3. Heatshrink Systems

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Shrink-Kon®
To insulate and protect cables
3. Heatshrink systems

### 3.1 Thin wall heatshrink tubing

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<td>200</td>
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<td>201</td>
</tr>
</tbody>
</table>

### 3.2 Medium & thick wall heatshrink tubing and accessories

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Overview

Type PLG / PLG HSB boxes
General purpose, flexible heatshrink tubing for protection, insulation and bundling.
Shrink ratio 2:1.

Shrink-Kon® set
A handy carry case comprising PLG heatshrink tubing with or without the T&B hot air tool.
Shrink ratio 2:1

Shrink-Kon® pre-cut bags
Type PLG pre-cut strips supplied in Euroslot bags.
Shrink ratio 2:1

Type CMP
Dual listed CSA / UR flexible heatshrink tubing.
Shrink ratio 2:1

Type MLP
Flexible heatshrink tubing for high specifications. Meets Military standards.
Shrink ratio 2:1

Type GYS / GYS HSB boxes
Flexible green and yellow striped heatshrink tubing for the identification and marking of earthing cables and connectors.
Shrink ratio 2:1

Type FRH
A very flexible and highly flame retardant heatshrink tubing.
Shrink ratio 2:1

Type PIG / PIG HSB Boxes
A flexible heatshrink tubing with a higher shrink ratio for highly contoured components.
Shrink ratio 3:1

Type PKG
Semi flexible heatshrink tubing particularly suitable for corrosion and damp protected casing as well as highly contoured components.
Shrink ratio 3:1 / 4:1

Type KYN
Rigid transparent heatshrink tubing suitable for areas of high mechanical loads, high temperatures and chemical stress.
Shrink ratio 2:1

Type VIT
Highly flexible and flame retardant heatshrink tubing for enhanced protection.
Shrink ratio 2:1

Type ZHFR
Zero Halogen and flame retardant flat heatshrink tubing for use in contained areas.
Shrink ratio 2:1
Thin wall heat shrink tubing
Selection guide

Select your criteria and you will find the best product for your requirement (in the blue cell)

Figure 1

Approvals

yes
no

Operating temperature

>135°C
<135°C

Chemical resistance

good
high

Water proof

yes
no

PLG

Figure 2

Silicone free

Lead free

Halogen free

Approvals

yes
no

Operating temperature

>135°C
<135°C

PLG*/ZHFR

* Transparent version only

PLG/ CMP/ MLP/ FRH/ GYS/ KYN/ VIT/ ZHFR

PLG/ CMP/ MLP/ FRH/ GYS/ KYN/ VIT/ ZHFR

MLP*/ PIG*

CMP*

CR/ UR

MIL

MLP/ FRH/ GYS/ PIG/ KYN/ VIT

PLG

PKG

CSA/ UR

CMP

KYN

VIT
## Technical Information

<table>
<thead>
<tr>
<th>Type</th>
<th>PLG</th>
<th>CMP</th>
<th>MLP</th>
<th>FRH</th>
<th>GYS</th>
<th>PIG</th>
<th>PKG</th>
<th>KYN</th>
<th>VIT</th>
<th>ZHFR</th>
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<tbody>
<tr>
<td>Shrinking Temperature</td>
<td>+110°C</td>
<td>+110°C</td>
<td>+90°C</td>
<td>+110°C</td>
<td>+90°C</td>
<td>+90°C</td>
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<td>+175°C</td>
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<td>-55°C to -55°C</td>
<td>-55°C to -55°C</td>
<td>-55°C to -55°C</td>
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<td>-55°C to -55°C</td>
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<td>2:1</td>
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<td>3:1</td>
<td>3:1</td>
<td>2:1</td>
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<tr>
<td>Dielectric Strength</td>
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<td>20 kV/mm</td>
<td>20 kV/mm</td>
<td>24 kV/mm</td>
<td>20 kV/mm</td>
<td>20 kV/mm</td>
<td>10 kV/mm</td>
<td>25 kV/mm</td>
<td>6 kV/mm</td>
<td>24 kV/mm</td>
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<tr>
<td>Resistivity (Ohm-cm)</td>
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<td>10¹⁴</td>
<td>10¹⁴</td>
<td>10¹⁴</td>
<td>10¹⁴</td>
<td>10¹⁴</td>
<td>10¹³</td>
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<td>flexible</td>
<td>semi-rigid</td>
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<td>Polyolefin</td>
<td>Polyolefin</td>
<td>Polyethylene Fluoride</td>
<td>Vinyldiene Fluoride</td>
<td>Hexafluoropropylene</td>
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<td>Elongation at Break</td>
<td>200%</td>
<td>200%</td>
<td>250%</td>
<td>200%</td>
<td>200%</td>
<td>250%</td>
<td>200%</td>
<td>200%</td>
<td>250%</td>
<td>200%</td>
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<tr>
<td>Tensile Strength</td>
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<td>14 N/mm²</td>
<td>14 N/mm²</td>
<td>10 N/mm²</td>
<td>14 N/mm²</td>
<td>10 N/mm²</td>
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<td>35 N/mm²</td>
<td>10.5 N/mm²</td>
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<td>Longitudinal Shrinkage</td>
<td>±10% max.</td>
<td>±10% max.</td>
<td>±10% max.</td>
<td>±5% max.</td>
<td>±10% max.</td>
<td>±10% max.</td>
<td>±5% max.</td>
<td>±10% max.</td>
<td>±10% max.</td>
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<td>Inner Diameters Before Shrinkage</td>
<td>1.2 mm (1/16&quot;)</td>
<td>1.2 mm (1/16&quot;)</td>
<td>1.2 mm (1/16&quot;)</td>
<td>3.2 mm (1/8&quot;)</td>
<td>1.5 mm (1/32&quot;)</td>
<td>3.0 mm (1/8&quot;)</td>
<td>1.2 mm (1/32&quot;)</td>
<td>3.2 mm (1/8&quot;)</td>
<td>2.4 mm (1/8&quot;)</td>
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</tr>
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<td>Water Absorption Max.</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.05%</td>
<td>1%</td>
<td>0.20%</td>
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<td>Chemical Resistance</td>
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<td>very good</td>
<td>very good</td>
<td>good</td>
<td>very good</td>
<td>very good</td>
<td>good</td>
<td>very good</td>
<td>good to excellent</td>
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<td>Specific Gravity (g/cm³)</td>
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<td>1.3</td>
<td>1.3</td>
<td>1.4</td>
<td>1.4</td>
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<td>1.8</td>
<td>1.9</td>
<td>1.45</td>
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<td>Dielectric Constant</td>
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<td>max. 2.5</td>
<td>max. 2.5</td>
<td>max. 2.5</td>
<td>max. 2.5</td>
<td>max. 2.5</td>
<td>max. 5.5</td>
<td>max. 9.0</td>
<td>max. 2.5</td>
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<td>Silicone Free</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Lead / Cadmium Free</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Halogen Free</td>
<td>yes****</td>
<td>yes****</td>
<td>yes****</td>
<td>no</td>
<td>no</td>
<td>yes****</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

For more detailed technical specifications, please see pages 216 and 217.

