

3500 Machinery Protection System: Functional Safety Certified Products

Bently Nevada* Asset Condition Monitoring



Description

Functional Safety (FS) certified products provide additional assurance to users that the products will provide the necessary availability to serve as safety systems to initiate automatic shutdown of critical production machinery by detecting machinery conditions that precede hazardous failure. Bently Nevada FS certified products give users a way to better document and enable compliance of plant processes with IEC 61511 and IEC 61508.

The Bently Nevada 3500 Machinery Protection and Monitoring System offers a broad range of Functional Safety Certifications ranging from SIL 1 to SIL 2 across multiple protective and safety functions. This data sheet is intended to provide a summary of these SIL certified offerings. Please contact your Bently Nevada representative for more detailed information.

Functional Safety (FS) certified products typically require conditions of use and specific implementation parameters that are described in the SIL certificate, SIL test report, or associated FS product safety manuals. Certificates, test reports, and applicable FS product safety manuals are available from Bently Nevada and should be referred to during planning and deployment of an FS system.

Functional Safety Certified Products:

- The 3500/53_SIL3 Overspeed Detection System is now replaced by the 3701/55 ADAPT.ESD for all new installations. The 3701/55 ADAPT.ESD is a Triple Redundant system available with SIL 3 certification that serves as both an emergency shutdown device and an overspeed detection system (ODS).
- SIL 1 radial vibration, thrust position, and casing (seismic) vibration using the 3500/40_SIL and 3500/42_SIL in a simplex configuration with either 3500/32_SIL1 4-Channel Relay Module or 3500/33_SIL1 16-Channel Relay Module. Sensors for the SIL 1 system may be 3300XL Proximity Transducer Systems or 350500 or 330525 Velomitors*.
- SIL 1 and SIL 2 options for temperature and SIL 1 for process variable monitoring using the 3500/60_SIL1, 3500/60_SIL2, 3500/61_SIL1, or 3500/62_SIL2 Temperature Monitors or the 3500/62_SIL1 Process Variable Monitor are available. 3500/32_SIL1, 3500/32_SIL2, 3500/33_SIL1, or 3500/33_SIL2 relay modules may be used to complete the functional safety certified temperature or process variable system.
- Full SIL 2 reciprocating compressor protection using the 3500/70_SIL2 Impulse Velocity, 3500/72_SIL2 Rod Position, or 3500/77_SIL2 Cylinder Pressure Monitors. Additionally the 3500/60_SIL2 or 3500/61_SIL2 temperature monitors, 3500/32_SIL2 or 3500/33_SIL2 relay modules, and the 3500/25_SIL2 Keyphasor* module may be selected as needed. The SIL 2 sensors are the 3300XL 8mm and 11mm Proximity Transducer Systems and 330500, 190501, 330400, and 330425 seismic transducers also support a fully SIL 2 certified reciprocating compressor protection solution.



Bently Nevada Functional Safety certifications are of two types with respect to the included components:

- 1 The most common is a partial loop certification that includes sensor(s), monitor, and relay output module. The end-user or entity with unit responsibility can use the SIL statistics for the partial loop and then combine with FS attributes of the Electronic Shutdown Device (logic solver) and/or final element (for example – trip valve) to ensure a compliant loop design.
- 2 The second type is a component, or device, certification that certifies a particular device for use in a particular SIL and provides the SIL statistics for the device. Certifications of this type exist for individual sensors, monitors, and relay output modules. The loop FS design must be carefully evaluated for the specific combination of devices.

Conditions of Use

The following are requirements and recommendations for Functional Safety products to be applied to the configuration and installation of Functional Safety Certified systems. For detailed information on conditions of use, refer to the applicable SIL certificates, SIL test reports, FS product safety manuals or contact Bently Nevada. For further certification and approvals information please visit the following website: <http://www.GEmeasurement.com/>

Requirements

- Only those components contained within the TUV certified configurations can be used within certified systems. Contact your local representative for details
- Dual power supplies are required
- Verification of configuration – uploading rack configuration after configuration loaded and comparing to specified settings
- For 3500/32 and 3500/33: The de-energized state has to be the safe state to indicate a fault and trip condition. Contact rating for the relay contacts is 30Vmax. To achieve SIL 2 rating, redundant relay configuration must be used.

Recommendations

- GE Bently Nevada Services to inspect during validation/commissioning for proper installation, configuration and usage
- One year interval for Proof Testing

Ordering Information

For a detailed listing of country and product specific approvals, refer to the Approvals Quick Reference Guide (document 108M1756) located at the following website: <http://www.GEmeasurement.com>.

Options for standard monitors and functional safety monitors are selected in 3500_SYSTEM under Other Approvals.

