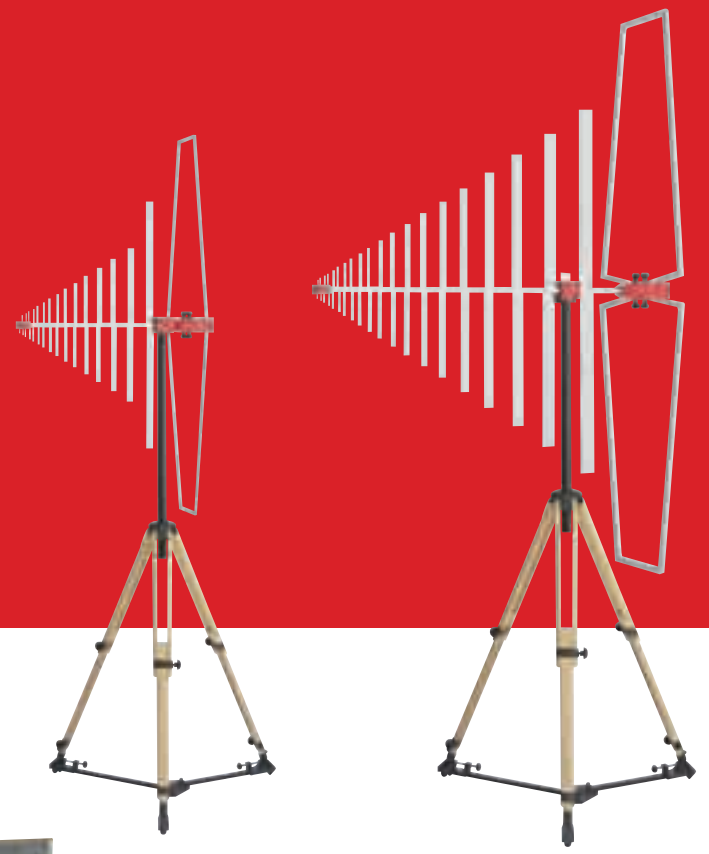




FRANKONIA

EMC TEST INSTRUMENTS
AND COMPONENTS



RF-Relay Switching Unit, Antennas, GTEM-Cells, RF Power Meter, Striplines, TEM-Cells, COMB Generator



EMC TEST INSTRUMENTS:

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Ultra-Broadband Antennas

The BTA antennas were developed in cooperation with the antenna specialists of TESTCOM, Prague. By combining their experience gained in decades of antenna construction with our know how in the planning and construction of anechoic chambers, and being acquainted with the interaction between antennas and anechoic chambers, it was possible to develop a group of antennas which exclude the weak points of conventional broadband antennas in almost every respect.

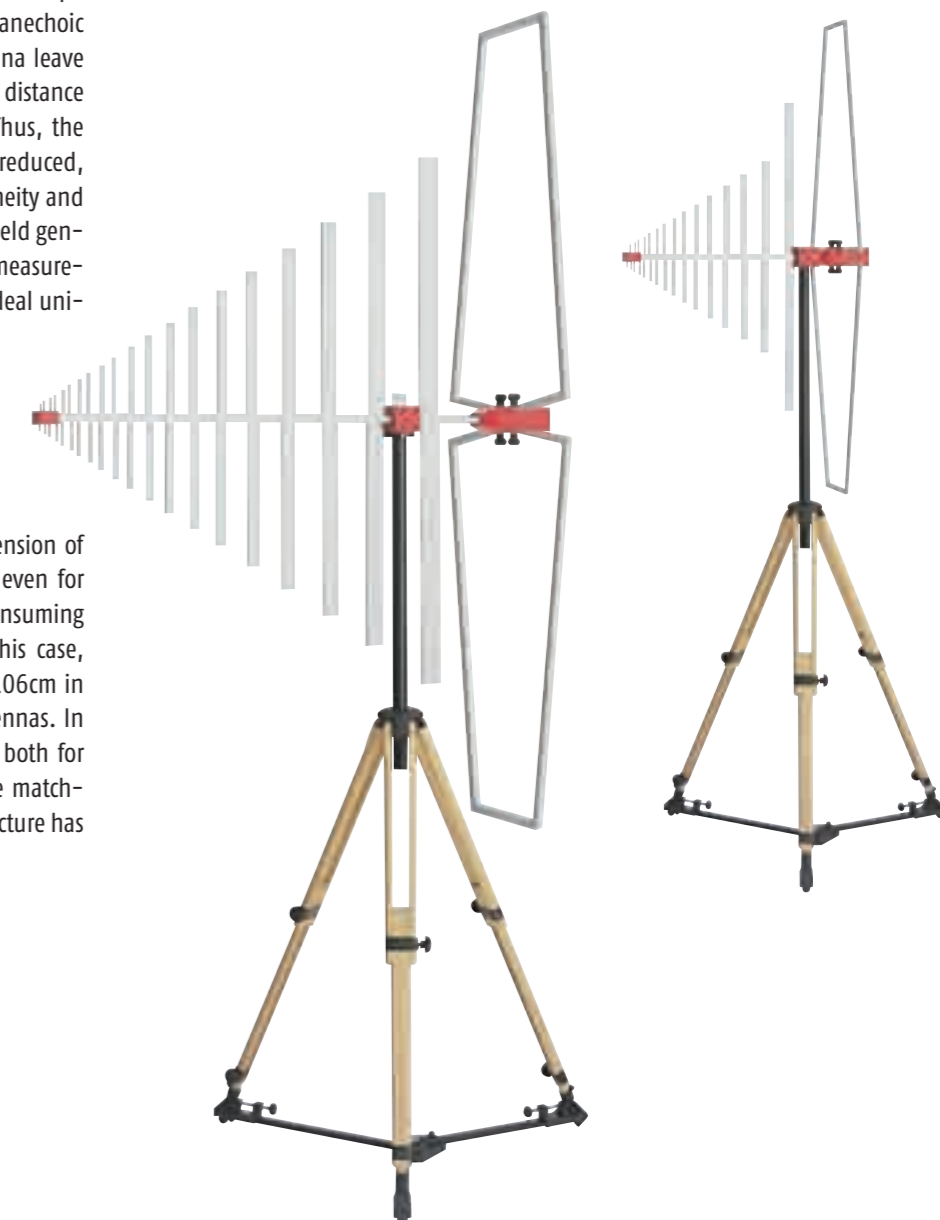
BTA-H Antenna

The BTA-H is perhaps the smallest broadband antenna presently available on the market. With only 70cm in length, and a weight of 3.0kg, this antenna is optimally suited for the operation on the antenna mast. An advantage in small anechoic chambers is that the small dimensions of the antenna leave room for an increased testing distance and a larger distance to the absorbers or the conducting surface, resp. Thus, the coupling effects between absorbers and antenna are reduced, which has a positive influence on the field homogeneity and the max. reachable field strength, especially in the field generation. The BTA-H is equally suitable for emission measurements and susceptibility tests, and is therefore the ideal universal antenna for OATS and anechoic chambers.

