Color Codes for Optical Fibers

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To make the work of technical teams easier when building optical networks and connecting optical cables/fibers, a color code system was introduced. Its purpose is to enable quick and easy identification of fibers during work.

During factory production, a color layer is applied to the primary coating of the optical fiber, whose diameter is approximately 200 or 250 µm, thereby increasing the diameter by about 4 µm. During the process of preparing an optical fiber for fusion splicing, the primary coating together with the color layer is removed using a fiber stripper.

The way fibers were identified by color has been mostly based on how old telephone pairs were marked. But today, there are many different color code systems. In addition to internationally accepted color code standards, individual countries — and even companies and individuals — have also created their own systems!

Why companies and individuals, you may logically ask? In the beginning of fiber optics, fusion splicing was performed by just a few small companies, and the knowledge of color codes and splicing techniques was held by only a handful of individuals. It was clear that mass construction of optical networks was only a matter of time, which would increase the demand for fusion splicing and for companies with trained personnel for such work. Because of this, some companies and individuals created “their own color codes” to keep their “trade secrets” for as long as possible.

Nowadays, the most well-known color code standards are:

- TIA/EIA-598 & ISO 11801
- IEC 60304 & DIN-0888
- IEC 60794-2
- S12
- FIN2012
- Standard Type E

In addition there are many other standards for color codes adopted by countries, telecommunications companies, fiber cable manufacturers and customers. These include Dutch KPN, Antel UR, NOR STD, MidEastCode, Turkcell, Turk Telekom and many more. It is important to double check what version{s} are being used in a given application.

All of these standards use 12 different colors that are grouped together in a common bundle, such as a PVC tube, ribbon, or yarn-bound bundle. If there are more than 12 fibers, the color sequence is usually repeated, but with additional rings or stripes added

to the colors. Of course, there are exceptions, such as the Standard Type E. This standard uses only a few basic colors for PVC tubes. For all optical cables, the counting direction is clockwise.

ANSI/TIA/EIA 598-C

Today, the most common and widely used standard is ANSI/TIA/EIA 598-C, developed in the USA and adopted by ISO 11801. The U.S. color codes originally came from old AT&T copper cables. This color coding system is shown in table below.

Number	Colour	Number	Colour
1	blue	13	blue with black tracer
2	orange	14	orange with black tracer
3	green	15	green with black tracer
4	brown	16	brown with black tracer
5	slate	17	slate with black tracer
6	white	18	white with black tracer
7	red	19	red with black tracer
8	black	20	black with white tracer
9	yellow	21	yellow with black tracer
10	violet	22	violet with black tracer
11	rose	23	rose with black tracer
12	aqua	24	aqua with black tracer

Fiber 20 can be clear or uncolored, with a black ring so it can be seen.

This standard also defines the colors of individual fibers from 13 to 16, which is applied when the fiber set consists of 16 fibers. These colors may also be used with a black tracer for fibers from positions 29 to 32, as can be seen in the table below.

Number	Colour	Number	Colour
13	olive	29	olive with black tracer
14	magenta	30	magenta with black tracer
15	tan	31	tan with black tracer
16	lime	32	lime with black tracer

IEC 60304 and DIN-0888

Besides TIA-598, a very common color code is IEC 60304 and DIN-0888. It is widely used in Germany, Austria, Switzerland, Denmark, the Balkan countries, etc. The color sequence is shown in the table below.

Number	Colour	Number	Colour
1	red	13	red with black tracer
2	green	14	green with black tracer
3	blue	15	blue with black tracer
4	yellow	16	yellow with black tracer
5	white	17	white with black tracer
6	grey	18	grey with black tracer
7	brown	19	brown with black tracer
8	violet	20	violet with white tracer
9	turquoise	21	turquoise with black tracer
10	black	22	clear with black tracer
11	orange	23	orange with black tracer
12	pink	24	pink with black tracer

IEC 60794-2

This is an international standard for optical fiber cables with many separate documents covering specifications and test procedures.

Number	Colour	Number	Colour
1	blue	13	
2	yellow	14	
3	red	15	
4	white	16	
5	green	17	
6	violet	18	
7	orange	19	
8	slate	20	
9	aqua	21	Buffer 1 red
10	black	22	Buffer 2 green
11	brown	23	Transparent
12	pink	24	Transparent

S12

The S12 color code was introduced by Sweden in 2012 and is also used in other countries for ribbon, micro and nano cables.

