

WHITE PAPER

BRAIDED SHIELDING AND THE EMC BEHAVIOUR OF COPPER DATA CABLES

In connection with our high-performance S/FTP cables our customers have raised queries relating to braided shielding, shielding coverage, shielding attenuation, coupling attenuation and electromagnetic compatibility (EMC). This White Paper explains the most important relationships. At the same time it makes clear that, despite their comparatively low degree of braided shielding coverage, Datwyler's S/FTP standard cables still display excellent EMC behaviour – as well as other benefits.

Datwyler has been producing high-grade data cables for decades. As a pioneer in the development and fabrication of shielded copper data cables for LANs, data centres and industrial environments we established the importance of EMC as a focus of product development back in the early days. Good EMC characteristics help to consolidate in-house data network security. They suppress a variety of electromagnetic interference, which can occur in the form of regular radio services, and create additional system reserves. They also ensure that a data network does not generate its own electromagnetic interference.

In combination with our know-how in high frequency technology and process technology Datwyler can produce copper data cables with significantly more material efficiency than many other cable manufacturers. In this context and with specific reference to S/FTP cables (see image below), material efficiency means achieving excellent shielding action even with a relatively low degree of braided shielding coverage. This is not only an environmental issue (to save resources). The corresponding cables from Datwyler are also characterised by a lower fire load and a lower copper index than many comparable constructions from other vendors.

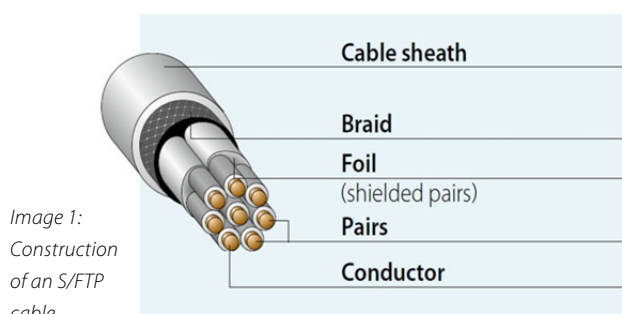


Image 1:
Construction
of an S/FTP
cable.

Relevance of coupling attenuation

First of all, it is basically correct that when constructing an S/FTP cable a cable manufacturer is able to control coupling attenuation and shielding attenuation by means of the braided shielding coverage, thereby achieving better EMC characteristics. However this relationship is not incremental, meaning that a cable with a higher degree of coverage does not automatically have better coupling and shielding attenuation than a cable with a lower degree of coverage.

This is also why coupling attenuation was primarily specified as the relevant parameter for EMC behaviour in the cable standards.

For Category 7_A cables, for example, the corresponding technical parameters are found in Standard EN 50288-9-1 "Multi-element metallic cables used in analog and digital communication and control – Part 9-1: Sectional specification for screened cables characterised up to 1000 MHz – horizontal and building backbone cables".

This standard defines two levels of quality performance for the coupling attenuation of shielded data cables: A coupling attenuation of at least 85 decibels (dB) is stipulated for Type I. Type Ib cables need to meet a slightly lower standard of 70 dB.

5.1.2.10	Coupling attenuation	Type I: ≥ 85 dB, 30 MHz ≤ f ≤ 1000 MHz; ≥ 85 - 20 log (f/100) dB, 100 MHz ≤ f ≤ 1000 MHz
		Type Ib: ≥ 70 dB, 30 MHz ≤ f ≤ 1000 MHz; ≥ 70 - 20 log (f/100) dB, 100 MHz ≤ f ≤ 1000 MHz

Image 2: Specification for coupling attenuation as specified in EN 50288-9-1.

The S/FTP structure of Datwyler’s current copper data cables complies with Type 1 requirements.

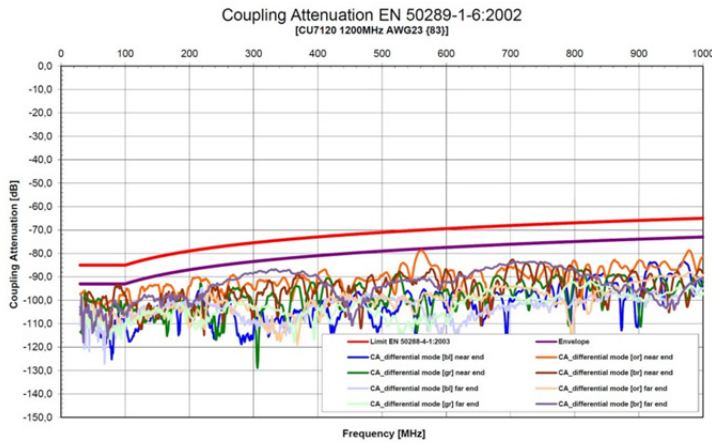


Image 3: Result of coupling attenuation test on the “Datwyler CU 7120 4P”.

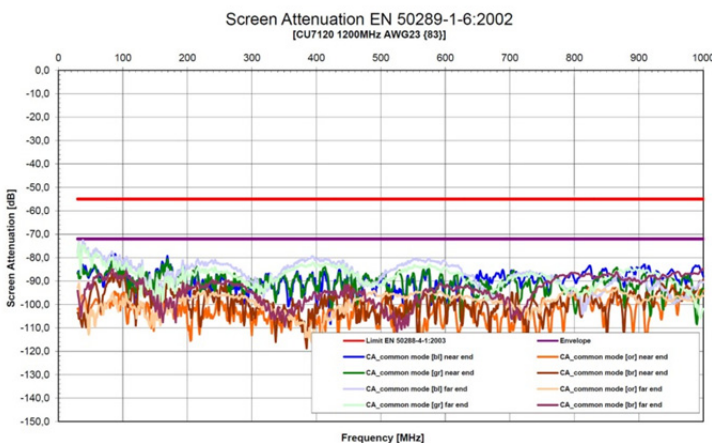


Image 4: Result of shielding attenuation (screen attenuation) test on the “Datwyler CU 7120 4P”.

EN 50288-1-6 specifies an “envelope curve” for coupling attenuation. According to standard the measured plateau value gives the nominal value for the coupling attenuation. In the measurement shown above this is 93 dB.

Only in order to impart a certain mechanical stability to the cable and to guarantee a certain current load capacity is the degree of shielding coverage in this standard set at a minimum of 30% for cables with foil and braided shielding – as also defined in EN 50290-2-1.

Of course Datwyler is able to produce S/FTP cable with a higher degree of braided shielding coverage (higher “optical coverage”) on request, but this does not make much sense in view of the excellent test results on our standard cables, which far exceed the figures for comparable products by other manufacturers..

Argument in favour of braided shielding

Datwyler relies on a combination of foil and braided shielding (S/FTP) for screening high-performance symmetrical data cable. Braided shielding, which is applied to the Datwyler cables in a complex production process, is especially significant from an engineering point of view when compared with only foil shielded cables. It not only noticeably improves the attenuation characteristics of the cable, but has other positive effects as well.

For example, it results in the current load capacity of the cable shielding being boosted significantly, which means that the cable contributes to better segmentation of the intermeshed equipotential bonding system in the building. The cable itself is also much more resistant to any shield currents which may occur due to lightning or other imponderables.

When assembling connection components the shield contact effected with braided shielding is considerably simpler, safer, more durable and hence better than would be possible with a cable having only a foil shield.

Last but not least, braided shielding improves a cable’s mechanical properties. For instance, it increases maximum tensile strength, which can be important when installing data cables. With patch cables, which are subject to great bending stresses, it is the braided shielding which gives the screened cable optimum flexibility, mechanical stability and hence improved electrical reliability.