3300 XL 8mm Proximity Transducer System

Bently Nevada* Asset Condition Monitoring

Description

The 3300 XL 8 mm Proximity Transducer System consists of:

- One 3300 XL 8 mm probe,
- One 3300 XL extension cable[1], and
- One 3300 XL Proximitor* Sensor[2].

The system provides an output voltage that is directly proportional to the distance between the probe tip and the observed conductive surface and can measure both static (position) and dynamic (vibration) values. The system's primary applications are vibration and position measurements on fluid-film bearing machines, as well as Keyphasor* reference and speed measurements[3].

The 3300 XL 8 mm system delivers the most advanced performance in our eddy current proximity transducer systems. The standard 3300 XL 8 mm 5-metre system also fully complies with the American Petroleum Institute's (API) 670 Standard (4th Edition) for mechanical configuration, linear range, accuracy, and temperature stability. All 3300 XL 8 mm proximity transducer systems provide this level of performance and support complete interchangeability of probes, extension cables, and Proximitor sensors, eliminating the need to match or bench calibrate individual components.

Each 3300 XL 8 mm Transducer System component is backward-compatible and interchangeable[4] with other non-XL 3300 series 5 mm and 8 mm transducer system components[5]. This compatibility includes the 3300 5 mm probe, for applications in which an 8 mm probe is too large for the available mounting space[6,7].

Proximitor Sensor

The 3300 XL Proximitor Sensor incorporates numerous improvements over previous designs. Its physical packaging allows you to use it in high-density DIN-rail installations. You can also mount the sensor in a traditional panel mount configuration, where it shares an identical 4-hole mounting "footprint" with older Proximitor Sensor designs. The mounting base for either option provides electrical isolation and eliminates the need for separate isolator plates. The 3300 XL Proximitor Sensor is highly immune to radio frequency interference, allowing you to install it in fiberglass housings without adverse effects from nearby radio frequency signals. The 3300 XL Proximitor Sensor's improved RFI/EMI immunity satisfies European CE mark approvals without requiring special shielded conduit or metallic housings, resulting in lower installation costs and complexity.

The 3300 XL's SpringLoc terminal strips require no special installation tools and facilitate faster, more robust field wiring connections by eliminating screw-type clamping mechanisms that can loosen.

Proximity Probe and Extension Cable

The 3300 XL probe and extension cable also reflect improvements over previous designs. A patented TipLoc* molding method provides a more robust bond between the probe tip and the probe body. The probe's cable incorporates a patented CableLoc* design that provides 330 N (75 lbf) pull strength to more securely attach the probe cable and probe tip.

You can also order 3300 XL 8 mm probes and extension cables with an optional FluidLoc* cable option. This option prevents oil and other liquids from leaking out of the machine through the cable's interior.

Connectors

The 3300 XL probe, extension cable, and Proximitor sensor have corrosion-resistant, gold-plated ClickLoc* connectors. These connectors require only finger-tight torque (the connectors will "click" when tight), and the specially-engineered locking mechanism prevents the connectors from loosening. These connectors require no special tools for installation or removal.

You can order the 3300 XL 8 mm probes and extension cables with connector protectors already installed. We can also supply connector protectors separately for field installations (such as when an application must run the cable through restrictive conduit). We recommend connector protectors for all installations to provide increased environmental protection[8].

Extended Temperature Range Applications

An extended temperature range (ETR) probe and ETR extension cable are available for applications in which either the probe lead or extension cable may exceed the standard 177 °C (350 °F) temperature specification. The ETR probe has an extended temperature rating for up to 218 °C (425 °F). The ETR extension cable rating is up to 260 °C (500 °F). Both the ETR probe and cable are compatible with standard temperature probes and cables, for example, you can utilize an ETR probe with the 330130 extension cable. The ETR system uses the standard 3300 XL Proximitor Sensor. Note that when you use any ETR component as part of your system, the ETR component limits the system accuracy to the accuracy of the ETR system.