Note: When ordering monitors to be used as part of a SIL 1 or SIL 2 safety instrumented system, the appropriate FS modifications and tagging options are automatically added based on the I/O modules selected.

Note: Components in the following tables that are marked with the dagger (†) symbol are not available for new installations; available for spares only.

FS monitors and modules in a rack			
Monitor	Select		Notes
3500/25	3500/25 (SIL2)		Keyphasor Module
3500/32	3500/32 (SIL1)		4-Channel Relay Module
	3500/32 (SIL2)		
3500/33	3500/33 (SIL1)		16-Channel Fail Safe Relay Output Module
	3500/33 (SIL2)		16-Channel Fail Safe Relay Output Module
3500/40	3500/40 (SIL1)	-01-BB	Proximito I/O Module with Internal Term.
		-02-BB	Proximito I/O Module with External Term.
		-03-BB	Proximito I/O Module with Internal Barriers and Internal Term.
3500/42	3500/42 (SIL1)	-01-BB	Prox/Seismic I/O Module with Internal Term.
		-02-BB	Prox/Seismic I/O Module with External Term.
		-04-BB	I/O Module with Internal Barriers (4x prox/accl ch's) and Internal Term.
		-05-BB	I/O Module with Internal Barriers (2x prox/accl + 2x channels) and Internal Term.
		-06-BB	I/O Module with Internal Barriers (4x Velomitor channels) and Internal Term.
		-09-BB	Prox/Velom I/O Module with Internal Term.
3500/60	3500/60 (SIL1)	-01-BB	RTD/TC Temperature I/O Module (w/o recorders, internal term)
		-02-BB	RTD/TC Temp I/O Module (w/o recorders, external term)
		-05-BB	Internal Barrier IO Module

FS monitors and modules in a rack		
Monitor	Select	Notes
3500/60	3500/60 (SIL2)	-01-BB RTD/TC Temp I/O Module (w/o recorders, internal term)
		-02-BB RTD/TC Temp I/O Module (w/o recorders, external term)
		-05-BB Internal Barrier IO Module
3500/61	3500/61 (SIL1)	-01-BB RTD/TC Temp I/O Module (with recorders, internal term)
		-02-BB RTD/TC Temp I/O Module (with recorders, external term)
		-05-BB Internal Barrier IO
3500/61	3500/61 (SIL2)	-01-BB RTD/TC Temp I/O Module (with recorders, internal term)
		-02-BB RTD/TC Temp I/O Module (with recorders, external term)
		-05-BB Internal Barrier IO
3500/62	3500/62 (SIL1)	-01-BB -10 to +10 Vdc I/O Module w/ Internal term.
		-02-BB -10 to +10 Vdc I/O Module w/ External term.
		-03-BB Isolated 4 to 20 mA I/O Module w/ internal term.
		-04-BB Isolated 4 to 20 mA I/O Module w/ external term.
		-05-BB Internal Barrier IO - 4-20 mA
3500/70	3500/70 (SIL2)	-01-BB Prox/Velom I/O w Internal Term.
		-02-BB Prox/Velom I/O w External Term.
		-03-BB Int Barrier I/O-4 Prox/Accl.
		-04-BB Int Barr I/O-2 Prx/Acl-2 Vlm.
		-05-BB Int Barrier I/O-4 Velom.
3500/72	3500/72 (SIL2)	-01-BB I/O Module w Internal Term
		-02-BB I/O Module w External Term
		-03-BB Int Barrier I/O-4 Prox/Accl
3500/77	3500/77 (SIL2)	-03-BB Cylinder Pressure I/O Int Term
		-04-BB Cylinder Pressure I/O Ext Term

Spare monitors and modules	
Monitor	Part Number
3500/25	3500/25_SIL2
3500/32	3500/32_SIL1
	3500/32_SIL2
3500/33	3500/33_SIL1
	3500/33_SIL2
3500/40	3500/40_SIL
3500/42	3500/42_SIL
3500/53	3500/53_SIL3
3500/60	3500/60_SIL1
3500/60	3500/60_SIL1
3500/61	3500/61_SIL2
3500/61	3500/62_SIL2
3500/62	3500/62_SIL1
3500/70	3500/70_SIL2
3500/72	3500/72_SIL2
3500/77	3500/77_SIL2

* Denotes a trademark of Bently Nevada, Inc., a wholly owned subsidiary of General Electric Company.

© 2002 – 2015 Bently Nevada, Inc. All rights reserved.

Printed in USA. Uncontrolled when transmitted electronically.

1631 Bently Parkway South, Minden, Nevada USA 89423

Phone: 775.782.3611 Fax: 775.215.2873

www.GEmeasurement.com