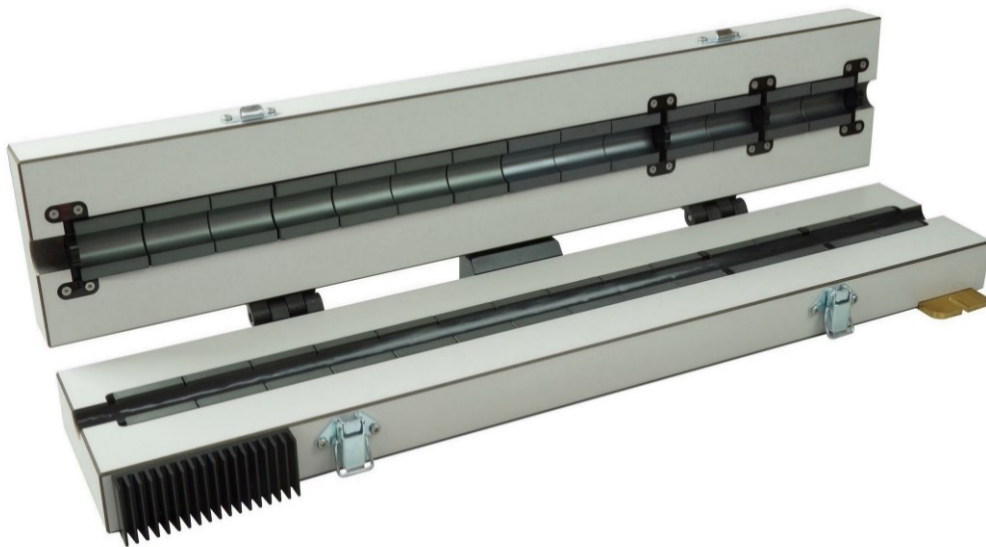


USER MANUAL

EM clamp



CDN EMCL-20

CDN EMCL-35

Attention!

Please observe the safety instructions to be followed for this device in chapter 2.

Scope of delivery:

- CDN EMCL-20 or CDN EMCL-35
- Calibration set (KAL SET EMCL) :
 - 2 mounting brackets incl. 50/150 Ohm transition
 - 1 BNC termination
 - 1 adapter with banana plugs
 - 1 piece brass rod with banana plugs
 - N-male to BNC female (ADAPTER-N_ST-BNC_BU)
- Calibration certificate
- User manual



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1 Introduction

The EM clamp CDN EMCL-20 or CDN EMCL-35 is suitable for tests according to IEC / EN 61000-4-6 for cables up to 20 mm diameter or 35 mm diameter respectively and additionally includes a calibration set as well as the corresponding calibration data. The calibration set for EM clamp is intended for retrofitting existing coupling sections to the valid IEC 61000-4-6 standard (standard accessory with CDN-EMCL).

The EM clamp is always used when the use of coupling / decoupling networks (CDN) does not seem suitable or appropriate.

This applies, for example, to unshielded cables which are made up of a large number of individual conductors.

The EM clamp achieves both capacitive and inductive coupling into the cable connected to the EUT.

The EM clamp has a directivity of > 10 dB above 10 MHz, so that a defined impedance between the asymmetrical connection point of the AE and the reference ground plane is no longer required. Above 10 MHz, the behavior of the EM clamp is therefore similar to that of a CDN.

2 Safety instructions

2.1 Used symbols



Note

This symbol points out additional hints, application tips or information.



Warning

is used if not following the instructions may cause personal injury, material damage or environmental damage. Regard these instructions and take care of your actions.



Danger

is used if not following the instructions may result in danger of life. Regard these instructions and take care of your actions.



Electric shock

This symbol warns against danger for life caused by electric shock. Regard these instructions and take care of your actions.



2.2 Important safety instructions

The application of the CDN-EMCL-20 / CDN EMCL-35 and the performance of EMC tests should be carried out exclusively by qualified personnel only. In particular, a comprehensive knowledge of the underlying basic standard is mandatory. These operating instructions cannot replace an intensive study of the basic standard.

We expressly point out that when the CDN-EMCL is operated as intended, high frequency is generated which can lead to electromagnetic disturbances.

Ground the instrument as provided in the test setup.

If in doubt, use the CDN-EMCL-20 / CDN EMCL-35 and perform all tests in a shielded room.

