Engineering Base

Protection Wizard

AUCOTEC AG
Oldenburger Allee 24
D-30659 Hannover
Phone: +49 (0)511 61 03-0
Fax: +49 (0)511 61 40 74

www.aucotec.com

AUCOTEC, INC.
17177 North Laurel Park Drive,
Suite 437
Livonia, MI 48152
Phone: +1 630 485 5600
Fax: +1 248 655 7800

Content

1 The Protection Wizard

You can use the Protection Wizard to assign protection material to the segments of a cable harness. When assigning the protection material, the filling degree of the selected protective material is determined. In the graphic, the protection material is represented by special line styles.

You can start the Protection Wizard only on segments in the graphic.

You can use the wizard with the following licenses / add-on licenses:

- Cable Harness Design
- Cable Manufacturing
- Engineering Base Cable
- Engineering Base Cable Logic
- Engineering Base Cable Logic VOBES
- Engineering Base Cable Pro

The wizard is included in the business solutions EB Cable SE and EB Cable AM.

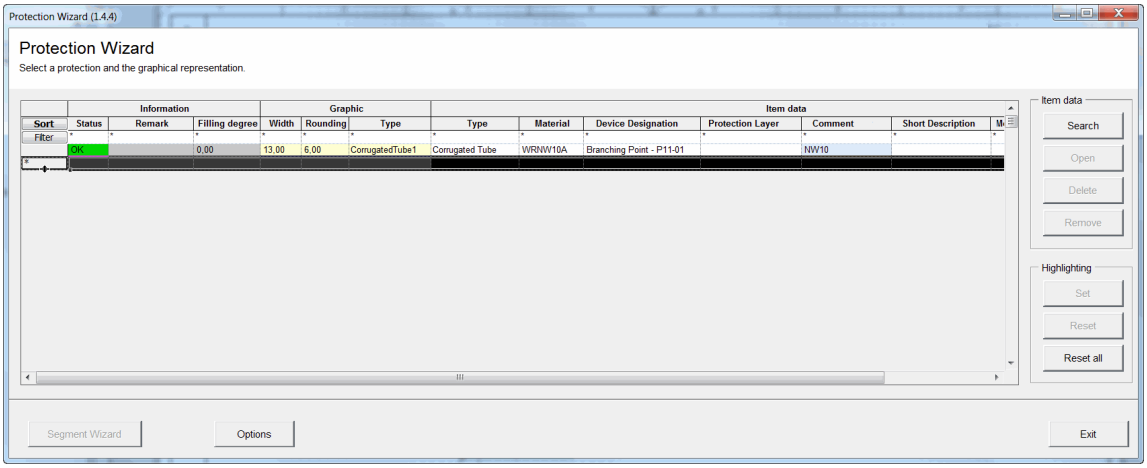
1.1 Preconditions

- The segments have two destinations.
- The wires in the drawing are assigned to segments. This is required for the complete (automatic) functionality.
- The preferred catalog must contain protection material. If the catalog does not contain protection material, then you can also enter it directly in the Protection Wizard.
- The line styles required for representing the protection material are assigned to the sheet. You can find line styles for the most common protection materials in the graphic toolbox under Protection (see also Line style naming convention) or the EBCable demo project.
- The calculation of the bend radii, outer diameters etc. can only be carried out if diameter values are defined for the relevant objects.
  - Wires: Outside diameter und bend radius
  - Protection material: Inside diameter

