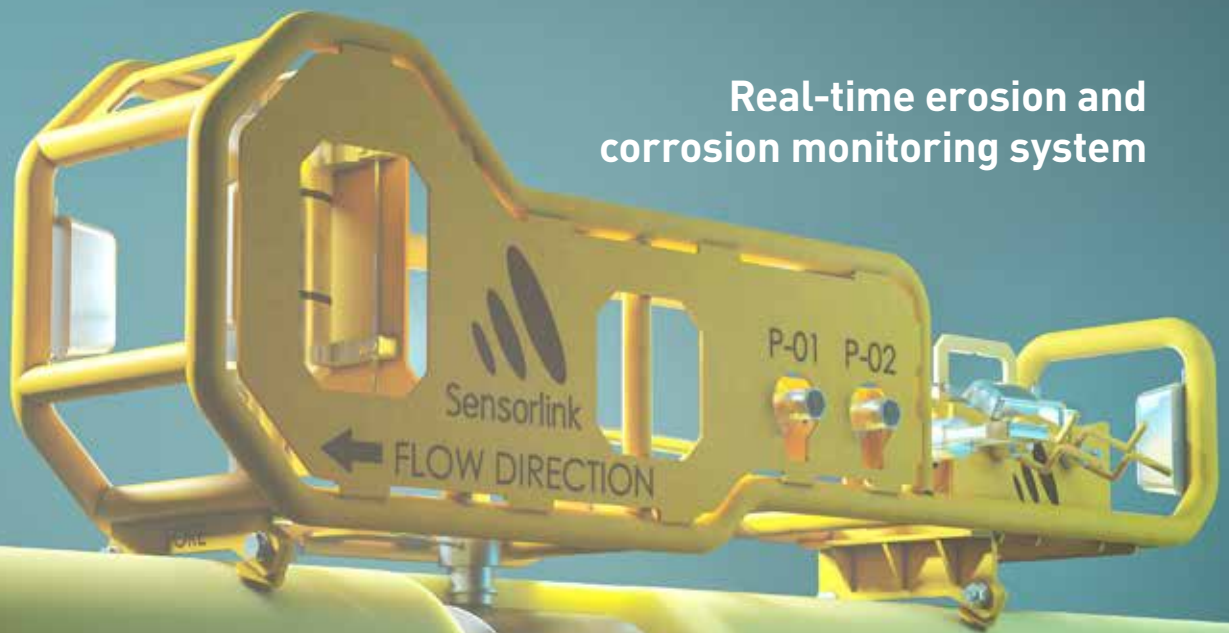


Real-time erosion and
corrosion monitoring system



UltraMonit[®] - subsea solutions

UltraMonit[®] In Situ

The UltraMonit[®] is an ultrasonic erosion and corrosion monitoring tool providing real-time and online wall thickness data on subsea spools and pipelines. It is non-invasive and comes in two configurations; UltraMonit[®] In Situ for permanent installation and UltraMonit[®] Retrofit for temporary installation on new and existing spools and pipelines. This document describes the UltraMonit[®] In Situ.

The UltraMonit[®] system uses an array of ultrasound transducers providing reliable high precision ultrasonic wall thickness measurements at selected locations. It is based on the well-established ultrasonic pulse-echo method. The UltraMonit[®] system integrates with the subsea control system providing the operators with live wall thickness data. Some key advantages are:

