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MR660 Series Multiaxis Fiber Optic Acceleration Sensor System

Instruction Manual

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For Authorized Sales & Support in North America:

MICRONOR SENSORS, INC. 2085 Sperry Ave, Suite A-1 Ventura, CA 93003 USA +1-805-389-6600 sales@micronor.com www.micronor.com

Manufacturer and Worldwide Sales & Support:

MICRONOR AG Pumpwerkstrasse 32 CH-8105 Regensdorf Switzerland +41-44-843-4020 sales@micronor.ch www.micronor.ch

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Revision History

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Table of Contents

Revisior	h History2
1. Pro	oduct Description5
1.1 1.2	MR660 Fiber Optic Acceleration Sensor Product Family5 How the MR660 FO Acceleration Sensor Works7
2. Init	ial Preparation9
2.1 2.2 2.3 2.4	Unpacking and Inspection
3. Ins	tallation and Operation11
3.1 3.2 3.3 3.4	Mounting the Sensor Unit11Mounting Signal Conditioner Module12Sensor Optical Connection to the Signal Condition14Electrical Connections to Signal Conditioner14
4. Sp	ecifications
4.1 4.2 4.3 4.4	1-Axis System (MR660-1 Signal Conditioner + MR661/MR662 Sensor) 15 2-Axis System (MR660-2 Signal Conditioner + MR663 Sensor) 16 3-Axis System (MR660-3 Signal Conditioner + MR664 Sensor) 17 Response Curves
5. Me	chanical Reference Drawings19
5.1 5.2 5.3 5.4 5.5 5.6 5.7	MR660-1 1-Axis Signal Conditioner19MR660-2 2-Axis Signal Conditioner19MR660-3 3-Axis Signal Conditioner19MR661 1-Axis Round Sensor20MR662 1-Axis Rectangular Sensor20MR663 2-Axis Rectangular Sensor21MR664 3-Axis Rectangular Sensor21

Figures

Figure 1. MR660 Series Fiber Optic Acceleration Sensor – Available in 1/2/3 Axis5
-igure 2. MR660 1-Axis Sensor System – Signal Conditioner + Sensor
-igure 3. MR660 2-Axis Sensor System – Signal Conditioner + Sensor
-igure 4. MR660 3-Axis Sensor System – Signal Condtioner + Sensor7
-igure 5. How the MR660 MEMS based Acceleration Sensor Works7
Figure 6. Block Diagram of the MR660 Signal Conditioner per Axis
-igure 7. Example of Rectangular MR662 Sensor epoxied to DUT11
Figure 8. Example of Round MR661 Sensor mechanically secured to DUT
Figure 9. Mounting Signal Conditioner to 35mm DIN Rail
Figure 10. Electrical and Optical Connections to the Signal Conditioners
Figure 11. Typical Sensor Linearity over acceleration range at different frequencies 18
-igure 12. Typical Frequency Response18

1. Product Description

1.1 MR660 Fiber Optic Acceleration Sensor Product Family

Micronor's MR660 series fiber optic acceleration sensors are based on an opto-mechanical acceleration sensor. Depending on the number of axis, there is a dedicated sensor and signal conditions depending on the number of axes – 1, 2 or 3. Where required, fiber optic extension cables are also available for extended distances.



Figure 1. MR660 Series Fiber Optic Acceleration Sensor – Available in 1/2/3 Axis

Why use a fiber optic acceleration sensor? The following table summarizes Features and Applications:

FEATURE	APPLICATION
Reliable	Vibration sensing in harsh environment
Insensitive to magnetic and	Transformers and high voltage systems,
electrical fields	Electric trains and pantographs
Insensitive to rf fields	Antennas and telecom systems



Figure 2. MR660 1-Axis Sensor System – Signal Conditioner + Sensor



Figure 3. MR660 2-Axis Sensor System – Signal Conditioner + Sensor



Figure 4. MR660 3-Axis Sensor System – Signal Condtioner + Sensor

1.2 How the MR660 FO Acceleration Sensor Works

Micronor AG's MR660 series multiaxis fiber optic acceleration sensors are based on an optomechanical acceleration sensor. As shown in Figure 5, the sensing device is a micromechanical silicon mirror (MEMS) which deflects a light beam proportional to the acceleration. Hence, the sensor can be placed in a harsh environment and is separated from the measurement electronics by optical fibers.



Figure 5. How the MR660 MEMS based Acceleration Sensor Works

Depending on the number of axes, a MEMS reflective membrane and fiber optic pickup (light in and modulated light out) is mounted with the appropriate orientation. The sensor head

housing is available in aluminum, stainless steel or ceramic material (MACOR). No epoxy is present in the optical path. This ensures an outstanding long term stability.

