

Orbit 60 Series

Machinery protection and
condition monitoring system



Protection never looked so good

Say hello to Orbit 60. The most advanced machinery protection system we have ever offered, built on 60 years of domain expertise that many strive to emulate, but none can duplicate. Orbit 60 is more than just protection—it's also condition monitoring done in a way that's integrated yet cybersecure. Use Orbit 60 for protection alone, for condition monitoring alone, or both. The choice is yours with Orbit 60.



Bently Nevada
CELEBRATING OVER



Years of
Innovation

Leaders aren't born. They're built.

The Bently Nevada name is synonymous with the entire industry of vibration, machinery protection, and condition monitoring. That association isn't lost on us. We're proud to have been a pioneer in this industry—from our humble beginnings in a Berkeley, California garage—to our present world-class capabilities spanning the entire globe.

In the intervening 60+ years, we've learned what works through five successful generations of full-featured, machinery protection platforms culminating in Orbit 60—our new flagship for continuous machinery protection and condition monitoring.



1956

Bently Scientific begins in Berkeley, CA

**BENTLY
NEVADA** 

1961

Moves to Nevada and becomes Bently Nevada



1965

First generation
5000 Series



1975

Second generation
7200 Series



1988

Third generation
3300 Series



1995

Fourth generation
3500 Series



2021

Fifth generation
Orbit 60 Series

Our commitment to 3500—continuing a legacy of customer-centric platform support

Don Bently instilled a very important value that continues to guide us to this day: **take excellent care of customers**. When we introduce new platforms such as Orbit 60, we don't abandon the prior generation. It's why our 3300 series and 3500 series coexisted for a full 23 years before we retired 3300, allowing customers to choose the platform that best met their needs with the assurance of full support measured in decades. And it's why we will treat 3500 and Orbit 60 exactly the same—coexisting to give you a choice of platforms based on your needs and installed base with full support for 3500 extending into the foreseeable future.

You spoke. We listened.

Orbit 60 is not just the result of 60 years of know-how. It's the result of more than 200 focused customer engagements where we asked you directly what you needed in a new platform. You told us clearly your three biggest requirements:

- A cybersecure solution for both machinery protection and condition monitoring. A solution that satisfied the needs of not just machinery engineers, but the OT and IT worlds in which data must move
- A reduction in installation costs by using less space for the same channel count, by allowing more flexibility in where the system was located, and by reducing the length and number of wiring runs
- An easier and more cost-effective way to integrate process data into the machinery monitoring ecosystem while delivering machinery data to the process control and monitoring ecosystem

To keep us laser-focused on these customer imperatives, and the resulting technologies, we introduced three new concepts to embody them: Orbit conneX™, Orbit aXess™, and Orbit Xtend™—revolutionary capabilities unique not just to Orbit 60, but to the industry.

And amidst all this innovation, we stayed true to our roots: the unwavering quality, value, and performance that you have come to expect and rely on from Bently Nevada.

conne
aXess
tend

Orbit conneX



Publish alarm, event,
and overall values

←..... and→



Retrieve high-speed
process data

Orbit aXess



Isolates condition
monitoring network

←..... from→



Machinery protection
network with patented
circuit design

Orbit Xtend



Extend full bandwidth

←...digital backplane...→



Up to 2 km via bridging



Completely flexible

Orbit Xtend

In the age-old debate of centralized versus distributed architectures, we did something profoundly simple: an architecture that delivers both.

Prior generations of monitoring systems limited a “rack” to a single, physical chassis. Not with Orbit 60. Our Xtend™ technology allows you to connect multiple chassis with a virtual, digital backplane using copper or fiber*. It’s fast. It’s secure. And it’s flexible. The result is that Orbit 60 can be deployed as not just a conventional “single” rack, but as a distributed rack where I/O is located near the machine to dramatically reduce wiring costs, linked to the master rack and its common controllers, communication gateways, and displays via ultra-fast communications through simplex or redundant bridging modules in each chassis. Xtend™ technology allows multiple chassis and up to 80 dynamic channels to be connected, with chassis located up to 2 km from one another. Mission-critical protection applications use three redundant cables between chassis; condition monitoring-only applications require only a single cable between chassis.

