

ORBIT 60 SERIES

System Overview

Datasheet

Cordant™

137M5182 Rev. AA



Plant-wide • One System

The Bently Nevada™ Orbit 60 Series Protection and Condition Monitoring System provides one continuous, online monitoring system for both critical and plant-wide applications.

Cyber Secure • Data Isolation

Orbit 60 Series data isolation creates a safe industrial data environment designed to meet IEC 62443-4-2 with world class network security features and segregation of protection and condition monitoring functions.

Modular • Flexible • Scalable

The Orbit 60 Series system is deployable in any combination of rackmounted and distributed hardware. This provides for better alignment of instrumentation to the machinery application.

High Speed Process Data Integration

Next generation architecture facilitates full bi-directional communications with plant control systems over a suite of standard protocols.

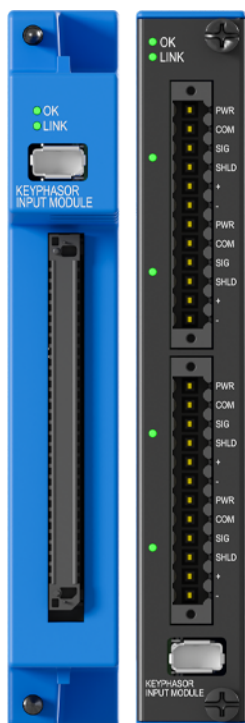
Extended Field Wiring Length

With the Orbit 60 Series distributed architecture, connection of multiple chassis through Bridge modules decreases overall electrical installation costs, reduces analog ground loops and noise issues, and moves key maintenance activities further from hazardous areas.

Industry Leading System Capabilities

The Orbit 60 Series supports monitoring of one or multiple machine trains in a single deployment. One System Interface Module (SIM) defines each system and can encompass up to 68 dynamic channels.

Keyphasor Input Module



Unlike previous systems, the Bently Nevada™ Orbit 60 Series system supports Keyphasor configurations for any dynamic input channel through the PAV, PAS, PAA, PAD, and PVT input modules. For high-phase accuracy applications (over 12,000 rpm) the Keyphasor Input Module must be used. The input speed limit is 120,000 rpm and can accept input speed signals up to 1,200,000 cpm (20 kHz). Each Keyphasor Input Module can accept up to four speed inputs. Input configurations to this module can also support Acceleration, Differential Expansion, Radial Vibration, and Thrust inputs. The Keyphasor input Module occupies a single slot.



Although the system allows the user to configure channels on the Keyphasor Input Module to serve as non-speed input types as described above, there will be a decrease in accuracy on these measurements when compared to PAV, PAS, PAA, PAD, and PVT modules. The accuracy is decreased from 1% of Full Scale Range to 2% of Full Scale Range on all 3-wire (non-speed) connections from 0 to 40 kHz. These non-speed inputs also cannot be utilized in SIL applications. The Keyphasor Input Module can only be utilized in SIL applications when configured for speed inputs.

Any channel on the module can be configured as a once-per-turn Keyphasor or a multiple-event-per-turn speed signal from a rotating shaft or gear used to provide a precision timing measurement. The Keyphasor Input Module Speed Channels can be configured to support Recip Multi-Event Wheel speed signals. The Keyphasor Input Module works with the following transducers:

- Magnetic pickup
- 3-wire Prox
- 3-wire Accel

The 2-wire input connection provides a galvanically isolated, hi-impedance input which primarily supports magnetic pick-up speed sensors. The isolated input eliminates potential ground loops that can occur when speed sensors are shared between the vibration system and other instrumentation.

The Keyphasor Input Module provides a buffered transducer output for each channel. Within Orbit Studio software, each output can be configured within Orbit Studio Software to be either a true analog signal representative of the input or a conditioned/processed digital TTL signal replicating machine speed and maintaining phase with the input signal.

The Keyphasor Input Module can accept a recip multi-event wheel signal, which is used to track shaft rotation more precisely during a revolution. This 13 tooth gear has a unique tooth used to indicate the crank angle reference for specific recip measurements.

The module supports backup speed source functionality. When configured, if the primary speed source enters an invalid state, a backup speed channel will be utilized to provide a speed reference for configured synchronous measurements. Compensations for differences in shaft speed and phase reference timings can be configured to maintain measurement accuracy upon transitioning to backup speed sources.

When utilizing magnetic pickups with a non-uniform speed wheel, the speed channel allows users to utilize a relaxed validation threshold of 50% between consecutive speed readings by disabling the [Enhanced Signal Validation](#) parameter (specifically targeting LM6000 applications.)

Specifications

Orbit 60 System

Full-Load Chassis	
Power Consumption	
3U 19" full load	Typical: 120 Watts Maximum: 180 Watts
6U 19" full load	Typical: 160 Watts Maximum: 300 Watts



The Orbit 60 Series system was qualified with the power supplies listed in datasheet 142M8947. Use of a reduced wattage power supply may result in changed behavior under fault conditions.