CMP-tubing: listing acc. to UL 224; file E 79546 (M). MLP-tubing meets MIL-I-23053/5B Class I and II. FRH-tubing: exting. acc. to UL224, VW-1; file E79546

* Transparent, not self-extinguishing  
** Melting point of the inner adhesive is +85°C  
*** Viton is a registered trademark of DuPont  
**** Transparent version only  
***** Kynar is a registered trademark of ATOFINA
Thin wall heat shrink tubing
Product reference structure

Example:

Expanded diameter as supplied in thousandths of an inch

XXX

PLG  1000  0  A

Type of heatshrink

Colour

Packaging type*

See Selection Guide page 183

0 = black (standard)
1 = brown*
2 = red
3 = orange*
4 = yellow
5 = green*
6 = blue
7 = violet*
8 = grey*
9 = white
C = transparent
E = green / yellow

* For special colours, please contact sales office

A = 1,22 m cut lengths
B = reels
BG = reels
C = 0,6 m cut lengths
D = box
E = mini-reels

* Not necessary for HSB boxes
Thin wall heatshrink tubing
Type PLG - flexible

- Multi-purpose use for insulation, bundling, identification, strain relief and much more
- Heatshrink tubing with 14 nominal diameters to enclose components from Ø 1.2 mm to Ø 101.6 mm
- Flame retardant
- Flexible, rapid shrinkage, non-melting for effective electrical insulation
- Available colours: Black, Red, Yellow, Blue, White, Transparent (see page 185 for product reference structure)
- Special colours available on request

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<th>Wall thickness</th>
<th>Thin</th>
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<td>Shrink ratio</td>
<td>2:1</td>
</tr>
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<td>Tube characteristics</td>
<td>Single wall</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>Shrinking temperature</td>
<td>+110°C</td>
</tr>
<tr>
<td>Material</td>
<td>Crosslinked polyolefin</td>
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<tr>
<td>IP rating</td>
<td>IP60</td>
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<tr>
<td>Standard colour</td>
<td>Black</td>
</tr>
<tr>
<td>Other properties</td>
<td>Silicone, Cadmium and Lead free, Transparent version: Halogen free</td>
</tr>
</tbody>
</table>

**Ordering Information**

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<tr>
<th>PRODUCT REF.</th>
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<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>LENGTH PER REEL</th>
<th>MINI-REEL</th>
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<tbody>
<tr>
<td></td>
<td>[inch] [mm]</td>
<td>[mm]</td>
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<td>[mm]</td>
<td>[m]</td>
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<td>PLG46-0-E</td>
<td>3/64 1.2</td>
<td>0.6</td>
<td>0.20</td>
<td>0.4</td>
<td>–</td>
<td>150</td>
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<tr>
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<td>1/16 1.6</td>
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<td>0.4</td>
<td>–</td>
<td>150</td>
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<tr>
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<td>3/32 2.4</td>
<td>1.2</td>
<td>0.25</td>
<td>0.5</td>
<td>–</td>
<td>150</td>
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<tr>
<td>PLG125-0-E</td>
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<td>1.6</td>
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<td>0.5</td>
<td>–</td>
<td>150</td>
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<tr>
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<td>2.4</td>
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<td>0.5</td>
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<td>0.6</td>
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<td>–</td>
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<td>0.6</td>
<td>–</td>
<td>75</td>
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<td>PLG500-0-E</td>
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<td>0.7</td>
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<td>1.4</td>
<td>25</td>
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For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white and C = transparent
Thin wall heatshrink tubing
Type PLG - flexible

- Multi-purpose use for insulation, bundling, identification, strain relief and much more
- Heatshrink tubing with 14 nominal diameters to enclose components from Ø 1.2 mm to Ø 101.6 mm
- Flame retardant
- Flexible, rapid shrinkage, non-melting for effective electrical insulation
- Available colours: Black, Red, Yellow, Blue, White, Transparent (see page 185 for product reference structure)
- Special colours available on request

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<tr>
<th>Wall thickness</th>
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<tbody>
<tr>
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<td>IP rating</td>
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<tr>
<td>Standard colour</td>
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<tr>
<td>Other properties</td>
<td>Silicone, Cadmium and Lead free</td>
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<tr>
<td>Transparent version</td>
<td>Halogen free</td>
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**Ordering Information**

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<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
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<th>WALL THICKNESS AFTER SHRINKING</th>
<th>TOTAL LENGTH PER BOX</th>
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<tr>
<td></td>
<td>D [inch]</td>
<td>d [mm]</td>
<td>z [mm]</td>
<td>w [mm]</td>
<td>[m]</td>
<td>[pieces 1.22m]</td>
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For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white and C = transparent
Thin wall heatshrink tubing
Type PLG - HSB boxes

- PLG heatshrink tubing in a compact, handy sized box used for electrical maintenance and repair
- Convenient amount of heatshrink, for small users
- Offered in 10 sizes to cover a heatshrink range from Ø 1.2 mm to Ø 25.4 mm
- Stackable boxes for easy storage
- Flexible, rapid shrinkage, non-melting for effective electrical insulation
- Flame retardant
- Available colours: Black, Red, Yellow, Blue, White, Transparent (see page 185 for product reference structure)

Technical Information

| Wall thickness: Thin | Shrink ratio: 2:1 |
| Tube characteristics: Single wall | Temperature range: -55°C to +125°C |
| Shrinking temperature: +110°C | Material: Crosslinked polyolefin |
| IP rating: IP60 | Standard colour: Black |
| Other properties: Silicone, Cadmium and Lead free | Transparent version: Halogen free |

Ordering Information

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<th>Product Ref.</th>
<th>Expanded Diameter as Supplied</th>
<th>Fully Recovered Diameter</th>
<th>Wall Thickness Before Shrinking</th>
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<th>Length Per Box</th>
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</table>

For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white and C = transparent
Thin wall heatshrink tubing
Shrink-Kon® Set

