

**Comment (145.2.7, Page 167, Line 36):**

Pac\_margin calculations has some errors and need to be updated.

**Proposed Remedy:**

1. Update Pac\_marging with the following numbers per class.
2. Editor may merge entries with differences  $< 0.1W$ .

Recommendations for Pac_margin		
Class	D3.3 Spec value	Units
Class 8	1.4	W
Class 7	0.9	W
Class 6	0.6	W
Class 5	0.3	W
Class 4	0.3	W
Class 1-3	0.1	W

Baseline ends here

See Annex A for detailed calculations



## Annex A – Detailed calculations

### Input data:

Parameter	Value	Units
Ta	45	°C
Trise_max	15	°C
Cordage length, L1	10	m
Cable Length, L2	90	m
Cordage resistance per meter for AWG 26 at 20 °C, r1	0.1339	Ω/m
Cable resistance per meter for AWG 24 at 20 °C, r2	0.08422	Ω/m
Number of connectors, N	6	-
Connector resistance, Rconn for Category 5e, 6, and 6A (for CAT 3 it is 0.3 Ω)	0.2	Ω
(*) Cooper temperature coefficient, α	0.00393	Ω /°C
Vpse for class 1-6	50	V
Vpse for class 7-8	52	V
Pclass_PD for Class 2 to 8	6.69, 13, 25.5, 40, 51, 62, 71.3	W

(\*) Assuming only copper and ignoring coating with other metals.

### Working assumption:

Temperature rise inside the cable is 15degC max. As a result, calculating the resistance at 60degC and finding the Pac\_margin as the power loss difference between 45degC to 60degC.

$$R_{ref} = L_1 \times r_1 + L_2 \times r_2 + N \times R_{conn} \quad \text{Equation 1}$$

$$R(T) = R_{ref} \times (1 + \alpha \times (T - Ta)) \quad \text{Equation 2}$$

$$I_{port} = \frac{\left( V_{pse} - \sqrt{V_{pse}^2 - 4 \times R(T) \times P_{Class\_PD}} \right)}{2 \times R(T)} \quad \text{Equation 3}$$

$$P_{cable} = R(T) \times I_{port}^2 \quad \text{Equation 4}$$

$$Pac\_margin = P_{cable}(T = 60^\circ C) - P_{cable}(T = 45^\circ C) \quad \text{Equation 5}$$

### Example for Class 8:

#### Step 1: Calculating Rref

$$R_{ref} = 10m \times 0.1339 + 90m \times 0.08422 + 6 \times 0.2 = 5.0594\Omega$$

#### Step 2: Calculating Pcable at 45degC.

$$R(T = 45^\circ C) = 5.0594 \times (1 + 0.00393 \times (45 - 20)) = 5.556\Omega, \quad I_{port}(T = 45^\circ C) = \frac{(52 - \sqrt{52^2 - 4 \times 5.556 \times 71.3})}{2 \times 5.556} = 1.669A$$

$$P_{cable}(T = 45^\circ C) = 5.556 \times 1.669^2 = 15.472W$$

#### Step 3: Calculating Pcable at 60degC.

$$R(T = 60^\circ C) = 5.0594 \times (1 + 0.00393 \times (60 - 20)) = 5.855\Omega, \quad I_{port}(T = 60^\circ C) = \frac{(52 - \sqrt{52^2 - 4 \times 5.855 \times 71.3})}{2 \times 5.855} = 1.694A$$

$$P_{cable}(T = 60^\circ C) = 5.855 \times 1.694^2 = 16.809W$$

#### Step 4: Calculating Pac\_margin.

$$Pac\_margin = 16.809 - 15.472 = 1.337W$$



## Annex B – Connector resistance

From ANSI/TIA-568-C.2-2009, APPROVED: AUGUST 11, 2009

### 6.8.1 DC resistance

DC resistance shall be measured in accordance with ASTM D4566 at **20 °C ± 3 °C** for all connecting hardware cable pairs.

NOTE – DC resistance is a separate measurement from contact resistance as specified in Annex A. Whereas DC resistance is measured to determine the connector's ability of transmit direct current and low frequency signals, contact resistance is measured to determine the reliability and stability of individual electrical connections.

Category 3 connecting hardware DC resistance between the input and the output connections of the connecting hardware (not including the cable stub, if any) used to terminate 100  $\Omega$  twisted-pair cabling shall not exceed **0.3  $\Omega$**

Category 5e, 6, and 6A connecting hardware DC resistance between the input and the output connections of the connecting hardware (not including the cable stub, if any) used to terminate 100  $\Omega$  twisted-pair cabling shall not exceed **0.2  $\Omega$**

