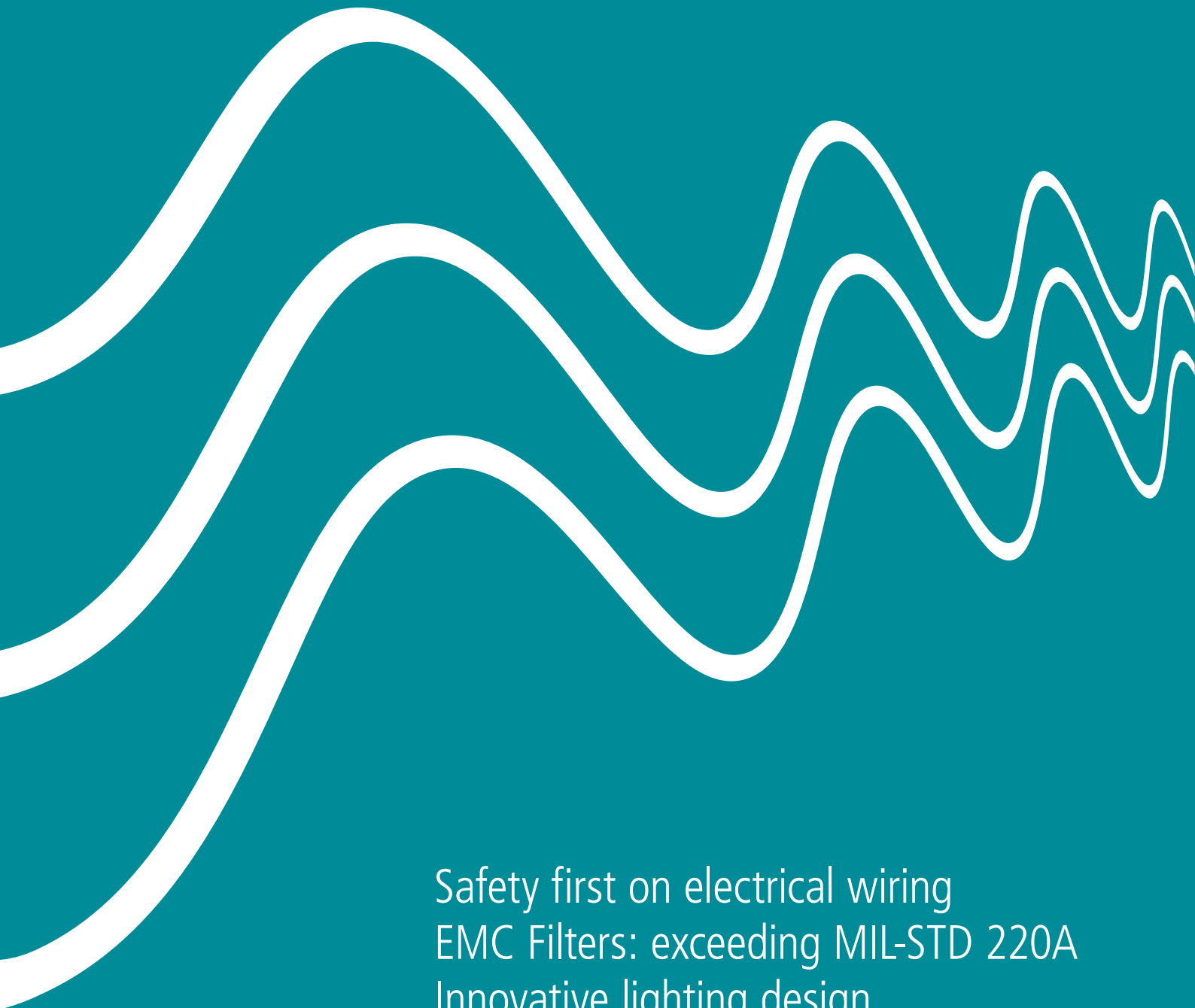




## Electrics

ELECTRICAL SYSTEM | POWER & MEDIA FEED-THROUGH



Safety first on electrical wiring  
EMC Filters: exceeding MIL-STD 220A  
Innovative lighting design  
FO converters: your choice for  
data lines

As a system supplier, we ensure our expertise and strict compliance to quality standards, that all components and equipment installed, form part of a wholly integrated facility design. The electrical wiring in an EMC facility, like the arteries and veins in a human body, brings power to every area of the facility.