- A kit comprising PLG heatshrink with or without hot air tool in a handy carry case
- Maintenance and repair, research and development, small series manufacture and much more
- 9 different expanded diameters
- 6 different colours
- 23 types
- Flame retardant
- Case made from shock-resistant plastic
- All types available in refill packages

Ordering Information

- Product Ref. with hot air tool
  SK-1400GTG (with GR121)
  SK-1400GTG-UK (with GR321)
- Product Ref. without hot air tool
  SK-1400G

See page 215 for tooling specifications

Technical Information

| Wall thickness | Thin |
| Shrink ratio | 2:1 |
| Tube characteristics | Single wall |
| Temperature range | -55°C to +125°C |
| Shrinking temperature | +110°C |
| Material | Crosslinked polyolefin |
| IP rating | IP60 |
| Other properties | Silicone, Cadmium and Lead free |
| Transparent version | Halogen free |

Heathshrink set contents information

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<th>PRODUCT REF.</th>
<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>COLOUR</th>
<th>LENGTH</th>
<th>QUANTITY</th>
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Thin wall heatshrink tubing
Type PLG - Pre-cut bags

- The Shrink-Kon® Pre-cut packs of PLG heatshrink are available to replenish the Shrink-Kon® Set or for use on displays
- 9 different expanded diameters
- 6 different colours
- Packed in small quantities
- Flexible, rapid shrinkage, non-melting for effective electrical insulation
- Flame retardant
- Available colours: Black, Red, Yellow, Blue, White, Transparent (see page 185 for product reference structure)

Technical Information

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<td>Temperature range</td>
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<td>Shrink temperature</td>
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Ordering Information

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Thin wall heatshrink tubing
Type CMP - Dual listed

- Typical applications are mechanical and electrical insulation, corrosion protection, bundling, mechanical protection and much more
- Internal diameters from 1.2 mm to 51 mm
- Flame retardant
- Flammability per UL 224
- The tubing is marked
- Available colours: Black, Red, Yellow, Blue, White, Transparent (see page 185 for product reference structure)

### Technical Information

<table>
<thead>
<tr>
<th>Wall thickness</th>
<th>Thin</th>
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### Ordering Information

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<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>LENGTH PER REEL</th>
<th>TOTAL LENGTH PER BOX</th>
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Transparent version not UL recognized
For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white and C = transparent
Thin wall heatshrink tubing
Type MLP - flexible for high specifications

- Typical applications are insulation, corrosion protection, component strain relief and connections in applications requiring the highest specifications (e.g. aeronautical and military applications)
- Internal diameters from 1.2 mm to 25.4 mm
- Meets MIL-DTL-23053/5 requirements, Class 1 and Class 2
- Weather UV-resistant
- Good chemical resistance
- Flame retardant
- Available colours: Black, Red, Yellow, Blue, White, Transparent (see page 185 for product reference structure)

Technical Information

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<tr>
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Ordering Information

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<th>LENGTH PER REEL</th>
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For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white and C = transparent
Thin wall heatshrink tubing
Type GYS - flexible green and yellow

- For identifying and marking earthing connectors and cables
- Mechanical and electrical insulation, corrosion protection
- Internal diameters from 3.2 mm to 25.4 mm
- Flame retardant
- Meets MIL-DTL-23053/5 requirements, Class 1 and Class 2
(see page 185 for product reference structure)

### Technical Information

<table>
<thead>
<tr>
<th>Wall thickness</th>
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<tr>
<td>Shrink ratio</td>
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<td>Single wall</td>
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### Ordering Information

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Thin wall heatshrink tubing
Type GYS - HSB boxes

- For identifying and marking earthing connectors and cables
- GYS heatshrink in a compact, handy sized box
- Convenient amount of heatshrink, for small users
- Offered in 7 sizes to cover a heatshrink range from 3.2 mm to 25.4 mm diameters
- Stackable boxes for easy storage
- Flame retardant
- Meets MIL-DTL-23053/5 requirements, Class 1 and Class 2
- Mechanical and electrical insulation, corrosion protection (see page 185 for product reference structure)

Technical Information

| Wall thickness | Thin |
| Shrink ratio   | 2:1  |
| Tube characteristics | Single wall |
| Temperature range | -55°C to +135°C |
| Shrinking temperature | +90°C |
| Material       | Crosslinked polyolefin |
| IP rating      | IP60 |
| Standard colour | Green / Yellow striped |
| Other properties | Silicone, Cadmium and Lead free |

Ordering Information

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Thin wall heatshrink tubing
Type FRH - very flexible, flame retardant

- Mechanical and electrical insulation where UL 224, class VW-1 is required
- Internal diameters from Ø 1.2 mm to Ø 51 mm
- Listed per UL 224, class VW-1, CSA OFT
- High flame retardancy
- Resistant to common fluids and solvents (see page 185 for product reference structure)

Technical Information

| Wall thickness | Thin |
| Shrink ratio   | 2:1  |
| Tube characteristics | Single wall |
| Temperature range      | -55°C to +135°C |
| Shrinking temperature | +110°C |
| Material           | Crosslinked polyolefin |
| IP rating          | IP60 |
| Standard colour    | Black |
| Other properties   | Silicone, Cadmium and Lead free |

Ordering Information

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<tr>
<th>PRODUCT REF.</th>
<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>LENGTH PER REEL</th>
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Thin wall heatshrink tubing
Type PIG - flexible for highly contoured components

- Heatshrink tubing to enclose highly contoured components with large diameter variations. Provides mechanical and electrical protection
- Meets UL 224 requirements
- Internal diameters from 1.6 mm to 40 mm
- Excellent mechanical strength
- Resistant to common fluids and solvents
- Flame retardant (except transparent version)
- Meets MIL-DTL-23053/5 requirements, Class 1 and Class 2
- Available colours: Black, Red, Yellow, Blue, White, Transparent, Green / Yellow striped (see page 185 for product reference structure)

Technical Information

| Wall thickness | Thin |
| Tube characteristics | Single wall |
| Temperature range | -55°C to +135°C |
| Shrinking temperature | +90°C |
| Material | Crosslinked polyolefin |
| IP rating | IP60 |
| Standard colour | Black |
| Other properties | Silicone, Cadmium and Lead free |
| Transparent version: | Halogen free |

Ordering Information

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<tr>
<th>PRODUCT REF.</th>
<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
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<td>PIG0451-0-B 3/16 4.5 1.5 0.20 0.60 300</td>
<td>PIG0602-0-B 1/4 6.4 2.0 0.22 0.65 300</td>
<td>PIG0903-0-B 3/8 9.5 3.0 0.25 0.75 150</td>
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* Not available in green / yellow

