

# Bucket – VELOX-B1

## WOOD MOISTURE

*Radar and radio solutions for harsh environment*

## VELOX-B1 for Wood Moisture Measurement in Buckets

### DESCRIPTION

VELOX-B1 is the solution to determine the wood chip moisture content in wheel loader buckets. The probes are installed as a function in most existing and new wood chip buckets. The solution and installation are generic. The number of probes is in relation to the size of the bucket. There will be 1-3 sections between the probes where the average moisture contents of 50-100 liters wood chips per section are measured. Thanks to large samples outspread in the whole bucket, representative moisture content can be determined with high accuracy. The measurement is fast and performed in seconds. Two clicks away – click *wood type* and click *measure*. Each and all measurements are uploaded into the cloud for reports, data exchange, and online control.

VELOX-B1 is based on digital UWB radio transmission technology. Digital UWB radio is a time-of-flight system working at high measurement cycles. UWB radio is known for robust radio signals and accurate measurements in harsh environmental extremes. The equipment is built for tough treatment. The probes can be screwed or welded onto the bucket. The radio equipment is protected in two metal layers with acid-proof stainless steel. It is built for harsh weather conditions like cold and hot weather, rain, snow, and wind. It is built for high impacts when the bucket hits the ground.

VELOX-B1 is designed with a cloud service to retrieve data and reports. With this service, it is possible to optimize logistics and handling of wood chips, like sorting into dry and wet piles. The system supports online control like periodically goals (daily or weekly) to load wood chips with an average moisture content. This function improves the loading of wood chips with specific moisture into the heat boiler or furnace.

### FEATURES AND BENEFITS

- MEASUREMENT AS A FUNCTION (MAAS)
- FAST MOISTURE MEASUREMENT
- ACCURATE AND LARGE SAMPLES
- SUPPORT SMARTER LOGISTICS
- MEASUREMENT IN THE WHOLE SUPPLY CHAIN
- OPTIMIZED COMBUSTION
- MEASUREMENT OF DIFFERENT WOOD FUELS
- DECREASED MEASUREMENT COSTS
- CLOUD SERVICE FOR DATA AND REPORTS
- EASY AND GENERIC INSTALLATION

### SPECIFICATIONS

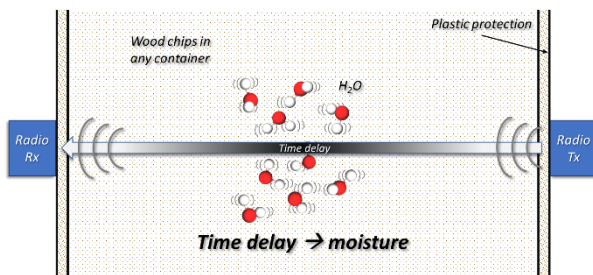
- **Probes:** 2-4
- **Sections:** 1-3
- **Section length:** 1 meter
- **Measurement volume:** 0,05-0,1 m<sup>3</sup> per section
- **Bucket volume:** 6-24 m<sup>3</sup>
- **Accuracy:**  $3\sigma = 1.5$  percentage points
- **Sensor:** UWB radio transmission (DiRP)
- **Measurement time:** 1 second
- **Power:** 24 V to sensor on bucket
- **Environment temperature:** -30 - +80 °C
- **Communication:** WIFI to sensor
- **Other sensors:** GPS and PT100 (temperature)
- **Cloud service:** Telia 4G, Amazon S3
- **Standards:** ETSI 302 065-4-4 (fixed material sensor), Virkesmättningskontroll (VMK)
- **Data:** Excel-files, PDF-reports from Microsoft Power BI

## MOISTURE MEASUREMENT

There are 125 larger district heating plants in Sweden, where moisture content of wood fuel is measured for correct payment. It is also important to determine the moisture content directly, fast, and reliably in the whole supply chain: sorting, storing, loading, and feeding to the boiler. Accurate measurement of moisture content in wood fuel enables efficient transports, product customization, correct payment, reduced risk of self-ignition, and efficient combustion. Radarbolaget has developed a method for moisture determination of wood fuel with radio measurement. The method has an accuracy of 1.5 percentage points. The objective is to implement the method in different measurement solutions.

## MEASUREMENT PRINCIPLE

Radio waves in the GHz-spectrum are very sensitive to water since water consist of dipole molecules. The oxygen atom has a higher electronegativity than the hydrogen atom, which gives one side with a positive charge and another side with a negative charge. This causes the water molecule to oscillate with the radio wave, which delays the wave. Simply described, this time delay correlates with the amount of free and bounded water in wood chips.



Measurement principle of moisture in wood chips. The water molecules oscillate and delay the radio waves.

## RADARBOLAGET

**Radarbolaget** manufactures radar, radio systems, sensors, probes and measurement solutions for industry applications. Radarbolaget has proprietary technology and whole-sale solutions for measurement in harsh environments.

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HIDDEN  
PROCESSES.**

## PROBE DETAILS

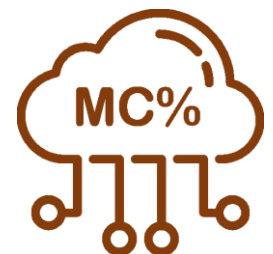
The probes consist of UWB-dipole antennas encapsulated of special plastic details. The antennas are connected to a digital UWB-radio sensor (DiRP). The probes are generically placed with 1-meter distance in the back of the bucket and centered in the middle of the bucket. For small buckets (6-8 m<sup>3</sup>), two probes are used. For larger buckets (8-24 m<sup>3</sup>), 3-4 probes are used.



Probe for measurement of moisture content in wood chips.

## MEASUREMENT AS A FUNCTION

Measurement as a function makes it possible for you to focus on objectives for correct payment, improved combustion, energy savings, decreased costs, and smarter logistics. Data about moisture content are stored in the cloud service, directly and online from the bucket. From this service, you can download data and reports from Microsoft Power BI, connect data to web services (Amazon S3), as well as setting periodic moisture goals for the driver. We take care of initial deployment, installation, annual service, and exchange of spare parts. Be online and in control!



## REDSKAPARNA

**Redskaparna** manufactures and sells buckets, gear, equipment, and spare parts for construction equipment in industries, ports, wood chip handling, and for the cleaning sites.

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