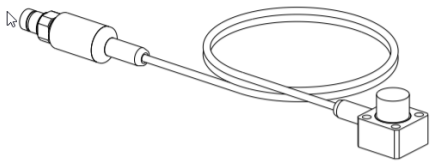
350900 HT Velocity and Acceleration Sensor

Datasheet

Bently Nevada Machinery Condition Monitoring

168780 Rev. J



Description

The 350900 High Temperature Velocity and Acceleration Sensor (HTVAS) provides a continuous acceleration and velocity output, allowing the customer to protect their machine with an velocity signal while simultaneously capturing the acceleration signal for machinery diagnostics. Its design is primarily for use with the 3500/42M and 3500/44M monitors. When attaching the HTVAS to a 3500/42M or 3500/44M monitor you must use the acceleration and velocity signals from the transducer on a separate channel pair (such as channels 1 and 3) or on separate monitors.

The 350900 High Temperature Velocity and Acceleration Sensor (HTVAS) separates the high-temperature sensing element from the signal conditioning electronics, with the two permanently connected via a hardline cable. This arrangement allows you to mount the sensing head on surfaces with temperatures as high as +482 °C (+900 °F), while installing the signal conditioning electronics in a cooler location. Eliminating connections between the sensing head and its associated signal conditioning electronics also eliminates a significant source of potential transducer failures (connector problems). This achieves overall transducer system performance comparable to other case-mounted vibration transducers, but permits use at significantly higher temperatures.

350900 HTVAS Features

- Velocity and acceleration output
- High temperature operation up to +482°C (+900 °F)
- Electronics rated to +125°C (+257°F), survivable to +155°C (+311°F)

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Most common machine malfunctions (unbalance, misalignment, etc.) occur on the rotor and originate as an increase (or at least a change) in rotor vibration. For any individual casing measurement to be effective for overall machine protection, the system must continually transmit a significant amount of rotor vibration to the machine casing, or mounting location of the transducer.

In addition, be careful to install the accelerometer transducer on the bearing housing or machine casing. Improper installation may decrease the transducer amplitude and frequency response and/or generate false signals that do not represent actual vibration. Refer to the appropriate instruction manuals and Application Notes.

Upon request, Bently Nevada provides engineering services that can identify the appropriate machine housing measurements and installation assistance if needed.

Upon request, Bently Nevada can provide engineering services to determine the suitability of housing measurements for the machine in question and/or to provide installation assistance.

Specifications

Specifications are between +20 °C and +30 °C (+68 °F to +86 °F) with machine casing vibration at 100 Hz (6000 cpm) and with a 10 kΩ load unless otherwise indicated.

Electrical

Power Requirements	
Input Voltage	-18 to -30 Vdc; -18 to −28 Vdc for hazardous area approval options.
Quiescent Current	6 mA nominal, no load.
Transverse Sensitivity	Less than 5% of axial sensitivity.
Amplitude Linearity	± 1% to 4900 m/s2 (500 g) peak overall acceleration.
Mounted Resonant Frequency	Greater than 15 kHz.
Maximum Cable Length	305 meters (1000 ft).
Grounding	Case isolated.

Velocity Output

Sensitivity	3.94 mV/mm/s (100 mV/in/s) ±5%.
Frequency Response	40 Hz to 1 kHz (2400 cpm to 60 kcpm) ±5% with 305 metres (1000 ft) of cable. 25 Hz to 2 kHz (1500 cpm to 120 kcpm) ±3 dB with 305 metres (1000 ft) of cable.
System Sensitivity over Extended Temperatures	Over a sensor temperature range of −54 °C to +399 °C (-65 °F to +750 °F) and with the electronics between −54 °C to +125 °C (-65 °F to +257 °F), the output remains within ± 10% of 3.94 mV/mm/s (100 mV/in/s). Over a sensor temperature range of −54 °C to +482 °C (-65 °F to +900 °F) and with the electronics between −54 °C to +125 °C (-65 °F to +257 °F), the output remains within ± 15% of 3.94 mV/mm/s (100 mV/in/s).
Output Bias Voltage	-10.0 ± 2.0 Vdc.
Velocity Range	1270 mm/s (50 in/s).
Broadband Noise Floor (5 Hz to 2 kHz)	0.05 mm/s rms (0.002 in/s rms), max.