For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white, C = transparent and E = green / yellow striped
Thin wall heatshrink tubing
Type PIG - HSB boxes

- PIG heatshrink in a compact, handy sized box
- Workshop, installation, laboratory and much more
- Heatshrink tubing to enclose highly contoured components with large diameter variations. Provides mechanical and electrical protection
- Convenient amount of heatshrink, for small users
- Offered in 8 sizes to cover a heatshrink range from Ø 1.6 mm to Ø 25.4 mm
- Stackable boxes for easy storage
- Meets UL 224 requirements
- Excellent mechanical strength
- Resistant to common fluids and solvents
- Flame retardant (except transparent version)
- Meets MIL-DTL-23053/5 requirements, Class 1 and Class 2 (except green / yellow version)
- Available colours: Black, Red, Yellow, Blue, White, Transparent, Green / Yellow striped (see page 185 for product reference structure)

**Technical Information**

<table>
<thead>
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<th>Wall thickness</th>
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<td>Tube characteristics</td>
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<td>Temperature range</td>
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<td>Shrinking temperature</td>
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<tr>
<td>Material</td>
<td>Crosslinked polyolefin</td>
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<tr>
<td>IP rating</td>
<td>IP60</td>
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<td>Standard colour</td>
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<td>Other properties</td>
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<td>Transparent version</td>
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* Not available in green/yellow

For other colours add colour suffix to Product Reference:
0 = black, 2 = red, 4 = yellow, 6 = blue, 9 = white, C = transparent and E = green / yellow striped
Thin wall heatshrink tubing
Type PKG - semi-flexible for moist environments

- Crosslinked modified Polyolefin with thermoplastic adhesive lining
- Particularly suitable for corrosion and damp protected casings as well as highly contoured components
- Flame retardant
- Moisture resistant
- Good chemical resistance
- High mechanical stability
- The high shrink ratio and flexibility of this range allows the user maximum coverage with minimal parts
- The adhesive lining bonds to plastic, rubber, neoprene, steel and polyethylene (see page 185 for product reference structure)

Technical Information

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<th>Wall thickness</th>
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Ordering Information

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</table>
Thin wall heatshrink tubing
Type KYN - rigid transparent

- In areas of heavy mechanical loads, high temperatures and chemical stress. Insulation in densely packed wiring, in heating elements and much more
- Internal diameters from 1.2 mm to 25.4 mm
- High mechanical strength
- Excellent electrical insulation performance
- High flame retardancy
- Highly abrasion and cut resistant
- Resistant to Diesel
- Very good resistance against chemicals and solvents
- Meets MIL-DTL-23053/8 requirements

**Technical Information**

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<tr>
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<th>Specification</th>
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* registered trademark of ATOFINA

**Ordering Information**

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<th>PRODUCT REF.</th>
<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>LENGTH PER BOX</th>
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Thin wall heatshrink tubing
Type VIT - highly flexible, flame retardant

- High flexibility makes it suitable even under heavy-duty conditions e.g. sensors in vehicle engine compartments
- Excellent strength and resistance against corrosive fluids even at high temperatures
- Internal diameters from 3.2 mm to 50.8 mm
- Offers excellent resistance to aggressive fuels and chemicals
- High flame retardancy
- Meets MIL-DTL-23053/13 requirements

Technical Information

| Wall thickness | Thin |
| Shrink ratio   | 2:1  |
| Tube characteristics | Single wall |
| Temperature range | -55°C to +220°C* |
| Shrinking temperature | +175°C |
| Material       | Viton*, Crosslinked fluoroelastomer |
| IP rating      | IP60 |
| Standard colour | Black |
| Other properties | Silicone, Cadmium and Lead free |

*Viton is a registered trademark of DuPont.

Ordering Information

<table>
<thead>
<tr>
<th>PRODUCT REF.</th>
<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS BEFORE SHRINKING</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>LENGTH PER BOX</th>
<th>QUANTITY PER BOX</th>
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Thin wall heatshrink tubing
Type ZHFR - flexible, Halogen free & flame retardant

- Flattened tube
- Flexible
- Low smoke generation when burnt
- Halogen free
- Flame retardant
- Particularly recommended for use in contained areas and with Halogen free wires and cables
- Meets DEF STAN 59-97, issue 3, type 8

Technical Information

- Wall thickness: Thin
- Shrink ratio: 2:1
- Tube characteristics: Flat - Single wall
- Temperature range: -40°C to +105°C
- Shrinking temperature: +115°C
- Material: Crosslinked polyolefin
- IP rating: IP60
- Standard colour: Black
- Other properties: Silicone, Cadmium, Lead and Halogen free

Ordering Information

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For other colours add colour suffix to Product Reference:
0 = black, 4 = yellow, 9 = white
Medium/thick wall heatshrink tubing, braided sleeving systems and accessories
3. Heatshrink systems

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tubing and accessories

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Type TEB - cable breakouts 209
Type TEC - end caps 210
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Medium and thick wall heatshrink tubing Selection guide

Type TBM and TBW
Medium and Thick wall, heatshrink tubing ideal for the protection of cable joints and terminations in low voltage power applications.
Rated for 600V, 90°C continuous use.
Shrink ratio 3:1

Low Voltage Kits up to 600V
VMS medium and thick wall cable jointing kit for polymeric insulated cables.
Shrink ratio 3:1

Type TBCHR
Semi rigid thick wall heatshrink tubing for submerged and underground installations
Shrink ratio 3:1

Type TEB
Medium and thick wall adhesive lined heatshrink cable breakouts for insulating and sealing of cable crutches.

Type TEC
Medium and thick wall adhesive lined heatshrink end caps to seal and protect cable-ends against the ingress of moisture and contamination.
Shrink ratio >2:1

TBTA-ZH
Self Amalgamating tape which provides a thick insulating layer with flawless electrical stability and a long term resistance to moisture penetration.
Stretch ratio 3:1

Type CPS - Flame retardant
Flame retardant polyester braided sleeving for protecting and bundling cables and wires inside cabinets and enclosures.

Type CPS - Non-flame retardant
Non-flame resistant polyester braided sleeving for protecting and bundling cables and wires inside cabinets and enclosures.