1.2 Assigning Protection Material

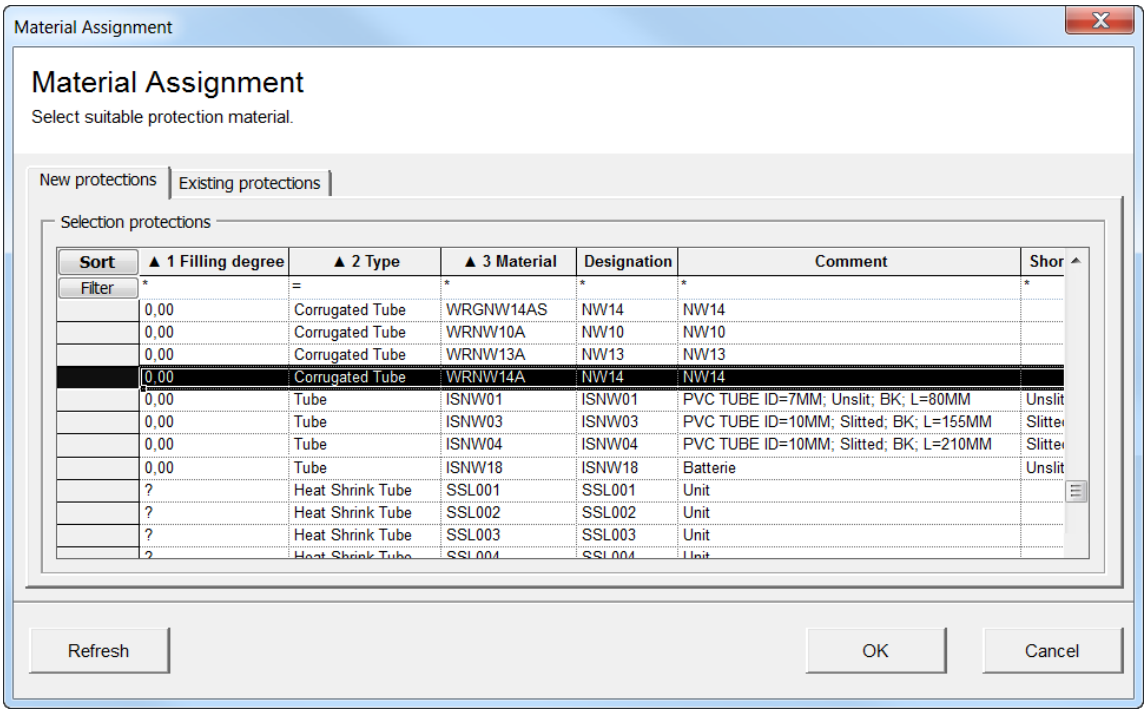
1. Open the sheet of your choice in Visio.
2. Mark one or several segments in the graphic.
3. Use the context menu to select **Protection Wizard**, or select it in the Assistant selection dialog.

   The Protection Wizard is opened.



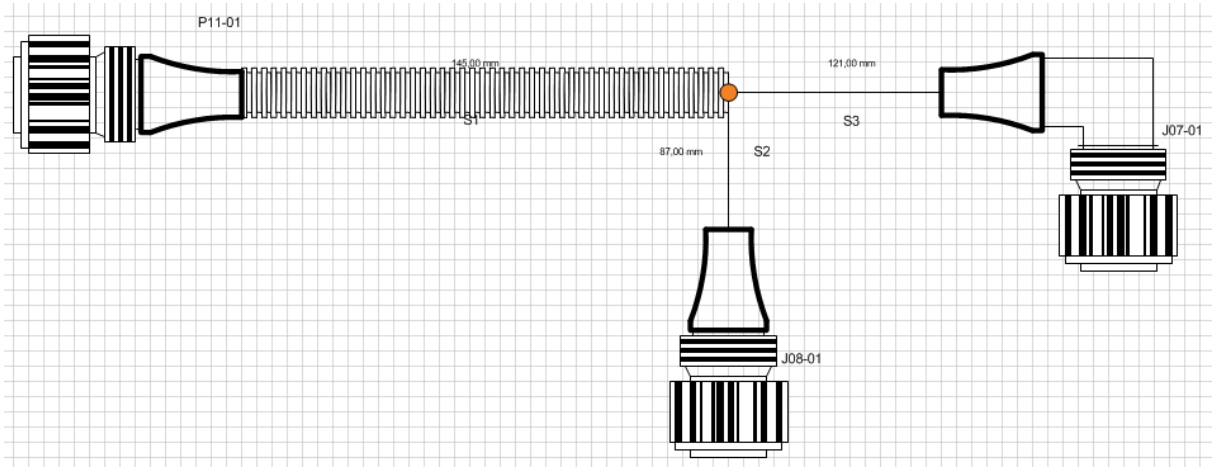
4. Click on **Search** to select the protection material of your choice from the catalog.

   The **Material assignment** dialog is opened.



