

A STRUCTURAL HEALTH MONITORING SYSTEM FOR WIND TURBINE STRUCTURES

SHM01

The SHM01 system is a digital system for Structural Health Monitoring on wind turbine structures.

The SHM01 system is designed to make installation, data collection, and service smooth and hassle-free. Pre-existing knowledge of the equipment is not needed, and the user can start monitoring without spending much time on preparations. Analogue-to-digital conversion is done at each node while signal processing is done on request in the cloud.

SHM01 is available for purchase or rental.

Enabling

SHM01 is customized for enabling service-life predictions, real time warnings in case of abnormal behaviour, and structural response to loads and production. The data will provide insight for decision making in all phases during the design life of the structure.

For optimal use and power production together with a sufficient baseline it is key to initiate monitoring at an early stage.

Easy Installation

SHM01 employs an installation solution that minimizes cabling thereby saving time and reducing installation cost.

The system consists of four nodes each containing a triaxial geophone and a uniaxial inclinometer for monitoring the dynamic and static position of the tower. Utilizing a single string digital cable, the nodes are connected with minimal cabling in



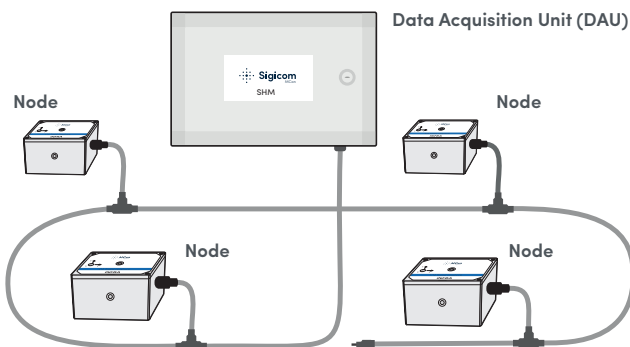
a "daisy-chain" configuration. The cable goes from the Data Acquisition Unit (DAU) to the nodes in a sequence connecting the DAU to the first node followed by the second node and so forth in a "daisy-chain" concept.

The standard system includes a total of 135 meters of cables. The four nodes should be mounted at same height in the tower and be evenly spaced 90 degrees apart for optimal use. The sensors are directly connected to the DAU and therefore always synchronized.

+10 years of service

The system is designed for a +10-year service life, provided that the annual service agreement is purchased and kept. Design life can be extended beyond the 10 years provided normal use.

The SHM01 system warranty is void if alternative solutions, services, or expansion of the system are made without previous approval from Sigicom MCon ApS. Warranty and expected lifetime are provided for normal use, namely that the installation is permanent, or otherwise an agreement is reached with Sigicom MCon ApS.



The SHM01 system

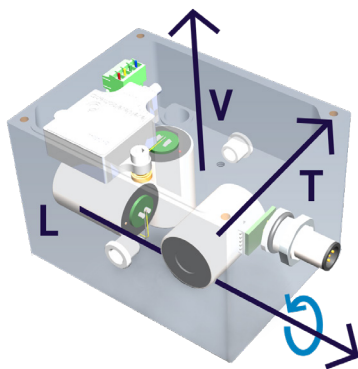
Technical Data

NODE

The node is enclosed by a milled anodized aluminum housing. The IP rating of the node is IP67.

Analog-to-digital conversion is done directly at the node, keeping noise and interference extremely low. Due to the good Signal to Noise Ratio (SNR), the signal bandwidth of the geophone is 0.05-10 Hz with a sampling rate of 32 Hz. The maximum vibration level is frequency dependent. Contact us for maximum vibration level and frequency dependent accuracy.

The inclinometer is a solid-state MEMS with internal digital signal processing and an analogue output of the gravitational force. The range is $\pm 10^\circ$. The relative accuracy (linearity) is $\pm 0.01^\circ$ (at 20°C). The resolution and noise are in total 0.001° with a frequency low pass at 3 Hz.



DATA ACQUISITION UNIT (DAU)

The Data Acquisition Unit (DAU) manages the communication to and from the nodes and the cloud, the latter over TLS encrypted MQTT protocol via Ethernet. Other solutions will require adjustments.

For safety purposes, data is kept locally for 12 hours in case of temporary internet failure or similar events. Data will be lost in case of a power loss. The DAU and sensor nodes can be managed, and the software updated remotely. This however requires that the service agreement is included.

The DAU is housed in a UL94-5VA approved and rugged polycarbonate enclosure resistant to dust and water. The DAU requires a stable internet connection provided by the customer.

CLOUD APPLICATION

The DAU provides quality data in engineering units to the customer via an API pull service. Final storage of customer data is based on agreement and needs of the customer.

DETAILS

Contact us for the specific maximum range in displacement, velocity, and acceleration together with frequency-dependent noise and accuracy.

POWER SUPPLY

100-240V AC 50-60 Hz power supply.

MOUNTING

The nodes are prepared to be bolted into a threaded connection on the inner face of the tower. For a fast and rigid connection this could be done using a magnet together with glue. This double fastening system ensures that the nodes are kept rigidly connected, limiting disturbing movements from the signal. The system is furthermore designed so that other mounting possibilities are easily adapted.

SERVICE AGREEMENT

Sigicom MCon ApS service agreement is customized to the specific project. Services may include calibration, hardware replacement and update, software updates, remote system service and data error handling. The agreement will include the items purchased by the customer.

Note! Service of the system requires that Sigicom MCon ApS has access to the installed system. Access should preferably be constant, but service can also be provided with periodic access during time of service.

ABOUT SIGICOM

Sigicom started as a one-person company in Tullinge, Sweden, in 1981. For the past four decades, the company has been producing instruments for the professional measurement industry. Today, Sigicom is an industry leader in developing autonomous and rugged vibration and noise monitoring solutions.

FOR MORE DETAILED INFORMATION

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