Orbit 60 is also smaller than prior generations of Bently Nevada monitoring systems—meaning less space is required for the same number of channels. That space savings translates directly to cost savings through cabinets that can be more densely populated and precious panel space that can be more efficiently used. The 3U, 19” rack can hold approximately the same number of channels as 3500 yet in just half the space. The 6U version holds more channels than 3500 yet fits in exactly the same space—allowing you to reuse panel cutouts without modification when upgrading.

Flexible deployments



Extend the virtual backplane through bridge modules—star or daisy chain configurations



Expand to remote i/o, reduce field wiring lengths



The 6U “double height” form factor holds more channels than 3500 but fits in the same size cutout



The 3U form factor holds 60+ channels and fits in just 19” x 5.2” x 9.7”



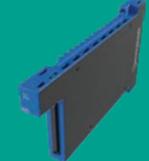
The half-rack size holds 24+ channels and fits in just 11.5” x 5.2” x 9.7”



Racks can be mounted in panel cutouts using integral clamps, on 19” EIA rails, or bulkhead-style



The utility side of modules gives access to wiring, buffered outputs, and all status LEDs



The public side of modules provides buffered outputs and LEDs while leaving room for an optional integral display*

* Future

Ultra-secure

Orbit aXess

Customers told us loud and clear that today's number one priority is cybersecurity. They needed an architecture that was SIL-capable for machinery protection, yet fully segregated from the condition monitoring environment so that one does not interfere with the other. One way to do this is with entirely separate platforms—one for condition monitoring and one for protection—but that would take the industry backwards in time nearly 25 years to an era of stand-alone condition monitoring boxes connected to protection racks. Surely there had to be a better way.

There is.

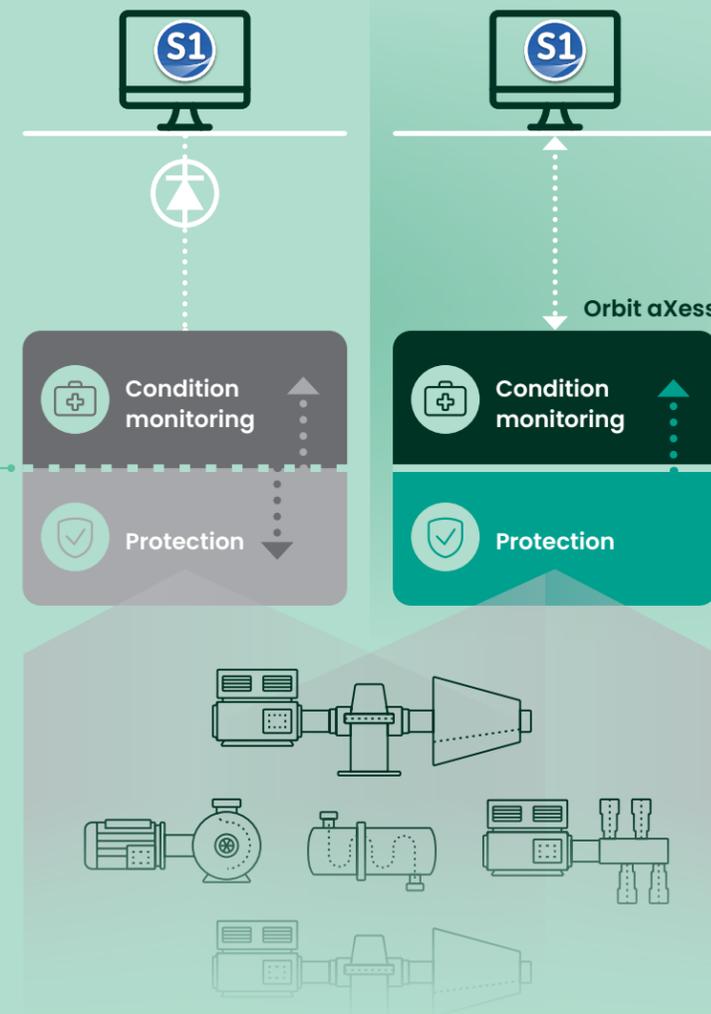
We call it Orbit aXess™ technology. It allows the protection and condition monitoring functions to coexist in the same rack and use the same I/O, yet function completely independent of one another. The protection components are able to publish their data for consumption by the condition monitoring system, but without any physical circuit board traces that allow the data to move from the condition monitoring components back to the protection components. The data moves one direction, and one direction only, without any digital handshaking. It's like a diode—only better. And, it's patented.

