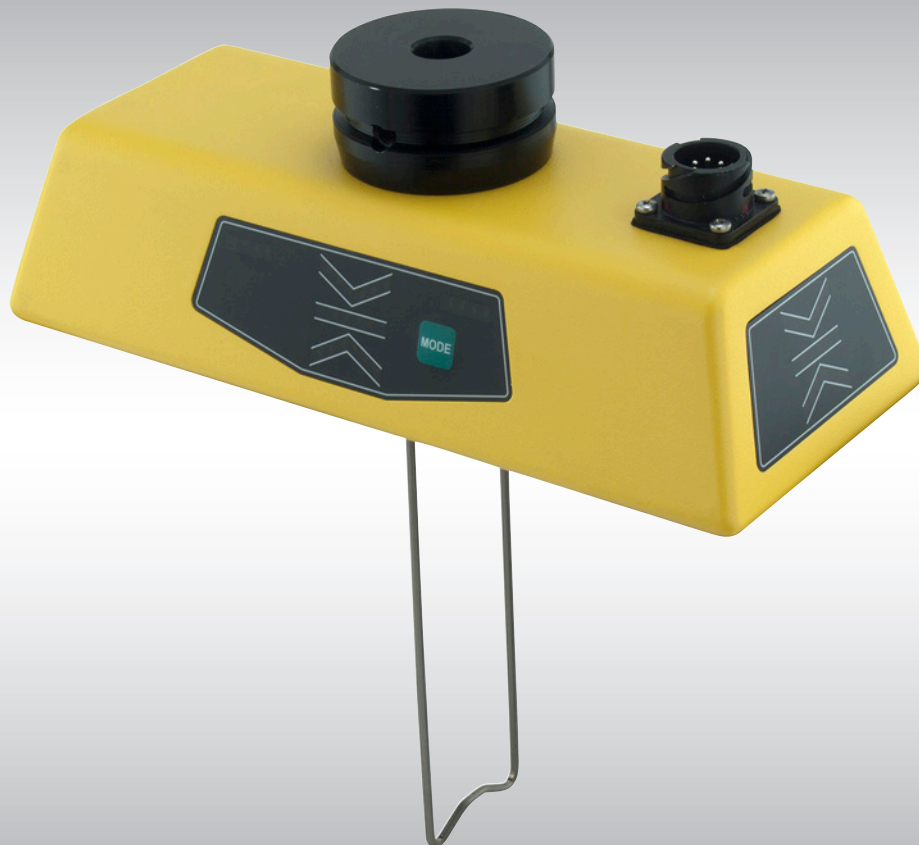




Technical Information

PLUS+1[®] Compliant MSS100 Multi-Sonic Sensor



Revisions**Revision History***Table of Revisions*

Date	Page	Changed	Rev
01 Nov 2013	10, 11	LED control summary, CAN message to sensor	BA
20 Feb 2013			AA

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General Information

Product Overview

The MSS100 Multi-Sonic grade sensor is designed to be highly versatile with regards to use and connectivity. It's equipped with four ultra sonic sensors operating at an optimized frequency resulting in high precision. The large span of the four sensors gives the MSS100 excellent abilities for string line sensing.

The sensor is equipped with LED panels on two sides. The active panel facing the operator and his crew gives a visual indication showing how the current mat thickness is following the set reference. Switching between string line mode and ground mode is achieved by pressing the "Mode" button or by digital communication. When in string line mode an LED indicator shows if the sensor is working within or is about to exceed it's operating range.

The MSS100 features a reference bail for optimum temperature and wind compensation. The bail is made of spring steel and will return to it's original shape despite significant bending. The reference bail can easily be removed when the sensor is not in use. Sensor communications is maintained digitally via CAN bus.

Features and Options

- Ceramic based ultrasonic sensing technology
- Multiple sensors
- PLUS+1™ Compliant
- Capable of string line or ground sensing
 - String line sensing range: 270 to 650 mm
 - Ground sensing range: 250 to 900 mm
- CAN 2.0 B compliant
- Supports 11 bit and 29 bit message ID
- 1 mm resolution
- Temperature bail for temperature and wind compensation
- LED grade indicators for high/on/low operator feedback

User Liability and Safety Statements

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. Sauer-Danfoss has no responsibility for any consequences, direct or indirect, caused by failures or malfunctions.

