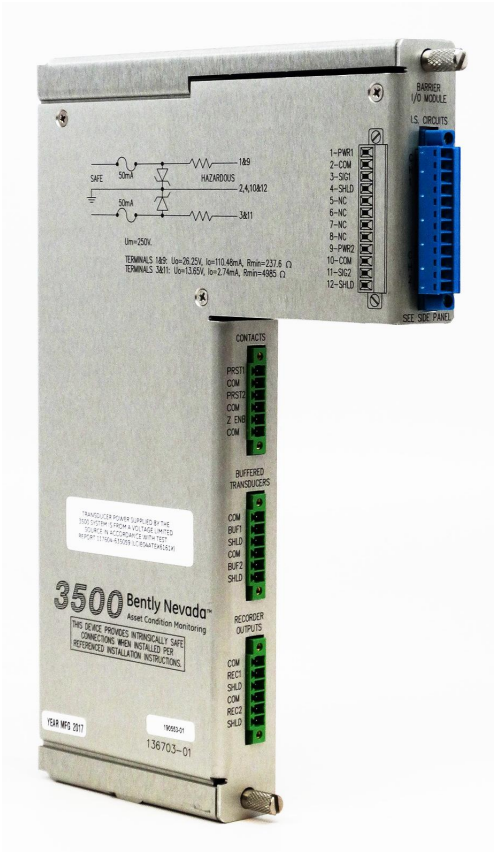
3500/04 Internal Barriers

Datasheet

Cordant™

141495 Rev. R



Description

Bently Nevada™ 3500 Internal Barriers are intrinsically safe interfaces that provide explosion protection for transducer systems connected directly to the 3500 Machinery Protection System.

The internal barriers are fully compatible with the 3500 System and provide a convenient and cost-effective solution for installing all types of transducer systems within a hazardous area.

> Unlike external barriers, 3500 Internal Barriers are an integral part of the 3500 System and will not degrade the system's performance.

We offer Bently Nevada transducer systems with comprehensive approvals for hazardous area installations. The transducer systems are matched to those of the 3500 Internal Barriers. See Compatible Monitors and Transducers on page 8.

Each component complies both individually and as part of a system with the safety requirements of North American and international standards. Hence, you don't have to reference individual certificates to verify the compatibility between components.

Standard and internal barrier monitors can reside within the same 3500 rack. You can upgrade standard monitors by replacing existing I/O modules with those that contain internal barriers.

Baker Hughes

Installation Guidelines

The internal barriers for a 3500 rack are incorporated in special Monitor I/O Modules. These barriers provide explosion protection for transducer systems that are connected to the 3500 system. An intrinsically safe (IS) earthing module provides the IS earth connection through the 3500 system backplane.

The IS Earth Module requires a dedicated I/O module position and precludes the use of this monitor position for other 3500 System modules. This limits a standard 19-inch rack to 13 monitor positions. Furthermore, a number of installation options are not available when internal barriers are installed in a 3500 rack.

New Rack Installations

The same rack can contain both internal barrier and standard I/O module types without compromising the separation between hazardous and safe area field wiring.

The External Termination option is not available for I/O modules with internal barriers because hazardous area approvals do not allow the use of intrinsically safe wiring within a multi-cored cable assembly.

Monitors that contain Triple Modular Redundant (TMR) rack options cannot use internal barrier I/O modules since connecting a transducer to multiple I/O module inputs will compromise the integrity of the IS system.

A rack that contains any internal barrier module must have a 3500/04-01 IS Earthing Module to provide the Barrier Module IS earth connection.

I/O Module Positioning

Internal barrier I/O modules have an increased depth over that of standard barrier I/O modules. Consider the rack position with respect to adjacent modules to ensure that you can easily access the I/O modules during maintenance.

Internal barrier I/O and IS Earthing modules can occupy any general-purpose rack position and can be adjacent to standard I/O module types without compromising the 50 mm (2 in) physical separation requirement between safe and hazardous area field wiring.