The block diagram of Figure 6 shows the inner workings of the signal conditioner module per axis. Note that the electronics only condition the optical-to-electrical conversion of the sensor optical response so that the analog output reflects real time acceleration.



Figure 6. Block Diagram of the MR660 Signal Conditioner per Axis

2. Initial Preparation

2.1 Unpacking and Inspection

The unit was carefully inspected mechanically and electrically before shipment. When received, the shipping carton should contain the following items listed below. Account for and inspect each item before the carton is discarded.

In the event of a damaged instrument, write or call your nearest MICRONOR AG local representative or Micronor AG headquarters in Switzerland.

Please retain the shipping container in case re-shipment is required for any reason.

2.2 Damage in Shipment

If you receive a damaged instrument you should:

- 1) Report the damage to your shipper immediately.
- 2) Inform MICRONOR
- 3) Save all shipping cartons.

Failure to follow this procedure may affect your claim for compensation.

2.3 Standard Contents

1-Axis System:

- MR660-1 Signal Conditioner/Controller
- MR661 Sensor (round aluminum with 6m FO4 pigitail or
- MR662 Sensor (square aluminum housing) with 6m FO4 pigitail
- Teach/Calibration Pendant (optional)

2-Axis Calibrated System:

- MR660-2 Signal Conditioner/Controller
- MR663 Sensor (rectangular aluminum housing) with 6m FO4 pigitail
- Teach/Calibration Pendant (optional)

3-Axis Calibrated System:

- MR660-3 Signal Conditioner/Controller
- MR664 Sensor (rectangular aluminum housing) with 6m FO4 pigitail

2.4 Warranty Information

Warranty

MICRONOR AG warrants this product to be free from defects in material and workmanship for a period of 1 (one) year from date of shipment. During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local MICRONOR representative or contact MICRONOR AG headquarters. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

Limitations of Warranty

This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to Fiber Optic Connector interfaces, fuses or AC line cords. This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability of fitness for a particular use. Neither MICRONOR AG or MICRONOR SENSORS shall not be liable for any indirect, special or consequent damages.

Authorized sales and service in North America:

Micronor Sensors, Inc.	Tel	+1-805-389-6600
2085 Sperry Ave, Suite A-1	Email	sales@micronor.com
Ventura, CA 93003	URL	www.micronor.com
USA		

Product Engineering/Manufacturing HQ and Worldwide Sales & Support:

Micronor AG Pumpwerkstrasse 32 CH-8015 Regensdorf SWITZERLAND Tel+41-44-843-4020Emailsales@micronor.chURLwww.micronor.ch

3. Installation and Operation

3.1 Mounting the Sensor Unit

The sensor unit should be securely fastened to the surface or object being monitored so as not to affect the vibration characteristic being monitored. One method is to design a mechanical bracket which securely fastens the sensor to the DUT (device under test). Another method is to use suitable epoxy to secure sensor to DUT.



Figure 7. Example of Rectangular MR662 Sensor epoxied to DUT



Figure 8. Example of Round MR661 Sensor mechanically secured to DUT

3.2 Mounting Signal Conditioner Module

The MR661 series Signal Conditioners are design to mount on standard 35mm DIN rail. Consult Figure 9 below on securing module to DIN rail.



Figure 9. Mounting Signal Conditioner to 35mm DIN Rail



MR660-3 3-Axis Signal Conditioner Connections



Figure 10. Electrical and Optical Connections to the Signal Conditioners

3.3 Sensor Optical Connection to the Signal Condition

As shown in Figure 1, the 1- and 2-Axis Sensors connects to their corresponding Signal Conditioners via F04 Circular Connector while the 3-Axis Sensor connects via 3 pairs of Duplex E2000 Connectors.

3.4 Electrical Connections to Signal Conditioner

As shown in Figure 1, all electrical connections are the same for the 1-, 2- and 3-Axis Signal Conditions – 12 VDC power connection (via Phoenix connector) and analog outputs via BNC connectors.

First, connect 12 V DC power via the Phoenix 2-Channel Terminal Plug.

Next connect your oscilloscope or other analog-to-digitial converter/data acquisition system to corresponding BNC ports of the Signal Conditioner. Load impedance should not be less than 100 Ohms.

If power is applied and sensor is operating correctly, the front panel status LEDs should be all green. Red LED represents either damaged sensor or optical connection for that channel. If Red LED, contact Micronor for further instructions.

Teach Pendant connection (optional) only applies to 1- and 2- Axis Signal Conditioners.

