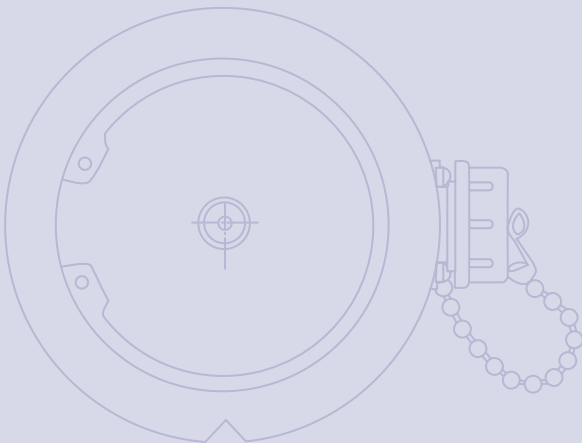


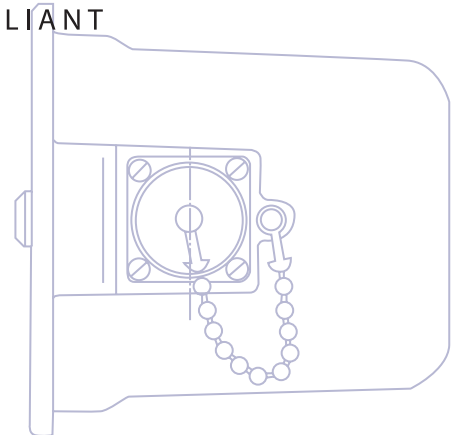


MCX104A
DC Microsyn
Level Sensor

Technical
Information



 TM
COMPLIANT



Revision History

Table of Revisions

Date	Page	Changed	Rev
06 Apr 2011	4	Ordering Information	BA
07 Dec 2010	Cover	Added PLUS+1 Compliant logo	AD
03 Nov 2010		Typo	AC
18 Oct 2010	5, 6	Corrected input voltage to 5 to 8 Vdc	AB
08 Oct 2010		Replaces BLN-95-8996	AA

© 2011 Sauer-Danfoss. All rights reserved.

Sauer-Danfoss accepts no responsibility for possible errors in catalogs, brochures and other printed material. Sauer-Danfoss reserves the right to alter its products without prior notice. This also applies to products already ordered provided that such alterations can be made without affecting agreed specifications. All trademarks in this material are properties of their respective owners. Sauer-Danfoss, the Sauer-Danfoss logotype, the Sauer-Danfoss S-icon, PLUS+1™, What really matters is inside® and Know-How in Motion™ are trademarks of the Sauer-Danfoss Group.



MCX104A DC Microsyn Level Sensor
Technical Information
Contents

Overview	Description	4
	Features	4
	Ordering Information.....	4
	Theory of Operation.....	5
Technical Data	Electrical	6
	Environmental.....	6
Installation	Dimensions.....	7
	Mounting.....	7
	Wiring	8
	Final Leveling	8
	Troubleshooting	9

Description

The MCX104A DC Microsyn Level Sensor electromagnetically measures the deviation of the sensor and its mount from a gravity reference. The reference is an oil damped pendulous mass having freedom of movement in one plane about a fixed center point.

The sensor can be used as a component in a system requiring a reference for control with respect to gravity. It is ideal for use on mobile equipment where a surface must be finished to a required level with respect to gravity.

In typical use, the sensor is connected to a controller, which controls a hydraulic control valve such as a KVF servovalve. If an off-level surface is required, an adjustable setpoint reference can be used, providing up to a $\pm 10\%$ slope reference.

Features

- Modular design. Compact unit can be mounted on any vertical surface.
- Totally enclosed in a rugged cast aluminum housing.
- Easy to wire. Connections between controller and sensor are made through MS connectors.
- Excellent sensitivity. The shaft supporting the pendulous mass and the rotor of the microsyn is mounted on ball bearings for smooth, low-friction rotation.
- Oil damped to ignore extraneous vibration.
- DC input and output voltages designed for analog and microcontroller interface.

