Test Report
Transfer Impedance / Shielding attenuation

Test Laboratory:
VDE Prüf- und Zertifizierungsinstitut
VDE Testing and Certification Institute
Laboratory for EMC measurements
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Equipment under test (EUT):

Applicant:	Jacob GmbH Elektrotechnische Fabrik; Gottlieb-Daimler-Straße 11, 71394 Kernen
Manufacturer:	Jacob GmbH Elektrotechnische Fabrik; Gottlieb-Daimler-Straße 11, 71394 Kernen
File number:	715700-1492-0004/112965
EUT:	EMC-Cable gland
Brand/model:	Jacob / PERFECT EMV-Cable gland Art.-No. 50.616 M/EMVD, Connecting thread M16x1,5 Art.-No. 50.620 M/EMVD, Connecting thread M20x1,5 Art.-No. 50.625 M/EMVD, Connecting thread M25x1,5 Art.-No. 50.650 M/EMVD, Connecting thread M50x1,5
EUT received:	2009-01-06

Applied standards:
The measurements were done following the VG Standard VG 95373 Teil 40:1997-12. The deviations from the standard are given in the description of the test set-up.

Result:	Measurement for information only. The measurement data are given on the individuel test protocol pages.

Date of issue:	2009-01-19	
Tested by:	Gerald Gossmann	
Reviewed:	Lothar Ott	

Contents Directory

1 Description of the cable under test (CUT)

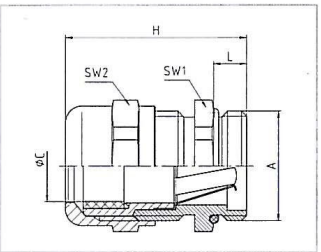
Type:	Cable gland
Construction:	PERFECT EMC-cable gland
Serial number	--

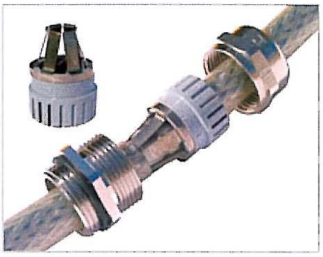
Technical data:

jacob

PERFECT EMV-Kabelverschraubung / *PERFECT EMC-cable gland* 50.6xx M/EMVD

Aufbau		*Configuration*	
Hutmutter	Messing CuZn39Pb3, galv. vernickelt	*Dome nut*	*Brass CuZn39Pb3, nickel-plated*
Lamelleneinsatz	Polyamid PA6 V-2	*Lamellar insert*	*Polyamide PA6 V-2*
Dichtring	Polychloropren-Nitrilkautschuk CR/NBR	*Sealing ring*	*Polychloroprene-Nitrile rubber CR/NBR*
Kontaktfeder	Edelstahl	*Contact spring*	*Stainless steel*
Zwischenstutzen	Messing CuZn39Pb3, galv. vernickelt	*Gland body*	*Brass CuZn39Pb3, nickel-plated*
O-Ring	Nitrilkautschuk NBR	*O-ring*	*Nitrile rubber NBR*
Anschlussgewinde	metrisch, nach EN 60423	*Connecting thread*	*metric as per EN 60423*
Eigenschaften		***Properties***	
	für Kabel und Leitungen mit Schirmung, schnelle und einfache EMV-Verbindung des Schirmgeflechts über die Kontaktfeder und den Zwischenstutzen mit dem Gehäusepotenzial, integrierte Zugentlastung, großer Dicht- und Klemmbereich,		*for cables with shielding, quick and easy EMC connection of the cable shield via the contacting spring with the gland body and the housing potential, integrated anchorage, wide sealing and clamping range,*
Temperaturbereich	-20°C / +100°C	*Temperature range*	*-20°C / +100°C*
Schutzart	IP68	*Protection grade*	*IP68*
Prüfnorm	UL 514B	*Test standard*	*UL 514B*
UL / CSA-File	E140310	*UL / CSA-File*	*E140310*
Hinweis	Angaben zu den Prüfungen - siehe Anhang	*Comment*	*details about tests - see annex*





Merkmale / ***Characteristics***

Anschlussgewinde Standardlänge / *Connecting thread standard length*

	A	øC mm	L mm	SW1 mm	SW2 mm	H mm		Art.-Nr. / *Part No.*
XXX	M16x1,5	5 - 9	5	17	17	30	100	50.616 M/EMVD
	M20x1,5	9 - 13	6	22	22	33,5	100	50.620 M/EMVD
	M25x1,5	11 - 16	7	27	27	36,5	50	50.625 M/EMVD
	M32x1,5	14 - 21	8	34	34	38	25	50.632 M/EMVD
	M40x1,5	19 - 27	8	43	43	41	10	50.640 M/EMVD
X	M50x1,5	24 - 35	9	55	55	49,5	5	50.650 M/EMVD
	M63x1,5	32 - 42	10	65	65	52,5	5	50.663 M/EMVD

Anschlussgewinde lang / *Connecting thread long*

A	øC mm	L mm	SW1 mm	SW2 mm	H mm		Art.-Nr. / *Part No.*
M16x1,5	5 - 9	10	17	17	35	100	50.616 M/EMVDL
M20x1,5	9 - 13	10	22	22	37,5	100	50.620 M/EMVDL
M25x1,5	11 - 16	11	27	27	40,5	50	50.625 M/EMVDL
M32x1,5	14 - 21	13	34	34	43	25	50.632 M/EMVDL
M40x1,5	19 - 27	13	43	43	46	10	50.640 M/EMVDL

X = repräsentativ geprüfte Ausführung
X = representatively tested version

16 Jacob GmbH · Elektrotechnische Fabrik · Gottlieb-Daimler-Straße 11 · 71394 Kernen · Telefon 07151 4011-0 · Fax 07151 4011-49 · E-Mail: jacob@jacob-gmbh.de

Used cables:	
The measurements were done together with cables with a braided shield or with a combined braided/foil shield as they are usually being used for the tested cable glands. For the measurements, cables with a small outer diameter were chosen as they are assumed to represent the worst case concerning the contact quality. They were also chosen for practical reasons because smaller diameters are easier to mount inside the measurement tube. The measurements were done on combinations of cable glands and cables as described in the table below (No. 1-5). In addition, two double-shielded reference cables were measured for comparison (No. 6 and 7 in the table).	
1	PERFECT EMC-cable gland, M16x1,5, Art.-No. 50.616 M/EMVD with CC-Datenleitung LiYCY-(TP)-240, Art.-No. 240 0001 006, Manufacturer ConCab
2	PERFECT EMC-cable gland, M20x1,5, Art.-No. 50.620 M/EMVD with CC-Datenleitung LiYCY-(TP)-240, Art.-No. 240 0002 008, Manufacturer ConCab
3	PERFECT EMC-cable gland, M20x1,5, Art.-No. 50.620 M/EMVD with CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30015 002 00, Manufacturer ConCab
4	PERFECT EMC-cable gland, M25x1,5, Art.-No. 50.625 M/EMVD with CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30040 007 00, Manufacturer ConCab
5	PERFECT EMC-cable gland, M50x1,5, Art.-No. 50.650 M/EMVD with CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30350 060 00, Manufacturer ConCab
6	CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30025 004 00, Manufacturer ConCab
7	CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30040 004 00, Manufacturer ConCab

2 Method for determining the quality of cable glands for shielded enclosures.

For the valuation of the quality of cable entry into enclosures there are no civil standards available. Therefore a military standard has been used as base.

Standard: VG 95373 Teil 40 “Messverfahren für geschirmte Steckverbinder”
(Measuring method for screened connectors)

The method is modified in a way that the connector is replaced by a cable entry. The cable entry is used as a termination of the screened cable inside. The cable with the cable entry is then measured in the triaxial tube (see picture), as it is described in the VG 95373 part 40. The general method is known as the mesurement method for the transfer impedance of cables.

Valuation:

The different cable entry systems are intended for the use with different cable shield qualities. Therefore the valuation of the cable entry system is done allways together with a certain shielding quality of the cable. The valuation is based on the minimum disturbance of the shielding quality of the cable. The less the shielding effect of the cable is disturbed, the better the cable entry system works.

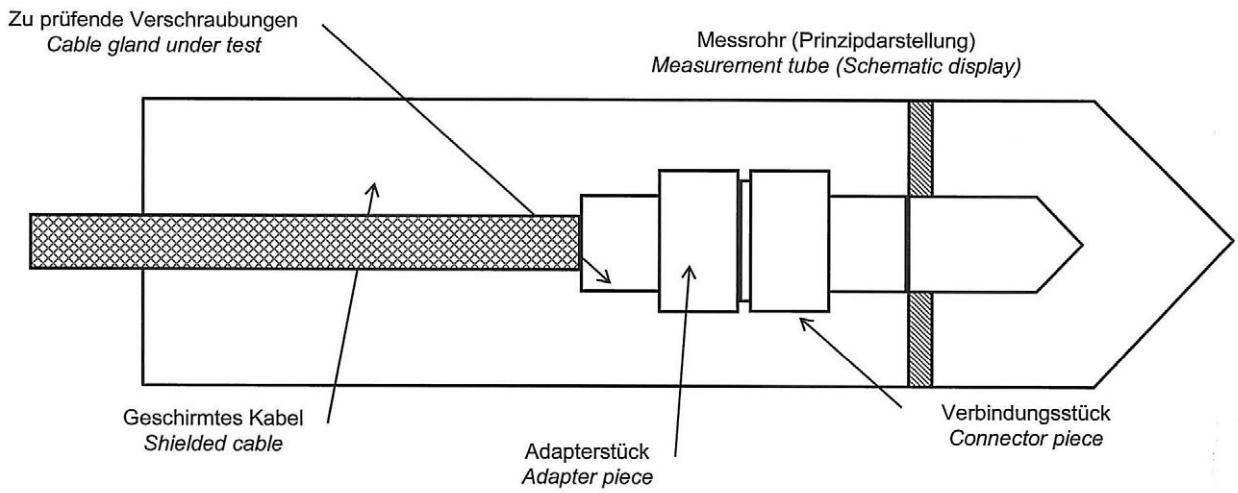
2.1 Measurement procedure

The measurement is done by the following steps:

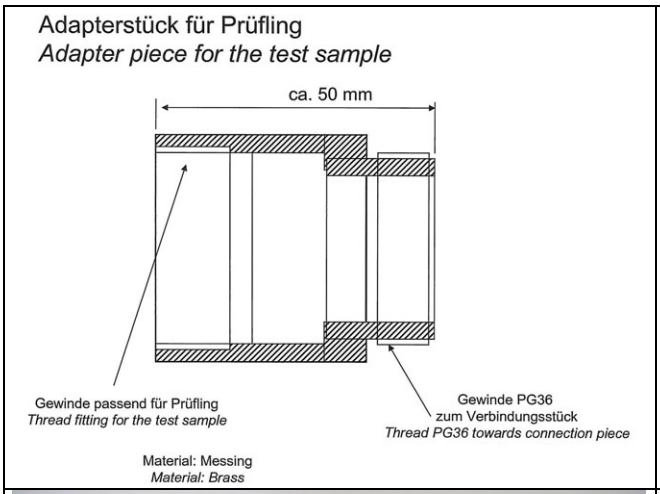
1. Assembly of the cable.
2. Mesurement of the cable without cable gland in the triaxial tube. The result of this measurement gives the quality of the used cable/shield.
3. Assembly of the cable with the cable gland according to the manufacturer´s specifications.
4. Measurement of the cable with cable gland in the triaxial tube. The result of this measurement gives the quality of the used cable/shield together with the cable gland.
5. Comparison of the measurement results in a diagram.

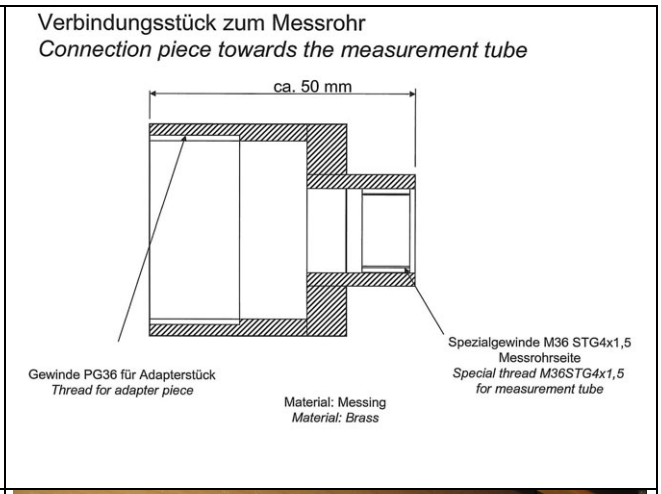
For comparison two double shielded cables without cable gland are measured as well.
If the cable is used with the cable gland there should be no significant degradation of the shielding performance.

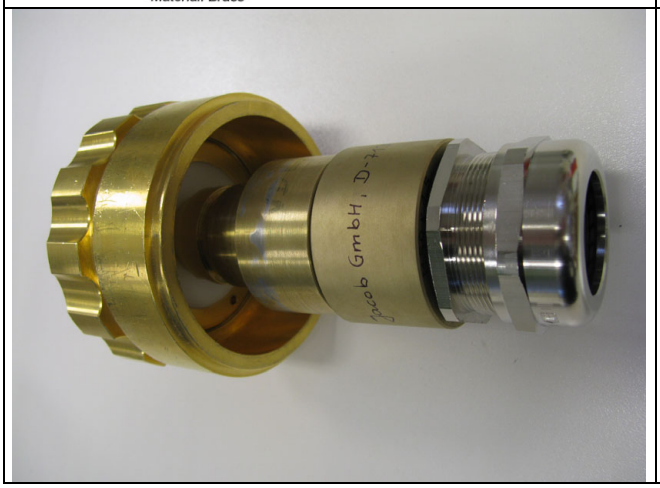
2.2 Test instrumentation



The mounting of the cable gland in the measurement tube is done using an adapter piece which adapts the thread of the cable gland under test to the connection piece of the measurement tube. This connection piece has a specific inner thread (M36 STG 4 x 1,5).