Description Notes:

1. One-metre systems do not use an extension cable.
2. Proximitor sensors are supplied by default from the factory calibrated to AISI 4140 steel. Calibration to other target materials is available upon request.
3. Consult Bently Nevada* Applications Note, *Considerations when using Eddy Current Proximity Probes for Overspeed Protection Applications*, when considering this transducer system for tachometer or overspeed measurements.
4. 3300 XL 8 mm components are both electrically and physically interchangeable with non-XL 3300 5 mm and 8 mm components. Although the packaging of the 3300 XL Proximitor Sensor differs from its predecessor, its design fits in the same 4-hole mounting pattern when used with the 4-hole mounting base, and will fit within the same mounting space specifications (when minimum permissible cable bend radius is observed).
5. Mixing XL and non-XL 3300-series 5 mm and 8 mm system components limits system performance to the specifications for the non-XL 3300 5 mm and 8 mm Transducer System.
6. The 3300-series 5 mm probe (refer to Specifications and Ordering Information p/n 141605-01) uses smaller physical packaging, but does not reduce the side view clearances or tip-to-tip spacing requirements as compared to an 8 mm probe. It is used when physical (not electrical) constraints preclude the use of an 8 mm probe. When your application requires narrow side view probes, use the 3300 NSv* Proximity Transducer System (refer to Specifications and Ordering Information p/n 147385-01).
7. 8 mm probes provide a thicker encapsulation of the probe coil in the molded PPS plastic probe tip. This results in a more rugged probe. The larger diameter of the probe body also provides a stronger, more robust case. We recommend that you use 8 mm probes when possible to provide optimal robustness against physical abuse.
8. Each 3300 XL extension cable includes silicone tape that you can use instead of connector protectors. We do not recommend silicone tape for applications that will expose the probe-to-extension cable connection to turbine oil.

Specifications

Unless otherwise noted, the following specifications are for a 3300 XL 8 mm Proximitor Sensor, extension cable and 8 mm probe between +18 °C and +27 °C (+64 °F to +80 °F), with a -24 Vdc power supply, a 10 kΩ load, an AISI 4140 steel target, and a probe gapped at 1.27 mm (50 mils). Performance characteristics apply to systems that consist solely of 3300 XL 8 mm components. The system accuracy and interchangeability specifications do not apply to transducer systems that are calibrated to any target other than our AISI 4140 steel target.

Electrical

Proximitor Sensor Input

Accepts one non-contacting 3300-series 5 mm, 3300 8 mm **or** 3300 XL 8 mm Proximity Probe and Extension Cable.

Power

Requires -17.5 Vdc to -26 Vdc without barriers at 12 mA maximum consumption, -23 Vdc to -26 Vdc with barriers. Operation at a more positive voltage than -23.5 Vdc can result in reduced linear range.

Supply Sensitivity

Less than 2 mV change in output voltage per volt change in input voltage.

Output Resistance

50 Ω

Nominal Probe DC Resistance

Resistance (R_{PROBE}) from Center Conductor to Outer Conductor

Probe Length	R_{PROBE} (Ω)
0.5	7.45 ± 0.50
1.0	7.59 ± 0.50
1.5	7.73 ± 0.50
2.0	7.88 ± 0.50
3.0	8.17 ± 0.60
5.0	8.73 ± 0.70
9.0	9.87 ± 0.90

Nominal Extension Cable DC Resistance

Resistance (R_{CORE}) from Center Conductor to Center Conductor

Length of Extension Cable (m)	R_{CORE} (Ω)
3.0	0.66 ± 0.10
3.5	0.77 ± 0.12
4.0	0.88 ± 0.13
4.5	0.99 ± 0.15
6.0	1.32 ± 0.21
7.0	1.54 ± 0.23
7.5	1.65 ± 0.25
8.0	1.76 ± 0.26
8.5	1.87 ± 0.28

Resistance (R_{JACKET}) from Outer Conductor to Outer Conductor

Length of Extension Cable (m)	R_{JACKET} (Ω)
3.0	0.20 ± 0.04
3.5	0.23 ± 0.05
4.0	0.26 ± 0.05
4.5	0.30 ± 0.06
6.0	0.39 ± 0.08
7.0	0.46 ± 0.09
7.5	0.49 ± 0.10
8.0	0.53 ± 0.11
8.5	0.56 ± 0.11

Extension Cable Capacitance

69.9 pF/m (21.3 pF/ft) typical

Field Wiring

0.2 to 1.5 mm^2 (16 to 24 AWG) . Recommend using 3-conductor shielded triad cable and tinned field wiring. Maximum length of 305 metres (1,000 feet) between the 3300 XL Proximitor Sensor and the monitor. See the frequency response graphs in through Figure 13 (pages 27 and 28) for signal rolloff at high frequencies when using longer field wiring lengths.

