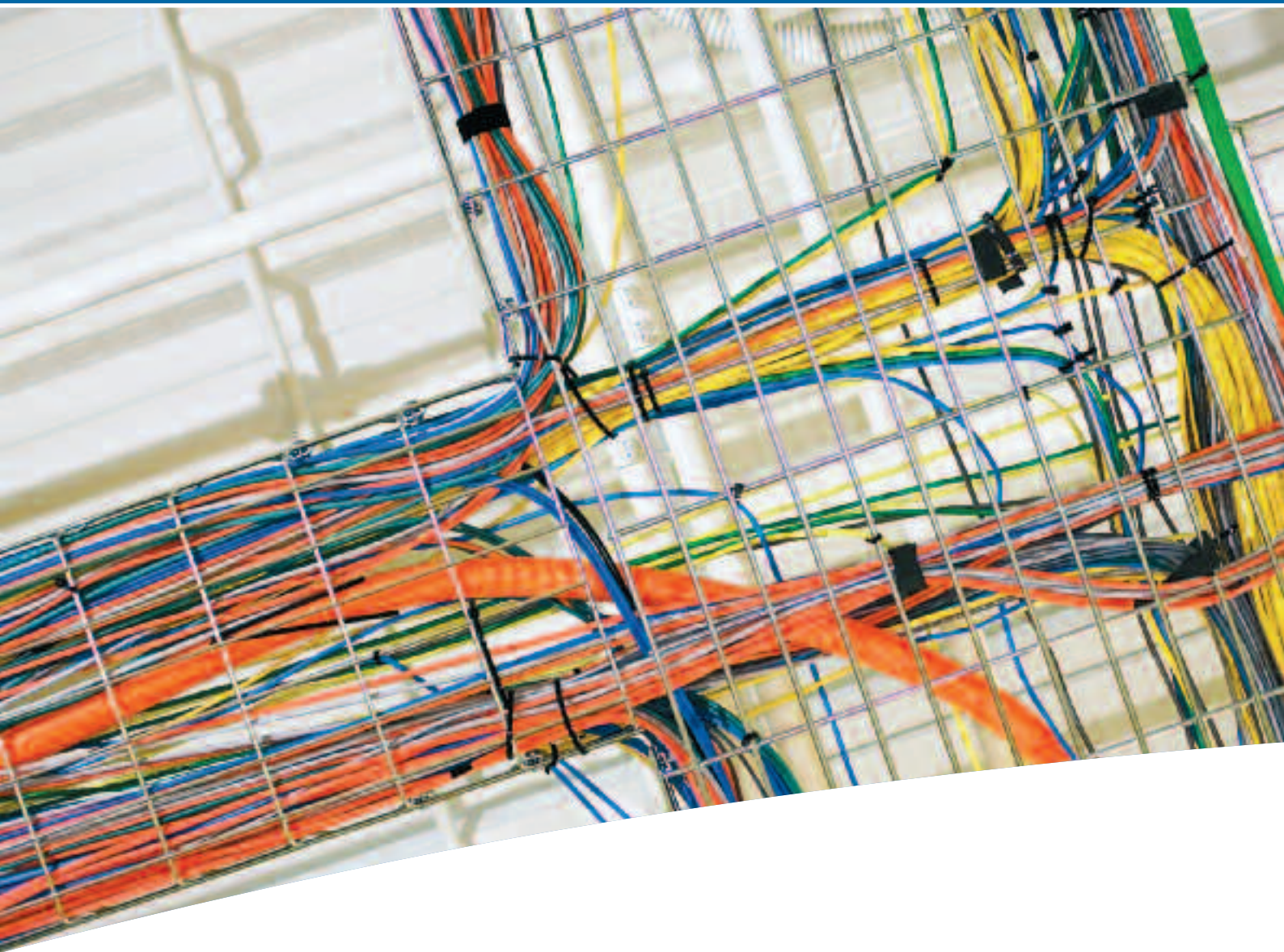
Product Ref.: CT4-TB

- Bantam tool, suitable for Releasable Type and Ladder Type stainless steel ties
- Unique 3-way handle can be used in various positions. Especially useful in tight areas with minimal access