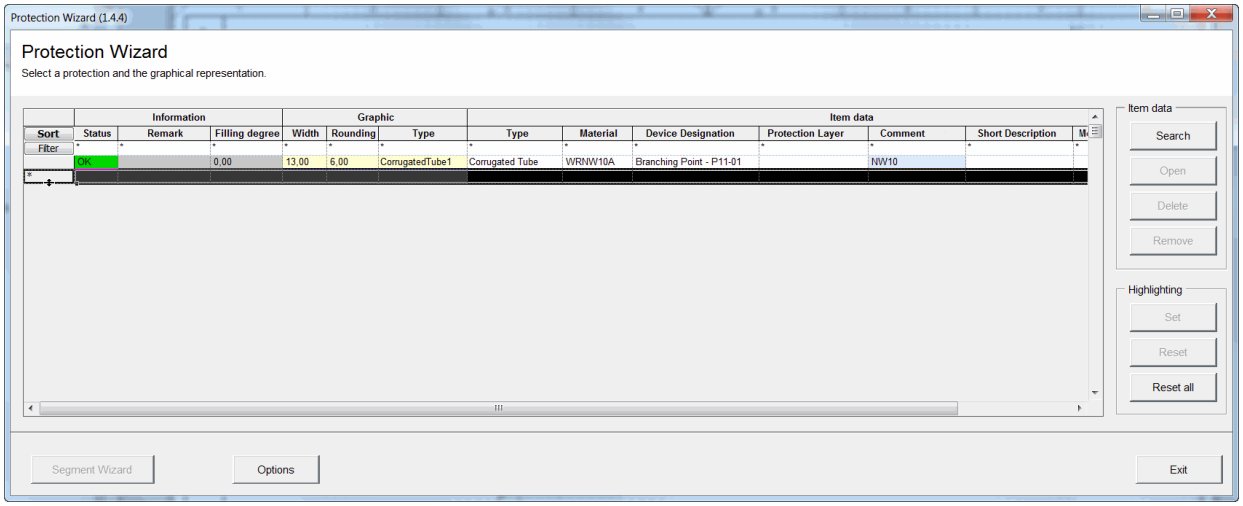
5. Select the desired protection material and confirm your selection with **OK**.

The selected protection material is displayed with the predefined line in the Protection Wizard and in the graphic and is stored as object in the **Equipment** folder as a function of the selected option.



1.3 Structure of the Dialog

The dialog of the Protection Wizard consists of a table with the buttons for item data, highlighting, segment wizard and options.



You can sort and/or filter the data shown in the table via the first line.

The columns and their meaning

The columns are each combined to groups.

Column		Meaning
Information		Warnings and notes on the current status with the selected protection material
	Status	Tells you whether the selected protection material can be used as intended. Possible values: OK, warning, note or error.
	Remark	Notes on the status messages.
	Filling Degree	The filling degree (in %) is determined via the diameter of the segment and the inner diameter of the selected protective material (see Calculations by the wizard).
Graphic		Contains the calculated dimensions and the line style of the protection material
	Width	Width of the line type in the drawing in mm. This is determined by the outer diameter of the protection material or the segment if no outer diameter is specified at the protection material.
	Rounding	Rounding of the line type in the drawing in mm. Corresponds to the bend radius of the protection material or the segment, the higher value being the one that is used.
	Type	Line style shown in the graphic as a function of the protection material. You can select the line style via the selection menu with . If the line style does not match the type of the protection material, a warning or an error is displayed in the status (see also Line style naming conventions).
Item data		Object data and catalog data of the selected protection material
	Type	Type of protection material
	Material	Materials from the catalog
	Device Designation	Device designation of the protection material object in the project. This is composed of the start and end points of the protection material. Example P11-01 branching point: The protection material starts at the object P11-01 and ends at the branching point.
	Protection Layer	This indicates in which order the protection material is mounted at the segment. Counting is done from the inside to the outside. In the catalog, the attribute **Protection Layer** must be present at the protection material.
	Comment	Comment from the catalog
	Module code	Corresponds to the assignment via the module code wizard
	Option Code	Corresponds to the assignment via the option code wizard

In order for the columns for the module and option formula to be displayed, these two attributes must be inserted in the existing worksheet template **Protection Wizard(FrmMain1)**, to be found in the project under Templates/Worksheets/Other. If these templates do not exist in the project, then you must copy them from the EBCable 2-D Harness project or the demo project System Engineering.

