

RadiCoupler®

Part of the conducted immunity testing bundle

Product Manual



Models:

CPL M1-16A, CPL M2-16A, CPL M3-16, CPL M5-32A
CPL AF2, CPL AF3, CPL AF4
CPL T2, CPL T4, CPL T8
CPL USB-P, CPL USB-C, CPL USB3.0-P, CPL USB3.0-C
CAL adapter sets

RadiCoupler® Product Manual

This service and operating manual pertains to the RadiCoupler® system.

Model: CPL M1-16A, CPL M2-16A, CPL M3-16, CPL M5-32A

CPL AF2, CPL AF3, CPL AF4

CPL T2, CPL T4, CPL T8

CPL USB-P, CPL USB-C, CPL USB3.0-P, CPL USB3.0-C

Cal adapter sets

Made by DARE!! Instruments.

We ask that you read this manual carefully before operating your new product and adhere to any safety instructions it might contain.

Please contact DARE!! Instruments or your local reseller if you have any questions.

Supplier Information

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WARNINGS & PRECAUTIONS



Read the contents of this manual and become familiar with the safety markings, instructions, operation and handling of the system.



Become familiar with the contents of the manual.



Only qualified service personnel is allowed to carry out adjustments, maintenance or repairs on the equipment.



The RadiCoupler® contains materials that can be recycled and reused to minimize material waste. At the 'end-of-life', specialized companies can dismantle the discarded system to collect the reusable and recyclable materials. If your product is discarded at its 'end-of-life', please return it to your local reseller for recycling.



The RadiCoupler® M3 and M5 models require a protective earth connection. The mains power source for the equipment must supply an uninterrupted safety ground to the IEC input connector.



The RadiPower® contains no hazardous substances as described in the RoHS-directive.

1 Introduction

1.1 Product Introduction

The international basic standard for conducted immunity testing (IEC 61000-4-6) specifies the design and characteristics of a range of coupling / decoupling networks (CDN's). To be able to perform conducted immunity testing on an EUT (Equipment Under Test) with several types of connecting cables, different CDN's are needed. DARE!! Instruments introduces a complete range of high quality, full compliant and easy-to-use CDN's that enables customers to perform full compliant, simple and reliable conducted immunity testing on any kind of EUT cable.

1.2 Related Products



Conducted Immunity Test Bundle

The CI test Bundle is a turn-key solution for conducted immunity testing based on the RadiCentre® modular EMC test system including RadiGen® RF signal generator, RadiAmp® RF power amplifier and RadiPower® RF power meter.



RadiMation® software

RadiMation® is the EMC software package from DARE!! Instruments used for remote control and automated testing of the RadiCentre® plug-in cards and modules (such as the RadiField® system).

1.2.1 Available plug-in cards

The RadiCentre® can be expanded with many different plug-in cards. The following cards are available:



RadiControl®

A versatile antenna tower and turntable controller.



RadiField®

Power supply plug-in card to power the Triple A, this card fills two slots.



RadiGen®

A range of EMC signal generators, from 9 kHz to 6 GHz.



RadiLink®

A range of analogue fiber optic RF links, up to 3 GHz.



RadiPower®

A four channel USB plug-in card for a range of power meters for EMC and RF applications, at 6 and 18 GHz.



RadiSupply®

Power supply plug-in card for battery free, laser powered, RadiSense® EM Field Sensors, at 4, 10 and 18 GHz.



RadiSwitch®

A range of coaxial switch plug-in cards with SMA, N-type and K-type relays up to 50 GHz.

2 The RadiCoupler

2.1 Product Characteristics

The RadiCoupler® Coupling / Decoupling Network (CDN) is intended for conducted immunity testing on EUT cables. The RadiCoupler® is full compliant to the international standards CISPR16, IEC61000-4-6, EN55015 and EN55035 and each model covers a frequency range from 100 kHz to 300 MHz. The RadiCoupler® has a robust RF N-type input connector and uses a patented Easy Magnetic-Grounding connection.

2.2 Components

The RadiCoupler® is delivered with the following items:

- The RadiCoupler® Coupling / Decoupling Network
- Calibration certificate (ISO17025 accredited calibration is optional)
- USB stick containing the (digital) User Manual
- 2x connecting adapters (CPL CAL adapters)

2.3 Different Models

The RadiCoupler® is available as a range, suitable for different types of cables and/or connectors.