Acceleration Output

Sensitivity	1.02 mV/m/s2 (10 mV/g) ± 5%.
Frequency Response	25 Hz to 4 kHz (1500 cpm to 240 kcpm) ± 5% with 305 metres (1000 ft) of cable. 10 Hz to 10 kHz (600 cpm to 600 kcpm) ± 3 dB with 305 metres (1000 ft) of cable.

System Sensitivity over Extended Temperatures	Over a sensor temperature range of -54 °C to +399 °C (-65 °F to +750 °F) and with the electronics between −54 °C to +125 °C (-65 °F to +257°F), the output remains within ± 10% of 1.02 mV/m/s2 (10 mV/g). Over a sensor temperature range of −54 °C to +482 °C (-65 °F to +900 °F) and with the electronics between −54 °C to +125 °C (-65 °F to +257 °F), the output remains within ± 15% of 1.02 mV/m/s2 (10 mV/g).
Output Bias Voltage	-10.0 ± 2.0 Vdc.
Acceleration Range	4900 m/s2 (500 g).
Broadband Noise Floor (5 Hz to 2 kHz)	147 mm/s2 (1.5 mg) rms, max.

Environmental Limits

Operating and Storage Temperatures	
Sensor	-54°C to +482°C (-65°F to +900°F).
Mineral Insulated Cable	-54°C to +482°C (-65°F to +900°F).
Electronics	-54°C to +125°C (-65°F to +257°F).
Soak Back Temperature	The electronics will survive temperature exposure of +155°C (+311°F) for four hours without failure. Electrical performance does not be met during this period.
Shock Survivability	19,620 m/s2 (2000 g) peak, maximum.
Relative Humidity	100% condensing, non-submerged. Case is hermetically sealed.

Physical

Sensor	
Dimensions	See Graphs and Figures on page 9.
Mounting	30.2 mm (1.188 in) square mounting hole pattern, 7.2 mm (0.283 in) mounting holes (4 holes).
Mounting Surface	32 microinch rms.
Material	Nickel alloy 600.
Integral Cable	
Diameter	6.35 ± 1.27 mm (0.25 ± 0.05 in)
Material	300 Series Stainless Mineral Insulated Integral Cable with Stainless Steel Overbraid.
Bend Radius	Minimum bend radius of 51 mm (2.0 in).
Integral Electronics	
Dimensions	See Graphs and Figures on page 9.
Mounting	Patch panel hub mount.
Material	300 series stainless steel.
Connector	MIL-DTL-83723/90 - 1006N with gold-plated 300 series stainless steel.
System Weight (without field wiring)	0.545 kg + 0.10 kg/m cable length (1.200 lb + 0.006 lb/in cable length), typical.
Mounting Angle	Any orientation

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

EMC Directive 2014/30/EU

RoHS

RoHS Directive 2011/65/EU

Maritime

DNV rules for classification – Ships

DNV rules for classification – High speed and light craft

DNV offshore standards

Hazardous Area Approvals

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

CSA/NRTL/C

330450	Ex ia IIC T4: AEx ia IIC T4: Class I, Div 1, Groups A, B, C, D. Class II, Div 1, Groups E, F, G; Class III, Div 1 Install per drawing 168078 T4 @ Ta (-40°C to 100°C) Enclosure Type 4X Ex nL IIC T4: Ex ec IIC T4: Class I, Zone 2 Class II, Div 2, Groups A, B, C and D Install per drawing 168078 T4 @ Ta (-40°C to 100°C) Enclosure Type 4X
350900	Ex ia IIC T4 AEx ia IIC T4 Class I, Zone 0 Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 When installed with an approved zener barrier per BN drawing 167923. T4 @ T4 = 100°C Ex nL IIC Class 1, Zone 2 Ex ec IIC Class 1, Zone 2 Class I, Division 2 (non-incendive), Groups A, B, C, and D when installed per BN drawing 168077.
330750, 330752	Ex ia IIC Class I, Zone 0, AEx ia IIC Class I, Division 1, Groups A, B, C and D Class II, Division 1, Groups E, F and G Class III, Division 1 Ex nL IIC Ex ec IIC Class I, Division 2, Groups A, B, C and D

