

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

- Broad frequency range from 5 to 8 MHz to provide ranges from 200 to more than 300 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 as compact site configuration for Direction Finding or 8 to 12 array type antenna system for Beam Forming
- WERA always provides the best ocean radar configuration for your specific application

Pos	Parameter	Description	Value		
01	Working range <i>Can be reduced due to environmental effects</i>	Depends on frequency	all values are valid for 5.25 MHz		
		for currents:	320 km		
		wind direction & ship detection:	175 km		
		for wave height:	110 km		
		for wave spectra:	100 km		
02	Range resolution <i>Integration in range</i>	Depends on allocated bandwidth	30 kHz	50 kHz	100 kHz
		The used grid size should be 20 % wider than this value:	5000 m	3000 m	1500 m
03	Angular field of view	$\pm 50^\circ$ with 8 antennas (180 m long array) $\pm 60^\circ$ for 12 antennas in a linear array (282 m long array) $> \pm 70^\circ$ for 12 antennas in a curved array $> \pm 90^\circ$ for 4 antennas in a square (20.5 x 20.5 m square for Direction Finding)			
04	Angular Accuracy	$\pm 2^\circ$ for 8 antennas $\pm 1^\circ$ for 12 antennas in a linear array (Beam Forming) $\pm 5^\circ$ typical for 4 antennas in a square (Direction Finding)			
05	Beam width <i>Integration in azimuth</i>	depends on beam steering angle	at centre	typical	at edge
		for 12 antennas	$\pm 4^\circ$	$\pm 6^\circ$	$\pm 8^\circ$
		for 8 antennas	$\pm 7^\circ$	$\pm 10^\circ$	$\pm 16^\circ$
		angular resolution is always		$< 1^\circ$	

Pos	Parameter	Description	Value		
06	Temporal resolution <i>Integration time</i>	recommended integration time to get independent data sets:	for current measurements:	5 ... 9 min	
			for wave parameters:	10 ... 20 min	
			for disaster warning:	2 min	
			minimal time step:	30 sec	
07	Data up-date rate <i>to optimise data transfer rate</i>	recommended up-date rate:	for current measurements:	15 ... 30 min	
			for wave parameters:	20 ... 60 min	
			for disaster warning:	30 sec	
08	Data output <i>all data (current, wind and wave) are provided on a user defined grid</i>		currents	wave	spectra
		Available on the defined grid: for each individual WERA station	radial velocity vector	significant wave height	-
		Within the overlapping area of two WERA stations	velocity vector	direction of sig. wave	-
		Within the overlapping area of two WERA stations and sufficient S/N	current vectors	wave height & direction	wave spectra
09	Accuracy <i>These parameters are typical values, affected by site configuration, geometry and environmental conditions</i>	for 7 MHz, radial current velocity:	5 cm/s @ 9 min integration time		
		significant wave height:	< 10 % @ 20 min integration time		
		mean wave direction:	< 5° @ 20 min integration time		
		mean wave period *:	* available with optional WERA-Wave software only	1.1 ... 1.4 sec	
		directional wave spectra *:		0.01 Hz	
		wind direction:	10° ... 40° depends on wind speed		
10	Limits for wave detection	min. significant wave height	1.50 m		
		max. significant wave height	18.0 m		
11	Limits for wind direction	at very low wind speed the measurement of the direction becomes uncertain			
12	Antenna construction <i>Transmit and receive antennas are designed identical</i>	Simple vertical monopoles, individually match to site specific ground conditions	Pole length:	4.5 m	
			Overall height:	5.5 m	
13	Antenna array	Rectangular configuration for Tx	28.5 x 8.5 m		
		Linear receive array, 8 antennas	180 m		
		Linear receive array, 12 antennas	282 m		
14	Transmit power	Low, non harmful rf power, typically 7.5 W per antenna pole, 30 Watts total			

