SAUER DANFOSS

MCX103 CAN Non-Contact Rotary Position Sensor

Technical Information

E1™ COMPLIANT

L1304054 • Rev AA • Jun 2013

Revisions

Revision History

Table of Revisions

Date	Page	Changed	Rev
28 Jun 2013			AA

MCX103 CAN Non-Contact Rotary Position Sensor Technical Information

Contents

Product Overview

The MCX103 CAN Non-Contact Rotary Position Sensor serves as either a command or feedback source. The sensor is a non-contacting proportional hall chip which is ideal for the rugged off-highway environment. The sensor's housing is aluminum, and the rotary hub is supported by dual sleeve bearings that resist side loading damage. This sensor provides a CAN signal to the control system.

Features and Options

- Non-contact sensor withstands high shock and vibration
- Long life
- Designed to withstand the mobile environment
- PLUS+1™ Compliant GUIDE function block available
- CAN 2.0 B compliant
- Supports J1939 and Sauer-Danfoss proprietary CAN message protocols
- Sensor parameters can be set via the PLUS+1 GUIDE Service Tool
- Input configuration pin for use of multiple sensors on a single CAN bus
- 9 to 36 Vdc power supply
- CE compliant

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.

Theory of Operation

The MCX103 CAN Non-contact Rotary Position Sensor is powered by a source in the 9 to 36 Vdc range. Typically, a follower attachment that traces a string line or other reference surface provides input to the sensor. Changes in the reference move the follower, which in turn rotates a spring-loaded hub. The hub is attached to a shaft, mounted upon the shaft is a U-shaped magnet. A linear Hall effect chip, stationary between the two poles, outputs a voltage in proportion to the number of impinging magnetic flux linkages. As the poles rotate about the chip, the flux linkages decrease with the increasingly oblique angle. The sensor's output is a CAN signal.

Ordering Information

Part Number Quick Reference

Part number	Supply voltage	Total electrical rotation	Body style	Connector
11087919	9 to 36 Vdc	± 30°	Stud mount with flange	6 pin

Surface Contacts

Part number	Description
KG04003	Right angle follower (nylon)
KG06601	Skate assembly
KG07002	Steering follower (with nylon grid adapter)

Service Part

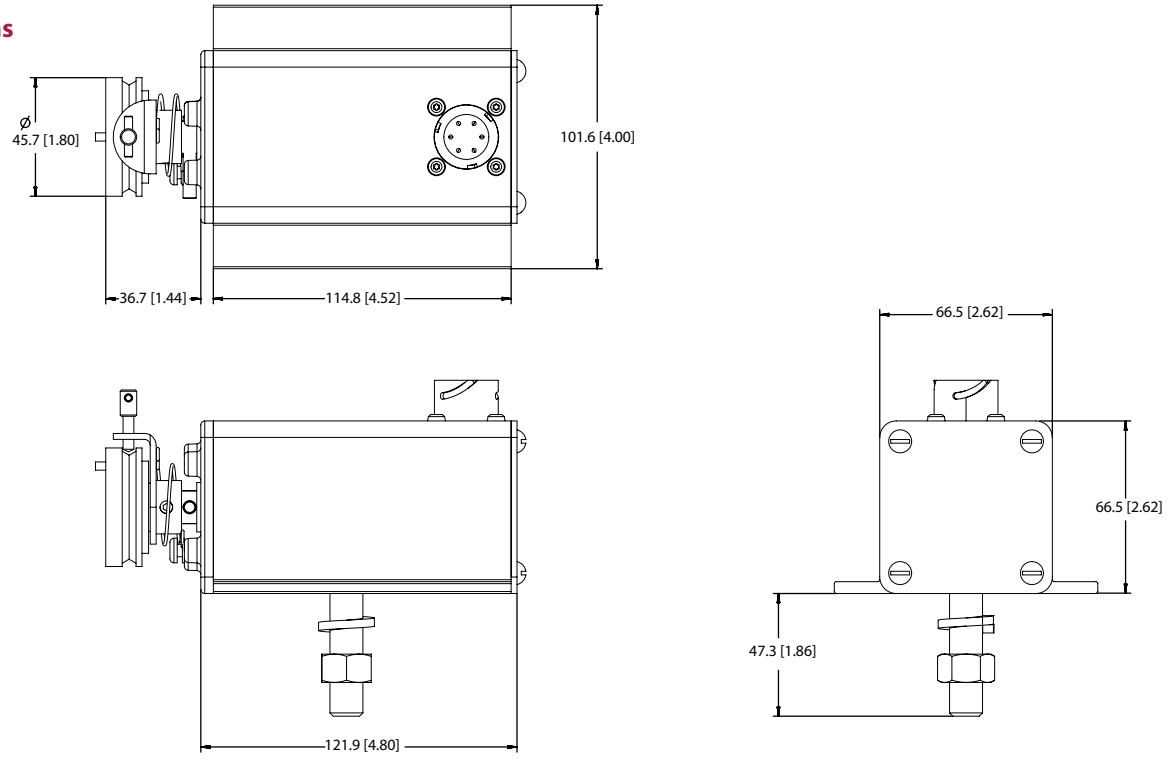
Part number	Description
K32299	Hub and hanger assembly