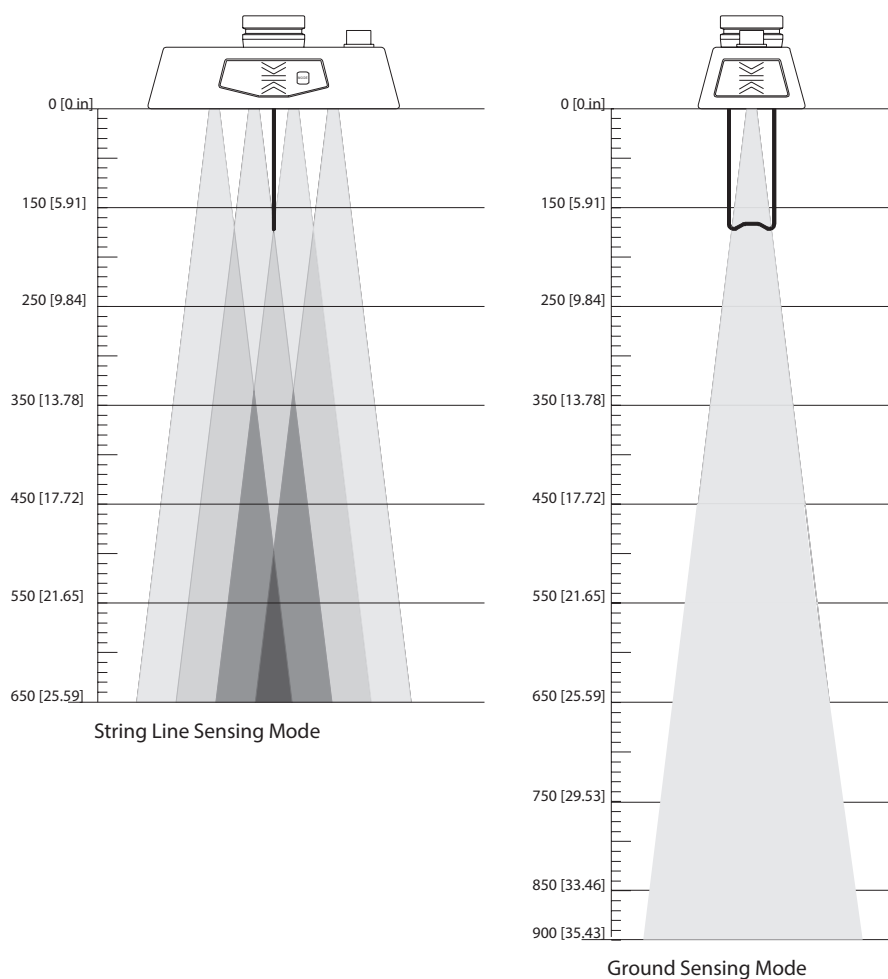
- This product is not intended to be used as a stand-alone safety device in safety critical applications.
- Sauer-Danfoss has no responsibility for any accidents caused by incorrectly mounted or maintained equipment.
- Sauer-Danfoss does not assume any responsibility for products being incorrectly applied 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.

General Information

Theory of Operation

MSS100 Ranges for String Line and Ground Sensing

mm [in]



P200 102

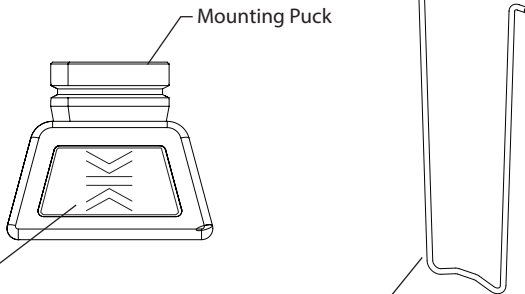
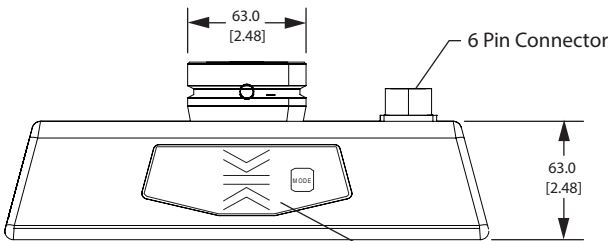
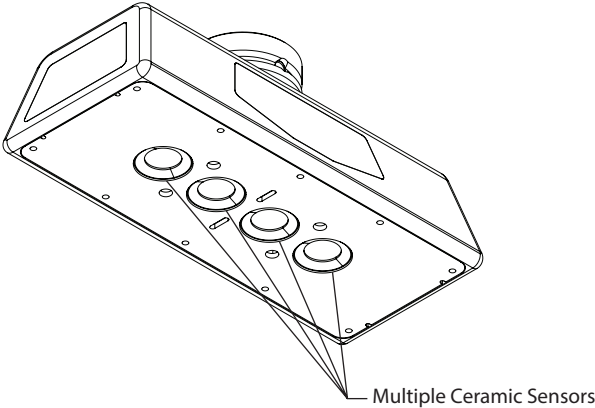
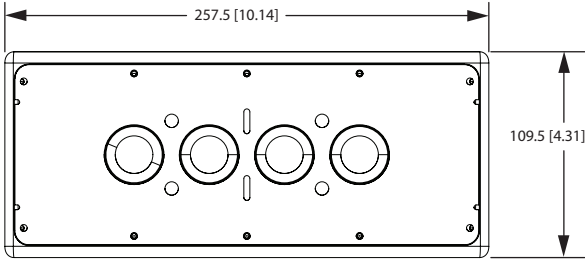
Switch between string line and ground sensing mode by pushing "Mode" button or through "set work mode" CAN message.