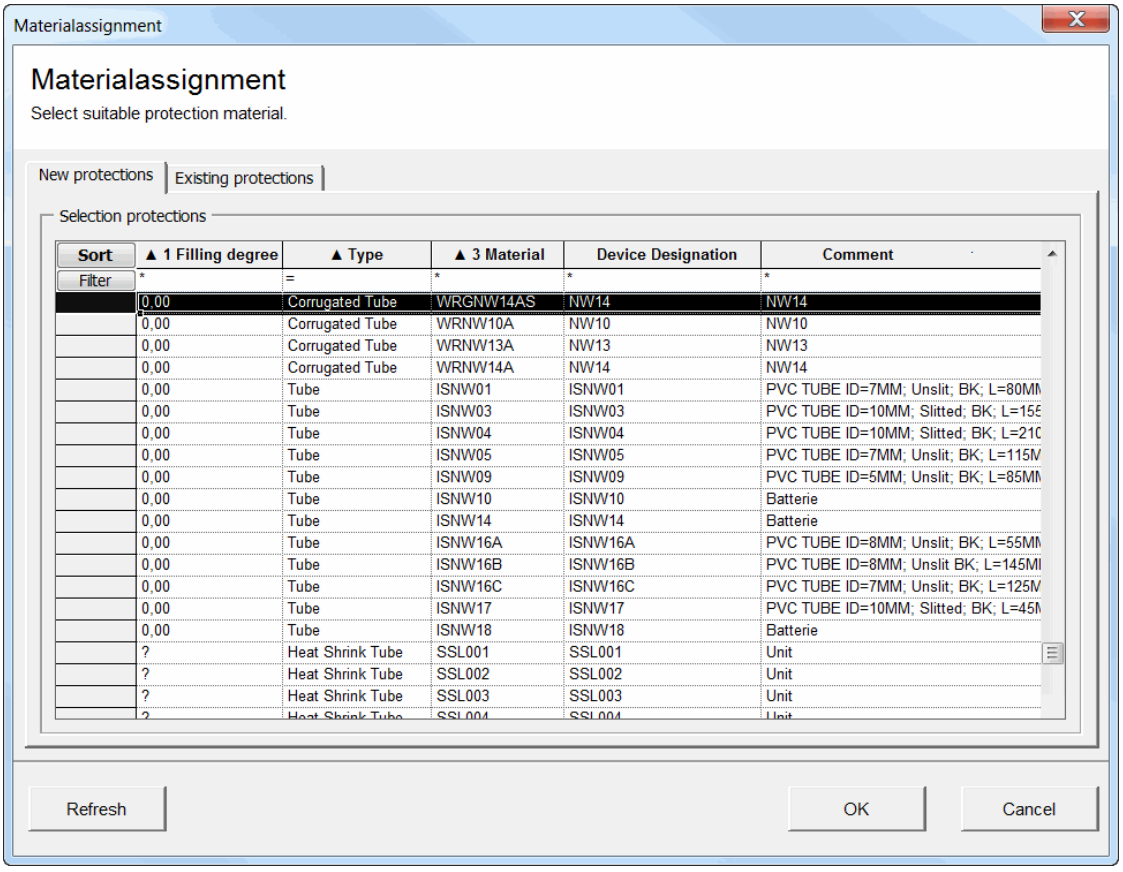
Please note:

- If you enter formulas in the columns module or option formula, then the corresponding attributes get the properties "Read-Only" and "Manual entry".
- If both the option and the module formula do not have entries, then all existing associations with the modules/variants are removed, and the attribute properties "Read Only" and "Manual Entry" are no longer set.
- If only one of the two, the module or the option formula, is described, then only those modules/variants are associated that are valid for the respective formula.

1.3.1 Buttons item data

You can use the buttons in the item data sector to assign protection material to the segment or to remove it.

- **Search**
  With a right mouse click on this button you open the dialog **Material assignment**.



It shows the available protection materials with the attributes filling degree, type, material, name, comment and short description. You can sort and/or filter the shown material via the first line.