Type Cable	Product name*	Application	Connector EUT port	Connector AE port
Mains	CPL M1 16A	1 line, 16 A	4 mm safety banana	4 mm safety banana
Mains	CPL M2 16A	2 line, 16 A	4 mm safety banana	4 mm safety banana
Mains	CPL M3 16A	3 line, 16 A	4 mm safety banana	4 mm safety banana
Mains	CPL M3 32A	3 line, 32 A	4 mm safety banana	4 mm safety banana
Unscreened	CPL T2	2 line, balanced	4 mm safety banana	4 mm safety banana
Unscreened	CPL T4 RJ11	4 line, balanced	RJ11	RJ11
Unscreened	CPL T8 RJ45	8 line, RJ45	RJ45	RJ45
Screened	CPL S8 RJ45	8 line, RJ45	RJ45	RJ45
Screened	CPL USB-C	USB	USB-B	USB-A
Screened	CPL USB-P	USB	USB-A	USB-B
Screened	CPL USB-3.0-C	USB 3	USB-B 3.0	USB-A 3.0
Screened	CPL USB-3.0-P	USB 3	USB-A 3.0	USB-B 3.0
Screened	CPL HDMI	HDMI	HDMI	HDMI
Unbalanced	CPL AF2	2 line, unbalanced	4 mm safety banana	4 mm safety banana
Unbalanced	CPL AF3	3 line, unbalanced	4 mm safety banana	4 mm safety banana
Unbalanced	CPL AF4	4 line, unbalanced	4 mm safety banana	4 mm safety banana

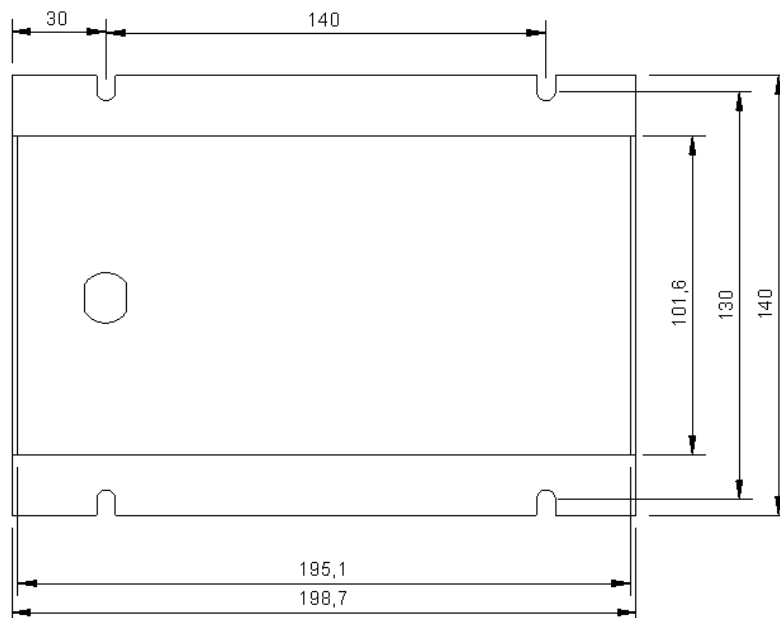
3 Hardware

The RadiCoupler® with calibration adapters (optional: CPL CAL SET)