Ordering Information

Product	Danfoss part number
MSS100	11103282
CG150 CAN/USB Gateway	10104136
Mating connector	11031032
PLUS+1 GUIDE single user license	10101000

Product Installation

Dimensions and Key Features

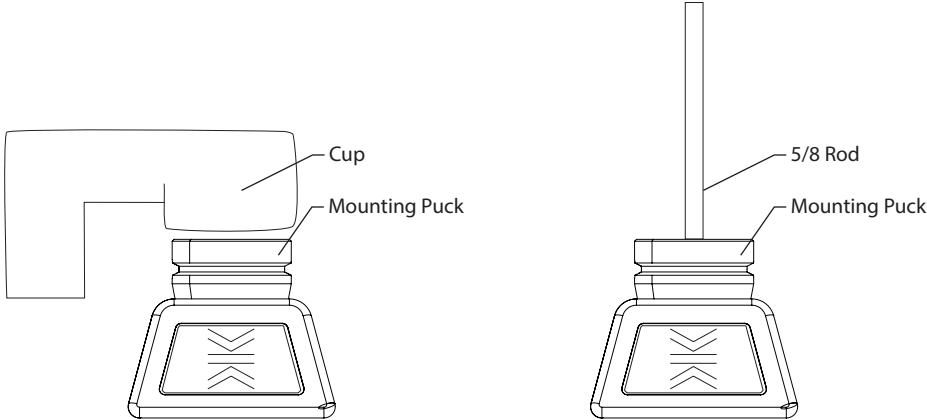


P200 103

Caution
This device is not field serviceable. Opening the device housing will void the warranty.

Mechanical Installation

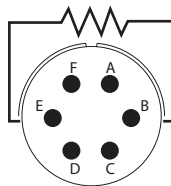
Install by either using the mounting puck or inserting a 5/8 rod through the center of the mounting puck with two set screws.



P200 105

Product Installation
Connector Pin Assignments

6 Pin Connector (Configuration resistor between pins E and B)



P200 106

Connector

Pin	Controller function
A	Power
B	Ground
C	CAN Hi
D	CAN Lo
E	Config
F	Not used

Use care when wiring mating connector. Above pinouts are for device pins.

Product Installation**Wiring Guidelines**

- Protect wires from mechanical abuse, run wires in flexible metal or plastic conduits.
- Use 85° C (185° F) wire with abrasion resistant insulation and 105° C (221° F) wire should be considered near hot surfaces.
- Use a wire size that is appropriate for the module connector.
- Separate high current wires such as solenoids, lights, alternators or fuel pumps from sensor and other noise-sensitive input wires.
- Run wires along the inside of, or close to, metal machine surfaces where possible, this simulates a shield which will minimize the effects of EMI/RFI radiation.
- Do not run wires near sharp metal corners, consider running wires through a grommet when rounding a corner.
- Do not run wires near hot machine members.
- Provide strain relief for all wires. Avoid running wires near moving or vibrating components.
- Avoid long, unsupported wire spans. Power the analog sensors by the sensor power source from the module and ground returned to the sensor ground pin on the module.
- Twist sensor lines about one turn every 10 cm (4 in). Use wire harness anchors that will allow wires to float with respect to the machine rather than rigid anchors.
- Ground electronic modules to a dedicated conductor of sufficient size that is connected to the battery (-).