## Purpose & Overview

WHAT IS THIS SOLUTION FOR? .....

The electrical system is an important sub-system of a safe and highly functioning test site. The electrical system includes components such as materials, illumination, EMC filters for power, control and communication lines and fibre optic (FO) converters.

The wiring design and components we use are developed to meet the electrical safety requirements of the VDE 100 or corresponding international standards. The major challenge is the RF noise which needs to be controlled, not to surpass the allowed noise level in the anechoic chamber. Special attention has to be paid to A/D converters used in battery buffered power supplies.

In the test site, a sufficient level of illumination is required, thus the right lighting design is a priority. Lighting is a source of heat and depending upon the type used, can be a source of RF noise. We provide solutions for the corresponding frequencies in the chamber, (i.e. EMC or microwave applications), while shielded rooms are

normally less critical. Special illumination winch systems are available to facilitate maintenance and exchange of light fixtures.

The supply of power, data, and information while maintaining the requested shielding effectiveness, are necessary for proper function of a test site. We provide a wide variety of FO converters and EMC filters, which are available in a standard attenuation grade with 100 dB insertion loss at 150 kHz and an enhanced grade with 100 dB at 14 kHz.



# Quality Management

QUALITY MEANS DOING IT RIGHT FROM THE VERY FIRST THOUGHT. ....

Our quality management ensures a most efficient quality control over products, management and organizational systems.

The organization ensures the availability of resources and information necessary to support the operation and monitoring of these processes. All relevant processes are defined in our management system. Through monitoring, analysis, and improvement, the highest quality and customer satisfaction is our target.

In an effort to improve our quality assurance systems, we ask our customers to provide an evaluation of our performance at the conclusion of each project. This feedback, coupled with input from the market and the Standards Committees, gives continuous enhancement to our systems and correction to any non-conformity found.

Product purchasing and sourcing is a priority in our role as system integrator, so much that it encompasses one of sixteen chapters in our quality management system. Key process figures are:

- audit & approval of suppliers
- evaluation of products by our technical team
- technical reporting on delivered products
- project related factory acceptance by the project manager.

In our commitment to quality solution designs, we work closely with our long time suppliers to ensure that our stringently designed specifications are met.

Quality is not only doing it right from the very beginning, but also delivering the right products in the expected quantity on the scheduled dated at the right place. For a global solutions supplier these aspects are key. Each project is subject to a quarterly review of quality, cost, and delivery specifications.

Our ISO 9001 and ISO 14001 certification guarantees that our designs, products, and solutions will always meet the highest quality standards. It's our goal to provide you the very best of expertise, project management, and products. The main system components like shielding, absorbers etc. are manufactured by daughter companies or by our shareholders. This ensures a full control with regard to quality and delivery time.

# ILLUMINATION

Light creates not only the safe working environment, it's also responsible for a bright and pleasant appearance.

## Lighting technologies

EMISSION FREE AND BRIGHT, THAT'S THE TARGET. ....

Illumination in chambers for EMI measurements shall be free of emission. The state-of-the-art switch mode power supply for illumination systems, (e.g. for LED lighting) is especially interfering in the frequency range from 30 MHz to 300 – 400 MHz.

Today, our absorber chambers are equipped with 300 W, 500 W and 750 W halogen lamps. Appropriate cooling extends the overall lifetime of a light bulb and the electric contacts. The lamps are located under the ceiling honeycombs to better exhaust of the radiated heat.

While fluorescent lamp technology cannot be applied for measurement chambers, it represents an advanced solution for amplifier rooms and other RF unclean environments. Fluorescent lighting has a long lifespan, low heat dissipation, and most importantly, is cost efficient with its low power consumption.

In shielded areas for radiated measurements, the use of LED lighting is limited to special applications. The electrical triggering takes place by phase control and causes HF interference. To overcome this situation is complex and expensive. Today, the cost for comparable illumination in LED version is approximately 5 – 8 times higher than traditional halogen lighting. However, the total cost of ownership

(i.e. inclusive of lifetime aspects and annual power consumption) shows the LED lighting is becoming more and more competitive. In medical facilities, LED lighting has practically become the standard and its presence is growing in the test site industry as well.