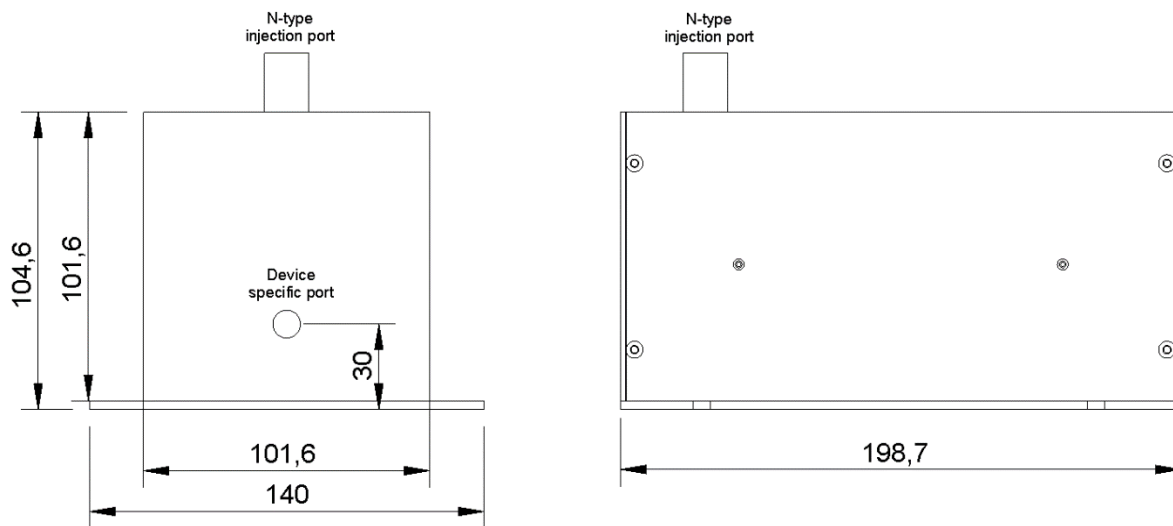


3.1 CDN Dimensions

Top view of the RadiCoupler®



Side views of the RadiCoupler®



Each RadiCoupler® has a device specific connector for the EUT and AE-port. This connector is located at 30mm above the bottom plate of the CDN.

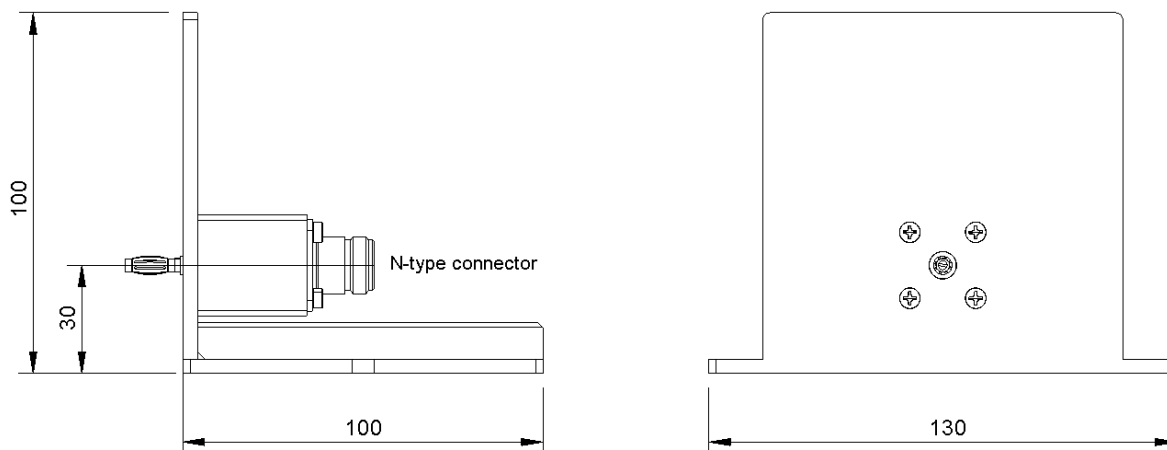
3.2 CPL CAL set

The optional RadiCoupler® CPL CAL SET consists of:

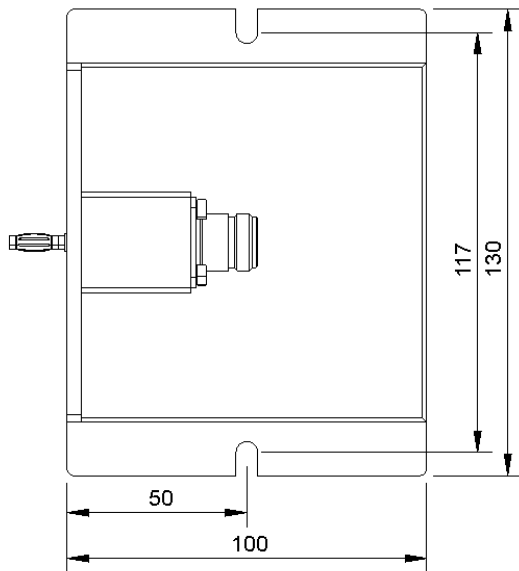
- 2x CAL adapter (100 Ohm)
- 1x 50 Ohm terminator

The CPL CAL set is required to calibrate the CDN in accordance to IEC61000-4-6. The set consists of 2x mechanical CAL adapter (one for EUT side, one for AE side) to match the impedance from 50 Ohm to 150 Ohm. Each CAL adapter has an internal 100 Ohm resistor and matches the height of the CDN. The CAL adapter can be connected to the CDN using the adapter connectors which are standard delivered with each RadiCoupler® CDN.