To protect against voltage spark from the EUT line to the CDN-EMCL-20 / CDN EMCL-35, the operator must ensure adequate isolation.



Attention

**The CDN EMCL-20 / -35 may only be operated by qualified personnel.
Technical knowledge of electricity and product standards is mandatory.**



3 Setting of the output level at the EUT port of the EM clamp

Setting of the output level at the EUT port of the EM clamp is explained hereafter:

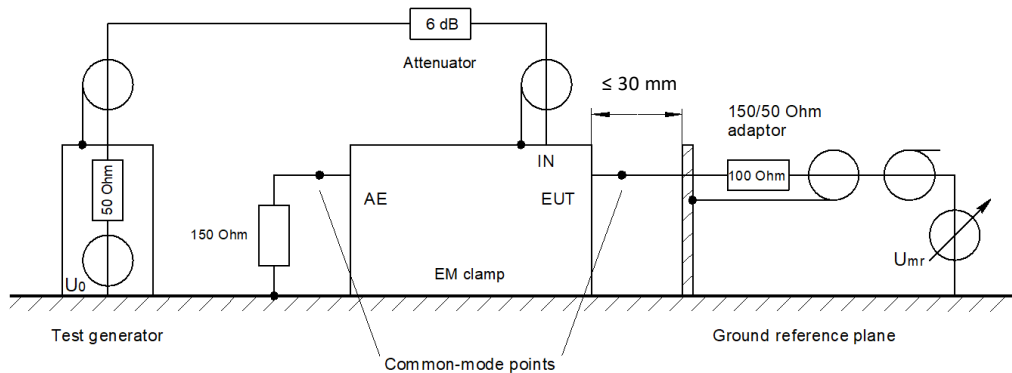


Figure: Schematic set-up for level setting at the EUT port of the EM clamp

The test generator shall be connected to the RF input port of the EM clamp. The EUT port of the clamp shall be connected in common mode through the 150 Ω to 50 Ω adaptor to a measuring equipment having a 50 Ω input impedance. The AE port of the EM clamp shall be loaded in common mode with a 150 Ω to 50 Ω adaptor, terminated with 50 Ω. The test jig shall be in contact with the clamp on the AE side to ensure the required distances specified by the standard.

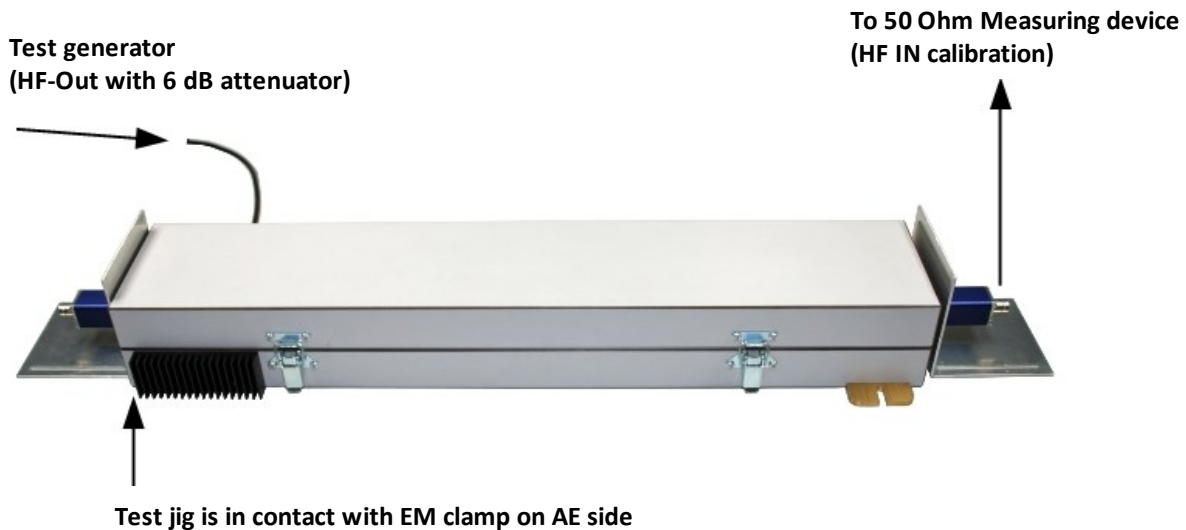
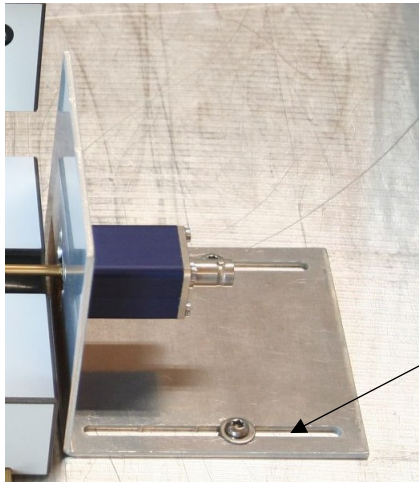