Linear Range

2 mm (80 mils). Linear range begins at approximately 0.25 mm (10 mils) from target and is from 0.25 to 2.3 mm (10 to 90 mils) (approximately –1 to –17 Vdc).

Recommended Gap Setting for Radial Vibration

-9Vdc [approximately 1.27 mm (50 mils)]

Incremental Scale Factor (ISF)

Standard 5- or 1- metre System:

7.87 V/mm (200 mV/mil) ± 5% including interchangeability error when measured in increments of 0.25 mm (10 mils) over the 80 mil linear range from 0 °C to +45 °C (+32 °F to +113 °F).

Standard 9-metre System:

7.87 V/mm (200 mV/mil) ± 6.5% including interchangeability error when measured in increments of 0.25 mm (10 mils) over the 80 mil linear range from 0 °C to +45 °C (+32 °F to +113 °F).

Extended Temperature Range (ETR) for 5- and 9-Metre Systems:

7.87 V/mm (200 mV/mil) ± 6.5% including interchangeability error when measured in increments of 0.25 mm (10 mils) over the 80 mil linear range from 0 °C to +45 °C (+32 °F to +113 °F).

Deviation from best fit straight line (DSL)

Standard 5- or 1-metre System:

Less than ±0.025 mm (±1 mil) with components at 0 °C to +45 °C (+32 °F to +113 °F).

Standard 9-metre System:

Less than ±0.038 mm (±1.5 mil) with components at 0 °C to +45 °C (+32 °F to +113 °F).

Extended Temperature Range 5 and 9-metre Systems:

Less than ±0.038 mm (±1.5 mil) with components at 0 °C to +45 °C (+32 °F to +113 °F).

Performance over Extended Temperatures

Standard 5- or 1-metre System:

Over a probe temperature range of –35 °C to +120 °C (-31 °F to +248 °F) with the Proximitor sensor and extension cable between 0 °C to +45°C (+32 °F to +113 °F), the ISF remains within ±10% of 7.87 V/mm (200 mV/mil) and the DSL remains within ±0.076 mm (±3 mils).

Over a Proximitor sensor and extension cable temperature range of –35 °C to +65 °C (-31 °F to +149 °F) with the probe between 0 °C to +45 °C (+32 °F to +113 °F), the ISF remains within ±10% of 7.87 V/mm (200 mV/mil) and the DSL remains within ±0.076 mm (±3 mils).

Standard 9-metre System:

Over a probe temperature range of –35 °C to +120 °C (-31 °F to +248 °F) with the Proximitor sensor and extension cable between 0 °C to +45°C (+32 °F to +113 °F), the ISF remains within ±18% of 7.87 V/mm (200 mV/mil) and the DSL remains within ±0.152 mm (±6 mils).

Over a Proximitor sensor and extension cable temperature range of –35 °C to +65 °C (-31 °F to +149 °F) with the probe between 0 °C to +45 °C (+32 °F to +113 °F), the ISF remains within ±18% of 7.87 V/mm (200 mV/mil) and the DSL remains within ±0.152 mm (±6 mils).

Extended Temperature Range 5 and 9-metre Systems:

Over a probe and extension cable temperature range of –35 °C to +260 °C (-31 °F to +500 °F) with the Proximitor sensor between 0 °C to +45 °C (+32 °F to +113 °F), the ISF remains within ±18% of 7.87 V/mm (200 mV/mil) and the DSL remains within ±0.152 mm (±6 mils).

Frequency Response

(0 to 10 kHz), +0, -3 dB, with up to 305 metres (1000 feet) of field wiring.