Side & back view of the CAL adapter



Top view of the CAL adapter



3.3 Calibration of RadiCoupler CDN's

Before the RadiCoupler CDN can be used for immunity testing, the CDN needs to be calibrated in a 150 Ohm common mode impedance environment. This can be achieved by connecting the EUT side of the RadiCoupler CDN to the RF port of the RadiPower model RPR2006C via one of the 100 Ohm CAL adapters. This adapter ensures that the impedance is matched from 150 Ohm to 50 Ohm.

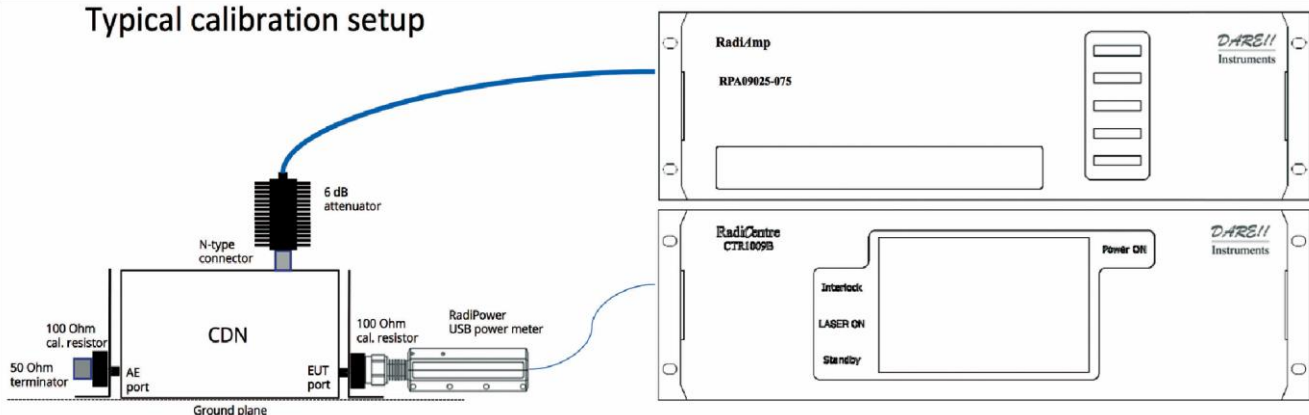
The USB port of the RadiPower needs to be connected to the 'current sensor' USB input of the BCI1004A plug-in card.

The other side (AE port) of the RadiCoupler CDN will need to be connected to the other 100 Ohm CAL adapter and needs to be closed with a 50 Ohm terminator.

The RF port of the second RadiPower model RPR2006C will need to be connected to the 'forward power output port' of the RadiAmp RF amplifier (on the back side).

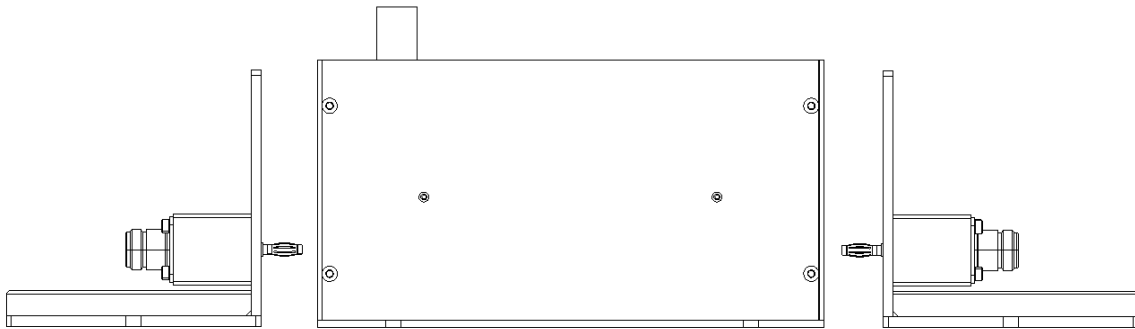
The USB port of this RadiPower needs to be connected to the 'forward power' USB input of the BCI1004A plug-in card.