Figure: Set-up for level setting at the EUT port of the EM clamp





EMCL-20 and calibration bracket are best screwed to the ground plate. Good ground ratios are important.

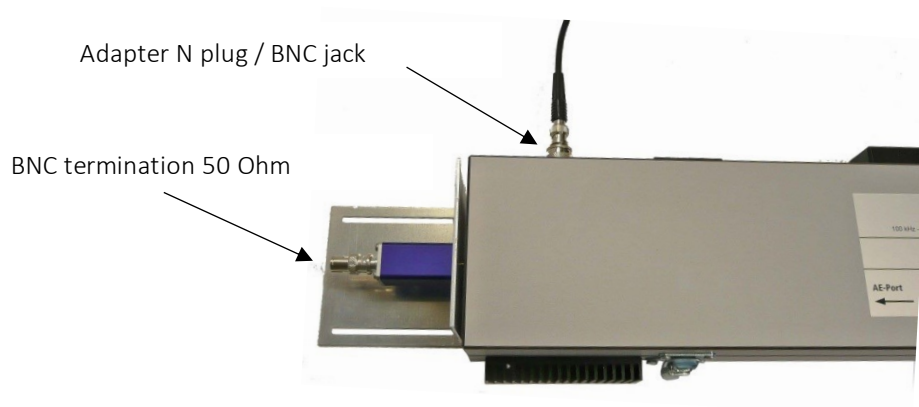


Figure: CDN EMCL-20 with adapter

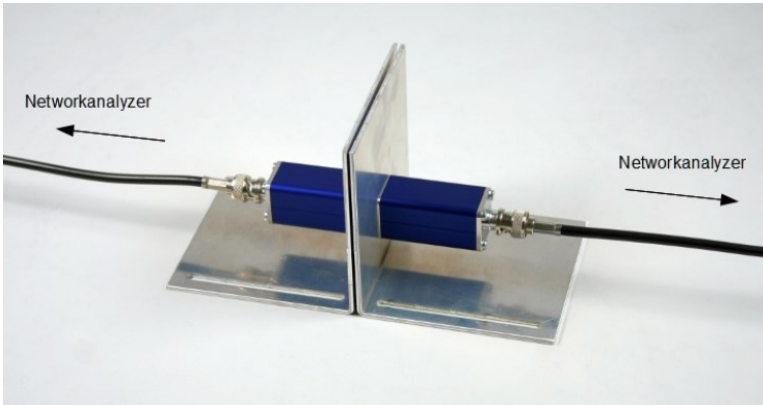


Figure: CDN EMCL-20 open



3.1 Set-up for calibration of the network analyzer

It is recommended to place attenuators (typ. 10 dB) ahead of the 150 Ω to 50 Ω adapters.



4 Procedure for clamp injection

When using clamp injection, the AE set-up shall present the common-mode impedance as required as closely as possible. Each AE used with clamp injection shall represent the functional installation conditions as closely as possible. To approximate the required common mode impedance the measures as described in 7.6 of the standard need to be taken.

In all other cases the procedure defined in 7.7 shall be used.