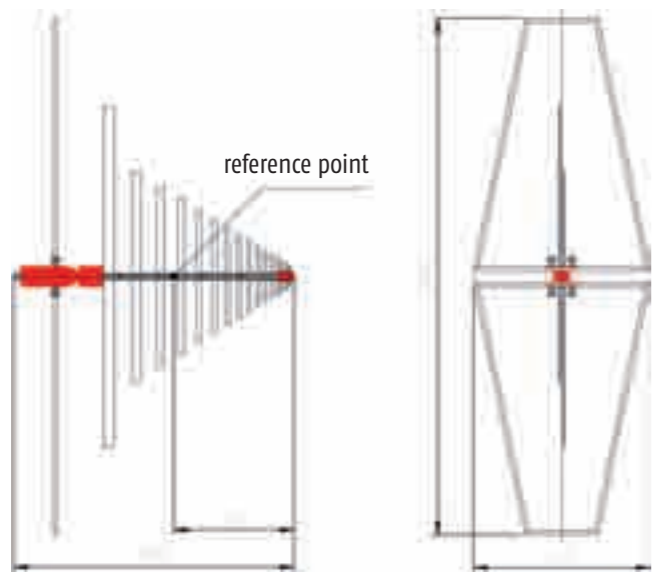


BTA-M Antenna

The most important aspect of the BTA-M is the extension of the frequency range to higher frequencies so that even for measurements from 30MHz to 3000MHz the time-consuming changing of antennas is no longer necessary. In this case, the antenna has to be somewhat larger, but with 106cm in length it is still much smaller than comparable antennas. In practice, the BTA-M offers considerable advantages both for emission measurements and susceptibility tests. The matching of the broadband dipoles to the log-periodic structure has been optimized for the whole frequency range.