Pos	Parameter	Description																										
15	Synchronise WERA systems	Multiple stations can use the same frequency band with WERA-multi method																										
16	Analog data acquisition system	Non multiplexed quadrature detector with amplitude and phase conserving analogue to digital conversion																										
17	Digital data acquisition	WERA software beam forming in near real time Unique WERA noise reduction in connection with beam forming Optional direction finding software for compact antenna type systems																										
18	System control	Access to all radar parameters via web based user interface, listen before talk mode with frequency adaptation, rf interference reduction, system self-check and automatic calibration																										
19	System Hardware	All system parts are modular, easy to replace in case of a fault. Desktop case to be installed indoors width 19" rack depth 650 mm height 850 mm supply 115 – 230 V / 50 - 60 Hz 600 Watts-peak																										
20	WERA Container	The WERA system should be installed indoors in an air conditioned room. If such a room is not available a WERA container can be provided: Vandalism protected, thermal and EMI insulated cabin, electricity installation, 19" cabinet for WERA rack, desk, shelves, lightning protection, fire proof, water tight. Integrated high efficient air-conditioning dimensions: 3000 x 2200 x 2300 mm (L x W x H) (other dimensions available) weight app.: 900 kg																										
21	Software packages <i>All packages are included in the standard WERA tool box.</i>	<table border="1"> <tr> <td>WERA-RT:</td> <td>real-time processing</td> </tr> <tr> <td>WERA-CTL:</td> <td>remote system control via web interface</td> </tr> <tr> <td>WERA-RFI:</td> <td>unique noise reduction for array type WERA systems</td> </tr> <tr> <td>WERA-FA:</td> <td>frequency adaptation (listen-before-talk mode)</td> </tr> <tr> <td>WERA-Share:</td> <td>Use of allocated radio band for multiple WERA stations</td> </tr> <tr> <td>WERA-DF:</td> <td>direction finding</td> </tr> <tr> <td>WERA-BF:</td> <td>beam forming with self calibration feature</td> </tr> <tr> <td>WERA-crad:</td> <td>radial current velocity</td> </tr> <tr> <td>WERA-wrad:</td> <td>significant wave height for about 40 % of the current range</td> </tr> <tr> <td>WERA-Wind:</td> <td>wind direction for about 70 % of the current range</td> </tr> <tr> <td>WERA-2D:</td> <td>combines radial data of wind, waves and currents of multiple WERA stations</td> </tr> <tr> <td>WERA-QC:</td> <td>Quality control</td> </tr> <tr> <td>WERA-HK:</td> <td>House keeping tool to optimise the available disk space</td> </tr> </table>	WERA-RT:	real-time processing	WERA-CTL:	remote system control via web interface	WERA-RFI:	unique noise reduction for array type WERA systems	WERA-FA:	frequency adaptation (listen-before-talk mode)	WERA-Share:	Use of allocated radio band for multiple WERA stations	WERA-DF:	direction finding	WERA-BF:	beam forming with self calibration feature	WERA-crad:	radial current velocity	WERA-wrad:	significant wave height for about 40 % of the current range	WERA-Wind:	wind direction for about 70 % of the current range	WERA-2D:	combines radial data of wind, waves and currents of multiple WERA stations	WERA-QC:	Quality control	WERA-HK:	House keeping tool to optimise the available disk space
WERA-RT:	real-time processing																											
WERA-CTL:	remote system control via web interface																											
WERA-RFI:	unique noise reduction for array type WERA systems																											
WERA-FA:	frequency adaptation (listen-before-talk mode)																											
WERA-Share:	Use of allocated radio band for multiple WERA stations																											
WERA-DF:	direction finding																											
WERA-BF:	beam forming with self calibration feature																											
WERA-crad:	radial current velocity																											
WERA-wrad:	significant wave height for about 40 % of the current range																											
WERA-Wind:	wind direction for about 70 % of the current range																											
WERA-2D:	combines radial data of wind, waves and currents of multiple WERA stations																											
WERA-QC:	Quality control																											
WERA-HK:	House keeping tool to optimise the available disk space																											

Pos	Parameter	Description
22	Software packages <i>Optional (extra charge)</i>	WERA-Parallel (Variable integration time) Recommended to get optimised wave data and sub-mesoscale current structures in parallel. Required for time sensitive applications like disaster warning.
		WERA-Synthetic-Wave-Buoy Provides directional wave spectra for selected user-defined grid cells within the overlapping radar ranges and timeseries of derived parameters such as significant waveheight, peak period, peak direction as well as wind direction.
		WERA-Wave-Grid Provides directional wave spectra for all grid cells with sufficient signal quality within the overlapping radar ranges. Various options for real-time or off-line processing are available.
		WERA-Data-Manager Provides vector maps for ocean currents, wind and waves. Comfortable user interface for data viewer and data archive. Display of time series of individual grid points.
		WERA-CurDrift Surface current drift prediction for search and rescue or environmental protection applications.
		WERA-SDT Ship detection and tracking software in non real-time mode for scientific applications.
		WERA-TEWS Extracts current signature generated by an approaching tsunami at the shelf edge. Providing automatic alerts according to user settings.
		23
Site preparation		
Installation of WERA systems		
User training at Helzel factory and at customers site		
WERA system configuration		
WERA data management service		
Extended warranty		
Software hotline		
Maintenance contracts		
Financing support (leasing)		