Optoelectronic converter eoSense™

Make UWB EM-field measurement in time & frequency domains with optical RX antennas from 10 Hz up to 100 GHz

Optoelectronic converter compliant with eoProbe™ optical RX antennas

Constant AF (Antenna Factor) regardless of optical RX antenna position and temperature

4th converter gen. with ultra high EMI shielding usable with both E-field & H-field probes

Optoelectronic converter line covering RF spectrum
from low frequency LF model (10 Hz → 50 MHz) up to high frequency
HF-25-40 model (25 → 40 GHz) & customized models

KEY PARTNER FOR ELECTROMAGNETISM
kapteos

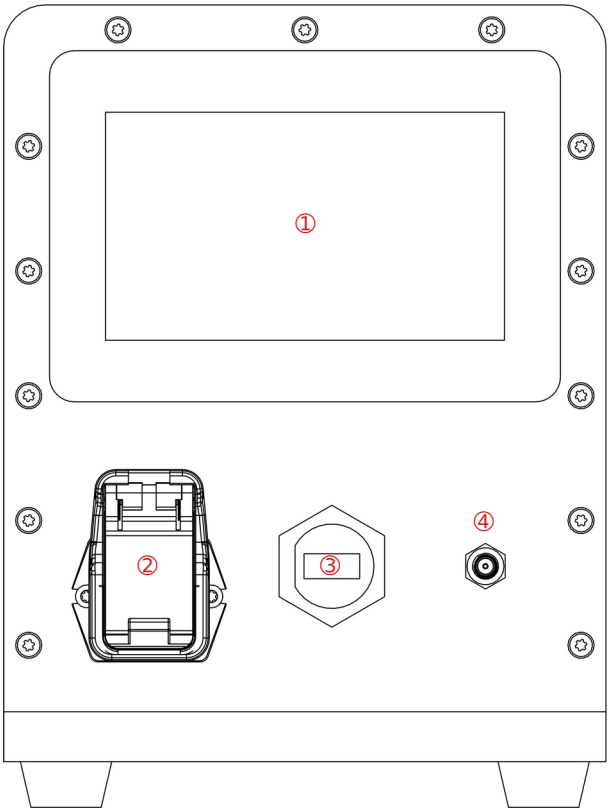
PERFORMANCE SPECIFICATIONS

	Model	Min	Typical	Max	Unit
Frequency bandwidth (cutoff freq. f_{low} & f_{high} ± 10%)	LF	10		50M	Hz
	MF		*for next release*		
	HF-0.04-3.2	40M		3.2G	
	HF-0.04-6.4	40M		6.4G	
	HF-2.5-18	2.5G		18G	
	HF-18-26.5	18G		26.5G	
	HF-25-40	25G		40G	
	Customized model	f_{low}		f_{high}	
P1dB (1-dB compression point) in Frequency Domain	LF	18	19		dBm
	MF		*for next release*		
	HF-0.04-3.2 & HF-0.04-6.4	19	20		
	HF-2.5-18	20	22		
	HF-18-26.5 & HF-25-40	15	18		
Output voltage swing in Time Domain	LF	5.0	5.6		Vpp
	MF		*for next release*		
	HF-0.04-3.2 & HF-0.04-6.4	5.6	6.3		
	HF-2.5-18	6.3	8.0		
	HF-18-26.5 & HF-25-40	3.5	5.0		
Output noise spectral density	LF (f > 200 kHz)		-120	-110	dBm/Hz
	MF		*for next release*		
	HF-0.04-3.2 & HF-0.04-6.4		-110	-100	
	HF-2.5-18		-110	-100	
	HF-18-26.5		-100	-90	
	HF-25-40		-90	-80	
Phase noise with use of any probe eoProbe™	@10 Hz from carrier			-70	dBc/Hz
Antenna factor AF for use with EL5-air probe	LF		115	125	dB/m
	MF		*for next release*		
	HF-0.04-3.2/6.4		100	110	
	HF-2.5-18 (for f < 10 GHz)		100	110	
Dynamic range in Frequency Domain	LF (f > 200 kHz)	130	140		dB.Hz
	MF		*for next release*		
	HF-0.04-3.2/6.4 & HF-2.5-18	120	130		
	HF-18-26.5	110	120		
	HF-25-40	100	110		