ATEX/IECEx

330450, 350900, 330750, 330752

330450, 350900, 330750, 330752	II 1 G Ex ia IIC or IIB Ta, T4 492°C II 3 G Ex na IIC or IIB Ta, T4, T1 492°C Gc Ex ec IIC or IIB Ta T4, T1 492°C Gc Ta, T1, T4 492°C Ta, T4, T1 492°C

Temperature Class	Temperature Range	Equipment
T4	-40°C to +100°C	Electrical Housing
T1	-40°C to +400°C	Sensor and Cable
T1	-40°C to +482°C	Sensor and Cable (3509000)

Entity Parameters for Zone 0/1 and Zone 2					
Group	IIC				IIB
Type	**330450** **330450 Type S**	**330750** **330750 Type S**	**330752** **330752 Type S**	**350900**	**350900**
Ui	30 V	28 V	28 V	28 V	29.2 V
Ii	200 mA	120 mA	120 mA	153 mA	279 mA
Pi	1.5 W	1.0 W	1.0 W	0.84 W	1.95 W
Ci	7 ηF	1 ηF	1 ηF	37 ηF	37 ηF
Li	30 µH	30 µH	30 µH	30 µH	30 µH

Hazardous Area Conditions of Safe Use

ATEX/IECEx

Zone 0/1:

Equipment must be connected to equipment, which meets the above listed entity parameters.

The cables type A or B (in compliance with EN 60079-25) must respect the cable parameters listed with the entity parameters.

Special Notes for 330450, 330750, 330752 and 350900

- This equipment is intrinsically safe and can be used in potentially explosive atmospheres.
- The intrinsically safe apparatus shall only be connected to an associated intrinsically safe apparatus. The association shall comply with the requirements of EN 60079-25 standard.
- Operating ambient temperature range:
  - -40°C Tamb +100°C (electronic housing)
  - -40°C Tamb +400°C (sensor and cable)
  - -40°C Tamb +482°C (sensor and cable) for model 350900

Zone 2 :

The supply electrical parameters shall not exceed the values mentioned in the tables above.

Special Notes for 330450, 330750, 330752 and 350900

- The equipment is safe when connected to an associated source, containing a reliable material limiting current and voltage meeting the entity parameters.
- Operating ambient temperature -40°C to +100°C (Electronic Housing)
- Operating ambient temperature -40°C to +400°C (Sensor and Cable)
- Operating ambient temperature -40°C to +482°C (Sensor and Cable for 350900).
- The mating part of the connector shall provide IP54 ingress protection or better according to requirements of IEC 60079-0 and IEC 60079-7 or IEC 60079-15.
- Provisions shall be made for ensuring that the rated voltage and current are not exceeded while in service.
- Shall be supplied from Class II limited energy source according to requirements of C22.2 No 61010-1-12 and UL 61010-1 3rd Edition.
- Transient protection shall be provided that is set at a level not exceeding 140 % of the peak rated voltage value at the supply terminals to the equipment.