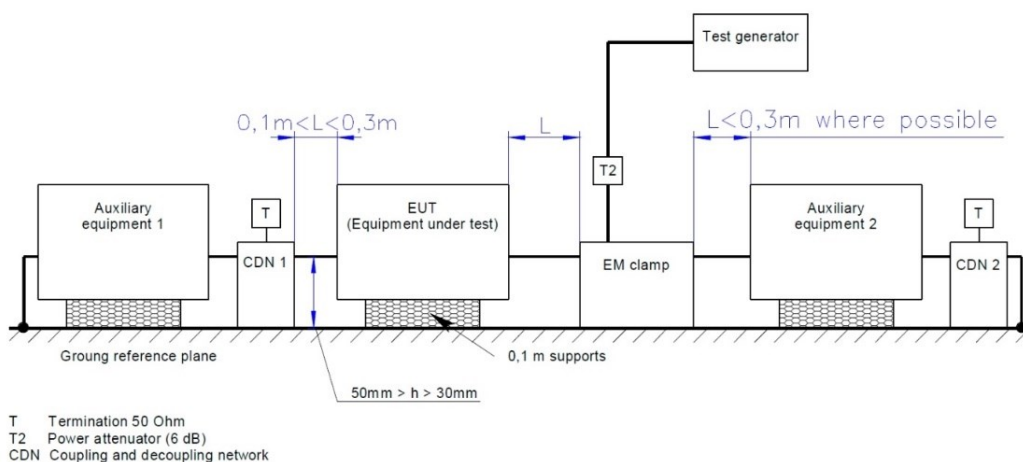


Figure: Schematic set-up for immunity test to RF conducted disturbances



5 CDN EMCL-20 for use in the frequency range 10 kHz - 150 kHz



Attention!

A **CDG 7000-75_10** is required for this test (a generator from 10 kHz and a power amplifier of 75W)!



CDN-EMCL-NW_10 matching network

The EM clamp is developed for test frequencies above 150 kHz. For product standards with testing requirements **in the frequency range of 10 kHz – 150 kHz the EMCL-20 clamp cannot normally operate with a 6 dB attenuator**. The insertion loss for an effective coupling is too high. Therefore, a matching network (e.g. **CDN-EMCL-NW_10**) should be used. This network transforms the low impedance of the EM clamp to an acceptable impedance for the amplifier. With this matching network reproducible tests are feasible up to 10 V at 80% AM – **without** the 6 dB attenuator.



Note!

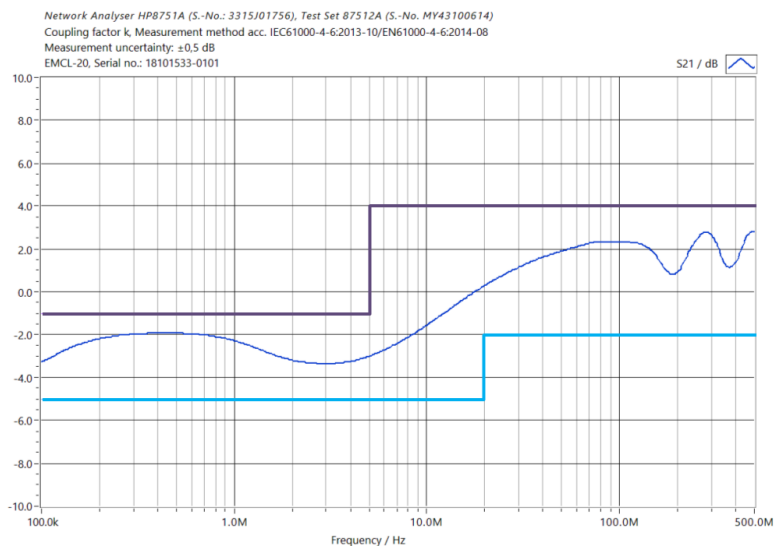
For the EMCL-35 the matching network **CDN-EMCL-NW_10** is not necessary.



