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Technical Information

WMSS1000 Wireless Multi-Sonic Sensor

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General Information

Product Overview

The WMSS1000 Wireless Multi-Sonic elevation sensor is a wireless sensor that eliminates costly sensor cables that are prone to failure or damage. Like the CMSS1000, it is designed for superior performance and flexibility in grade control applications.

The sensor is manufactured with six ultrasonic sensors set to an optimized frequency that results in high precision output signals. The width of the six sensors allows for implementation of a string line sensing mode.

The sensor has LED panels on two sides that allow the machine operator and ground crew a visual indication of where the sensor is in relation to the active set point of the application. An LED panel mounted on one end of the sensor includes a wireless indicator, battery gauge, and a power switch. A rechargeable internal battery provides for 16 hours of continuous use.

A reference bail for optimum temperature and wind compensation is included. The bail is firmly held in place by magnets and designed to break away upon contact rather than break or bend. The bail can be easily removed and stored in the alternate position when the sensor is not in use.

The WMSS1000 is IP67 rated and features an innovative quick mount. This quarter-turn, cam lock mount allows for a one handed install/remove of the sensor that requires no tools. Imbedded in the quick mount is an RFID tag that allows for the source addressing of each mount location in the controller application.

The Danfoss WH1000 Wireless Hub provides a gateway to the machine controller by transmitting and receiving data to and from the sensors. Refer to the WH1000 Wireless Hub Technical Information document (Lxxxxxxxx) for information.

Features and Options

- Ultrasonic sensing technology
- Multiple sensors
- PLUS+1 Compliant
- Capable of string line or ground sensing
- String line sensing range: 20 to 150 cm
- Ground sensing range: 20 to 150 cm
- CAN 2.0 B compliant
- Supports 11 bit and 29 bit message ID
- Data height precision 0.1 mm
- Temperature bail for temperature and wind compensation
- LED grade indicators for high/on/low operator feedback

- LED power switch and LED indicators for wireless operation and battery level

User Liability and Safety Statement

OEM User Liability and Safety Responsibility

The OEM of a machine or vehicle in which PLUS+1™ compliant product is installed has the full responsibility for all consequences that might occur. Danfoss has no responsibility for any consequences, direct or indirect, caused by failures or malfunctions.

- This product is not intended to be used as a stand-alone safety device in safety critical application.
- Danfoss has no responsibility for any accidents cause by incorrectly mounted or maintained equipment.
- Danfoss does not assume any responsibility for products being incorrectly applied or the system being programmed in a manner that jeopardizes safety. All safety critical systems shall include an emergency stop to switch off the main supply voltage for the outputs of the electronic control system.
- All safety critical components shall be installed in such a way that the main supply voltage can be switched off at any time. The emergency stop must be easily accessible to the operator.

Theory of Operation

Wireless sensors provide information to and respond to messages under control of a wireless hub which uses a proprietary protocol to prevent signal tampering. The wireless hub is itself wired to the control module and communicates with the control application using CAN messages.

The sensors themselves have six transducers that are sampled one at a time every 10ms (60ms total). Each transducer takes two measurements at each sample cycle: one for temperature compensation and one for the target measurement.

Ultrasonic transducer signals are affected by temperature. To compensate for temperature errors, these sensors use a temperature bail mounted in the path of the transducer that runs the entire length of the sensor. This makes it accessible to each individual transducer and allows for excellent temperature compensation and allows the sensor to respond to fluctuations caused by wind gusts and vehicle exhaust. This also allows for an overall faster sensor response time since no breaks in measurements are needed to account for temperature compensation readings.

When the transducer sends out a signal, the signal first hits the temperature bail and provides an echo that is reflected back to the transducer. The signal then continues on to the target and a second echo is reflected back to the transducer. Because the distance to the bail is constant, it can be used to compensate the second echo for temperature errors.

The sensor can detect when the temperature bail is not present and sends a message to the system application that temperature compensation is not available

and accuracy of the sensor may be compromised. When the temperature bail is replaced and the operator's hand is removed from the temperature bail echo region, the sensor automatically recalibrates for temperature compensation.

A rechargeable battery provides power to the sensor for up to 16 hours of continuous use.

