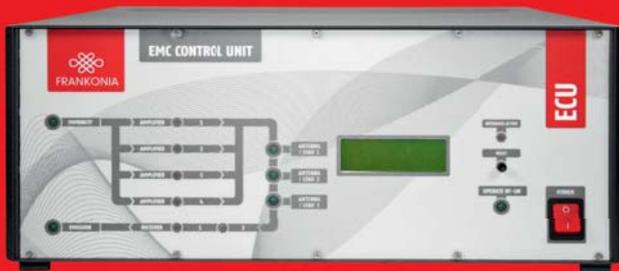


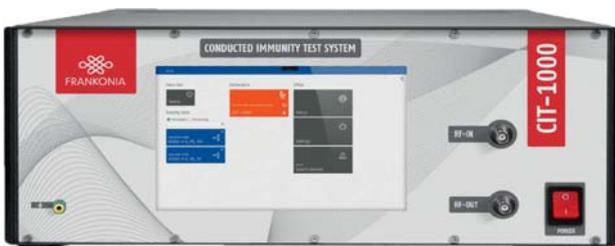


FRANKONIA

- ANECHOIC CHAMBERS & SHIELDED ROOMS
- ACCESSORIES FOR ANECHOIC CHAMBERS / SHIELDED ROOMS
- RADIATED IMMUNITY TEST SYSTEMS
- RF-POWER-AMPLIFIERS
- BROADBAND ANTENNAS
- EMC TEST & MEASUREMENT INSTRUMENTS
- GTEM-CELLS



EMC TEST & MEASUREMENT INSTRUMENTS



Including:

- ECU, EMC control unit
- Conducted RF immunity testing
 - IEC/EN 61000-4-6
 - IEC/EN 61000-4-16
- BCI testing
- Magnetic-Field testing
- MIL-STD 461 testing
- Electric Field-strength meter
- RF-Power meter
- RF-relay switching unit

THE FRANKONIA GROUP



Frankonia Group

The FRANKONIA GROUP was founded in 1987 as a solution provider for EMC laboratories to meet the increasing demand for highly specialized testing environments for the electronic and automotive industry. With more than 25 years of experience to date, FRANKONIA maintains its leading position in EMC solutions worldwide. Without limitations in capabilities and resources, FRANKONIA develops future-oriented concepts for EMC laboratories, which guarantees an optimal use of resources as well as the best possible customized solutions.

- FRANKONIA demonstrates a global presence in cooperation, with a well-structured network of productions, representations and service units.
- FRANKONIA strives to be the preferred partner for customized and state-of-the-art solutions.
- FRANKONIA provides fundamental knowledge to operate as a complete solution provider.
- FRANKONIA implements innovative technologies to enhance the efficiency and improve the outcomes and quality along with customers' needs.



We are proud of our highly specialized team that is putting our customers' demands into practice. It is our philosophy to improve the products, to realize new ideas, and to complete our product range within our broad scope of business. The fact that FRANKONIA is able to offer complete solutions from the first sketch to the final handover makes FRANKONIA a unique and trustworthy partner worldwide.

Frankonia's authenticity

FRANKONIA stands for latest technologies, highest quality, innovative concepts and materials and reliable solutions. Due to its easy and efficient usability along with its time-saving configuration, Frankonia's Anechoic Chambers set new standards for innovative and complete EMC testing solutions and offer a real added value to our customers.

Frankonia solutions

FRANKONIA as a turnkey solution provider and manufacturer offers a complete range of anechoic chambers and RF-shielded enclosures, test equipment, instruments, software and accessories.



- 1 FRANKONIA GmbH
- 2 Frankonia EMC Test-Systems GmbH
- 3 FRANKONIA - POLAND Sp. z o.o.
- 4 FRANKONIA Huize Co., Ltd.
- 5 Jiashan FRANKONIA EMC Co., Ltd.



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EMC TEST AND CONTROL UNIT - ECU-3/-6



ALL-IN-ONE UNIT: ECU-3 / -6

Description

The ECU-3/-6 is a central EMC test and control unit, which combines in just one compact box many major test components like signal generator, power meter, directional couplers and relay switching unit, which are needed for EMC tests. That reduces the cabling work and possible cabling mistakes to a minimum. Furthermore it includes general functions like EUT-monitoring and an interlock safety-system. With all the functions described above, the ECU-3/-6 is a real all-rounder, which can be used for many different conducted and radiated immunity tests as well as control unit to switch between EMI-receiver and spectrum analyzer and different measuring antennas without time consuming cabling work. It allows to control and to switch automatically between up to four external amplifiers, all connected to the ECU-3/-6 and up to three different outputs for antennas or coupling devices (CDNs, EM-coupling clamp, BCI-clamps). The integrated signal generator is available to cover the frequency range from 9 kHz to 3 GHz or from 9 kHz to 6 GHz. Amplitude modulation is available with a modulation rate of 1 Hz to 30 kHz and a modulation depth of 0 % to 90 %. Pulse modulation can be switched on with a repetition frequency of 0.1 Hz to 100 kHz and a duty cycle of 1 % - 99 %. In a word, it includes all requirements according to present EMC standards and it is best prepared for possible future changes.

Special Features:

- Conducted immunity tests according to IEC/EN 61000-4-6, 10 kHz – 230 MHz
- BCI-tests according to ISO 11452-4 and MIL-STD 461, CS 114
- Radiated immunity tests according to: IEC/EN 61000-4-3, ISO 11452-2/3/4/5, MIL-STD 461, RS 103
- Automatic switching between up to four external power amplifiers and connected coupling units / antennas
- Automatic switching between up to two EMI-receivers, spectrum analyzers and three different antennas
- Easy integration into any control software by dII-driver
- Integrated interlock safety system

Technical specifications	ECU-3	ECU-6
Signal Generator		
Output		50 Ω, N male
Output (Relay)	3 x N male	4 x N male
Frequency range	9 kHz to 3 GHz	9 kHz to 6.5 GHz
Frequency resolution	0.1 Hz	0.001 Hz
Output level range	-65 dBm to +10 dBm	-100 dBm to +13 dBm
Output level resolution		0.1 dB
Output level accuracy		±1 dB max.
Accuracy (frequency)	±25 ppm	±100 ppb
Harmonics		< -30 dBc
Non harmonics		< -55 dBc
Amplitude modulation		
Modulation rate	1 Hz to 30 kHz; resolution 0.02 Hz	1 Hz to 20 kHz; resolution 0.1 Hz
Modulation depth	0 to 90 %; resolution 1 %	0 to 90 %; resolution 1 %
Modulation waveforms	sinusoidal, triangular, square	sinusoidal, triangular, square

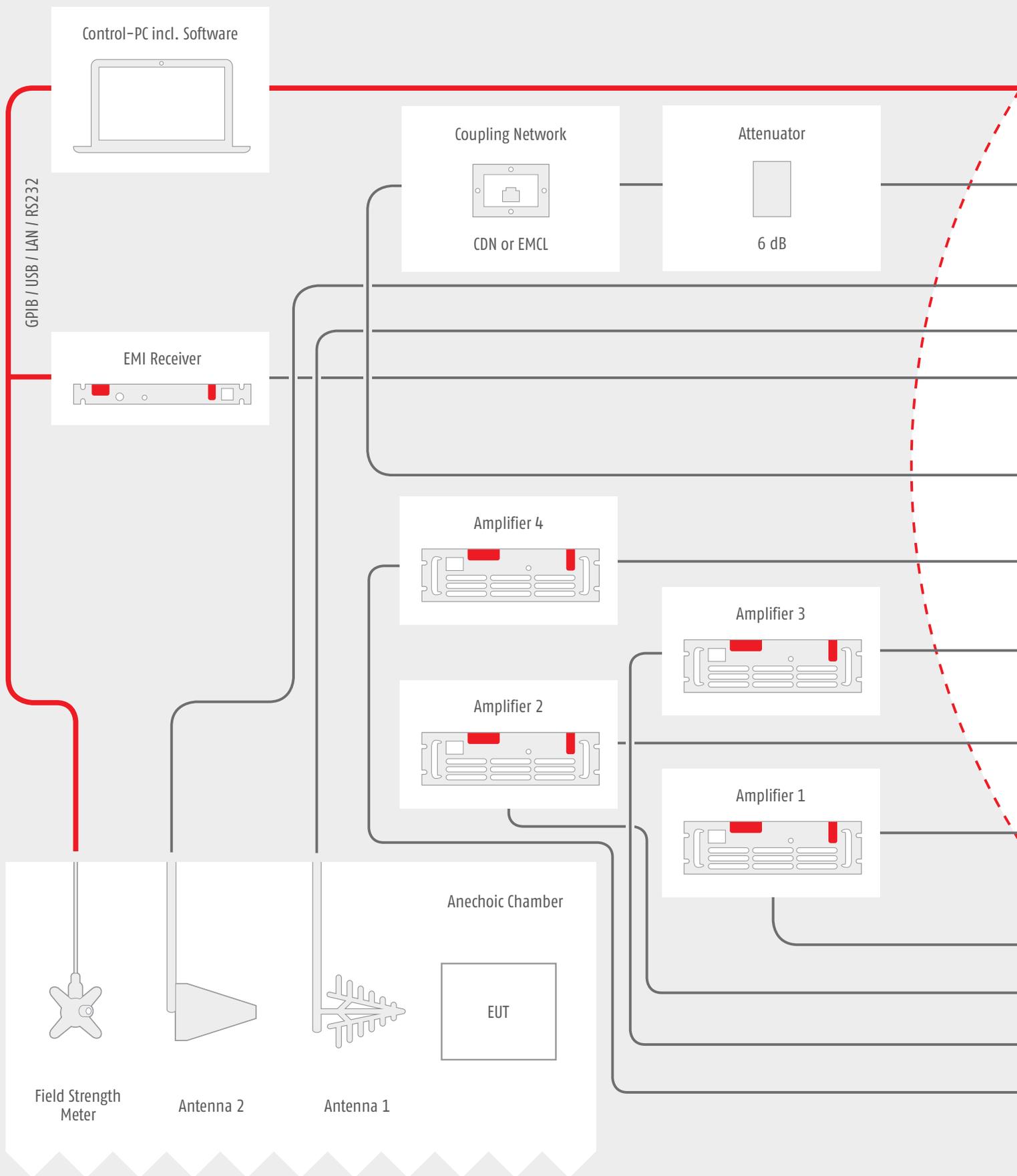
EMC TEST AND CONTROL UNIT – ECU-3/-6

Technical specifications	ECU-3	ECU-6
Pulse modulation		
On/off ratio	>50dB	typ. 80 dB
Repetition frequency	0.1 Hz to 100 kHz	0.1 Hz to 100 kHz
Duty cycle	1%-99%; resolution1%	1%-99%; resolution1%
Frequency modulation		
Modulation rate	---	300 Hz to 300 kHz
RF-Power Meter		
Number of channels	7	9
Frequency Range	10 kHz - 500 MHz (channel 1,2,7) 100 kHz - 6 GHz (channel 3,4,5,6)	10 kHz - 500 MHz (channel 1,2,9) 100 kHz - 6 GHz (channel 3,4,5,6,7,8)
Measuring range	-60 dBm to +20 dBm (10 kHz ≤ f ≤ 4 GHz) -45 dBm to +20 dBm (4 GHz < f ≤ 6 GHz)	
Accuracy	±1 dB (0.5 dB typical)	
Resolution	0.1 dB	
Max. input level	+27 dBm (= 500 mW)	
VSWR	1.15	
EUT-fail input	2 x TTL/CMOS compatible	
Input resistance	2.2 kΩ	
Level	TTL / CMOS compatible, optical decoupled	
EUT-monitor input		
Input voltage (2 x)	0 - 10 V	
Resolution	2.5 mV	
Input impedance	100 kΩ	
USB-A	Multimeter (for EUT control)	
Remote control		
USB-B	Connection to computer	
GPIB / IEEE488	Connection to computer	
Ethernet / RJ45	option	
Display		
Displayed items	Frequency, Power levels P(forw), P(rev), modulation (4 lines x 16 characters)	
RF-Relay Switching Unit		
max. power up to 100 MHz	2000 W	
max. power up to 600 MHz	1000 W	
max. power up to 1 GHz	700 W	
max. power up to 3 GHz	400 W	
max. power up to 6 GHz	300 W	
General data		
Temperature range	0 to 40°C	
Warm-up time	15 min.	
Housing	19"-Subrack or desktop case	
Dimensions(WxHxD)	449 mm x 177 mm x 580 mm	
Weight	approx. 18 kg	
AC input	100 - 240 VAC, 50 / 60 Hz	