Related Product

Part number	Description
11031032	Mating connector

Dimensions

mm [in]



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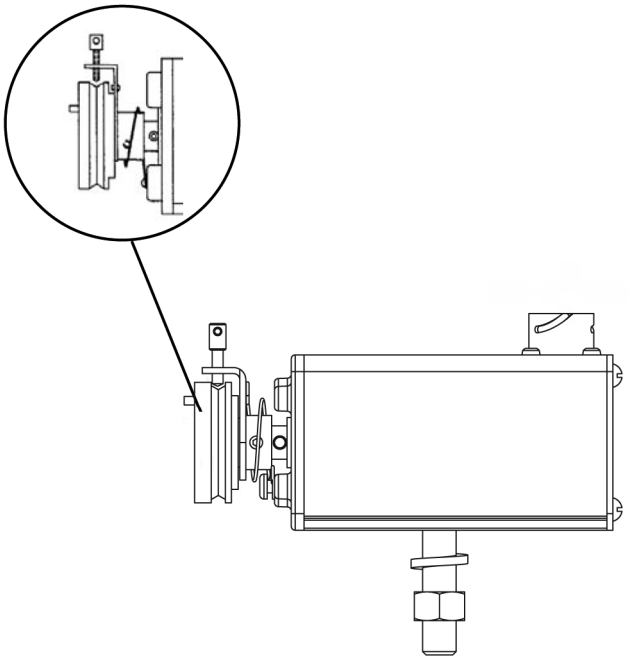
Service Part

Hub and Hanger Assembly

Service Part Number: K32299



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Product Installation

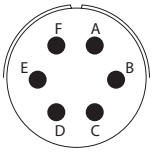
Mounting

The stud mount has a 2 inch bolt extending from the case serving as a rotatable mount, allowing for proper leveling. It is important that the sensor be level in the plane of rotation around the pivot.

The mounting stud must be inserted through a vertical plate attached to an appropriate height-adjusting jack. The mounting stud is approximately 4.25 inches above the string line when trailing a grid at 45° below horizontal.

Connector Pin Assignments

6 pin Connector



Pinout and Wiring Information

Pin	Controller function
A	Power
B	Ground
C	CAN Hi
D	CAN Lo
E	Config
F	CANshield

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

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.

Parameter Set-up

The sensor's source address may be configured in one of two ways: Configuration through the use of the configuration pin (E) or through the use of the PLUS+1 Service tool. All other adjustable parameters are serviced only through the PLUS+1 Service tool.

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

The sensor is capable of achieving 256 distinct source addresses, 31 of which may be selected through the use of the configuration pin. The pin can be connected directly to ground (source address 129), left floating (last programmed source address) or connected to ground through one of thirty different resistor values. The table below defines the allowable source addresses and the required resistor value to achieve each address.

The source addresses are checked by the sensor's microprocessor each time it is powered up. In order to change the source address via the configuration pin, the sensor must be powered up with the configuration input pin connected to the appropriate value resistor. Any changes made to the source address while the sensor is powered are ignored until power has been cycled.

If, on power up, the source address configured by the resistor differ from the value currently stored in the sensor's non-volatile (NV) memory then the value in NV memory will be over written with the new source address, as long as the selected resistor value does not exceed 51,100 Ohms.