Signal lamps are used for displaying simple information or warnings. The preferred location for the installation of signal lamps is the area above entrance or exit doors. These lamps are stand alone buffered to provide service even after a general power breakdown. Typical applications include EMERGENCY EXIT, TEST IN PROGRESS indicators and ALARM display.

The illumination winch system (IWS) is designed for convenient lamp service in anechoic chambers and/or shielded rooms with a high ceiling structure (e.g. above 5 m). The IWS consists of the following components: fixation brackets, gearboxes, motors, belts drives and lamps. Each lamp can be lowered by radio control. The lowest position is adjusted during the project commissioning phase. The motor stops automatically in the fully-up position. The light power is automatically switched off during the lifting operation. Due to the belt designed suspension, the lamp is free of rotation during the lifting operation.



# OTHER COMPONENTS

All parts are designed to exceed your expectations of a functional, safe, and user-friendly infrastructure in the test site or shielded area.

## FO Converters

SHIELDING BY ELECTRICAL/OPTICAL CONVERSION. ....

It isn't possible to bring high bit rate signals into a shielded area by using conventional filtering measures. The necessary passband for the signals would significantly degrade the shielding effectiveness of the Faraday cage. To overcome this challenge, FO converters have been designed. The information, converted to an optical signal, is transmitted galvanic isolated via an optical fiber to the shielded area. Finally, the optical signal is converted back to the original electrical signal. To avoid the generation of RF noise in the shielded area, the inside converter is RF shielded. Upon request, the outer one can be shielded too. The most important features are:

- EMI compliant to CISPR 22 Class B
- RF immunity of the EMC hardened satellite (200 V/m up to 18 GHz)
- Compact metal housings of both units
- 8 hours continuous operation
- Housing is approximately 185 mm x 135 mm x 90 mm (7.3 in x 5.3 in x 3.5 in)

Some of the converters currently available are LAN/Ethernet, USB, RS232, CAN and GPIB.

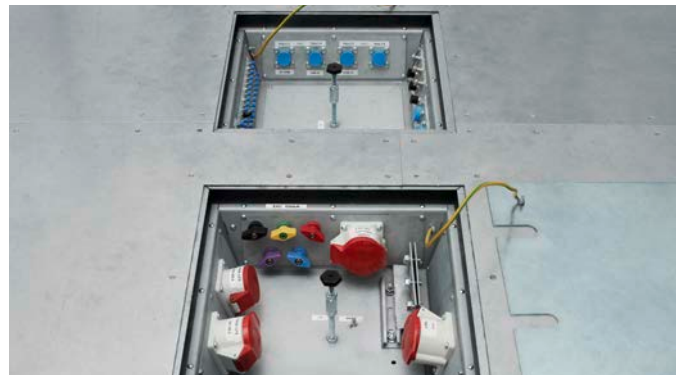
## Receptacles

SAFE AND RELIABLE CONNECTION FOR YOUR LINES. ....

A top priority for on-site engineering is the flexibility for future modifications. In anechoic chambers, the cabling is in cable ducts lying underneath the floor. The standard connection point (CP), in semi-anechoic chambers (SAC) and fully anechoic rooms (FAR), is a metal box which can house both the receptacles and the connectors. On request, a CP for liquid and/or gaseous media is available. Receptacles can be implemented at the box bottom and the two side plates, which can be easily dismantled. The cover plate is made of a solid galvanized steel plate. The standard CP applied for modular raised floors in shielded rooms, has the body and cover plate made of a plastic-metal compound, designed for aesthetics and stability. The following receptacles are provided in our standard electrical system:

- AC socket, single phase: 16 A, SCHUKO type, with neutral and protection ground, 230 V AC
- AC socket, three phase: 16 A, 32 A and 63 ACEE type, with neutral and protection ground, 400 V AC
- DC terminals: type and size according ampere rating

On request, additional and/or alternative receptacles are provided according to the national standards and customer's requirements.