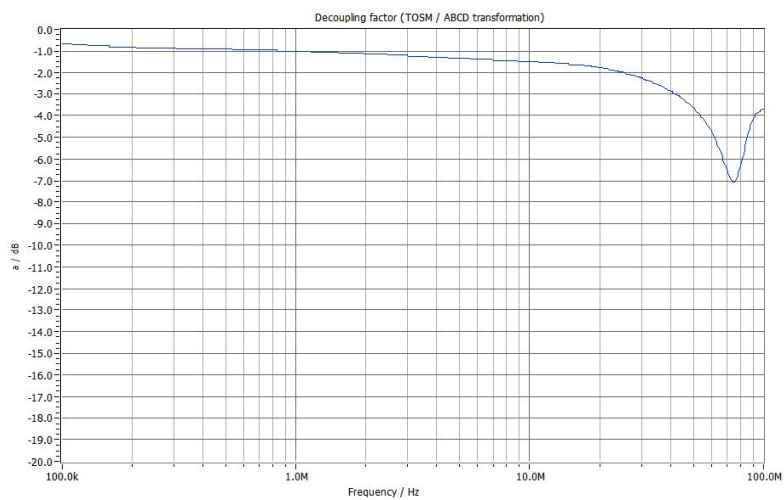
6 Typical curves of the CDN EMCL

6.1 Typical curves of the CDN EMCL-20

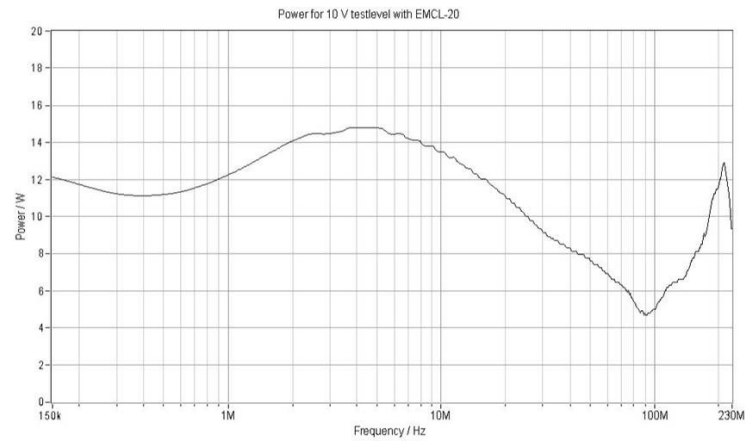
CDN EMCL-20: Typical coupling factor



CDN EMCL-20: Typical decoupling factor (transformed)

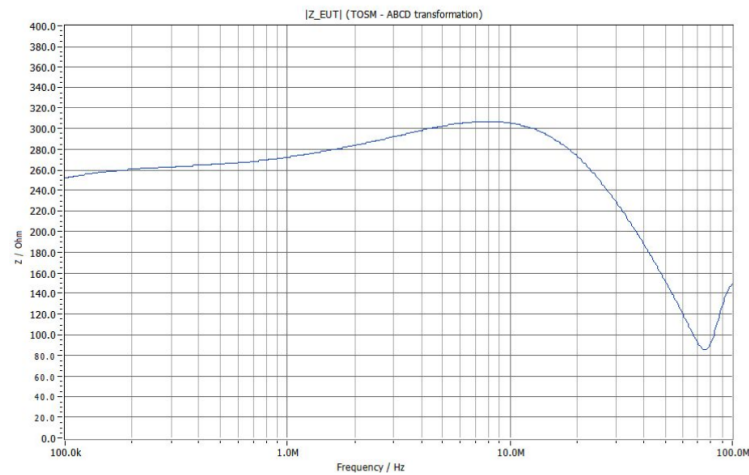


CDN EMCL-20: Measured amplifier power



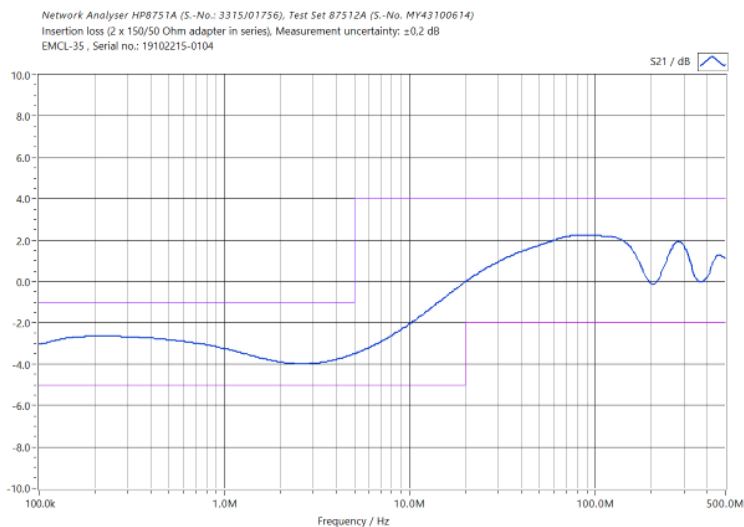
Measured amplifier power to achieve the highest level required in EN 61000-4-6 of 10 V.
Measurement was carried out with 6 dB attenuator and 80% amplitude modulation.