Part Numbers	
ECU-3	Compact EMC control unit, basic Instrument, 9 kHz - 3 GHz
ECU-6	Compact EMC control unit, basic Instrument, 9 kHz - 6 GHz
ECU-DC1A	Directional Coupler, 10 kHz - 250 MHz, 30 dB, 100 W
ECU-DC1B	Directional Coupler, 10 kHz - 400 MHz, 30 dB, 100 W
ECU-DC1C	Directional Coupler, 10 kHz - 250 W, 30 dB, 500 W
ECU-DC2	Directional Coupler, 80 MHz - 1000 MHz, 50dB, 1500 W
ECU-DC3	Directional Coupler, 1 GHz- 4 GHz, 40 dB, 600 W
ECU-DC4	Directional Coupler, 2 GHz - 8 GHz, 40 dB, 600 W
ECU-KS2	Cable-set and GPIB-interface for immunity test systems with 2 amplifiers
ECU-KS3	Cable-set and GPIB-interface for immunity test systems with 3 amplifiers
ECU-KS4	Cable-set and GPIB-interface for immunity test systems with 4 amplifiers
ECU-LAN	Additional interface: LAN
ECU-OUT2	Switching between 2 outputs (antenna/load)
ECU-OUT3	Switching between 3 outputs (antenna/load)
ECU-PM1	RF-Power Meter / RF-milli-voltmeter, 10 kHz - 500 MHz, 1 channel
ECU-PM2	RF-Power Meter / RF-milli-voltmeter, 100 kHz - 6 GHz, 1 channel
ECU-REC1	Switching to emission path and connection of 1 measuring receiver / spectrum analyzer
ECU-REC2	Switching to emission path and connection of 2 measuring receivers / spectrum analyzers
ECU-RI	19"-Rack version
ECU-SW6	Standard software for testing acc. to IEC/EN 61000-4-6 in a system with ECU-3/-6

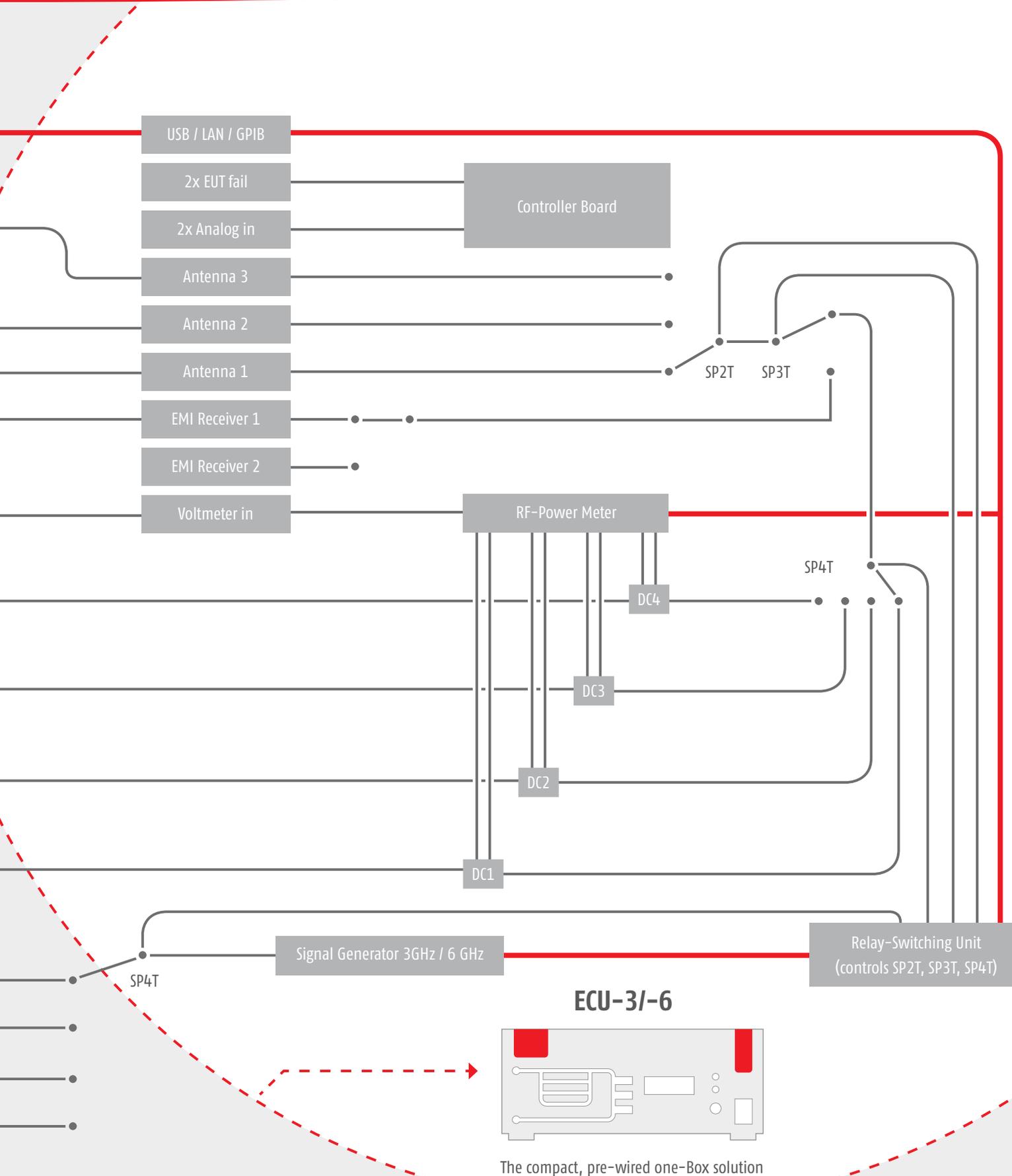
EMC TEST AND CONTROL UNIT - ECU-3/-6

EXAMPLE OF A TEST SYSTEM SETUP WITH ECU-3/-6



EMC TEST AND CONTROL UNIT - ECU-3/-6

EXAMPLE OF A TEST SYSTEM SETUP WITH ECU-3/-6



CONDUCTED IMMUNITY TEST SYSTEM CIT-10, 10kHz – 400MHz

ACC. TO IEC/EN 61000-4-6 / ISO 11452-4 / MIL-STD 461 CS 114



- Conducted RF Immunity Testing
- BCI-Testing

Description

The CIT-10 is a complete test system for conducted RF-immunity tests according to IEC/EN 61000-4-6, ISO 11452-4, MIL-STD 461 CS114, SAE-J1113-2, DC 10614 and similar standards. Its internal RF-generator and RF-power amplifier produce output signals with max. up to 150 W within a frequency range from 100 (10) kHz up to 400 MHz. Generated signals are measured via one of the max. 3 internal RF-Volt-meters. Furthermore via an optional, internal directional coupler forward and reflected power can be measured. The whole test system allows full au-tomatic tests for the specified frequency range. As a "stand-alone" test system the CIT-10 is convincing by its easy and comfortable handling and the excellent cost-performance ratio. Add-ons like coupling/decou-pling devices are available as well.

Special Features:

- Conducted RF immunity tests acc. to IEC/EN61000-4-6 and BCI tests acc. to ISO 11452-4 and MIL-STD 461 CS 114
- Signalgenerator, RF-power amplifier, RF-power meter and direc-tional coupler (optional) in one 19"-case
- Stand-alone operation possible with optional available netbook
- Control-software included
- Most important parameters are shown on an integrated display
- Automatic EUT-monitoring
- Operation via USB port of a PC or Notebook
- Complete range of CDNs available

Applications:

Immunity Testing

Testing according to IEC/EN 61000-4-6, ISO 11452-4, MIL-STD 461 CS114, DC10614 can be performed automatically.

Generation, amplification and verification of RF-Signals

The internal amplifier amplifies any signal from 100 (10) kHz up to 400 MHz. By using the internal generator a desired narrowband signal can be generated. Signals up to 30 dBm can be measured at the same time. If a directional coupler is installed, forward and reflected power are measured as well.

CONDUCTED IMMUNITY TEST SYSTEM CIT-10, 10kHz - 400MHz

ACC. TO IEC/EN 61000-4-6 / ISO 11452-4 / MIL-STD 461 CS 114

Technical specifications

RF Voltmeter (external in-/output)

Frequency range	10 kHz to 400 MHz
Measuring range	+30 dBm to -40 dBm
Accuracy	±0.5 dB
VSWR	< 1.1 : 1
Input	BNC, 50 Ω

RF-Signal Generator

Output	BNC, 50 Ω
Frequency range	10 kHz to 400 MHz
Frequency resolution	1 Hz
Output level range	0 to -63 dBm
Output level resolution	0.1 dB
Output level accuracy	±0.5 dB (± 1 dB max)
Accuracy (frequency)	±5 ppm (TCXO)
Harmonics	< -30 dBc
Non harmonics	< -45 dBc
Amplitude modulation (internal)	0 to 100 %; resolution 0.5 % (internal AF-Generator)
Amplitude modulation (external)	BNC jack 1 Hz to 100 kHz, 0 to 100% Input impedance > 100 kΩ
Pulse modulation	variable duty cycle 10 - 90 %; resolution 1 % (internal AF Generator)
VSWR	< 1.5:1

AF-Generator

Output jack	BNC
Frequency range	1 Hz to 100 kHz
Frequency resolution	0.1 Hz
Output voltage	0 to 1 V amplitude; resolution 5 mV
Accuracy (frequency)	±50 ppm
Signal	Sine wave / square wave / triangular

RF-Voltmeter (internal, 2 pcs.)

Frequency range	10 kHz to 400 MHz
Measuring range	+53 dBm to - 0 dBm
Accuracy	±0.5 dB

Directional coupler (optional)

Frequency range	10 kHz to 400 MHz
Power	200 W CW
Insertion loss	0.5 dB max
VSWR	1.25 : 1 max
Directivity	20 dB min

Technical specifications

RF-Power Amplifier

Frequency Range	Power	Gain	Distortion
10kHz - 250 MHz	75 W	51 dB ± 1.5 dB	< -20dBc @ 50W
100kHz - 400 MHz	75 W	51 dB ± 1.5 dB	< -20dBc @ 50W
100kHz - 250 MHz	25 W	46 dB ± 1.5 dB	< -20dBc @ 20W

Input impedance 50 Ω, VSWR < 1.5:1

Output impedance 50 Ω nom.

EUT-fail input

Input resistance 2.2 kΩ

Level TTL/CMOS compatible, optical decoupled

EUT-Monitor input

Input voltage 0-10 V

Input impedance 100 kΩ

Amplifier monitor

Output BNC, 50 Ω

Level -40 dB (amplifier output), ±3 dB

Interfaces

USB-A Multimeter (for EUT control)

USB-A Relay switching unit

USB-B Connection to computer

General data

Temperature range 0 to 40 °C

Warm-up time 15 min.

Housing 19"-Subrack or desktop case

Dimension (W x H x D) 449 mm x 133 mm x 435.5 mm

AC input 100 - 240 VAC; 50/60 Hz

Volume of delivery CIT-10 (basic equipment), cabling, system software

CIT-10/25 with integrated 25 W RF-power amplifier

CIT-10/75 with integrated 75 W RF-power amplifier

Part Number CIT-10/75MIL with integrated 75 W RF-power amplifier

CIT-10/W without internal RF-power amplifier

CONDUCTED IMMUNITY TEST SYSTEM CIT-10, 10kHz - 400MHz

ACC. TO IEC/EN 61000-4-6 / ISO 11452-4 / MIL-STD 461

Features:

Internal RF-Power Amplifier

Several amplifier modules are available. Highest output power can be 75 W over the specified frequency range. The amplifier input can be accessed via the back panel of the CIT-10, so that the amplifier can also be used with any external generator. 25 W and 75 W amplifiers are available as standard.

Amplitude Modulation

Frequencies generated by the generator can also be modulated with a LF signal. Modulation frequencies may vary from 1 Hz up to 100 kHz, modulation levels are available from 0 % to 100 %.

BCI-Tests with additional RF-Power Meter

For BCI-Tests the CIT-10 can be equipped with up to 3 pieces of internal power meters.

Internal RF-Voltmeter

Accurate measurements of RF signals from -40 dBm up to +30 dBm are done by the internal RF-voltmeter which can be accessed (for separate use) via a BNC connector. Two internal voltmeters measure the forward and reverse power on an optional available directional coupler. If no directional coupler is installed, the output voltage of the amplifier is measured.

Internal RF-Signal Generator

As the internal generator generates its output signal without any internal mixing components, low harmonics and spurious frequencies are assured.