Ordering Information

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

High Temperature Velocity and Acceleration Sensor

350900-AAA

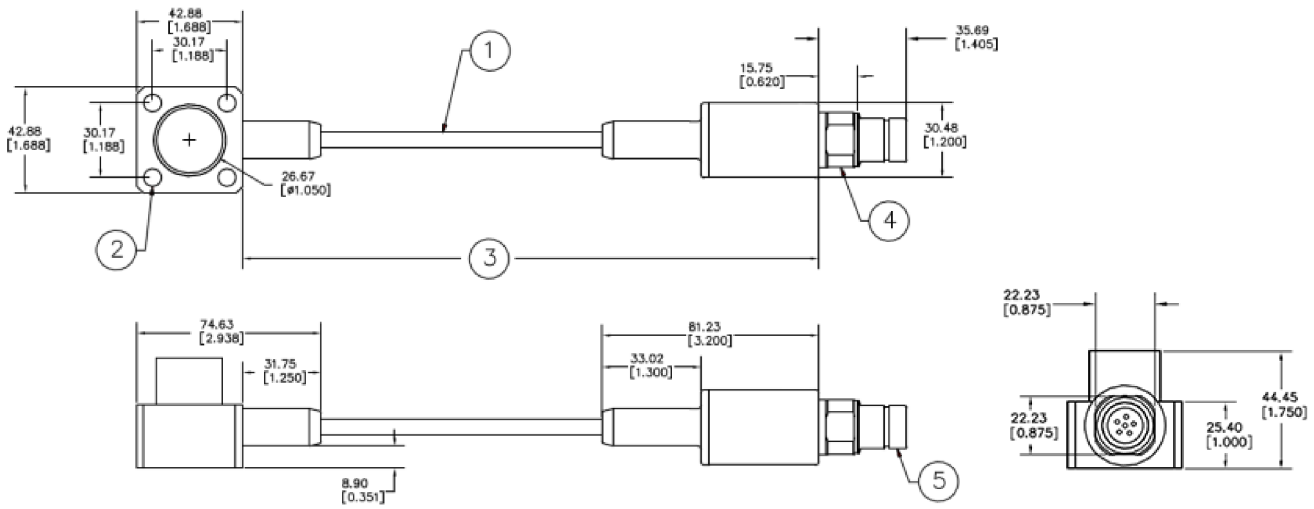
A: Integral Cable Length Option	
023	23 inches (0.58 metres)
026	26 inches (0.66 metres)
027	27 inches (0.69 metres)
044	44 inches (1.12 metres)
077	77 inches (1.96 metres)
083	83 inches (2.11 metres)
158	158 inches (4.0 metres)
237	237 inches (6.0 metres)
315	315 inches (8.0 metres)
394	394 inches (10.0 metres)

HTVAS Field Interconnect Cable

350901-AAA

A: Cable Length	
010	10 ft (3.05 metres)
040	40 ft (12.2 metres)

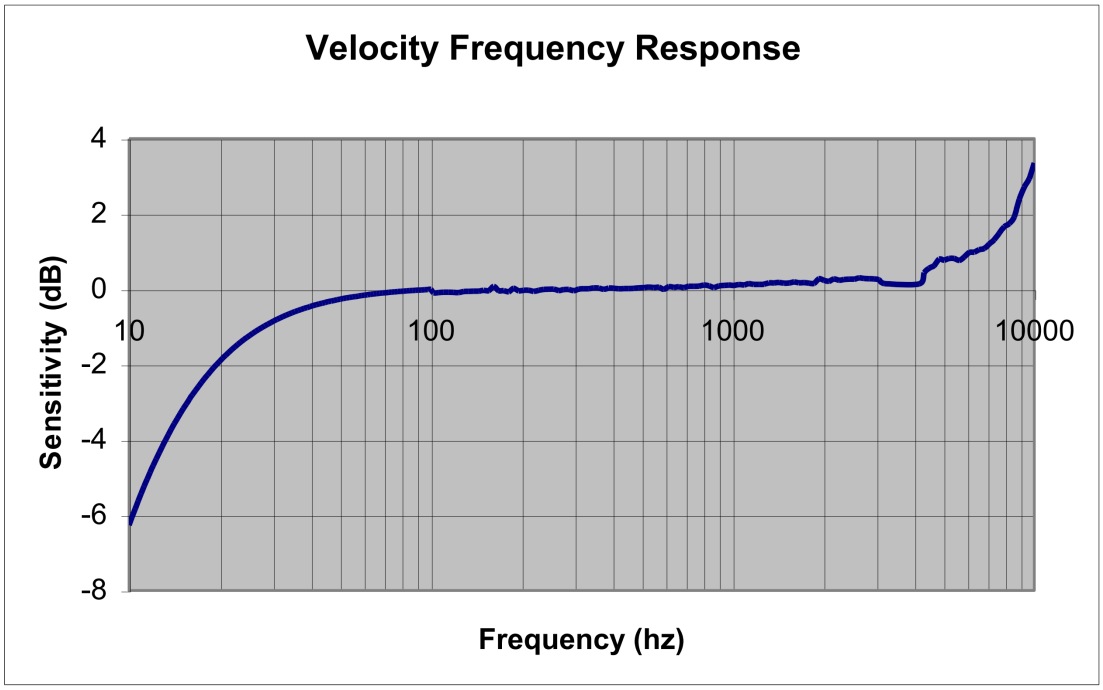
Graphs and Figures



1. Stainless steel overbraided MI cable
2. 0.283 diameter through (typical), 4 places
3. Length
4. 1-12 UNF-2A
5. MIL-DTL-83723/90 connector