CDN EMCL-20: Typical clamp impedance (transformed)

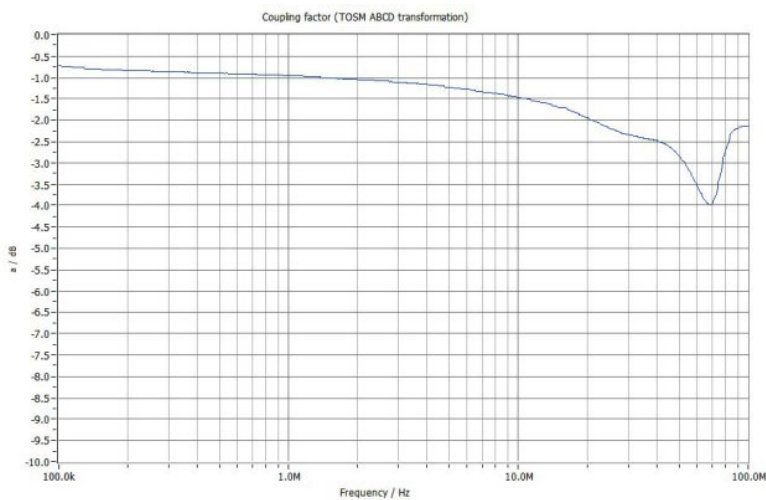


6.2 Typical curves of the CDN EMCL-35

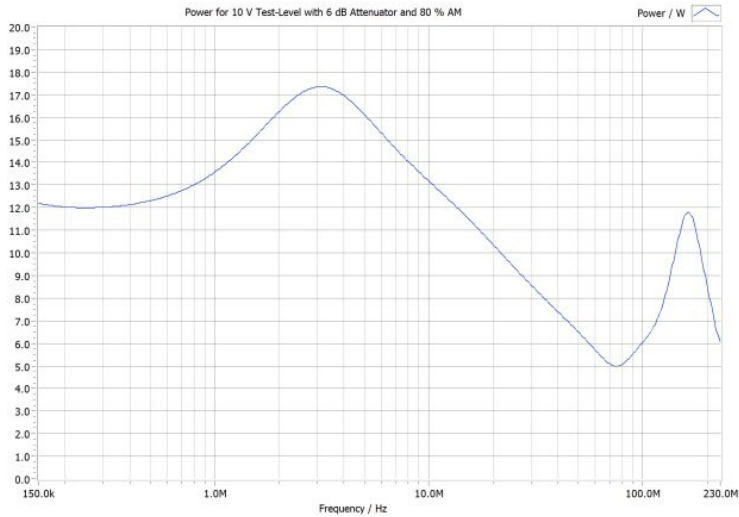
CDN EMCL-35: Typical coupling factor



CDN EMCL-35: Typical decoupling factor (transformed)