Follow these guidelines when positioning I/O modules:

- Group all internal barrier I/O modules in adjacent rack positions to simplify the installation.
- Place the IS Earthing Module in a rack position that provides easy access for routine online maintenance.
- Consider the IS Earthing Module's positioning relative to adjacent internal barrier I/O modules and cabinet bulkheads.

If you plan to install standard I/O modules or the IS Earthing Module between a pair of internal barrier I/O modules, allow a minimum of two rack positions so that you can easily access the standard I/O or IS Earthing Module online without disturbing the adjacent I/O modules.

Upgrading a 3500 Rack

To upgrade a 3500 rack with standard I/O modules to a rack containing one or more internal barrier I/O modules, replace the standard I/O modules with the appropriate internal barrier modules. You can order the IS Earthing Module separately. See Ordering Information on page 7. for more information.

> The IS Earthing Module must be installed in a dedicated monitor position.

Revision 2.3 or later of 3500 Rack Configuration software is required to enable the use of internal barriers with the following monitor types:

- 3500/25
- 3500/40
- 3500/42
- 3500/50
- 3500/60
- 3500/61
- 3500/62
- 3500/70
- 3500/72

The following firmware revisions are required:

Monitor	Firmware Version	Firmware Rev
3500/25	1.06	D or later
3500/50	1.05	E or later
3500/60	1.06	E or later
3500/61	1.06	E or later
3500/62	1.06	C or later

No firmware revisions are required for the following monitors:

- 3500/40M
- 3500/42M
- 3500/70M
- 3500/72M

Cabinet and Panel Installations

The internal barrier I/O modules add approximately 50 mm (2 in) to the depth of the rack to provide the 50 mm (2 in) physical separation between safe and hazardous area field wiring. Hence, a standard rack with internal barrier modules will not fit into a 400 mm cabinet.

The bulkhead rack version is available for installations that require this cabinet type. A standard rack with internal barrier modules will fit comfortably in a 600 mm cabinet and the 3500/06 Weatherproof Housing.

We recommend the following installation guidelines for the internal barriers within a cabinet or panel:

- The positioning of the hazardous and safe area connectors dictates installations route the hazardous area field wiring above the 3500 rack and safe area wiring below the 3500 Rack.
- Installations should carefully route the safe area wiring from the bulkhead version along the top of the 3500 rack to maintain the 50 mm (2 in) separation between safe and hazardous area wiring.

When multiple racks are installed within the same cabinet, hazardous area and safe area wiring can share the same cable trays as long as a separator is physically insulating the wires from one another.

Specifications

Physical Information

Internal Barrier I/O Module	
Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 163.1 mm (9.50 in. x 0.96 in. x 6.42 in.)
Weight	0.46 kg (1.01 lb)
Internal Barrier Earthing Module	
Dimensions (Height x Width x Depth)	241 mm x 24.4 mm x 103.1 mm (9.50 in. x 0.96 in. x 4.06 in.)
Weight	0.201 kg (0.443 lb.)

Proximity and Acceleration

The following information also applies to aeroderivative and dynamic pressure.

Bandwidth	30 kHz
Amplitude Accuracy	3% @ 10 kHz, -15/+10% @ 30 kHz
Phase Accuracy	-11° @ 10 kHz
Channel Parameters	U_m = 250 V U_o = 27.45 V I_o = 113.24 mA C_o = 0.086 uF L_o = 2.77 mH P_o = 726.96 mW
Circuit Parameters	
Power (PWR)	U_o = 26.25 V Rmin = 237.6 Ω I_o = 110.48 mA
Signal (SIG)	U_o = 13.65 V Rmin = 4985 Ω I_o = 2.74 mA

Velomitor Sensor

Amplitude Accuracy	±1%
Circuit Parameters	U_o = 26.25 V Rmin = 297 Ω I_o = 88.39 mA
Channel Parameters	U_m = 250 V U_o = 26.25 V I_o = 88.39 mA C_o = 0.097 uF L_o = 4.55 mH P_o = 580.02 mW