User defined signals

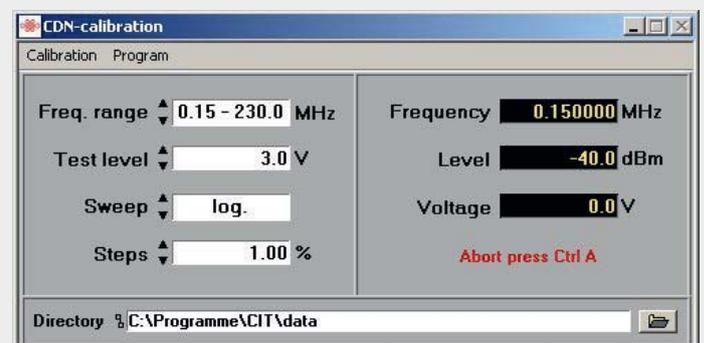
External signals (e.g. EUT-fail or external instruments) can be connected and monitored using the application software.

Setup

The CIT-10 is a PC-controlled test equipment. It can be operated by any commercial IBM compatible PC (Microsoft® Windows software) via USB port. All settings of the equipment, e.g. start frequency, stop frequency, step width, test voltage etc. are made by means of the control software which is also included in the delivery. The three functional units RF-signal generator, RF-power amplifier and RF-voltmeter are set automatically by the software, depending on the pre-set test parameters. Each component, however, may also be called and operated as separate measuring and testing equipment. This means: using the CIT-10 as testing system, you have three full, additional "single units" at your disposal, for which separate inputs and outputs are available as BNC connections. Due to the computer-aided control of the CIT-10, any modifications which may become necessary, for example, due to the revision of standards, may be performed without problems and without having to manipulate the hardware of the equipment.

1 Calibration

In **<CDN-Calibration>** the CDNs (Coupling/Decoupling Networks) serve to inject the test voltage into the lines to be tested and/or to decouple any connected peripheral equipment from the EUT. The characteristics of the CDNs as well as of the power amplifier are not absolutely linear over the whole frequency range, i.e. the amount of power required to generate a constant test voltage over the whole frequency range varies slightly, depending on the frequency. In the calibration run, the frequency-dependent output level of the signal generator, which is necessary for a constant test voltage, will be determined and stored in the software, together with the defined frequency range and the desired test voltage. The data records thus created may then be stored and recalled for tests.



When selecting **<Self-calibration>**, the test equipment will perform a self-calibration. In this case, the output of the signal generator must be connected to the input of the voltmeter.

CONDUCTED IMMUNITY TEST SYSTEM CIT-10, 10kHz - 400MHz

ACC. TO IEC/EN 61000-4-6 / ISO 11452-4 / MIL-STD 461



Functioning

The equipment is ready for operation immediately after connection with the USB port and installation of the drivers and the control software. After starting the control software, the main menu offers the manual control of **<RF-Generator>** and **<RF-Power Meter>**. Further options in the menu are **<Calibration>** ① (**<CDN-Calibration>**, **<Self-Calibration>**) and **<Test>** ② (**<Complete Test>**, **<Selective Test>**).

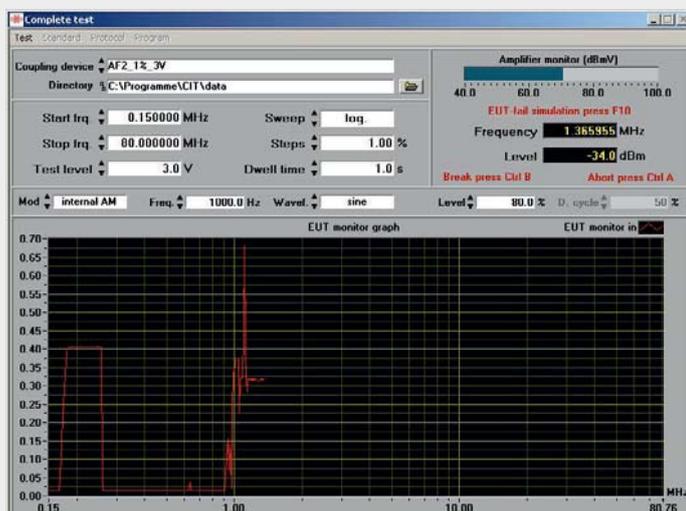
② Test

The menu option **<Test>** offers the selection possibilities **<Complete Test>**, **<Selective Test>** and **<Protocol>**. The settings for a test, e.g. start and stop frequency, step width and test voltage are made automatically via the calibration file of the selected coupling unit. It is now possible to decide whether the test is to be performed exactly according to these pre-settings, i.e. exactly as in the calibration, or whether modifications of the pre-settings shall be admissible. If the calibration run was performed, for example, for a test voltage of 10 V, and the test is to be performed now with 3 V without having to perform a new calibration run for this purpose, this can be done by selecting menu item **<Extrapolation>**.

Is a suitable measuring instrument connected to the specified serial port of the CIT-10, EUT can be monitored automatically. Data are shown graphically. During all test routines the amplifier output is monitored in a bar display. This guarantees correct tests. In the case of **<Complete Test>**, a test is performed over the complete selected frequency range; in this case the test frequency is increased by the control software according to the selected step width and the entered dwell time. If there is a malfunction of the EUT, the test may be stopped at any time. It is then possible to either increase or reduce the frequency by any number of steps, as well as to switch on and off the modulation and test voltage. Besides, a description of the malfunction occurred may be entered in a comment line which is included in the test record.

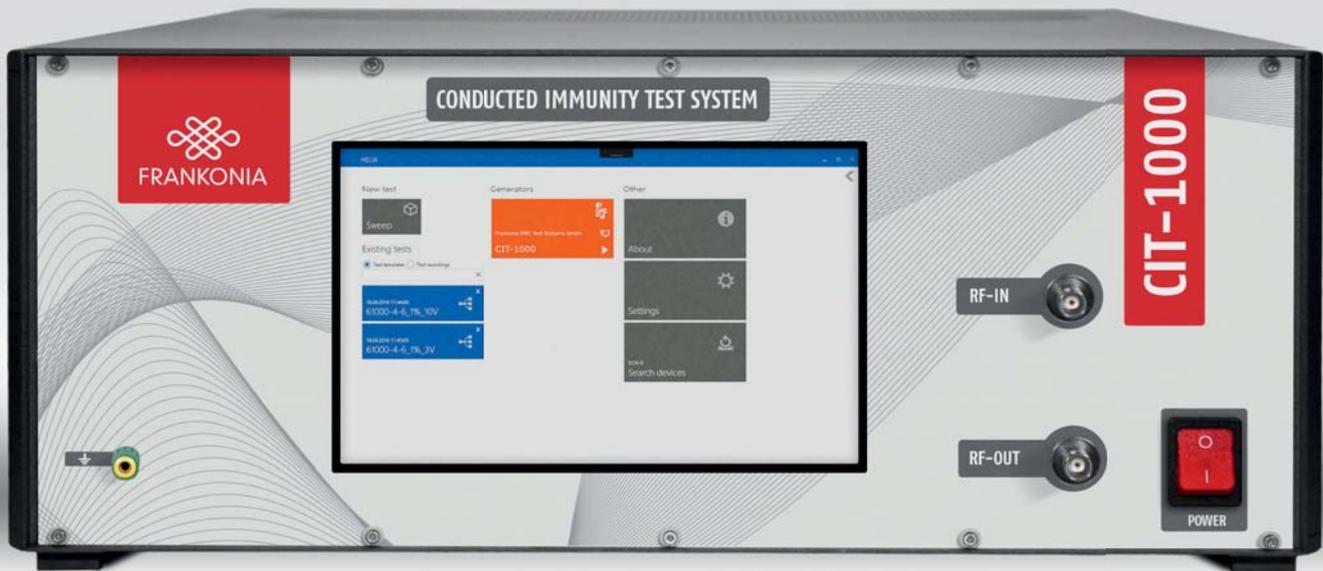
<Selective Test> offers the possibility of testing the EUT at discrete frequencies. This can be done either with a fixed test voltage or, optionally, with a ramp function. In case of the ramp function, the start and stop voltage, the step width by which the test voltage is to be increased, as well as the dwell time between the individual steps may be preset by the tester.

The standard **<Protocol>** consists of the head of the protocol and a diagram which shows the test results. In the head of the protocol the date and time are taken over from the computer; in addition, details like temperature, air humidity, tester, as well as testing set-up and EUT, may be registered. The protocol may be printed directly. It is also possible to edit the protocol individually.



CONDUCTED IMMUNITY TEST SYSTEM CIT-1000, 10kHz – 1200MHz

ACC. TO IEC/EN 61000-4-6 / ISO 11452-4 / MIL-STD 461



Description

The CIT-1000 is a further development of the for years available and proven „CIT-10“, with the extended frequency range up to 1200MHz, stand-alone-operation via integrated Touch-Screen-PC as well as integrated directional coupler and power-meter for forward and reverse power measurement.

As usual with our CIT-series, all integrated instruments, like Signal-generator, RF-Power-Amplifier and the 3-channel-RF Power Meter can be used as „stand-alone-unit“, too.

Hence, the Signal-generator and the RF-power-meter can also be used for radiated immunity tests acc. IEC/EN 61000-4-3. Furthermore an additional external RF-Power-amplifier could be connected to the CIT-1000 for this purpose.

Special Features:

- Conducted RF immunity tests acc. to IEC/EN 61000-4-6, BCI-tests acc. to ISO 11452-4 and MIL-STD 461
- Signalgenerator, RF-Power-Amplifier, 3-channel power-meter and directional coupler combined in one 19“-case.
- Stand-alone operation via integrated touch-screen-PC
- Frequency-range 10kHz-1200MHz
- With integrated amplifier 25W / 75W / 180W
- Control-Software included
- Temperature-measuring-input for control and display of the BCI-clamp temperature
- Interfaces: USB, LAN, GPIB

CONDUCTED IMMUNITY TEST SYSTEM CIT-1000, 10kHz – 1200MHz

ACC. TO IEC/EN 61000-4-6 / ISO 11452-4 / MIL-STD 461 CS 114

Technical specifications

RF-Generator

Two switchable outputs (only one can be used simultaneously)	2 x SMA
Frequency range	9 kHz to 1.2 GHz
Frequency resolution	1 Hz
Output level range	0 to -63 dBm
Output level resolution	0.1 dB
Harmonics	< 30 dBc
Spurious	< 45 dBc
Amplitude modulation (internal)	0 to 100%, resolution 1%
Amplitude modulation (external)	0 to 100% , max. Amplitude 1V = 100%, BNC jack
Pulse modulation (internal)	5 to 95%, resolution 1%
Pulse modulation (external)	DC...1MHz, 3,3/5V CMOS/TTL, BNC jack

LF-Generator (modulation)

Connector	BNC jack
Frequency range	1 Hz to 100 kHz
Frequency resolution	0.1 Hz
Signal	Sine wave / square wave / triangular
Amplitude	0...1 V

RF-Voltmeter 1 (test level)

Connector	BNC jack
Frequency range	9 kHz to 1.2 GHz
Measuring range	-40 to +30 dBm

RF-voltmeter 2+3 (forward and reverse power)

Connector	2 x SMA
Frequency range	9 kHz to 1.2 GHz
Measuring range	-40 to + 33 dBm + directional coupler typ. 40 dB

EUT-Monitor input

input voltage	0 to 10 V DC
resolution	2.5 mV
Input impedance	100 k Ω

EUT-failed input

Input signal	3,3/5V CMOS/TTL level
Detection mode	status or edge controlled
Temperature measurement	10 to 100 °C (1039 to 1385 Ω) resolution < 1 °C (PT 1000)

