



EC Cabling News

News on International Standardisation and European Union regulation

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Next generation cabling – 40 Gbit/s Ethernet on balanced twisted pair copper cabling

A lot of effort continues to be invested in the development of standards to support data transmission of 40 Gbit/s on twisted pair cabling in IEEE as well as in cabling and component committees under ISO/IEC and IEC. Updates on the activities in each of the main standardisation committees are given below.

IEEE 802.3 Ethernet working group

The development of the new Ethernet standard supporting a data rate of 40 Gbit/s on twisted pair cabling, the 40 GBASE-T, is undertaken by the IEEE P802-3bq Task Force. As previously reported, the 4-pair, twisted pair channel configuration for the future 40GBASE-T has been restricted to a length of (at least) 30 m and to having up to 2 connections only, with the primary objective of providing as EoR (End-of-Row) and ToR (Top-of-Rack) connections in data centres. Channel requirements, including upper frequency, are still under discussion in the task force. At present, it seems that the upper frequency will settle around 1750 to 1850 MHz.

Another task force, the IEEE P802.3bp 1000BASE-T1 PHY Task Force, is working on a “Reduced Twisted Pair Gigabit Ethernet” standard, which will support 1 Gbit/s operation over a single twisted pair and which is targeted for use in automotive and industrial environments. Related to this activity, work is ongoing on defining a power distribution technique for one twisted pair cabling (1-pair PoE).

The work on a new 4-pair Power over Ethernet with higher power levels than the current PoEP has progressed into a formal project by the approval of the IEEE P802.3bt task force in November 2013. Delivery of up to 100 W at the powered device is under consideration, which may cause significant cable heating and lead to enhanced requirements for cable resistance, resistance unbalance, ventilation etc.

Standardisation of cabling in ISO/IEC JTC 1/SC 25/WG 3

Working group 3 of JTC 1/ SC 25 is responsible for cabling standards, with ISO/IEC 11801 - Generic cabling for customer premises - being one of the most important. The scope of WG 3 also includes test procedures and planning and installation guides.

The 56th meeting of ISO/IEC JTC 1/SC 25/WG 3 was held on 25 February – 1 March 2014 in Kyoto, Japan. The meeting was attended by more than 50 experts and DELTA was represented by Lars Lindskov Pedersen.

Below, a summary is given for selected projects in the work programme of WG 3.

Balanced cabling for 40 Gbit/s data transmission

The technical report (TR) ISO/IEC TR 11801-9901 "Information technology - Generic cabling for customer premises - Part 9901: Guidance for balanced cabling in support of at least 40 Gbit/s data transmission" was progressed to a final draft, DTR, and circulated for vote in late 2013 with a deadline March 2014. The numbering format was changed (from -99-1 to -9901) due to ISO system restrictions. The document formally passed the vote (by majority), however, with negative votes and technical comments from 5 national bodies. It is therefore expected that the TR has to be reviewed again in SC 25 (WG 3) before proceeding to final vote and publication.

The report introduces the new Class I and Class II channels, which are characterised up to 1600 MHz (with 2000 MHz for further study (ffs.)), and based on Cat. 6_A (Class I) and Cat. 7_A (Class II) components with enhanced performance and extended frequency, also referred to as Category 8.1 and Category 8.2 components, respectively. The TR only addresses the channel characteristics and contains no component requirements or characteristics. The channel configurations are based on a maximum length of 30 m and maximum 2 connections, i.e. aligned with the channels configurations in the 40GBASE-T work in IEEE (see above). As previously reported, the main objective of this report has been to describe what channel performance is considered achievable with balanced cabling, and thus to provide input to IEEE for the development of the 40GBASE-T standard. Once again, it must be emphasized that the Class I and Class II channels of the TR do not necessarily have the performance required to support the future 40GBASE-T. As reported under IEEE, the 40GBASE-T requirements are still under discussion, and e.g. the upper frequency will most likely be higher than the 1600 MHz currently specified in the TR.