Bind-It™
Open and wraparound sleeving to protect cable assemblies against abrasion.
Thick wall heatshrink tubing
Type TBW - rated for 600V, 90°C continuous use

- TBW is an excellent product for sealing and insulating cable splices, connections, terminations and jacket repairs. The tubing is designed to withstand the severe mechanical requirements of submersible and direct-buried installations
- Low voltage power applications 600V
- High resistance to abrasion, corrosion and chemicals
- Excellent weatherability
- Cut sleeves and non-standard lengths are available upon request
- 9 standard sizes in thick wall: internal diameters from 9 mm to 120 mm
- Meets requirements of ESI 09-11

Technical Information

| Wall thickness | Thick |
| Shrink ratio | 3:1 |
| Tube characteristics | Dual wall |
| Temperature range | -55°C to +110°C (Jacket only +105°C) |
| Shrinking temperature | +120°C |
| Material | Crosslinked polyolefin with thermoplastic adhesive liner |
| IP rating | IP67 |
| Standard colour | Black |
| Other properties | Silicone and Halogen free |

Ordering Information

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<th>FULLY RECOVERED DIAMETER</th>
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Supplied with adhesive as standard
For non-adhesive versions, please contact your Sales Office
Medium wall heatshrink tubing
Type TBM - rated for 600V, 90°C continuous use

- TBM an excellent product for sealing and insulating cable splices, connections, terminations and jacket repairs where light weight and high flexibility are required
- High resistance to abrasion, corrosion and chemicals
- Excellent weatherability
- Cut sleeves and non-standard lengths are available upon request
- 12 standard sizes in medium wall: internal diameters from 10 mm to 229 mm
- Meets requirements of ESI 09-11

### Technical Information

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### Ordering Information

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Supplied with adhesive as standard
For non-adhesive versions, please contact your Sales Office
Medium and Thick wall heatshrink tubing
Low voltage kits up to 600V

• VMS heatshrinkable sleeves (TBM and TBW) are suitable for jointing multi-core, polymeric insulated energy cables in the low voltage range
• Quick, simple installation
• Exceptionally good electrical insulation and environmental protection
• Good mechanical load-bearing ability
• No maintenance time necessary
• Unlimited storage life
• Tested to DIN 47632 / VDE 0278 Part 1 and 3

Standard Content
• 1 Outer sleeve (TBW)
• 5 Inner sleeves (TBM)
• Cleaning cloths
• Abrasive cloth
• Installation instructions

Technical Information

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Thick wall heatshrink tubing
Type TBCHR - semi rigid - for submerged and underground installations

- TBCHR is a reliable thick wall heat shrinkable tubing suitable for applications where extraordinary insulating and sealing characteristics are required
- The interior of the tubing is coated with an effective thermo-plastic covering, which provides excellent adhesion and corrosion protection, acting as a valuable insulating resin
- Ideal for a variety of applications including the insulation of electrical connections, the repair of damaged earthing conductors and cable sheathing.
- As a result of the high shrink ratio of this product, only a few sizes of shrinkable tubing are required
- Internal diameters from 19 mm to 120 mm

**Technical Information**

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<td><strong>Other properties</strong></td>
<td>Silicone, Halogen, Cadmium and Lead free</td>
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</table>

**Ordering Information**

<table>
<thead>
<tr>
<th>PRODUCT REF.</th>
<th>EXPANDED DIAMETER AS SUPPLIED</th>
<th>FULLY RECOVERED DIAMETER</th>
<th>WALL THICKNESS AFTER SHRINKING</th>
<th>LENGTH PER BOX</th>
<th>QUANTITY PER BOX</th>
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<tbody>
<tr>
<td></td>
<td>D [mm]</td>
<td>d [mm]</td>
<td>w [mm]</td>
<td>[m]</td>
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The nominal wall thickness depends on the condition of the shrinking
The wall thickness is decreased in the case where it is shrunk excessively
Non-standard sizes and lengths available on request
Medium and Thick wall heatshrink tubing
Type TEB - cable breakouts

- Cable Breakouts are designed for the insulation and sealing of cable crutches
- They offer extreme strain relief and mechanical protection
- Adhesive line provides complete sealing
- UV-resistant
- They also provide good insulation and resistance to common fluids and solvents

Technical Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Wall thickness</td>
<td>Medium and thick</td>
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<tr>
<td>Shrink ratio</td>
<td>Various</td>
</tr>
<tr>
<td>Tube characteristics</td>
<td>Dual wall</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-55°C to +100°C</td>
</tr>
<tr>
<td>Shrinking temperature</td>
<td>+135°C</td>
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<tr>
<td>Material</td>
<td>Crosslinked polyolefin with thermoplastic adhesive liner</td>
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<tr>
<td>IP rating</td>
<td>IP67</td>
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<td>Standard colour</td>
<td>Black</td>
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Ordering Information

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<th>RECOVERED</th>
<th>FINGER LENGTH</th>
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<td>d [mm]</td>
<td>l [mm]</td>
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<td>L [mm]</td>
<td>l [mm]</td>
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<td>21</td>
<td>7.0</td>
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<tr>
<td>TEB3-38/11</td>
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<td>11</td>
<td>4.0</td>
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<td>11</td>
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<td>245.0</td>
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Medium and Thick wall heatshrink tubing
Type TEC - end caps

- End Caps are designed to seal and to protect cable-ends against the ingress of moisture and contamination.
- They offer extreme strain relief and mechanical protection
- Adhesive line provides complete sealing
- They also provide optimal sealing and resistance to chemicals and solvents
- UV-resistant

Technical Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Wall thickness</td>
<td>Medium and thick</td>
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<tr>
<td>Shrink ratio</td>
<td>&gt; 2:1</td>
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<tr>
<td>Tube characteristics</td>
<td>Dual wall</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-55°C to +100°C</td>
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<tr>
<td>Shrinking temperature</td>
<td>+120°C</td>
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<td>Material</td>
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<tr>
<td>IP rating</td>
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<tr>
<td>Standard colour</td>
<td>Black</td>
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<td>Other properties</td>
<td>Silicone, Halogen, Cadmium and Lead free</td>
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Ordering Information

<table>
<thead>
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<th>Product Ref.</th>
<th>Expanded diameter as supplied [mm]</th>
<th>Recovered diameter d [mm]</th>
<th>Recovered length L [mm]</th>
<th>Wall thickness after shrinking T [mm]</th>
<th>Cable diameter [mm²]</th>
<th>Quantity [pieces]</th>
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<td>44.0</td>
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<tr>
<td>TEC25/9</td>
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<tr>
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<td>107.0</td>
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<td>28 - 47</td>
<td>10</td>
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<tr>
<td>TEC80/40</td>
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<td>40.0</td>
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<tr>
<td>TEC102/60</td>
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<td>68 - 90</td>
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<tr>
<td>TEC124/60</td>
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<td>60.0</td>
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<td>TEC148/57</td>
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<td>57.0</td>
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<td>80 - 135</td>
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</tbody>
</table>
TBTA-ZH - self amalgamating tape