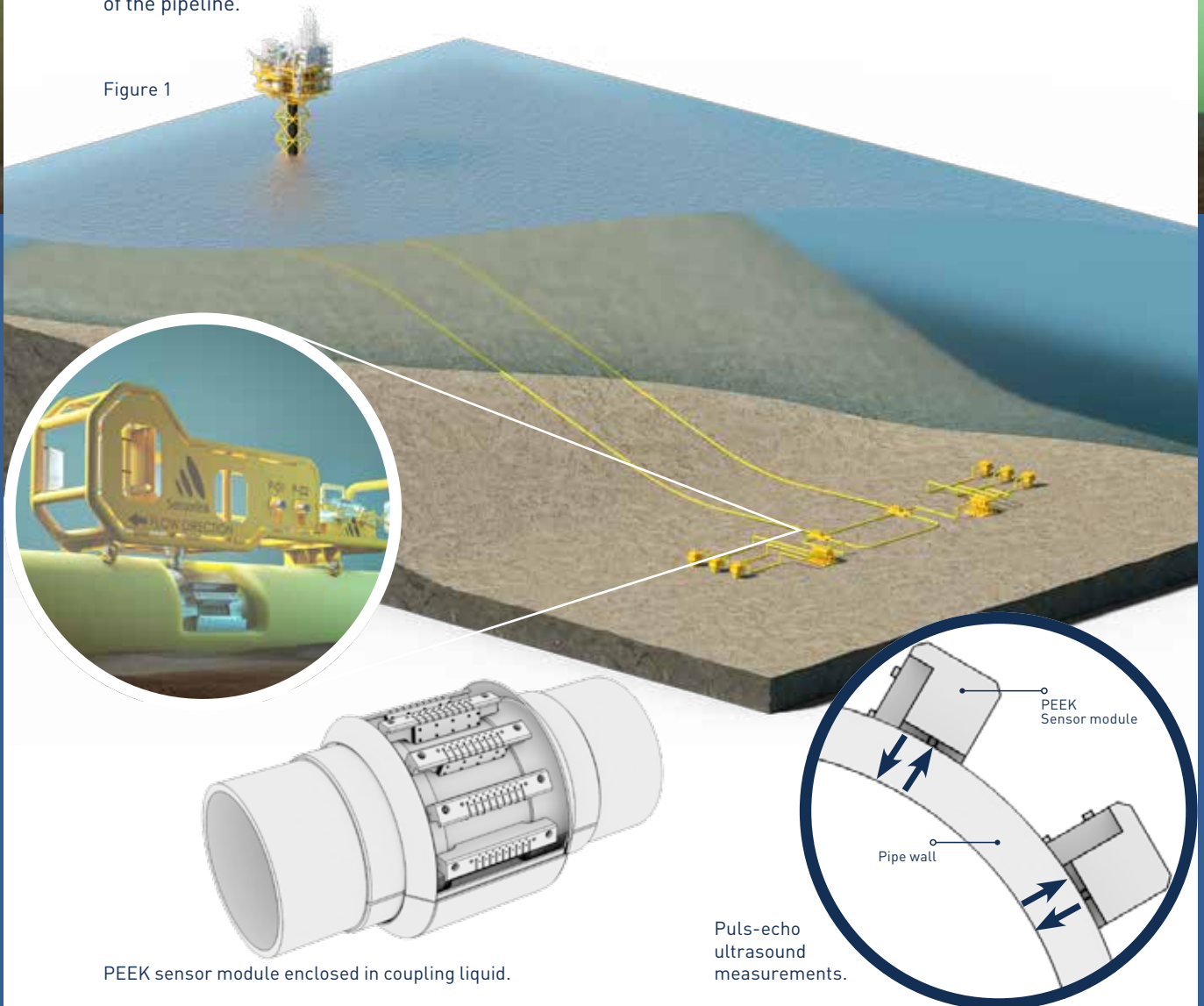
- Reduces or eliminates the need for intelligent pigging
- Real-time monitoring of the effectiveness of corrosion inhibitors (feedback on corrosion inhibitor programmes)
- Benchmarking of intelligent pigging
- Improved pipeline integrity management on non-piggable pipelines
- Life extension and improved safety margins for late life pipelines
- Monitor weld/HAZ on pipe to show variation in corrosion rates

How does it work?

The ultrasound transducers measure wall thickness as a function of time and provide high resolution data on material wall loss. The sensors are installed directly on the pipe outer wall, or on top of the weld seam, before the pipeline or pipe spool is installed.

Figure 1 shows a subsea layout where the UltraMonit® typically can be installed. The ultrasound transducers are mounted in PEEK sensor housings, which are fixed to the pipe. Wall thickness is detected by pulse-echo ultrasound measurements, with the transducers immersed in a coupling liquid in front of the pipe wall. A short ultrasound pulse is generated by the transducer, and echoes from different interfaces are recorded by the same transducer. The UltraMonit® consists of multiple ultrasound sensor module spread around the pipe, and each contains several ultrasound transducers mounted together with a multiplexer card and a temperature sensor. The transducer assembly is moulded into the same insulating material as the rest of the pipeline.