ISO/IEC 11801 3rd edition

The work on the 3rd edition of ISO/IEC 11801-x has been formally approved as a new work item for ISO/IEC JTC 1/SC 25/WG 3. This 3rd edition will include a restructuring of the ISO/IEC generic cabling standards (11801, 15018, 24702, and 24764) into a series of standards ISO/IEC 11801-x where ISO/IEC 11801-1 will contain the general requirements, and each of the following parts -2 to -5 will contain the specific requirements for different premises (offices, industrial, homes, data centres). A new standard specifying cabling for distributed building services is included in the series as part 6. In addition to the editorial "re-shuffling", the 3rd edition will consist of a technical revision and update, such as the inclusion of new cabling classes in support of 40 Gbit/s data transmission. The new cabling classes will be based on the Class I and Class II channels described in ISO/IEC TR 11801-9901, but will be updated to reflect and be aligned with the requirements of 40GBASE-T (frequency range, transmission requirements etc.).

The ISO/IEC 11801-x series also includes a number of cabling design technical reports. In addition to ISO/IEC TR 11801-9901 (cabling for 40 Gbit/s) discussed above, technical reports on the end-to-end (E2E) link and on matrix modelling are in development as -9902 and -9903, respectively. The E2E link is in principle similar to a channel except that it typically has field terminated plugs at the ends and may have no internal connections, and thus no test interfaces. The E2E link is primarily used in industrial environments, and the TR is intended to provide guidelines and recommended limits for this new type of structured cabling. The TR on matrix modelling is based on the results from the work carried out in the JMTG – Joint Modelling Task Group – and the objective is to support new, improved cabling specifications to be included in the 3rd edition of ISO/IEC 11801.



Standardisation of cables and related test methods in IEC TC 46

TC 46 and its subcommittees develop and maintain standards for e.g. coaxial and balanced cables, cable assemblies (e.g. cords), and coaxial connectors, as well as related test methods such as screening effectiveness test methods (transfer impedance, coupling attenuation etc.). The latest meeting of IEC TC 46 and all SC's and WG's was held in Arlington (Washington), US, 5 - 9 May 2014 with participation by Lars Lindskov Pedersen from DELTA.

New standards for cables characterised up to 2 GHz are being developed in WG 7 of SC 46C as IEC 61156-9 (horizontal cable) and IEC 61156-10 (work area cable). The first committee drafts (CD) have been circulated and comments received. The comments were discussed and resolved at the Arlington meeting, where it was agreed to circulate revised drafts as a 2nd CD. The standards contain specifications for Category 8.1 and Category 8.2 cables, and list characteristics and minimum transmission requirements up to 1600 MHz with 2000 MHz ffs. In addition to the requirements given in IEC 61156-9 (IEC 61156-10), a Category 8.1 cable shall meet all requirements for a Category 6_A cable as given in IEC 61156-5 (IEC 61156-6). Similarly, the Category 8.2 cable shall also meet all Category 7_A requirements, which will ensure backwards compatibility.

Other activities in WG 7 include the work on cable performance and measurement techniques for frequencies significantly higher than 1 GHz, e.g. revision/amendment of IEC TR 61156-1-2 to include the mixed mode or balun less test procedures for test of transmission characteristics. Further, it is planned to start new work on conductor heating of bundled cables (revision of IEC/PAS 61156-1-4) with reference to the increased power levels for PoE under consideration in IEEE. Also related to IEEE activities, reduced twisted pair cables are being examined as a potential new work item for WG 7.

Test methods for screening effectiveness of cables and cable assemblies are under the responsibility of WG 5 of TC 46. The test methods for coupling attenuation using a coupling clamp, IEC 62153-4-5, or a triaxial test setup with an open test head, IEC 62153-4-9, are being investigated to find out which one is best suited for measurement up to 2 GHz, cf. the coupling attenuation requirements to be included for new Cat. 8.1 and Cat. 8.2 cables.

TC 46/WG 9 covers cable assemblies and testing of installed cabling, and is currently working on 4th edition of IEC 61935-1 (testing of installed balanced cabling as specified in ISO/IEC 11801), which has the addition of Class E_A and Class F_A cabling, and test methods for alien crosstalk as the most important technical changes. The document is currently at CD-level, but already now preliminary discussions have started on the next amendment or revision, which will address the new Class I and Class II cabling for 40GBASE-T. A potential new work item for a technical report on guidance for field testers is in the initial investigation phase.