Better than diodes

Data diodes are highly effective because they preclude any inbound communications, allowing only outbound. This one-directional design comes at a price, however: it means that on-the-fly changes to the condition monitoring system cannot be done. Thus, while protecting the protection system from intrusion, they also prevent the condition monitoring functions from being accessed. Our aXess™ technology enables segregation between the protection system and the condition monitoring functions—not between the condition monitoring functions and the outside world. The result is that users can access full configuration flexibility over the condition monitoring capabilities of Orbit 60, while keeping the protective capabilities safely and securely isolated from intrusion of any kind. With aXess technology, cybersecurity is assured and IT infrastructure costs are lowered.

Without aXess technology

Conventional technology leaves a porous boundary between the protection and condition monitoring systems. The data diode's location blocks **all** 2-way communication with the **entire** system—including condition monitoring. Security is maintained at the expense of usability.



With aXess technology

Bently Nevada's patented aXess technology allows data to flow from protection to condition monitoring, but not the other way around—all while preserving bi-directional communications between users and the condition monitoring layer. Neither usability nor security are sacrificed.

Totally connected

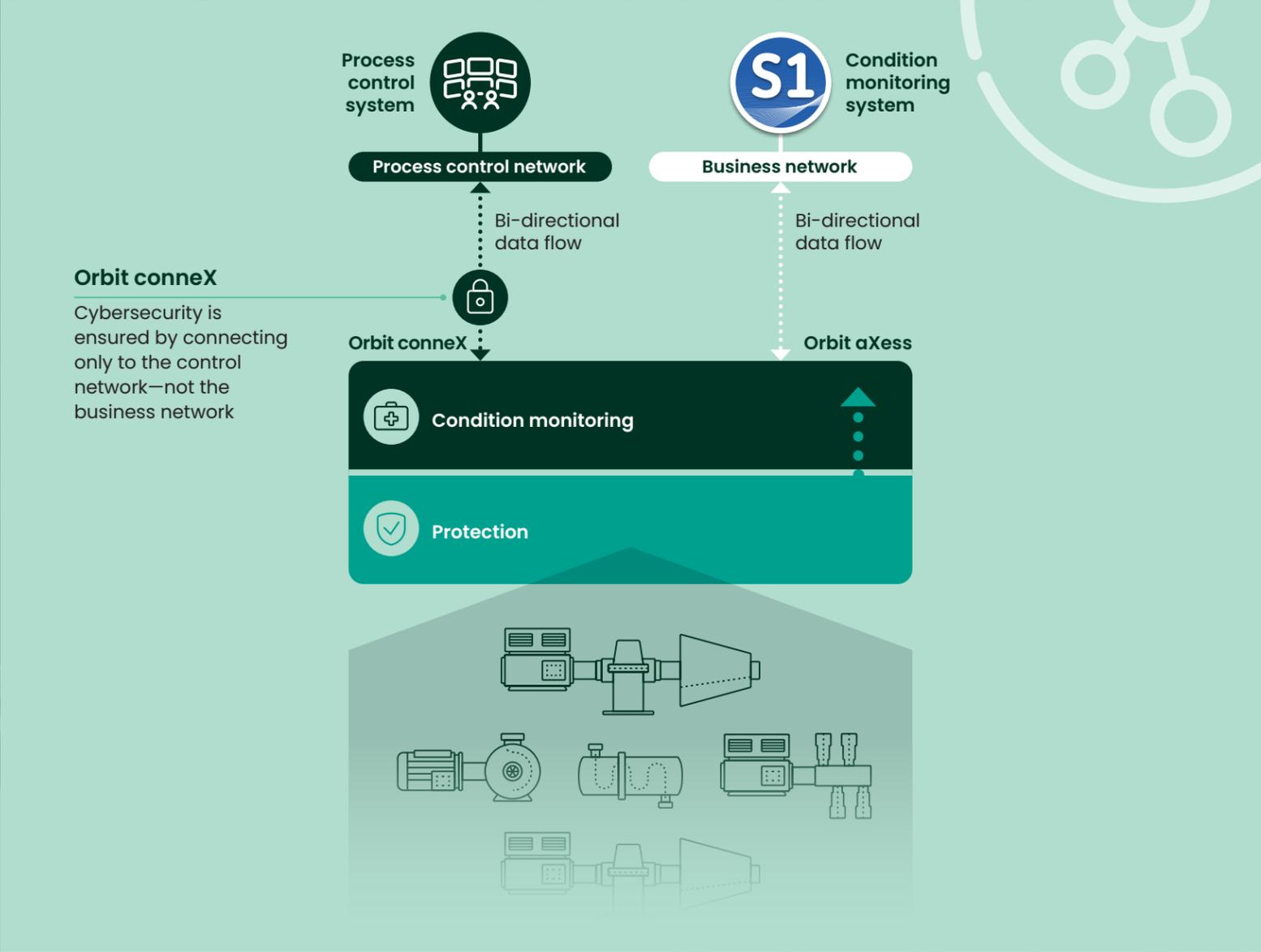
Orbit conneX

We've always been connected, but never like this. In the 1960s and 70s, monitor connections to the process control world consisted of recorder outputs and relays. In the 1980s, digital communications emerged with protocols such as Modbus, allowing a single cable to carry all those signals. As new protocols and physical media emerged over the next 3 decades, things improved, but there was a catch: one interface was used to move data from the monitoring system to the process control system or historian, and an entirely separate interface was used to move process data in the other direction—to the condition monitoring system.

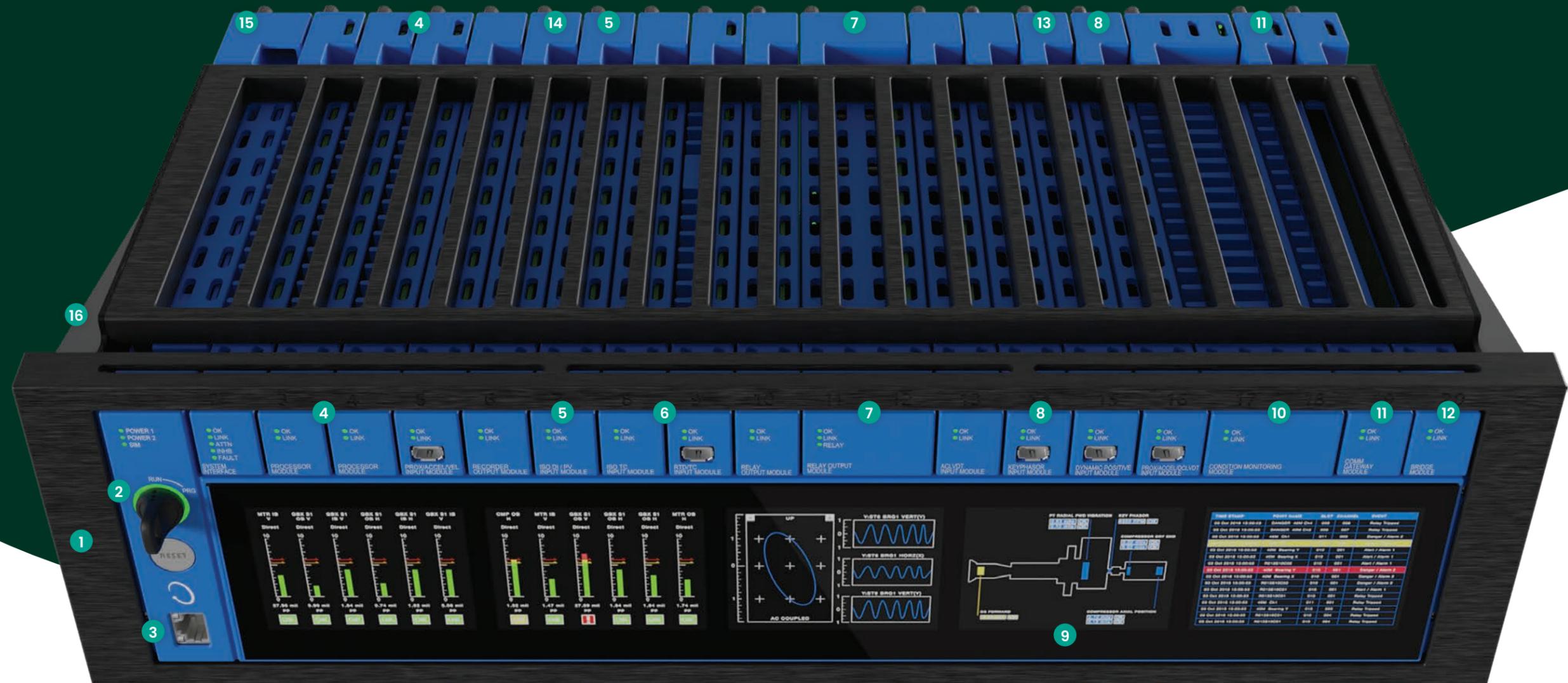
That meant a minimum of two interfaces. Two cables to run. Two interfaces to maintain. Two gateways to program.