SCPI interfaces

USB 2.0	USB-B
LAN, 100 Mbit	RJ45
GPIB (optional)	Centronics

Digital I/Os

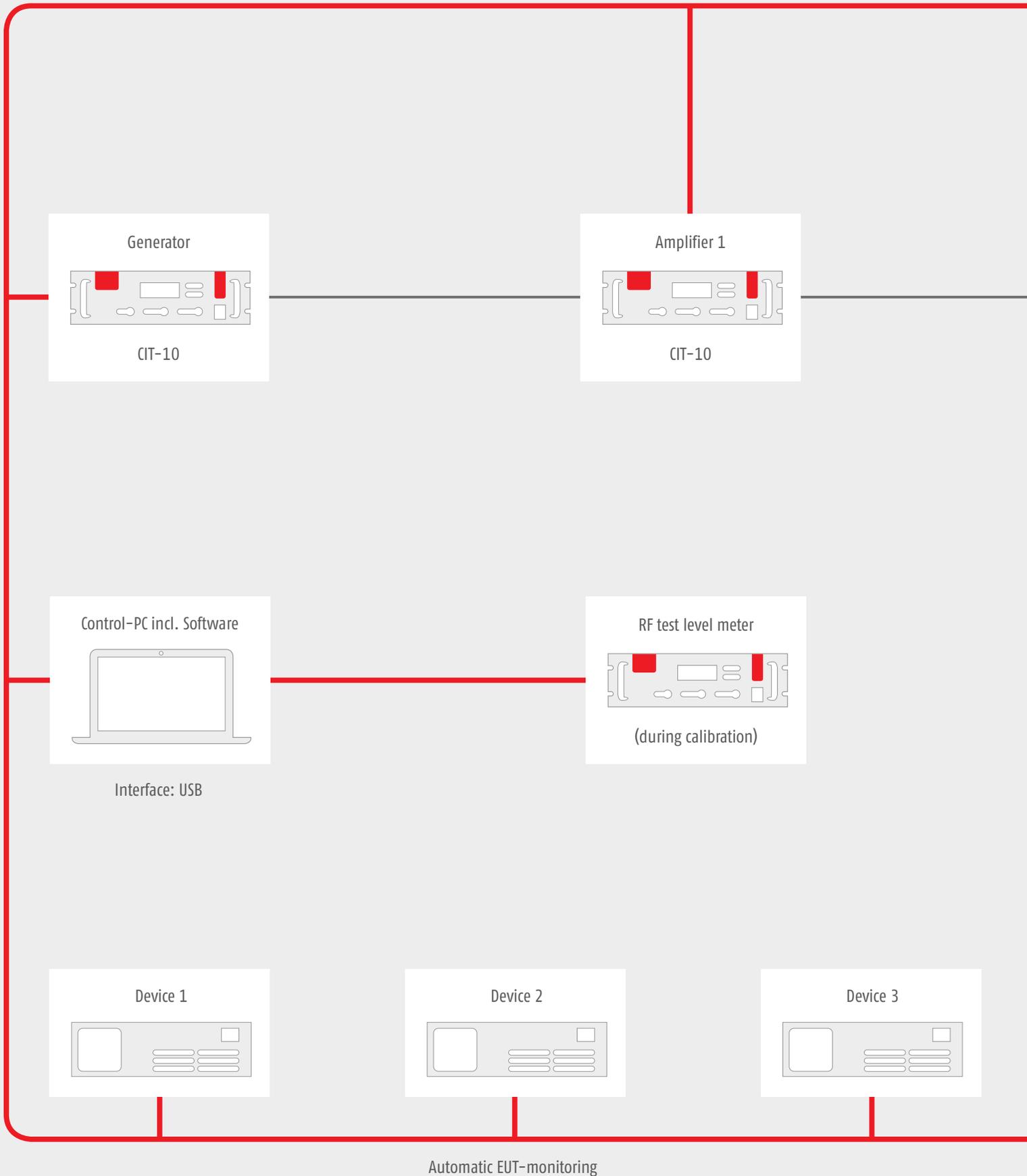
Out	4 Bit Digital out, 5 V CMOS/TTL
In	4 Bit Digital in, 5 V CMOS/TTL

Interlock

Closes at	R < 1 k Ω
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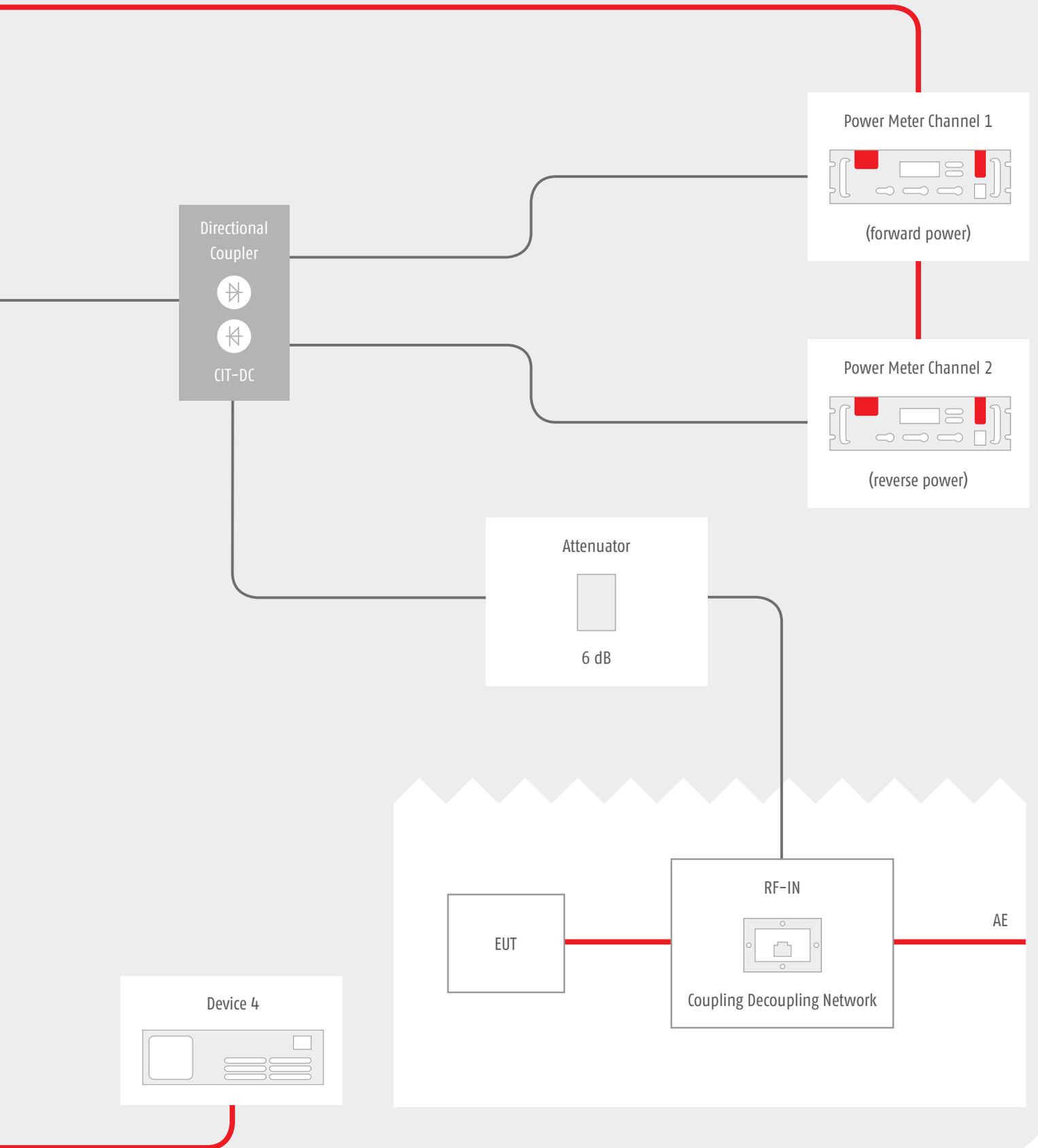
CIRCUIT DIAGRAM OF A TEST SYSTEM