Temperature

Temperature Accuracy	±1 °C @ +25 °C, ±15 °C over operating temperature
Phase Accuracy	-11° @ 10 kHz
Channel Parameters	U_m = 250 V U_o = 7.71 V I_o = 89.17 mA C_o = 9.3 uF L_o = 4.55 mH P_o = 132.41 mW
Circuit Parameters	
Channel B	U_o = 5.36 V Rmin = 133.25 Ω I_o = 40.23 mA
Channel C	U_o = 6.51 V Rmin = 133.25 Ω I_o = 48.86 mA

Process Variable

Channel Parameters	U_m = 250 V U_o = 27.98 V I_o = 279.34 mA C_o = 0.083 uF L_o = 0.455 mH P_o = 842.89 mW

Circuit Parameters	
Power (PWR)	U_o = 26.78 V Rmin = 297 Ω I_o = 90.17 mA
Signal (SIG)	U_o = 9.56 V Rmin = 50.58 Ω I_o = 189.01 mA

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

DNV GL rules for classification – Ships, offshore units, and high speed and light craft

ABS Rules for Condition of Classification, Part 1

- Steel Vessels Rules
- Offshore Units and Structures

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 nA nC ic IIC T4 Gc;
Class I, Zone 2: AEx/Ex ec nC ic IIC T4 Gc;
Class I, Division 2, Groups A, B, C, and D;

T4 @ Ta= -20˚C to +65˚C (-4˚F to +149˚F)
When installed per drawing 149243 or 149244.

ATEX/IECEx

II 3 G

Ex nA nC ic IIC T4 Gc
Ex ec nC ic IIC T4 Gc

T4 @ Ta= -20˚C to +65˚C
(-4˚F to +149˚F)
When installed per drawing 149243 or 149244.

Ordering Information

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

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3500/04-AA-BB

A: I/O Module type: Earthing module	
01	Earthing I/O Module
B: Agency Approval	
00	None
01	North Americal Hazloc
02	Multi (CSA, ATEX, IECEx)

When ordering internal barriers, specify the appropriate I/O module type for each monitor module.

Install an IS Earthing Module in each rack containing internal barriers.

Refer to each monitor module's datasheet for specifications and ordering information.

Spares

136719-01	Earthing I/O Module
138257-01	Earthing Module Front Panel
135473-01	3500/25 I/O Module with Internal Barriers and Internal Terminations
135489-01	3500/42, /70, /72 I/O Module with Internal Barriers (4 prox/accel channels) and Internal Terminations
135489-02	3500/42, /70 I/O Module with Internal Barriers (2 prox/accel + 2 Velomitor channels) and Internal Terminations
135489-03	3500/42, /70 I/O Module with Internal Barriers (4 Velomitor channels) and Internal Terminations
135489-04	3500/40 I/O Module with Internal Barriers and Internal Terminations
136703-01	3500/50 I/O Module with Internal Barriers and Internal Terminations
136711-01	3500/60 I/O Module with Internal Barriers and Internal Terminations
136711-02	3500/61 I/O Module with Internal Barriers and Internal Terminations
137110-01	3500/62 I/O Module with Internal Barriers and Internal Terminations

Compatible Monitors and Transducers

Compatible Monitors	3500/25 Keyphasor Monitor 3500/40M Proximitor Monitor 3500/42M Proximitor/Seismic Monitor 3500/44M Aeroderivative (only with mods) 3500/50 Tachometer Monitor 3500/60 Temperature Monitor 3500/61 Temperature Monitor with Recorders 3500/62 Process Variable Monitor 3500/64 Dynamic Pressure Monitor (only with mods) 3500/70M Recip Impulse/Velocity Monitor 3500/72M Recip Rod Position Monitor
Compatible Transducer Systems	
Proximity	3300 XL Proximitor Sensor 3300 5 mm Proximitor Sensor 3300 XL 8 mm Proximitor Sensor 3300 RAM Proximitor Sensor 7200 5 & 8 mm Proximitor Sensor
Acceleration	23733-03 Standard Acceleration Transducer 330400 Standard Integral Acceleration Transducer 330425 Standard Integral Acceleration Transducer 49578-01 Standard Acceleration Transducer Modified 86517 Interface Module
Velocity	Velomitor Sensor High Temperature Velomitor Sensor
Temperature	**3-wire Thermocouples:** Type J Type K Type E Type T **3-wire RTDs:** 10 Ω 3-wire Copper 100 Ω 3-wire Platinum 120 Ω 3-wire Nickel
Process Variable	+4 to +20 mA

