

# CATEGORY 6<sub>A</sub> AND CATEGORY 7 PATCH CORDS

## Point of view

Although being an integral part of high-performance cabling infrastructures, patch cords are often neglected. To make sure that patch cords meet all the necessary requirements, appropriate standards have been published and are regularly updated. However, too often people refer to the wrong standards, causing confusion among installers, system integrators and end-users. "Do we need cat.7 patch cords? What cords do we need for 10 Gigabit Ethernet"? This paper will give you the answers to these questions.

## PATCH CORD STANDARDS

Patch cords are specified in

- ISO/IEC 11801 (global standard)
- EN 50173 (European standard)
- ANSI/TIA-568 (American standard).

They are made of four pair cable with solid or stranded wires according to

- ISO/IEC 61156 (global standard)
- EN 50288 (European standard)
- ANSI/TIA-568 (American standard)

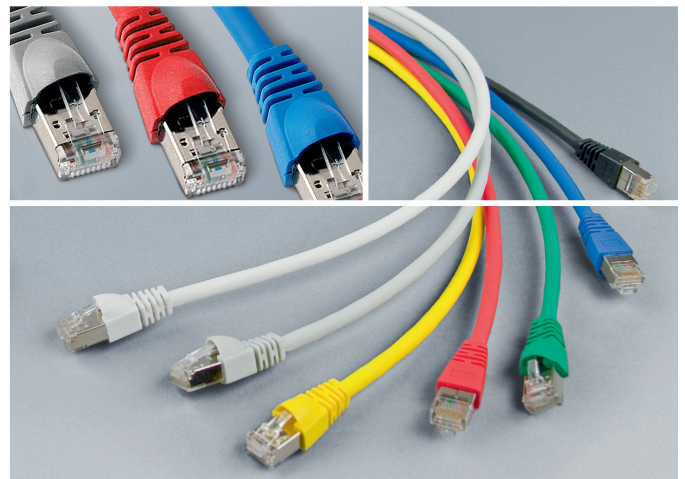
and are in most cases connectorized with 8P8C modular connectors ("RJ45 plugs") on both ends.

The connectors are specified in

- ISO/IEC 60603-7 (global standard)
- EN 60603-7 (European standard, based on IEC 60603-7)
- ANSI/TIA refers directly to IEC 60603-7.

Standards for patch cord testing are

- ISO/IEC 61935-2 (global standard)
- EN 61935-2 (European standard, based on IEC 61935-2)
- ANSI/TIA-568 (American standard)



„Do we need cat .7 patch cords? What patch cords do we need for 10 Gigabit Ethernet"? This paper will give you the answer.

Unfortunately, people very often mix the standards for the patch cords with the standards for the cables the cords are made of. It is important to distinguish between

- “patch cord”, which means the completely connectorized cord made of cable and connectors, and
- “patch cable”, which stands for the cable only, without any connectors.

## COMPONENT CATEGORIES

Just like the cable and the connectors they consist of, patch cords are classified into different performance levels – the component categories.

ISO/IEC specifies the following component categories on a global basis (the terms for the categories in EN 50173 are identical):

- Category 6: for components up to 250 MHz, e.g. used for Gigabit Ethernet and below
- Category 6<sub>A</sub>: for components up to 500 MHz, e.g. used for 10 Gigabit Ethernet and below
- Category 7: for components up to 600 MHz, e.g. used for multimedia applications
- Category 7<sub>A</sub>: for components up to 1000 MHz, e.g. used for multimedia applications.
- Category 8.1: for components up to 2000 MHz, e.g. used for 40 Gigabit Ethernet and below
- Category 8.2: for components up to 2000 MHz, e.g. used for multimedia applications

Component categories according to ANSI/TIA-568, which applies to the U.S.:

- Category 6: for components up to 250 MHz, e.g. used for Gigabit Ethernet and below; corresponds largely to Category 6 according to ISO/IEC 11801
- Category 6A: for components up to 500 MHz, e.g. used for 10 Gigabit Ethernet and below; corresponds largely to Category 6<sub>A</sub> according to ISO/IEC 11801
- There is no category 7 or 7A specified in this TIA standard.
- Category 8: for components up to 2000 MHz, e.g. used for Gigabit Ethernet and below; corresponds largely to Category 8.1 according to ISO/IEC 11801

RJ45 connectors are available in categories 6, 6A, 6<sub>A</sub>, 8 and 8.1. Cables are available in any of the categories listed above.

In “Category 7 patch cords”, only the cable itself meets the specifications of category 7, not the connectors, simply because there is no RJ45 connector that meets the category 7 specs on all four pairs simultaneously. The requirements for category 7 connecting hardware are even more strict than for category 8 or 8.1 connecting hardware.