We knew we could do better.

Our Orbit conneX™ technology allows data to move both directions. One interface to get all data into the process control world while simultaneously getting thousands of points of process data out of the process control world and into the condition monitoring world. One interface. One gateway. One set of cables. One great innovation. Orbit conneX simplifies your world and saves you money.



Orbit conneX
Cybersecurity is ensured by connecting only to the control network—not the business network



Capably equipped

1. Global Div 2/Zone 2 hazardous area approvals
2. Physical keylock security
3. Ethernet port (1 public, 2 utility) for use by config SW and external displays
4. Protection processing module (PPM)
 - One PPM typically supports 80 dynamic and hundreds of static points
 - Supports multiple PPMs for larger channel counts, redundancy, and API 670 and/or SIL-2 compliance
 - Can be used without PPM(s) for condition monitoring-only applications
5. Discrete and process variable inputs
 - Supports discrete inputs for state-base measurements and annunciation
6. RTD and TC inputs
7. SIL-rated electromagnetic and/or solid-state relays
 - Fully programmable relay logic
8. Buffered outputs and status LEDs on both utility and public sides
9. Integral display options*
 - VIEWS BR01 VERT(V)
 - VIEWS BR02 HORIZED
 - VIEWS BR03 VERT(V)
 - AG COUPLED
 - PF RADIAL PWD MONITORING
 - REV PHASOR
 - PHASOR MONITORING
10. Condition monitoring module
 - Use multiple CMMs for additional processing power
11. Communications gateway module
 - Bi-directional connex™ digital communications with plant control, historian, and other automation platforms
 - Suitable for use in protection loop if desired; multiple CGMs per system supported
 - Serial or ethernet versions of CGM available for maximum compatibility with new and existing networks
 - Supports Modbus TCP, Modbus RTU, and EGD protocols; others in future
12. Bridge module links multiple chassis into a “virtual” rack
13. Works with virtually all proximity and seismic sensors—including +24V IEPE accelerometers, AC and DC LVDTs
14. SIL-rated recorder outputs (4-20mA, 1-5Vdc, 0-10Vdc); fully programmable
15. Energized with std +24Vdc instrument power—simplex or redundant
16. Integral panel clamps

* Future



Modularly designed

Protection

We take machinery protection seriously, and have for over 60 years. That's why the protective functions in Orbit 60 are completely independent of non-protective functions, ensuring the integrity of machinery protection loops is never compromised. We've also designed the system from the ground up to fully meet SIL-2 requirements, reflecting the large number of installations now requiring SIL-1 or SIL-2 rated loops*.

API 670

We meet the API 670 requirement that a single module failure may only impact 4 dynamic channels or 6 static channels. Orbit 60 has also removed the channel pair requirements making it easy to configure X and Y sensors on separate modules. Redundant Protection Processor Modules (PPMs) are required to ensure a failure of the PPM itself will have no impact on any channels.

Condition monitoring

Condition monitoring isn't an afterthought in Orbit 60. In fact, it's such an integral part of the architecture that you can use Orbit 60 for condition monitoring alone if desired—without a protection processing module.

In those instances where Orbit 60 is used for both protection and condition monitoring, our aXess™ technology segregates the two systems without constraining your ability to make on-the-fly changes to CM measurements and signal processing parameters. Total security and total flexibility perfectly co-exist.