- **Tab New protections**
  The indicated protection material is read in from the catalog.
- **Tab Existing Protections**
  The protection material used up to now in the project is shown.

With **Refresh** you can update the display of the protection materials.

With **OK** you confirm the selection of the marked protection material and close the dialog.

Cancel closes the dialog Material assignment without assigning protection material.

- **Open**
  The attributes of the material marked in the table (right mouse click in the first column) are shown.
- **Delete**
  Deletes the marked protection material at the segment **and** in the equipment. If the material has been assigned elsewhere, then there is a cautionary query whether the protection material is really to be deleted.
- **Remove**
  The protection material is removed from the segment. In the Equipment folder, the protection material is kept, although without device designation.

1.3.2 Highlighting Buttons

- **Set**
  The marked segment is highlighted in color in the graphic
- **Reset**
  The color marking of the segment is removed.
- **Reset all**
  This option removes the color marking from all marked segments of the graphic.

1.3.3 Segment Wizard

This button is activated only if protection material has already been assigned. In the Protection Wizard dialog, use a right mouse click in the first column to mark a line, and click on the button **Segment Wizard**.

The segment wizard offers the segment attributes Designation, Comment, Electromagnetic Compatibility and Length for editing.

With **Exit** you finish the dialog, the changes made are stored.

1.3.4 Options

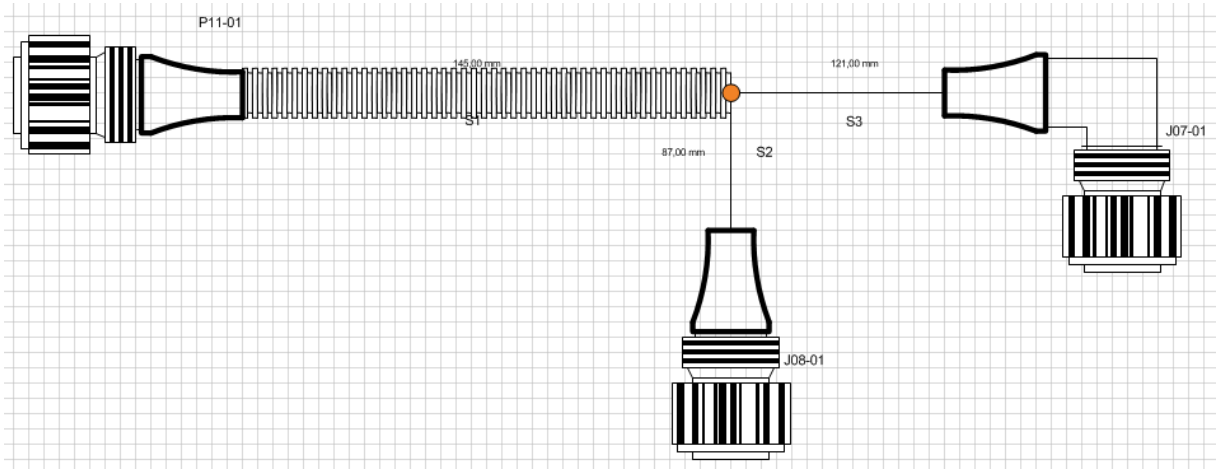
The options are used to specify how to represent the defined protection material in the project.

The following options are possible:

- **Aggregate Protections to Usage Location**
  The protection material is shown directly under the usage location. The protection material designation is taken from the catalog. If this option is not selected, then the protection material is placed under the wire harness and associated with the segment. The link to the protection material under the segment shows the name of the protection material.
- **Create automatic protection designation**
  The protection material designation is composed of the designations of the start and end points of the segment. Example: start point **Connector Assembly P11-01**, end point **Branching Point** results in the designation **Branching Point-P11-01**.

Example

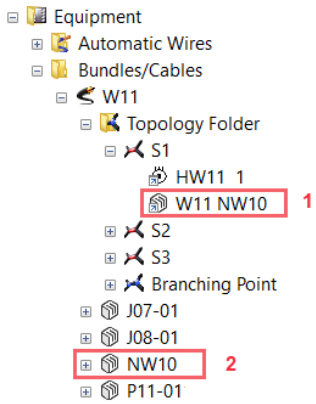
The wizard assigns protection material to the segment between connector assembly P11-01 and a branching point.