Ordering Information

Reference

Part number	Supply voltage	Body style	Connector	Oil fill
1030040	5 to 8 Vdc	Cast aluminum housing	6 pin MS	3000 cs
1030043	5 to 8 Vdc	Cast aluminum housing	6 pin MS	5000 cs

Remote Slope Setpoint (if necessary)

Part Number	Description
MCQ101B1012	Hand-held digital remote setpoint. Required if off-level surface. Provides adjustable setpoint reference (up to $\pm 10\%$).

Related Product

Part Number	Description
KW01026 cable assembly	Braided (not foil) shield cable with a minimum of 75% shielding.
KW01009 cable assembly	Standard unshielded.

Cables are two to ten feet retractable, completely assembled with a six position straight socket terminal plug connected to each end, and on one end there is a cap and chain.

To ensure avoiding the harmful effects of EMI/RFI use KW01026 shield cable assembly. See *Wiring*, page 10.

Theory of Operation

The MCX104A accepts a regulated 5 to 8 Vdc from a controller and converts it to 3.8 kHz ac. The ac excitation is applied to the primary of four transformers mounted 90° from each other in the sensor housing, see *Rotor-Stator Relationship*, below.

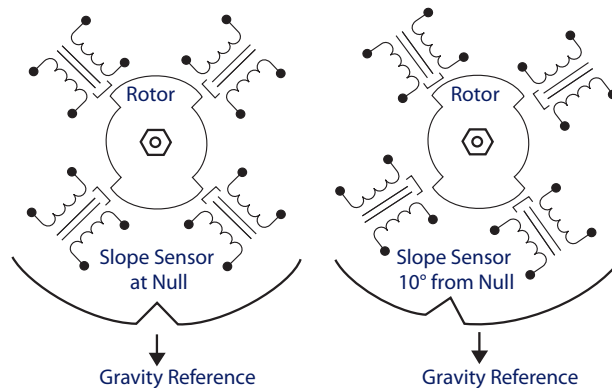
The rotor of the microsyn is made of permeable material and is attached to a ball bearing-mounted shaft. The stator, consisting of the four transformers, is mounted on the outer housing of the sensor. Secondaries of the coils, 180° apart, are wired in series.

Rotor position, with respect to the stator, determines the number of flux linkages between primary and secondary of each coil. The voltages induced in the secondaries are summed so that the output is proportional to the magnitude of the deviation from the gravity reference. Phase indicates the direction of rotation.

At null, an equal amount of the magnetically permeable material of the rotor is in the magnetic field of each coil. As the stator and housing rotates from null, more magnetically permeable material is introduced into the magnetic field of one set of two coils and some material is removed from the magnetic field of the other set of coils. The material displacement results in a higher voltage output from the secondaries of the two coil set with the greater amount of magnetically permeable material in its magnetic field. The displacement also results in a lower voltage output from the other two coil set.

The output signal from the secondaries is demodulated to a nominal range of 2 to 6 Vdc at 8 Vdc excitation and fed back to the controller.

Rotor-Stator Relationship



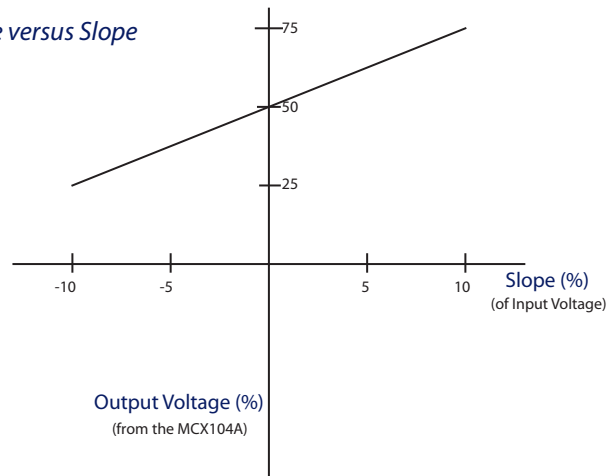
P200 043

Electrical

Input voltage	5 to 8 Vdc (positive to Pin A, negative to Pin C)
Power consumption	0.8 watts, maximum
Output voltage	25% of input to 75% of input from -10% to +10% slope
Range	10% slope from vertical, beyond $\pm 10\%$ range, output is undefined
Accuracy (linearity)	$\pm 0.3\%$ slope from $\pm 10\%$ slope
Resolution	Infinite
Short circuit protection	Output lead may be shorted to (+) or (-) input without damage to the device.
Repeatability (hysteresis)	0.04% slope, maximum, when brought to the same position from (+) and (-) 10% slope.
Step function response	0.42 s to reach 63% of rated output with 3000 centistoke oil.
Phasing	When the sensor is rotated clockwise from null, as viewed from the closed end of the cast housing, output (Pin B positive, Pin C negative) will decrease.