Source address	Resistor (Ohms)	Source address	Resistor (Ohms)
129	0	145	2430
130	76.8	146	2740
131	162	147	3160
132	249	148	3570
133	340	149	4120
134	442	150	4750
135	562	151	5490
136	665	152	6490
137	806	153	7680
138	931	154	9310
139	1100	155	11,500
140	1270	156	14,700
141	1430	157	19,600
142	1650	158	28,700
143	1870	159	51,100
144	2150	No change	Open

If a system has multiple sensors of the same type and the configuration input pins are used for setting the source addresses, it is recommended that all of these sensors use a unique resistance value. It is not recommended to leave one sensor in the open state.

Parameter Set-up

Using the PLUS+1 Service Tool

All of the sensor's parameters can be set up using the PLUS+1 Service Tool. The source address can only be changed by the PLUS+1 Service Tool if the configuration pin is left open.

The table below defines the allowable values for each of the sensor's parameters that can be modified using the PLUS+1 Service Tool.

PLUS+1 Service Tool signal (sensor parameter)	Allowable values	Comments
CANBaudRate	100,000; 250,000; 500,000; 1,000,000	Default 250,000
CANID	0- 536870911(0x00-0x1FFFFFFF)	The 8 Least Significant Bits are overwritten by the Source Address Value Default CAN ID: 0X00F031SA
UseExtendedID	0,1	0=11 bit mode, 1=29 bit mode (factory default = 1)
SourceAddress	0-255	Factory default=224
UseJ1939AddressClaim	0,1	Factory default=1
Damping Factor	0-100	Factory default=0
OutputMode*	0-1	Factory default=0

* If the OutputMode is changed, the corresponding J1939 ID must also be update.

Sensor Data and Status

All communication for the MCX103 CAN sensor is through a J1939 protocol using an existing J1939 PGN.

PGN/ID Summary

Sensor type	J1939 PGN (d)	J1939 ID (d)	J1939 ID (h)	Trans rate
Wand	61489	61489 + (0 – 255)	0X00F031SA	20 ms
Steer FB	61451	61451 + (0 – 255)	0X18F00BSA	20 ms

SA is the source address which can be selected by the PLUS+1 Service Tool or through a configuration resistor attached to the analog input.

OutputMode = 0

Byte	0	1	2	3	4	5	6	7
Bits	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7
Description	(Degrees x 10+640)*50		FOM No error 0 x F0 Out of range 0 x F2	Degrees x 10		Percent x 10		0 x FF
Type	U16		U8	S16		S16		U8
Data Range	0 x 0000 to 0 x FFFF		0 x F0 or 0 x F2	-32767 - 32767		-32767 - 32767		0 x FF
Units	— —		— —	Degrees		Percent full range		— —
Resolution	— —		— —	0.1 degree per bit		0.1 % per bit		— —

OutputMode = >0

Byte	0	1	2	3	4	5	6	7
Bits	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7	0 to 7
Description	(Degrees+125)*256		0 x FF	FOM No error 0 x F0 Out of range 0 x F2	0 x FF	0 x FF	0 x FF	0 x FF
Type	U16		U8	U8	U8	U8	U8	U8
Data Range	0 x 0000 to 0 x FFFF		0 x FF	0 x F0 or 0 x F2	0 x FF	0 x FF	0 x FF	0 x FF

Specifications

Electrical

Input voltage	9 to 36 Vdc
Hall effect electromagnetic sensor	Life is not limited by the number of cycles.
Maximum current draw	50 mA
Linearity	Approximately ± 3% over the rated angle. Since the output is proportional to the sine of the input angle, greater linearity can be achieved by reducing the angle employed.
EMI/RFI*	100 V per meter

* All EMI/RFI specifications subject to shielded cabling.

Environment

Operation temperature rating	- 40° to 85° C (- 40° to 185° F)
Storage temperature rating	- 55° to 125° C (- 67° to 257° F)
Vibration (random test)	Random IEC 60068-2-64, test Fh light hr per axis 7.67 g
Shock (Three shocks in both directions of the three mutually perpendicular axes for a total of 18 shocks.)	50 g per 11 ms

Notes

Notes

Notes

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