- Self amalgamating tape
- Thomas & Betts TBTA-ZH tape provides a thick insulating layer with flawless electrical stability and a long term resistance to moisture penetration, which demands waterproofing
- To repair and maintain cable sleeving up to 65 Kv
- For installations, where open flame and heat may not be used
- Excellent resistance to UV rays and Ozone
- Easy to apply - no tools or heating required
- Excellent protection at low temperatures

Technical Information

- Stretch ratio: 3:1
- Temperature range: -55°C to +105°C
- Material: EPR based tape
- IP rating: IP67
- Standard colour: Black
- Other properties: Silicone, Halogen, Cadmium and Lead free

<table>
<thead>
<tr>
<th>PRODUCT REF.</th>
<th>ROLL LENGTH</th>
<th>WIDTH</th>
<th>THICKNESS</th>
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<tr>
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<td>9.0</td>
<td>19</td>
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<tr>
<td>TBTA-ZH-25</td>
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<td>TBTA-ZH-51</td>
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<td>51</td>
<td>0.76</td>
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</tbody>
</table>

Ordering Information

TBTA-ZH must be stretched on application for the self-adhesive properties to be activated. TBTA-ZH has a stretch ratio of more than 3:1.

Installation notes

1. The surface of the connection and the cable entry must be clean
2. TBTA-ZH should be used under high tension as the stretching process activates the adhesive
3. By wrapping the TBTA-ZH tape around the cable, a sealed casing is created
4. If a cable or pipe needs protection, the TBTA-ZH tape should be wrapped around itself twice at the beginning point and then should overlap throughout by 50%. This means that the tape will also stretch when the cable is under tension
5. Finally, the surface (see point 4) should be covered once more using 100% tape overlap
6. At the end, the tape should be held at the overlap point and torn off
7. To conclude the installation, the ripped off end should be pressed firmly to close.
Cable protection systems
CPS Series - Braided Sleeving

Flame retardant

- Standard colour – black with grey identification yarn
- Flame-retardant polyester, rated at UL 94V-0
- Available in nominal diameters from 3 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. WTHSG)

Ordering Information

<table>
<thead>
<tr>
<th>PRODUCT REF.</th>
<th>NOMINAL DIAMETER AS SUPPLIED [mm]</th>
<th>EXPANDABLE DIAMETER RANGE [mm]</th>
<th>LENGTH PER MINI-REEL [m]</th>
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<tbody>
<tr>
<td>CPS3B-100-V0</td>
<td>3</td>
<td>2 - 5</td>
<td>100</td>
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<tr>
<td>CPS4B-100-V0</td>
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<td>3 - 7</td>
<td>100</td>
</tr>
<tr>
<td>CPS5B-100-V0</td>
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<td>4 - 9</td>
<td>100</td>
</tr>
<tr>
<td>CPS6B-100-V0</td>
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<td>5 - 11</td>
<td>100</td>
</tr>
<tr>
<td>CPS8B-100-V0</td>
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<td>7 - 13</td>
<td>100</td>
</tr>
<tr>
<td>CPS10B-50-V0</td>
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<td>9 - 15</td>
<td>50</td>
</tr>
<tr>
<td>CPS12B-50-V0</td>
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<td>11 - 17</td>
<td>50</td>
</tr>
<tr>
<td>CPS15B-50-V0</td>
<td>15</td>
<td>13 - 20</td>
<td>50</td>
</tr>
<tr>
<td>CPS20B-50-V0</td>
<td>20</td>
<td>18 - 25</td>
<td>50</td>
</tr>
<tr>
<td>CPS25B-50-V0</td>
<td>25</td>
<td>22 - 30</td>
<td>50</td>
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<tr>
<td>CPS30B-50-V0</td>
<td>30</td>
<td>27 - 40</td>
<td>50</td>
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<tr>
<td>CPS40B-50-V0</td>
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<td>35 - 50</td>
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<td>CPS50B-50-V0</td>
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<td>45 - 60</td>
<td>50</td>
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Grey sleeving and other lengths available to special order, please contact your Sales Office.
Cable protection systems
CPS Series - Braided Sleeving
Non-flame retardant

- Standard colour – black or grey
- 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. WTHSG)

### Ordering Information

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<th>PRODUCT REF. GREY</th>
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<th>EXPANDABLE DIAMETER RANGE [mm]</th>
<th>LENGTH PER MINI-REEL [m]</th>
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<tbody>
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<td>CPS3G-100</td>
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<td>1 - 5</td>
<td>100</td>
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<tr>
<td>CPS4B-100</td>
<td>CPS4G-100</td>
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<td>100</td>
</tr>
<tr>
<td>CPS5B-100</td>
<td>CPS5G-100</td>
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<td>100</td>
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<tr>
<td>CPS6B-100</td>
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<td>4 - 11</td>
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<td>CPS50G-25</td>
<td>50</td>
<td>40 - 66</td>
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</table>
• 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 wraparound 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 on request for the 5 mm, 8 mm and 13 mm nominal sizes
• Product is supplied black as standard with a white version available on request
• For a UL version please contact your Sales Office

Technical Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Typical performance</th>
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<td>Smoke density</td>
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<td>Fire resistance</td>
<td>FMVSS-302 Test method D45 1333</td>
<td>Self-extinguishing, type B</td>
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<td>Hard Vacuum</td>
<td>ASTM E-595</td>
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<td>• TML (Mass)</td>
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<td>• CVCM (Condensation)</td>
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<td>• WVR (Steam)</td>
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<td>Copper corrosivity</td>
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<td>Fluid resistance</td>
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<td>Tensile retention</td>
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<td>• Jet fuel: JP-41</td>
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<td>• Hydraulic fluid: (MIL-H-5606)</td>
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<tr>
<td>• Lube oil: (MIL-I-7808)</td>
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<tr>
<td>• De-icing fluid: (MIL-A08243)</td>
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<tr>
<td>• Salt Water: (O-S-1926)</td>
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Ordering Information

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<tr>
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<td>CPS05W-150</td>
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<td>150</td>
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<td>CPS08W-100</td>
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<td>CPS13W-50</td>
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<td>CPS19W-25</td>
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<td>CPS25W-25</td>
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<td>CPS29W-25</td>
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<td>CPS32W-15</td>
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<tr>
<td>CPS38W-15</td>
<td>38</td>
<td>15</td>
</tr>
</tbody>
</table>

* Nominal size is determined by wrapping the product around a mandrel of a given size to obtain 90 degrees of overlap (average value)
The Hot Air Tool from Thomas & Betts achieves a rapid shrink action. This tool is ideal for industrial and military applications.