# POWER LINE FILTERS

A great variety of current and voltage ratings, cases, and cabinets covers the market requirements up to several thousands of amperes.

## Single choke filters

### FULL INSERTION LOSS UNDER ALL LOAD CONDITIONS. ....

To prevent interferences or surge voltages from penetrating or escaping a shielded room, all lines passing through the shield should be equipped with appropriate filters. Our standard filters come in an RF-tight case for wall mounting and include single or multiple filter circuits depending on the requirement.

For EMC Test Site applications we use single choke filters, damping common-mode and differential-mode currents equally well. The large gapping, (e.g. through the outer air gap in I-core chokes) prevents saturation of the magnetic core by the operating current. For protective measures (e.g. Tempest applications), we use current compensated chokes filters, damping for the most part common mode interference currents. This circuit arrangement offers the lowest leakage current values on the market.

The insertion loss of filters is determined according to the stricter CISPR 17, as opposed to the frequently used MIL-STD 220A, where only an open-circuit measurement is required in the frequency range below 100 kHz. The loss figures for all of filters apply for full load in the stated frequency range.

With regard to the insertion loss, we offer two basic grades of power line filters for EMC Test Sites:

- B84299-xxxx-x001 with 100 dB at 150 kHz
- B84299-xxxx-x003 with 100 dB at 14 kHz

The high capacitances between the lines and ground require special protective measures. If there are no product-specific requirements, protection with a secondary ground wire (cross section min. 10 mm<sup>2</sup>) in accordance with EN 50178, is necessary. For this purpose, the filter case has connecting bolts at each end. Resistors are incorporated in the filter to discharge capacitors after shut-down.

The danger to electrical and electronic equipment and systems from electromagnetic pulses (EMP) is characterized by fields of the order of kilovolts per meter and amps per meter. Where EMP is concerned, rise and fall times of just a few nanoseconds to a few hundred nanoseconds must be taken into account. On request, we deliver an appropriate overvoltage protection for our power line filters.

The overvoltage protection is housed in an add-on case or in the filter case itself, together with extra nonlinear components in the filter configuration.

The standard range of our power line filters includes, but is not limited to, the following current ratings available in two grades of insertion loss:

- |  |   |
|--|---|
| B84299-xxxx-x001                                 | 100 dB at 150 kHz                             |
| B84299-xxxx-x003                                 | 100 dB at 14 kHz                              |
| – Filter for power lines, type B84299–D2160–.... | 2 or 4 lines 16 A, 250 V AC and/or, 400 V AC  |
| – Filter for power lines, type B84299–D2320–.... | 2 or 4 lines 32 A, 250 V AC and/or, 400 V AC  |
| – Filter for power lines, type B84299–D1630–.... | 2 or 4 lines 63 A, 250 V AC and/or, 400 V AC  |
| – Filter for power lines, type B84299–D1100–.... | 2 or 4 lines 100 A, 250 V AC and/or, 400 V AC |

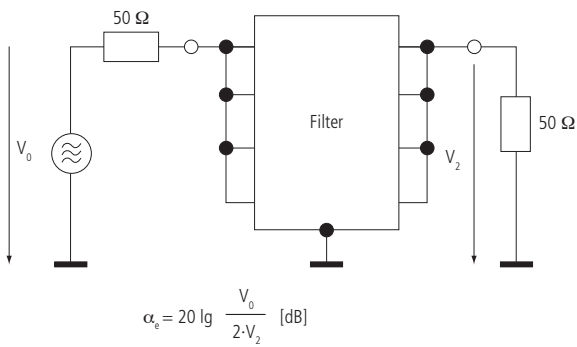




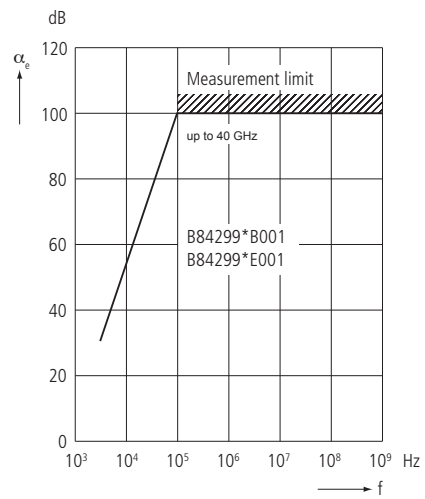
## Standard insertion loss

Insertion loss  $\alpha_e$  (typical values at  $Z = 50 \Omega$ )

