

High Resolution, Long Range Remote Ocean Sensing System



Leader in reliable high-quality
ocean current, wave and wind mapping

- Broad frequency range from 5 to 50 MHz to provide ranges from 15 to more than 250 km
- Very low RF-power typically <30 Watts to guarantee no interference with other radio services
- FM-cw principle provides best signal to noise performance and high temporal resolution
- Robust and small antenna system, easy to install
- Flexible, modular system with 4 channels for Direction Finding (current mapping) or 8 to 16 channels for Beam Forming to provide current, wave and wind mapping

Pos	Parameter	Description	Condition 1	Condition 2	Condition 3
01	Broad band system concept	useable for various applications	8 MHz	16 MHz	30 MHz
		range for ocean currents up to:	250 km	110 km	50 km
		resolution: (depends on frequency allocation)	5 ... 1 km	3 ... 0.5 km	1 0.15 km
02	Sweep repetition time	programmable from 2 ... 10 Hz			
03	Transmit power	Low, non harmful rf power, 7 W per antenna pole, 28 Watts total			
04	Antenna construction <i>Transmit and receive antenna design is identical</i>	Simple vertical monopoles	8 MHz	16 MHz	30 MHz
		shorter poles will result in slightly reduced range	3 ... 6 m	2 ... 4 m	1.5 ... 3 m
05	Antenna array	Rectangular configuration for Tx	18 x 5 m	10 x 3 m	5 x 1.5 m
		Linear receive array, 12 antennas	< 180 m	< 100 m	< 40 m
		Linear receive array, 16 antennas	< 250 m	< 140 m	< 55 m
06	Synchronise WERA systems	simultaneous with WERA-multi method			
07	Analog data acquisition system	Narrow band receiver with 16 bit, complex, parallel AD conversion Noise figure: 10 dB Bandwidth: 1.5 kHz			
08	Digital data acquisition	near real time processing			
09	System control	access to all radar parameters, listen before talk mode, automatic frequency adaptation, rf interference reduction, system self-check and calibration			
10	Working range <i>Can be reduced due to environmental effects</i>	Depends on frequency	8 MHz	16 MHz	30 MHz
		for currents:	140 .. 250 km	70 ... 110 km	35 ... 60 km
		for wind direction:	110 .. 200 km	55 ... 90 km	30 ... 50 km
		for waves:	65 ... 110 km	30 ... 50 km	15 ... 30 km

Pos	Parameter	Description	Condition 1	Condition 2	Condition 3
11	Range resolution	Depends on allocated bandwidth	50 kHz	200 kHz	500 kHz
		The used grid size should be 20 % wider than this value:	3000 m	750 m	300 m
12	Angular field of view	<p>± 50° with 8 antennas</p> <p>± 60° for Beam Forming with 16 antennas in a linear array</p> <p>> ± 70° for Beam Forming with 16 antennas in a curved array</p> <p>> ± 90° for Direction Finding (max. 270°)</p>			
13	Beam width <i>valid for optimised window function</i>	depends on beam steering angle	at centre	typical	at edge
		for 16 antennas	± 3°	± 4°	± 6°
		for 12 antennas	± 4°	± 6°	± 8°
		for 8 antennas	± 7°	± 10°	± 16°
		angular step size is always		1°	
14	Data output		currents	waves	wind
		Available on the defined grid: <i>In addition to that the data can be provided on radials or as raw data</i>	currents as vector	significant wave height & direction	wind direction
		<i>With Seaview Sensing software additional data are provided</i>		directional wave spectra	wind direction and velocity
15	Temporal resolution	recommended integration time:	3 ... 10 min	15 ... 30 min	15 ... 30 min
		data processing time:	1 ... 3 min	2 ... 4 min	2 ... 4 min
16	Accuracy <i>These parameters are typical values, affected by site configuration, geometry, environmental conditions and operation frequency</i>	depends on integration time	5 min	10 min	20 min
		for 10 MHz, radial current velocity:	8 cm/s	4 cm/s	2 cm/s
		significant wave height:	< 20 %	< 15 %	< 10 %
		mean wave direction:	< 10°	< 5°	< 2°
		mean wave period *:	* with Seaview Sensing software only		1.1 ... 1.4 sec
		directional wave spectra *:			0.01 Hz
		wind direction: <i>wind speed is under investigation</i>	10° ... 40° depends on wind speed		
17	Limits for wave detection	depends on operation frequency	8 MHz	16 MHz	30 MHz
		min. significant wave height	0.8 m	0.4 m	0.2 m
		max. significant wave height	16 m	8 m	4 m
18	Limits for wind direction	at very low wind speed the measurement of the direction becomes uncertain			