Figure 1: 350900 Transducer Dimensional Drawing

Dimensions are in millimetres [inches]



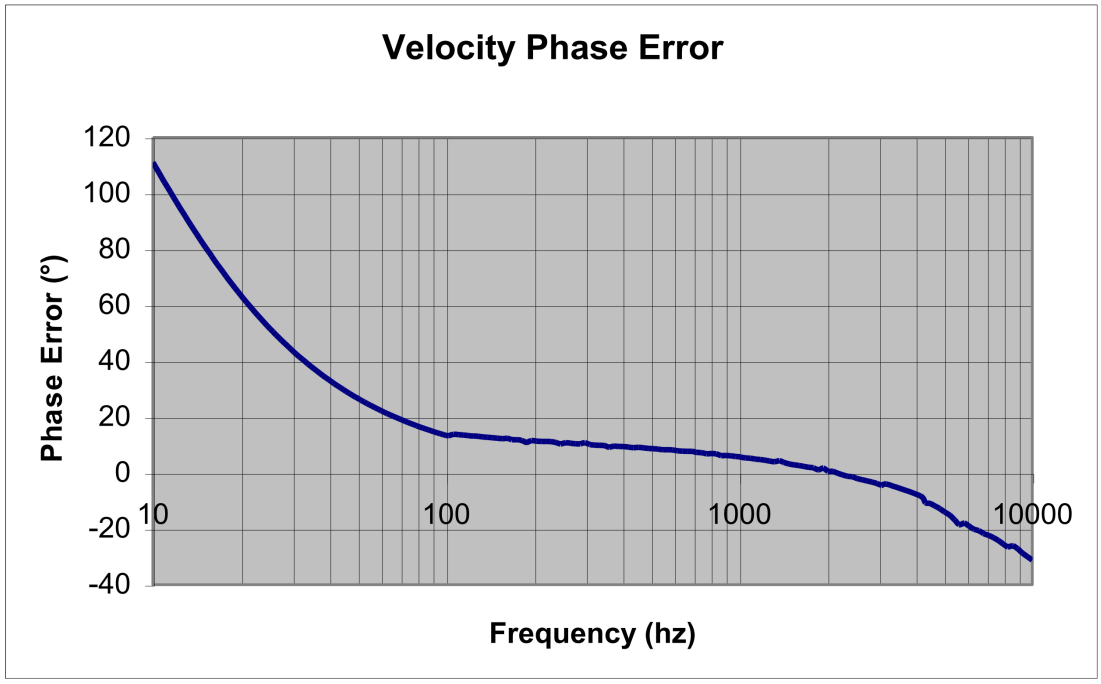
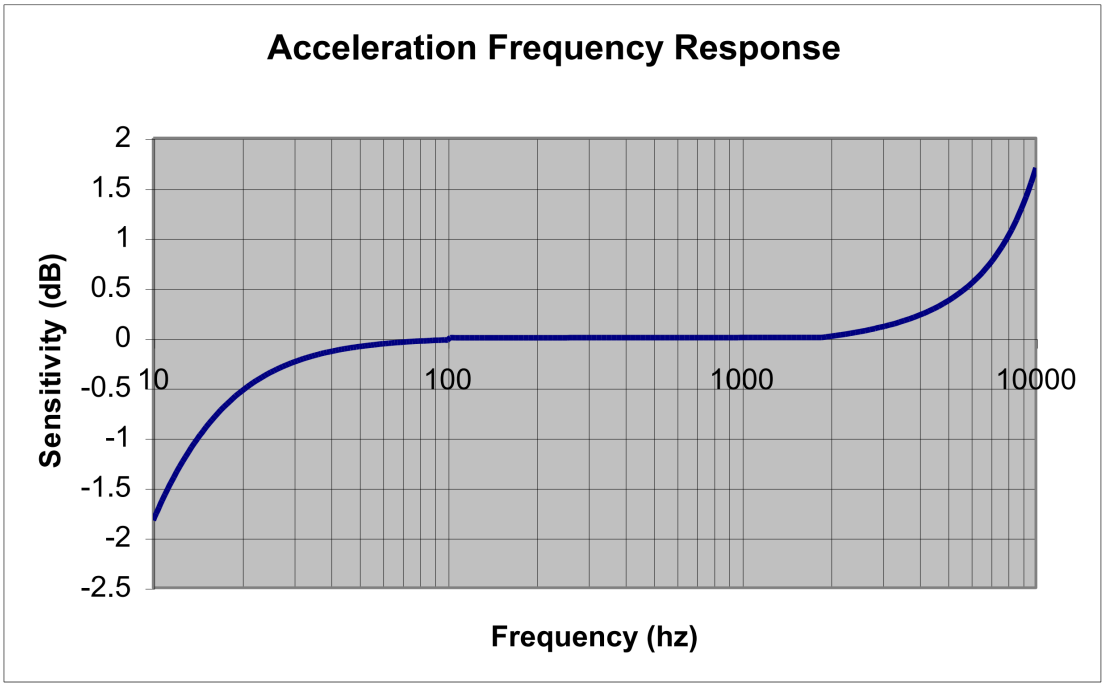


