

## Description:

Belden's PVC Vari-Twist series was designed to reduce crosstalk in the balanced mode by twisting the pairs, but can be mass-terminated in the flat sections with standard IDC connectors.

## Physical Characteristics (Overall)

### Conductor

**AWG:**

| # Pairs | AWG | Stranding | Conductor Material |
|---------|-----|-----------|--------------------|
| 8       | 28  | 7x36      | TC - Tinned Copper |

Conductor Spacing Center to Center Flat Section: .050 +/- .005

Conductor Spacing Outside Center to Outside Center: .75 +/- .012

### Insulation

**Insulation Material:**

| Insulation Material      | Wall Thickness (in.) |
|--------------------------|----------------------|
| PVC - Polyvinyl Chloride | .010                 |

Substrate Thickness and Material: .010" Clear PVC

Insulation Resistance: >10,000 Mega Ohms

### Outer Shield

**Outer Shield Material:**

| Outer Shield Material |
|-----------------------|
| Unshielded            |

### Overall Cabling

Overall Nominal Thickness Flat Section: .042 +/- .003

Overall Nominal Thickness Twisted Section: .080

Overall Nominal Width: .80

Overall Flat Section Length: 2 +/- .0

Overall Twisted Length: 18 in.

Flat Section Center to Center Spacing: 20 +/- .50

### Pair

**Pair Color Code Chart:**

| Number | Color      |
|--------|------------|
| 1      | Brown/Tan  |
| 2      | Red/Tan    |
| 3      | Orange/Tan |
| 4      | Yellow/Tan |
| 5      | Green/Tan  |
| 6      | Blue/Tan   |
| 7      | Purple/Tan |
| 8      | Gray/Tan   |

### Spacing

Twisted Pair Spacing Center to Center: .100

## Mechanical Characteristics (Overall)

Operating Temperature Range: -20°C To +105°C

## Applicable Specifications and Agency Compliance (Overall)

### Applicable Standards & Environmental Programs

|                                       |                        |
|---------------------------------------|------------------------|
| UL AWM Style:                         | 2693 and 2697          |
| UL Rating:                            | 105°C, 300 V RMS, VW-1 |
| EU CE Mark:                           | Yes                    |
| EU Directive 2000/53/EC (ELV):        | Yes                    |
| EU Directive 2002/95/EC (RoHS):       | Yes                    |
| EU RoHS Compliance Date (mm/dd/yyyy): | 10/01/2005             |
| EU Directive 2002/96/EC (WEEE):       | Yes                    |
| EU Directive 2003/11/EC (BFR):        | Yes                    |
| CA Prop 65 (CJ for Wire & Cable):     | Yes                    |
| MII Order #39 (China RoHS):           | Yes                    |

### Flame Test

UL Flame Test: VW-1

### Plenum/Non-Plenum

Plenum (Y/N): No

## Electrical Characteristics (Overall)

### Nom. Inductance:

| Description | Inductance (µH/ft) |
|-------------|--------------------|
| @ 1 MHz     | .24                |

### Nom. Capacitance Conductor to Conductor:

| Description | Capacitance (pF/ft) |
|-------------|---------------------|
| @ 1 kHz     | 20                  |
| @ 1 MHz     | 16                  |

### Nominal Velocity of Propagation:

| Description | VP (%) |
|-------------|--------|
|             | 64     |

### Nominal Delay:

| Delay (ns/ft) |
|---------------|
| 1.6 NS/FT.    |

### Nom. Conductor DC Resistance:

| DCR @ 20°C (Ohm/1000 ft) |
|--------------------------|
| 68.2 OHMS/1000 FT. MAX.  |

### Nom. Attenuation:

| Freq. (MHz) | Attenuation (dB/100 ft.) |
|-------------|--------------------------|
| 10          | 3.5                      |
| 20          | 5.5                      |
| 30          | 7.2                      |
| 40          | 8.8                      |
| 50          | 10.2                     |
| 60          | 12                       |
| 70          | 13                       |
| 80          | 14.2                     |
| 90          | 15                       |
| 100         | 16                       |

**Max. Operating Voltage - UL:**

| Voltage   |
|-----------|
| 300 V RMS |

**Max. Recommended Current:**

| Current                    |
|----------------------------|
| 1 Amp per conductor @ 20°C |