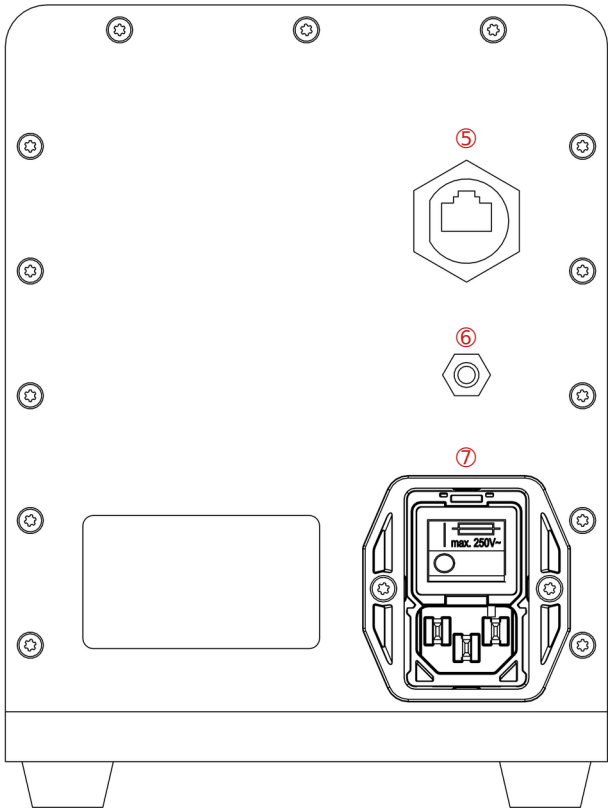
MECHANICAL SPECIFICATIONS

		Min	Typical	Max	Unit
Dimensions ± 1mm (cf. Max for overall dimensions)	Width		150	150	mm
	Depth		450	522	
	Height		185	195	
Weight	All models	6.7		7.4	kg
Ingress Protection rating			IP41		
Front panel I/O	① Human Machine Interface	4.3" capacitive touchscreen			
	② Optical probe	Push-Pull Diamond HE-2000			
	③ USB 2.0	Type A socket			
	④ Signal output (Z = 50 Ω)	SMA or SMK (2.92 mm)			
Rear panel I/O	⑤ Ethernet	RJ45 socket			
	⑥ Earthing stud	POAG-S6			
	⑦ Power entry connector	C14 socket			

Front panel



Rear panel



Environmental specifications

		Min	Typical	Max	Unit
Power supply	Voltage	90		260	VAC
	Frequency	47		63	Hz
	Power		65	130	W
Temperature	Operating	15		30	°C
	Storage	5		40	
Pressure		690		1075	hPa
Relative humidity	Non-condensing			90	%
Storage	Only in its original case in a clean, dry environment				
Cleaning	Use cloth moistened with clean water mixed with < 20% of isopropyl alcohol (only for outer part of connectors)				

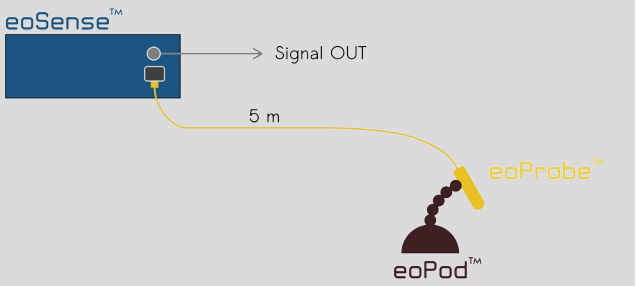
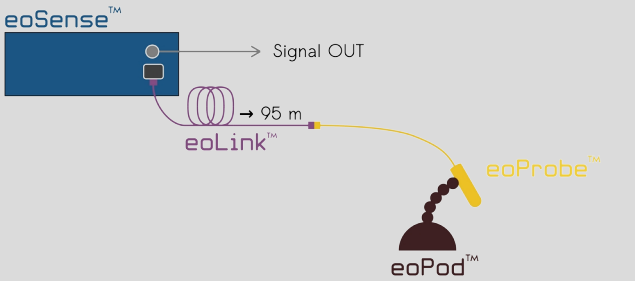
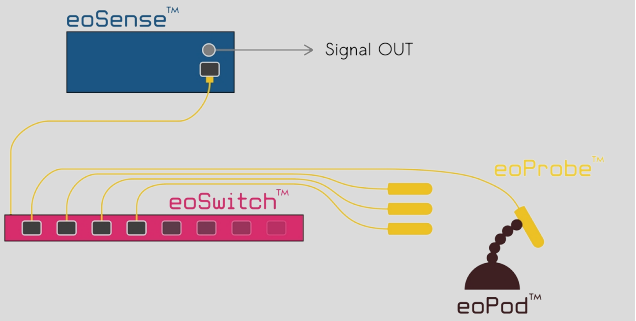
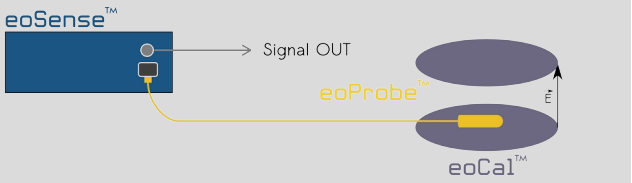
Standards compliance