ACCORDING TO IEC/EN 61000-4-6

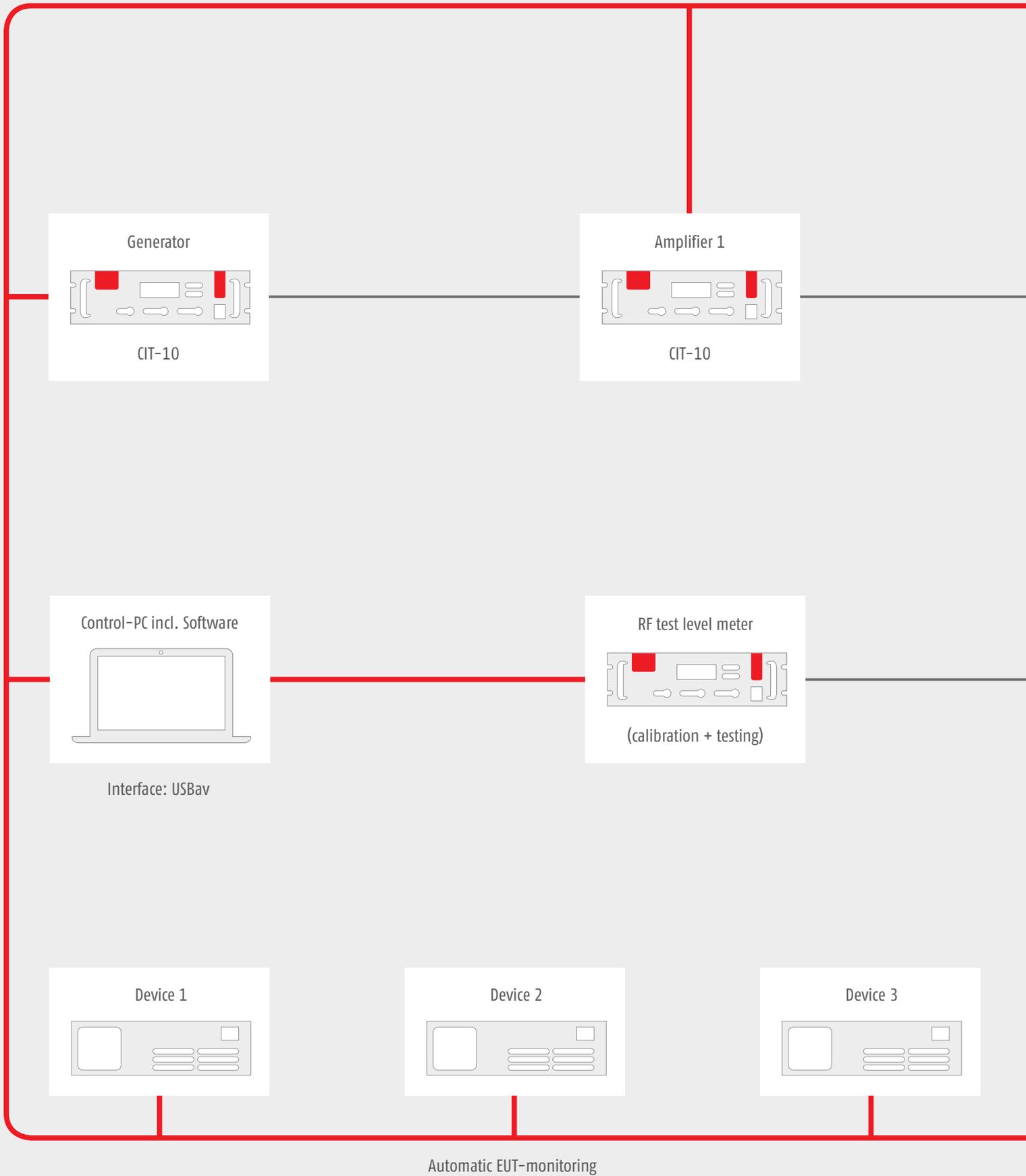


CIRCUIT DIAGRAM OF A TEST SYSTEM

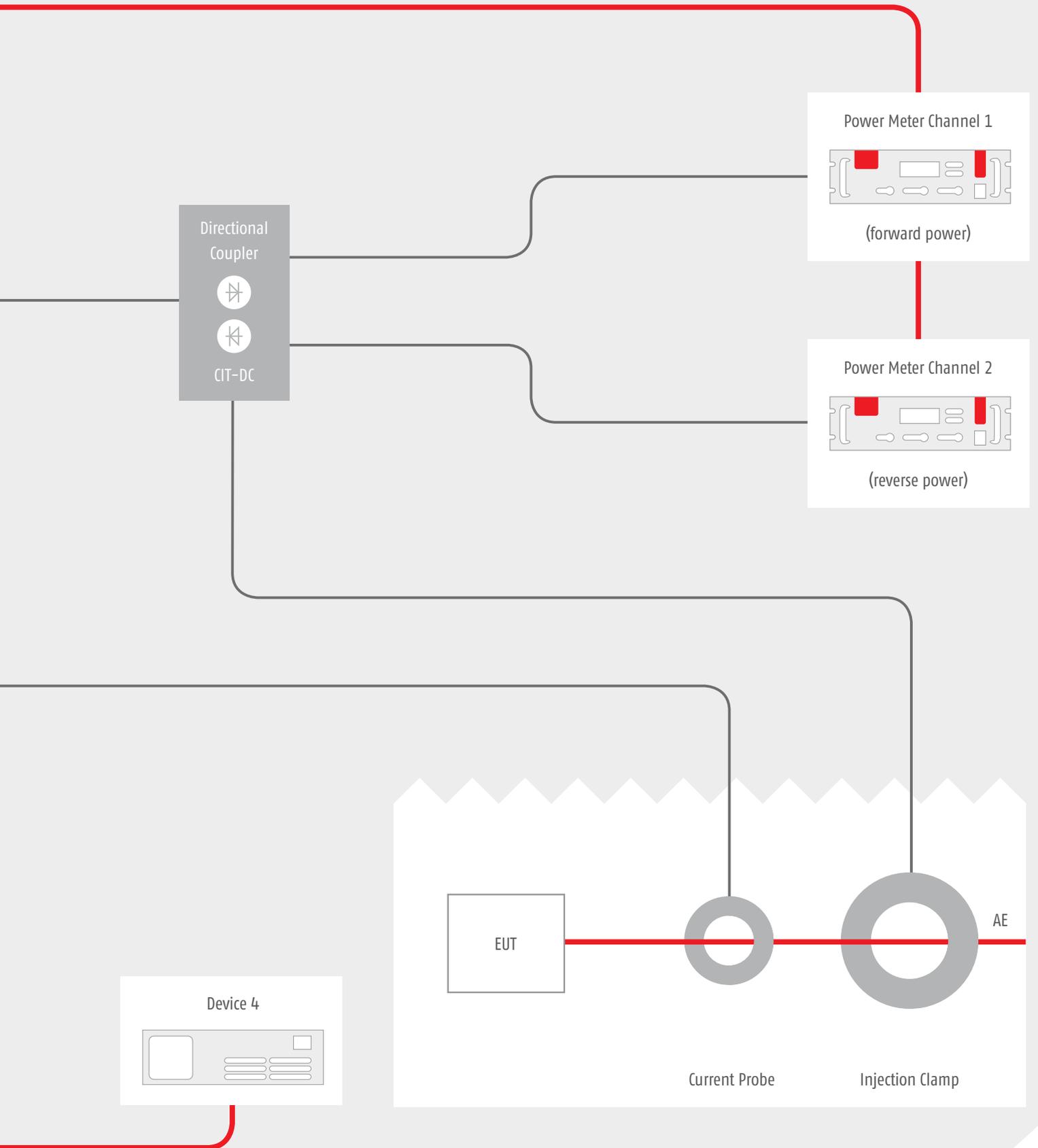
ACCORDING TO IEC/EN 61000-4-6



CIRCUIT DIAGRAM OF A BCI TEST SYSTEM



CIRCUIT DIAGRAM OF A BCI TEST SYSTEM





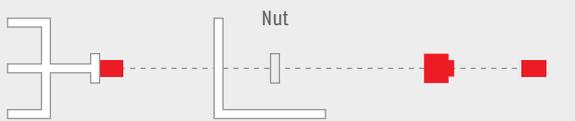
Description

Immunity tests according to IEC/EN require coupling of RF disturbance voltages into any conducting cable of an EUT. Furthermore these disturbances should not be coupled into any further equipment so that a decoupling path to any auxiliary equipment is provided. We offer a wide range of CDNs for different types of interconnected lines which are fully calibrated for the frequency range from 150kHz to 230MHz. The following CDNs are available: M-, AF-, S-, T-, RJ, USB-types. Almost any network can be assembled on customer's requests. Guidance for selecting the appropriate CDN is given in the following table:

Type	Interconnected lines
M1, M2, M3, M4, M5, M2+M3	Unscreened supply (mains)
AF2, AF4, AF5, AF6, AF8	Unscreened nonbalanced lines
S1, S2, S4, S8, S9, S15, S25, S36	Screened lines
T2, T4, T8	Unscreened balanced lines
RJ11, RJ45	Unscreened data lines
RJ11/S, RJ45/S, USB	Screened data lines

Calibration:

To calibrate a CDN an adaptor, a fastening angle and 50 Ω / 150 Ω adaptor are required. Fastening angle and 50 Ω / 150 Ω adaptor should be ordered for the first CDN. For each following CDN only the specific adaptor has to be ordered.



Adapter with BNC jack, specific for each CDN, e.g. with 3 banana plugs for CDN M3

Fastening angle

50 / 150 Ω adaptor with BNC connectors

Test procedure with Coupling/Decoupling (CDNs) Networks acc. to IEC/EN 61000-4-6:

- The EUT shall be placed on an isolating support, 0.1 m above the ground reference plane. For table-top equipment, the ground reference plane may be placed on a table.
- On all cables to be tested, coupling and decoupling devices shall be inserted.
- The coupling and decoupling devices shall be placed on the ground reference plane, making direct contact with it at about 0.1 – 0.3 m from the EUT.
- The cables between the coupling and decoupling devices and the EUT shall be as short as possible and shall never be bundled or wrapped.
- The height above the ground reference plane shall be between 30 and 50mm (where possible).
- The 6dB attenuator shall be placed to the coupling and decoupling device as near as possible.
- The test shall be performed with the test generator connected to each of the CDNs in turn while the other non-exited RF-input ports of the CDNs are terminated by a 50 Ω load resistor.

Set-up for level setting at the EUT-port of coupling and decoupling devices:

1. The test generator (RF-out) shall be connected to the RF-input port of the coupling device via the 6dB-attenuator.
2. The EUT port of the coupling device shall be connected in common-mode through the 150 Ω to 50 Ω adaptor to the RF-Voltmeters (calibration).
3. The AE-port shall be loaded in common-mode with a 150 Ω to 50 Ω adaptor, terminated with 50 Ω .

With direct injection to screened cable (CDN S-types), the 150 Ω load at the AE-port is not required as the screen will be connected to the ground reference plane at the AE-port side.

Although the 150 Ω load at the AE-port is mandatory with CDN T-, AF- and M-types calibration data are identical with the AE-port open or short. This is because a capacitor is connected to ground at the AE-port side, which leads to a RF-short-circuit similar to the CDN S-types. This means that even with CDN M-, AF- and T-types the 150 Ω load at the AE-port is not required.

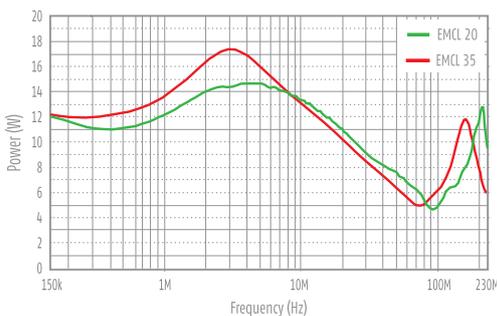
EM COUPLING CLAMP – EMCL

FOR IMMUNITY TESTS ACC. TO IEC/EN 61000-4-6



Features

- EM-clamp for immunity testing of cables with up to 20 mm diameter
- High coupling factor: less than 15 watts amplifier output power is required to obtain a test level of 10 V
- Calibration unit and calibration data are supplied with each instrument



Measured amplifier output power to obtain a test level of 10 V. 6 dB attenuator and 80% amplitude modulation depth are taken into account.



Calibration unit of EMCL (included as standard)

Description

According to IEC/EN 61000-4-6 the preferred coupling and decoupling devices are the CDNs, for reasons of test reproducibility and protection of the AE. However, if they are not suitable or available, clamp injection should be used.

Often, clamp injection needs to be applied to multi-pair balanced cables because suitable CDNs might not be available.

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

The EM clamp (in contrast to the conventional current injection clamp) has a directivity ≥ 10 dB, above 10 MHz, so that a defined impedance between the common-mode point of the AE and the ground reference plane is no longer required. Above 10 MHz, the behavior of the EM clamp is similar to that of a CDN.

Technical Specifications	EMCL-20	EMCL-35
Frequency range	10 kHz-1000MHz	10kHz-1000MHz
Nominal impedance	50Ω	50Ω
Connector	N-type female	N-type female
Maximum input level		
0.15MHz-100MHz	100W, 15 min.	100W, 15 min.
100MHz-230MHz	100W, 5min.	100W, 5min.
230MHz-1000MHz	50W, 3 min.	50W, 3 min.
Cable diameter	<20mm	<37
Weight	7 kg	14 kg
Dimension (LxWxD)	655 x 120 x 80mm	666x135x120mm

BULK CURRENT INJECTION & CURRENT MONITORING PROBE



(Optional matching transformer)



Bulk current injection probe

The Bulk Current Injection Probe is used to inject RF-current into cables of electrical equipment to test the susceptibility against radiated electromagnetic energy.

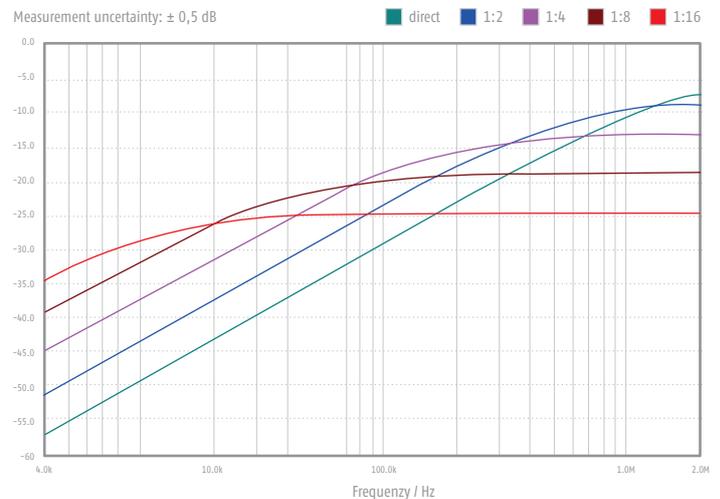
It was designed to meet the specifications of ISO 11452-4:2005 and IEC 61000-4-6 standards for automotive BCI testing with secondary currents of 300 mA and more.

The probe can be easily clamped around test conductors and supports cable harness diameters up to 40 mm diameter.

Technical Specifications

Frequency range	4 kHz – 400 MHz
Input Connector	Type N Female
Inner diameter	120 mm
Outer Diameter	40 mm
Width	40 mm
Max. core temperature	90 °C
Turns Ratio	1:1
Primary inductance	5.1 μ H @ 100 kHz
Ambient temperature	0 to 40 °C
Fastening	1 Clip
Input Power rating until core temperature is 90 °C*	90 min @ 70 W (48.45 dBm) 45 min @ 100 W (50 dBm)

* higher input power possible for shorter duration. Control via integrated temperature sensor



Insertion loss when using the matching transformer MT-1. The selection of the ratio in dependence of the frequency can be optimized by automatic software control via LAN or UB-interface.

Features

- Meets specifications of ISO 11452-4:2005 and IEC 61000-4-6
- Frequency range from 4 kHz up to 400 MHz
- Designed for automotive BCI testing
- Low insertion loss with optional matching transformer

Current monitoring probe – MP50

The Current Monitoring probes may be used whenever RF current measurements are required. Current measurements are made by placing a current carrying conductor within the "sensing" window of the probe and measuring the probe's output voltage with an RF detector. Calibration of the probe permits the conversion of the voltages measured to current. Current measurements can be made over the frequency range shown in the transfer impedance curve furnished with each probe. There is virtually no loading of the

circuit and the technique permits normal operation of the device under test during measurements.

The MP-50 can be used for the procedure for clamp injection when the common-mode impedance requirements cannot be met given in chapter 7.4 of IEC/EN 61000-4-6 „Immunity to conducted disturbances, induced by radio frequency fields“. The MP-50 can also be used as current monitor for BCI testing as per ISO11452-4, RTCA/DO-160 section 20, MIL-STD-461 and various automotive standards.

Technical Specifications

Frequency range	10 kHz – 400 MHz
Insertion impedance	< 2,5 Ohm
Cable diameter	< 46 mm
Signal output	BNC socket
Max signal current (10 kHz–400 MHz)	1A
Dimensions	Outer diameter 115 mm
	Thickness 30mm
	Overall length 136mm
Weight	0,55 kg

Features

- As required in IEC/EN 61000-4-6
- Suitable for BCI testing per ISO11452-4, RTCA/DO-160 section 20, MIL-STD 461 CS 114, and various automotive standards
- Individual calibration data with each probe



MAGNETIC-FIELD / LOW-FREQUENCY TEST SYSTEM – MTS-800

FOR EMISSION AND IMMUNITY TESTS



Description

The MTS-800 is a compact test system for broadband generation and measurement of magnetic fields. Its internal components allow automatic EMC tests according to automotive standards where high field strength need to be generated or measured.

In combination with our triaxial Helmholtz coils full automated susceptibility tests are possible at magnetic field strength up to 1000 A/m for frequencies from DC to 1 kHz. Lower field strength can be generated for frequencies up to 250 kHz. Due to the triaxial set-up of our Helmholtz coil major improvement in device handling is achieved because there is no need to turn an EUT during tests.

Tests and measurements are controlled by a program which will set most parameter automatically. For any relevant standard, which are fulfilled by the MTS-800, limit values are already included into the software package, although any different value can be defined by a user. After every test full reports will be created automatically. Report layout is pre-defined, though any user-defined layout is possible. High performance is guaranteed by a self-calibration process which utilizes an internal source as reference.