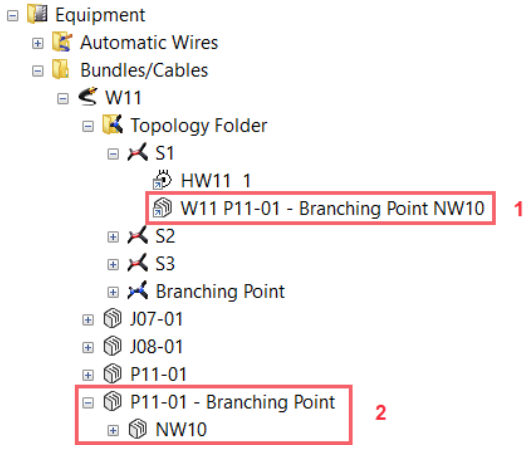
Representation in the project

A corrugated tube (NW10) is assigned to segment S1 (between P11-01 and branching point) as protection material.

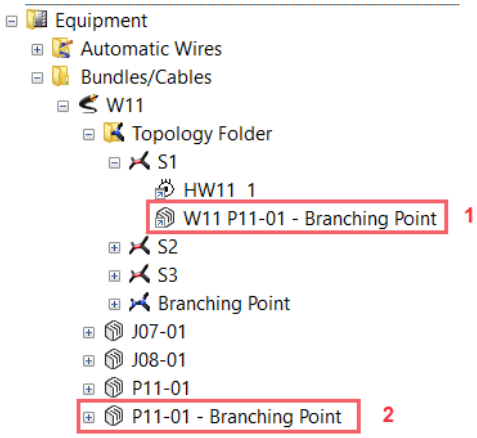
- **No option is selected**
  The protection material is shown under the cable harness (2), at segment S1 it is shown correspondingly (1).



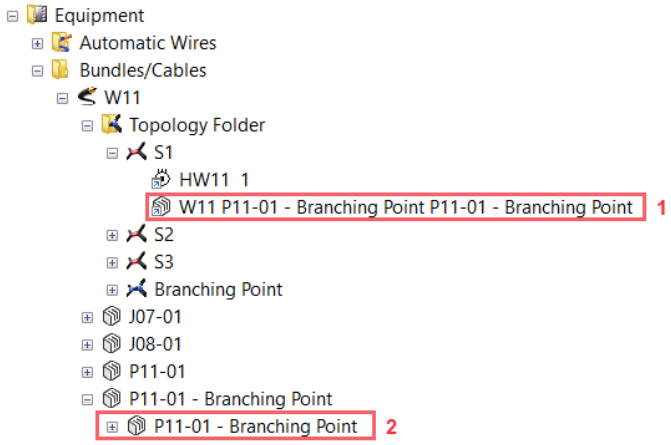
- With option **Aggregate Protections to Usage Location**
  A usage location **Branching Point-P11-01** is generated, underneath it the protection material is stored together with its catalog designation (2). The protection material is correspondingly shown at the segment S1 (1).



- With option **Create automatic protection designation**
  The protection material is shown with its designation **Branching Point-P11-01** (2). The protection material is correspondingly shown at the segment S1 (1).



- With the options **Aggregate Protections to Usage Location** and **Create automatic protection designation**
  The protection material is shown under the usage location (Branching Point -P11-01) with the same designation as the usage location (2). The protection material is correspondingly shown at the segment S1 (1).



1.4 Calculations by the Wizard

Filling degree

= (max(diameter of the affected segments))² / (inner diameter protection material)²

If either the inner diameter of the protection material or the diameter of at least one of the segments concerned is not specified, then the filling degree is not calculated.

For the types "Tape" and "Yarn", the filling degree is not calculated.

Segment diameter

The cable/wire outer diameter is used for the calculation.