Adapterstück für Prüfling
Adapter piece for the test sample
ca. 50 mm
Gewinde passend für Prüfling
Thread fitting for the test sample
Gewinde PG36
zum Verbindungsstück
Thread PG36 towards connection piece
Material: Messing
Material: Brass


Verbindungsstück zum Messrohr
Connection piece towards the measurement tube
ca. 50 mm
Gewinde PG36 für Adapterstück
Thread for adapter piece
Spezialgewinde M36 STG4x1,5
Messrohrseite
Special thread M36STG4x1,5
for measurement tube
Material: Messing
Material: Brass



3 Measurement procedure

3.1 Transfer impedance

General information about the test:

Tested by:	Gerald Gossmann
Test date:	2009-01-14/15/16

Instruments:			
Inventory number	Description	Manufacturer	Type
5110250 1800099	Network Analyzer Triaxial measuremend tube, thick	R&S Bedea/Rosenberger	ZVRE --

Information concerning the test:

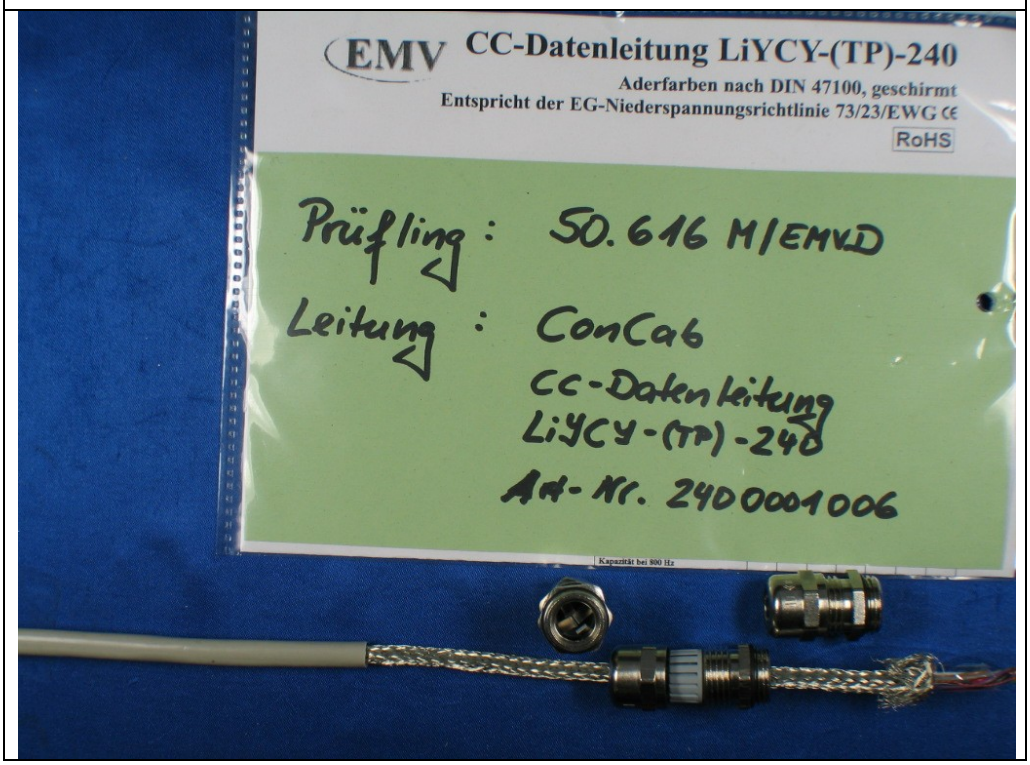
Test set-up:	The measurement is done in the triaxial tube connected to a network analyzer. The analyzer is controlled via PC and the software WinComet version 1.3 of Bedea. The inner system consists of the cable under test (CUT) resp. of the cable gland under test with a typical shielded cable usually used for this gland. The inner leads of the CUT are soldered together on both ends. The CUT is terminated at the inner end with a 50 Ohm resistor connected to the rear ground socket inside the Shielding tube. The open end is fitted with an N-Plug. The inner system is fed by port 1 of the network analyzer. Prior to the measurement, a feed-through calibration of the used measurement cables and adapters has to be done.
Further test parameters:	Measurement length: 0.82 m; Fequency range: 0.01 MHz to 1000 MHz; Number of points: 801; IF-BW 10 Hz;

Test diagram:	Next pages

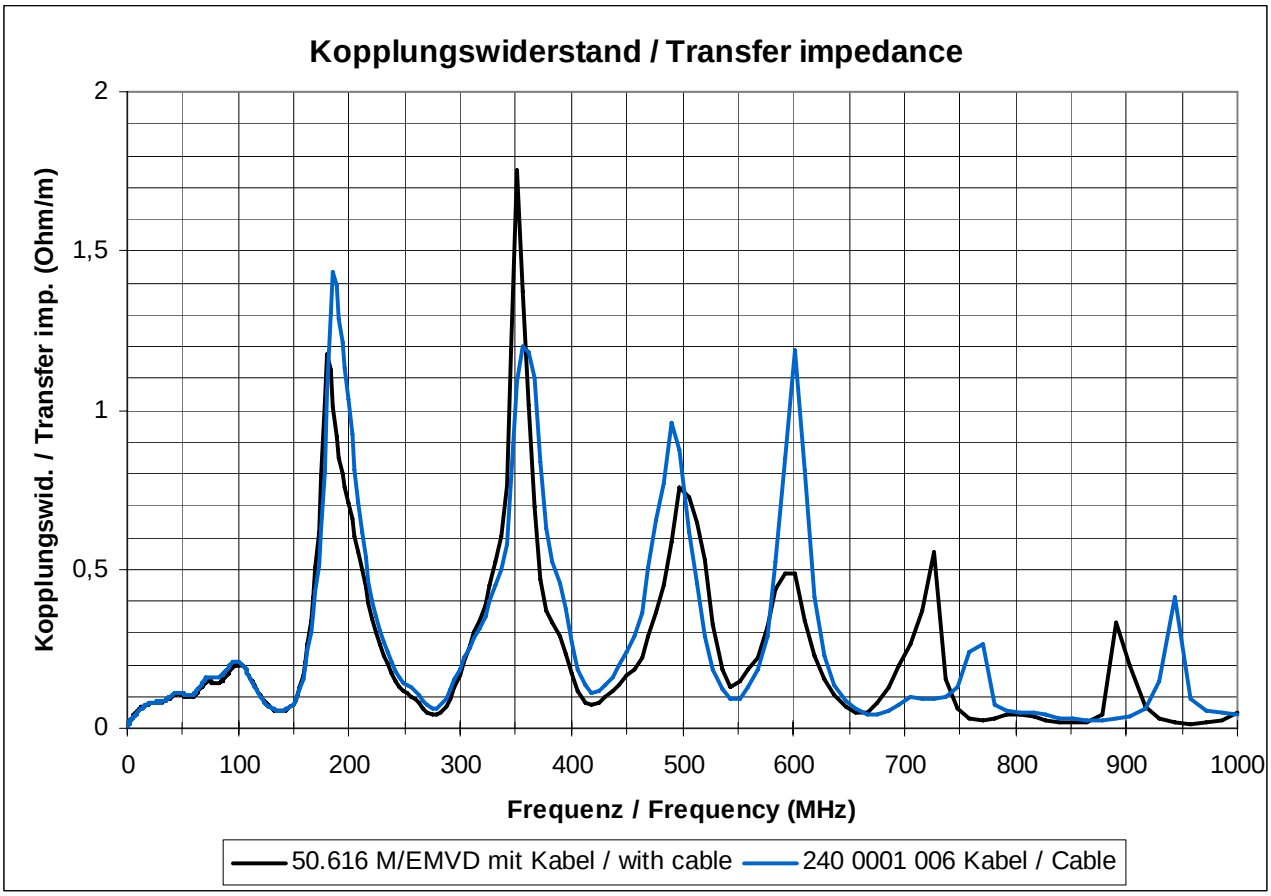
4 Measurement results

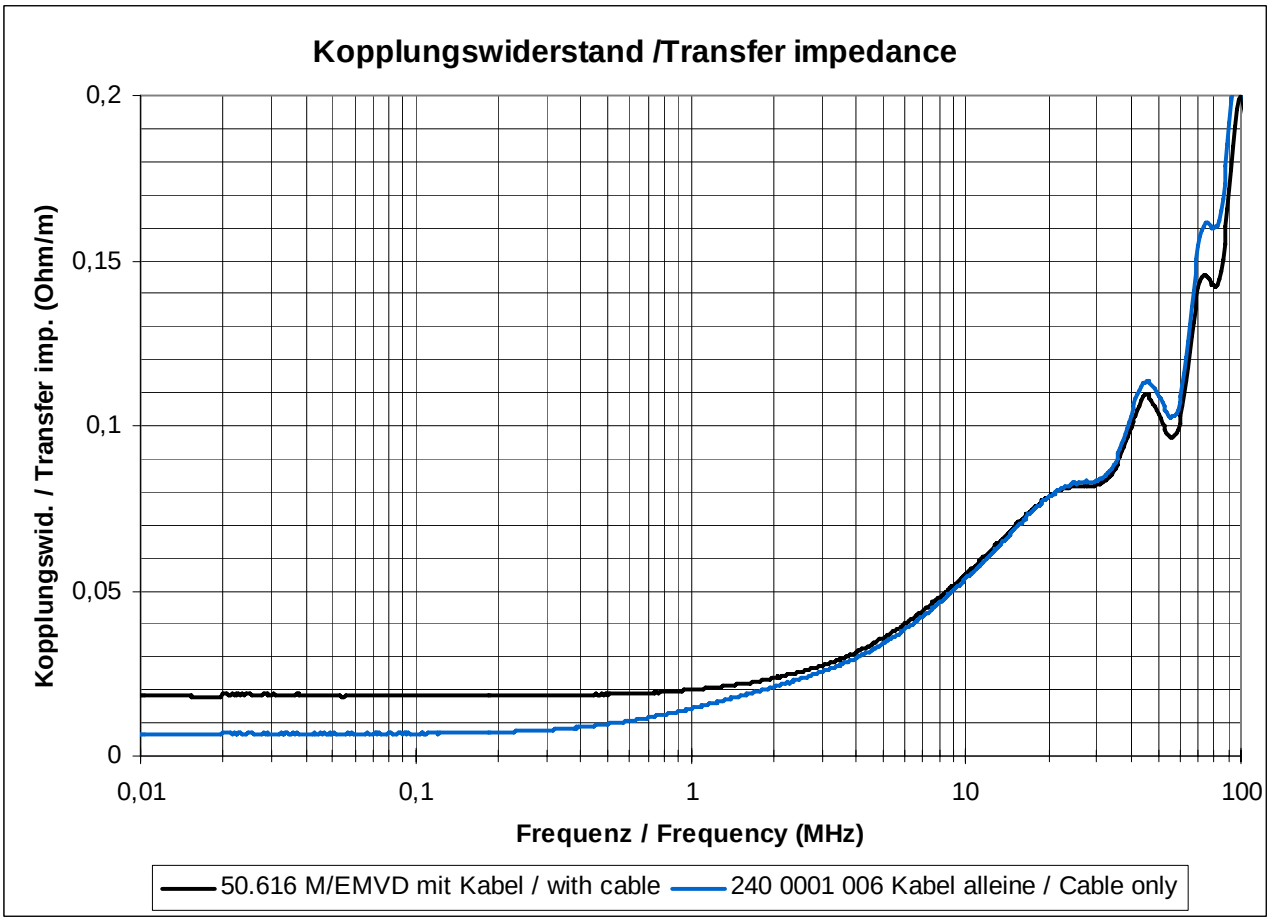
4.1 Cable gland 50.616 M/EMVD with Data Cable

PERFECT EMV-Cable gland, M16x1,5, Art.-No. 50.616 M/EMVD mit
CC-Datenleitung LiYCY-(TP)-240, Art.-No. 240 0001 006, Manufacturer ConCab



