

# Spot the difference

Arvind Patel of AEM compares the various copper cable certification standards

► Field testing of network cables is an important step in ensuring a good quality installation. Standards bodies across the world play a significant role in developing requirements for various electrical parameters to certify cable.

## MULTIPLE CHOICE

There are several standardisation bodies around the world. The good news is that most of them collaborate well with each other and define similar standards. However, there still are areas where these standardisation bodies differ. If

you are dealing with network infrastructure projects in multiple countries, knowing these differences is necessary. There are various standards that we should consider. First, networking standards defined by IEEE (802.3 series) – the electrical parameters of the cabling must comply with the

requirements of these standards.

Second, cabling standards as specified by bodies such as TIA or ISO/IEC. These standards consider current and future networking technologies, cable construction technologies, installation practices and operating environment, while developing standards that cables, components and cabling channels and links are specified for. Standards bodies also specify requirements for field testers, including how they should report test results, based on the cabling standards. In this article, we will look at cabling standards

and corresponding field tester standards, and outline similarities and differences among TIA and ISO/IEC specifications.

## PREMISE CABLING STANDARDS

In most parts of the world, four pair twisted pair copper cabling follows either TIA-568.2-D or ISO/IEC 11801-1 specifications. There are other regional standards in some parts of the world, such as China, which are strongly aligned with ISO/IEC standards. Table 1 shows

Table 1. Cabling parameters and standards

Parameters	TIA-568.2-D	ISO/IEC 11801-1
Wiremap, DC loop resistance, DC resistance unbalance within two wires of a pair, DC resistance unbalance pair-to-pair, length, delay, delay skew, insertion loss, return loss, TCL, ELTCTL, coupling attenuation, NEXT, PSNEXT, ACRF, PSACRF, PSANEXT, PSAACRF	Specified	Specified
ACRN/PSACRN	Not specified	Specified

a comparison of electrical parameters specified in TIA-568.2-D and ISO/IEC 11801-1.

As you can see, all parameters other than attenuation to near end crosstalk ratio (ACRN) and power sum attenuation to crosstalk ratio near end (PSACRN) are specified by both standards. ACRN is specified only in the ISO/IEC standard. As ACRN is derived from insertion loss (attenuation) and near end crosstalk (NEXT), which are specified parameters for the TIA standard, this difference is non-material in nature.

## OTHER CABLING STANDARDS

### • Industrial cabling

TIA-1005-A is an industrial cabling standard that specifies parameters like those listed in Table 1, except for DC resistance. This standard specifies transverse conversion loss (TCL) and equal level transverse conversion loss (ELTCTL) only for unshielded cables.

### • Single Pair Ethernet (SPE)

SPE is an emerging technology for cabling

**Table 2. SPE parameters**

Parameters	TIA-568.5	ISO/IEC 11801-1/AMD1 (draft)
Wiremap, DC loop resistance, DC resistance unbalance within two wires of a pair, length, delay, insertion loss, return loss, PSANEXT, PSAACRF	Specified	Specified
TCL, ELTCTL	Specified for UTP only	Specified for UTP only

in many different environments ranging from automotive to industrial to enterprise. TIA-568.5 specifies SPE cabling for enterprise environments. Performance parameters specified in TIA-568.5 are listed in Table 2.

## FIELD TESTING STANDARDS

TIA-1152A and IEC 61935-1 are standards that specify the performance requirements for field testers. They also specify test

**Table 3. Field test parameters**

Parameters	TIA-568.2-D	ISO/IEC 11801-1
Wiremap including shield connection if present, length, delay, delay skew, insertion loss, return loss, coupling attenuation, NEXT, PSNEXT, ACRF, PSACRF, PSANEXT, PSAACRF	Specified, mandatory	Specified, mandatory
ACRN/ PSACRN	Not specified	Specified, mandatory
DC loop resistance	Specified, optional	Specified, mandatory
DC resistance unbalance within two wires of a pair, DC resistance unbalance pair-to-pair	Specified, optional	Specified, optional
Length	Specified	Not specified
TCL, ELTCTL	Not specified	Specified, optional
Coupling attenuation	Not specified	Not specified

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parameters that need to be reported, the reporting format and classify reporting parameters as either mandatory or optional.

Table 3 specifies field test parameters for four pair cabling certification testers. Please note that it is not necessary that every certification test report all the mandatory parameters. The table lists the capability of the tester, which gets utilised depending on the parameters required for a chosen certification test.

Between the TIA and ISO versions of these requirements, there are some differences. DC loop resistance and unbalance in resistance are important parameters for power over Ethernet

**Table 4. SPE field test parameters**

Parameters	TIA-5071	IEC 61935-4 (draft)
Wiremap including shield connection if present, DC loop resistance, length, delay, insertion loss, return loss, coupling attenuation, TCL (unshielded), ELTCL (unshielded), PSANEXT, PSAACRF	Specified, mandatory	Specified, mandatory
DC resistance unbalance (shielded)	Specified, mandatory	Specified, optional
Coupling attenuation	Not specified	Specified, optional

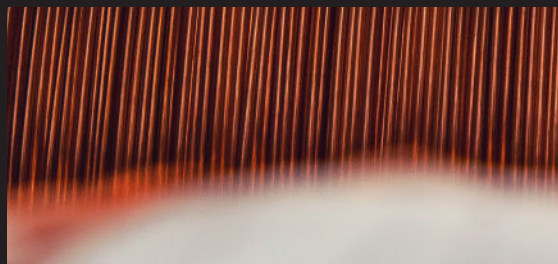
(PoE). Even if they are marked optional, these measurements provide important assurance of PoE performance. Coupling attenuation is a parameter that provides insight on shield effectiveness for shielded cables. This measurement is a laboratory measurement and ensured by the design of the cables, and hence field testers are not required to support this.

**SPE FIELD TESTING**

TIA-5071 specifies field tester requirements based on the TIA-568.5 standard. In addition to the parameters as listed in Table 4, the two standards also specify testing to different lengths and frequencies, as shown in Table 5. This allows a possibility to have field testers that only support one of the specified categories. However, in practice commercial field testers support all these categories.

**ROLE PLAY**

Standards bodies play an important role in formalising the requirements for cabling, their test parameters, testing methodologies and reporting. TIA and international standards are largely similar, with some differences originating from the applications targeted and range of cabling systems covered. ■



**Table 5. Frequency ranges and field tester categories**

Frequency Range	TIA-5071	IEC 61935-4 (draft)
0.1-20 MHz	SP-I	SP-I
0.1-600 MHz	SP-II	SP-II
1-1250 MHz	-	SP-III



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