

## Micro-ring resonator Electro-optic E-field sensor

### Description

E-field sensor products uses electro-optic micro-ring resonators or Mach-Zehnder modulators made from lithium niobate thin films for sensing of electric fields. The sensors can achieve very high spatial resolution and can operated from near DC frequencies up to several THz. The sensors are made from all dielectric materials. Hence it does not perturb measurand electric field. Also, since fiber optic cables are used these sensors are immune to electro-magnetic interference and can be used in highly noisy environments. The readout system is based on a tunable laser and a detector. The sensor consists of the sensor element which is in a cylindrical housing and one fiber which is connected to a laser source and two additional fibers that will connect to detectors. The interrogation system includes the laser source and detector(s) and control circuits. The sensor operates at an eye safe wavelength of 1550nm. The sensor produces a voltage proportional to measurand electric field. An oscilloscope, digitizer board, lock in amplifier or spectrum analyzer instrument need to be connected to system output to measure the electric field.

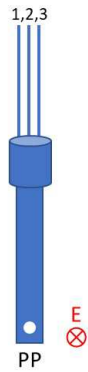
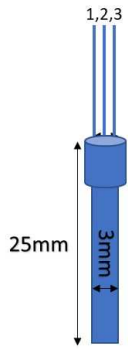
**Microring resonator sensor element, P/N MR-2.5GHz-300-XX-B**

Parameter	Value	Optional information
Dynamic range	0.1V/m-0.5MV/m	
Sensitivity	100 mV/(m. Hz <sup>0.5</sup> )	Sensitivity for f>10kHz
Response Gain	50 (V/m)/(mV)	Measured at low frequency using standard controller unit
Selectivity (Orthogonal components reiection)	>30 (dB)	
Optical insertion loss of the sensor	-12 (dB)	
E-filed direction <u>XX</u>	PP or PL	PP: E field Perpendicular to fiber PL: E field Parallel to fiber
-3dB sensor bandwidth	2.5(GHz)	
Spatial Resolution	300 (μm)	Can be reduced
Packaged sensor size	3(mm)x25(mm)	Can be reduced down to 1mm
Fiber pigtail	1(m)	
Fiber type, Connector	PM, FC/APC	

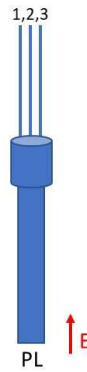
**E-field sensor controller system P/N: L-1550-40-D-XX-B**

Parameter	Value	Optional information
Laser power	40 (mW)	
Operating wavelength	1550 (nm)	
Balanced detector bandwidth <u>XX</u>	400:100Hz-400MHz 2500:1MHz-2.5GHz	
Typical Response gain	50 (V/m)/(mV)	Measured at low frequency using standard controller unit
Rise time	0.25(nsec)	
Interrogator dimension	200x275x40(mm)	
Interrogator weight	1(kg)	
Interrogator output	SMA-50 ohm	
Input power	110-220 volt ,2 A	

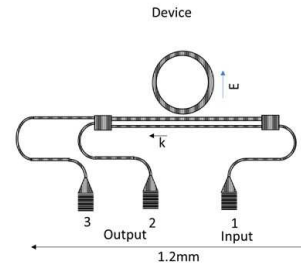
1m To FC/APC connector



Max sensitivity E Field direction for PP type sensor is shown by a white dot on the sensor head



Max sensitivity E Field direction for PL type sensor is parallel to fiber axis



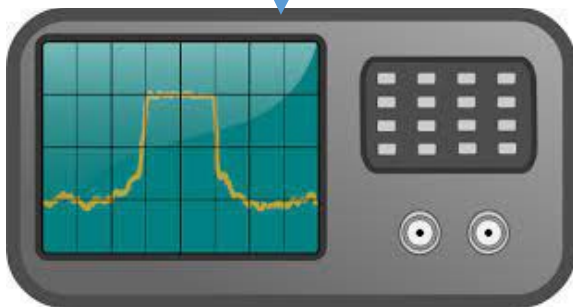
### Measurement setup for Micro-ring resonators



Controller unit



Micro-ring resonator sensor element



Spectrum analyzer, oscilloscope, or other data acquisition system (not provided)