Applications:

Magnetic Field Generation

MTS-800 enables a user to generate strong magnetic fields up to 1000 A/m. Even alternating fields up to 250 kHz can be generated by the magnetic test system.

Low Frequency emission and immunity tests

acc. to MIL-STD 461, CE 101, RE 101, CS 101, CS 109 and RS 101. Individual software modules and hardware accessories are available for each of these tests.

Automotive Testing

Intensive testing is required for new products which should be used in any automotive application. The MTS-800 allows fast and easy testing according to many automotive standards as described before.

Special Features:

- Frequency range for emission and immunity measurements: DC–250kHz
- 800W precision power amplifier, signal generator and spectrum analyzer in one compact unit
- All instruments may as well be used as stand-alone devices
- Powerful but easy to operate software, fully expandable for future standards modifications
- Standard software allows easy operation, report generation and integration of external measuring instrument for EUT monitoring
- Prepared for connection of external multimeter for EUT control
- Fully automated tests with triaxial Helmholtz coil. Software controlled generation of magnetic field in x-, y- and z- direction; no need to turn the EUT!
- Large variety of extensive accessories available
- The MTS-800 complies to all magnetic field requirements of relevant EMC and military standards

Options:

- Common mode test adapter for balanced signal and control connections according to IEC/EN 55103-3
- Calibration network for common mode test adapter according to IEC/EN 55103-2
- Current transducer for balanced video connections according to IEC/EN 55103-2
- Enclosed variable transformer for short term field according to IEC/EN 61000-4-8; prim. 230 V, sec. 0 to 230 V, max. current 20 A; incl. supply cable

Technical specifications

Voltage input (Analyzer)

Frequency range	DC – 250 kHz
Input impedance	1 M Ω / 50 Ω switchable
Connector	XLR, unbalanced
Max. input voltage	100 V continuous (attenuator autoset at overvoltage); 10 V at 50 Ω
Gain	-20/0/20 dB Preamplifier, 0/20/40 dB ADC Amplifier; Self-calibration with ultra stable on-board reference

Current input

Frequency range	DC – 250 kHz
Shunts	10 m Ω / 1 Ω / 100 Ω
Max. input current	20 A continuous (overload protection); 1 Ω and 100 Ω shunt are protected by an additional 1.5 A fuse
Connector	4 mm safety jack (+, -) measurement via insulation amplifier or input jacks
Measurement range	20 A, 10 A, 1 A, 100 mA, 10 mA, 1 mA automatic offset and gain; Self-calibration with ultra stable on-board reference

AD converter

Resolution	16 Bit
Sampling rate	1.25 MSPS
Aliasingfilter	0.01 dB Tschebyscheff filter, fg = 260 kHz; filter may be switched off

Generator

Frequency range	DC – 250 kHz
Output impedance	50 Ω
Connector	BNC, unbalanced
Signal	Sine wave / triangular /square wave / DC
Amplitude	0 to 10 VAC, -10 V to +10 VDC
Resolution	12 Bit (2.5 mV), Switchable - 20 dB Attenuator; Self-calibration with ultra stable on-board reference

Amplifier

Frequency range	DC – 1 MHz
Connector	4 mm safety jacks (output); BNC, unbalanced (input)
Current	16 Arms
Voltage	50 Vrms / 75 VDC
Distortion (DC-100 kHz, load \geq 4 Ω)	< 0.10 %

General data

EUT control / Connector	9-pin Sub-D; RS232
Connection to Computer	USB
Temperature range	0 to 40 $^{\circ}$ C
Warm-up time	15 min.
Housing	19"-Subrack or desktop case
Dimensions (W x H x D)	449 x 177 x 580 mm
Weight (shipping)	approx. 40 kg (net 34 kg)
Gain	10 \pm 0.1% (\pm 0.01% / $^{\circ}$ C)

MAGNETIC-FIELD / LOW-FREQUENCY TEST SYSTEM – MTS-800

FOR EMISSION AND IMMUNITY TESTS

Features:

Automatic Testing Capabilities

Full compliance with several immunity test as ISO 11452-8, MIL-STD-461 RS101, CS101, CS109, IEC/EN 55103-2, IEC/EN 61000-4-8, SAE J1113-2, SAE J1113-22, Ford ES-XW7T-1A278-AC, GM W3097, PSA B21 7110, Renault 36-00-808, DC-11224, DC 10614 and similar standards. Furthermore the MTS-800 allows emission measurements according to MIL-STD-461E/F RE101, CE101 and IEC/EN 55103-1.

Software

Any function is controlled via a software which also guide the user through any test or measurement. Adaptation of signal strength or measurement graphs are possible at any stage. User defined signals complement the usage for fast and reliable tests. The software is written in LabVIEW which guarantees stable and fast performance on any Microsoft® Windows platform.

Components

MTS-800 consists of 3 independent modules: a signal generator (DC – 250 kHz), a power amplifier (800 W output maximum, DC – 1MHz bandwidth) and spectrum analyzer (16 Bit, 1 MSPS sampling rate). All modules can be used as stand-alone units.

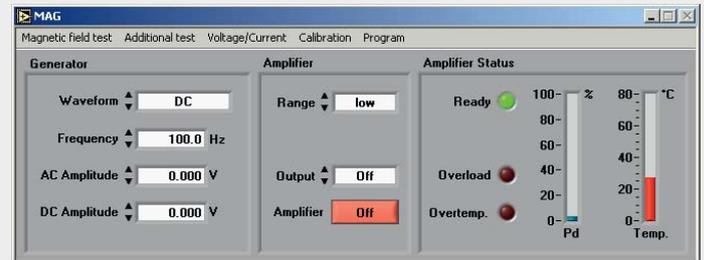
Self-calibration

Using an ultra-stable voltage source self-calibration correction values are stored in an internal EEPROM. Any voltage signal or voltage measurement device is calibrated at a self-calibration process automatically in about a minute.

Accessories

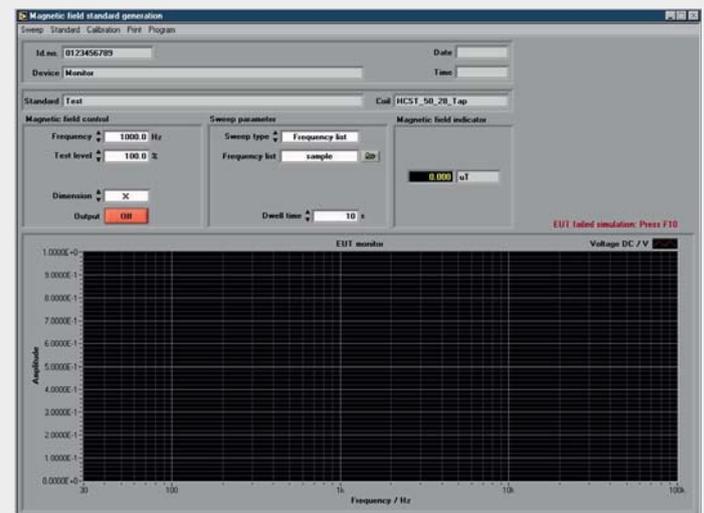
Frankonia provides also many different coils and loop sensor which are ideally suited for the described tests. Any additional equipment is ready to use without a need for recalibration. Not only our own equipment can be used with the MTS-800, but also user defined coils. A calibration mode is included in the software to complement the magnetic test system with any further equipment.

Control Panel:



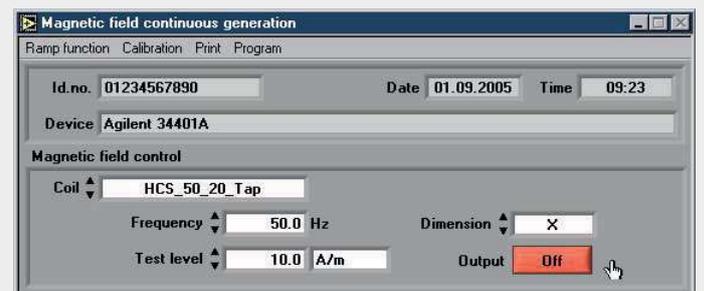
The software starts with the generator/amplifier control panel. This window allows basic settings of generator and amplifier.

Standard generation window:



Open the Magnetic field generation window for susceptibility tests according to predefined standards.

Magnetic field continuous generation window:



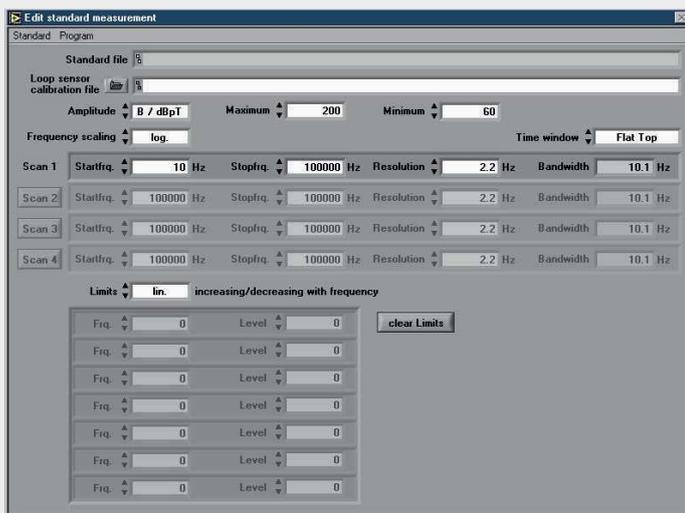
Open the continuous generation window for long term magnetic field test.

MAGNETIC-FIELD / LOW-FREQUENCY TEST SYSTEM – MTS-800

FOR EMISSION AND IMMUNITY TESTS



Example standard file:



Edit a predefined standard or create a new one. Load, save and print data.

Measurement results:



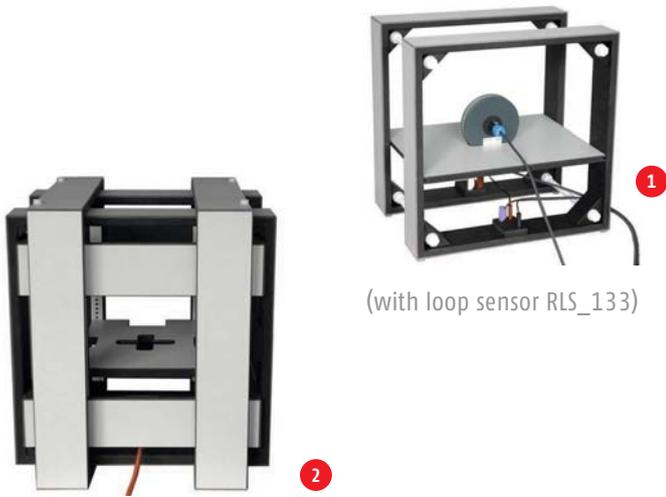
Open the Magnetic field measurement window for spectrum analyzer measurements. Perform a single or continuous measurement. Perform test according to predefined standards.

Further features and possibilities:

- Susceptibility tests with fixed frequencies and test levels or use the ramp function to sweep from start to stop level. Verify the generated field of any radiating coil with loop sensor.
- Short term generation window for short term magnetic field tests (optional).
- Scope mode window.
- Determine the coil factor of an unknown coil
- Self calibration of the MTS-800

MAGNETIC-FIELD / LOW-FREQUENCY TEST SYSTEM – MTS-800

FOR EMISSION AND IMMUNITY TESTS



(with loop sensor RLS_133)



Helmholtz Coils

Several Helmholtz coils are available for susceptibility tests. We also offer tri-axial Helmholtz coils which are suitable for MTS-800. To achieve 1000 A/m at 1 kHz, it is absolute necessary to use our Helmholtz coils and an optional compensation board.

Loop Sensors / Radiating Loops

For immunity tests we offer radiating loops which are necessary to generate magnetic fields. The required loop sensors for measuring emission can also be ordered.

Coil-Type	Technical specifications
1 HCST_50/28_TAP	Tapped triaxial Helmholtz coil for immunity tests
2 HCS_50/28_TAP	Tapped single axis Helmholtz coil for immunity tests
Max. current	Designed for the generation of magnetic fields with field strength > 1000 A/m
HCS_125/75_TAP	Tapped single axis Helmholtz coil for immunity tests according to IEC / EN 55103

Coil-Type	Technical specifications
3 RL_120	120 mm radiating loop according to MIL-STD-461
4 LS_040	Electrostatically shielded loop sensor according to MIL-STD-461
LS_133	Electrostatically shielded loop sensor according to MIL-STD-461
RLS_133	Electrostatically shielded loop sensor according to IEC/EN 55103-1/2
Can be used as radiating loop and loop sensor	



Coupling Transformer

MIL-STD-461 CS 101 requires a coupling transformer for conducted susceptibility tests. Frankonia has developed a coupling transformer which meets all requirements. Due to direct coupling to voltage mains, the coupling transformer has an additional differential amplifier for common mode rejection of the AC mains. Using the coupling transformer without this amplifier can destroy any measurement instrument due to overvoltage.