Minimum Target Size

15.2 mm (0.6 in) diameter (flat target)

Shaft Diameter

Minimum:

50.8 mm (2 in)

Recommended Minimum:

76.2 mm (3 in)

When gapped at the center of the linear range, the interaction between two separate transducer systems (cross-talk) will be less than 50 mV on shaft diameters of at least 50 mm (2 in) or greater. You should take care to maintain minimum separation of transducer tips, generally at least 40 mm (1.6 in) for axial position measurements or 38 mm (1.5 in) for radial vibration measurements to limit cross-talk to 50 mV or less. Radial vibration or position measurements on shaft diameters smaller than 76.2 mm (3 in) will generally change the scale factor.

Effects of 60 Hz Magnetic Fields up to 300 Gauss

Output Voltage in Mil pp/Gauss

Gap (mil)	5- or 1-metre Proximitor Sensor	9-metre Proximitor Sensor	Probe	Ext. Cable
10	0.0119	0.0247	0.0004	0.0004
50	0.0131	0.0323	0.0014	0.0014
90	0.0133	0.0348	0.0045	0.0045

Compliance and Certifications

EMC

European Community Directives:
EMC Directive 2004/108/EC
Standards:
EN61000-6-2
EN61000-6-4

Maritime

ABS 2009 Steel Vessels Rules
1-1-4/7.7, 4-8-3/1.11.1, 4-9-7/13

Hazardous Area Approvals

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

CSA/NRTL/C

3300 XL Proximitor Sensor and probe, ia:

Ex ia IIC T4/T5; Class I Zone 0 or Class 1; Groups A, B, C, and D, Class II, Groups E, F and G, Class III when installed with intrinsically safe zener barriers per drawing 141092 or when installed with galvanic isolators.

3300 XL Proximitor Sensor and probe, nA:

Ex nA IIC T4/T5 Class I Zone 2 or Class I, Division 2, Groups A, B, C, and D, when installed without barriers per drawing 140979.
T5 @ Ta= -35 °C to +85 °C.
T4 @ Ta= -51 °C to +100 °C.

ATEX/IECEx

3300 XL Proximitor Sensor

ia:

Ⓔx II 1 G
Ex ia IIC T4/T5 Ga
T5 @ Ta= -35 °C to +85 °C
T4 @ Ta= -51 °C to +100 °C

Ui= -28V Ci = 0
Ii= 140mA Li =10µH
Pi= 0.91W

nA:

Ⓔx II 3 G
Ex nA IIC T4/T5 Gc
T5 @ Ta= -35 °C to +85 °C
T4 @ Ta= -51 °C to +100 °C

3300 XL 8mm probe

Note: Probe entity parameters are met when used with BN extension cables and connected to BN Prox.

ia:

Ⓔx II 1 G
Ex ia IIC T1...T5 Ga, (see Table 1: Temperature Schedule)

Ui = -28V Ci = 1.5 nF
Ii = 140 mA Li = 210 µH
Pi = 0.91 W

nA:

Ⓔx II 3 G
Ex nA IIC T1...T5 Gc, (see Table 1: Temperature Schedule).

Ui = -28V

Table 1: Temperature Schedule

Temperature Classification	Ambient Temperature (Probe Only)
T1	-51ºC to +232ºC
T2	-51ºC to +177ºC
T3	-51ºC to +120ºC
T4	-51ºC to +80ºC
T5	-51ºC to +40ºC

Hazardous Area Conditions of Safe Use:

CSA/NRTL/C:

ia:

Install per Bently Nevada drawing 141092.

nA:

Install per Bently Nevada drawing 140979.

ATEX/IECEx:

ia:

The Prox must be installed so as to minimize the risk of impact or friction with other metallic surfaces.

nA:

The Prox must be installed so as to provide the terminals with a degree of protection of at least IP54.

Mechanical

Probe Tip Material

Polyphenylene sulfide (PPS).

Probe Case Material

AISI 303 or 304 stainless steel (SST).

Probe Cable Specifications

Standard cable:

75Ω triaxial, fluoroethylene propylene (FEP) insulated probe cable in the following total probe lengths: 0.5, 1, 1.5, 2, 3, 5, or 9 metres.