Welding Procedures

The following procedures are recommended when welding on a machine equipped with modules:

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

Sensor Configuration
Using the Sensor's Configuration Input Pin to Set the Source Address

An external resistor at the cable connection point is used to generate a unique source address for each sensor. The Sensors have a fixed base transmit message identifier from 0x630 (11 bit)/ 0x18FF5209 (29 bit) combined with its Sensor configuration resistor the sensor modifies the base identifier to create the final Sensor transmit identifier. An offset is added to the receive identifier: Offset * 0x1 (11 bit) or Offset * 0x10 (29 bit).

CAN IDs

Baud rate = 250 kbps	11 bit address	29 bit address, J1939
Transmit ID	0x630 + offset	0x18FF5209 + (offset * 0x10)
Receive ID	0x530 + offset	0x18FF4209 + (offset * 0x10)

Configuration ID Offset

Offset	Resistor (Ohms)
1	Open
2	0
3	390
4	750
5	1100
6	1500
7	2000
8	2700
9	3300
10	4300
11	5600
12	7500
13	10,000
14	13,000
15	22,000
16	33,000

Configuration resistor must be placed between pins E and B.

Controller Area Network (CAN) Message Protocols
Sensor Data and Status
Height CAN Message from Sensor: Cyclic and/or Requested Sensor Data

Byte	Sensor transmit ID: 0x530 + Offset (11 bit) or 0x18FF4209 + (Offset * 0x10) (29 bit)			
0	0x01			
1	Sensor status			
		Name	Bit 1	Bit 0
	0	Sensor stale	Sensor stale/wrong data	Correct data
	1	Sensor On/OFF	Sensor is switched off	Sensor is active (default)
	2			
	3			
	4			
	5			
	6	Reference bail	Bail (default)	No bail
	7	Sensor mode	String line mode	Ground mode (default)
2	Low byte	Elevation data sensor absolute range [LSB = 1 mm]		
3	High byte			

LED Control Summary
CAN Controller LED Transmit Message to All Sensors: Broadcast

Byte	Controller transmit ID: 0x630 (11 bit) or 0x18FF5209 (29 bit), no offset				
0	0x01				
1	External LED command				
	Hex byte	Bit 2	Bit 1	Bit 0	LED description "on"
	0x0	0	0	0	All off
	0x1	0	0	1	Up
	0x2	0	1	0	On-grade
	0x3	0	1	1	Up and on-grade
	0x4	1	0	0	Down
	0x5	1	0	1	Up and down
	0x6	1	1	0	Down and on-grade
	0x7	1	1	1	All on
2	Bit 0-3	ON time (0-15) (0 to 750 ms) in 50 ms steps			
3	Bit 0-3	OFF time(0-15) (0 to 750 ms) in 50 ms steps			
4-7	NA				
7	NA				

Controller Area Network (CAN) Message Protocols
CAN Message to Sensor
Data Request

Byte	Controller transmit ID: 0x630 + Offset (11 bit) or 0x18FF5209 + (Offset * 0x10) (29 bit)	
0	0x01	
1	Low byte	Cycle time in ms (if cycle time = 0 only one data message will be sent)
2	High byte	
3-7	NA	

Command: "Sensor On/Off"

Byte	Controller transmit ID: 0x630 + Offset (11-bit) or 0x18FF5209 + (Offset * 0x10) (29 bit)	
0	0x02	
1	Status unsigned char ; \$00 = Sensor active ; \$01 = Sensor off	
2-7	NA	

No answer from the sensor. The result will be shown in the next data message in the status flag.

Default: Sensor on.

Command: "Set Work Mode"

Byte	Controller transmit ID: 0x630 + Offset (11 bit) or 0x18FF5209 + (Offset * 0x10) (29 bit)	
0	0x03	
1	Work mode unsigned char ; \$00 = Ground Mode ; \$01 = String line mode	
2-7	NA	

No answer from the sensor. The result will be shown in the next data message in the status flag.

Default: Ground mode.

Sensor Control Example
Request to Sensor to Transmit Data 11 bit ID

Wait 2 seconds for sensor to initialize from power up before sending request.

SA ID offset used.

0631	8	01	14	00	FF	FF	FF	FF	FF
Request to sensor from controller		0x01	Cycle time in ms LSB 20 ms	Cycle time in ms MSB					

Return sensor Data/Status to Controller 11 bit ID

Sensor returns data/status after the receipt of: Request to sensor to transmit Data 11 bit ID.

SA ID offset used.