Characteristics	
3U Current Draw:	8.6 Amps Max
6U Current Draw:	14.3 Amps Max
Voltage Input	+21 to +32 Vdc
Out of Range Protection	An undervoltage does not harm the PIM. An overvoltage causes the replaceable fuse to open.
Chassis Loading	No minimum chassis loading is required.
Outputs	
Power OK LED	Input Voltage to PIM is within acceptable levels
Weight	
3U 19" Chassis	32 lbs (14.5 kg)
6U 19" Chassis	64 lbs (29.03 kg)

System Physical Dimensions

3U Standard Chassis (19")

See System Modules User Guide (142M9080) for detailed dimensions with illustrations.

Width	19" (48.26 cm)
Height	5.2" (13.21 cm)
Depth	9.67" (24.56 cm): panel and rack mount 9.76" (24.79 cm): bulkhead mount

6U Standard Chassis (19")

See System Modules User Guide (142M9080) for detailed dimensions with illustrations.

Width	19" (48.26 cm)
Height	10.45" (26.5 cm)
Depth	Depth values include mounted power supplies. 14.54" (36.94 cm): panel and rack mount 14.64" (37.18 cm): bulkhead mount

Single Wide Module

Width	0.8" (2.03 cm)
Height	5.2" (13.21 cm)
Depth	9.67" (24.56 cm)

Double Wide Module

Width	1.64" (4.17 cm)
Height	5.2" (13.21 cm)
Depth	9.67" (24.56 cm)

Environmental Limits (All Modules)

Environmental Limits	
Chassis Operating Temperature Range (indoor use only)	3U Chassis: -30°C to +70°C (-22°F to 158°F)  6U Chassis: -30°C to +65°C (-22°F to 149°F)   Temperatures over 50°C (122°F) require forced air convection with a minimum airspeed of 0.5 m/s.
Module Temperature Rating Certification	-30°C to +70°C (-22°F to 158°F)  When using a Bridge module in a 3U chassis, temperatures over 55°C (131°F) require forced air convection with a minimum airspeed of 0.5 m/s.  You must still meet the Chassis Operating Temperature Range defined above.
Storage Temperature Range	-40°C to +85°C (-40°F to 185°F)
Relative Humidity	0% to 95% rH non-condensing operating and storage
Vibration	Without Isolators: 0 g to 0.35 g @ 57-500 Hz With Isolators: 0 g to 5 g @ 57-500 Hz

Environmental Limits	
Shock	2" Incline Drop
Altitude	< 2000 m (6,562 ft)  Higher altitudes are possible but are site specific applications. Contact Bently Nevada support if you require higher altitudes.
Pollution Degree	Pollution Degree 2
Installation Category	Category II



Verify that temperature ratings on the wiring cables match the operating temperature range.



CAUTION

LOCATION TEMPERATURE AND HUMIDITY



While the system has been tested and capable of achieving the design life when operating in environments up to 70°C, whenever operating any electronics system in elevated humidity or temperatures exceeding 40°C, adding environmental controls maximizes the operational life of the system.

Keyphasor Input Module

Keyphasor Module Inputs (KPH)	
Inputs	
Analog Input	- Proximitors (3-wire) - Accelerometers (3-wire) - Proximitors Keyphasors (3-wire) - Magnetic Speed Pickups
Signal Conditioning	
Speed / Frequency Signal Ranges	Input range of 1 to 120,000 cpm (0.017 to 2 kHz).
Non-Speed Dynamic Input Specifications	
Analog Input	See Input Module Sensors and Channels on page 28.
Channels Supported	4 Dynamic Inputs
Sampling Rate	102.4 kHz
Accuracy and Frequency Response	
KPH	Prox/Accel (3-wire) 0–40 kHz 2% of Full Scale
Outputs	
Analog Buffered Transducer (BTO)	Short circuit protected output signal available through BTO connector on public and utility side.

Keyphasor Module Inputs (KPH)	
BTO Accuracy	AC > 0 to < 10 kHz, $\pm 1\%$ of input signal 10 kHz to < 20 kHz, $\pm 2\%$ of input signal 20 kHz to < 30 kHz, $\pm 4\%$ of input signal 30 kHz to ≤ 40 kHz, $\pm 6\%$ of input signal DC ± 100 mV over voltage range of Input Module
BTO Output Impedance	500 Ω
BTO Connector	Female Type A “ix” Connector available on the public and utility side of the Dynamic input modules. See the Accessories section of this document for the part numbers of available custom interface parts.
 When configured as an analog output, this is a true analog signal from the input and not a digital to analog reconstitution of the input signal. When configured as a processed output, this is a 5 V or 3.3 V compatible TTL signal with the same machine speed and phase as the input signal.	
Keyphasor Transducer Power Supply	–24 Vdc, 40 mA maximum per channel.
LEDs	
Channel Status LED (Rear Utility side only)	1 per input channel indicates when the connector sensor is in an OK condition

Keyphasor Module Inputs (KPH)	
Module OK LED	Indicates when the module is functioning properly
LINK LED	indicates when the module is communicating to the rest of the system
Physical	
Required Rack Space	1 Slot