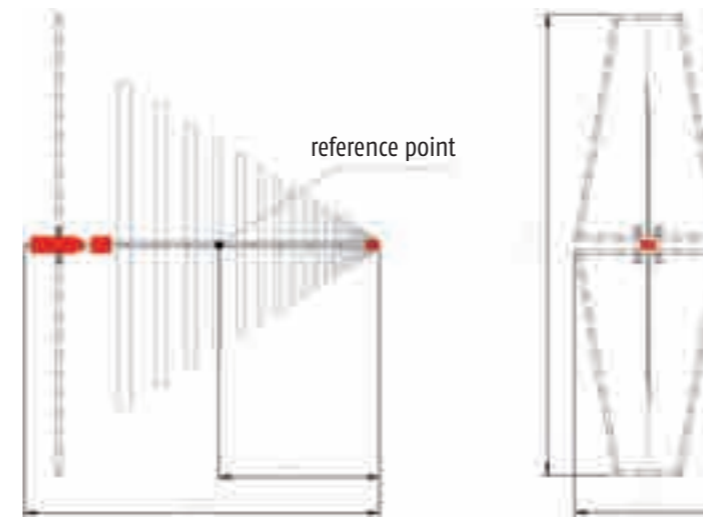


Ultra-Broadband Antenna - Type BTA-H

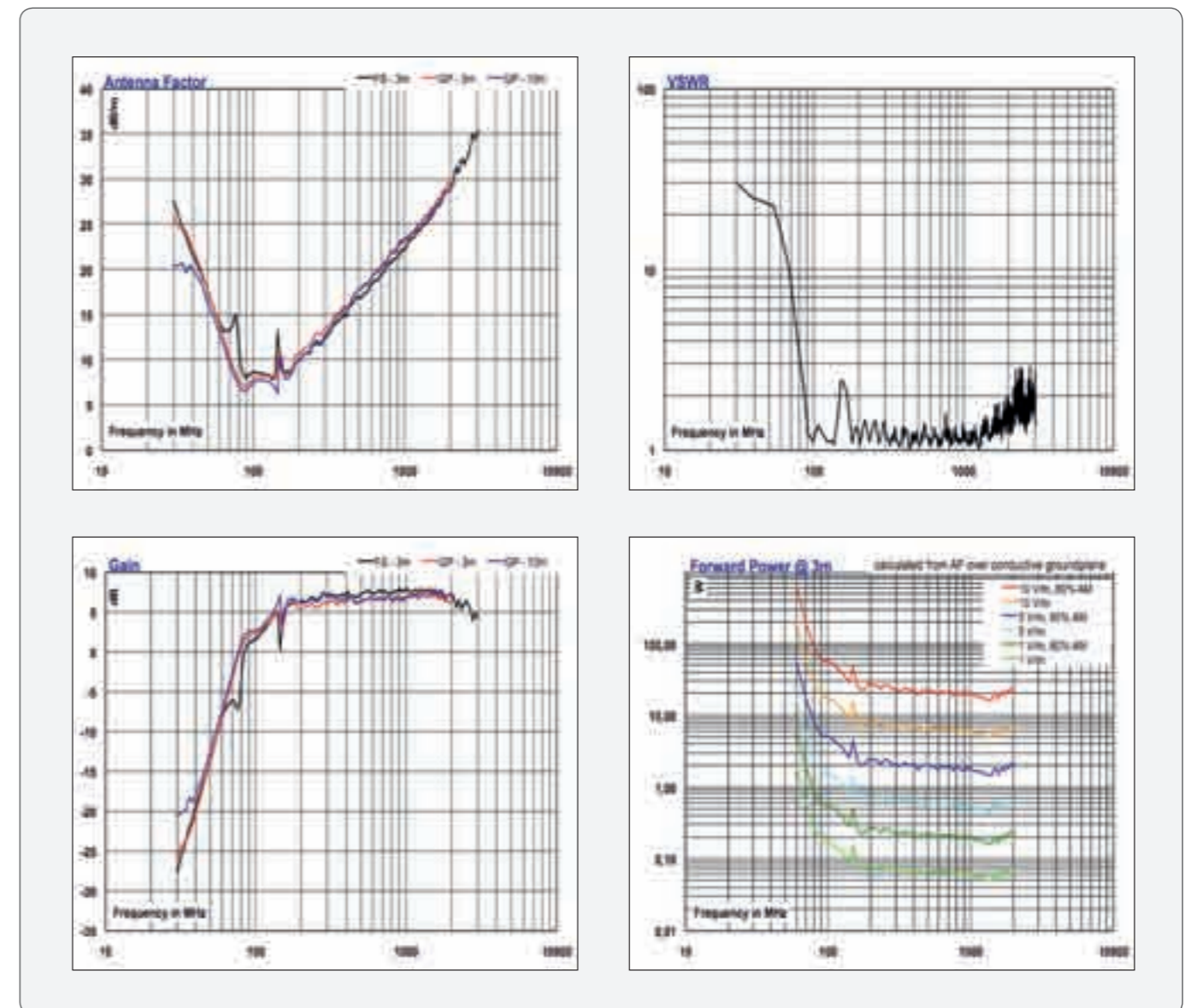
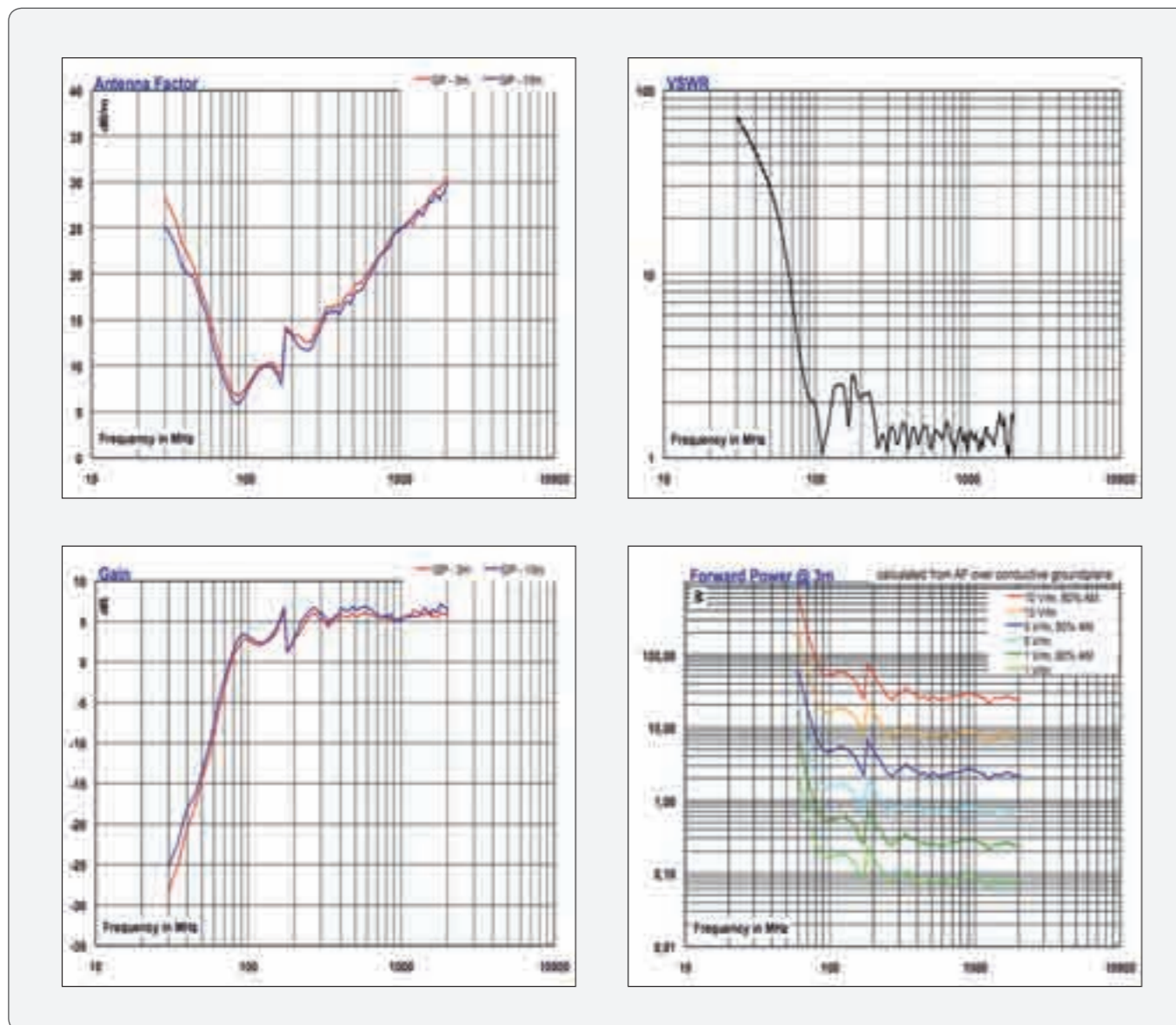


Technical specifications	
Type	BTA-H
Frequency range:	30MHz to 2000MHz
Dimensions (LxWxH) in mm:	700 x 1,289 x 440
Weight :	3kg
Max. input power :	1000W
Impedance :	50Ω
Connection :	type N female
Use:	Emission measurements Radiated immunity tests

Ultra-Broadband Antenna - Type BTA-M



Technical specifications	
Type	BTA-M
Frequency range:	30MHz – 3000MHz
Dimensions (LxWxH) in mm:	1,063 x 1,379 x 440
Weight :	4.4kg
Max. input power :	1000W
Impedance :	50Ω
Connection :	type N female
Use:	Emission measurements Radiated immunity tests