MAGNETIC-FIELD / LOW-FREQUENCY TEST SYSTEM – MTS-800

FOR EMISSION AND IMMUNITY TESTS



Current transducer incl. correction network



Calibration network



Common mode test adapter

Testing equipment acc. to IEC/EN 55103-2

IEC/EN 55103-2 requires certain immunity tests for frequencies from 50 Hz to 10 KHz. The following test equipment fulfills all requirements according to IEC/EN 55103-2, annex B.

Accessories selecting table:

Test equipment MIL-STD 461	Recommended Model	CE101	CS101	CS109	RE101	RS101
Measurement receiver	MTS-800	•		•	•	•
Current probe	Any commercially available model	•		•		•
Signal generator	MTS-800	•	•	•	•	•
Power amplifier	MTS-800		•	•		•
Data recording device	MTS-800	•			•	
Oscilloscope	MTS-800	•	•			
Coupling transformer	CT_2.5/50 AC		•	•		
Isolation transformer	IT-6/-16/-20/-20/3P		•	•		
LISNs	Any commercially available model	•	•		•	•
Radiating loop 12cm	RL_120					•
Loop sensor 4cm	LS_040					•
Loop sensor 13.3cm	LS_133				•	
Ohmmeter	Any commercially available model				•	

Standards

CE101	Conducted Emission, Power Leads, 30 Hz to 10 kHz
CS101	Conducted Susceptibility, Power Lead, 30 Hz to 150 kHz
CS109	Conducted Susceptibility, Structure Current, 60 Hz to 100 kHz
RE101	Radiated Emission, Magnetic Field, 30 Hz to 100 kHz
RS101	Radiated Susceptibility, Magnetic Field, 30 Hz to 100 kHz

POWER SIGNAL GENERATOR – PSG-300

ACC. TO IEC/EN 61000-4-16, IEC/EN 61000-4-19 AND IEC/EN 61543



Description

The PSG-300 contains a linear precision power amplifier with a wide bandwidth (DC-300 kHz), suitable for all applications concerning fast alternating signals at high output power. The built in generator provides sine, square and triangle waves. Communication between PSG-300 and PC is via USB connection. The application software is suited for general power generator applications and for immunity tests according to IEC/EN 61000-4-16 as well as to IEC/EN 61543. Short term tests are enabled by phase controlled switching of an external power source (optional). The PSG-300 is equipped with a silent, temperature-controlled fan. Internal safeguards protect the amplifier from overheating and high power dissipation. They also assure protection against short-circuits and overload.

Features:

- Short circuit and overload protection
- Completely linear and low noise design
- Outstanding DC stability
- Over temperature switch off
- Protection / Ready LED
- EUT-fail input
- EUT-monitor input

The number one choice for all applications with the need for fast and powerful signals, e.g.:

- Simulation of DC / AC supply lines
- Generation of magnetic fields with Helmholtz or similar coils
- Control of piezo actors
- Immunity testing according to IEC/EN 61000-4-16, IEC/EN 61000-4-19 AND IEC/EN 61543
- Calibration devices etc.

POWER SIGNAL GENERATOR – PSG-300

ACC. TO IEC/EN 61000-4-16, IEC/EN 61000-4-19 AND IEC/EN 61543

Technical specifications	PSG-300	PSG-300A
Amplifier		
Frequency range	DC – 1 MHz (small signal -3 dB)	
Power bandwidth	DC – 200 kHz	
Slew rate	100 V/μs	
Offset	±1 mV (±0.1 mV/°C)	
Gain	10 ±0.1 % (±0.01 %/°C)	
Output voltage	50 V _{eff} / ±75 V _{peak}	
Output current	5 A _{eff} / ±7.5 A _{peak}	16 A _{eff} / ±23 A _{peak}
Power output	250 W	800 W
Distortion (DC – 100 kHz, load ≥ 4 Ω)	< 0.10%	
Input impedance	100 kΩ	
Max. input voltage	80 V (cont.), 100 V (< 1 min)	
Noise (10 Hz – 1 MHz, input: 50 Ω)	0.5 mV _{eff}	
Output connector	4 mm MC	
Output connector 50 Ω	BNC	
Generator		
Frequency range	DC, 0.05 Hz – 300 kHz	
Frequency resolution	0.05 Hz	
Frequency accuracy	± 20 ppm	
Waveform	Sine, square, triangle	
External generator input	BNC	
General data		
Remote control	USB connector	
Dimension (LxWxD)	448,9x132.55x435.50mm	448.90 x 177 x 585.50 mm
Weight	approx. 14 kg	approx. 30 kg

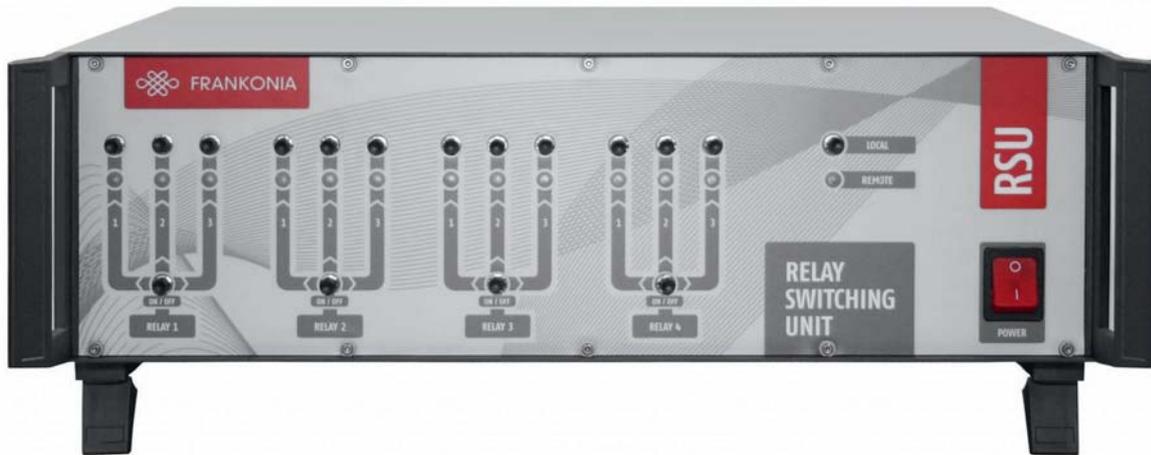
Options:

PSG-E300 External power source for short term test 300V@DC,162/3Hz,50Hz,60Hz

PSG-EXT Input connector for phase controlled switching of external power source

RF-RELAY SWITCHING UNIT – RSU

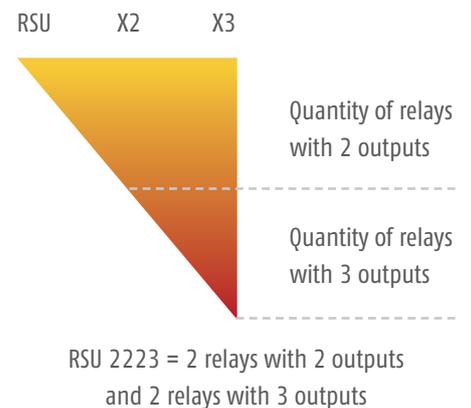
DC...12.4 GHz (up to 18 GHz or 40 GHz optional)



Description

The RSU Relay Switching Unit is applicable for all fields of RF- and EMC measurements to switch (manual or remote-controlled) from one input to 2 or 3 outputs. Typical applications in measuring systems are changeover switching between different amplifiers, antennas or power meters. This does also prevent circuit faults due to wrong cabling. By means of a selector switch on the front panel of the RSU it is possible to work in manual mode or remote-control mode via the RS232, USB or GPIB interface. The input/output connectors of the relays are installed on the rear panel of the RSU, this allows an easy cabling when or where the RSU is mounted into a 19"-rack. A RSU can be equipped with a maximum of 4 relays with 2 or 3 outputs. The quantity of relays with 2 or respectively 3 outputs is variable. The delivery includes a Windows software for easy remote-controlled applications. However for extensive systems it is recommended to integrate the RSU driver into the system control software. The easy to follow commands for RS232 and GPIB interfaces are listed in the user manual.

Definition of the relay assembly:



Technical specifications		RSU			
Frequency range	DC to 12.4 GHz (up to 18 GHz or 40 GHz optional)				
Test level	50 V cont., 300 V (1s) at energetically used frequencies				
	DC...1 GHz	1 GHz...5 GHz	5 GHz...10 GHz	10 GHz...12.4 GHz	
VSWR	≤ 1.04	≤ 1.14	≤ 1.3	≤ 1.5	
Isolation	≥ 90 dB	≥ 80 dB	≥ 70 dB	≥ 70 dB	
Insertion loss	≤ 0.05 dB	≤ 0.1 dB	≤ 0.2 dB	≤ 0.3 dB	
Max. power input	≤ 1.00 kW	≤ 0.44 kW	≤ 0.31 kW	≤ 0.28 kW	
Impedance	50Ω				
RF-connectors / Relays	N-female				
Switching time	≤ 60 ms				
Number of operations	Max. 10/Minute				
Operating temperature	+10 oC ... +40 oC				
Max. humidity	< 90 %				
Cabinet	19"-subrack or desktop case				
Dimensions (D x W x H)	435.5 x 448.9 x 132.55 mm				
Weight	7.6 kg				



Isolation Transformers IT-6/-16/-20

Disturbances shall not be coupled into any support instruments. This requires decoupling of the lines. In many cases isolation transformers are used for decoupling. We offer a wide range from 6A/1-phase to 20A/3-phase. All isolation transformers are compliant to IEC/EN 61000-4-16.

Technical specifications	IT-6	IT-16	IT-20
Voltage	230 V	230 V	230 V
Current	6 A	16 A	20 A
Phase	1-phase	1-phase	1 phase
Dimensions (W x D x H)	330x230x111 mm	400x310x181 mm	400x310x181 mm
Weight	18 kg	34 kg	45 kg

COUPLING NETWORKS – CNs

ACC. TO IEC/EN 61000-4-16



Description

Immunity test for coupling conducted, common mode disturbances in a frequency range from 0 Hz to 150 kHz onto cables of EUT is described in IEC/EN 61000-4-16. It requires a CN (coupling network) depending on the type of line. Following CNs are available: AF-, M- and T-type. The test setup requires a separate decoupling of the AE (additional equipment) which shall be done by means of isolation transformers, fibre optical transmitters etc. You can find an overview that helps to select the appropriate CN in the given tables.

Technical specifications	AF2-16	AF4-16	AF8-16
for unscreened, non-balanced lines			
Frequency range	DC/15 Hz - 150 kHz		
Test level	50 V cont.		
Number of lines	2	4	8
Max. current	0.5 A		
Max. voltage	40 VAC / 50 VDC		

Technical specifications	T2-16
for unscreened, non-balanced lines	
Frequency range	DC/15 Hz - 150 kHz
Test level	50 V cont.
Number of lines	2
Max. current	0.5 A
Max. voltage	150 VAC / 200 VDC

Technical specifications	M2/AC-16	M3/AC-16	M4/AC-16	M5/AC-16	M2/DC-16	M3/DC-16
for power supply lines						
Frequency range	15Hz-150kHz				DC	
Test level	50 V cont., 300 V (1s) at energetically used frequencies				50 V cont.	
Number of lines	2	3	4	5	2	3
Max. current	32A					
Max. voltage	250 VAC / 400 VDC				50V AC or DC	

- 1 CN-M2/DC
- 2 CN-AF2
- 3 CN-T4

Features

- Switchable coupling network M2, M3, M4, M5 acc. IEC/EN 61000-4-16
- Current rating up to 125A
- For continuous and short term tests up to ± 300 V
- Remote control in connection with MTS-800, PSG-300 and PSG-E300
- May be used as stand-alone device
- EUT 250V AC or DC

Universal Coupling Network M2345/32-16

As described in IEC/EN 61000-4-16 at the frequency of the electrical power supply (either DC, 16 2/3 Hz, 50 Hz or 60 Hz) the test stimuli are applied as both continuous and short-duration disturbances. Otherwise, over the frequency range 15 Hz to 150 kHz, the test stimuli are applied as continuous disturbances only. The normal duration for short duration disturbances at the electricity supply frequency is one second. The M2345/32-16 is a multifunctional coupling network for test levels up to ± 300 V in connection with test generators MTS-800, PSG-300 and PSG-E300. In this case the M2345/32-16 is remote controlled via the application software of the test generators. Otherwise the coupling network may be front panel operated as a stand-alone device. The M2345/32-16 operates as a M2, M3, M4 or M5 coupling network. The selection can be made by a rotary switch. The coupling capacitor is shorted out for the DC tests by a push-button. For automated test you may toggle between AC and DC tests via the USB-port.



