House cabling made easy way -
the trend towards structured cabling in residential buildings

Part 3: Planning and standards

The most important standards

DIN EN 50173-1

Information Technology - Generic Cabling Systems - Part 1: General Requirements

specifies the cabling performance classes, e.g. Class E_A with Category 6_A components. Contains examples of cabling types in ascending mains and specifications for RJ45 connectors (correct: connectors conforming to EN 60603-7).

DIN EN 50173-4

Information Technology - Generic Cabling Systems - Part 4: Homes

contains supplementary specifications for cabling in residential buildings, including the mandatory number of connections, in addition to the basic standard DIN EN 50173-1.

DIN EN 50174-2

Information Technology - Cabling Installation - Part 2: Installation Planning and Practices Inside Buildings

contains practical specifications on cable installation, mandatory minimum clearances and cable runs.

DIN EN 50310

Application of Equipotential Bonding and Earthing in Buildings with Information Technology Equipment

contains the specifications for earthing and equipotential bonding in buildings in which data cables are installed, regardless of the building use and occupancy; the standard applies equally to office buildings and residential buildings.

DIN 18015-2

Electrical Installations in Residential Buildings - Part 2: Nature and Extent of Minimum Equipment

specifies the number of electric outlets, etc., with IP connection points requiring not only data outlets but also electricity.

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Specifications: Class and category

The terms "class" and "category" are often confused in practice. The system application class (class for short) always refers to the cabling which is installed and connected, whereas the category only applies to one single component, such as the cable or the data outlet, and is quantified by the manufacturer or a test laboratory.

Cabling classes according to ISO/IEC and DIN EN:

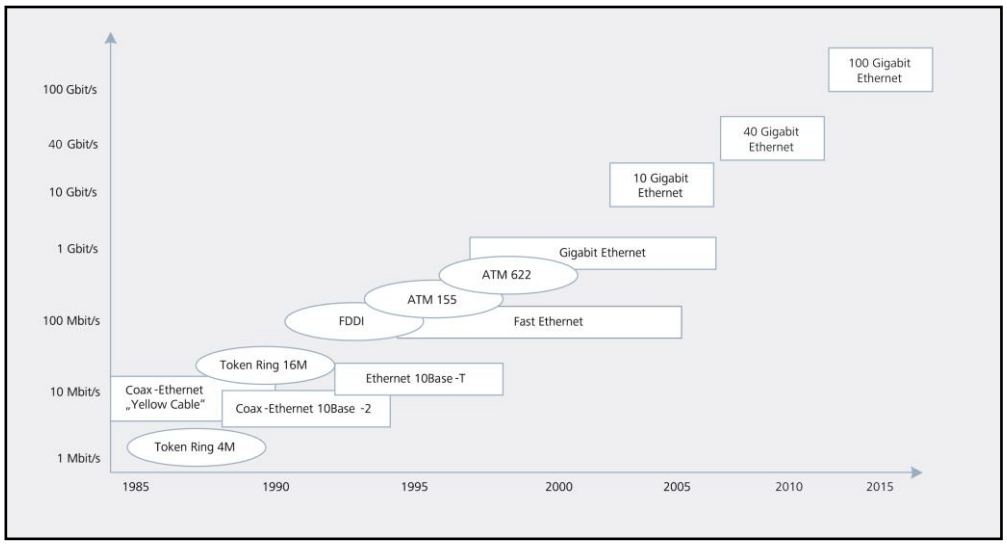
Class D: up to 100 MHz, for data rates of up to 1 Gbit/s

Class E: up to 250 MHz, for data rates of up to 1 Gbit/s

Class E_A: up to 500 MHz, for data rates of up to 10 Gbit/s

Class F: up to 600 MHz, for multimedia applications

Class F_A: up to 1000 MHz, for multimedia applications



Development of LAN technology: Ethernet has become established as the main LAN technology. Fast Ethernet and Gigabit Ethernet are most commonly used, with 100 Mbit/s and 1 Gbit/s respectively. 10 Gigabit Ethernet with 10 Gbit/s is used for very fast connections and is supplemented by 40 and 100 Gigabit Ethernet.

Component categories according to ISO/IEC and DIN EN:

Category 5: up to 100 MHz, for data rates of up to 1 Gbit/s

Category 6: up to 250 MHz, for data rates of up to 1 Gbit/s

Category 6_A: up to 500 MHz, for data rates of up to 10 Gbit/s

Category 7: up to 600 MHz, for multimedia applications

Category 7_A: up to 1000 MHz, for multimedia applications

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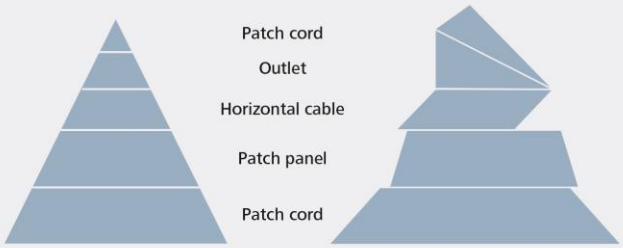
Coordinated systems and mix & match systems