Ordering Information

Product	*Danfoss Part Number*
Wireless Ultrasonic Sensor	TBD
Wireless Hub	TBD
CG150 CAN/USB Gateway	10104136
PLUS+1 Service Tool single user license	xxxxxxxxxxTBD

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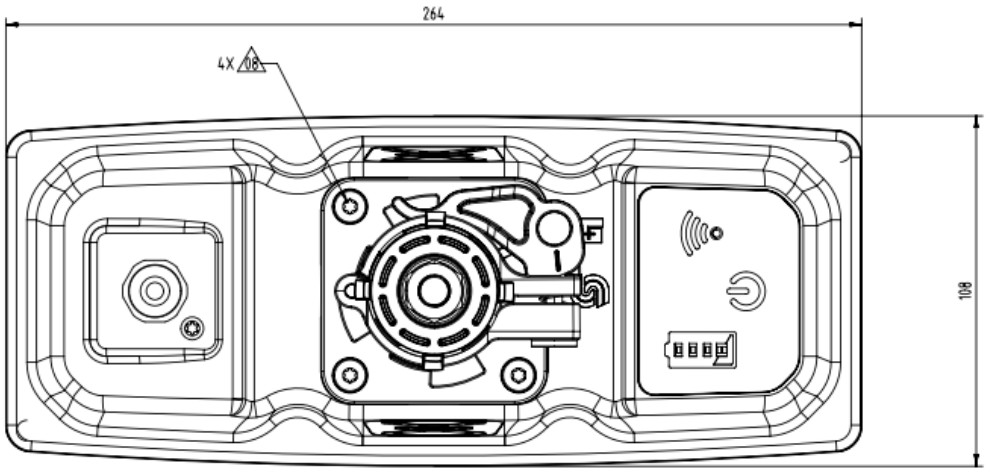
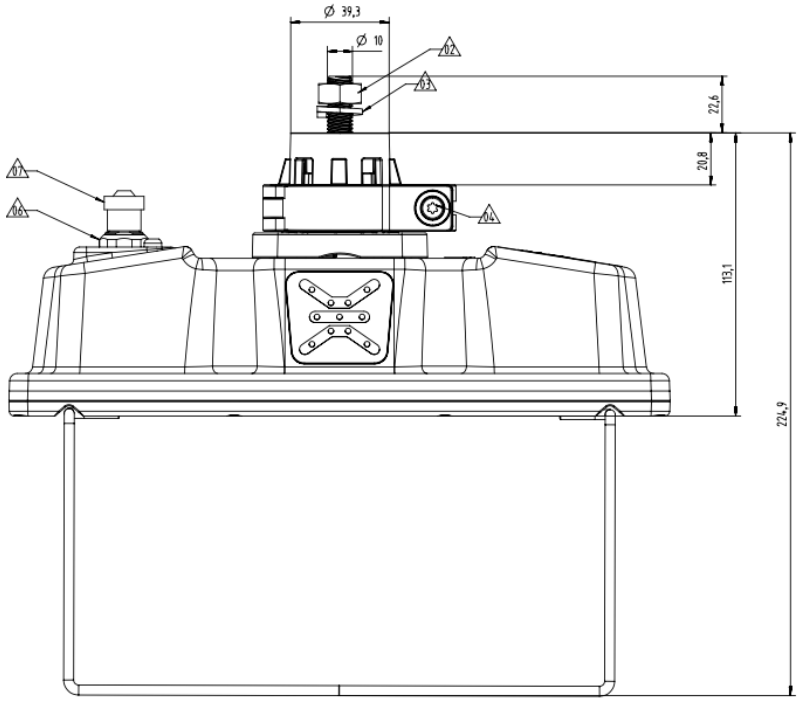
Product Installation

Sensor Dimensions and Key Features

Callouts to key features will be added (by Kim?).





LEDs

All LEDs are under software control and provide a visual indication of sensor status for the machine operators.

Power Indication

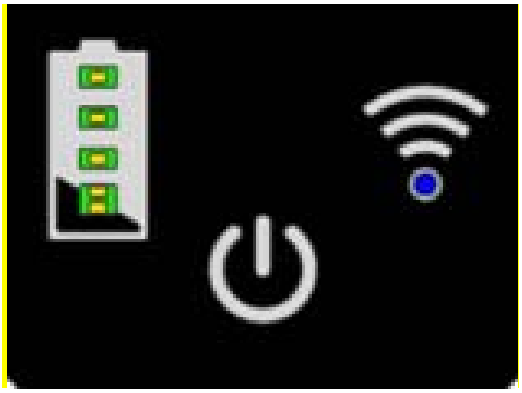
The power LED is lit whenever the sensor is turned on. To turn on the sensor, press and hold down the power LED until it lights. To turn off the sensor, press and hold the power LED until the light turns off.