Technical Information

Tool type	Hand tool
For type of cable tie	Releasable Type and Ladder Type stainless steel ties
Features	Tensioning, manual cutting
Weight	1200 g
Dimensions [L x W x H]	156 x 180 x 80 mm



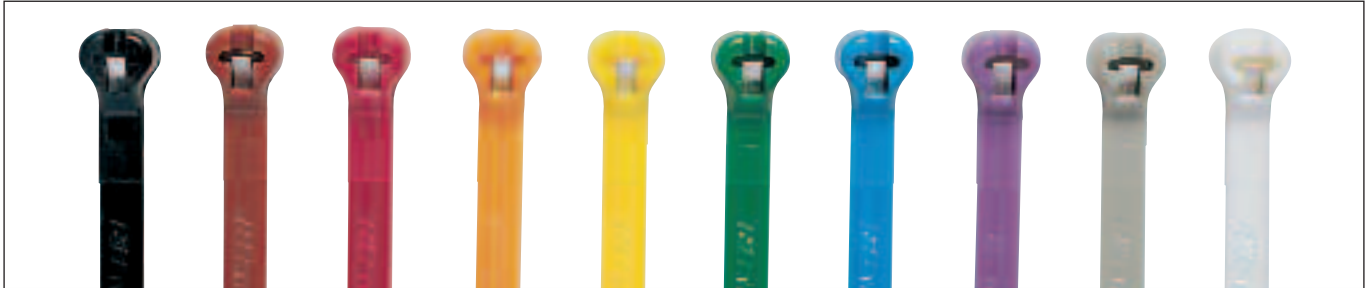


Material specifications

1.1	PREMIUM CABLE TIES WITH STEEL LOCKING BARB	4
1.2	ALL-PLASTIC CABLE TIES	44
1.3	STAINLESS STEEL CABLE TIES	64
1.4	MOUNTING BASES & ACCESSORIES	74
1.5	CABLE PROTECTION SYSTEMS	112
1.6	CABLE TIE TOOLING	122
1.7	MATERIAL SPECIFICATIONS	134
	UL flammability ratings	136
	Adhesive material specifications	137
	Material selection and specifications	138
	Unit conversion factors	145

UL flammability ratings

Materials specifications



Flammability ratings for selecting cable ties

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

UL 94 vertical burn test procedures

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

Materials classed 94 V-0:

A material classed 94 V-0 shall:

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

Materials classed 94 V-1:

A material classed 94 V-1 shall:

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

- D Not have any specimens that drip flaming particles that ignite the dry absorbent surgical cotton located 304.8 mm (12") below the test specimen
- E Not have any specimens with glowing combustion that persists for more than 60 seconds after the second removal of the test flame.

Materials classed 94 V-2:

A material classed 94 V-2 shall:

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

UL 94 horizontal burn (HB) test procedures

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

Materials classed 94 HB

A material that is less than 0.118 inch (3 mm) in thickness will be classified 94HB if it has a burning rate of less than 3 inches (76.2 mm) per minute or stops burning before the 5 inches (127 mm) mark. If one specimen from the set of three fails to comply, then a second set of three are tested. All three of this second set must comply. HB rated materials are considered "self-extinguishing". This is the lowest (least flame retardant) UL94 rating.

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

Adhesive material specifications

Materials specifications

Property	Method	Unit of measure	Rubber based (self-adhesive)	Acrylic based (2 component glue)
Coated Sides	–	each	2	2
Foam Density	–	Kg/m3	96.9	96.9
Peel Adhesion	PSTC 1	N/cm width	10.9	
	ASTM D 1000	Average		8.8
Shear Adhesion				
22°C 50% RH	PSTC 7	Hours	100 +	8 +
22°C Occasional Wetting		N/m2	68971	15174
Tensile Strength	ASTM D 412	PSI	100	100 +
Tear Resistance	ASTM D 624	N/cm	52.6	52.6 +
Elongation at Break	–	%	400	200
Service Temperature	–	°C Min	-18	-29
	–	°C Max	+66	+79
Flammability	ASTM D 624		Slow Burn	Slow Burn

Installation instructions for self-adhesive mounting bases

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

Installation instructions for Product Ref. : TC2PA (2 component glue)

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

Product Ref.: TC2PA

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

Technical Information

Description	2 component glue
Weight	0.21 kg

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

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

Material selection and specifications

Materials specifications



UV-resistant



Flame retardant



Heat resistant



Weatherproof



Low temperature flexibility



Radiation resistant



Low smoke



Chemically resistant



Detectable

Selecting the right material for your applications

Thomas & Betts offers cable ties and accessories in a wide variety of materials, each suited for specific environments. The purpose of this document, therefore, is to assist in choosing the best material for a particular application.