EMC, emissions	IEC 60601-1-2 4th ed. EN 55032 class B
	IEC / EN 61000-3-2, class B
	IEC / EN 61000-3-3, class B
EMC, immunity	IEC / EN 60601-1-2
	IEC / EN 61000-4-2, 8kV/6kV perf. criteria A
	IEC / EN 61000-4-3, 20V/m perf. criteria A
	IEC / EN 61000-4-4, ± 2kV perf. criteria A
	IEC / EN 61000-4-5, ± 1kV/± 2kV perf. criteria A
	IEC / EN 61000-4-6, 20 Vrms perf. criteria A
Laser safety	IEC / EN 60825-1, class 1
	IEC / EN 60825-2, class 1

Packaging information

	Contents
Converter	Delivered with a routine test report
Power cord	with CEE 7/7 plug (Europe, Asia) or with NEMA 5/15 plug (North America, Japon)
Ground strap	1 m length, 4 mm^2 cable cross-section
Transport box	Triple-wall cardboard with protective foam
Firmware update	See website https://en.kapteos.com/
User guide	See website https://en.kapteos.com/

Compatible devices and accessories

Device	Associated data sheet	Use	Outline schematic
EM-field probe	eoProbe-FT-23.07.pdf	Recommended setup in most cases	
Optical fiber extension cord	eoLink-FT-23.07.pdf	Required setup for measurements over great distances, like outdoor conditions	
Optical multiplexer	eoSwitch-FT-23.07.pdf	Recommended setup to sequentially connect up to 16 probes	
EM-field probe calibration cell	eoCal-FT-23.07.pdf	Required setup for probe calibration in air or in any fluid	

Hardware options, customization and accessories

Field of activity	Issue	Options and/or accessories
MRI	Ultra narrowband signals	-3T Ultra narrow external filters for 0.55T, 1.5T, 3T, 4.7T... MRI machines
High Voltage	Partial discharge assessment	-PD External diplexer with two channels: 10 Hz → 50 MHz and 2 kHz → 50 MHz
Antennas	RF spectrum coverage	-DB, -TB **Dual-band** or **triple-band** for HF converter only (e.g. 2.5 GHz → 40 GHz)
	Automotive radar characterization	-DC75 76-81 GHz converter with embedded freq. down-conversion to 1-6 GHz

SOFTWARE OPTIONS

Option	Function	Requirements
-ASA	**E-field strength display** through direct control of end customer spectrum analyzer through Ethernet cable.	Recent Automatic Spectrum Analyzer with Ethernet remote control
-AWG+ASA	**E-field strength display versus frequency** through direct control of both end customer synthesizer & spectrum analyzer through Ethernet cables	Recent Arbitrary Waveform Generator & Automatic Spectrum Analyzer with Ethernet remote control
-CRF	Correction of the Response Flatness of the EM-field measurement system (OEC + EM-field probe) to get a **flat response on the frequency range of interest**	Factory calibration of the OptoElectronic Converter (OEC)

USEFUL EQUATIONS

P_{OEC} → Power delivered by the optoelectronic converter
V_{OEC} → Voltage generated by the optoelectronic converter

	Equation
Frequency domain	E [dBV_{RMS}/m] = P_{OEC} [dBm] + AF [dB/m] - 13.01
Time domain	E [V/m] = V_{OEC} [V] x AF [m^{-1}]
Conversion of units	AF [dB/m] = 20 $\log_{10}$(AF [m^{-1}]) E [V_{RMS}/m] = 10^(E [dBV_{RMS}/m] / 20)

ORDERING INFORMATION

Model	Type	(Hardware option)	(Accessory)	(Software option)
eoSense	LF		-PD	-CRF
	MF		-3T	
	HF-0.04-3.2	-DB-2.5-18		-ASA
	HF-2.5-18	-TB-18-26.5-25-40		-AWG+ASA
	HF-75-85	-DC75		

Examples:
Optoelectronic converter for 10 Hz-50 MHz frequency range with diplexer for partial discharge assessment and correction of response flatness → **eoSense LF-PD-CRF**
Optoelectronic converter for 25 GHz-40 GHz frequency range → **eoSense HF-25-40**
Optoelectronic converter for 40 MHz-18 GHz frequency range in two RF bands with direct control of spectrum analyzer → **eoSense HF-0.04-3.2-DB-2.5-18-ASA**
Customized optoelectronic converter for 75 GHz-85 GHz frequency range with down conversion to DC-10 GHz → **eoSense HF-75-85-DC75**