### Ordering Information

<table>
<thead>
<tr>
<th>PRODUCT REF.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR121</td>
<td>Hot Air Tool (European Plug and WT993GR nozzle)</td>
</tr>
<tr>
<td>GR321</td>
<td>Hot Air Tool (UK Plug and WT993GR nozzle)</td>
</tr>
<tr>
<td>WT992GR</td>
<td>Wide slot nozzle</td>
</tr>
<tr>
<td>WT993GR</td>
<td>Reflector nozzle</td>
</tr>
<tr>
<td>WT994GR</td>
<td>Reduction nozzle Ø 20mm</td>
</tr>
<tr>
<td>WT995GR</td>
<td>Welding nozzle</td>
</tr>
<tr>
<td>WT996GR</td>
<td>Overlap welding nozzle</td>
</tr>
<tr>
<td>WT998GR</td>
<td>Solder sleeve reflector nozzle</td>
</tr>
<tr>
<td>WT999GR</td>
<td>Glass protection nozzle</td>
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### Technical Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Typical performance</th>
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<tbody>
<tr>
<td>Power Consumption</td>
<td>1400W</td>
</tr>
<tr>
<td>Temperature</td>
<td>+350°C to +500°C</td>
</tr>
<tr>
<td>Air Flow</td>
<td>350 / 500 l/min</td>
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<tr>
<td>Static pressure max.</td>
<td>1250 Pa</td>
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<tr>
<td>Weight</td>
<td>570 g</td>
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<tr>
<td>Electronics</td>
<td>Flicker-conformity</td>
</tr>
</tbody>
</table>

### Hot Air Tool - GR500

- Self contained refillable Industrial Torch
- Max. temperature: approx +850°C
- Uses butane gas
- Working time: 25 minutes per gas refill
- Auto ignition
- Adjustable flame
- Ideal for medium and thick wall heatshrink applications
- Supplied with attractive leather case for belt attachment
<table>
<thead>
<tr>
<th>Test Method</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>PLG</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +125°C</td>
<td>2:1</td>
<td>1.2 mm - 3/4&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no*</td>
<td>1.25 g/cm³</td>
<td>-10%</td>
</tr>
<tr>
<td>CMP</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +135°C</td>
<td>2:1</td>
<td>1.2 mm - 3/4&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no*</td>
<td>1.3 g/cm³</td>
<td>-5%</td>
</tr>
<tr>
<td>MLP</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +135°C</td>
<td>2:1</td>
<td>1.2 mm - 3/4&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no*</td>
<td>1.3 g/cm³</td>
<td>-5%</td>
</tr>
<tr>
<td>FRH</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +135°C</td>
<td>2:1</td>
<td>1.2 mm - 3/4&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no*</td>
<td>1.4g/cm³</td>
<td>-5%</td>
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<td>GYS</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +135°C</td>
<td>2:1</td>
<td>3.2 mm - 1/8&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>1.3 g/cm³</td>
<td>-5%</td>
</tr>
<tr>
<td>PIG coloured</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +135°C</td>
<td>3.1</td>
<td>1.6mm - 1/8&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no*</td>
<td>1.3 g/cm³</td>
<td>-10%</td>
</tr>
<tr>
<td>PIG transparent</td>
<td>PE Polyolefin</td>
<td>Flexible</td>
<td>-55°C to +135°C</td>
<td>3.1</td>
<td>1.6mm - 1/8&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no*</td>
<td>1 g/cm³</td>
<td>-10%</td>
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<tr>
<td>PKG</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>-55°C to +110°C</td>
<td>3:1/4:1</td>
<td>3.2 mm - 1/8&quot;</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>1.25 g/cm³</td>
<td>-12%</td>
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<tr>
<td>KYN</td>
<td>Kynar® Polvynylidene fluoride</td>
<td>Rigid</td>
<td>-55°C to +135°C</td>
<td>2.1</td>
<td>1.2 mm - 3/8&quot;</td>
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<td>yes</td>
<td>no*</td>
<td>1.8 g/cm³</td>
<td>-6%</td>
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<tr>
<td>VIT</td>
<td>Viton®, Vinylidene fluoride, Hexafluoropropylene</td>
<td>Highly flexible</td>
<td>-55°C to +220°C</td>
<td>2.1</td>
<td>3.2 mm - 1/8&quot;</td>
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<td>yes</td>
<td>no</td>
<td>1.9 g/cm³</td>
<td>-10%</td>
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<tr>
<td>ZHFR</td>
<td>PE Polyolefin</td>
<td>Very flexible</td>
<td>-40°C to +105°C</td>
<td>2.1</td>
<td>2.4 mm - 3/32&quot;</td>
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<td>yes</td>
<td>yes</td>
<td>1.4 g/cm³</td>
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<tr>
<td>TBBV</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>-55°C to +110°C</td>
<td>3:1</td>
<td>8.9 mm - 119.9 mm</td>
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<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>+1% to -10%</td>
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<tr>
<td>TBM</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>-55°C to +110°C</td>
<td>3:1</td>
<td>10.2 mm - 228.6 mm</td>
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<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>+1% to -10%</td>
</tr>
<tr>
<td>LV-Kit</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>-55°C to +125°C</td>
<td>3:1</td>
<td>1.5 - 400 mm</td>
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<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>10%</td>
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<tr>
<td>TEC</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>-55°C to +100°C</td>
<td>&gt;2:1</td>
<td>15 mm - 148 mm</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>+1% to -10%</td>
</tr>
<tr>
<td>TEB 3&amp;4 breakouts</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>various shrink ratios</td>
<td>38 mm - 125 mm</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>+1% to -10%</td>
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<tr>
<td>TEB 2 breakouts</td>
<td>PE Polyolefin</td>
<td>Semi-flexible</td>
<td>various shrink ratios</td>
<td>33 mm - 87 mm</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>+1% to -10%</td>
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<tr>
<td>TBT/TA-ZH</td>
<td>EPR-tape</td>
<td>Semi-flexible</td>
<td>-55°C to +105°C</td>
<td>stretch 3:1</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>2.5 MPa</td>
<td>min</td>
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<td>TBCHR</td>
<td>PE Polyolefin</td>
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<td>6:1</td>
<td>19 mm - 119.9 mm</td>
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<td>yes</td>
<td>yes</td>
<td>1.1 g/cm³</td>
<td>10%</td>
</tr>
</tbody>
</table>

* Transparent version is Halogen free
Viton® is a registered trademark of DuPont
Kynar is a registered trademark of ATOFINA