For 1 wire/cable:	Segment diameter = cable/wire diameter
For 2 wires/cables:	Segment diameter = sum of the diameters of the two wires/cables
For more than 3 wires/cables	Segment diameter = $1.27 \times \sqrt[2]{\sum d^2}$ d= outer diameter of wires or cables

Pipes/hoses

The lengths (AID 10193) of all segments assigned to a protection are totaled. The assigned topology pins for all segments are looked up and the "distance to center" values (AID 10807) are subtracted. The length is entered at the protection in the attribute "Length" (AID 10193) and in the attribute "Calculated Length" (AID 493). If the properties "Manual entry" or "From catalog" are set, then these values are not overwritten.

Example: At the distributor V001, a length of 50 mm is specified for the attribute "Distance to Center" at the topology pin, the segment has a length of 700 mm, then the length of the corrugated pipe is calculated as 650 mm.

$$ProtectiveLength_{Segment} = Length_{Segment} - DTC_{TopologicalPin1} - DCT_{TopologicalPin2}$$

DTC= DistanceToCenter

$$Length_{Protection} = \sum_{i=1}^{n} (ProtectiveLength_{Segment\ i}) + AdditionalLength_{Protection}$$

Tapes

For tapes, the overlap is subtracted from the width (in case of a positive overlap) or added to it (for a negative overlap).
There can be several protections for a single segment, e.g. a hose and a tape. To determine whether the tape is to be wound above or under the hose there is the attribute "Protection level" (AID 10872). This attribute determines the sequence of the protections. Counting is done from the inside to the outside.
This means that if the segment has additional protections, then the diameter of the protections with the highest protection level that is smaller than the layer of the tape is used.

$$Pitch_{Tape} = Width_{Tape} - Width_{Tape} * Overlap_{Tape}$$

$$CalculationDiameter = SegmentDiameter + \max(0, 2 * Thickness_{Tape} * Overlap_{Tape}$$

$$Circumference = CalculationDiameter * \pi$$

$$AmountPerTurn = \sqrt{Pitch_{Tape}{}^2 + Circumference^2}$$

$$Length_{Tape} = \sum_{i=1}^{n} \left(\frac{ProtectiveLength_{Segment\ i}}{Pitch_{Tape}} * AmountPerTurn\right) + NumberOfTurns_{Tape} * Circumference_{Segment1} + NumberOfTurns_{Tape} * Circumference_{Segment\ n} + AdditionalLength_{Protection}$$

1.5 Representation in the Graphic

So that the rounded edges of the protection material are correctly shown in the graphic, the **StayConnect mode** should be activated in Visio.

The sheet must have the attributes

- **Default protection linerounding**
- **Default protection lineweight**

If this is not the case, you can add the attributes via **Define Dialog**.

The EB Cable demo project contains predefined default lines for displaying the various protection materials. You can copy these into the corresponding templates. Since the names of the line styles correspond to the protection material types, you can automatically assign line styles to protection materials.

The following line styles are predefined. These line styles are stored in the stencils under protections.

- EB Default 186: Corrugated Tube
- EB Default 187: Tube
- EB Default 188: Heat Shrink Tube
- EB Default 189: Tape
- EB Default 190: Yarn

You can assign the line style to the material also directly via the attribute **Line Style**.

For certain protection materials, you can create new line styles and insert them in Engineering Base. The procedure is described in the Engineering Base Help (**Creating a line pattern**, **Transferring a line pattern to Engineering Base**).

1.5.1 Line Style Naming Convention

In order for the automatic assignment of line styles to protection materials to be possible, the name of the line type (line type in Visio) must follow certain conventions.

The name of the line type must be composed of the following parameters, separated by blanks.

Parameter	Optional.	Description
"EB":	No	All line types for the protection materials must start with this character string.
"DEFAULT"	Yes	This character string must be set if for interactive line style selection precisely this line style is to be used.
EB Type ID	No	List of the EB device type IDs (separated by "," or ">") The listing must contain at least the two outer protection materials. The separator ">" specifies the sequence of the protection materials. Example EB 186 for corrugated tube EB 187, 189 for insulating tube and tape EB 187 >189 for insulating tube over tape
":"	No	Separator
Line type	No	List of the line types (separated by "," or ">", ">" indicating the order of the protection materials).

Examples:

EB 189 > 187: Tape > Tube represents the protection materials band over insulating tube.

EB Default 188: Heat Shrink Tube line type for a heat shrink tube