AC LVDT

Module Inputs	
Channels	4 differential AC signals from AC LVDT
Power Consumption	5.7 W typical, 10 W maximum

TC/RTD Temperature

Temperature	
Thermocouple (TC) Temperature	
Thermocouple	Type J, K, E, T
Channel Supported	6
RTD Temperature	
RTD Type	Pt100 (385), Pt100 (392), Ni120, Cu10

Temperature	
	To achieve $\pm 3^{\circ}\text{C}$ MAX Error with Cu10 RTD with external termination wiring, a calibration process must be completed.
	Platinum RTD's with 0.00385 alphas are the worldwide industrial standard and are recommended for all applications.

Power Consumption	
Maximum	6 W
Typical	3 W
LEDs	
Channel Status LED (Rear Utility Side)	1 per unit channel indicates when the connected sensor is in an OK condition
Module OK LED	Indicates when the module is functioning properly
System Communication LED	Indicates when the module is communicating to the rest of the system
Physical Characteristics	
Required Rack Space	1 Slot

Isolated TC	
Characteristics	
Channels	6
Isolation	500 V Channel to System and 250 V Channel to Channel isolation

Compliance and Certifications

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

EMC

European Community Directive:

EMC Directive 2014/30/EU

Standards:

EN 61000-6-2; Immunity for
Industrial Environments
EN 61000-6-4; Emissions for
Industrial Environments

Electrical Safety

European Community Directive:

LV Directive 2014/35/EU

Standards:

EN 61010-1;
EN 61010-2-201;

†India – Battery EPR Marking

GE Oil & Gas India Private Limited

EPR Certificate No.: 1.1595372902047E+20

†Applies to 60R/BRG01, 60R/CGW01
60R/SIM01, 60R/PPM01, and
60R/CMM01

RoHS

European Community Directive:

RoHS Directive 2011/65/EU

Cyber Security

Designed to meet IEC 62443-4-2

*Maritime

ABS Rules for Condition of Classification,
Part 1

- Steel Vessels Rules
- Offshore Units and Structures

*Recorder Output module, Bridge
module, and 6U systems
approvals pending

Functional Safety

SIL 1 Certified / SIL 2 Capable

See the *Orbit 60 Series SIL User Guide*
(134M0398) for details regarding SIL
implementation for SIL 1 simplex and SIL 2
redundancy applications.

PROFINET Field Device Certification Standards

PROFINET V2.4MU3

Hazardous Area Approvals



For the detailed listing of country and product-specific approvals, refer to the [Approvals Quick Reference Guide \(108M1756\)](#).

For additional technical documentation, please log in to bntechsupport.com and access the Bently Nevada Media Library.

cNRTLus

Class I, Zone 2: AEx/Ex ec nC IIC T4 Gc;
Class I, Zone 2: AEx/Ex nA nC IIC T4 Gc;
Class I, Division 2, Groups A, B, C, D T4;
Class I, Division 2, Groups A, B, C, D T4
(N.I.);

T4 @ Ta= -30°C to +70°C (-22°F to +158°F)

ATEX/IECEx



II 3 G
Ex ec nC IIC T4 Gc
Ex nA nC IIC T4 Gc

T4 @ Ta= -30°C to +70°C (-22°F to +158°F)

Ordering Option	Description
0	No SIL
2	SIL 2

PAS (Prox/Accel/Seismic) Module

Ordering Option	Description
60R/INP03-AAA-B	

AAA – Hazardous Area Certifications

00	No Hazardous Area
01	CSA/NRTL/C (Class I, Div 2)
02	Multi (CSA, ATEX, IECEx)
XXX	Country Specific Approvals

B – SIL Level

0	No SIL
2	SIL 2

PAD (Prox/Accel/DCLVDT) Module

Ordering Option	Description
60R/INP04-AAA-B	

AAA – Hazardous Area Certifications

00	No Hazardous Area
01	CSA/NRTL/C (Class I, Div 2)
02	Multi (CSA, ATEX, IECEx)
XXX	Country Specific Approvals

B – SIL Level

0	No SIL
2	SIL 2

PVT (Prox/Accel/Velom)

Ordering Option	Description
60R/INP05-AAA-B	

AAA – Hazardous Area Certifications

00	No Hazardous Area
01	CSA/NRTL/C (Class I, Div 2)
02	Multi (CSA, ATEX, IECEx)
XXX	Country Specific Approvals

B – SIL Level

0	No SIL
2	SIL 2



For ETB installations, Keyphasor or speed signals should not be routed within the same ETB cable as vibration signals.

Keyphasor Input Module

Ordering Option	Description
60R/INP06-AAA-B	

AAA – Hazardous Area Certifications

00	No Hazardous Area
01	CSA/NRTL/C (Class I, Div 2)
02	Multi (CSA, ATEX, IECEx)
XXX	Country Specific Approvals

B – SIL Level

0	No SIL
2	SIL 2