**Nominal Balanced Characteristic Impedance:**

| Description | Impedance (Ohm) |
|-------------|-----------------|
|             | 115             |

**Nominal Unbalanced Characteristic Impedance:**

| Description | Impedance (Ohm) |
|-------------|-----------------|
|             | 100             |

**Dielectric Withstand Voltage:** 2,000 V RMS

**Typical Balanced Crosstalk - dB Suppression:**

| Description          | Freq. (MHz) | Start Freq. (MHz) | Stop Freq. (MHz) | Crosstalk (dB) |
|----------------------|-------------|-------------------|------------------|----------------|
| 10 ft. sample length |             | 10                | 100              | 35             |

**Typical Unbalanced Crosstalk:**

| Description  | Pulse Rise Time (NS) (MHz) | Near End % (MHz) | Far End % (MHz) |
|--|----------------------------|------------------|-----------------|
| 10 ft. sample length all grounds connected together. | 3                          | 5.8              | 5.2             |
| 10 ft. sample length all grounds connected together. | 5                          | 4                | 3.2             |
| 10 ft. sample length all grounds connected together. | 7                          | 2.5              | 2.8             |

## Notes (Overall)

**Notes:** The transition area is included in the twisted length to assure a full 2 inches of flat termination area.

## Kennedy Information (Overall)

**Construction:** 18" of Twisted Pairs, 2" of Flat Section

## Put Ups and Colors:

| Item #          | Putup  | Ship Weight | Color | Notes | Item Desc               |
|-----------------|--------|-------------|-------|-------|-------------------------|
| 9V28016 000H100 | 100 FT | 2.800 LB    | NONE  | E     | 8 PR #28 PVC VARI-TWIST |

# Vari-Twist® 9V280XX Series

.050" Pitch, 28 AWG, PVC

## Product Description

Belden's PVC Vari-Twist 9V280XX series was designed to reduce crosstalk in the balanced mode by twisting the pairs, but can be mass-terminated in the programmed flat sections with any standard IDC connector. To further reduce crosstalk, each adjacent pair is twisted in the opposite direction. The standard twist length is 18 inches followed by a 2 inch flat section of .050" spaced conductors. The cable consists of stranded 28 AWG (7x36) tinned copper, color-coded PVC pre-insulated singles — laminated to a single clear PVC substrate. Eleven various conductor/pair counts are standard; other sizes are available upon request. The cable is UL approved (CSA available upon request) and passes the VW-1 Vertical Wire Flame Test.

Upon your request, Vari-Twist can also be manufactured to your own specific requirements whether that be longer or shorter twist sections and/or flat sections.

**Color Code:** Each pair consists of a Tan conductor paired with a color-coded conductor. *Color Sequence Each Terminating Section:* Brown/Tan, Red/Tan, Orange/Tan, Yellow/Tan, Green/Tan, Blue/Tan, Purple/Tan, Gray/Tan, White/Tan, Black/Tan. Sequence is repeated as necessary.

**Application:** Internal interconnection or internal wiring of electronic equipment.

## Physical Specifications

|                            |   |
|----------------------------|---|
| <b>Conductor</b>           | 28 AWG (7x36) Tinned Copper                   |
| <b>Insulation</b>          | .010" Nom. Wall Color-coded PVC               |
| <b>Substrate</b>           | .010" Nom. Wall Clear PVC                     |
| <b>Pitch</b>               |   |
| Twisted Pair Centers:      | .100" Nom.                                    |
| Conductor Centers in Flat: | .050" ± .005"                                 |
| <b>Pairs</b>               | 1/2" Nom. Lay                                 |
|                            | Adjacent Pairs have Opposite Direction Lay    |
| <b>Construction</b>        | 18" of Twisted Pairs<br>2" of Flat Section    |
| <b>Temperature Rating</b>  | -20 to +105°C                                 |
| <b>Flammability Rating</b> | UL: VW-1                                      |
| <b>UL Approval</b>         | File #E12683,<br>Style Dual Rated 2693 & 2697 |
| <b>CSA Approval</b>        | Available Upon Request                        |
| <b>Packaging</b>           | H100  |