Measurement circuit



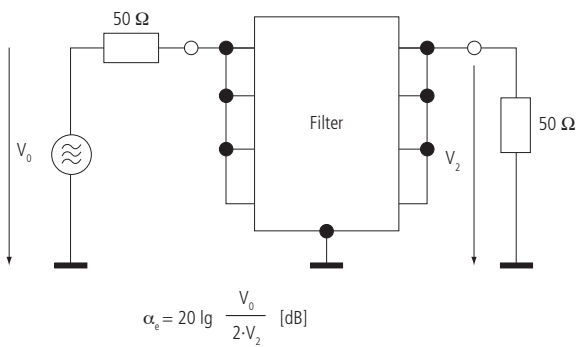
Asymmetrical measurement circuit to MIL-STD 220A



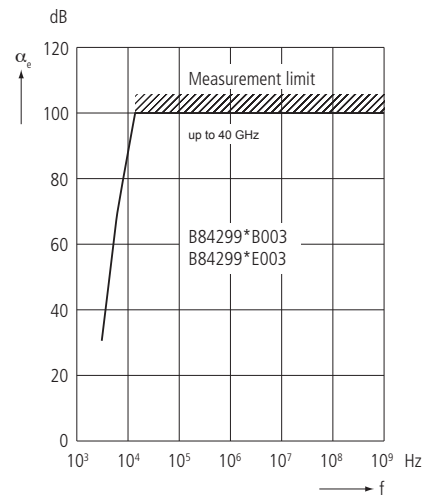
## Enhanced insertion loss

Insertion loss  $\alpha_e$  (typical values at  $Z = 50 \Omega$ )

Measurement circuit



Asymmetrical measurement circuit to MIL-STD 220A



# SIGNAL LINE FILTERS

Analog/digital lines up to 20 kbit/s and ISDN telephone lines are filtered with classic EMC filters. A wide variety of cases and circuits are available.

## Multiple pair line filters

TO PROTECT VOICE, DATA AND CONTROL LINES. ....

The range of analog/digital line and ISDN telephone filters offers a passband up to 300 kHz and a stop band insertion loss up to 40 GHz. Our product line offers many features such as coaxial feed-through capacitors on input and output, single or current balanced chokes, three different circuit diagrams, and integrated EMP protection.

The broad range of applications covered by our signal filters includes the following:

- Standard analog phone lines for smoke detection
- 24 V emergency lighting
- RS485 to 9600 Baud
- RS422 to 19200 Baud to DC motors

The electrical components are incorporated in an RF-tight case of tin-plated sheet steel. The filters are available for 2, 4 or 20 lines and for upright or flat installation on the shielding wall. Single filters are attached directly to the shielding wall. Larger numbers can be housed in filter cabinets or boxes. Various models and flexible connector fittings are available.

Hosted in a small box with the basic size of 262 mm x 56 mm x 25 mm (10.3 in x 2.2 in x 1.0 in) the filters have a maximum voltage rating of 100 V AC. When a larger number of lines need to be

filtered, it is suitable to install the single filters into boxes (up to maximum 52 pairs of lines) or into cabinets (up to maximum 500 pairs of lines). This preparation will simplify future filter upgrades and allow entry to the shielded area with multi-core cabling.