Standardisation of connectors and related test methods in IEC TC 48/SC 48B

Working group 3 of IEC TC 48/SC 48B is responsible for standards for electrical connectors such as the "RJ45"-type standardised with the IEC 60603-7-series. Working group 5 is responsible for standards for related test methods such as the IEC 60512-series. The latest meetings in WG 3 and WG 5 were held in Tampa, Florida, US, in March 2014.

WG 3 of SC 48B is currently working on extending the frequency range up to 2 GHz, or even 3 GHz for a number of connector standards, making them suitable for 40GBASE-T applications. New developments include IEC 60603-7-81 and -82 which will be the new connector standards for Category 8.1 and Category 8.2 connectors, respectively. For IEC 60603-7-81 a 3rd CD has been circulated, whereas a 2nd CD is expected for IEC 60603-7-82 later this year. IEC 60603-7-81 is based on the standard RJ45-type connector, characterised up to 2000 MHz and being backwards compatible to the IEC 60603-7-51 connector (Cat. 6_A), whereas IEC 60603-7-82, likewise characterised up to 2000 MHz, will be based on and backwards compatible with the IEC 60603-7-71 (Cat. 7_A) connector. New (third) editions of existing standards IEC 61076-3-104 (the "TERA"-type connector) and IEC 61076-3-110 (the "GG45"-type connector) are also in progress with extension of the frequency range



to 2 GHz and 3 GHz, respectively, as the primary changes. For all the aforementioned standards, new test methods are required to test and validate performance up to the specified upper frequency. Preliminary work has started in WG 5 on revising IEC 60512-28-100 to accommodate this need. IEC 60512-28-100 specifies signal integrity tests for connectors using the mixed mode approach, and is currently limited to an upper frequency of 1000 MHz.

European Union regulation and CE marking

The European Union directives and regulations and the rules for CE marking etc. can be a rather complex matter, which often gives rise to questions and uncertainty – and even sometimes confusion. Although European Union legislation is not our main area of expertise, we try to keep ourselves updated on activities that may concern or have an impact for cabling products.

It is important to emphasise that CE marking of a product corresponds to declaring conformity with ALL applicable CE marking directives and regulations. The first step in a CE marking process is therefore to identify which directives and regulations *may* apply to the type of product under review. Examples of directives and regulations that may apply for e.g. communication cables are the LVD (Low Voltage directive, 2006/95/EC), the RoHS 2 (Restriction of Hazardous Substances (recast), 2011/65/EU), and the CPR (Construction Product Regulation, EU regulation 305/2011).

For the LVD and RoHS 2 directives, the conformity assessment procedure is based on internal production control, and can in principle be performed by the manufacturer alone, without involvement of any external parties, such as test laboratories etc.

For the CPR on the other hand, conformity assessment may require involvement of a Notified Body depending on the declared reactance to fire class for the cable. A Notified Body is a certification, inspection or testing body, which is officially authorised and notified to the European Commission to perform the given conformity assessment, e.g. initial type testing and/or inspection of the factory and production control. It should be noted that in order to allow CE marking of a product under the CPR, a number of preconditions exists, such as the availability of a harmonised product standard, and accreditation of notified bodies for the conformity assessment. For communication cables, these preconditions are not yet fulfilled, and it is expected that CE marking of cables under the CPR cannot begin until early 2015 and will be obligatory by early 2016.

DELTA is able to offer consultancy services on issues relating to CE marking of copper cabling products and the respective conformity assessment procedures. For the special case of CE marking of communication cables under the Low Voltage Directive, we have worked out a guide, in which the manufacturer can find explanations of the CE marking fundamentals and principles, as well as a step by step presentation of the CE marking process. The guide is available for purchase.

You are welcome to contact us for further details or specific inquiries.

The next EC CablingNews with news on standardisation is planned to follow after the ISO/IEC JTC 1/SC 25/WG 3 and the IEC TC 46 WG meetings in the autumn.