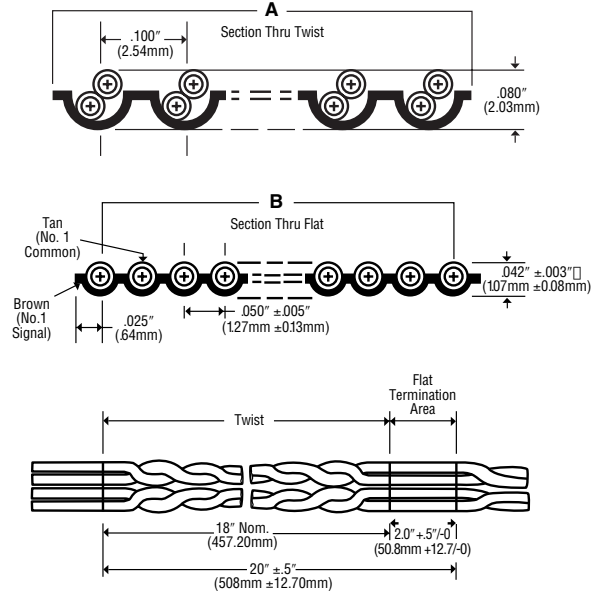
## Electrical Specifications

|                                |                                       |
|--------------------------------|---------------------------------------|
| <b>Voltage Rating</b>          | 300V RMS                              |
| <b>Current Rating</b>          | 1A                                    |
| <b>Conductor Resistance</b>    | 68.2Ω/1000 ft.                        |
| <b>Insulation Resistance</b>   | >1 x 10 <sup>10</sup> Ω • 10 ft. (3m) |
| <b>Impedance (Balanced)</b>    | 115Ω                                  |
| <b>Impedance* (Unbalanced)</b> | 100Ω                                  |
| <b>Capacitance* (@ 1 MHz)</b>  | 16 pF/ft. (52 pF/m)                   |
| <b>Inductance* (@ 1 MHz)</b>   | .24 μH/ft. (.79 μH/m)                 |
| <b>Propagation Delay*</b>      | 1.60 ns/ft. (5.25 ns/m)               |

\*Test Configuration: G-S (ground-signal), unbalanced.

| Part No. | No. of Pairs | Dimensions |       |            |            |
|----------|--------------|------------|-------|------------|------------|
|          |              | Width "A"  |       | Span "B"   |            |
|          |              | Inch       | mm    | Inch       | mm         |
| 9V28010  | 5            | .50        | 12.70 | .45 ±.012  | 11.43 ±.31 |
| 9V28014  | 7            | .70        | 17.78 | .65 ±.012  | 16.51 ±.30 |
| 9V28016  | 8            | .80        | 20.32 | .75 ±.012  | 19.05 ±.30 |
| 9V28020  | 10           | 1.00       | 25.40 | .95 ±.015  | 24.13 ±.38 |
| 9V28026  | 13           | 1.30       | 33.02 | 1.25 ±.015 | 31.75 ±.38 |
| 9V28034  | 17           | 1.70       | 43.18 | 1.65 ±.015 | 41.91 ±.38 |
| 9V28036  | 18           | 1.80       | 45.72 | 1.75 ±.017 | 44.45 ±.43 |
| 9V28040  | 20           | 2.00       | 50.80 | 1.95 ±.017 | 49.53 ±.43 |
| 9V28050  | 25           | 2.50       | 63.50 | 2.45 ±.017 | 62.23 ±.43 |
| 9V28060  | 30           | 3.00       | 76.20 | 2.95 ±.020 | 74.93 ±.51 |
| 9V28064  | 32           | 3.20       | 81.28 | 3.15 ±.020 | 80.01 ±.51 |

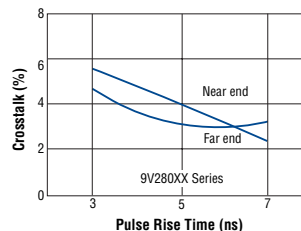
## Dimensions



NOTE: the transition area is included in the twisted section to assure a full 2 inches of flat termination area.

## Unbalanced Crosstalk\*

(See page 7.14 for Balanced Crosstalk)



## Attenuation\*