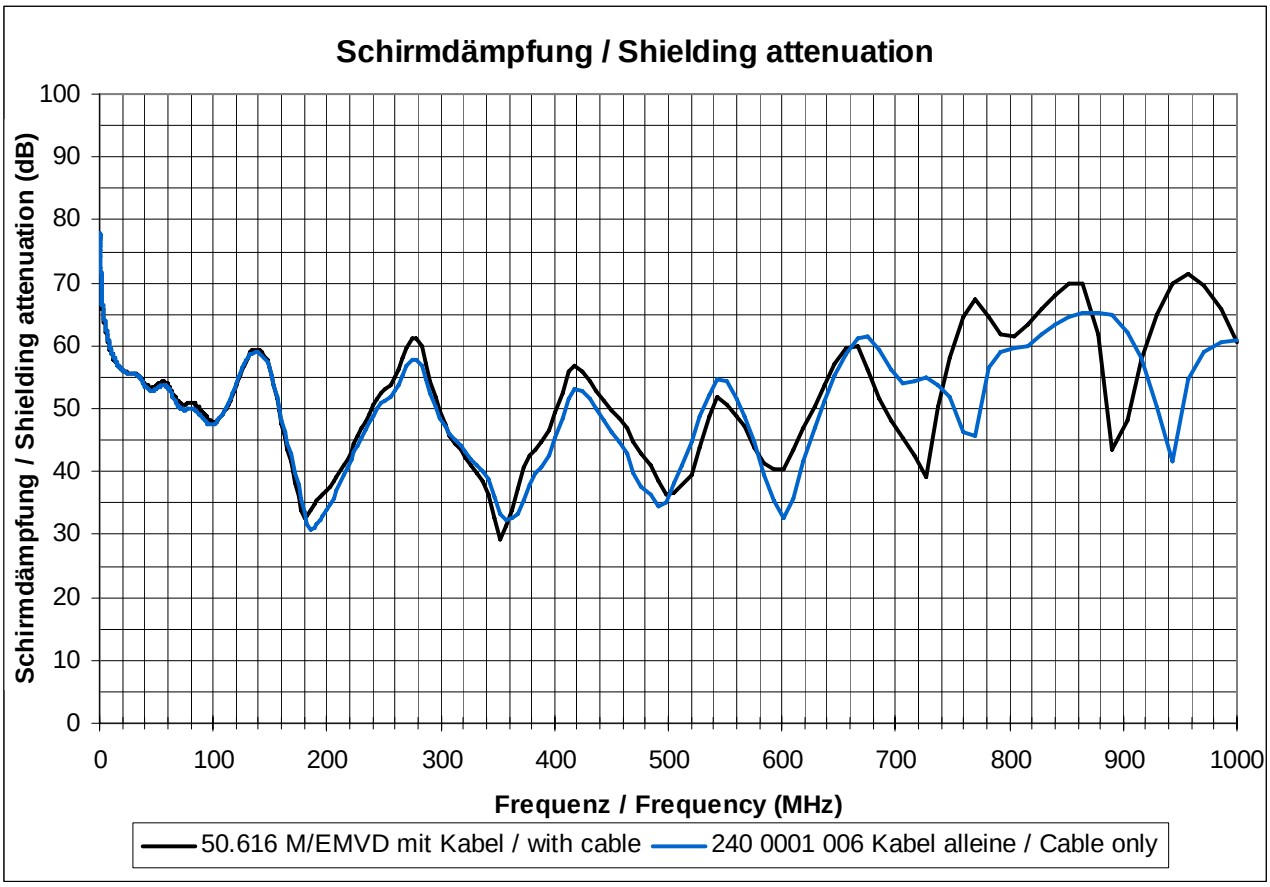
4.1.1 *Transfer impedance*

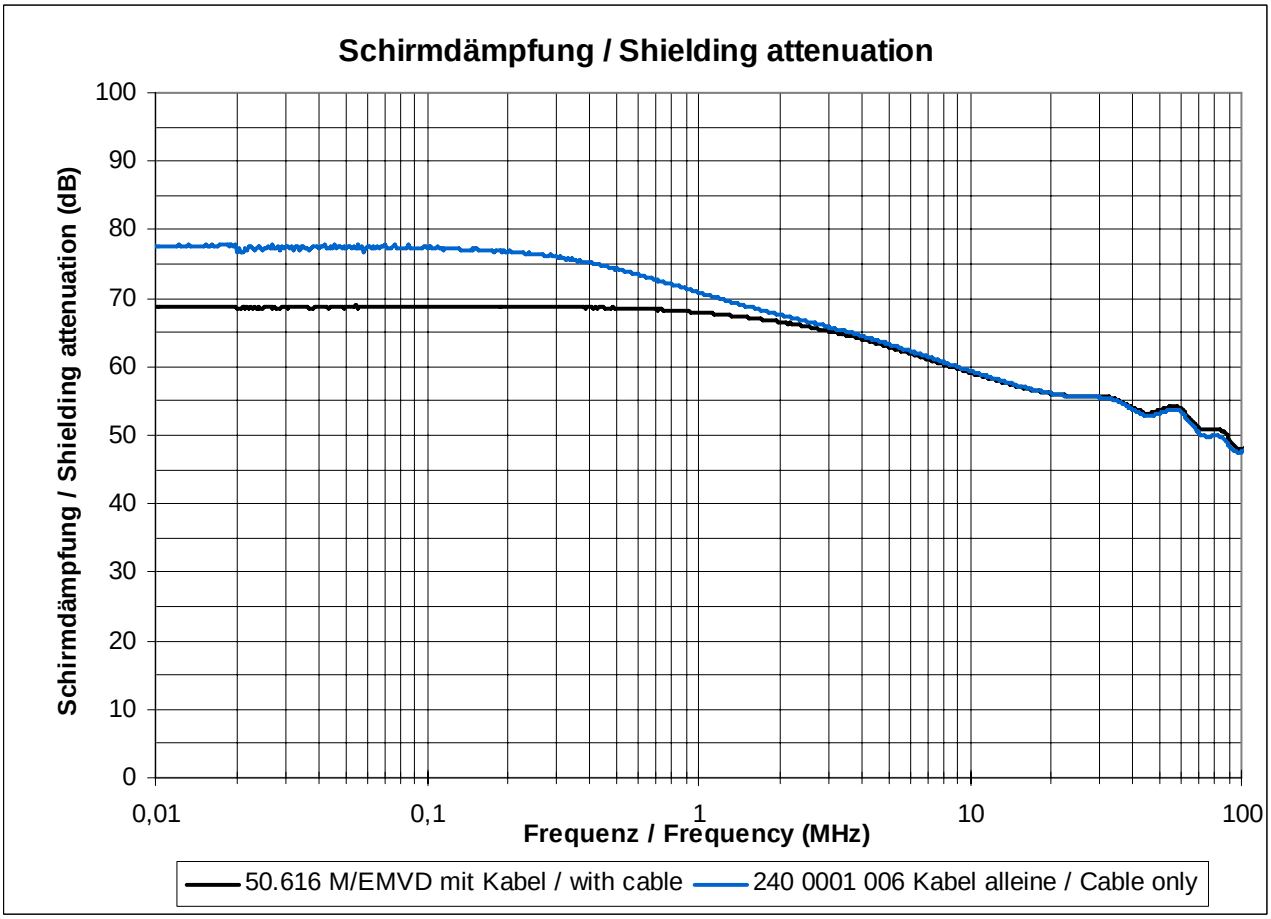




The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.1.2 Shielding attenuation



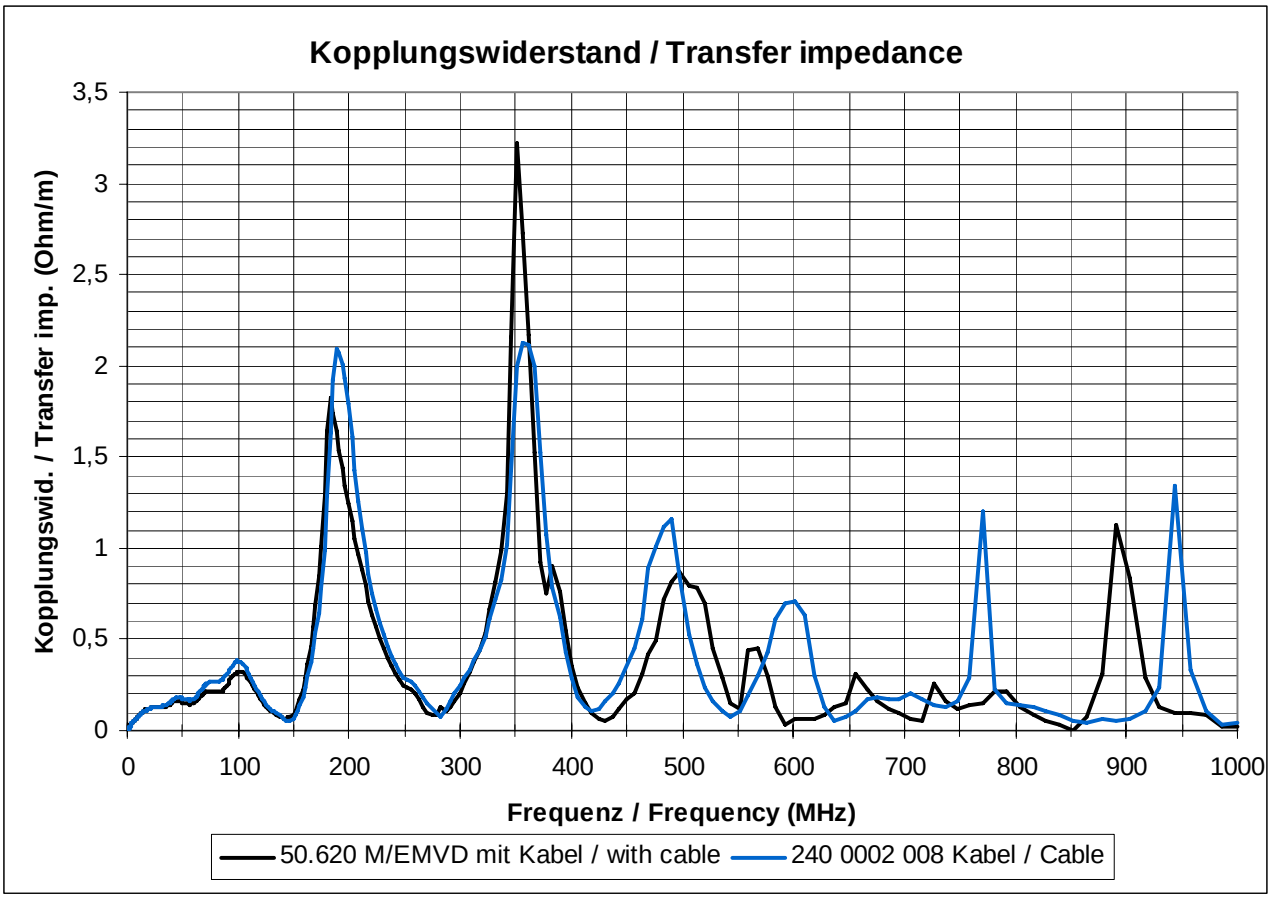


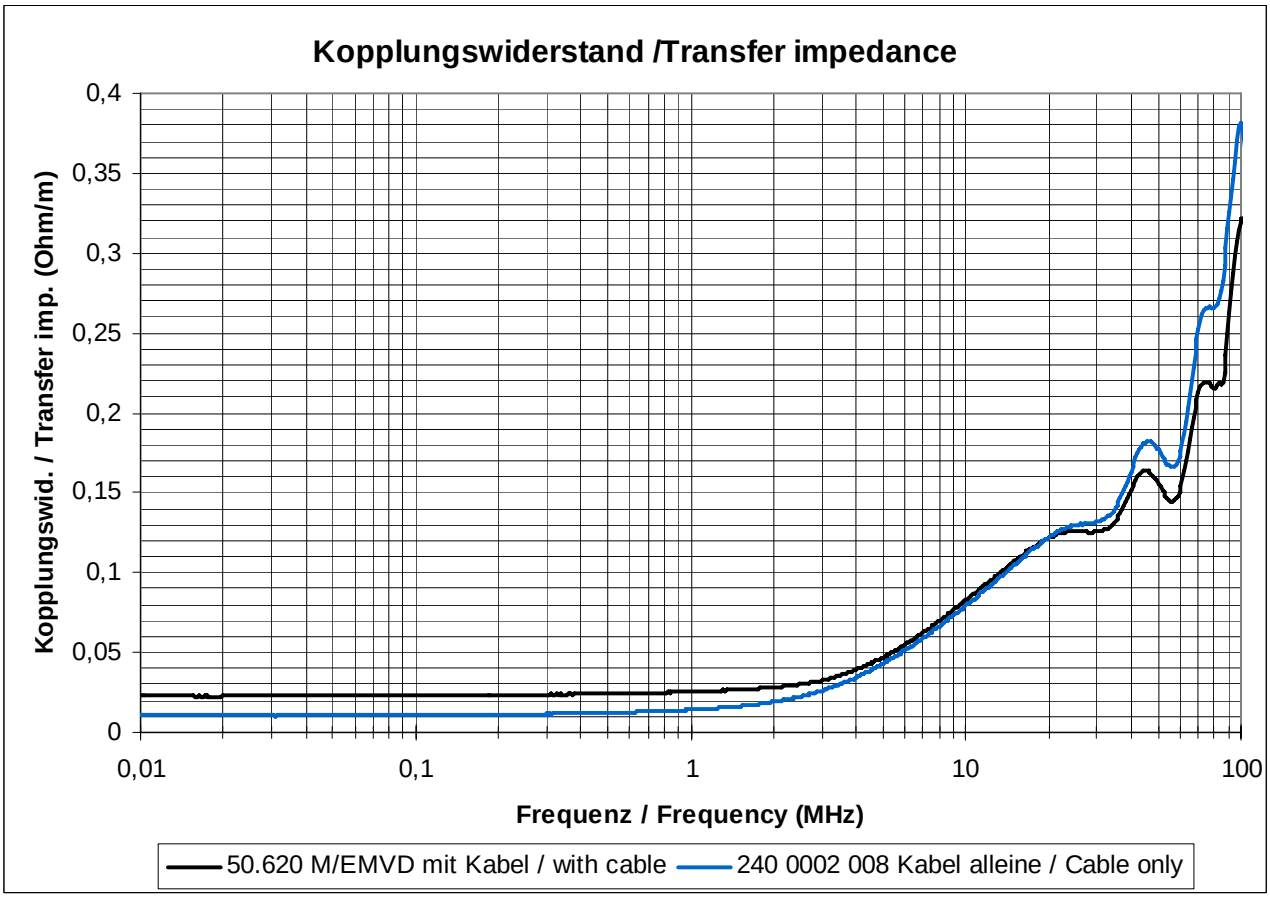
The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.2 Cable gland 50.620 M/EMVD with Data Cable

PERFECT EMV-Cable gland, M20x1,5, Art.-No. 50.620 M/EMVD mit
CC-Datenleitung LiYCY-(TP)-240, Art.-No. 240 0002 008, Manufacturer ConCab