Extended Temperature Range cable:

75Ω triaxial, perfluoroalkoxy (PFA) insulated probe cable in the following total probe lengths: 0.5, 1, 1.5, 2, 5, or 9 metres.

Armor (optional on both):

Flexible AISI 302 or 304 SST with FEP outer jacket.

Tensile Strength (Maximum Rated):

330 N (75 lbf) probe case to probe lead.

270 N (60 lbf) at probe lead to extension cable connectors.

Connector Material:

Gold-plated brass or gold-plated beryllium copper.

Probe Case Torque:

Probe Type	Maximum Rated	Recommended
Standard forward-mounted probes	33.9 N•m (300 in•lbf)	11.2 N•m (100 in•lbf)
Standard forward-mount probes - first three threads	22.6 N•m (200 in•lbf)	7.5 N•m (66 in•lbf)
Reverse-mount probes	22.6 N•m (200 in•lbf)	7.5 N•m (66 in•lbf)

Connector-to-connector recommended torque:

Connector Type	Tightening Instructions
Two 3300 XL gold "click" type connectors	Finger tight
One non-XL stainless steel connector and one 3300 XL connector	Finger tight plus 1/8 turn using pliers

Extension Cable Material

Standard cable:

75Ω triaxial, fluoroethylene propylene (FEP) insulated.

Extended Temperature Range cable:

75Ω triaxial, perfluoroalkoxy (PFA) insulated.

Minimum Cable Bend Radius:

25.4 mm (1.0 in)

Note: 3300 XL 8 mm components are both electrically and physically interchangeable with non-XL 3300 5 mm and 8 mm components when minimum permissible cable bend radius is observed..

Connector Material:

Gold-plated brass or gold-plated beryllium copper.

Maximum Connector Torque:

0.565 N•m (5 in•lbf)

Proximitor Sensor Material

A308 aluminum

Connector Material:

Gold-plated brass or gold-plated beryllium copper.

System Length

5 or 9 metres (including extension cable) or 1 metre (probe only).

Total System Mass (Typical)

0.7 kg (1.5 lbm)

Probe:

323 g (11.4 oz)

Extension Cable:

34 g/m (0.4 oz/ft)

Armored Extension Cable:

103 g/m (1.5 oz/ft)

Proximitor Sensor:

246 g (8.67 oz)

Environmental Limits

Probe Temperature Range

Operating and Storage Temperature

Standard Probe:

-51 °C to +177 °C (-60 °F to +350 °F)

Extended Temperature Range Probe:

-51 °C to +218 °C (-60 °F to +425°F) for the probe tip; -51 °C to +260 °C (-60 °F to +500 °F) for the probe cable and connector.

Note: Exposing the probe to temperatures below –34 °C (-30 °F) may cause premature failure of the pressure seal.

Probe Pressure

3300 XL 8 mm probes are designed to seal differential pressure between the probe tip and case. The probe sealing material consists of a Viton® O-ring. Probes are not pressure tested prior to shipment. Contact our custom design department if you require a test of the pressure seal for your application.

Note: It is the responsibility of the customer or user to ensure that all liquids and gases are contained and safely controlled should leakage occur from a proximity probe. In addition, solutions with high or low pH values may erode the tip assembly of the probe causing media leakage into surrounding areas. Bently Nevada, Inc. will not be held responsible for any damages resulting from leaking 3300 XL 8 mm proximity probes. In addition, 3300 XL 8 mm proximity probes will not be replaced under the service plan due to probe leakage.

Extension Cable Temperature Range

Operating and Storage Temperature

Standard Cable:

-51 °C to +177 °C (-60 °F to +350 °F)

Extended Temperature Range Cable:

-51 °C to +260 °C (-60 °F to +500 °F)

Proximitor Sensor Temperature Range

Operating Temperature

-51 °C to +100 °C (-60 °F to +212 °F)

Storage Temperature

-51 °C to +105 °C (-60 °F to +221 °F)

Relative Humidity

Less than a 3% change in Average Scale Factor (ASF) when tested in 93% humidity in accordance with IEC standard 68-2-3 for up to 56 days.

Patents

Components or procedures described in one or more of the following patents apply to this product: 5,016,343; 5,126,664; 5,351,588; and 5,685,884.