Number	Colour	Number	Colour
1	red	13	red with black tracer
2	blue	14	blue with black tracer
3	white	15	white with black tracer
4	green	16	green with black tracer
5	yellow	17	yellow with black tracer
6	grey	18	grey with black tracer
7	brown	19	brown with black tracer
8	black	20	clear with white tracer
9	violet	21	violet with black tracer
10	orange	22	orange with black tracer
11	turquoise	23	turquoise with black tracer
12	pink	24	pink with black tracer

FIN 2012

Finland has developed its own standard, which it uses. This color coding system is shown in table below.

Number	Colour	Number	Colour
1	blue	13	blue with black tracer
2	white	14	white with black tracer
3	yellow	15	yellow with black tracer
4	green	16	green with black tracer
5	grey	17	grey with black tracer
6	orange	18	orange with black tracer
7	brown	19	brown with black tracer
8	turquoise	20	turquoise with white tracer
9	black	21	clear with black tracer
10	violet	22	violet with black tracer
11	pink	23	pink with black tracer
12	red	24	red with black tracer

Standard Type E

Standard type E was created by the companies Televerket and Ericsson in Sweden. This standard is used worldwide; it was more common in the past, but recently in many regions it is being replaced by the S12 and TIA/EIA-598 standards. It is applied for fiber identification in ribbon cables.

Number	Colour	Number	Colour
1	red	13	red with black tracer
2	blue	14	blue with black tracer
3	white	15	white with black tracer
4	green	16	green with black tracer
5	yellow	17	yellow with black tracer
6	grey	18	grey with black tracer
7	brown	19	brown with black tracer
8	black	20	clear with white tracer
9	orange	21	orange with black tracer
10	violet	22	violet with black tracer
11	pink	23	pink with black tracer
12	turquoise	24	turquoise with black tracer

It is interesting to note that for PVC tubes only three colors are used: red for the 1st tube, blue for the 2nd and 7th tubes, and white for tubes 3 to 6 and 8 to 16. After that, the colors repeat starting again with the first red PVC tube.

What should be done in situations where you need to switch from one standard to another?

This rarely occurs during construction, as a single standard is typically used, but it is not impossible for this problem to appear. For example, you may have a primary 96F cable (8x12F) following the TIA598 standard, while the secondary drops are 24F (4x6F) following the DIN-0888 standard. However, it is much more common for old cables to be replaced with new ones due to increased network capacity or when a new cable of a different standard is inserted during the repair of a failure.

There is a major dilemma regarding the correct method of connecting fibers: whether to follow the fiber colors or the fiber numbers in the cable. Following the fiber numbers in the cable is one of the most reliable ways to ensure consistent fiber connections regardless of the number of fibers in the PVC tube and the type of standard. Trying to match colors is not always feasible. For cables with 12 or 24 fibers per PVC tube, it is possible to match the fiber colors, but not always the colors of the PVC tubes. However,

if the number of fibers is less than 12, problems arise both in matching the fiber colors and in matching the PVC tube colors.

This emphasizes the need for complete documentation. The original documentation should specify the color code standard to be used in all cables being procured for a new network and the color codes for cables that may be mismatched at drops. When replacements or matching cables with different color codes, the mismatches should be decided before installation and flagged in documentation.

Color Codes Cross Reference

Number /Color	TIA-598 ISO 11801	IEC 60304 DIN-0888	IEC 60794-2	S12	FIN 2012	Type E
1	blue	red	blue	red	blue	red
2	orange	green	yellow	blue	white	blue
3	green	blue	red	white	yellow	white
4	brown	yellow	white	green	green	green
5	slate	white	green	yellow	grey	yellow
6	white	grey	violet	grey	orange	grey
7	red	brown	orange	brown	brown	brown
8	black	violet	slate	black	turquoise	black
9	yellow	turquoise	aqua	violet	black	orange
10	violet	black	black	orange	violet	violet
11	rose	orange	brown	turquoise	pink	pink
12	aqua	pink	pink	pink	red	turquoise

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