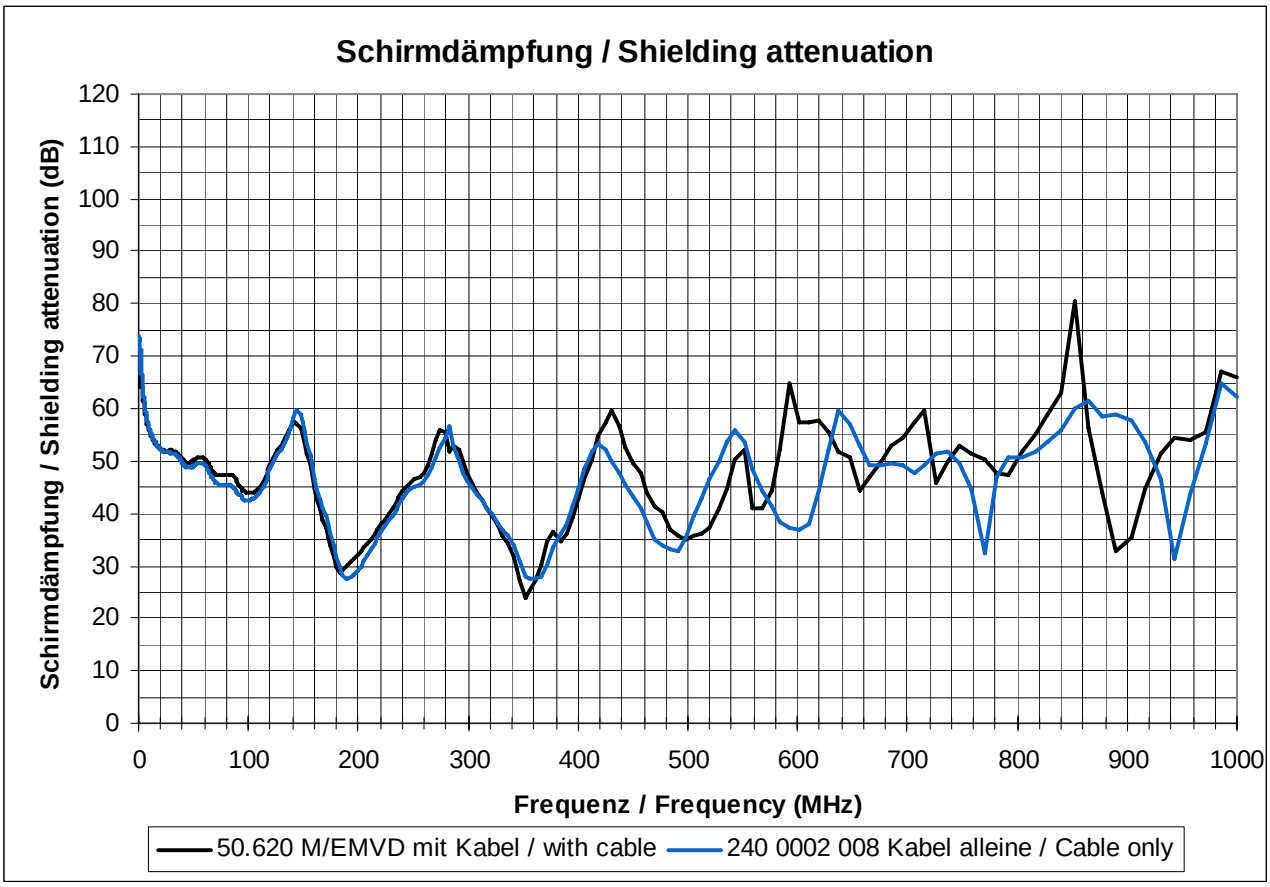
4.2.1 Transfer impedance

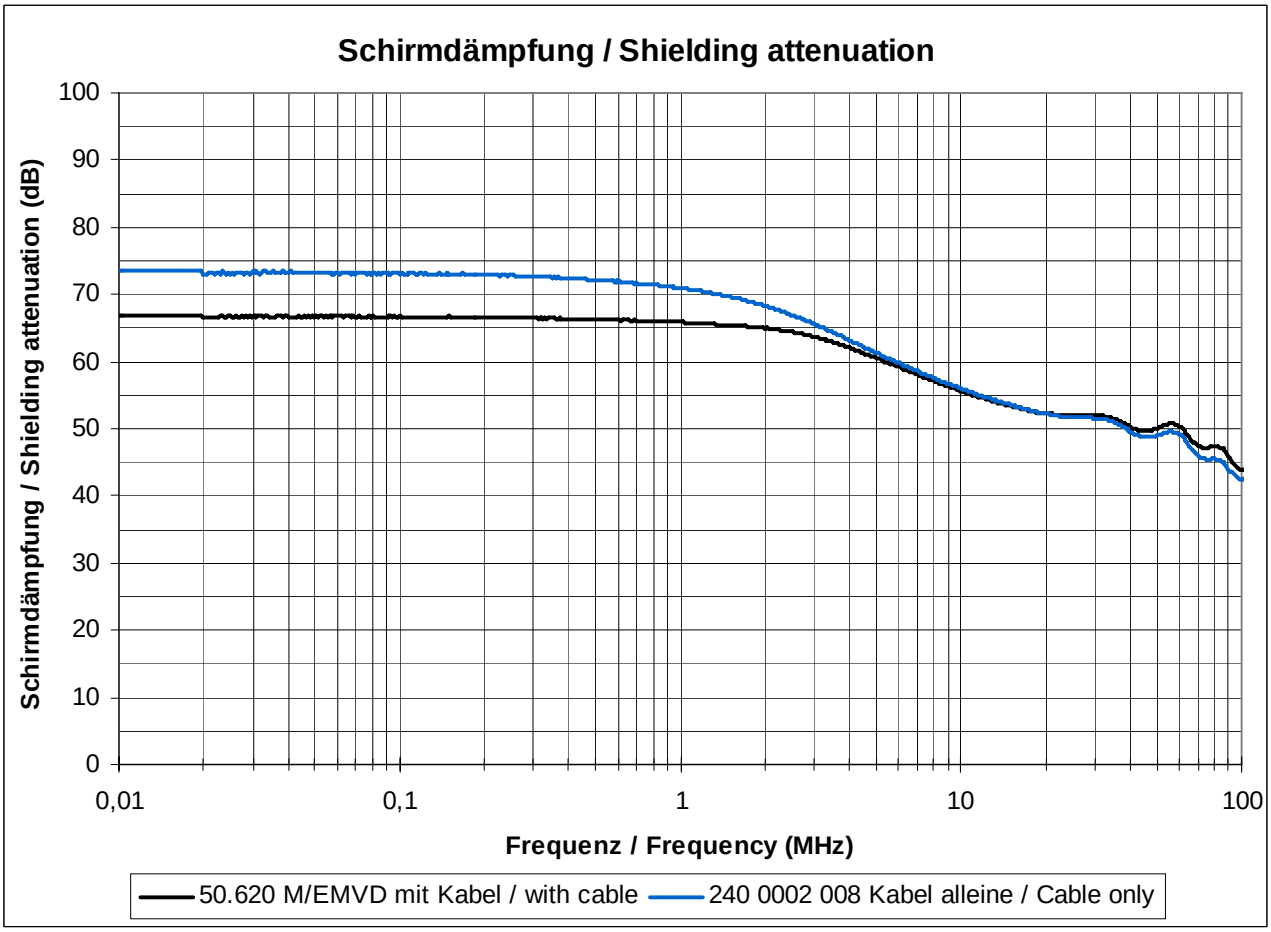




The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.2.2 Shielding attenuation

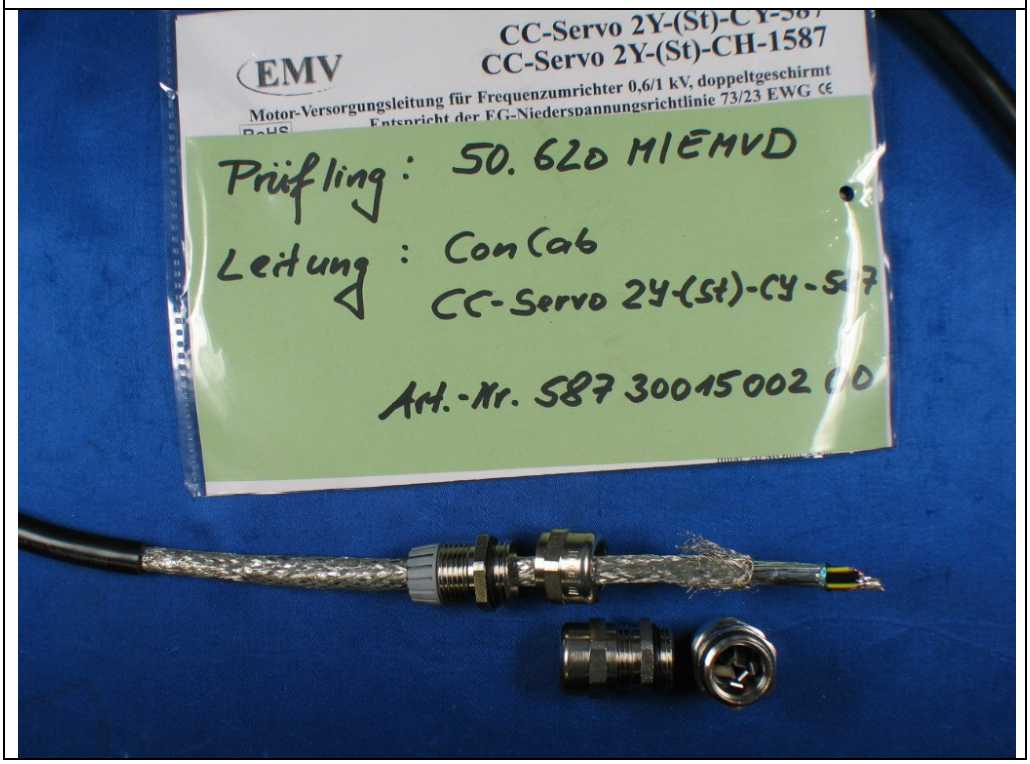




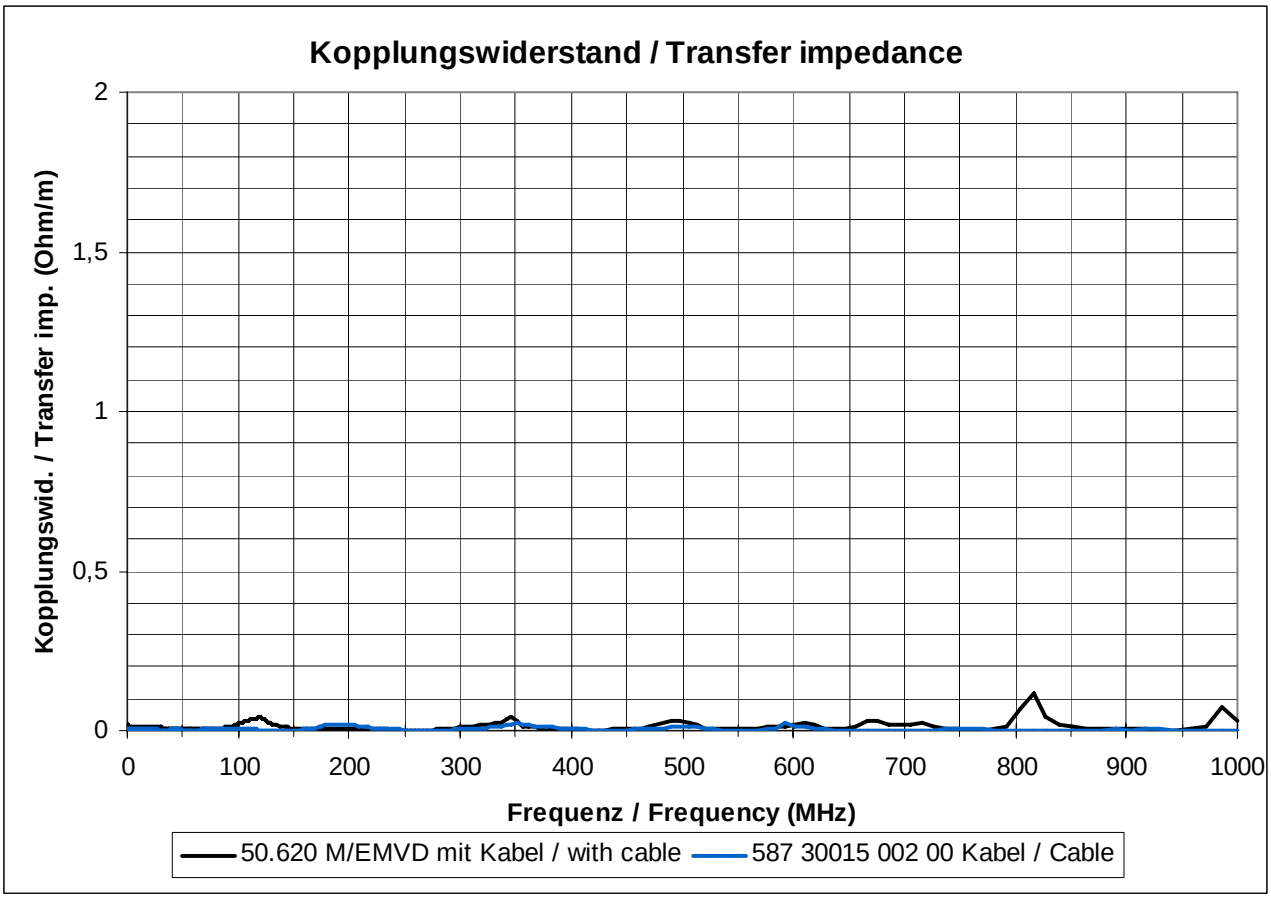
The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

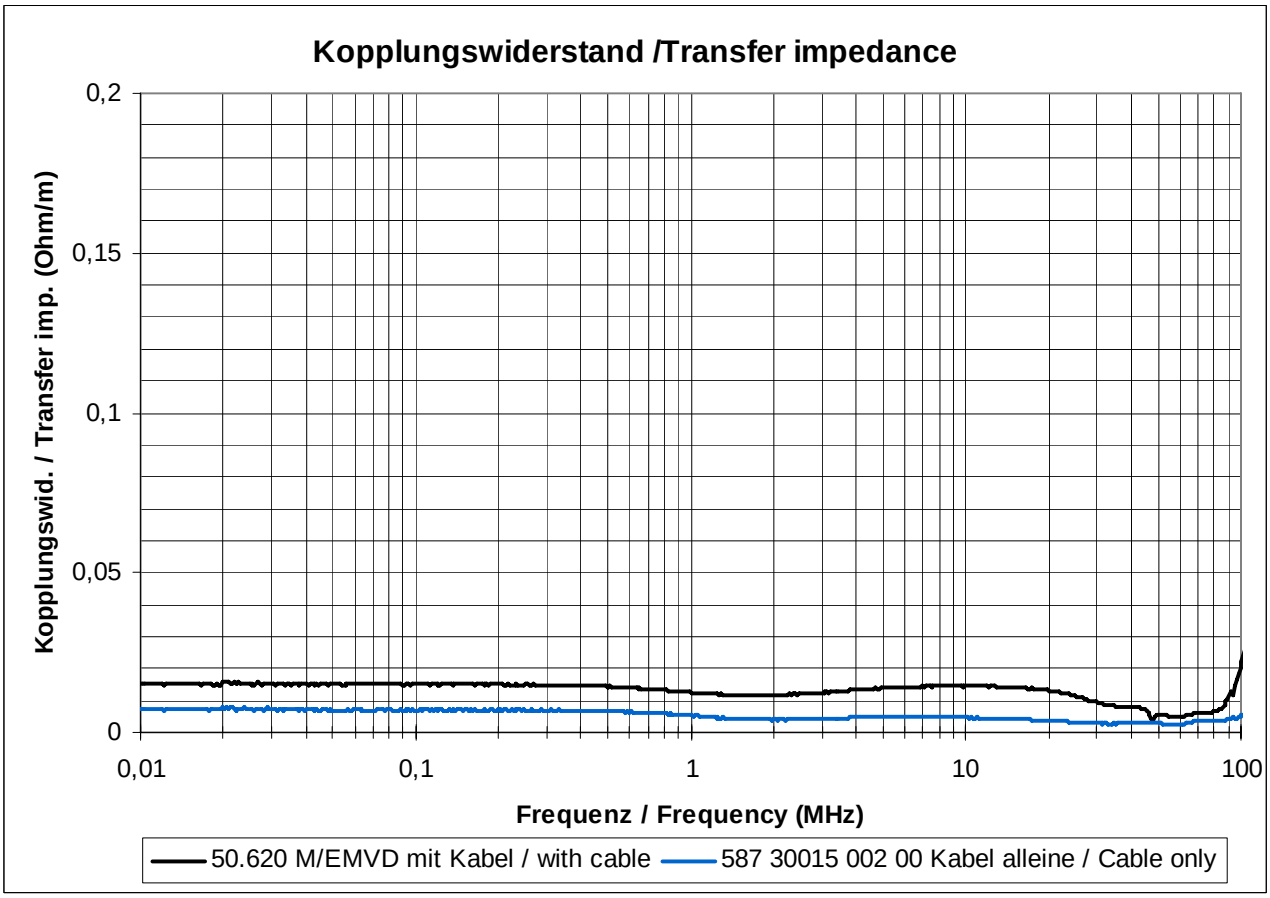
4.3 Cable gland 50.620 M/EMVD with Servo Cable

PERFECT EMV-Cable gland, M20x1,5, Art.-No. 50.620 M/EMVD mit
CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30015 002 00, Manufacturer ConCab