G-TEM Cells acc. to IEC/EN 61000-4-20

Septum-height: 250mm to 2000mm / 0.1MHz to 20GHz

G-TEM Cells acc. to IEC/EN 61000-4-20



Description

The GTEM cell is a TEM waveguide with the upper frequency limit extended to the GHz range. It is a low-cost alternative measurement facility for both radiated emission and immunity measurements. It is included in the published standard IEC 61000-4-20 "Emission and Immunity Testing in Transverse Electromagnetic (TEM) Waveguides". Compared to other measuring methods like EMC test in anechoic chambers or OATS (Open Area Test Sites), GTEM Cells offer some significant advantages for the testing of small and medium sized EUT's (Equipment

Under Test) up to a frequency range of 20GHz. Quick turnarounds of the EUT as well as numerous testing variations are easy and fast to handle. Switching from emission to immunity testing requires only simple adjustments, from receiver input to amplifier output. You are irrespective of long waiting times associated with off-site test labs or weather and ambient delays that can occur at OATS facilities. Whether you are at the design qualification, pre-compliance, compliance, or production sampling stage, the GTEM is the right choice for you.

Calculation of the required forward power for radiated immunity tests:

$P = (E \times h)^2 / R \times \text{flatness factor (2)} \times \text{modulation factor (3.24 for 80\%AM)}$
 E= required field strength; h=septum height in meter; R= input impedance 50Ω

Example:

Field strength 10V/m, 80%AM with GTEM 1000:
 $P = (10 \times 1.0\text{m})^2 / 50 \times 2 \times 3.24 = 12.96\text{W}$



Technical specifications	250	500	750	1000
Electrical Data				
Input connector	N	N	N	N
Nominal impedance	50	50	50	50
Frequency range, MHz	0,1MHz-20 GHz	0,1MHz-20 GHz	0,1MHz-20 GHz	0,1MHz-20 GHz
Typical VSWR within frequency range (up to 5GHz)	1:1.2	1:1.2	1:1.2	1:1.2
Typical VSWR at critical frequency (up to 5GHz)	1:1.6	1:1.6	1:1.6	1:1.6
Max input power, W	250/500	500/1000	600/1200	800/1600
Screening attenuation Typ.: >10KHz<10MHz	>50 / >100	>50 / >100	>50 / >100	>50 / >100
Electrical Equipment / Options				
Doubled input power	○	○	○	○
Sockets for EUT	1	2	2	2
Indoor lighting	○	○	○	○
Channels for fibre optic leads	1	1	1	1
RF feed-thru connectors N Type	1	2	2	2
RF feed-thru connectors SMA Type	2	○	○	○
10A / 2 wires (single phase)	●	●	●	●
Electrical safety interlock	○	○	○	○
Mains connectors	Fix/CEE	Fix/CEE	Fix/CEE	Fix/CEE
Ground connection M6	●	●	●	●
AC filter 16A/4 wires	○	○	○	○
AC filter 25A/4 wires	○	○	○	○
AC filter 32A/4 wires	○	○	○	○
AC filter 64A/4 wires	○	○	○	○
25-pole signal filter (Max.No.)	○	○	○	○
Video camera system	○	○	○	○
Mechanical Equipment / Options				
Secondary small door next to input	-	-	○	○
Window in door (WxH), 20cm Ø	-	○	○	○
Window next to door 20cm Ø	○	○	○	○
Gas / Water feed through plates	○	○	○	○
Honeycomb panel	○	○	○	○
Fans N.2 12x12cm	○	○	○	○
Light 50W	○	○	○	○
Mechanical Dimensions / Max. EUT size				
Outer (LxWxH), cm	115x64x44	300x165x110	400x220x147	500x276x184
Door (WxH), cm	30x23	42x42	61x61	79x79
Wheeled undercarriage	-	○	●	●
Weight kg approx.	80	200	400	650
Max. test volume (LxWxH), cm	20x20x15	40x40x30	60x60x50	75x75x70
Defined test vol. ±3dB	15x15x10	30x30x15	45x45x25	60x60x30
Septum height	250mm	500mm	750mm	1000mm

● Standard ○ Costed option - Not provided

Technical specifications	1250	1500	1750	2000
Electrical Data				
Input connector	7/16"	7/16"	7/16"	7/16"
Nominal impedance	50	50	50	50
Frequency range, MHz	0,1MHz-20 GHz	0,1MHz-20 GHz	0,1MHz-20 GHz	0,1MHz-20 GHz
Typical VSWR within frequency range (up to 5GHz)	1:1.2	1:1.2	1:1.2	1:1.2
Typical VSWR at critical frequency (up to 5GHz)	1:1.6	1:1.6	1:1.6	1:1.6
Max input power, W	800/1600	800/1600	800/1600	800/1600
Screening attenuation Typ.: >10KHz<10MHz	>50 / >100	>50 / >100	>50 / >100	>50 / >100
Electrical Equipment / Options				
Doubled input power	○	○	○	○
Sockets for EUT	2	2	2	2
Indoor lighting	○	○	○	○
Channels for fibre optic leads	1	1	1	1
RF feed-thru connectors N Type	2	2	2	2
RF feed-thru connectors SMA Type	○	○	○	○
10A / 2 wires (single phase)	○	○	○	○
Electrical safety interlok	○	○	○	○
Mains connectors	Fix/CEE	Fix/CEE	Fix/CEE	Fix/CEE
Ground connection M8	●	●	●	●
AC filter 16A/4 wires	○	○	○	○
AC filter 25A/4 wires	●	●	●	●
AC filter 32A/4 wires	○	○	○	○
AC filter 64A/4 wires	○	○	○	○
25-pole signal filter (Max.No.)	○	○	○	○
Video camera system	○	○	○	○
Mechanical Equipment / Options				
Secondary small door next to input	-	-	○	○
Window in door (WxH), 15 x 20cm	-	○	○	○
Window next to door (0,30 x 0,10cm)	○	○	○	○
Gas / Water feed through plates	○	○	○	○
Honeycomb panel	○	○	○	○
Fans N.2 12x12cm	○	○	○	○
Light 50W	○	○	○	○
Mechanical Dimensions / Max. EUT size				
Outer (LxWxH), cm	600x330x220	700x385x257	800x440x293	900x495x330
Door (WxH), cm	100x100	120x120	140x140	160x160
Wheeled undercarriage	●	●	●	●
Weight kg approx.	850	1000	1300	1650
Max. test volume (LxWxH), cm	95x95x85	120x120x100	140x140x120	160x160x140
Defined test vol. ±3dB	75x75x42	85x85x50	100x100x50	115x115x60
Septum height	1250mm	1500mm	1750mm	2000mm

