# DSP Subsea Corrosion-Erosion Monitor (CEM®)

## 1 General

<table>
<thead>
<tr>
<th>1.1 Model name</th>
<th>ClampOn Subsea Corrosion-Erosion Monitor (CEM®)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Model number</td>
<td>Depends on model type and mechanical configuration</td>
</tr>
<tr>
<td>1.3 Serial number</td>
<td>YY-MM-XXXXX, unique for each unit</td>
</tr>
</tbody>
</table>

## 2 Physical properties, ROV retrievable concept

<table>
<thead>
<tr>
<th>2.1 Dimensions (l x w x h)</th>
<th>Varies, typically 2.4 m x 0.6 m x 0.8 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2 Weight, including frame</td>
<td>Varies, typically 450 kg</td>
</tr>
<tr>
<td>2.3 Weight, electronics canister</td>
<td>60 kg</td>
</tr>
<tr>
<td>2.4 ROV handle</td>
<td>Typically V-notched paddle</td>
</tr>
<tr>
<td>2.5 Installation/retrieval torque</td>
<td>80 Nm to 120 Nm</td>
</tr>
<tr>
<td>2.6 Damage torque</td>
<td>Over 200 Nm</td>
</tr>
<tr>
<td>2.7 Typical application</td>
<td>Corrosion, erosion: live data transmitted to SCM, or logged internally</td>
</tr>
</tbody>
</table>

## 3 Physical properties, permanent installation concept

<table>
<thead>
<tr>
<th>3.1 Dimensions canister (l x w x h)</th>
<th>Approximately 0.7 m x 0.4 m x 0.4 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2 Clearance around pipe</td>
<td>70 mm, for transducer and tool access</td>
</tr>
<tr>
<td>3.3 Weight, system</td>
<td>Varies, typically 75 kg</td>
</tr>
<tr>
<td>3.4 Typical application</td>
<td>Corrosion, erosion: live data transmitted to SCM</td>
</tr>
</tbody>
</table>

## 4 Physical properties, general

<table>
<thead>
<tr>
<th>4.1 Installation concept</th>
<th>Most commonly used shown above, contact ClampOn for other options</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2 Number of EMAT transducers</td>
<td>6 to 16</td>
</tr>
<tr>
<td>4.3 Equipment marking</td>
<td>Metallised polyester marking label. Stainless steel tag plate where applicable</td>
</tr>
<tr>
<td>4.4 Material</td>
<td>Electronics canister: Titanium and PEHD. Transducer assembly: Titanium and PEEK. Funnel and protection frame: Carbon steel with welded anodes, depending on CP scheme</td>
</tr>
<tr>
<td>4.5 Maximum design depth</td>
<td>3050 m</td>
</tr>
<tr>
<td>4.6 Maximum test pressure</td>
<td>340 bar (According to ISO 13628-6)</td>
</tr>
<tr>
<td>4.7 Installation yard</td>
<td>On spool piece at ClampOn production facility, or on module/spool at client yard</td>
</tr>
</tbody>
</table>

## 5 Electrical

<table>
<thead>
<tr>
<th>5.1 Power input</th>
<th>18 VDC to 32 VDC or Battery operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2 Power consumption (@24 VDC)</td>
<td>Varies by configuration. Typically 7 W idle, 15 W peak</td>
</tr>
<tr>
<td>5.3 Electronics platform/generation</td>
<td>ClampOn DSP CEMAT</td>
</tr>
<tr>
<td>5.4 Processor</td>
<td>480 MIPS</td>
</tr>
<tr>
<td>5.5 Non-volatile memory</td>
<td>32 GB Flash</td>
</tr>
<tr>
<td>5.6 Insulation resistance</td>
<td>&gt;1 GΩ @ 50 VDC</td>
</tr>
<tr>
<td>5.7 Design life</td>
<td>25 years</td>
</tr>
</tbody>
</table>

## 6 Operation

<table>
<thead>
<tr>
<th>6.1 Manner of operation</th>
<th>Real-time wall thickness monitoring by active ultrasonic guided waves</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2 Unit of measurement</td>
<td>Remaining wall thickness (mm)</td>
</tr>
<tr>
<td>6.3 Sensitivity</td>
<td>0.1 %</td>
</tr>
<tr>
<td>6.4 Wall thickness range</td>
<td>8 mm to 50 mm [0.3 in to 2.0 in] depending on EMAT transducer</td>
</tr>
<tr>
<td>6.5 Coverage distance</td>
<td>Typical 30 cm to 100 cm [11.8 in to 39.4 in]</td>
</tr>
<tr>
<td>6.6 Coverage area</td>
<td>Typical 3 m² [32 ft²]</td>
</tr>
<tr>
<td>6.7 Minimum pipe OD</td>
<td>11.4 mm [0.4 inch NPS] with no limitation in maximum pipe diameter</td>
</tr>
<tr>
<td>6.8 Pipe material</td>
<td>Metals and alloys</td>
</tr>
<tr>
<td>6.9 Flow conditions</td>
<td>Oil/water/gas/multiphase/none</td>
</tr>
<tr>
<td>6.10 Maximum coating thickness</td>
<td>3 mm</td>
</tr>
<tr>
<td>6.11 Communication</td>
<td>Modbus RTU RS-485 or Modbus TCP/IP or SIIS L3. SIIS L3 is recommended.</td>
</tr>
</tbody>
</table>

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[Image of ClampOn Subsea Corrosion-Erosion Monitor (CEM®)]
Notes
1. Typical field proven examples shown. Details tailored according to application and system integration.
2. Excluding transducer installation point. Exact measurements dependent on installation brackets.
3. Parts made of titanium are isolated from pipe. More information available in project specific GA drawing. Material certificates for metals are according to EN 10204 3.1, and for PEEK/PEHD according to EN 10204 2.1.
4. Two transducer rings with 3 to 8 transducers in each ring. Separation between the rings is from 2 x OD to 5 x OD, depending on system configuration.
5. Option for installation on pipe laying vessel is available. Contact ClampOn for details.
6. Completely ROV-installable system is available. Contact ClampOn for details.
7. Sensitivity refers to wall thickness change, relative to correctly set baseline wall thickness. The repeatability of single measurements is <1%.
8. Limitations depend upon pipe geometry and configuration.
9. Transparent link from canister to a topside computer with ClampOn CEM® Client software for Windows is required for system configuration.
10. Communication protocol according to Modicon PI-MBUS-300.
11. See installation instructions for specific conditions of use.