Figure 1



Network and interfaces

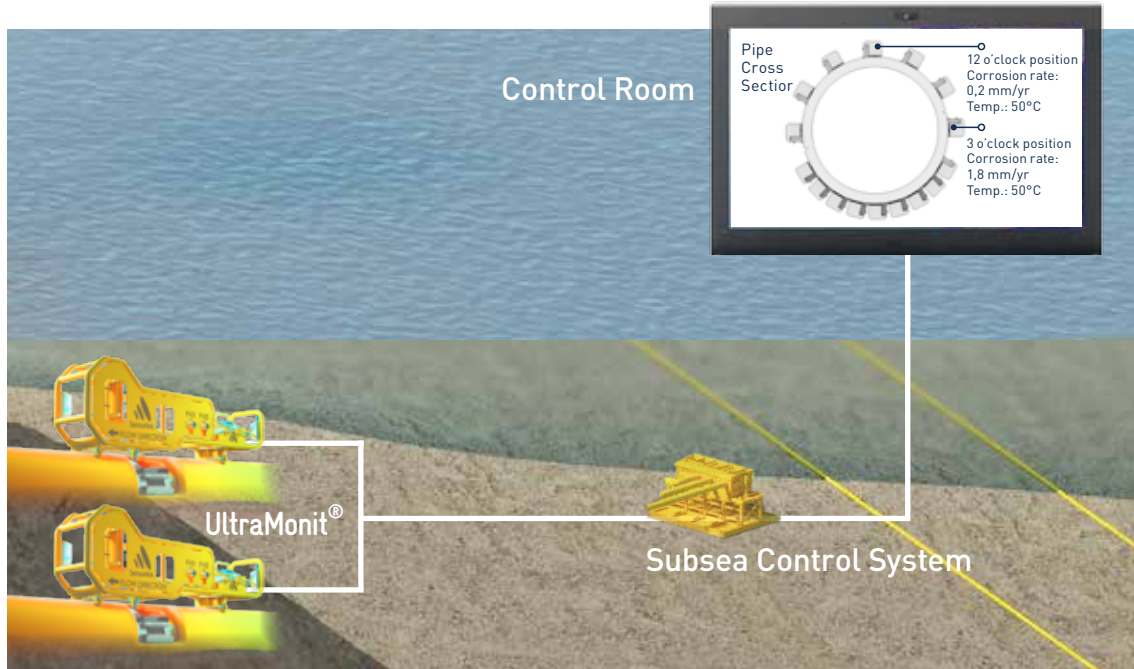


Figure 2. 24 VDC Power, RS 485 or Ethernet Transparent link, OPC or Modbus Communication

All data is processed by the UltraMonit® subsea unit. In addition, raw data can be transferred to topside. The data is communicated through the subsea control system via RS 485 or Ethernet using transparent link, OPC or Modbus protocols. As shown in Figure 2 the corrosion data can be presented in a simple table or a sector map in the platform control room. In addition, wall thickness trend curves can be provided as shown in Figure 3. The UltraMonit® In Situ gets its power from an external power supply (9-36 V), or alternatively from a battery pack.

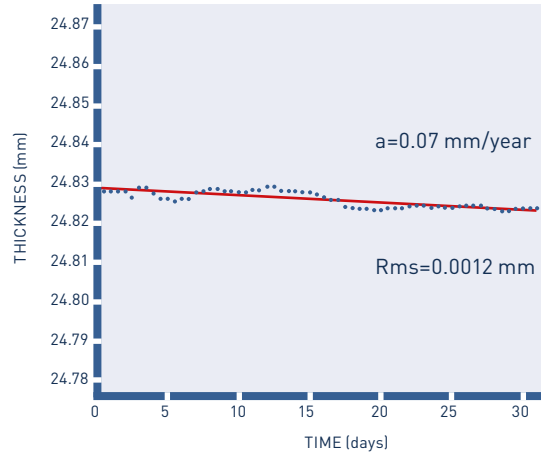


Figure 3: Example of wall loss measurements from a subsea UltraMonit® tool, mounted on a pipeline in the North Sea.

How do you install it?

The UltraMonit® In-Situ is pre-installed on the actual pipe joint or spool prior to pipe lay or subsea spool installation. The UltraMonit® may be insulated to avoid cold spots. A ROV connects the UltraMonit® to the subsea control system using a wet mateable jumper cable. All external cabling and electronics are ROV replaceable. The UltraMonit® sensors can be installed on top of FBE, 3LPP or other solid homogenous insulation materials.

PRODUCT SPECIFICATIONS**TECHNICAL DATA**

Output data:	Wall loss or corrosion rate
Design life:	30 years
Temperature range:	-20 to +90 °C (-4 to 194 Fahrenheit) (-20 to +160 °C in future design)
Water depth:	up to 3 000 meters/ 10 000 ft
Pipe size:	> 4 inch OD (0.1 meter)
Wall thickness:	>3 mm
Wall material:	Steel
Coating materials:	PE/PP/FBE
Inclinometer:	± 2° (angular)
Repeatability:	2.5 µm (0.1 mils)
Absolute accuracy:	0.1mm (4 mils)
ISO 13628-6 qualified:	YES
Transducer configuration:	Optional
Non-intrusive:	Yes
Dimensions	(LxBxH) 2600 mm x 639 mm x 835 mm (8.5ft x 2.1ft x 2.7 ft)

ELECTRICAL DATA

Power supply:	9-36 VDC – battery solution possible
Typical power consumption:	<6W
Communication options:	Ethernet (via cable) or wireless through water communication, Modbus TCP/IP, OPC, RS485