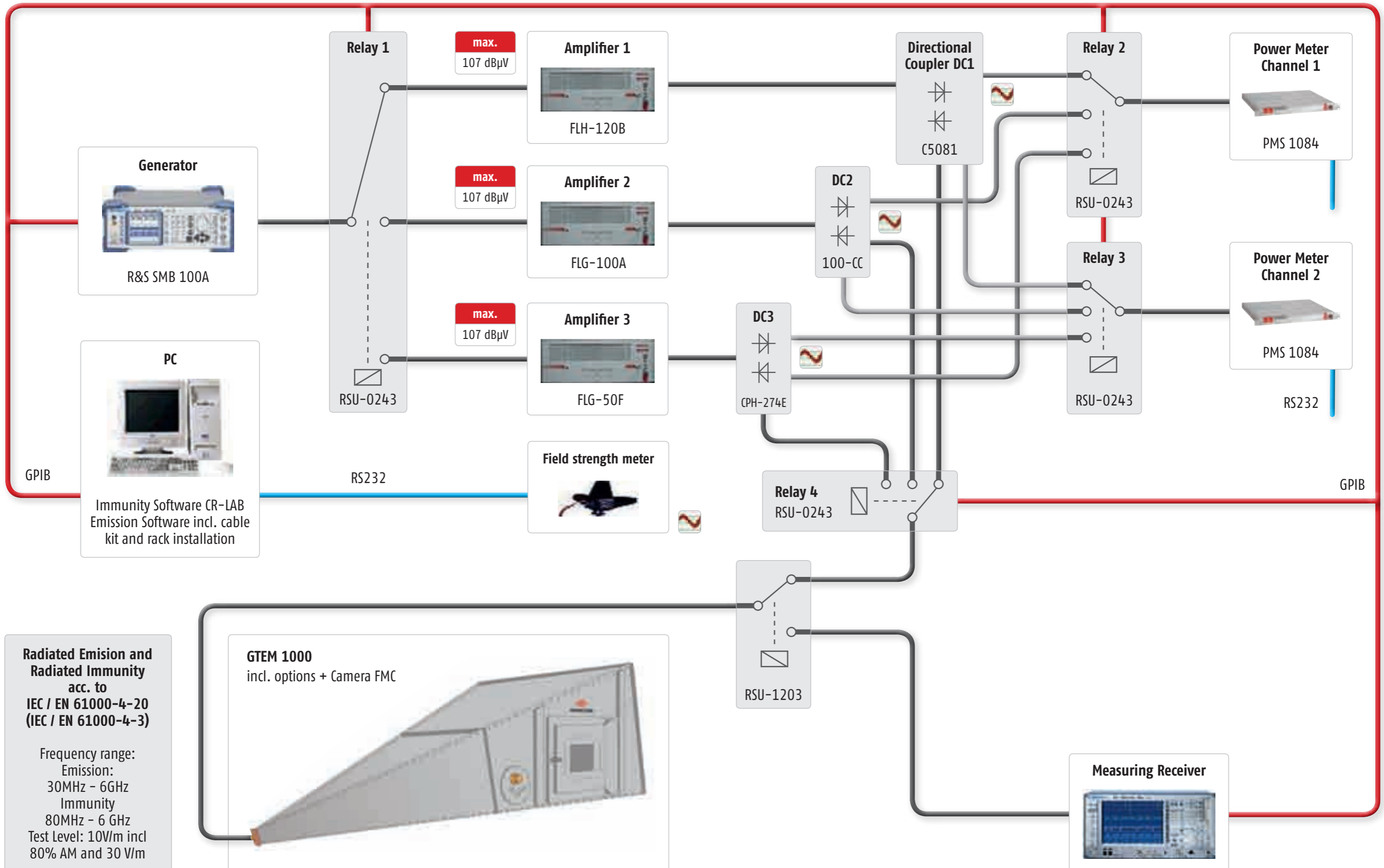
● Standard ○ Costed option - Not provided

Type	I/O ports	GTEMs MODEL	
		250-500	750-1000-1250-1500
GTEM-B01	EIA 7/8" Input Connector (max. 6GHz)	○	○
GTEM-B02	EIA 7/16" Input Connector (max. 6GHz)	○	○
GTEM-B03	700 W Max. Input power, (up to 3GHz) (The max. input power is limited by the spec. of the max input power of the selected GTEM)	○	○
GTEM-B04	Upgrade Input Power 1400W, (up to 3GHz) (The max. input power is limited by the spec. of the max input power of the selected GTEM)	○	○
GTEM-B05	Fibre optical feed-thru (3 Pairs)	○	○
GTEM-B06	N-Feedthru	○	○
GTEM-B07	SMA-feedthru	○	○
Electrical Equipment / Options			
GTEM-B08	Additional socket for EUT	○	○
GTEM-B09	Internal illumination (Halogene, 50 W)	○	○
GTEM-B10	Tube, diameter 5cm, can be closed by screwable cover	○	○
GTEM-B11	EMI-Filter Upgrade 2x10A to 4x32A, 440V/ 250V AC/ DC		○
GTEM-B12	Filter 4 x 32A, 440V/ 250V AC/ DC		○
GTEM-B13	Interlock relay at the door	○	○
GTEM-B14	DSub Signal Line Filter (25 pin)	○	○
GTEM-B24	1 pc. Sub-D 9 pin filtered, 1 pc. Sub-D 9 pin unfiltered	○	○
GTEM-B25	9 pin DSUB Filter	○	○
Mechanical Equipment / Options			
GTEM-B15	Second door close to input	○	○
GTEM-B16	Window in door (∅ 200mm)	○	○
GTEM-B17	Gas/ Waterfeedthru	○	○
GTEM-B18	Honeycomb		○
GTEM-B19	Fans (2 pieces) on technical panel		○
GTEM-B20	Door for tests acc. to SAE J1752/3		○
GTEM-B21	Wheeled undercarriage	○	●
GTEM-B22	Plastic table, round, d=35cm, max. load: 50kg	○	○
GTEM-B23	Vertical positioning, turn of door position, plastic table over pyramids	○	
GTEM-B26	Integrated circuit testing	○	○
GTEM-B27	Installation panel (not equipped)	○	○
GTEM-B28	Fan kit incl. channel for heat sink	○	○