4. Specifications

4.1 1-Axis System (MR660-1 Signal Conditioner + MR661/MR662 Sensor)

Sensor	Note: All electrical connections shall not exceed 3 meters	
Immunity	100% passive design	
No. of Axis	1, X (axial)	
Max frequncy (-3dB bandwidth)	1100 Hz, minimum	
Min frequency	0.5 Hz	
Linearity	3%, max	
Max acceleration range	50 g	
Max shock	1500 g	
Noise Denisty	100 μg/μHz, max	
Sensitivity	0.66 dB/g, typical	
Operating temperature	-40°C to +85°C	
Storage temperarure	-40°C to +155°C	
Humidity	0-95% RH, non-condensing	
Housing	Both models; Housing=Aluminum; Internal Sensor Head=Stainless Steel	
Fiber	Multimode, 100/125µm	
Optical Connector	Fischer FO4	
Cable length	6m	

Signal Conditioner	Specification
No. of Channels	1, (calibrated to supplied MR661 or MR662 sensor)
Nominal sensitivity	100 mV/g (interface)
Power supply	12V DC nominal, 11.5V min to 12.5V max
	300 mA, typical
Output Impedance	100 Ohms
Amplitude non-linearity	5%, max
Transverse sensitivity	3%, max
Optical output	Class 1 LED, 850nm
Temperature range	-40°C to +85°C
Ingress protection	IP50
Optical interface	Fischer FO4
Electrical interface (out)	BNC (analog output)

Specifications subject to change without notice

4.2 2-Axis System (MR660-2 Signal Conditioner + MR663 Sensor)

Sensor	Note: All electrical connections shall not exceed 3 meters
Immunity	100% passive design
No. of Axis	2, Y and Z Z+
Max frequncy (-3dB bandwidth)	1100 Hz, minimum
Min frequency	0.5 Hz
Linearity	3%, max
Max acceleration range	50 g
Max shock	1500 g
Noise Denisty	100 µg/µHz, max
Sensitivity	0.66 dB/g, typical
Operating temperature	-40°C to +85°C
Storage temperarure	-40°C to +155°C
Humidity	0-95% RH, non-condensing
Housing	Housing=Aluminum; Internal Sensor Head=Stainless Steel
Fiber	Multimode, 100/125µm
Optical Connector	Fischer FO4
Cable length	6m
Signal Conditioner	Specification
No. of Channels	2, (calibrated to supplied MR663 sensor)

Signal Conditioner	Specification
No. of Channels	2, (calibrated to supplied MR663 sensor)
Nominal sensitivity	100 mV/g (interface)
Power supply	12V DC nominal, 11.5V min to 12.5V max
	300 mA, typical
Output Impedance	100 Ohms
Amplitude non-linearity	5%, max
Transverse sensitivity	3%, max
Optical output	Class 1 LED, 850nm
Temperature range	-40°C to +85°C
Ingress protection	IP50
Optical interface	Fischer FO4
Electrical interface (out)	BNC (analog output)

Specifications subject to change without notice

4.3 3-Axis System (MR660-3 Signal Conditioner + MR664 Sensor)

Sensor	Note: All electrical connections shall not exceed 3 meters
Immunity	100% passive design
No. of Axis	3, X and Y and Z
Max frequncy (-3dB bandwidth)	1100 Hz, minimum
Min frequency	0.5 Hz
Linearity	3%, max
Max acceleration range	50 g
Max shock	1500 g
Noise Denisty	100 μg/μHz, max
Sensitivity	0.66 dB/g, typical
Operating temperature	-40°C to +85°C
Storage temperarure	-40°C to +155°C
Humidity	0-95% RH, non-condensing
Materials	Housing=Aluminum; Internal Sensor Head=Stainless Steel
Fiber	Multimode, 100/125µm
Optical Connector	Fischer FO4
Cable length	6m

Signal Conditioner	Specification
No. of Channels	2, (calibrated to supplied MR663 sensor)
Nominal sensitivity	100 mV/g (interface)
Power supply	12V DC nominal, 11.5V min to 12.5V max
	350 mA, typical
Output Impedance	100 Ohms
Amplitude non-linearity	5%, max
Transverse sensitivity	3%, max
Optical output	Class 1 LED, 850nm
Temperature range	-40°C to +85°C
Ingress protection	IP50
Optical interface	Fischer FO4
Electrical interface (out)	BNC (analog output)

Specifications subject to change without notice

4.4 Response Curves







Figure 12. Typical Frequency Response

5. Mechanical Reference Drawings

5.1 MR660-1 1-Axis Signal Conditioner





5.2 MR660-2 2-Axis Signal Conditioner





5.3 MR660-3 3-Axis Signal Conditioner



5.4 MR661 1-Axis Round Sensor



5.5 MR662 1-Axis Rectangular Sensor



5.6 MR663 2-Axis Rectangular Sensor



5.7 MR664 3-Axis Rectangular Sensor