0531	8	01	40	70	01	FF	FF	FF	FF
Status and data from sensor to controller		0x01	Status = correct data, sensor is active, bail on	Elevation data in mm LSB	Elevation data in mm MSB				

Controller Area Network (CAN) Message Protocols
Sensor Control Example (continued)
Broadcast Message to Sensor LEDs 11 bit ID

No SA ID offset used. If multiple sensors at different IDs are present they receive the same broadcast message.

0630	8	01	02	0A	0A	0A	FF	FF	FF	271.604 R
Broadcast message to sensor from controller		0x01	Sensor LED command	LED on time	LED off time	LED intensity				

Configure Sensor "Work Mode" 11 bit ID

SA ID offset used.

0631	8	03	00	FF	FF	FF	FF	FF	FF
Configure message to sensor from controller		0x03 sensor work mode type	0 = Ground (default) 1 = String line						

Configure Sensor "On/OFF" 11 bit ID

SA ID offset used.

0631	8	02	01	FF	FF	FF	FF	FF	FF
Configure message to sensor from controller		0x02 sensor on/off type	0 = sensor off 1 = sensor on (default)						

Request to Sensor to Transmit Data 29 bit ID

Wait 2 seconds for sensor to initialize from power up before sending request.

SA ID offset used.

18FF5219 X	8	30	00	00	FF	FF	FF	FF	FF
Data request sent to sensor from controller 29 bit		0x30							

Return Sensor Data/Status to Controller 29 bit ID

Sensor returns data/status after the receipt of: Request to sensor to transmit data 29 bit ID.

SA ID offset used.

18FF4219 X	8	01	C0	A2	01	00	00	00	00
Status and data sent from sensor to controller		0x01	Status = Correct data, sensor is active, bail on	Elevation data in mm LSB	Elevation data in mm MSB				

Controller Area Network (CAN) Message Protocols
Sensor Control Example (continued)
Broadcast Message to Sensor LEDs 29 bit ID

No SA ID offset used. If multiple sensors at different IDs are present they receive the same broadcast message.

18FF5209 X	8	01	07	0A	0A	0A	FF	FF	FF
Broadcast message sent to sensor from controller 29 bit		0x01	Sensor LED command	LED on time	LED off time	LED intensity			

Configure Sensor "On/OFF" 29 bit ID

SA ID offset used.

18FF5219	8	02	01	FF	FF	FF	FF	FF	FF
Configure message to sensor from controller		0x02 sensor on/off type	0 = Sensor off 1 = Sensor on (default)						

Configure Sensor "Work Mode" 29 bit ID

SA ID offset used.

18FF5219	8	03	00	FF	FF	FF	FF	FF	FF
Configure message to sensor from controller		0x03 sensor work mode type	0 = Ground (default) 1 = String line						

Technical Information **MSS100 Multi-Sonic Sensor**

Specifications**Electrical**

Supply voltage	12 to 30 Vdc
Maximum power consumption	250 mA

Environmental

Operating temperature range	-10o C to 70o C (-14° F to 158° F)
Storage temperature range	-40o C to 85o C (-40° F to 185° F)

Mechanical

Resolution	1 mm (0.04 in)
Temperature compensation	165 mm (6.50 in) detachable bail
Transducer beam width degrees	12o ± 2o
String line sensing range	270 to 650 mm (10.63 to 25.59 in)
Ground sensing range	250 to 900 mm (9.84 to 35.43 in)
Weight	1400 g (3.09 lbs)

Notes



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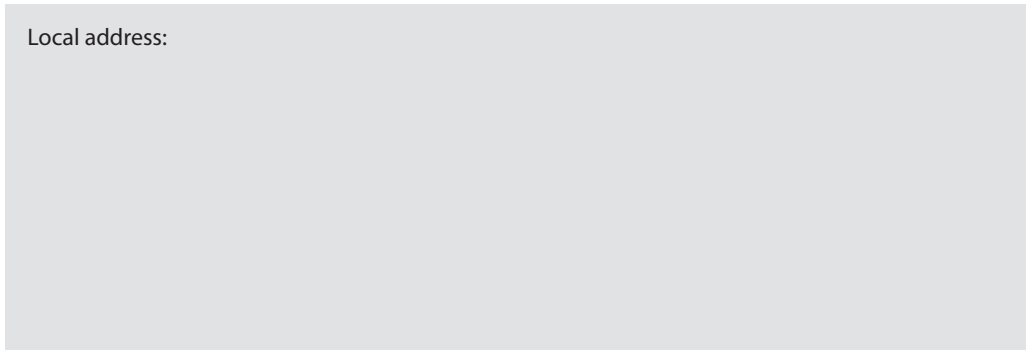
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