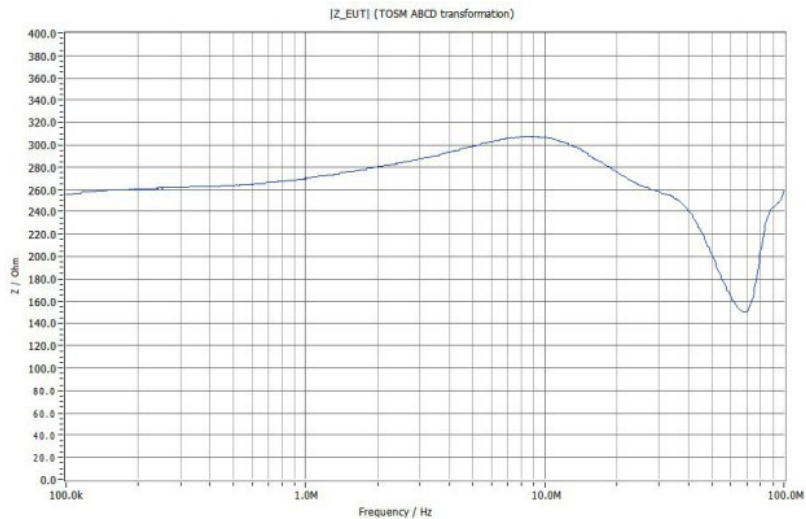


CDN EMCL-35: Measured amplifier power



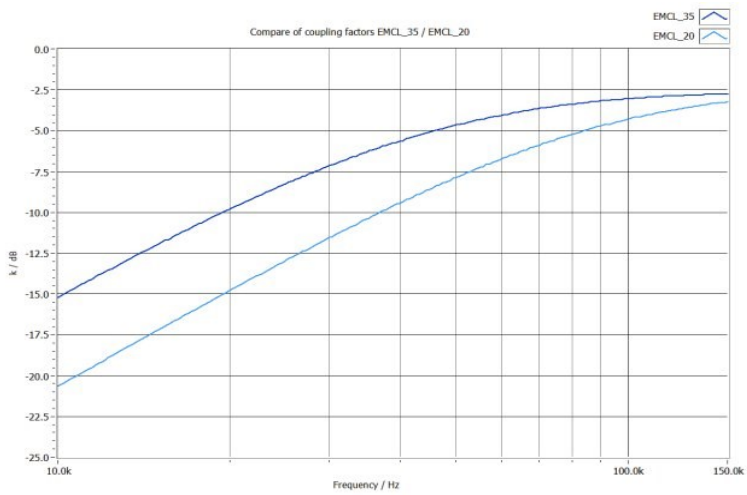
**Measured amplifier power to achieve the highest level required in EN 61000-4-6 of 10 V.
Measurement was carried out with 6 dB attenuator and 80% amplitude modulation.**

CDN EMCL-35: Typical clamp impedance (transformed)



6.3 Comparison of coupling factors CDN EMCL-35 and CDN EMCL-20

Comparison of coupling factors EMCL 35 /EMCL 20



The high coupling factor of the EMCL-35 allows a test according to level 3 (10V) of IEC 61000-4-6 already at 10 kHz with the test generator CDG 7000-75-10.



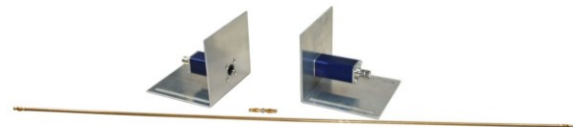
7 Technical data

CDN EMCL-20	
Frequency range	10 kHz – 1 GHz
Nominal impedance	50 Ohm
Max. input level	
0,15 – 100 MHz	100 W, 15 min
100 – 230 MHz	100 W, 5 min
230 – 1000 MHz	50 W, 3 min
Connector	N-type female
Cable diameter max.	< 20 mm
Dimensions (L x W x H)	632 x 120 x 80 mm
Weight	appr. 7 kg

CDN EMCL-35	
Frequency range	10 kHz – 1 GHz
Nominal impedance	50 Ohm
Max. input level	
0,15 – 100 MHz	100 W, 15 min
100 – 230 MHz	100 W, 5 min
230 – 1000 MHz	50 W, 3 min
Connector	N-type female
Cable diameter max.	< 35 mm
Dimensions (L x W x H)	665 x 160 x 135 mm
Weight	appr. 14 kg

Technical data calibration set (included in delivery)

- 2 mounting brackets
incl. 50/150 Ohm transition
- 1 piece BNC termination, 50 Ohm, 1 W
- 1 adapter with banana plugs for calibration
of the network analyzer, length 34 mm
- 1 piece brass rod 4 mm with banana plugs
for setting the test level, length 672 mm
- N male to BNC female



8 Accessories and suitable additional devices

CDG 7006-20W	Attenuator 6 dB, 20 W, BNC connector male / female
CDG 7006-100W	Attenuator 6 dB, 100 W, BNC connector male / female
CDN EMCL-NW_10	Matching network for CDN-EMCL-20, Frequency range of 10 kHz – 150 kHz
CDN ABCL-20	Absorber clamp for additional decoupling during immunity testing according to IEC / EN 61000-4-6, 100 kHz - 1000 MHz, cable diameter max. 20 mm
CDN ABCL-35	Absorber clamp for additional decoupling during immunity testing according to IEC / EN 61000-4-6, 100 kHz - 1000 MHz, cable diameter max. 35 mm



9 Packaging / Transport

If you send the device to the manufacturer for repair or calibration, use the supplied packing material for packing.

10 Disposal



Dispose of waste electrical equipment in an environmentally friendly manner!

Every consumer is legally obliged to dispose of waste electrical equipment in accordance with the relevant statutory regulations and national rules.

11 Address of the manufacturer

Schlöder GmbH
Professional EMC Equipment
Edisonstraße 6
85716 Unterschleißheim
Germany

Phone: + 49 (0) 89 69 3142 35-0

Fax: + 49 (0) 89 69 3142 35-9

E-mail: info@schloeder-emv.de

Web: www.schloeder-emv.de

All information regarding appearance and technical data correspond to the current state of development at the time of release of this manual. We reserve the right to make technical changes.

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