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19	System Hardware	<p>All system parts are modular, easy to replace in case of a fault. Desktop case to be installed indoors</p> <p>width 19" rack depth 650 mm height 850 mm (1210 mm incl. PC and UPS)</p> <p>supply 115 - 230 V / 50 - 60 Hz 16 channel WERA system: < 800 Watts 4 channel WERA system: < 500 Watts <i>low power version as option</i></p> <p>WERA container, to install WERA system outdoors: vandalism protected, thermic and EMI isolated cabin, electricity installation, air conditioned, 19" cabinet for WERA rack, desk, shelves, lightning protection (RF and power supply) dimensions: 3000 x 2200 x 2265 mm (L x W x H) weight app.: 2000 kg (complete equipped) transportation with regular truck, crane and fork lift smaller containers on request, minimum size 1.2 x 1.2 x 1.3 m</p>				
20	Software packages included	Included packages	required for			Tasks
		WERA-RT: real-time processing				FFT, sorting, auto-calibration
		WERA-CTL: system control				remote control of all system parameters
		WERA-RFI: noise reduction				unique noise and spurious reduction
		WERA-FA: frequency adaptation				"listen before talk" operation mode
		WERA-DF: direction finding				phase direction finding method
		WERA-BF: beam forming				software beam forming method
		WERA-crad: radial current velocity				providing radial velocity
		WERA-wrad: sign. wave height				range resolved wave data on radials
		WERA-Wind: wind direction				derives wind direction from two station
		WERA-2D: combines radial data of wind, waves and currents of multiple WERA stations				providing vector maps of multiple radar stations
		WERA-QC: Quality control tools				monitoring or system parameter
<p>The software packages listed above, are included with the delivery of the WERA system.</p> <p>Additional software packages are provided by our WERA partners.</p> <p>An overview about these options is given on the next page.</p>						

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21	Software packages provided by:	Optional packages for:	Tasks			
	Helzel Messtechnik	WERA-CONT: variable integr. time	Allows to optimise integration time for current and wave measurements as well as for time critical applications like disaster warning. Independent and simultaneous data processing for these specific tasks.			
	Actimar	ACTI-Drift: surface drift estimation	provides prediction of drifting objects			
		ACTI-Mon: Automatic system parameter check	support for system maintenance			
		ACTI-Weather: Combination with WRF data for forecasting	Integration into oceanographic models to improve metocean forecasting			
	Seaview Sensing	All Seaview Sensing data are archived and available via a web-based Data Viewer as maps. For each grid point time series or directional wave spectra (if available) can be plotted. MetOcean and radar quality data can be accessed.				
	SV-Realtime <i>with data viewer</i>	Server software providing real-time currents, full directional wave spectrum and derived parameters (e.g wave height, mean and peak direction and period) taking water depth into account, wind speed (not validated yet) and direction. For accuracy assessment see Seaview documentation: www.seaviewsensing.com				
	SV-Offline <i>with data viewer</i>	Software for offline processing of archived data providing the data as detailed for SV-Realtime				
22	Services	provided by different partners:	Helzel	ASL	Actimar	Seaview
		Site Planning	yes	yes	yes	yes
		Installation of WERA systems	yes	yes	yes	
		User training at customers site	yes	yes	yes	yes
		WERA system configuration	yes	yes	yes	yes
		Extended warranty for hardware	yes	yes	yes	
		Software hotline	yes	yes	yes	yes
		Maintenance contracts	yes	yes	yes	yes
		Financing support (leasing)	yes			