Battery Indication

The battery indicators are lit only when the sensor is configured for wireless application and consist of four green LEDs and one red LED. Each green LED indicates 25% battery life. The red LED indicates less than 10% battery life remains. When the battery is fully charged, all four green LEDs are lit. As the battery discharges, the green LEDs turn off sequentially. When battery life is less than 10 percent, all green LEDs are off and the red LED is lit. When the battery is charging, the green LEDs turn on in sequence. When the battery is fully charged all four green LEDs blink until the charging cable is removed.

Wireless Indication

When the sensor is configured for wireless communications, a blue LED blinks to indicate the sensor is communicating over with the Wireless Hub. If the sensor is configured for wired operation, the blue LED is turned off.



Callouts will be added (by Kim?)

Deviation Indication

LEDs on both sides of the sensor provide a visual indication of sensor status for the machine operators. The deviation LEDs consist of three sections; Up Arrow, On Grade, and Down Arrow. These LEDs are under software control and each section is controlled by the LED Command CAN message.

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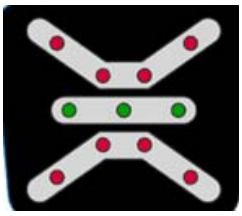
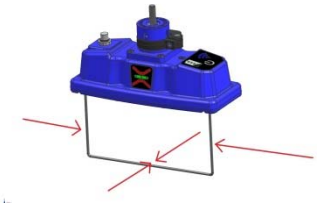


Callouts to be added (by Kim?).

Temperature Bail

The temperature bail is designed to magnetically lock in place when in use and is easily removed in the presence of a physical obstruction that could potentially bend or break the bail. If an object runs into the bail, the bail will detach from the sensor to prevent damage.

The sensor has cutouts on the underside that the bail to be repositioned from normal use in flat position for storage. The magnets retain the bail during storage.



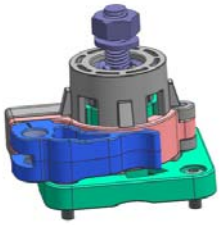
Add callouts to indicate bail in use.

Add new diagrams/photos showing bail in use and stored position (by Kim?).

Quick-Mount

The sensors are designed for quick mounting and removal.

- Quick release - requires no tools to remove the sensor from the mount.
- Locking tabs prevent the sensor from rotating counter-clock-wise from its installed position and help prevent the sensor from falling down if the release lever is inadvertently opened.



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This diagram will be replaced with diagrams/photos showing release of quick release and
twisting and downward motion to remove sensor (by Kim).

Rechargeable Battery

Info to come

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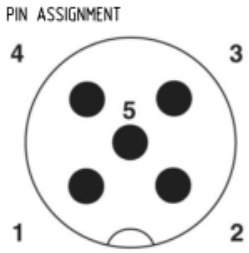
Connector Pin Assignments

During normal operation, the connector on the wireless sensor is capped (insert a photo, to come (Kim?)). Remove this cap to attach the battery charger or to attach the connector for the PLUS+1 Service Tool.



Pin	Controller Function	Description	Notes
1	Power Input	PWR_1	
2	Power Ground	GND	
3	CAN HI	CAN1_1_HI	
4	CAN LO	CAN1_1_LO	
5	CAN SHIELD	CANSHIELD1_1	There is a 0.68 uF capacitor and a 1 Ohm resistor in series to ground on this input for CAN shield termination.

Welding Procedures

Remove the sensors from the machine before any welding. Remember the sensor mounts contain an RFID which can be damaged. The following procedures are recommended when welding on a machine equipped with sensors:

- Turn the engine off.
- Disconnect the negative battery cable from the battery.
- Do not use electrical components to ground the welder.
- Clamp the ground cable for the welder to the component that will be welded as close as possible to the weld.

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Compliance Statements

To Come. Including:

IC: 3934C-WMSS1000; FCC ID: 2AA5L-WMSS1000

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

"Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help."

"Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment"

"This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Contains FCC ID: TFB-PROFLEX1 and IC: 5969A-PROFLEX1

- Wireless Sensor: CE, ROHS, WEEE
- Battery: UN DOT, IEC

Accessories

Battery Charger

Information to come; photo to come (Kim?)

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Specifications

Electrical

Battery

Info to come.

Environmental

Mechanical