And because Orbit 60 is an Edge device, all of that condition monitoring horsepower is inside the rack—not in some distant cloud or server. It's an architecture that delivers the results you need today without limiting tomorrow's possibilities.

Typical module



The public side

The "exposed" side of the rack normally accessed by personnel for day-to-day usage such as connection of portable instruments, viewing of integral display, etc.

The utility side

The side of the rack where wiring connections are made. LEDs and buffered output connections appear on both public and utility sides for maximum convenience.

* For SIL-3 overspeed and/or ESD applications, our independent 3701/55 system is available, providing both overspeed and emergency shutdown logic-solver functionality



Power Input Module

Supports simplex or redundant +24Vdc supplies; failure of a single supply in redundant configurations will not affect system operation



System Interface Module

Provides functions common to the entire system and interfaces to displays and configuration software



Protection Processing Module

Provides protection functionality from any mix of dynamic, static, and CGM inputs; multiple PPMs supported per system for handling large channel counts and/or redundancy requirements



Condition Monitoring Module

Provides fully integrated condition monitoring functionality—can be used with or without PPM(s) for condition monitoring-only applications. Multiple CMMs supported per system



Comm Gateway Module

Provides two independent ethernet or serial ports for bi-directional Modbus or EGD communications with process control, historian, and other automation platforms



Bridge Module

Links multiple chassis together in distributed architectures using Xtend™ technology; supports simplex and redundant link media



High-Speed Keyphasor® Input Module

4 channels; while standard Dynamic Input Modules can be used for most Keyphasor® measurements, this module is recommended for shaft rotative speeds above 12,000 rpm



Dynamic Input Modules

4 channels; supports most commercially available proximity, DC LVDT, speed, dynamic pressure, and 2- and 3-wire velocity and acceleration transducers



AC LVDT Input Module

4 channels; accepts 4-, 5-, and 6-wire AC LVDTs; routinely used for valve position and case expansion measurements



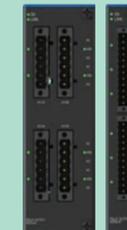
Static Input Modules

6 channels; accepts RTDs, TCs, wet or dry discrete contacts/signals, and process variable signals



Recorder Output Module

8 channels; provides proportional analog output of measured variables in 4-20mA, 1-5Vdc, or 0-10Vdc signal formats; fully programmable



Relay Output Modules

8 SPDT relays; available in solid-state and electromechanical versions; pairs of relays can be ganged into DPDT configurations

Perfectly paired

Let's face it—no matter how good a protection system might be, deficiencies in the condition monitoring capabilities and the relative pain or ease of configuring the system can be more than just inconvenient—they can be show-stoppers. With Orbit 60, you don't have to expend so much as a single second worrying about either. Both are world-class—just like Orbit 60.



Configuration with Orbit Studio

Configuration software should be effortless, requiring you to know only what you want your settings to be—not an endless parade of dialog boxes and cryptic navigation requiring special training. It should work whether you are connected to a system or not, allowing you to build an offline configuration and then simply upload it when connected. It should be intuitive. It should be powerful. It should provide on-the-fly guidance to keep you from making mistakes—like loading a protection processor module too heavily or selecting incompatible options. It should allow you to connect to multiple systems at the same time, allowing you to cut and paste between them instead of tedious retyping of repetitive configuration parameters. And, it should allow you to view live data to validate that your configuration settings are correct during system installation and Factory Acceptance Testing. With Orbit Studio, you get all of this and more. We've completely re-engineered our configuration environment by listening to our customers, making it easier, faster, and more intuitive. In fact, we're so impressed with the results that Orbit Studio will emerge as the configuration environment for all of our systems in the future.

Condition monitoring with System 1

We launched System 1 in 2000 and more than two decades later, it's better than ever. After all, we've invested more than 5 million developer hours transforming input from customers like you into a feature set that is unmatched in the industry. Turbomachinery. Gears. Rolling element bearings. Reciprocating compressors. Wind turbines. Hydro turbines. Slow-speed rolling mills. And so much more. System 1 is built with the tools you need for any type of machine. And, because it is built to accept any kind of data source from our broad range of wired and wireless continuous, intermittent surveillance, and portable instruments, you never have to worry about multiple software packages to address your ecosystem of machinery types and associated instrumentation. We bring it all together in one system. System 1.