Our standard range of signal line filters includes, but is not limited to, the following types:

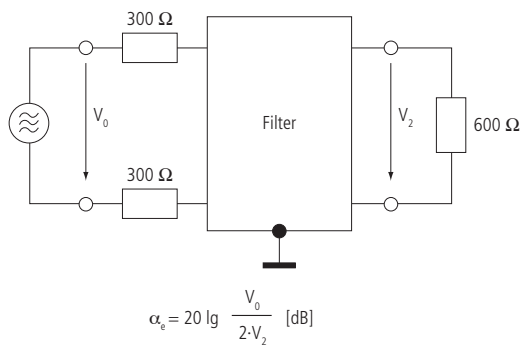
- Communication lines filter, type B84312-C20-....  
2 or 20 lines, bandwidth 3.4 kHz, 100 V AC
- Control lines filter, type B84312-C30-....  
2 or 20 lines, not matched, 2 x 1 A, 100 V AC
- Communication lines filter, type B84312-C40-....  
2 or 20 lines, bandwidth 50 kHz, 100 V AC
- Communication lines filter, type B84312-C50-....  
1 or 10 twin lines, bandwidth 120 kHz, 100 V AC
- Communication lines filter, type B84312-C60-....  
1 twin line, bandwidth 300 kHz, 100 V AC
- Communication lines filter, type B84312-C90-....  
1 or 10 twin lines, bandwidth 3.4 kHz, 100 V AC
- Control lines filter, type B84312-C100-....  
1 or 10 twin lines, 1 A, 100 V AC,
- Filter for S2 or PCM 30, type B84312-C112-....  
2 lines, band with 5.12 MHz, 100 V AC
- Filter for S0 ISDN, 2B+D, type B84312-C110-....  
2 lines, bandwidth 480 kHz, 100 V AC
- Filter for UPO ISDN, 2B+D, type B84312-C114-....  
2 lines, bandwidth 960 kHz, 100 V AC
- Filter for U2B1Q ISDN, 2B+D, type B84312-C060-....  
2 lines, bandwidth 300 kHz, 100 V AC
- Filter for UK0 ISDN, 2B+D, type B84312-C060-....  
2 lines, bandwidth 300 kHz, 100 V AC
- Filter for U200 1B+D, type B84312-C114-....  
2 lines, bandwidth 640 kHz, 100 V AC



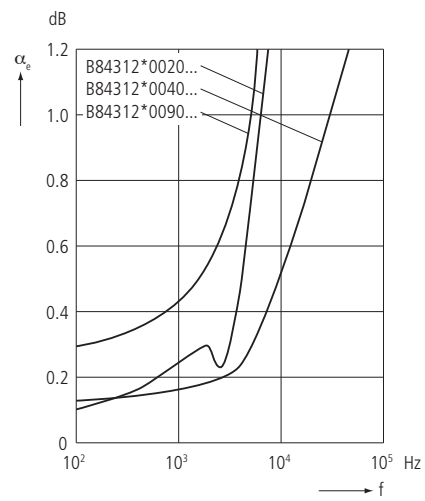
## Analog/digital data lines

### Insertion loss $\alpha_e$ in passband (typical)

Measurement circuit



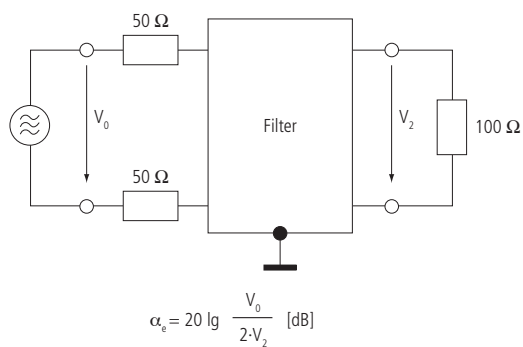
Symmetrical measurement circuit with  $Z_L = 600 \Omega$



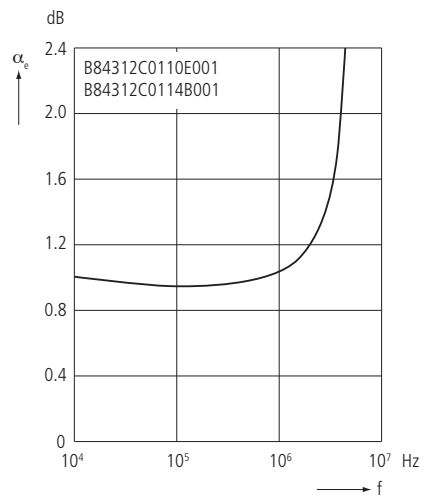
## ISDN telephone data lines

### Insertion loss in passband (typical)

Measurement circuit



Symmetrical measurement circuit with  $Z_L = 100 \Omega$



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