● Standard ○ Costed option - Not provided

G-TEM test set-up for radiated immunity tests and emission measurements:

G-TEM test set-up for radiated immunity tests and emission measurements:



Radiated Emission and Radiated Immunity acc. to IEC / EN 61000-4-20 (IEC / EN 61000-4-3)

Frequency range:
Emission:
30MHz - 6GHz
Immunity
80MHz - 6 GHz
Test Level: 10V/m incl 80% AM and 30 V/m

RF Relay-Switching-Unit – RSU

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



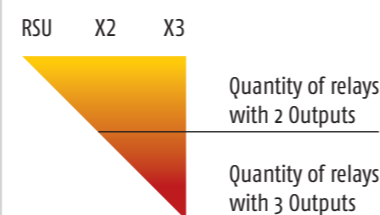
Main characteristics:

- Up to 4 pcs. Coax-Relays
- 1 input to 2 or 3 outputs
- Manual or remote controlled
- USB, RS 232 and GPIB interface
- Easy integration in test systems
- For RF- and EMC testing

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 change-over 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 RS-232 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 RS-232 and GPIB interfaces are listed in the user manual.

Definition of the relay assembly:



RSU 2223 = 2 relays with 2 outputs and 2 relays with 3 outputs

Technical specifications	RSU			
Frequency-range	DC to 12.4GHz (up to 40GHz optional)			
	DC...1GHz	1GHz...5GHz	5GHz...10GHz	10GHz...12.4GHz
VSWR	≤ 1.04	≤ 1.14	≤ 1.3	≤ 1.5
Isolation	≥ 90dB	≥ 80dB	≥ 70dB	≥ 70dB
Insertion loss	≤ 0.05dB	≤ 0.1dB	≤ 0.2dB	≤ 0.3dB
Max. power input	≤ 1.00kW	≤ 0.44kW	≤ 0.31kW	≤ 0.28kW
Impedance	50 Ω			
RF-connectors / Relays	N-female			
Switching time	≤ 60ms			
Number of operations	Max. 10/Minute			
Operating temperature	+10 °C ... +40 °C			
Max. humidity	< 90%			
Cabinet	19" subrack or desktop case			
Dimensions	450mm x 450mm x 150mm (Width x Depth x Height)			
Weight	7.6 kg			

2/4 Channel RF-Power-Meter – PMS 1084

10kHz to 6 GHz



Description

The PMS 1084 is in the standard version a 2-channel RF Power-Meter for the frequency-range from 100kHz up to 6 GHz or from 10kHz to 500MHz (PMS 1084 B). The measuring range reaches from -60dBm to +20dBm. 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 soft-

ware 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 EN/IEC 61000-4-6. It is available for the installation into 19" Racks 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:		10kHz - 500MHz
Frequency range 2 x Input-Module HF:	100kHz - 6 GHz	
Measuring range	-60 dBm - +20 dBm (10kHz ≤ f ≤ 4GHz) -45 dBm - +20dBm (4GHz < f ≤ 6GHz)	
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	50 Ω	
Interface (PC)	USB, RS-232 (9-pol Sub D. female)	
Input	N-type female connector	
Dimensions (L x W x H)	482.6 x 172 x 44.3 mm (19 x 6.77 x 1.74 inches)	
	19 inch / 1 HU	
Weight approx.	approx. 2500 g	
Power supply	115/230 V	
Accessories included	Power cord, serial cable, application software, user manual	
Options:		
PMS-CHA	Expansion of 1 measuring channel (max. up to 4 channels); 100kHz to 6GHz	
PMS-CHAB	Expansion of 1 measuring channel (max. up to 4 channels); 10kHz to 500MHz	



Description

This stripline is designed for immunity tests on automotive devices according to ISO 11452-5. The stripline is fixed on a table and is easy to move. The table can be sloped vertically in order to reduce the width. It is also possible to divide very easily the stripline in

2 parts for the storage or during the transport (50Ω version). It is the only stripline on the market able to carry out test up to 1 GHz with excellent return loss. The stripline is available with 50Ω or 90Ω impedance.

Technical specifications	SR/50/1000	SR90/1000
Frequency range	0 to 1 GHz	0 to 1 GHz
Max. input power	1 kW continuous	>200 W continuous (>100W with impedance adapter)
Wave impedance	377 Ω	377 Ω
Impedance	50 Ω +/- < 5 Ω	90 Ω ± < 6 Ω
VSWR	better than 1.22	<1.92
Return loss	better than 20dB	>10dB up to 1GHz
Connector type	N 50 Ω	N 75 Ω
Height of the plate	15 cm over ground plane	15 cm over ground plane
Height of the table	95cm	80 cm
Size (L x W x H)	430 x 150 x 105 cm (service position) 2 * 215 x 85 x 165 cm (storage)	350 x 90 x 95 cm
Weight	approx. 140kg	approx. 100 kg
Options:	Filter box	Impedance adapter 50-90 Ω
		Filter box
		Other height under plate



Description

These open TEM cells are well suited for immunity testing of small objects according to European (CE) and automotive standards (SAE J1113-25) or for biological experiments. The advantage of these TEM cells is that they are open and it is very easy to control the functions of the equipment under test. The applications are for instance the immunity testing of watches, pagers, telephones or PCB's. In comparison

with other closed TEM cells, the price is low. The field decreases rapidly outside the open TEM cells (approx. 33 dB at 1 meter) and it is therefore possible to use an open TEM cell in ordinary facilities. Another very interesting application is the calibration of field probes because the field inside the TEM cell is known with high precision. TEM cells are the most precise structures for field calibrations.

