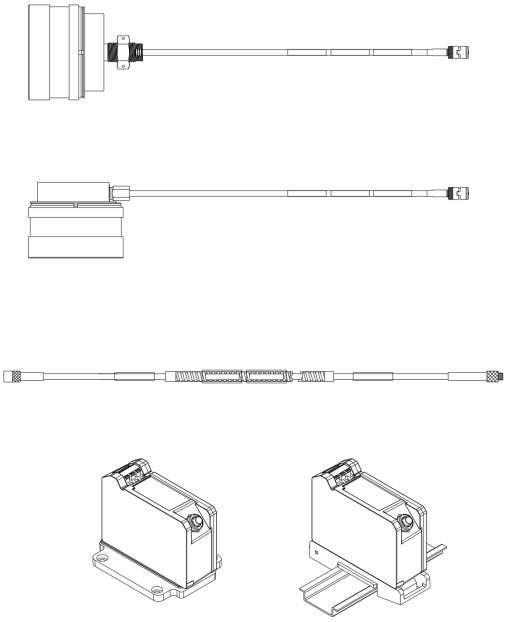
3300 XL 50 mm Proximity Transducer System

Datasheet

Cordant™

174014 Rev. L



Description

The 3300 XL 50 mm Transducer System consists of a separate 50 mm probe, an extension cable, and a 3300 XL 50 mm Proximitor Sensor. The large diameter coil gives this system a maximum linear range of 27.9 mm (1100 mils), the longest linear range of our eddy current transducer line. This linear range makes the 3300 XL 50 mm Transducer System ideal for measuring the differential expansion (DE) or rotor expansion (RX) of large steam turbine generators that results from the difference in growth rates between the turbine rotor and the machine stator (casing).

Measuring Differential Expansion

The Differential Expansion measurement is made by using two proximity transducers that observe a collar or ramp some distance from the thrust bearing. Typical transducer mounting arrangements that require the 3300 XL 50 mm Transducer's long linear range include:

- Two transducers observing the same side of a collar.
- Two complementary input transducers observing opposite sides of a collar, effectively doubling the measurable DE range.

The criteria for selecting a mounting method are the size of the available target, the expected amount of rotor axial movement, and the type of DE target that exists in the machine. If the collar height is sufficient and the required total measurement range is less than 27.9 mm 1.1 inches, the preferred configuration for redundant measurements is to use two transducers observing the same side of a collar. When 28 mm to 56 mm (1.1 to 2.2 inches) of total range are required, install the transducers in a complementary fashion

Baker Hughes

on opposite sides of the differential expansion collar or other target material.

System Compatibility

The 3300 XL 50 mm probe comes in three case & thread configurations to physically replace all standard 7200 50 mm systems (including side and rear exit probes). The standard 7200 style mounting brackets are still available as accessories. In addition, a new bracket to adapt the probe to the 50 mm DE Integral transducer sliding mount base is also available. The Proximitor Sensor has a 0.394 V/mm (10 mV/mil) output that is identical to that of the 7200 and 50 mm DE Integral systems, which allows customers to upgrade without requiring any changes in the monitor configuration. When upgrading from previous systems, every transducer system component (probe, extension cable, and Proximitor Sensor) must be replaced with 3300 XL 50 mm components.

Proximity Probe and Extension Cable

The 3300 XL 50 mm probe is designed to survive the harshest steam turbine DE environments. It can continually operate and maintain its accuracy in high temperatures up to 200°C (392°F), and can withstand intermittent high temperatures up to 250°C (482°F). The 50 mm probe has both a front and rear seal which, combined with the High Temperature FluidLoc cable (standard on all 50 mm probes), prevent moisture from entering the probe tip. Special high-temperature ClickLoc connectors are also standard on the probe and extension cable. Each probe and cable comes with connector protectors and a disposable connector protector installation tool to ensure that the connectors remain free of contamination. The ClickLoc connector on the probe lead features a removable collar that facilitates routing the cable through tight clearances.

