

# Annex 145C

(informative)

## Power system and parameters

This annex provides additional information for derivation of the system parameters of current and direct current resistance (DCR) given in Table 145-1. This allows analysis of the power delivery system, enabling consideration of applications not operating at the nominal highest current or maximum DC loop resistance.

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### 145C.1 Constant power

The power system provides constant power to the Powered Device (PD). Powering schematics with the nominal highest current per pair and the maximum DC loop resistance are illustrated in Figure 145C-1 and 145C-2 for a Class 4 PD with a constant power of 25.5 W and in Figure 145C-3 and 145C-4 for a Class 8 PD with a constant power of 71.3 W. Each 4-conductor connection is defined in 802.3bt as a “pairset”.

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### 145C.2 Current

The value of currents for the example power schematics in Figure 145C-1 through Figure 145C-4 are derived using Equation (145C-1). Note that Equation (145C-1) is of the same form given in Equation (145-3).

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Equation (145C-1) can be applied to all PD Classes. The currents ( $I_s$ , calculated using Equation (145C-1), are provided in Table 145C-1 as a function of  $R_{Cabling}$  with a constant voltage (52 V) and power (71.3 W) for Class 8.

The maximum value of  $R_{Cabling}$  assumes a 100 meter cabling topology along with other worst case elements in the cable plant (see 145C.3). The cable DCR scales linearly such that 50 % of  $R_{Cabling}$  is representative of a cabling topology of approximately 50 meters. Note that for a 50 % reduction in the maximum  $R_{Cabling}$  (3.125  $\Omega$ ), equating with approximately 50 meters of cabling, the current decreases from 0.43 A to 0.38 A and the power dissipated in the cabling decreases from 18.7 W to 7.1 W.

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### 145C.3 Direct current resistance (DCR)

The maximum conductor DCR of 12.5  $\Omega$  in Figure 145C-1 and Figure 145C-3 is derived

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from a cabling topology consisting of:

- 90 meters of 24 AWG horizontal cable (0.0938  $\Omega$ /m),
- 10 meters of 26 AWG patch cord (0.14  $\Omega$ /m),
- four inline connectors (.3  $\Omega$ /m per connector).

The DCR of the 90 meters of cable is adjusted for a temperature increase of 45° C from 20° C to 65° C with a 0.4 % increase per degree C (.1107  $\Omega$ /m), shown in Table 145C–2.

Using 23 AWG and 22 AWG horizontal cable or larger AWG patch cords reduces the per meter cable DCR; see Table 145C–3.

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Using cable smaller than 26AWG is not recommended in powering applications.

#### 145C.4 Bundled cabling applications

Table 145–1 lists the nominal highest current per pair and the maximum DCR loop resistance. The maximum current is used in ISO/IEC TS 29125, TIA TSB-184A and the NFPA 70: National Electrical Code (NEC) to limit the maximum number of 4-pair cables in a bundle. The additional information provided in this Annex will enable considerations for the number of 4-pair cables in a cabling bundle that are not at the nominal highest current or maximum DC loop resistance.

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