Current values and other information available on request
Transparent and adhesive versions not self extinguishing
<table>
<thead>
<tr>
<th>Product Name</th>
<th>Abrasion Resistance</th>
<th>Tensile Strength</th>
<th>Elongation</th>
<th>Low Temperature Flexibility</th>
<th>Combustion Behaviour</th>
<th>Shrink Temp</th>
<th>Storage Temp</th>
<th>Resistance Against Chemicals</th>
<th>Water Absorption (Max.)</th>
<th>Resistance to Fungus</th>
<th>Shore Hardness</th>
<th>Dielectric Strength</th>
<th>Dielectric Specific Volume</th>
<th>Specific Volume Resistance</th>
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<tr>
<td>TEST METHOD</td>
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<tr>
<td>PLG &gt;1000 cycles passed</td>
<td>12 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.30%</td>
<td>Very good</td>
<td>39 Shore D 22 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>CMP &gt;1000 cycles passed</td>
<td>13 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>39 Shore D 24 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>MLP &gt;1000 cycles passed</td>
<td>12 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>39 Shore D 24 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>FRH &gt;1000 cycles passed</td>
<td>13 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.50%</td>
<td>Very good</td>
<td>37 Shore D 20 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
</tr>
<tr>
<td>GYS &gt;1000 cycles passed</td>
<td>12 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>39 Shore D 24 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
</tr>
<tr>
<td>PIG coloured &gt;1000 cycles passed</td>
<td>13 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>38 Shore D 24 KV/mm</td>
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<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>PIG transparent &gt;1000 cycles passed</td>
<td>13 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>36 Shore D 24 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
</tr>
<tr>
<td>PKG &gt;1000 cycles passed</td>
<td>14 Mpa 168°C/158°C</td>
<td>120% 168°C/158°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.17%</td>
<td>Very good</td>
<td>36 Shore D 23 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/158°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>KYN &gt;1000 cycles passed</td>
<td>40 Mpa 168°C/200°C</td>
<td>320% 168°C/200°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.10%</td>
<td>Very good</td>
<td>65 Shore D 31.5 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/200°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>VIT &gt;1000 cycles passed</td>
<td>14 Mpa 168°C/250°C</td>
<td>220% 168°C/250°C</td>
<td>does not break at -55°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>30 Shore D 16 KV/mm</td>
<td>9</td>
<td>12 Mpa 168°C/250°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
</tr>
<tr>
<td>ZHFR &gt;1000 cycles passed</td>
<td>12 Mpa 168°C/135°C</td>
<td>168°C/135°C</td>
<td>does not break at -40°C</td>
<td>ASTM 2671 self-extinguishing**</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>36 Shore D 24 KV/mm</td>
<td>10°C</td>
<td>12 Mpa 168°C/135°C</td>
<td>self-extinguishing</td>
<td>10°C</td>
<td>10°C</td>
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<tr>
<td>TBNV &gt;1000 cycles passed</td>
<td>9 MPa min 168°C/150°C</td>
<td>500% 168°C/150°C</td>
<td>does not break at -55°C</td>
<td>Not self-extinguishing</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.10%</td>
<td>Very good</td>
<td>45 Shore D 20 KV/mm</td>
<td>5</td>
<td>10°C</td>
<td>10°C</td>
<td>10°C</td>
<td></td>
</tr>
<tr>
<td>TBM &gt;1000 cycles passed</td>
<td>9 MPa min 168°C/120°C</td>
<td>500% 168°C/120°C</td>
<td>does not break at -55°C</td>
<td>Not self-extinguishing</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.10%</td>
<td>Very good</td>
<td>45 Shore D 20 KV/mm</td>
<td>5</td>
<td>10°C</td>
<td>10°C</td>
<td>10°C</td>
<td></td>
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<tr>
<td>LV Kit &gt;1000 cycles passed</td>
<td>9 MPa min 168°C/120°C</td>
<td>500% 168°C/120°C</td>
<td>4 hours at -55°C no cracking or splitting</td>
<td>Not self-extinguishing</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.50%</td>
<td>Very good</td>
<td>45 Shore D 20 KV/mm</td>
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<tr>
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<td>ISO 914</td>
<td>ASTM D150</td>
<td>ISO 188</td>
<td>ISO 62</td>
<td>IEC 243</td>
<td>IEC 250</td>
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<tr>
<td>TEC &gt;1000 cycles passed</td>
<td>10 MPa min 168°C/120°C</td>
<td>250% 168°C/120°C</td>
<td>4 hours at -55°C no cracking or splitting</td>
<td>Not self-extinguishing</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.10%</td>
<td>Very good</td>
<td>45 Shore D 12 KV/mm</td>
<td>5</td>
<td>10°C</td>
<td>10°C</td>
<td>10°C</td>
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</tr>
<tr>
<td>TEB 3 &amp; 4 breakouts &gt;1000 cycles passed</td>
<td>9 MPa min 168°C/120°C</td>
<td>250% 168°C/120°C</td>
<td>4 hours at -55°C no cracking or splitting</td>
<td>Not self-extinguishing</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>40 Shore D 12 KV/mm</td>
<td>5</td>
<td>10°C</td>
<td>10°C</td>
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</tr>
<tr>
<td>TEB 2 breakouts &gt;1000 cycles passed</td>
<td>9 MPa min 168°C/120°C</td>
<td>250% 168°C/120°C</td>
<td>4 hours at -55°C no cracking or splitting</td>
<td>Not self-extinguishing</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.20%</td>
<td>Very good</td>
<td>40 Shore D 12 KV/mm</td>
<td>5</td>
<td>10°C</td>
<td>10°C</td>
<td>10°C</td>
<td></td>
</tr>
<tr>
<td>TEST METHOD</td>
<td>ASTMD 50</td>
<td>Flame retardant</td>
<td>Good</td>
<td>0.06%</td>
<td>Very good</td>
<td>30 KV/mm min</td>
<td>2°C 248/23°C</td>
<td></td>
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</tr>
<tr>
<td>TBTA-ZH &gt;1000 cycles passed</td>
<td>9 MPa min 168°C/150°C</td>
<td>250% 168°C/150°C</td>
<td>4 hours at -55°C no cracking or splitting</td>
<td>Not flame retardant</td>
<td>+10°C 30°C max</td>
<td>Good</td>
<td>0.50%</td>
<td>Very good</td>
<td>45 Shore D 20 KV/mm</td>
<td>5</td>
<td>10°C</td>
<td>10°C</td>
<td>10°C</td>
<td></td>
</tr>
</tbody>
</table>

**Except transparent version**

Current values and other information available on request.