Component categories and what they are used for

Component category	Standard	Validity	Max. Frequency	Used for
6	ISO/IEC 11801	global	250 MHz	Gigabit Ethernet and below
6 <sub>A</sub>	ISO/IEC 11801	global	500 MHz	10 Gigabit Ethernet and below
7	ISO/IEC 11801	global	600 MHz	multimedia applications
7 <sub>A</sub>	ISO/IEC 11801	global	1000 MHz	multimedia applications
8.1	ISO/IEC 11801	global	2000 MHz	40 Gigabit Ethernet and below
8.2	ISO/IEC 11801	global	2000 MHz	multimedia applications
6	ANSI/TIA-568	USA	250 MHz	Gigabit Ethernet and below; corresponds largely to Category 6 acc. to ISO/IEC 11801
6A	ANSI/TIA-568	USA	250 MHz	10 Gigabit Ethernet and below; corresponds largely to Category 6 <sub>A</sub> acc. ISO/IEC 11801
7	ANSI/TIA-568	--	--	not specified in this standard
7A	ANSI/TIA-568	--	--	not specified in this standard
8	ANSI/TIA-568	USA	2000 MHz	40 Gigabit Ethernet and below; corresponds largely to Category 8.1 acc. to ISO/IEC 11801



## REAL LIFE

Unfortunately, EN 50173-1:2018-10 adds to the confusion as it demands that the component category of the cable used in the patch cord has to be printed on the cable. On the cable of a cat. 6 or cat. 6A patch cord that is made of cat. 7 cable, "Category 7" is printed correctly on the cable jacket. But too many people tend to forget that this label applies solely to the pure cable. The manufactured patch cord doesn't meet the specs of cat. 7 for cords – it simply cannot meet them, as there is no RJ45 plug that meets the cat. 7 specs for connectors on all four pairs simultaneously. Real cat. 7 connectors cannot be plugged into RJ45 jacks.

Category 8 or 8.1 plugs don't help, as the requirements for cat. 7 connecting hardware is partially much more strict than for cat. 8 or 8.1 connecting hardware. A patch cord made of cat. 7 cable and cat. 8 or 8.1 plugs will not meet the requirements of cat. 7 patch cords. So everybody should be VERY careful whenever vendors advertise "Category 7 patch cords".

The quality and the performance of a patch cord depends on the quality of the cable used, on the quality of the connectors and the quality of the workmanship. Too often people ignore that the connector and the cable have to be matched for the patch cord to reach its full performance. The combination of a high-performing cable and low-performing connectors leaves them with a low-performing patch cord. This is especially true for many low cost patch cords, and it gets more and more important with high-performance networks like 10 Gigabit Ethernet (10GBASE-T).

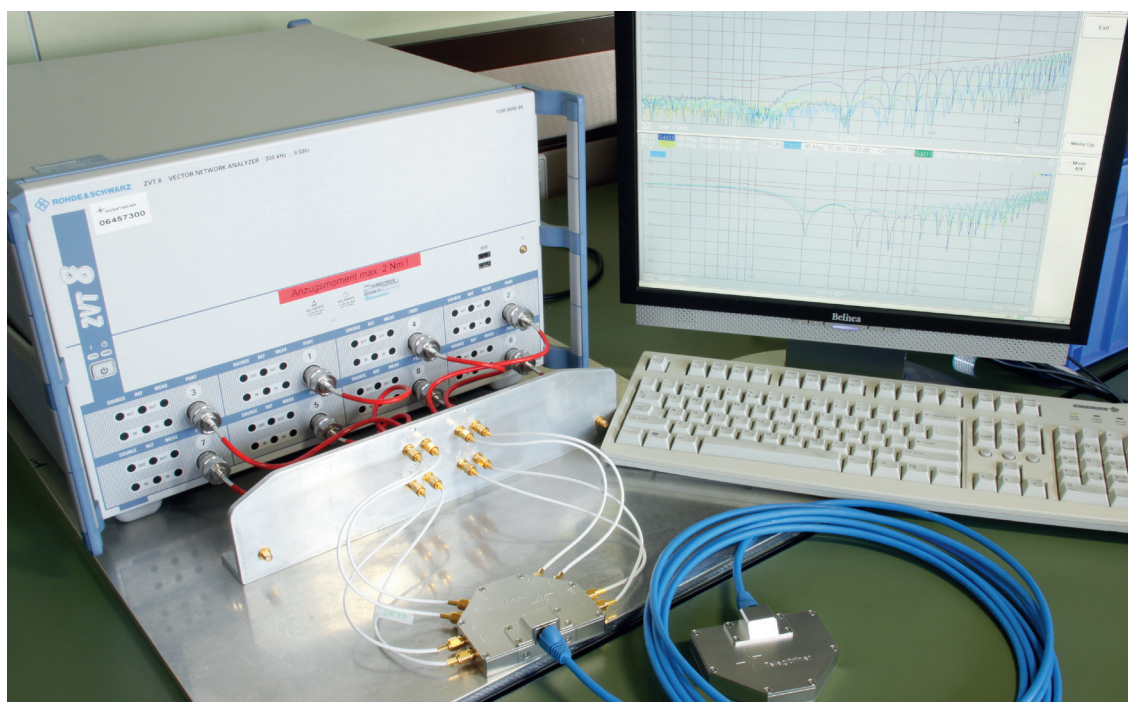
Much more important than the category of the cable is the quality of the finished patch cord and the use of matched components to manufacture it. When using components that are precisely matched, the cabling can reach its full performance. Companies like Telegärtner warrant them for as long as 25 years.





## TELEGÄRTNER: YOUR COMPETENT SYSTEM SUPPLIER

As an innovative competent system supplier, Telegärtner have their own very modern test laboratory for the testing of development samples, prototypes and series products. Telegärtner test equipment exceeds the requirements of applicable standards by far. Impressive examples are the Direct Probe used to test RJ45 components directly without diversion through coaxial test leads, providing reliable precision measurements, or the world's first test adapter for Category 6<sup>A</sup> RJ45 patch cords. Many of the test adapters used by independent measurement and testing laboratories originated at Telegärtner.



The latest test technology in the Telegärtner laboratories

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