The 3300 XL 50 mm probe is available in straight exit case styles with ½-20 English threads or M14x1.5 metric threads, including a locknut with predrilled safety wire holes. The side exit probe has two ¼-20 mounting holes in the rear of the probe case. For both straight exit and side exit probes the overall case diameter is 1.99 inches.

Proximitor Sensor

The 3300 XL 50 mm Proximitor Sensor has the same advanced features as all 3300 XL Proximitor Sensors. Its thin design allows it to be mounted in either a high-density DIN-rail installation or a more traditional panel mount configuration. Improved RFI/EMI immunity allows the 3300 XL Proximitor Sensor to achieve European CE mark approvals without any special mounting considerations. This RFI immunity prevents the transducer system from being adversely affected by nearby high frequency radio signals. SpringLoc terminal strips on the Proximitor Sensor require no special installation tools and facilitate faster, highly robust field wiring connections.

> Proximitor Sensors are supplied by default from the factory calibrated to AISI 4140 steel. Calibration to other target materials is available upon request.

Mounting Accessories

The correct operation of the transducer system must be initially verified during installation and periodically thereafter. This is done by physically moving the transducer to simulate the motion of the shaft collar. This requires a mounting bracket that allows the transducer system to slide relative to the shaft rotor and collar.

An optional Sliding Bracket can be ordered for the 50 mm Transducer for both single transducer and complementary input applications. This mounting bracket allows you to verify the transducer system and gap the probes by sliding the transducer system through its linear range. The base plate of the sliding bracket is installed on the inner surface of the turbine case near the differential expansion collar. Probes are installed in the probe clamp that attaches to the sliding

carriage. The sliding carriage slides onto and is secured to the base plate with bolts and safety wire. To verify and install the transducer, loosen the bolts securing the sliding carriage to the base plate and move the sliding carriage and probes. A verification kit with spindle micrometer can be temporarily secured to the base plate to provide a reference for axial verification measurements. The spindle micrometer measures the movement of the transducer system relative to the collar during these verification tests.

Specifications

Unless otherwise noted, the following specifications are for a 3300 XL 50 mm Proximitor Sensor, extension cable and probe between 0°C and +45°C (+32°F to +113°F) at a maximum altitude of 2000 meters, with a -24 Vdc power supply, a 10 kΩ load, a Bently Nevada supplied AISI 4140 steel target that is 102 mm (4.0 in) diameter or larger. The system accuracy and interchangeability specifications do not apply when using a transducer system calibrated to any target other than a Bently Nevada AISI 4140 steel target.

Electrical

Proximitor Sensor Input	Accepts one non-contacting 3300 XL 50 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.
Output resistance	50 Ω
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 three-conductor shielded triad cable.
Linear Range	27.9 mm (1100 mils). Linear range begins at approximately 1.3 mm (50 mils) from target and is from 1.3 to 29.2 mm (50 to 1150 mils) (approximately –1.5 to –12.5 Vdc).
Average Scale Factor (ASF)	394 mV/mm (10 mV/mil) nominal
Deviation from best fit straight line (DSL)	Less than ±0.74 mm (±29 mils)
System performance over extended temperatures	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 DSL remains within ±2.03 mm (±80 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 DSL remains within ±2.03 mm (±80 mils).
Recommended Minimum Target Size	102 mm (4.0 in) diameter (flat target)

<table>
<tr><td>Probe DC Resistance</td><td>
<table>
<tr><th>Probe Length</th><th>Resistance from Center to Coaxial Conductor</th></tr>
<tr><td>1.0 m</td><td>6.4 ± 0.5 Ω</td></tr>
<tr><td>5.0 m</td><td>7.6 ± 0.8 Ω</td></tr>
<tr><td>9.0 m</td><td>8.9 ± 1.1 Ω</td></tr>
</table>
</td></tr>
<tr><td>Cable DC Resistance</td><td>
<table>
<tr><th>Cable Length</th><th>Resistance from Center to Coaxial Conductor</th><th>Resistance from Coaxial to Coaxial Conductor</th></tr>
<tr><td>4.0 m</td><td>1.0 ± 0.25 Ω</td><td>0.3 ± 0.1 Ω</td></tr>
<tr><td>8.0 m</td><td>2.0 ± 0.5 Ω</td><td>0.6 ± 0.2 Ω</td></tr>
</table>
</td></tr>
<tr><td>Electrical Classification</td><td>Complies with the European CE mark.</td></tr>
</table>