Figure 2: Typical Velocity Amplitude and Phase Response



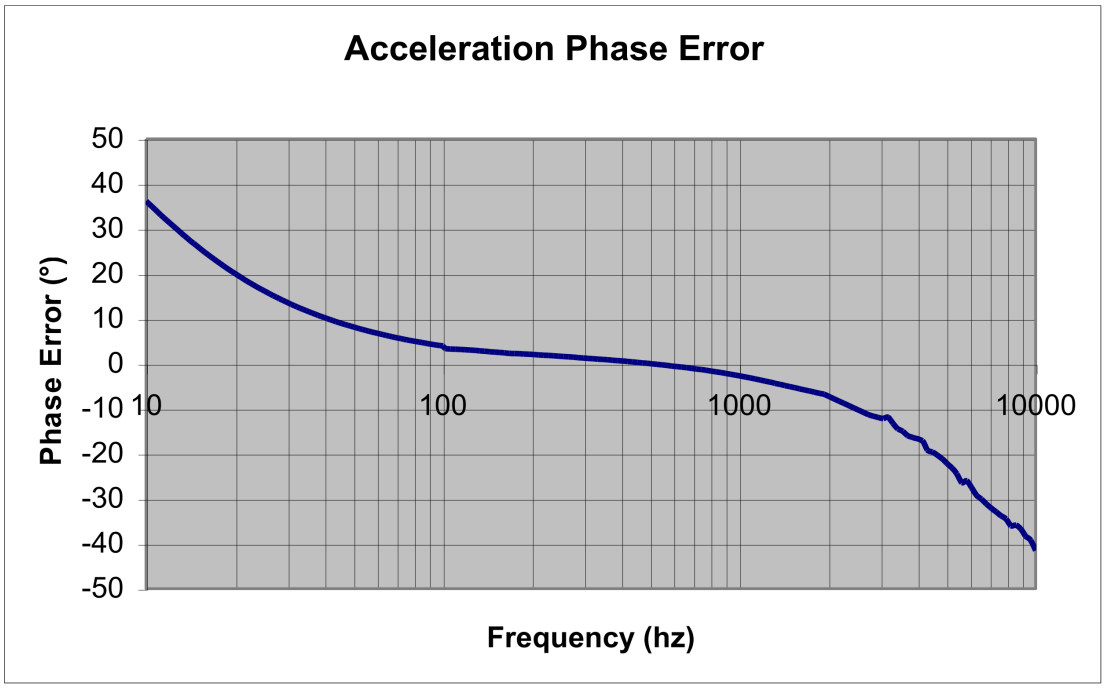


Figure 3: Typical Acceleration Amplitude and Phase Response

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