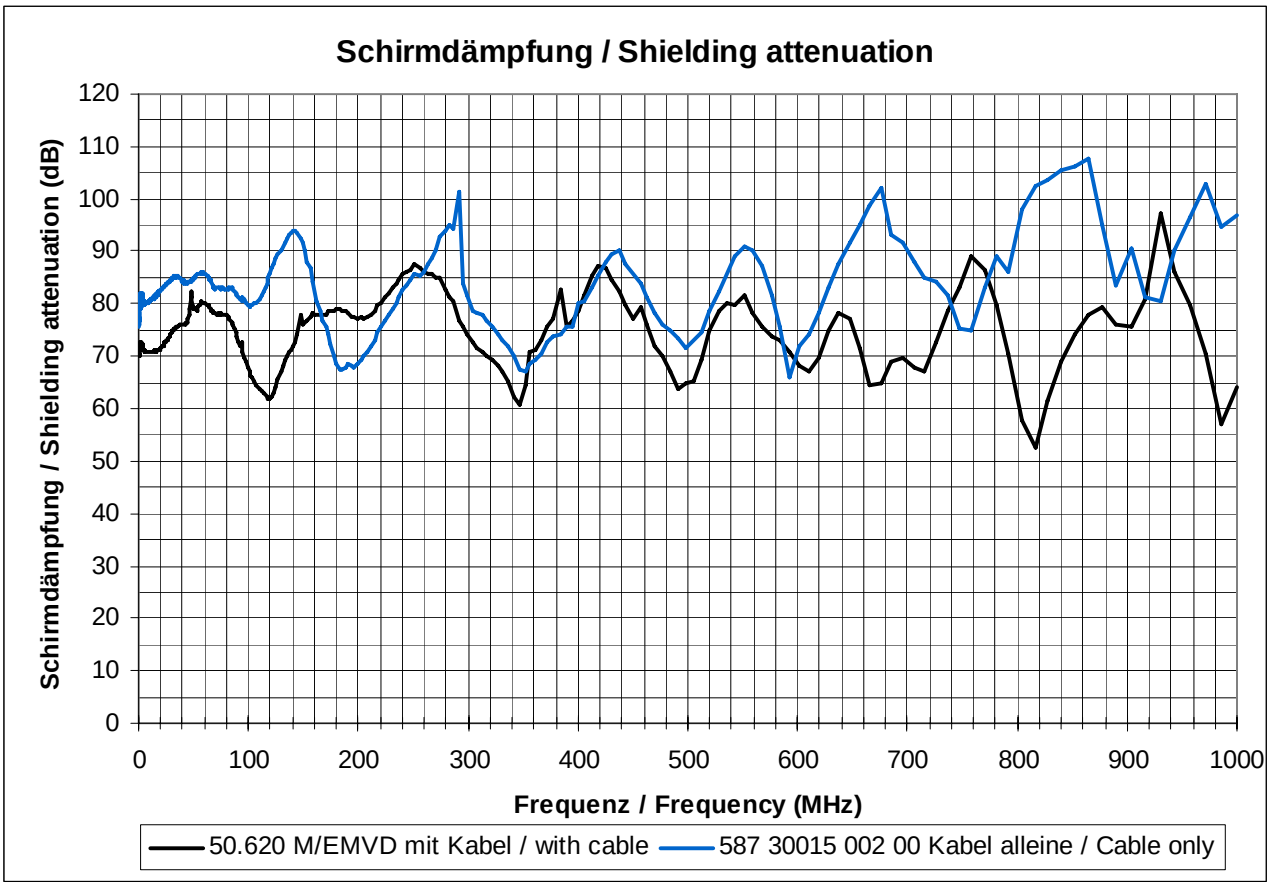
4.3.1 Transfer impedance

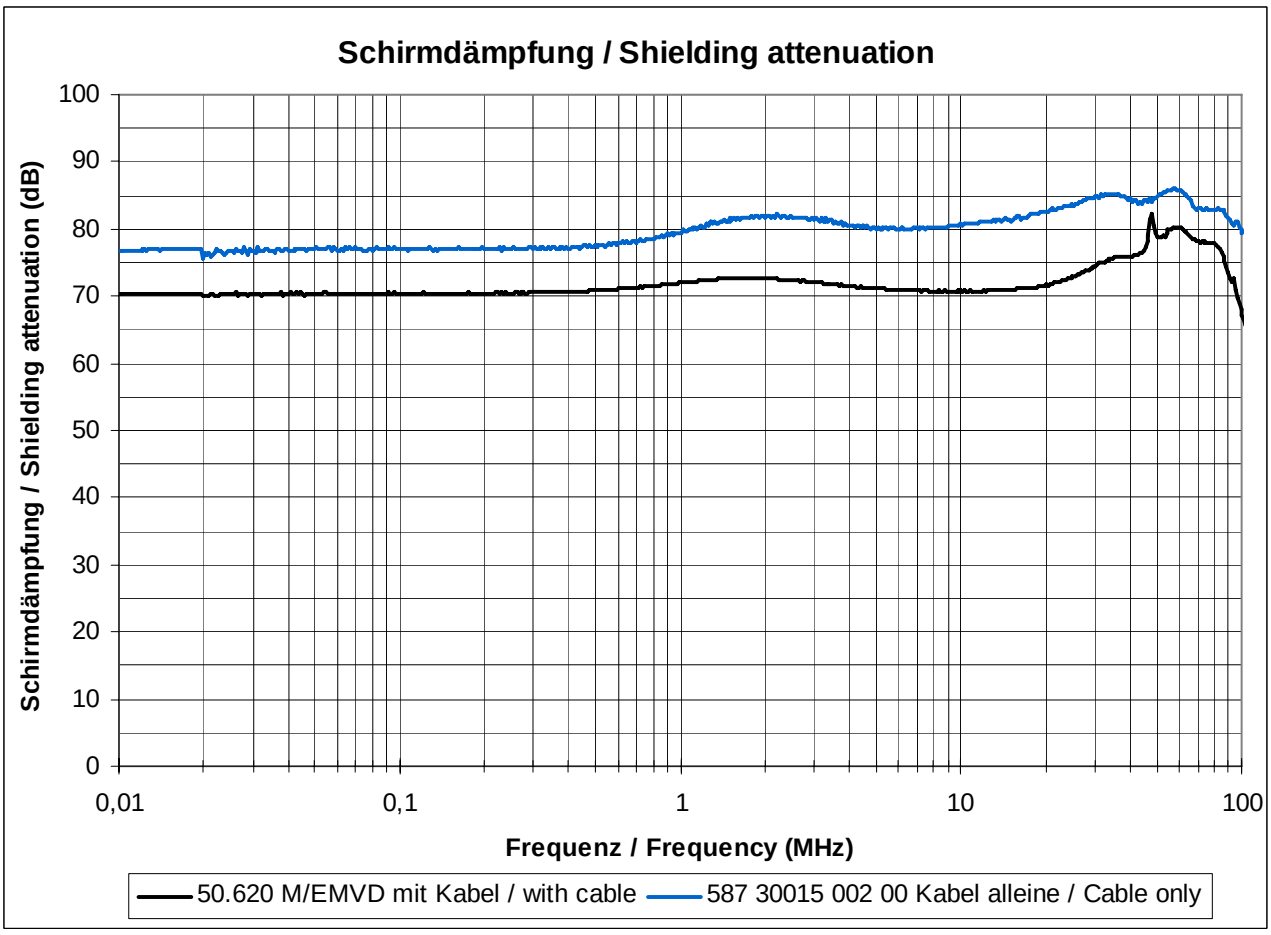




The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.3.2 Shielding attenuation



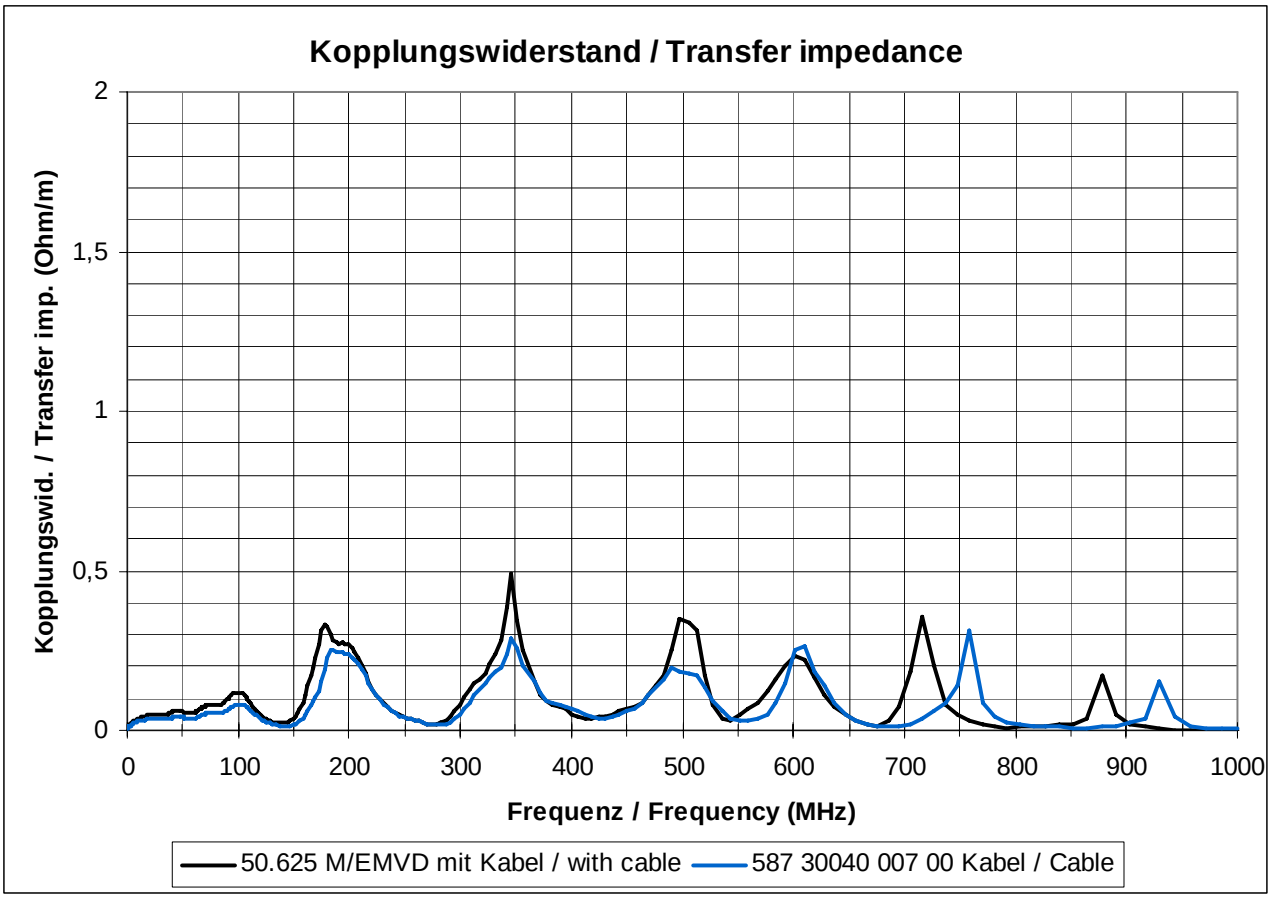


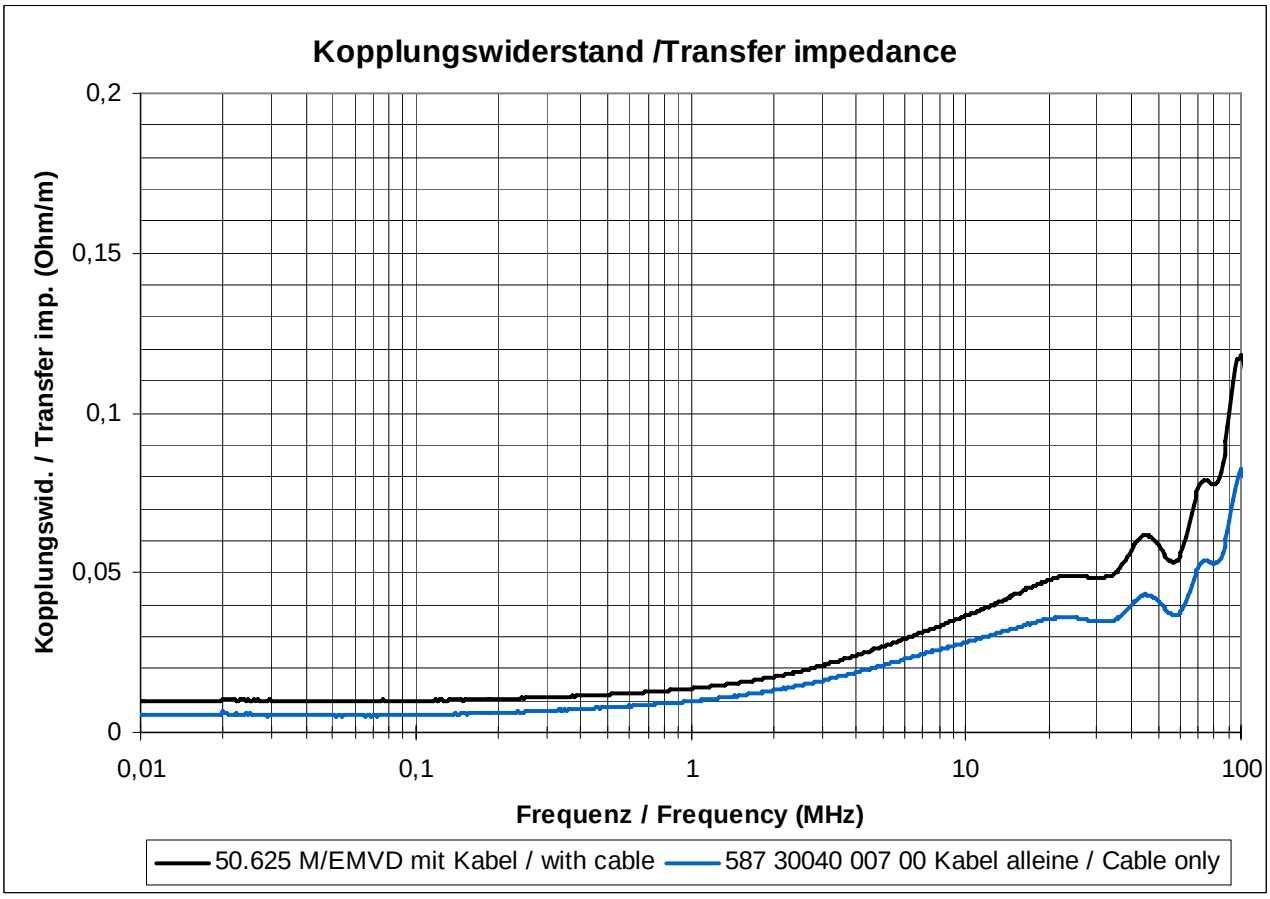
The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.4 Cable gland 50.625 M/EMVD with Servo Cable

