



## Underwater Electric Field Measurement

### Individual Sensing Elements

Ultra Electronics Electric Field Sensors are used to measure electric fields in seawater with high precision. The technology utilises specially designed Silver / Silver chloride sensor elements and extremely low noise pre-amplifiers to achieve detection in the nV/m range. The very high performance is achieved due to the exceptionally low noise of the electrodes and pre-amplifiers.

The three pairs of electrodes are shown overleaf, together with matching pre-amplifiers and filters. This configuration is typical of a simple sensor arrangement suitable for OEM integration. Alternatively Ultra are able to offer complete stand alone electric field sensor solutions and multi-influence sensor solutions that can measure magnetic, electric, acoustic and pressure influences.



- Geophysical measurements and CSEM surveying
- Oceanographic studies
- Long range detection and surveillance
- Ship signature ranging and management
- Corrosion protection

**Sensor Specifications**

Sensor type	Ag/AgCl
Package	Cylindrical
Package	Material Poly acetal
Overall length excluding penetrator (cover fitted)	165mm
Cable length	1.3m (other lengths upon request)
Diameter with cover fitted	70mm
Maximum working depth	4000m
Total Mass with cover fitted	700g
Electrical interface	Free end
Operating temperature range	0°C to + 50°C
Storage temperature range	0°C to +70°C

**Amplifier Specifications**

Supply voltage	±8V
Supply current	75mA
Gain	>1850
Gain tolerance	±1%
Output voltage swing	± 5V min
Input dynamic range	±2.5mV
Bandwidth DC	to 3kHz (-3db)
Output type	Analogue Voltage
Input noise	<0.44nV/√Hz at 1 Hz

The above specifications and performance parameters are 'typical' of production standard sensors and amplifiers. Ultra Electronics reserves the right to vary without notice.

**Overall System Performance**

Measurement channels	3
Power Supply	V <sub>s</sub> = ±8V ±1V DC
Power Consumption	< 5W
Power up time	< 10 minutes
Dynamic input range (within pass band)	± 2.5mV
Bandwidth	0.01 – 100 Hz (-3dB)
Roll on/Off rate	Roll on : 6dB/octave (20dB/decade); Roll off: 40dB/decade)
In band ripple	< ± 3dB
Output voltage swing	±5V min
Scale factor tolerance	±1.0%
Output type	Analogue Voltage
Equivalent input Noise at 1Hz	<0.75nV/√Hz
Examples of resolution for differing baselines	

- 1m baseline I/P noise = 0.5nV/√Hz = 0.5nV/√Hz m<sup>-1</sup>
- 5m baseline I/P noise = 0.5nV/√Hz = 0.1nV/√Hz m<sup>-1</sup>
- 10m baseline I/P noise = 0.5nV/√Hz = 0.05nV/√Hz m<sup>-1</sup>



Ultra Electronics Limited  
 PMES  
 Towers Business Park  
 Wheelhouse Road  
 Rugeley  
 Staffordshire WS15 1UZ  
 England  
 Tel: +44 (0) 1889 503300  
 Fax: +44 (0) 1889 572929  
 e-mail: enquiries@ultra-pmes.com  
 www.ultra-pmes.com

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