The effects of weathering, flame, chemicals, extreme temperatures and radiation on the different materials is clearly presented in tabular

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

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

Material specifications

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

Polyamide 6.6

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

Polyamide 6.6, weather resistant



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

Polyamide 6.6, heat stabilised



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

Polyamide 6.6, heat stabilised and UV-resistant



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

Polyamide 6.6, flame retardant



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

Polyamide 6.6, detectable



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

Material selection and specifications

Materials specifications

Polyamide 4.6, extra high temperature (150°C)



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

Polyamide 12, weather resistant



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

Polypropylene, weather resistant



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

Polypropylene, detectable



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

ETFE Fluoropolymer



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

ECTFE Fluoropolymer



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

Toughened weatherable acetal



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

302/304 Stainless Steel

316 Stainless Steel



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

Material selection and specifications

Materials specifications

General

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

How to use Table 1:

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

This information is based on data provided by the manufacturers of the specific materials listed and is provided only as a general guide. No specific recommendation is intended. As each application may vary, testing should be conducted by the user in the intended environment. Table 1 gives relative performance ratings of the different materials we offer. Chemical resistance is shown in Table 2

Table 1 - Information on cable tie materials

	Polyamide 6.6 PA6.6	Polyamide 6.6 weather resistant* UV PA6.6	Polyamide 6.6 heat stabilised HS PA6.6	Polyamide 6.6 heat stabilised UV resistant HSUV PA6.6	Polyamide 6.6 flame retardant FR PA6.6
Material Code	TY...M	TY...MX	TYH...M	TY...MXA	TY...MFR
	TY...	TY...X	TY...39		TS...HF
Max. operating temperature	+85°C	+85°C	+105°C	+105°C	+85°C
Min. operating temp.	-40°C	-40°C	-40°C	-40°C	-40°C
UL flammability rating	V-2	V-2	V-2	V-2	V-0
Specific density	1.14	1.14	1.14	1.14	1.16
Water absorption (24h/ASTM)	2.5 - 3.1%	2.5 - 3.1%	2.5 - 3.1%	2.5 - 3.1%	3.0 - 3.5%
Colours	Natural**	Black	Natural***	Black	White
E-module (N/mm ²)	2000	2000	2000	2000	1400
Notch impact strength conform DIN 53453 (KJ/m ²)	2-20	2-20	2-20	2-20	3-25
UV resistant		■		■	
Flame retardant					■
Heat resistant			■	■	
Enhanced weatherability				■	
Flexible at low temperatures					
Radiation resistant					
Chemically resistant					See table 2 (pages 142 - 144)
Halogen free	■	■	■	■	■
Silicon free	■	■	■	■	■

* 2% Carbon for military specifications

** Can be supplied in a wide range of colours

*** May have a greenish tint

Material selection and specifications

Materials specifications

Material codes used in tables

Material	Code
STANDARD POLYAMIDE 6.6	PA6.6
WEATHER RESISTANT POLYAMIDE 6.6	UV PA6.6
HEAT-STABILISED POLYAMIDE 6.6	HS PA6.6
HEAT-STABILISED UV RESISTANT POLYAMIDE 6.6	HSUV PA6.6
FLAME RETARDANT POLYAMIDE 6.6	FR PA6.6
HIGH TEMPERATURE POLYAMIDE 4.6	HT PA4.6
WEATHER RESISTANT POLYAMIDE 12	UV PA12
POLYPROPYLENE	PP
WEATHER RESISTANT POLYPROPYLENE	UV PP
ETFE FLUOROPOLYMER	TZ
ECTFE FLUOROPOLYMER	HAL
TOUGHENED WEATHERABLE ACETAL	DEL
STAINLESS STEEL	SS