PERFECT EMV-Cable gland, M25x1,5, Art.-No. 50.625 M/EMVD mit
CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30040 007 00, Manufacturer ConCab

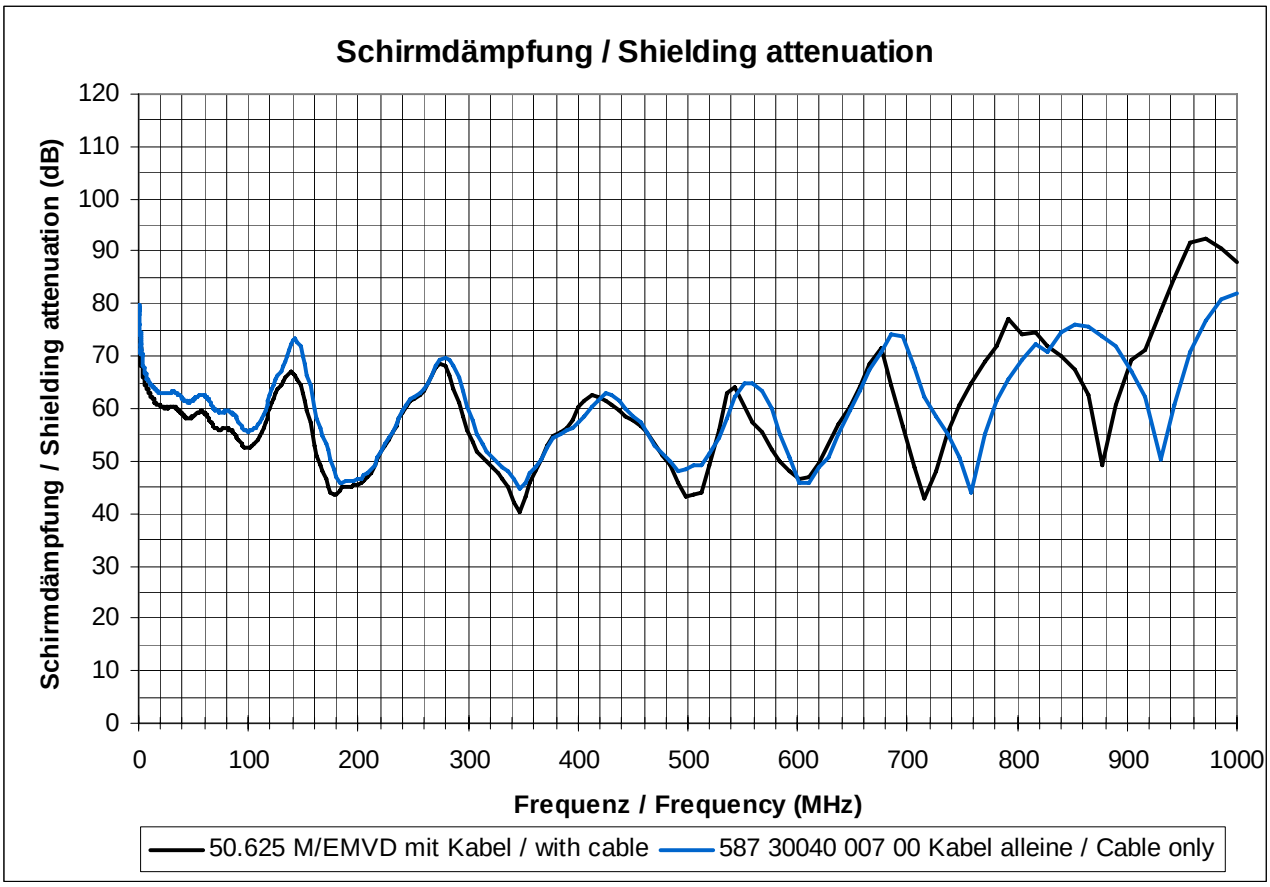
4.4.1 *Transfer impedance*

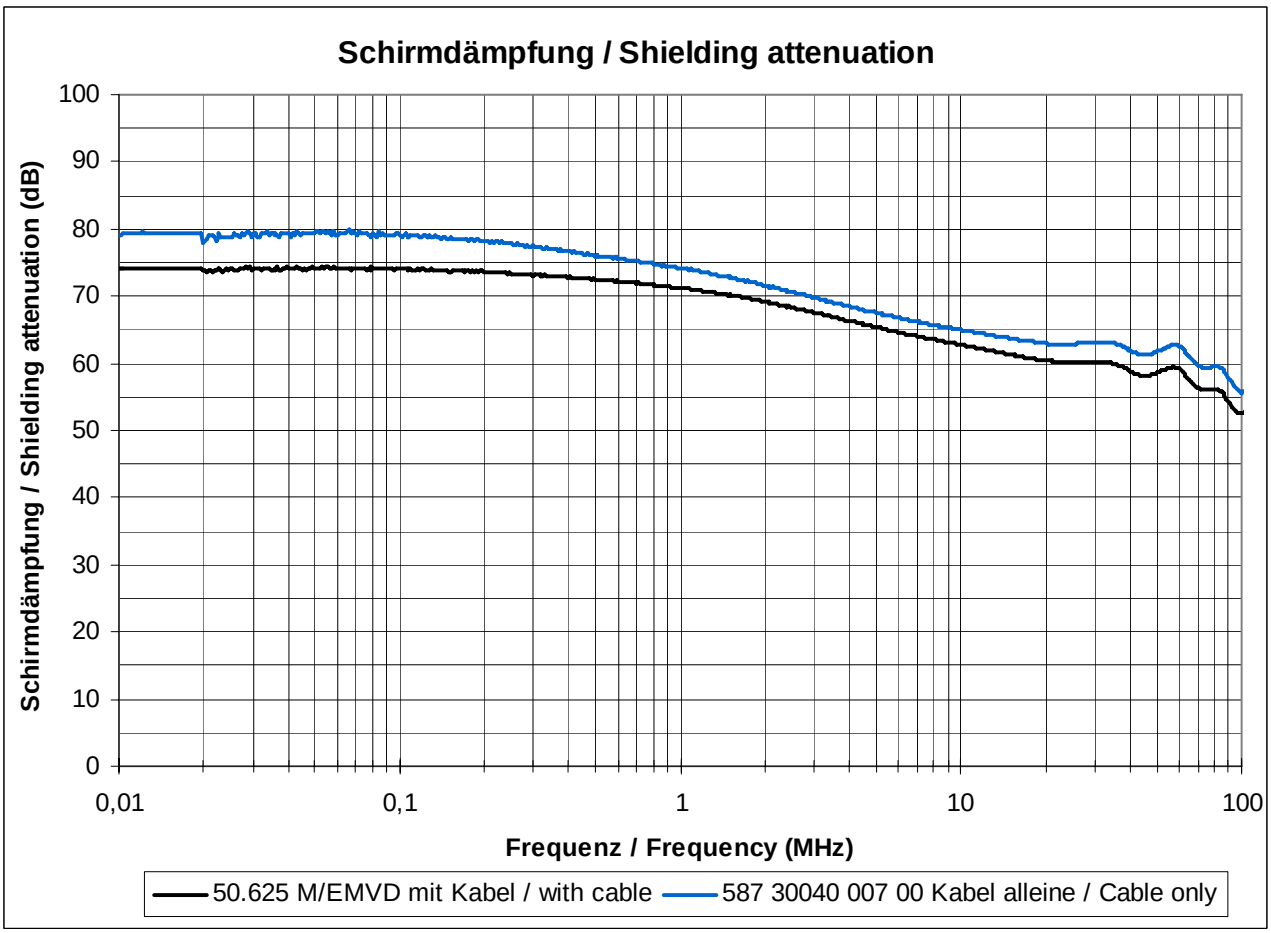




The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.4.2 Shielding attenuation



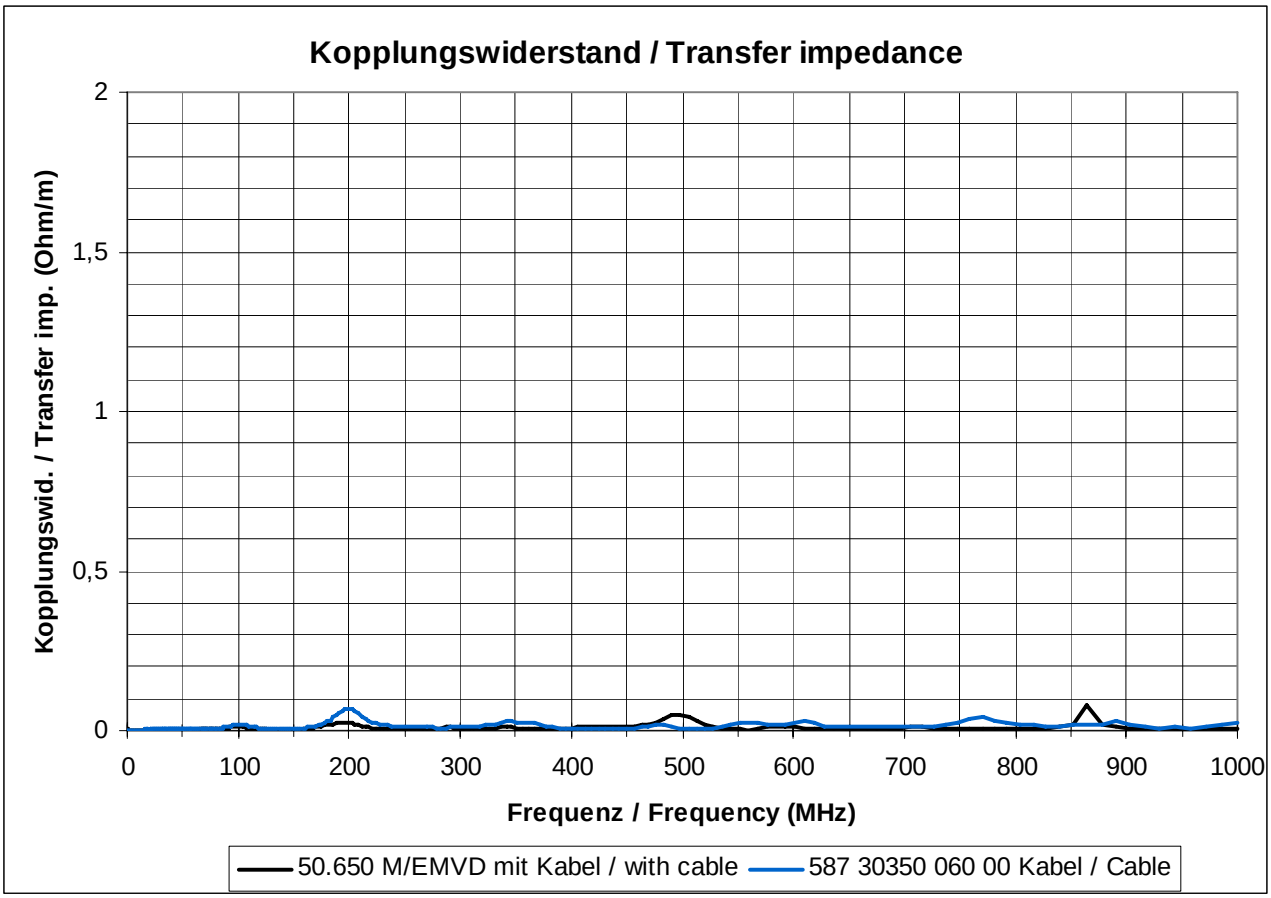


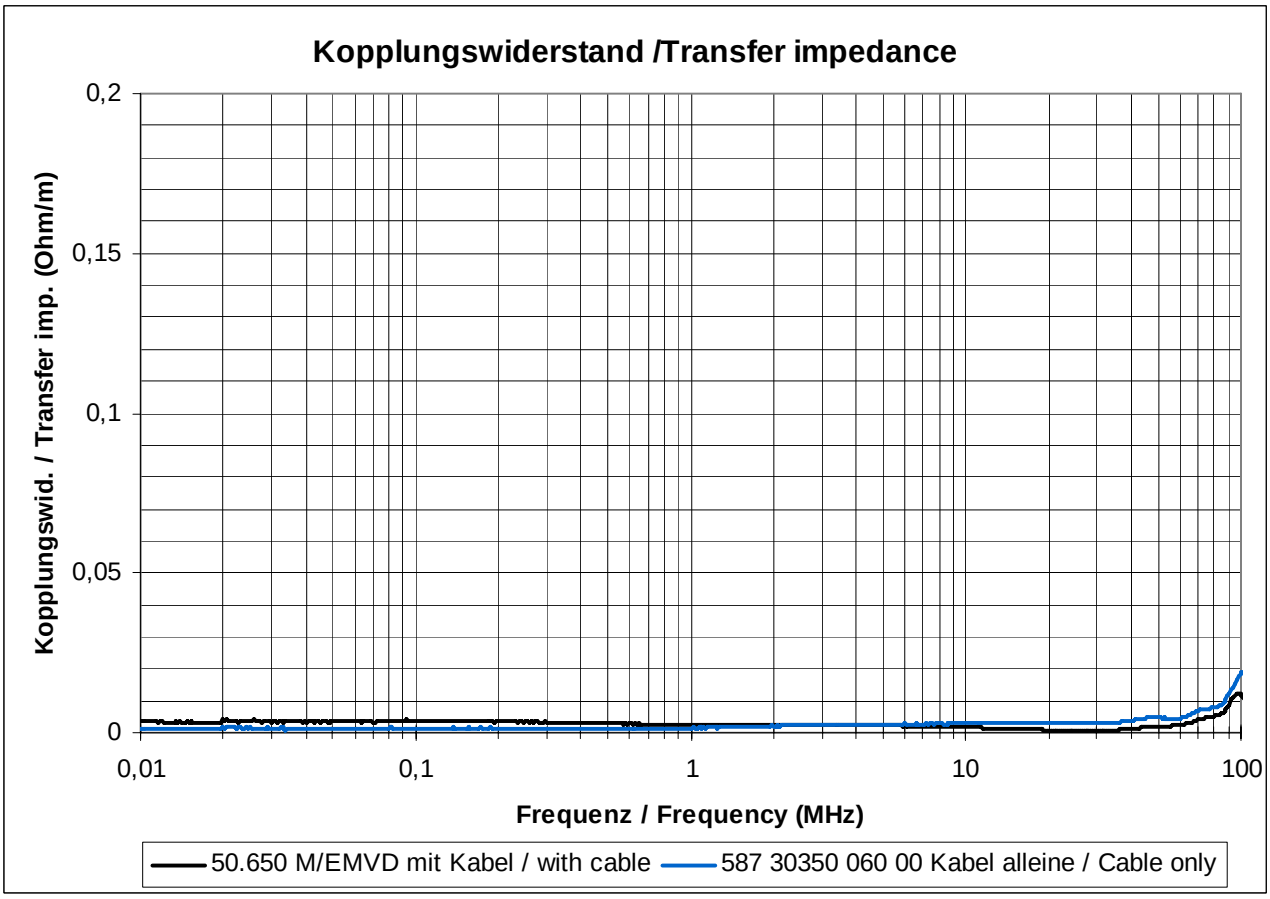
The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.5 Cable gland 50.650 M/EMVD with Servo cable