The Internal Barrier system does not support the following transducer systems:

- 11 mm, 14 mm, 16 mm, 25 mm, 35 mm, or 50 mm Proximitor Sensors
- Velocity Seismoprobe Sensors (/42)
- Velocity-to-Displacement Converter (/40)
- Magnetic pick-up (/50)
- 4-wire RTDs and Thermocouples (/60, /61)
- 1-5 Vdc Process Variables (/62)
- 0-10 Vdc Process Variables (/62)

Internal barriers are compatible with **approved** Bently Nevada transducer systems. For all other transducer systems, please consult your local Bently Nevada sales professional.

Graphs and Figures

Figure 1: Typical Internal Barrier I/O Module

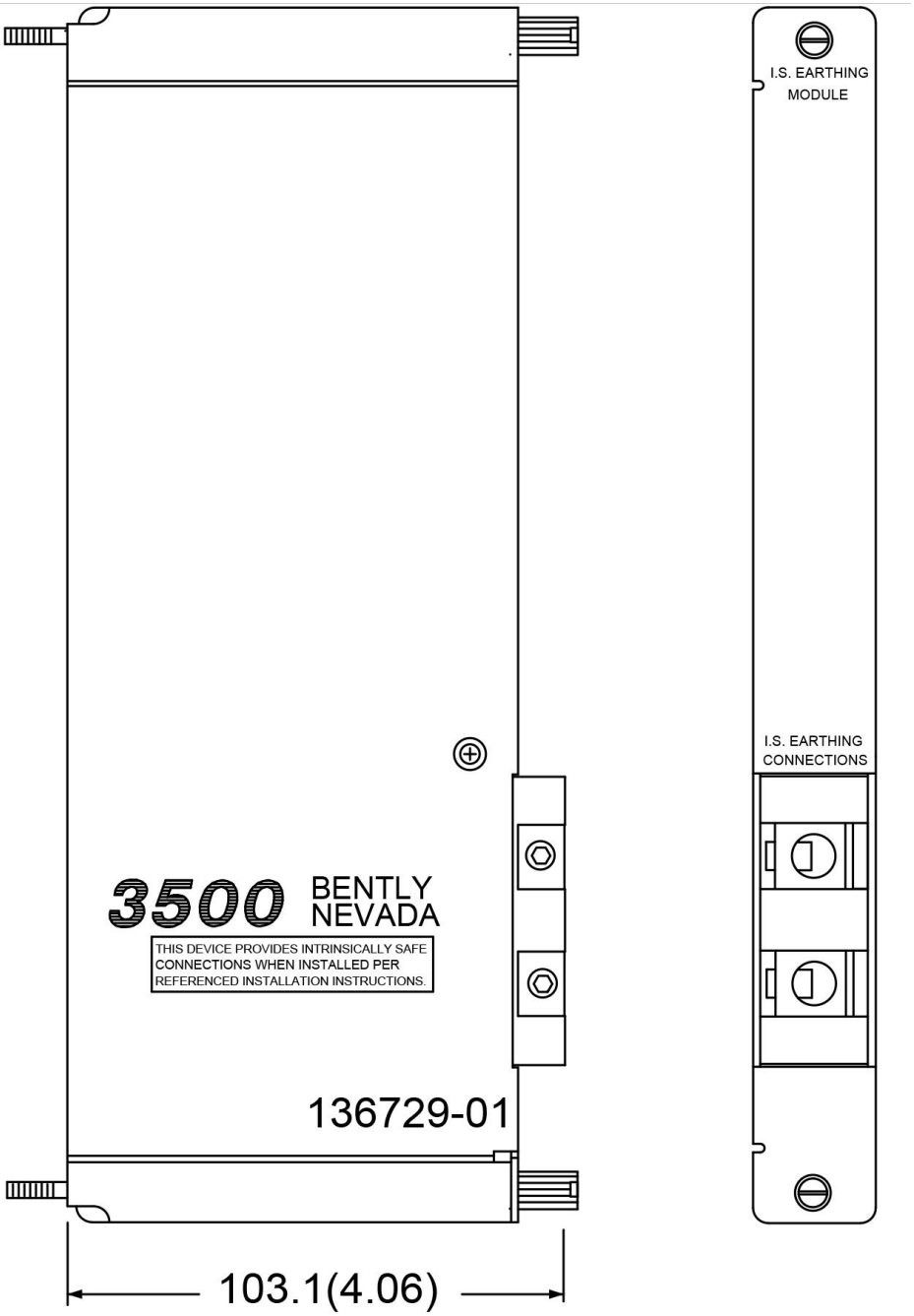
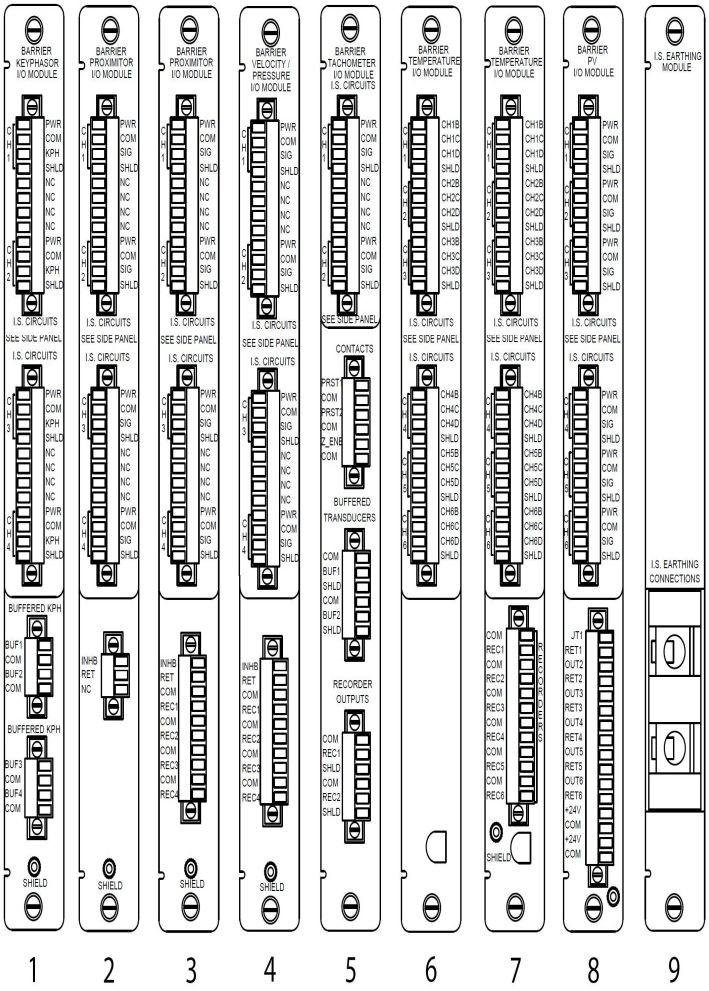


Figure 2: Rear Views of the 3500/04-01 Internal Barrier Earthing Module
Dimensions are in millimetres (inches)



1. 3500/25 Keyphasor Module
2. 3500/40M Proximity
3. 3500/42M, /70M, /72M Prox/Velom
4. 3500/44M, /64 Vel/Pressure (mods only)
5. 3500/50 Tachometer
6. 3500/60 Temperature
7. 3500/61 Temperature
8. 3500/62 Process Variable
9. Earthing Module

Figure 3: Typical Internal Barrier Installation