The device is ratiometric; at a constant slope, an increased input voltage will result in an increased output voltage (and vice versa). See *Output Voltage versus Slope*, below.

Output Voltage versus Slope



P200 044

Environmental

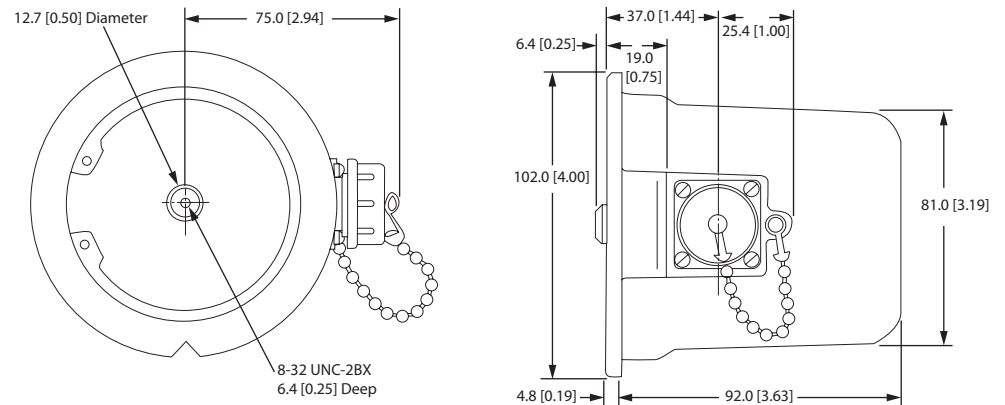
Operation temperature rating	- 40° to 77° C (- 40° to 170° F)
Storage temperature rating	- 18° to 77° C (0° to 170° F)
Temperature stability	Null shift of $\pm 0.35\%$ slope maximum; referred to 27° C (80° F)
Vibration (Two part vibration test designed for mobile equipment controls)	Withstands cycling test performed on each of the three major axes: Cycling from 5 to 2000 Hz for a period of one hour (if four resonant points) to three hours (if no resonant point). Withstands resonant dwell for one million cycles for each of the four most severe resonant points on each of the three major axes.
Shock (Three shocks in both directions of the three mutually perpendicular axes for a total of 18 shocks)	50 g per 11 ms
EMI/RFI*	20 V per meter between 14 KHz and 1 Ghz 100 V per meter over the ranges: 24 to 51 Mhz 148 to 175 Mhz 445 to 517 Mhz 798 to 875 Mhz

* All EMI/RFI specifications subject to shielded cabling. See *Wiring*, page 8.

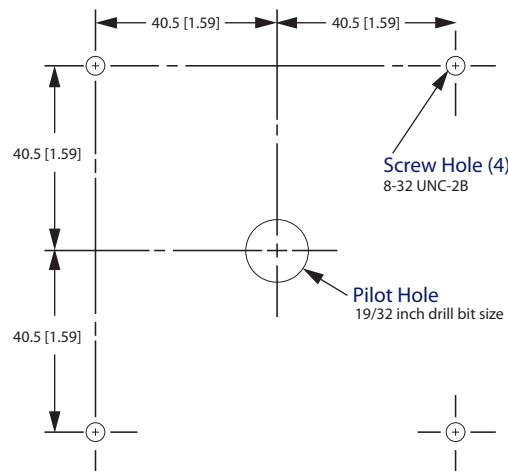
Dimensions

Mounting Dimensions

mm [in]



Mounting Holes Locations



P200 045

Mounting

Determine the location on any convenient vertical surface. Reference [Mounting Holes Locations](#), above. Drill and tap four #8/32 UNC-2B holes. Drill a 19/32 inch pilot hole at the center of the four holes.