PERFECT EMV-Cable gland, M50x1,5, Art.-No. 50.650 M/EMVD mit
CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30350 060 00, Manufacturer ConCab

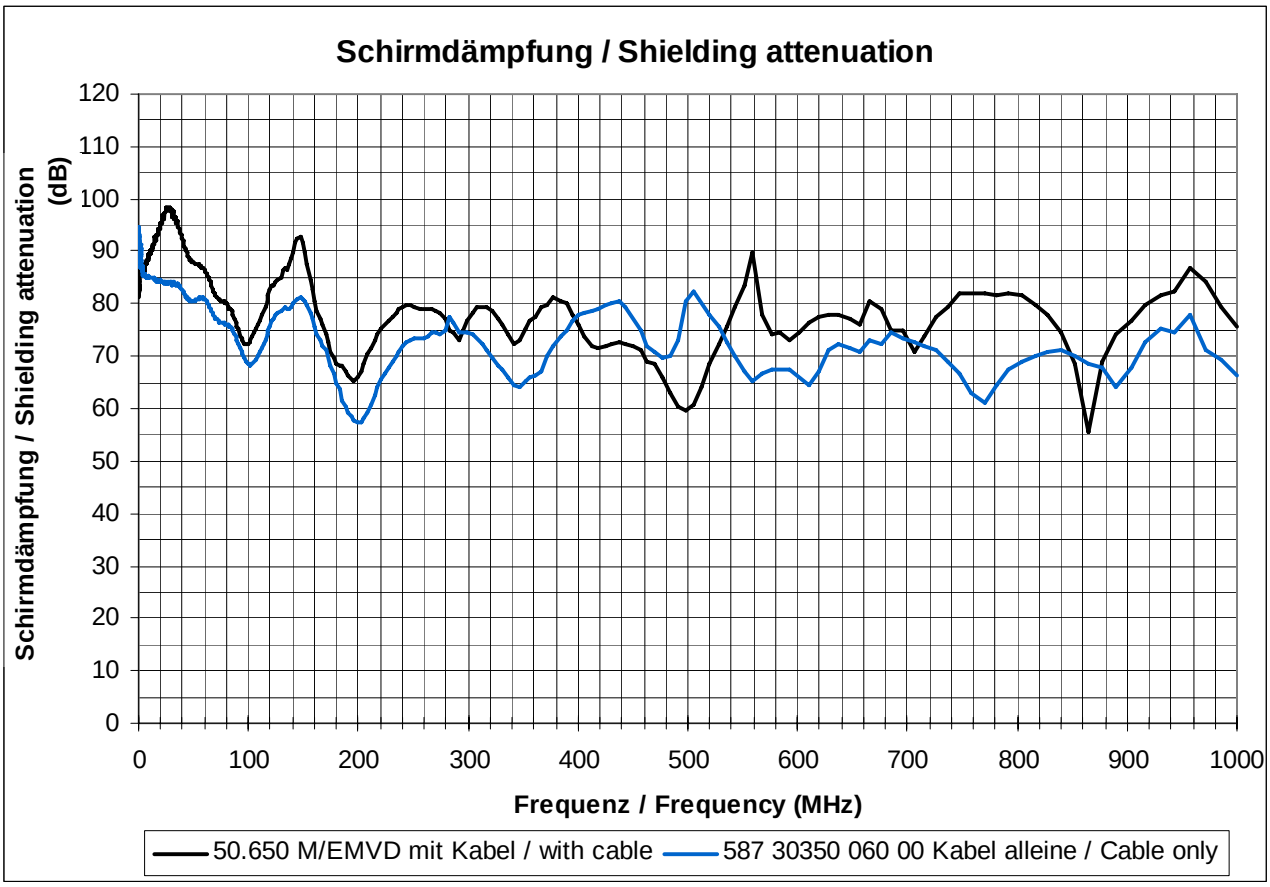
4.5.1 Transfer impedance

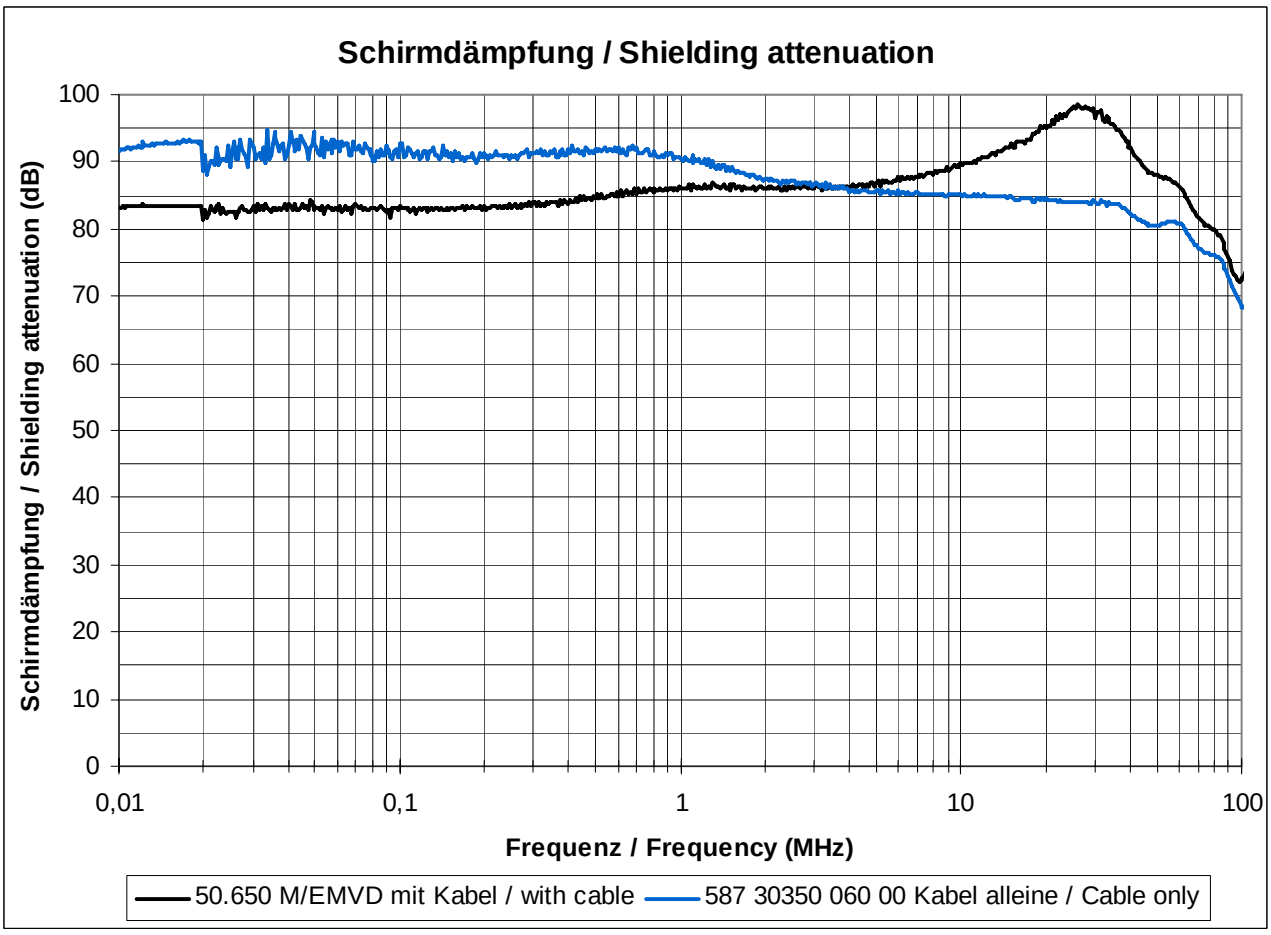




The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.5.2 Shielding attenuation

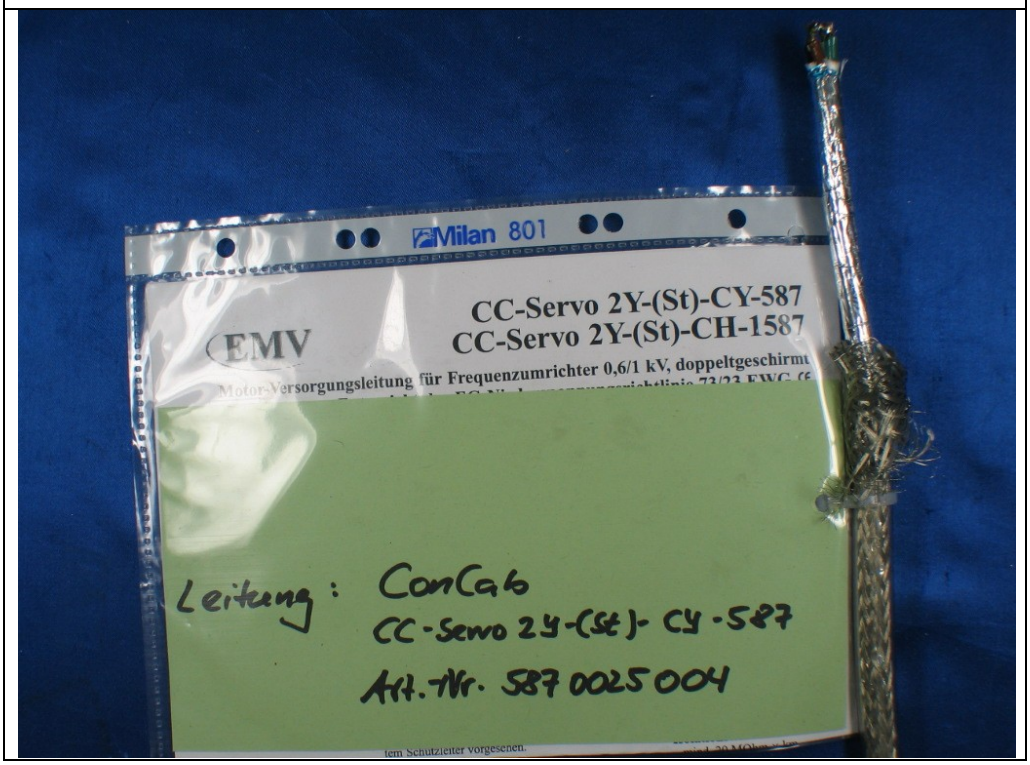




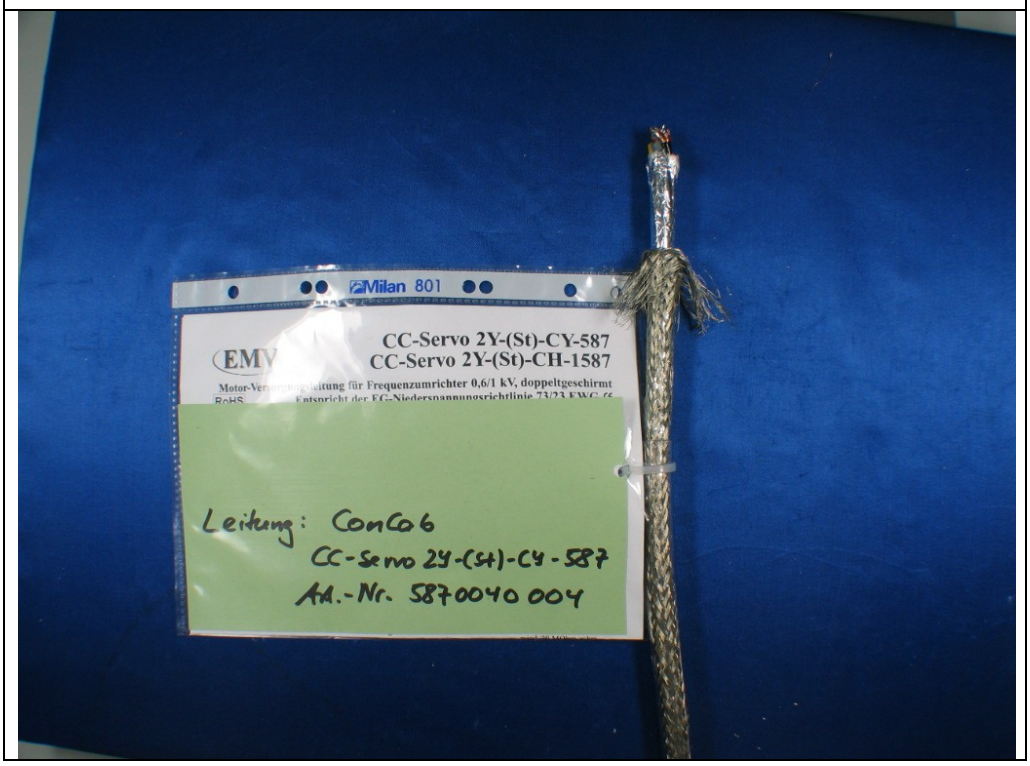
The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.6 Double-shielded reference cables for comparison