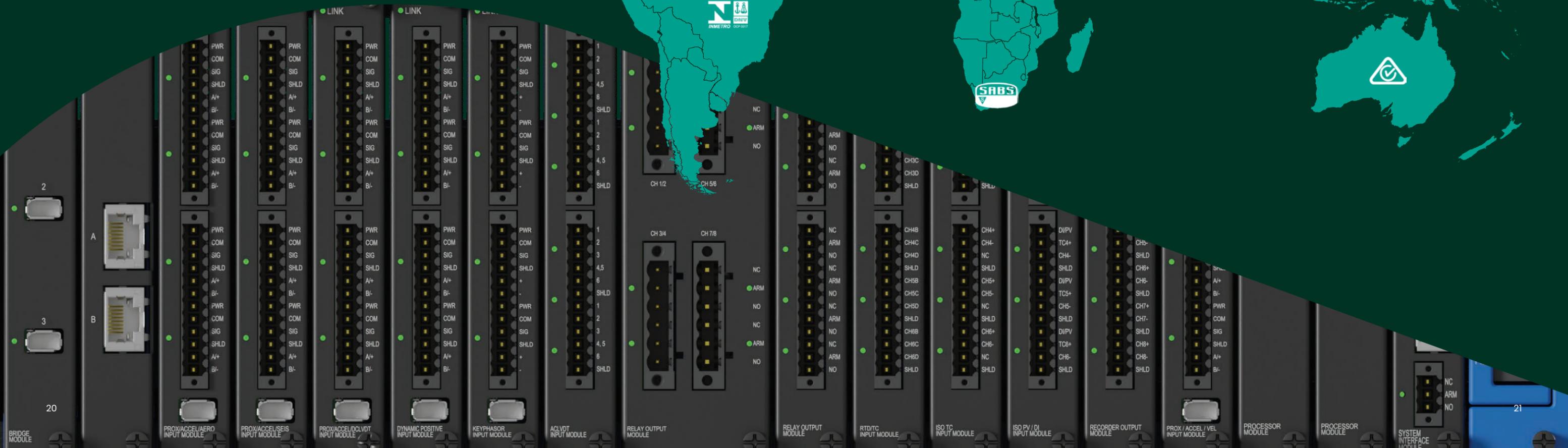
Automated analytics extend the power of System 1, reviewing the data for you using embedded intelligence built on 60+ years of machinery know-how.



System 1 is capable of not just mechanical condition monitoring, but thermodynamic performance monitoring as well.

Globally certified

Selecting the right system for protecting and managing your machinery shouldn't represent a compromise when it comes to approvals. Our broad portfolio of products allows you to apply the right product with the confidence that it has the right approvals, wherever you might be located. Orbit 60 continues our commitment to globally certified products by addressing not just hazardous areas and general electrical safety, but also functional safety, cybersecurity, and environmental standards—not to mention numerous industrial standards from IEEE, API, ISO, ABS, and many others. And we also pay attention to country-specific certifications that may not apply globally, but are essential for your country. We make it our business to understand, obtain, and maintain the right approvals so you can focus on what's most important to you: the machinery that powers your business.



Fully supported



We don't just build the best products in the industry. We stand behind them with a comprehensive suite of services that goes well beyond the monitoring system and extends all the way from the sensors in and on your machines to the software on top of your desk to data repositories in the cloud to all the infrastructure in between.

We pride ourselves in the support we offer, anchored by deeply experienced professionals in every region of the world, ensuring you receive competent help when you need it—in your own language and time zone.

Our customers represent a broad cross-section of internal capabilities and competencies, ranging from fully self-sufficient to fully dependent. Our service offerings are structured to fit every scenario whether it is augmenting your own capabilities or doing it all for you—including project management and arranging/supervising all required subtrades.

We also believe that knowledgeable customers make the best customers—which is why we invest so heavily in training. In fact, we have trained more than 10,000 customers over the last 60 years in more than a dozen languages across 80 countries. It ensures that when we leave the jobsite, you possess the skills to put our systems fully to work, fully delivering the results you expect.



Enclosures and cabinets



Machinery diagnostic services



Product service and repairs



Site and factory acceptance testing



System integration



Design and installation services



Remote machinery diagnostics



Hosted condition monitoring

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