Technical specifications	TEM220	TEM500	TEM1000 *	TEM3000 *
Frequency range	DC - 220 MHz	DC - 500 MHz	DC - 1 GHz	DC - 3 GHz
Height under plate	33.3 cm	14.7 cm	7.3 cm	2.5 cm
Max. input power	1.5 kW	1 kW	750 W	400 W
Maximum field	800 V/m	1.5 kV/m	2.6 kV/m	5.6 kV/m
Field for a 25 W amplifier	105 V/m	215 V/m	480 V/m	1400 V/m
Dimensions (L x W x H)	180 x 160 x 73 cm	97 x 81 x 32cm	54 x 45 x 16.8 cm	44 x 18 x 8 cm
Weight	55 kg	12 kg	3.5 kg	1.1 kg
Field precision	± 5 %			
Connector	type N 50 Ω			
Cell impedance	50 Ω			
Wave impedance	377 Ω			
VSWR	< 1.2 (<1,9 for the TEM3000)			
Options	Signal and power supply filters			
	* Can be equipped with a test setup for IC or PCB acc. to SAE J1752-3			

Other models are available on request



Description

The closed TEM cells TEMF200 and TEMF500 are specially designed for the immunity tests on automotive devices according to ISO 11452-3 and to SAE J1113-24. The TEMF1000 and TEMF3000 allow immunity tests on small devices and require a low power amplifier. Therefore the test installation is much cheaper compared with an absorber room with antennas. The TEM (Transverse Electro-Magnetic) mode is the only mode produced in the cell below the cut-off frequency. The

electric field is vertical and the magnetic field horizontal. The wave impedance is 377Ω . The field conditions inside the cell are similar to far field conditions. An optional filter box can be placed behind the cell for power and signal lines connections. For the automotive tests, the recommended minimum power of the amplifier is 100 W (TEMF200) and 50 W (TEMF500). It is also possible to use the cell for the radiation measurement, under certain conditions.

Technical specifications	TEMF200	TEMF500	TEMF1000 *	TEMF3000 *
Frequency range	DC - 200 MHz	DC - 500 MHz	DC - 1 GHz	DC - 3 GHz
Height under the plate	30 cm	10 cm	7.3 cm	2.35 cm
Size (l x w x h)	130 x 70 x 62 cm	60 x 30 x 22 cm	54 x 45 x 18 cm	15 x 8 x 6 cm
Max. input power	1.6 kW long term	1 kW long term	750 W long term	400 W long term
Field for a 25 W amplifier	118 V/m	350 V/m	475 V/m	1.4 kV/m
Impedance	$50 \Omega \pm 5 \Omega$	$50 \Omega \pm 5 \Omega$	$50 \Omega \pm 7 \Omega$	$50 \Omega \pm 7 \Omega$
VSWR	< 1.1	< 1.1	< 1.2	< 1.2
Return loss	> 25 dB	> 25 dB	> 20 dB	> 20 dB
Connector type	N 50 Ω	N 50 Ω	N 50 Ω	N or SMA 50 Ω
Weight	approx. 29 kg	approx. 20 kg	approx. 4.8 kg	approx. 8 kg
Options	Signal and power supply filters			
	* Can be equipped with a test setup for IC or PCB acc. to SAE J1752-3			