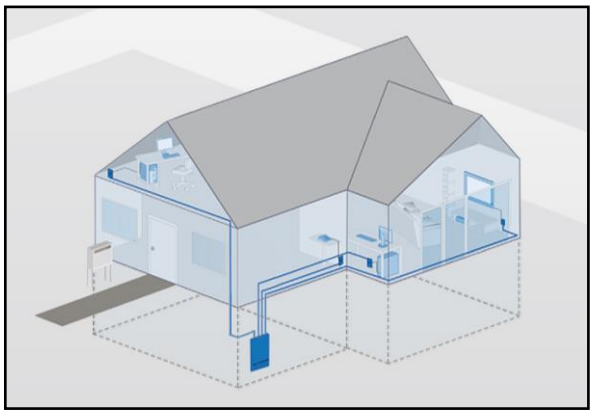
Although the cabling standards were introduced in order to be able to use components made by different manufacturers on one and the same transmission path, it can be problematic to mix products. The standards allow a relatively large tolerance range and manufacturers use different ways to compensate for interference in the components. What is likely to happen in practice with components which are not compatible is the occurrence of signal reflections and therefore high bit error rates. This results in longer response times and a severe case of underperformance of the data network.



Compatible and incompatible systems

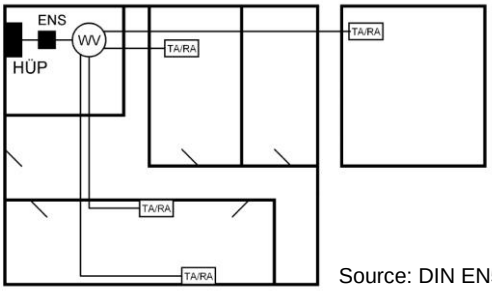
How many connections are needed for one room, and of what performance class?

As a general rule, the number of connections is determined by the use of the room. If room usage is not factored into the cabling process then it should prove useful to follow the established guideline of one connection for every 3.75 m of surface area, which is also the reference value in the relevant standard DIN EN 50173-4:2011. In a room measuring four metres by three metres, for example, this would result in the following calculation:



Volume: 3 m + 4 m + 3 m + 4 m = 14 m

1 connection per 3.75 m: 14 m: 3.75 m = 3.73

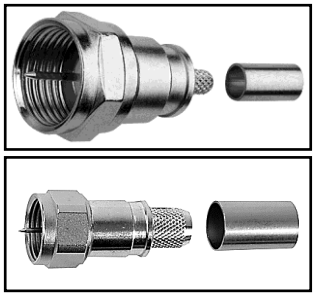


Source: DIN EN50173-4:2007

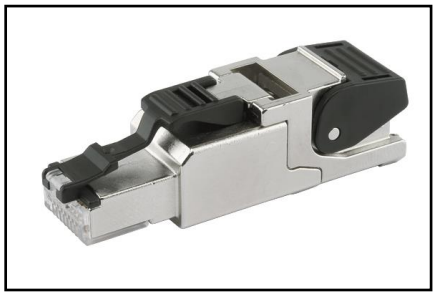
This room would therefore need 3.73 connections, i.e. 4 after rounding up. The usual decision would be to install two double outlets instead of four single outlets, but experience has proved that it is preferable to install one connection too many than one connection too few. It is better to have a outlet which is not used than to have to go to the trouble and expense of installing one at a later date. Cables are normally selected with long-term sustainability in mind, therefore the most frequent choice is Category 7 (up to 600 MHz) or, as a minimum, Category 6_A (up to 500 MHz). Many pieces of IP equipment already have a connection for Gigabit Ethernet (1000Base-T) and these cables are also a safe choice going forward for a problem-free upgrade to the next network generation of 10 Gigabit Ethernet (10GBase-T). When it comes to selecting connection components, the obvious choice is Category 6_A outlets and modules. The difference in price compared to the cheaper Category 6 products is immaterial given the low number of connections in residential buildings, especially bearing in mind that the cabling with Cat.6 components would be limited to the current Gigabit Ethernet standard. It would be a false economy if modules and outlets were to need replacing in a few years, and would turn out to be much more expensive than investing in future-proof installations in the first place which will last for many years.

Beyond Category 7

If all this performance leaves yet more to be desired, there is still the option of Category 7_A components (up to 1000 MHz) for multimedia applications. It will then no longer be possible to use the RJ45 connector, however, which has established itself as the standard connector for all IP applications. Such cases call for special connectors and outlets, most of which are very expensive. It would only be feasible for applications like cable television, for example, which needs very high frequencies. Yet the performance is often better with the established technology using coaxial aerial cables - and cheaper at the same time. In any case, television is moving in the direction of IPTV which again requires structured cabling with the familiar RJ45 connector.



F HDTV cable connector



Field-customisable MFP8 connector