2/4-CHANNEL RF-POWER METER – PMS 1084

10 kHz to 6 GHz



Description:

The PMS 1084 is in the standard version a 2-channel RF-Power Meter for the frequency range from 100 kHz up to 6 GHz or from 10 kHz to 500 MHz (PMS 1084 B). The measuring range reaches from -60 dBm to +20 dBm. It is possible to upgrade the PMS 1084 up to max. 4 measuring channels at any time. The measured values can be displayed via a software which is included in the delivery or via

the control software of an automated test system. For the integration of the PMS 1084 into a remote-controlled test system it is equipped with serial and USB interface. Hence the PMS 1084 is very good suitable for the automated measurement of forward and reverse power in immunity test systems acc. to IEC/EN 61000-4-3 / -6. It is available for the installation into 19"-rack or as stand-alone unit.

Technical specifications	PMS 1084	PMS 1084B
Number of channels	2 (standard); up to 4 (option)	
Frequency range 2 x Input-Module LF	10 kHz - 500 MHz	
Frequency range 2 x Input-Module HF	100 kHz - 6 GHz	
Measuring range	-60 dBm to +20 dBm (10 kHz ≤ f ≤ 4 GHz) -45 dBm to +20 dBm (4 GHz < f ≤ 6 GHz)	
Accuracy	± 1 dB (0.5 dB typical)	
Resolution	0.1 dB	
Integration time	0.5 - 200 ms (firmware)	
Max. input level	+27 dBm (= 500 mW)	
VSWR	1.15	
RF-Impedance	50Ω	
Interface (PC)	USB, RS232 (9-pol Sub D. female)	
Input	N-type female connector	
Dimensions (D x W x H)	172 x 482.6 x 44.3 mm	
Weight	approx. 2.5 kg	
Power supply	115/230 V	
Accessories included	Power cord, USB cable, application software, user manual	
Options		
PMS-CHA	Expansion of 1 measuring channel (max. up to 4 channels); 100 kHz to 6 GHz	
PMS-CHAB	Expansion of 1 measuring channel (max. up to 4 channels); 10 kHz to 500 MHz	

FIELD STRENGTH METER – EFS-10 / -100 / -300 / -500

FOR FIELD STRENGTH MEASUREMENTS DURING RADIATED IMMUNITY TESTS

Description:

The Frankonia EFS field strength meters especially have been designed for field strength measurements / field homogeneity measurements during radiated immunity tests according to IEC/EN 61000-4-3 / -20. But it could also be used to measure the radiation exposure of the environment, for example at workplaces or flats.

The EFS is an isotropic miniature E-field sensor to ensure that the E-field will not be influenced by the size of the sensor itself. It even does not need any metering unit (which could also influence the field strength), because of its direct fibre optic output which allows direct connection of the sensor to the USB-interface of the control PC or laptop. The measuring values may be displayed via the individual IEC/EN 61000-4-3 / -20 control software or via a Windows software included in the delivery.

The EFS-10 / EFS-100 cover the frequency range from 10 kHz up

to 9.25 GHz and are able to detect electrical field strength in the range from 0.14 V/m to 500 V/m (depending on type).

The sensors are battery operated by Li-Mn batteries, which allow a maximum operation time of 80 hours before recharging.

Features

- Extreme small size
- PC connection via fibre optic link
- Excellent isotropy (0.3 dB typical)
- Frequency range: 10 kHz to 26,5GHz
- Field strength measurements from 0.14 V/m to 500 V/m
- Up to 80 hours operating time before recharging



FIELD STRENGTH METER – EFS-10 / -100 / -300 / -500

FOR FIELD STRENGTH MEASUREMENTS DURING RADIATED IMMUNITY TESTS

Technical specifications	EFS-10	EFS-100
Frequency range	10 kHz-9.25GHz	100 kHz - 9.25 GHz
Flatness	0.1MHz-150MHz: 0.4 dB	1 - 150 MHz: 0.8 dB
With frequency correction OFF	0.05GHz-6GHz: 1.6 dB 0.03GHz-7.5GHz: 3.2 dB	0.5 - 6 GHz: 1.6 dB 0.3 - 7.5 GHz: 3.2 dB
With frequency correction ON	0.05GHz-7.5GHz: 0.4 dB	0.3 - 7.5 GHz: 0.4 dB
Dynamic range (single range)	0.5-500 V/m (60 dB)	0.14 - 140 V/m (60 dB)
Linearity	0.4 dB @ 50 MHz / 1-500 V/m	0.4 dB @ 50 MHz / 0.3 - 100 V/m
Resolution	0.01 V/m	
Sensors	6 monopoles	
Isotropy	0.5 dB (0.3 dB typical) (@50 MHz)	
Overload	1000 V/m	300 V/m
Measured data X-Y-Z axis	sampling simultaneous on X-Y-Z axis	
Sampling rate	22 S/s to 0.03 S/s, depending on filter setting	
Digital filter	2.3 to 28 Hz, low-pass-pre-settable	
Internal battery	3V-5mAh, rechargeable Li-Mn	
Operation time	80 hours @0.4 S/sec., 28 Hz filter 60 hours @ 5 S/sec., 28 Hz filter	
Recharging time	48 for full operation time	
Internal data memory	serial number, calibration date, calibration factors, firmware version	
Communication	bidirectional fiber optic link	
Fibre optic connector	HFBR-0500	
Fibre optic length	10 m standard (20/40 m) optional	
Fibre optic to PC connection	fibre optic to RS232 converter, RS232 to USB converter	
PC Software	included (display of field, temperature and battery voltage measurements, setting of filters, sampling rate, frequency)	
Operating temperature	-10 °C ÷ +50 °C	
Temperature reading	0.1 °C resolution	
Battery voltage reading	10 mV resolution	
Dimensions	53 mm overall, (body: 17 mm diameter, sensor: 17 mm)	
Weight	25 g, including 1 m fibre optic pigtail	
Probe mount	20 UNC female	
Included accessories	10 m fibre optic cable, optical/RS232 adapter + RS232/USB adapter, software, battery charger	
Optional accessories	20 m fibre optic cable, order-no.: EFS-OF20 40 m fibre optic cable, order-no.: EFS-OF40	

FIELD STRENGTH METER – EFS-10 / -100 / -300 / -500

FOR FIELD STRENGTH MEASUREMENTS DURING RADIATED IMMUNITY TESTS

Technical specifications	EFS-300	EFS-500
Frequency range	300kHz-18GHz	300kHz-26.5GHz
Flatness	0.3MHz-18000MHz: 0.4dB	0.10MHz-18000MHz: 1.8dB
With frequency correction OFF	3MHz-8200MHz: 1.4dB 1MHz-12000MHz: 2.4dB	3MHz-23000MHz: 3.2dB
With frequency correction ON	0.6MHz-18000MHz: 3.8dB	0.3MHz-26500MHz: 0.4dB
Dynamic range (single range)	0.17-170 V/m (60dB)	0.4-800 V/m (66dB)
Linearity	0.4dB @ 50MHz / 0.3-170V/m	0.4dB @ 50 MHz / 0.8-800V/m
Resolution	0.01 V/m	
Sensors	6 monopoles	
Isotropy	0.4dB (0.2dB typical @ 50MHz)	
Overload	350 V/m	1600 V/m
Measured data X-Y-Z axis	sampling simultaneous on X-Y-Z axis	
Sampling rate	22 S/s to 0.03 S/s, depending on filter setting	
Digital filter	2.3 to 28Hz, low-pass, pre-settable	
Internal battery	3V-5mAh, rechargeable Li-Mn	
Operation time	80 hours @ 0.4 S/sec., 28 Hz filter 60 hours @ 5 S/sec., 28 Hz filter	
Recharging time	48 hours for full operation time	
Internal data memory	serial number, calibration data, calibration factors, firmware version	
Communication	bidirectional fiber optic link	
Fibre optic connector	HFBR-0500	
Fibre optic length	10m standard (20/40m optional)	
Fibre optic to PC connection	fiber optic to RS232 converter, RS232 to USB converter	
PC Software	included (display of field, temperature and battery voltage measurements, setting of filters, sampling rate, frequency)	
Operating temperature	-10 °C ÷ +50 °C	
Temperature reading	0.1°C resolution	
Battery voltage reading	10mV resolution	
Dimensions	53mm overall, (body:17mm diameter, sensor: 17mm)	
Weight	25g, including 1m fiber optical pigtail	
Probe mount	20 UNC female	
Included accessories	10m fiber optical cable, optical RS232 adapter + RS232/USB adapter, software, battery charger	
Optional accessories	20m fiber optic cable, order-no.: EFS-OF20 40m fiber optic cable, order-no.: EFS-OF40	

LASER-POWERED FIELD STRENGTH METER – EFS-LASER

10 kHz to 6 GHz



Description:

The Frankonia EFS-LASER Electric Field Probe especially has been designed for field strength measurements / field homogeneity measurements during radiated immunity tests according to IEC/EN 61000-4-3. However, it is also excellent to measure the radiation pollution of the environment, for example at workplaces or flats.

The EFS-LASER is an isotropic miniature E-field sensor to ensure, that the E-field will not be influenced by the size of the sensor itself. It even does not need any metering unit (which could also influence the field-strength), because of its direct fibre-optic output, which does allow direct connection of the sensor to the USB-interface of the control PC or laptop. The measuring values may be displayed via the individual IEC 61000-4-3 control software or via a windows-software included in the delivery.

The EFS-Laser cover the frequency-range from 10 KHz – 6 GHz. The utilized linearization technology provides a dynamic range up to 100 dB. The EFS-Laser is a smart, fast, extremely accurate electric field probe, which provides linearization, temperature compensation, control and communication functions. Noise

reduction and temperature compensation allow accurate measurements down to 0.1 V/m. The probe is laser-powered to allow continuous, galvanically isolated operation without recharging or battery replacement. The power supply unit comes in a small handy box.

Features

- Laser powered – no more empty batteries
- Extreme small size
- High resolution, high speed, low noise
- Frequency range: 10 kHz to 6 GHz
- Field strength measurements from 0.1 V/m up to 10 kV/m
- Wide dynamic range
- Continuous real-time data streaming
- Temperature compensation

LASER-POWERED FIELD STRENGTH METER – EFS-LASER

10 kHz to 6 GHz

Computer-Interface

PC Interface	USB 2.0
Application Software	included
Burst Trigger Output Level	3.3 V CMOS
Burst Trigger Output Connector	BNC
Laser – Wavelength	850 nm
Laser – Output Power	750 mW
Laser – Shutdown Time	1 ms
Fiber Optic Connector	FC / ST
Fiber Optic Cable Length	15 m
Max. Fiber Optic Cable Length	100 m (sold on request)
Input Voltage (power supply included)	5V ± 5%
Input Current	< 2A
Ambient Temperature	10 °C ... 40 °C
Dimensions (W x D x H)av	483 x 43.5 (1HE) x 120 mm

Field Sensor

Frequency range	10 kHz ... 6GHz
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Analog Rise Time

10 kHz ... 100 MHz low Bandwidth	4 µs
10 kHz ... 100 MHz high Bandwidth	40 ns
100 MHz ... 6 GHz	25 ns

Minimum Pulse Width

Burst Mode	500 ns
Streaming Mode	2 µs

Resolution	< 0.01 dB
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Sampling Rate

Burst Mode	2 MSample/s
Streaming Mode	> 500 kSample/s

Field Strength

10 kHz ... 100 MHz	< 1 V/m ... > 10 kV/m
100 MHz ... 6 GHz	< 0.1 V/m ... > 700 V/m

Damage Level

10 kHz ... 100 MHz	40 kV/m
100 MHz ... 6 GHz	10 kV/m

Dynamic Range

10 kHz ... 100 MHz	80 dB ... 100 dB
100 MHz ... 6 GHz	70 dB ... 80 dB
Isotropy, 900 MHz	< 1dB

Amplitude Accuracy

10 kHz ... 10 MHz (1.5 V/m to 30 V/m)	1.3 dB
> 10 MHz ... 1 GHz (1 V/m to 80 V/m)	1.5 dB
> 1 GHz ... 8 GHz (3 V/m to 100 V/m)	1.0 dB

Linearity Error	< 0.1 dB
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Temperature Stability	0.1 dB
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Ambient Temperature	10 °C ... 40°C
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Dimensions (W x D x H)	67 x 67 x 124 mm
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