Other models are available on request

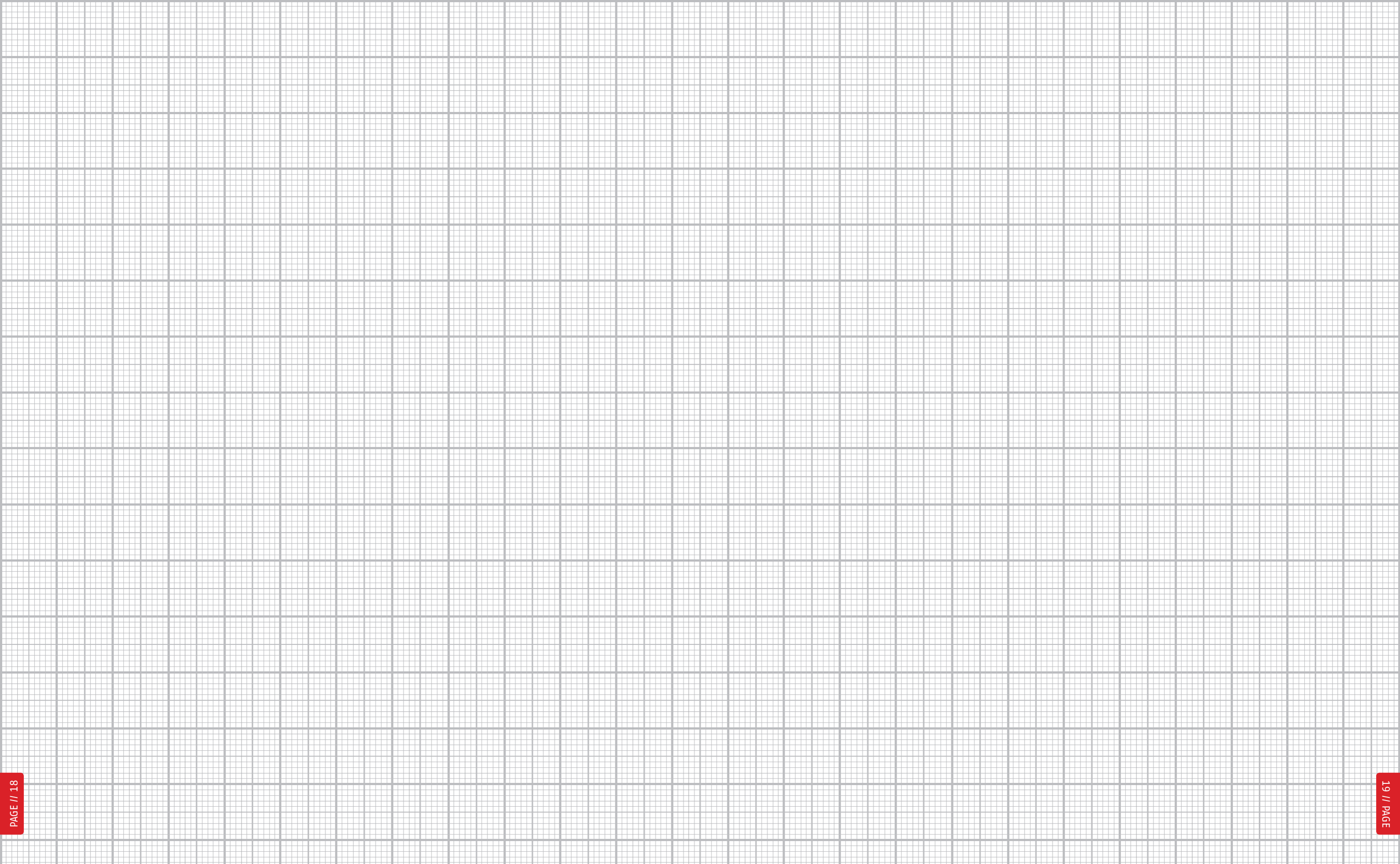


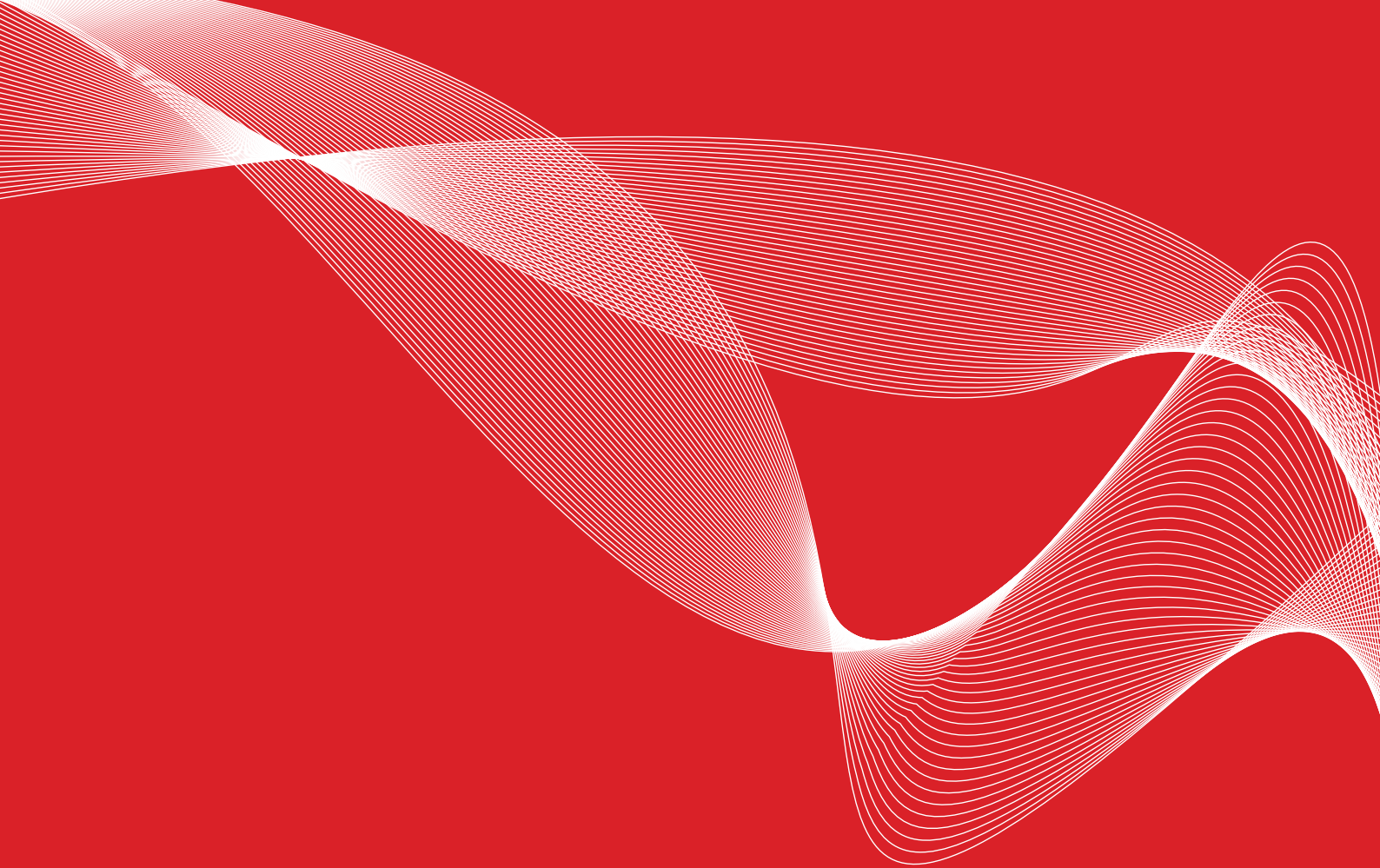
Description

This harmonic comb generator is designed for the periodical control of EMC test sites (measurement of radiated field). With this equipment it is possible to control the reproducibility of the whole measurement system from the antenna to the spectrum analyser including the cabling, preamplifiers, receiver, quasi-

peak detector, etc. The equipment is also designed to measure the shielding effectiveness of small boxes and cubicles. The repetition frequency can be changed with a remote control (optic fibre) in order to increase the dynamic in level and frequency.

Technical specifications	HCG-E
Repetition frequency	10 MHz or 50 MHz
Frequency range	10 MHz - >3,5 GHz
Frequency stability (10-75°C)	Given by the quartz: +/- 100 ppm
Level stability (10-50°C)	0.25dB
Level stability (7-13Vdc)	0.02dB
Radiated field polarisation	mainly vertical
RF Level (50 MHz repetition)	up to 85 dB μ V/m @ 10 m, at least 55 dB μ V/m @ 10 m
Battery life (generator)	15 hours @ 10 MHz / 8 hours @ 50 MHz
Battery type	6LR61 9 V (rechargeable batteries can be used but the duration of the emission will be shorter)
Optic fibre type	Plastic fibre HFBR
Size (with battery) (L x W x H)	114 x 72 x 38 mm (without antenna) 114 x 72 x 130 mm (with antenna)
Weight (with battery)	180 g





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