Typical calibration setup



3.4 Mechanical fixation

All RadiCoupler® CDN's as well as the Cal adapters are provided with an integrated powerful magnet for easy and quick fixation to a metal ground plane. Please beware that while placing the CDN or Cal adapter on any metal plate, the force can be quite large. The housings of the CDN's and Cal adapters are all conductive to provide good grounding to the ground plane of the test setup.



4. RadiCoupler specifications

For measurements using CDN's, several standards are available. The table below gives an overview of these standards with each specific requirement for the impedances, transfer and isolation.

Standard	Value	Frequency	RadiCoupler®
CISPR 16-1-2			
Impedance (magnitude)	150 ± 20 Ω	0,15 - 30 MHz	✓
Impedance (phase)	± 20 °	0,15 - 30 MHz	✓
Response	-9,6 to -12,6 dB	0,15 - 150 MHz	✓
Isolation	> -40 dB	0,15 - 108 MHz	✓
IEC 61000-4-6			
Impedance (magnitude)	150 ± 20 Ω	0,15 - 24 MHz	✓
	150 + 60 Ω / -45 Ω	24 - 80 MHz	✓
	150 ± 60 Ω	80 - 230 MHz	✓
EN 55015			
Impedance (magnitude)	150 ± 20 Ω	0,15 - 26 MHz	✓
	150 + 0 Ω / -45 Ω	26 - 80 MHz	✓
	150 ± 60 Ω	80 - 300 MHz	✓
EN 55020			
Impedance (magnitude)	150 ± 20 Ω	0,15 - 30 MHz	✓
Impedance (phase)	± 20 °	0,15 - 30 MHz	✓
EN 55035			
Response	± 30 dB	0,15 - 30 MHz	✓
All standards combined			
Impedance (magnitude)	150 ± 20 Ω	0,15 - 30 MHz	✓
Impedance (phase)	± 20 °	0,15 - 30 MHz	✓
Response	-9,6 to -12,6 dB	0,15 - 150 MHz	✓
Isolation	> -40 dB	0,15 - 108 MHz	✓

The RadiCoupler® CDN's comply to all of these standards

Mechanical specification	
Dimensions CDN housing (W x H x D)	100 mm x 100 mm x 200 mm
Dimensions CDN outline (W x H x D)	140 mm x 120 mm x 206 mm
Weight	± 1.2 kg

WARRANTY CONDITIONS

DARE!! Instruments offers a standard warranty term of three years on their products, starting from the shipping date. This warranty is applicable to all EMC test & measurement products, such as:

- RadiCentre® modular / multifunctional EMC test systems
- RadiControl® antenna tower/turntable controllers
- RadiField® Triple A field generators
- RadiGen® signal generators
- RadiPower® RF power meters
- RadiSense® laser powered E-field probes
- RadiSwitch® RF coaxial switches
- RadiCoupler® Coupling / Decoupling Networks

On the conducted immunity bundle (complete system) is a warranty term of 5 years applicable.

If a defect occurs within the warranty term, a Return Material Authorization (RMA) 'Warranty Repair' request can be issued using the RMA link at <http://rma.dare.eu>. The defective product can then be shipped to DARE!! Instrument for repair by our service department.

There will be no charge for repair services (materials or labor) within the warranty term. The customer will need to cover the costs for returning the product to DARE!!, such as shipping and/or any applicable duties and taxes. DARE!! Instruments will arrange the courier and cover the costs for the return shipment.

These warranty terms are not applicable to:

- Fiber optic cables
- Products that have been improperly used
- Products that have been used outside their specified range
- Products that have been improperly installed and/or maintained
- Products that have been modified without approval of DARE!! Instruments
- Calibration and/or re-calibration of the product
- Consumable products such as batteries, ink etc.

Repair services on products that are not covered by the DARE!! warranty will be charged to the customer. If a defect occurs to our product outside the warranty period, a RMA repair and/or re-calibration request must be issued using the RMA link at <http://rma.dare.eu>.

The repairs (outside the original warranty period) have a warranty limited to six months. Shipping conditions are the same as with repairs within the original warranty period.