When the notch in the flange of the sensor is at the bottom, the sensor is approximately at null. If enough clearance exists above the sensor, install the two bottom cleats, leaving the screws loose enough to get the flange beneath the cleat. The cleats and screws are provided with the sensor. Slide the flange of the sensor beneath these two cleats and install the other two. Tighten the four cleats so the sensor is snug but can still be turned by hand for final leveling.

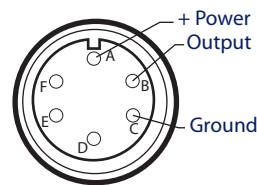
Wiring

EMI/RFI will be present in varying degrees in any environment that has static electricity, power lines, radio equipment, solenoid switching, etc. To avoid the harmful effects of EMI/RFI, use KW01026 braided (not foil) shield cable with a minimum of 75% shielding. Terminate the shield at both ends to the connector shell with the length short as possible. See *Ordering Information, Related Product*, page 4.

Standard unshielded cables can be ordered from Sauer-Danfoss. KW01009, a two foot coiled cable extending to ten feet is available, which is completely assembled with mating MS connectors for ease of installation. See *Ordering Information, Related Product*, page 5.

All electrical connections are made to the sensor through a 6 pin MS connector, see below for connector diagram.

Reverse power polarity may damage the sensor.

6 pin MS Mating Connector

P200 040

Final Leveling

After all wiring has been completed, only minor adjustment is needed to bring the sensor to null:

1. Raise or lower the machine to level.
2. Slowly turn the sensor until the output voltage (Pin B to C) equals one half the supply voltage.

With 8 Vdc input, the device will be nulled with 4 Vdc output.

3. Tighten the cleats so that the sensor is secured.

Troubleshooting

The MCX104A will provide extended trouble free operation and should not need servicing under normal operating conditions. Be sure the sensor is malfunctioning before replacing it:

1. Check the MS connectors. One of the two at either the controller or the sensor may be loose.
2. Check wiring. Inspect the coil cord along its entire length looking for a cut or evidence of pinching.
3. Check mounting cleats. Cleats may have loosened from excessive vibration.
4. If a replacement sensor is available, attach it. With the notch in the flange down, rotate the replacement sensor a few degrees side-to-side and observe operation. If operation appears normal, replace the original sensor.



MCX104A DC Microsyn Level Sensor
Technical Information
Notes



MCX104A DC Microsyn Level Sensor
Technical Information
Notes



- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1™ GUIDE
- Proportional Valves
- Sensors
- Steering
- Transit Mixer Drives

Members of the Sauer-Danfoss Group

Comatrol

www.comatrol.com

Schwarz Müller-Inverter

www.schwarzmueller-inverter.com

Turolla

www.turollaocg.com

Hydro-Gear

www.hydro-gear.com

Sauer-Danfoss-Daikin

www.sauer-danfoss-daikin.com

Sauer-Danfoss is a global manufacturer and supplier of high-quality hydraulic and electronic components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market. Building on our extensive applications expertise, we work closely with our customers to ensure exceptional performance for a broad range of off-highway vehicles.

We can help speed up system development, reduce costs and bring your vehicles to market faster. Sauer-Danfoss – Your Strongest Partner in Mobile Hydraulics.

Go to www.sauer-danfoss.com for further product information.

Wherever off-highway vehicles are at work, so is Sauer-Danfoss.

We offer expert worldwide support for our customers, ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide comprehensive global service for all of our components.

Local address:

Sauer-Danfoss (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000
Fax: +1 515 239 6618

Sauer-Danfoss ApS
DK-6430 Nordborg, Denmark
Phone: +45 7488 4444
Fax: +45 7488 4400

Sauer-Danfoss GmbH & Co. OHG
Postfach 2460, D-24531 Neumünster
Krokamp 35, D-24539 Neumünster, Germany
Phone: +49 4321 871 0
Fax: +49 4321 871 122

Sauer-Danfoss-Daikin LTD.
Shin-Osaka TERASAKI 3rd Bldg. 6F
1-5-28 Nishimiyahara, Yodogawa-ku
Osaka 532-0004, Japan
Phone: +81 6 6395 6066
Fax: +81 6 6395 8585