

Hi Chad,

When this came up on the call yesterday, and after talking to you, I was certain that I had been round this loop before. I therefore had a look at my IEEE P802.3at comments, sure enough I have a number on this subject, one reads 'The objectives state that we will support ISO/IEC 11801-1995 Class D cabling. This cabling is specified with a maximum loop resistance of 40 Ohms [<http://www.ieee802.org/3/at/public/nov06/3n807.pdf>] although as stated in this liaison, a high proportion of the 1995 Class D channels are expected to meet the 25 Ohms. DC loop resistance.'

Unfortunately the link to the liaison letter in the comment is incorrect, it should be to [http://www.ieee802.org/3/minutes/nov06/1106\\_ISO\\_IEC\\_to\\_802\\_3\\_3n807.pdf](http://www.ieee802.org/3/minutes/nov06/1106_ISO_IEC_to_802_3_3n807.pdf). As you will see in that liaison letter it is stated that 'Class D 2002 DC loop resistance is 25 Ohm, and Class D 1995 was specified at 40 Ohm at 20 °C. Note: A high proportion of the 1995 Class D channels are expected to meet the 25 Ohm DC loop resistance.'. I seem to remember that 40 Ohm was used for ISO/IEC 11801:1995 Class D at the request of Germany, to permit cabling based on small gauge wire, however this was not prevalent, hence the note in the liaison letter.

I wasn't also able to find an excerpt of the DC loop resistance text from ISO/IEC 11801:1995 anywhere on the IEEE 802.3 website, but I was able to find a few examples of subclause 6.4.7 'Direct current (d.c) loop resistance' of ISO/IEC 11801:2002, the most recent seems to be <http://www.ieee802.org/3/4PPOE/email/pdfjfoRJksOqW.pdf>. In that you will see ISO/IEC 11801 Class C has a DC loop resistance of 40 Ohms, and ISO/IEC 11801:2002 Class D has a DC loop resistance of 25 Ohms.

In summary, based on the above, I believe that the values in ISO/IEC 11801 are as follows. Please note that the category designation under the heading 'TIA' is just for cross-reference, it is not to state that TIA specifies the same DC loop resistance for that category.

ISO/IEC 11801	DC L R	TIA
ISO/IEC 11801 Class C	40 Ohms	Cat 3
ISO/IEC 11801:1995 Class D	40 Ohms	Cat 5
ISO/IEC 11801:2002 Class D	25 Ohms	Cat 5e

The 40 Ohms specification for ISO/IEC 11801 Class C seems to explain the use of 40 Ohms for IEEE 802.3af. And the 40 Ohms specification for ISO/IEC 11801:1995 Class D, along with the note in the liaison letter, seems to explain the statement in IEEE Std 802.3-2015 subclause 33.1.4.1 'Type 2 cabling requirement' that reads 'Type 2 operation requires Class D, or better, cabling as specified in ISO/IEC11801:1995 with the additional requirement that channel DC loop

resistance shall be 25 Ohms or less.'. it also explains the structure of IEEE P802.3at Objective 2 which reads 'The target infrastructure for PoEPlus will be ISO/IEC 11801-1995 Class D / ANSI/TIA/EIA-568-B-2 category 5 (or better) systems with a DC loop resistance no greater than 25 Ohms.'.

Now I note some IEEE P802.3bt presentations such as

<[http://www.ieee802.org/3/bt/public/may15/darshan\\_05\\_0515.pdf](http://www.ieee802.org/3/bt/public/may15/darshan_05_0515.pdf)> state that Class D (ISO/IEC 11801:1995) is 12.5 Ohm Rchan. I also note the IEEE P802.3bt objective that reads 'Support for operation over the following channels that have DC loop resistance of no greater than 25 ohms' and lists 'Class D or better media from ISO/IEC 11801:1995'. It appears that these may not be strictly correct, instead it is IEEE Std 802.3at subclause 33.1.4.1 that mandates an additional requirement for Type 2 operation of 25 Ohm DC loop resistance.

Best regards,  
David

Objective:

Support for operation over the following channels that have DC loop resistance of no greater than 25 ohms:

- Class D or better 4-pair copper medium from ISO / IEC 11801:2002, including Amendments 1 & 2
- Class D or better media from ISO / IEC 11801:1995
- Category 5e or better cable and components as specified in ANSI/TIA-568-C.2
- Category 5 cable and components as specified in ANSI/TIA/ EIA-568-A

D2.4:

**Table 145–1—System parameters**

<b>PSE Type</b>	<b>Nominal highest current per pair (<math>I_{Cable}</math>, A)</b>	<b>Number of powered pairs</b>	<b>Channel pairset maximum DC loop resistance (<math>R_{Ch}</math>, <math>\Omega</math>)</b>	<b>Minimum cabling type</b>
Type 3	0.6	2 or 4	12.5	Class D (ISO/IEC 11801:2002) or Category 5e (ANSI/EIA/TIA-568-B.2:2001)
Type 4	0.96	2 or 4	12.5	Class D (ISO/IEC 11801:2002) or Category 5e (ANSI/EIA/TIA-568-B.2:2001)

NOTE—The current per pairset may be impacted by pair-to-pair system resistance unbalance. See 145.2.8.5.1. For additional information on Type 4 current unbalance, see TIA TSB-184-A [Bx1] and ISO/IEC TS 29125.

Type 3 and Type 4 operation requires Class D or better cabling as specified in ISO/IEC 11801:2002. These requirements are also met by Category 5e or better cable and components as specified in ANSI/TIA-568-C.2.

802.3at:

Type 2 operation requires Class D, or better, cabling as specified in ISO/IEC 11801:1995 with the additional requirement that channel DC loop resistance shall be 25  $\Omega$  or less. These requirements are also met by Category 5e or better cable and components as specified in ANSI/TIA/EIA-568-B.2, ANSI/TIA/EIA-568-B.2-1, and ANSI/TIA/EIA-568-B.2-10; or Category 5 cable and components as specified in ANSI/TIA/EIA-568-A-1995.

Will file a late comment to replace

“Type 3 and Type 4 operation requires Class D or better cabling as specified in ISO/IEC 11801:2002. These requirements are also met by Category 5e or better cable and components as specified in ANSI/TIA-568-C.2.”

with: “Type 3 and Type 4 operation requires Class D, or better, cabling as specified in ISO/IEC 11801:1995 with the additional requirement that channel DC loop resistance shall be 25  $\Omega$  or less. These requirements are also met by Class D or better cabling as specified by ISO/IEC 11801:2002, Category 5e or better cable and components as specified in ANSI/TIA-568-C.2, or Category 5 cable and components as specified in ANSI/TIA/EIA-568-A-1995.”