Polyamide 4.6 high temperature HT PA4.6	Polyamide 12 weather resistant UV PA12	Polypropylene weather resistant UV PP	ETFE TZ	ECTFE HAL	Toughened weatherable acetal DEL	Stainless Steel SS
TYHT...M	TYC...MX TY...PX	TYP...MX	TYZ...M	TYV...M	TYD... CSS	YRL... or YLD... or YLS...
+150°C	+85°C	+85°C	+150°C	+140°C	+85°C	+538°C +150°C for coated
-40°C	-40°C	-40°C	-46°C	-40°C	-40°C	-80°C
V-2	V-2	HB	V-0	V-0	HB	Excellent
1.18	1.02	0.90 - 0.91	1.67 - 1.75	-	-	7.95
1.3%	0.7 - 1.1%	0.01 - 0.03%	0.02%	-	-	0%
Light green	Black	Black	Aquamarine	Maroon	Black	Metallic / Black
3200	1600	1100-1300	1000	-	-	193000
	3.5-13	3-17	o.B.	-	-	122J(IZOD)
	■	■	■	■	■	■
			■	■		■
■			■	■		■
	■	■	■	■	■	■
	■	■				■
			■			■
■	■	■			■	■
■	■	■	■	■	■	■

Material selection and specifications

Materials specifications

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

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

Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

Material selection and specifications

Materials specifications

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

Reagents	Concentration	HS PA6.6	HAL	DEL	PA6.6	UV PA6.6	FR PA6.6	UV PA12	PP	UVPP	TZ	SS
Furfural	100%	–	E	–	–	–	–	–	F	F	E	E
Gallic Acid	AQ	–	E	–	–	–	–	–	–	–	E	E
Gasoline	100%	E	E	–	E	E	E	–	S	S	E	E
Glycerine	100%	–	E	–	–	–	–	E	E	E	–	E
Hydrocyanic Acid	All	–	E	–	–	–	–	–	E	E	E	E
Hydrogen Peroxide	30%	NR	E	F	NR	NR	NR	S	E	E	E	E
Hydrogen Sulfide	Dry	NR	E	–	NR	NR	NR	E	E	E	E	E
Iodoform	100%	–	E	–	–	–	–	–	–	–	E	E
Isopropyl Alcohol	100%	S	E	–	S	S	S	E	E	E	E	E
Jet Fuel	100%	E	E	–	E	E	E	–	S	S	E	E
Lactic Acid	10%	E	E	–	E	E	E	S	E	E	E	E
Lanolin	10%	E	E	–	E	E	E	E	E	E	E	E
Lead Acetate	5%	–	E	–	–	–	–	–	E	E	E	E
Linseed Oil	10%	E	E	E	E	E	E	E	E	E	E	E
Magnesium Carbonate	All	–	E	–	–	–	–	E	E	E	E	E
Magnesium Chloride	10%	F	–	–	F	F	F	F	F	F	F	F
Magnesium Nitrate	All	–	E	–	–	–	–	E	E	E	E	E
Malic Acid	AQ	–	E	–	–	–	–	–	E	E	E	E
Mercury	100%	–	E	–	–	–	–	E	E	E	E	E
Methyl Alcohol	100%	S	E	–	S	S	S	E	E	E	E	E
Methyl Chloride	100%	–	S	–	–	–	–	–	S	S	E	E
MethylEthyl Ketone	100%	–	E	F	–	–	–	E	E	E	E	E
Naptha	100%	–	E	–	–	–	–	–	E	E	E	E
Nitric Acid	30%	NR	E	NR	NR	NR	NR	–	E	E	E	E
Nitric Acid	30-70%	NR	S	NR	NR	NR	NR	–	F	F	S	E
Nitrous Acid	5%	–	E	–	–	–	–	–	F	F	E	E
Oieic Acid	100%	–	E	S	–	–	–	–	E	E	E	E
Oxalic Acid	10%	–	E	–	–	–	–	S	E	E	E	E
Paraffin	100%	E	E	–	E	E	E	E	E	E	E	E
PetroleumEther	100%	–	E	–	–	–	–	E	F	F	E	E
Phenol	90%	NR	E	NR	NR	NR	NR	–	E	E	E	E
Phosphoric Acid	10%	NR	E	–	NR	NR	NR	–	E	E	E	E
Picric Acid	1%	–	E	–	–	–	–	–	E	E	E	E
Potassium Bromide	AQ	–	–	–	–	–	–	–	S	S	S	S
Potassium Carbonate	1%	–	E	–	–	–	–	E	E	E	E	E
Potassium Chlorate	AQ	–	E	–	–	–	–	S	E	E	E	E
Potassium Dichromate	40%	NR	E	–	NR	NR	NR	F	E	E	E	E
Potassium Ferrocyanide	25%	–	E	–	–	–	–	–	E	E	E	E
Potassium Hydroxide	5%	S	E	–	S	S	S	–	E	E	E	E

Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

Material selection and specifications

Materials specifications

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

Reagents	Concentration	HS PA6.6	HAL	DEL	PA6.6	UV PA6.6	FR PA6.6	UV PA12	PP	UVPP	TZ	SS
Potassium Iodide	All	–	E	–	–	–	–	E	E	E	E	E
Potassium Nitrate	50%	F	E	–	F	F	F	E	E	E	E	E
Potassium Permanganate	5%	NR	E	S	NR	NR	NR	NR	E	E	E	E
Potassium Sulfate	5%	–	E	–	–	–	–	E	E	E	E	E
Potassium Sulfide	AQ	–	E	–	–	–	–	–	E	E	E	E
Propyl Alcohol	100%	E	E	–	E	E	E	–	E	E	E	E
Silver Nitrate	10%	–	E	–	–	–	–	E	E	E	E	E
Sodium Acetate	60%	E	E	–	E	E	E	–	E	E	E	E
Sodium Bicarbonate	All	E	E	–	E	E	E	E	E	E	E	E
Sodium Bisulfate	10%	–	E	E	–	–	–	E	E	E	E	E
Sodium Borate	All	–	E	–	–	–	–	–	E	E	E	E
Sodium Carbonate	5%	E	E	S	E	E	E	E	E	E	E	E
Sodium Chlorate	25%	–	E	E	–	–	–	S	E	E	E	E
Sodium Chloride	2%	E	E	S	E	E	E	E	E	E	E	E
Sodium Fluoride	5%	–	–	–	–	–	–	–	F	F	F	F
Sodium Hydroxide	10%	E	E	S	E	E	E	E	E	E	E	E
Sodium Hyposulfite	AQ	–	E	–	–	–	–	–	–	–	E	E
Sodium Nitrate	5%	E	E	–	E	E	E	E	E	E	E	E
Sodium Nitrite	AQ	–	E	–	–	–	–	S	E	E	E	E
Sodium Perchlorate	10%	–	E	–	–	–	–	–	–	–	E	E
Sodium Phosphate	5%	–	E	–	–	–	–	E	E	E	E	E
Sodium Sulfate	5%	S	E	–	S	E	E	E	E	E	E	E
Sodium Thiosulfate	5%	–	–	S	–	–	–	S	S	S	S	S
Stearic Acid	100%	–	E	–	–	–	–	F	E	E	E	E
Sulfur	100%	–	E	–	–	–	–	E	E	E	E	E
Sulfur Dioxide	All	NR	E	–	NR	NR	NR	E	E	E	E	E
Sulfuric Acid	Conc.	NR	E	NR	NR	NR	NR	–	S	S	E	E
Sulfuric Acid	5%	NR	F	F	NR	NR	NR	F	F	F	F	F
Tannic Acid	10%	–	E	–	–	–	–	–	E	E	E	E
Tartaric Acid	50%	–	E	E	–	–	–	E	E	E	E	E
Tetrahydrofuran	100%	–	F	E	–	–	–	S	F	F	E	E
Toluene	100%	E	E	F	E	E	E	E	F	F	E	F
Xylene	100%	E	–	E	E	E	E	F	F	E	E	
Zinc Chloride	70%	F	E	NR	F	F	F	E	E	E	E	E
Zinc Nitrate	AQ	–	E	–	–	–	–	E	E	E	E	E
Zinc Sulfate	AQ	–	E	–	–	–	–	E	E	E	E	E

Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

Unit conversion factors

Materials specifications

Unit	x	Constant	=	Unit
BTU		778.0		foot-pound (ft x lb)
BTU		1054.8		Joules
BTU		0.293		Watt-hours (W x h)
centimetres (cm)		0.032808		feet (ft)
centimetres (cm)		0.3937		inches (in)
centimetres (cm)		0.00001		kilometres (km)
centimetres (cm)		0.010		metres (m)
centimetres (cm)		10.0		millimetres (mm)
circular mils		0.00064516		circular millimetres
circular mils		0.0000007854		inches ² (in ²)
circular mils		0.000506671		square millimetres (mm ²)
circular mils		0.7854		mils ²
cubic centimetre (cm ³)		0.000035314		cubic foot (ft ³)
cubic centimetre (cm ³)		0.061023		cubic inch (in ³)
cubic centimetre (cm ³)		0.000001		cubic metre (m ³)
cubic centimetre (cm ³)		0.0026417		gallons
cubic foot (ft ³)		17280.		cubic inch (in ³)
cubic foot (ft ³)		28317.016		cubic centimetre (cm ³)
cubic inch (in ³)		0.00057870		cubic feet (ft ³)
cubic inch (in ³)		0.000016387		cubic metre (m ³)
cubic inch (in ³)		16.387162		cubic centimetre (cm ³)
cubic metre (m ³)		1000000.0		centimetre (cm)
cubic metre (m ³)		35.314456		cubic foot (ft ³)
cubic metre (m ³)		264.17		gallons
foot (ft)		0.00018939		miles
foot (ft)		0.33333		yards (yd)
foot (ft)		12		inches (in)
foot (ft)		0.00030480		kilometres (km)
foot (ft)		0.30480		metres (m)
foot (ft)		30.480		centimetres (cm)
foot (ft)		304.80		millimetres (mm)
foot/pound (ft/lb)		0.00067197		metres/grams (m/g)
foot-pound (ft x lb)		0.001285		BTU
foot-pound (ft x lb)		1.356		Joules (J)
foot/pound (ft/lb)		0.1383		kilogram/metre (kg/m)
gallons (US)		3.785332		litres (l)

Unit	x	Constant	=	Unit
gallons		0.13368		cubic foot (ft ³)
gallons		231.0		cubic inch (in ³)
gallons		3785.332		cubic centimetres (cm ³)
grams (g)		15.432		grains
gram/centimetre ³ (gm/cm ³)		0.0361275		pounds/in ³ (lb/in ³)
horsepower (hp)		33000.0		ft x lb/min
horsepower (hp)		550.0		ft x lb/sec
horsepower (hp)		745.7		Watts (W)
inch (in)		0.027178		yards (yd)
inch (in)		0.083333		feet (ft)
inch (in)		0.00002540		kilometre (km)
inch (in)		0.025400		metre (m)
inch (in)		2.54000514		centimetre (cm)
inch (in)		25.4000514		millimetre (mm)
inch (in)		1000.0		mils
Joules		0.000948		BTU
Joules		107		ergs
liters (l)		61.0250		cubic inch (in ³)
metres (m)		1.093611		yard (yd)
metres (m)		3.2808333		feet (ft)
metres (m)		39.37		inch (in)
metres (m)		100.0		centimetre (cm)
miles		1760.0		yards (yd)
miles		5280.0		feet (ft)
miles		1.6093		kilometre (km)
millimetres (mm)		0.0032808		feet (ft)
millimetres (mm)		0.03937		inch (in)
millimetres (mm)		0.001		metres (m)
millimetres (mm)		0.01		centimetres (cm)
millimetres (mm)		39.3701		mils
millimetres (mm)		1000.0		microns (µm)
Watts (W)		44.25		ft x lb/minute
Watts (W)		0.737562		ft x lb/sec
Watts (W)		0.001341		horsepower (hp)
Watt-hours (W x h)		3.41266		BTU