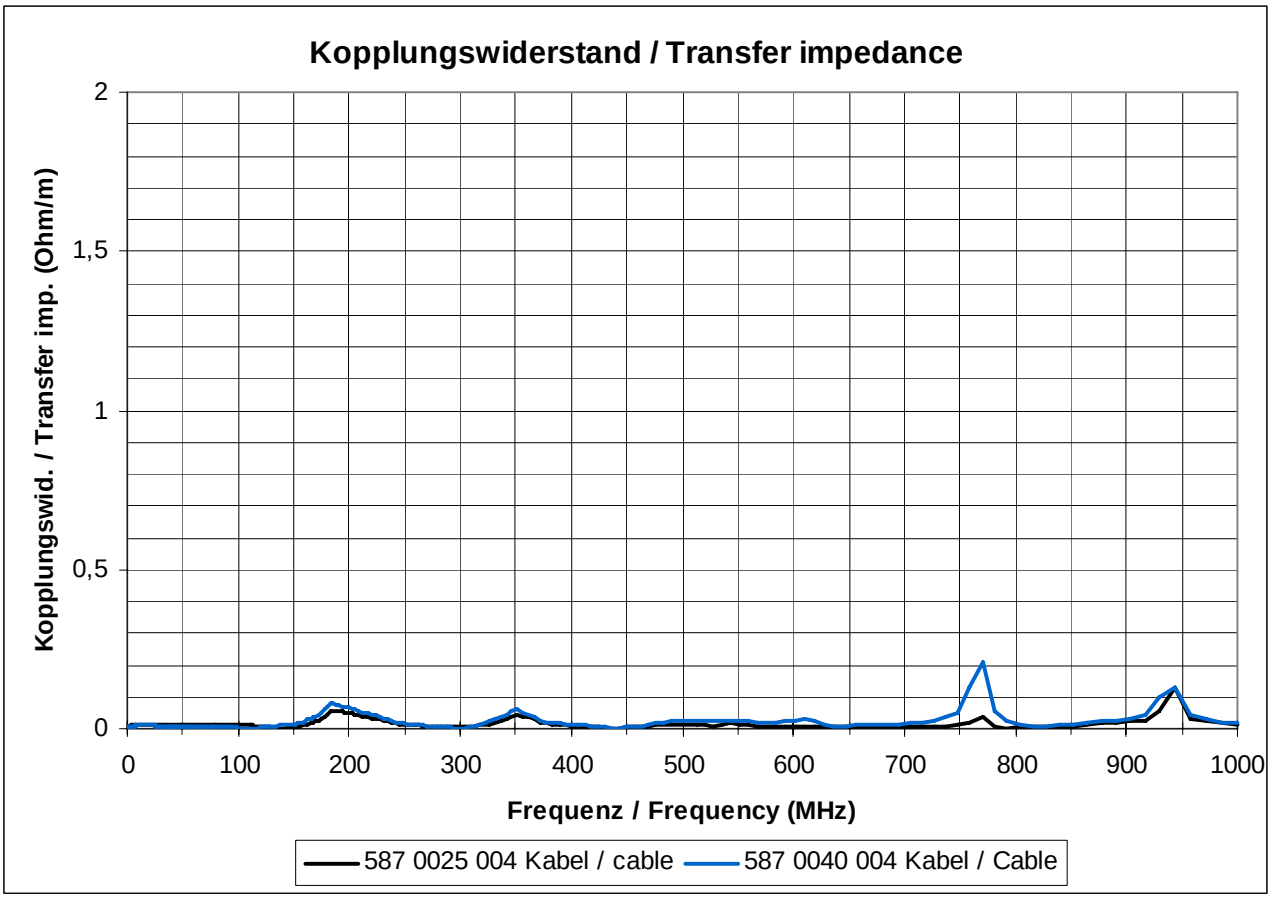
CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30025 004 00, Manufacturer ConCab

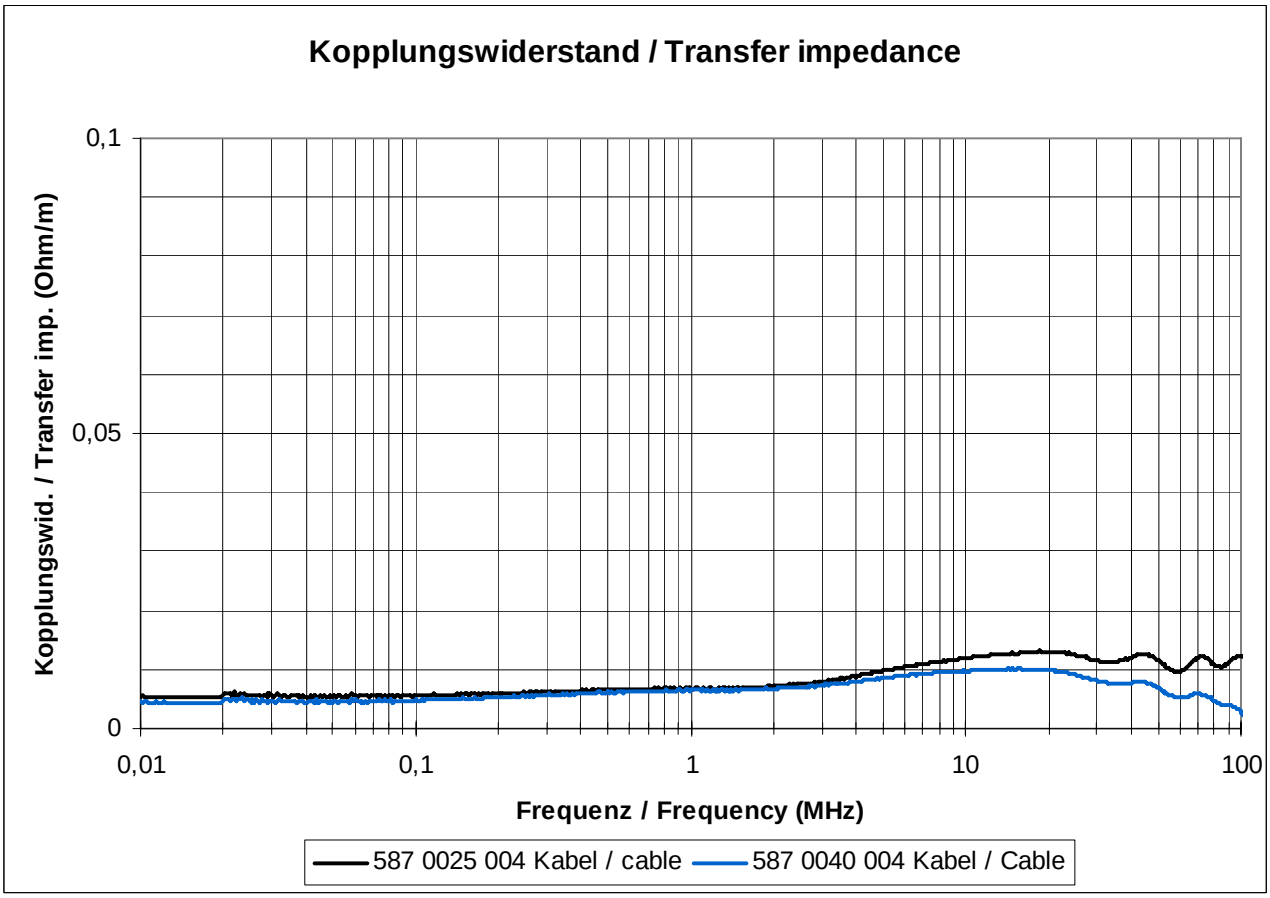


CC-Servo 2Y-(St)-CY-587, Art.-No. 587 30040 004 00, ManufacturerConCab



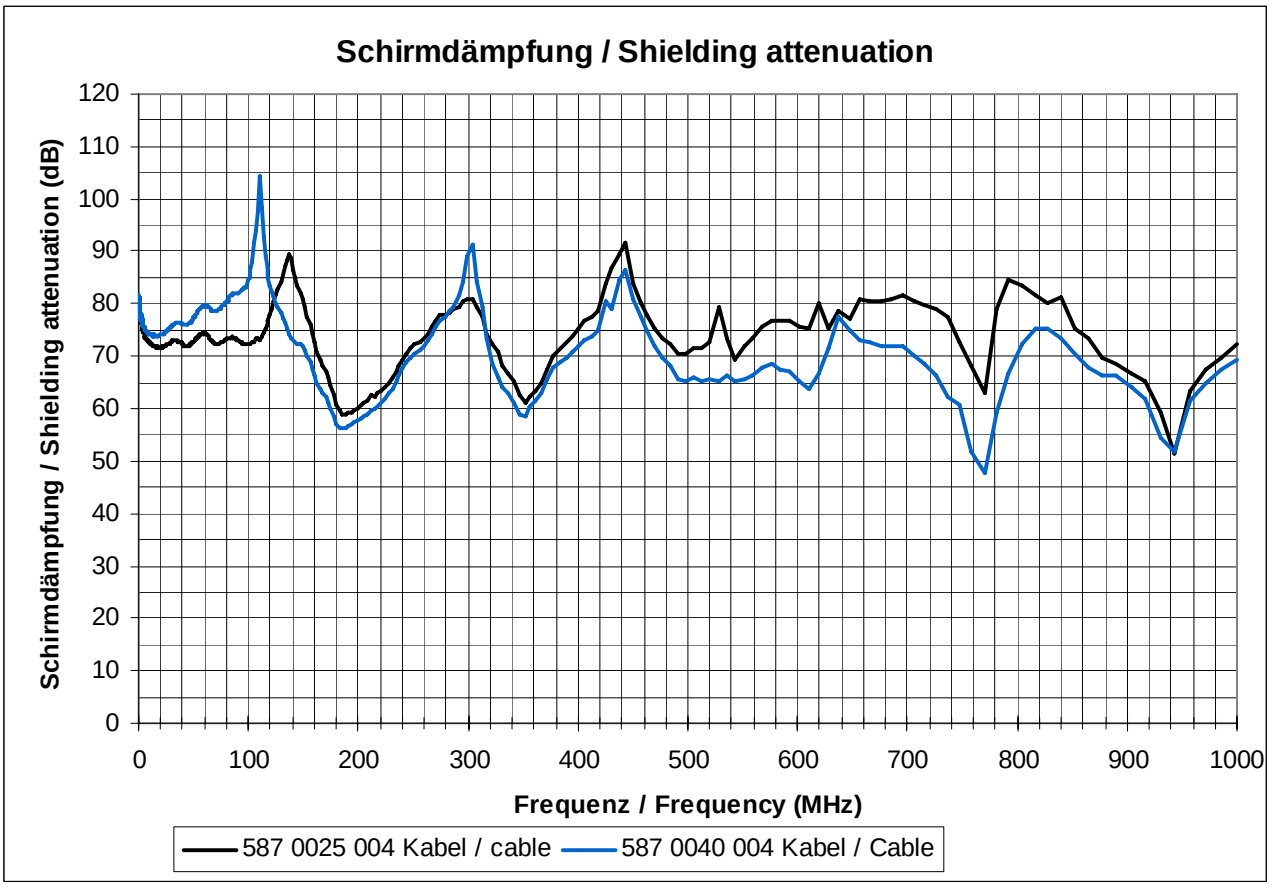
4.6.1 Transfer impedance

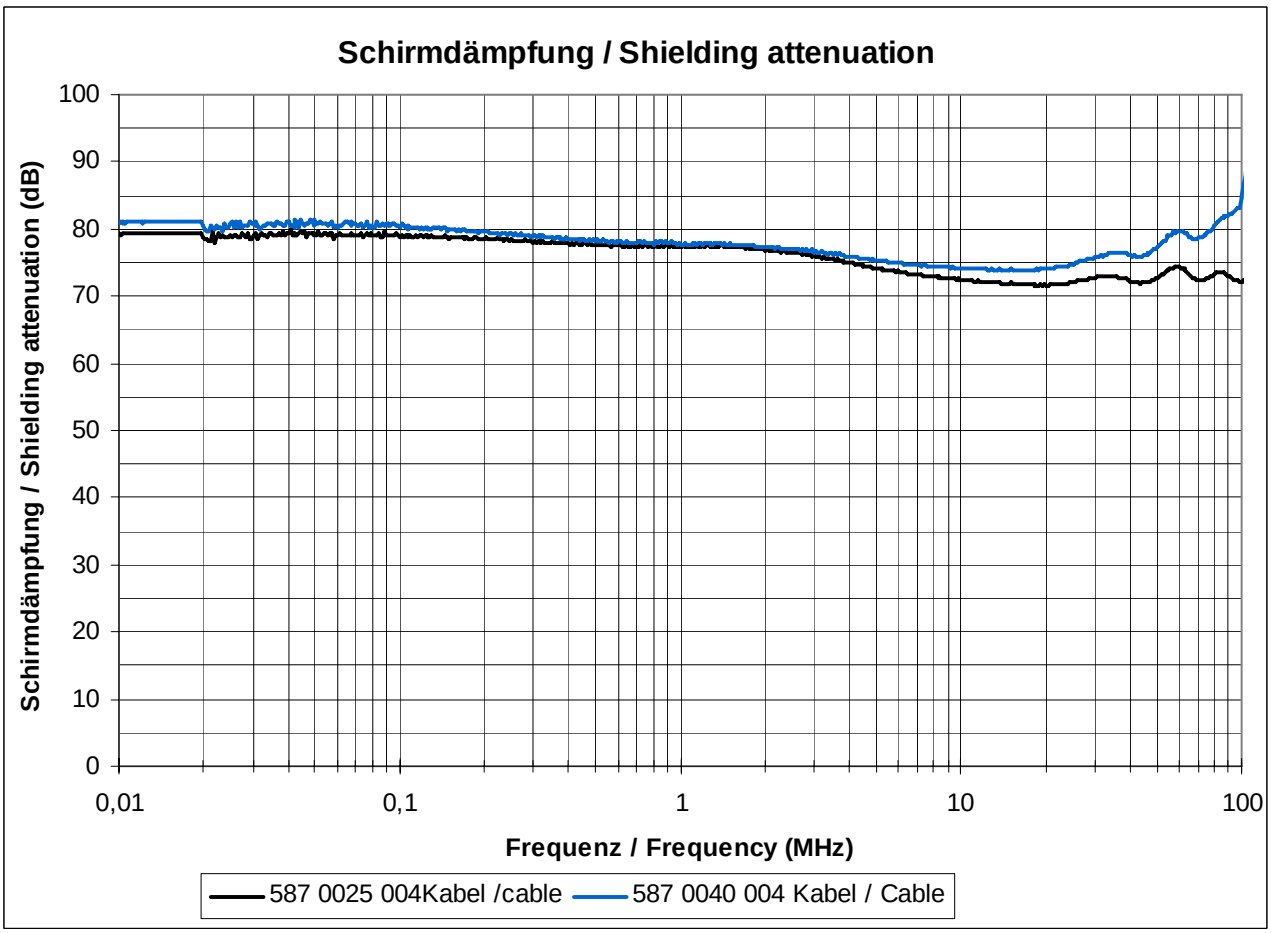




The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.6.2 Shielding attenuation





The diagram shows only a partial frequency range up to 100 MHz with logarithmic scaling.

4.7 Interpretation of the measurement results

The evaluations must be done like this:
From 30 MHz on, only the maximal values of the transfer impedance and the shielding attenuation shall be evaluated. The Minima are created by the interference of the wave fronts in the triaxial tube. Therefore the minima are caused by the measurement method and should not be counted as characteristic of the shield or cable entry.

4.8 Evaluation of the results

The evaluation of the test results is considered to be an additional information and not part of the test report.

The mesured cable glands have shown no significant degradation of the quality of the used and similar cable types. Therefore the measured cable glands are assumed to be suitable to lead cables into enclosures without losing the performance of the cable shield.