Mechanical

Probe Tip Material	Polyphenylene Sulfide (PPS).
Probe Case Material	AISI 304 stainless steel (SST).
Probe Cable Specifications	75 Ω triaxial, perfluoroalkoxyethylene (PFA) insulated FluidLoc probe cable in the following total probe lengths: 1, 5 or 9 meters.
Extension Cable Material	75 Ω triaxial, perfluoroalkoxyethylene (PFA) insulated FluidLoccable.
Proximitor Sensor Material	A380 aluminum
Sliding Bracket Material	Anodized aluminum and stainless steel
System Length	5 or 9 meters including extension cable
Probe and Extension Cable Armor (optional)	Flexible SST with PFA outer jacket.
Tensile Strength (maximum rated)	330 N (75 pounds) probe case to probe lead. 270 N (60 pounds) at probe lead to extension cable connectors.
Connector material	Gold-plated brass and gold-plated beryllium copper
Torque Specifications	
Description	Maximum Rated
All threaded probe cases	45 N•m (400 in•lbf)
M5x.8 sliding bracket cap screws	9.6 N•m (85 in•lbf)
Connector-to-connector Torque	
Recommended torque	Finger tight
Maximum torque	0.565 N•m (5 in•lb)
Minimum Bend Radius (with or without SST Armor)	25.4 mm (1.0 in)

Thread Engagement Limits

Probe Case Thread	Maximum Length of Thread Engagement
1/2-20	0.750 in
M14x1.5	21 mm

Maximum thread engagement lengths are per the industry standard of 1.5 times the nominal thread diameter. A fit class matching that of the external probe thread is assumed for all internal threads. Applications with thread engagement lengths exceeding the values in the table above may exhibit binding during installation. Contact your Bently Nevada representative if you require probe thread engagement lengths exceeding the values above. Bently Nevada does not replace proximity probes under warranty due to excessive thread engagement lengths.

Environmental Limits

Probe Temperature Range	
Operating and Storage Temperature	-35°C to +200°C (-31°F to +392°F)
Short-term Operating and Storage Temperature	+250°C (+482°F) for less than 24 hours.
Extension Cable Temperature Range	
Operating and Storage Temperature	**--51°C to +200°C (-31°F to +392°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)
Sliding Bracket Temperature Range	
Operating and Storage Temperature	-35°C to +200°C (-31°F to +392°F)
Relative Humidity	Less than a 3% change in Average Scale Factor (ASF) when tested in accordance with IEC standard 68-2-66.

3300 XL probes are designed to seal differential pressure between the probe tip and case. The probe is sealed with Viton O-rings. 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.

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 does not be held responsible for any damages resulting from leaking 3300 XL proximity probes. In addition, 3300 XL proximity probes does not be replaced under the service plan due to probe leakage.

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

RoHS

European Community Directive:

RoHS Directive 2011/65/EU

China RoHS

Cables associated with the product(s) mentioned in this datasheet have an EFUP designation of 15 years, in accordance with SJ/T 11364-2024.



Maritime

2019 Rules for Conditions of Classification,

Part 1, 1-1-1/7.7, 1-1-A3, 1-1-A4

2019 Rules for Conditions of Classification,

Part 1, Offshore Units and Structures

1-1-4/9.7, 1-1-A2, 1-1-A3

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

3300 XL Proximitor Sensor

ia When installed with intrinsically safe zener barriers per drawing 141092 or when installed with galvanic isolators.	Class I, Zone 0: AEx/Ex ia IIC T4/T5 Ga; Class I, Groups A, B, C, and D, Class II, Groups E, F and G, Class III; T5 @ Ta= -55°C to + 40°C. T4 @ Ta= -55°C to + 80°C.
nA, ec When installed with non-incendive circuit connected per drawing 140979.	Class I, Zone 2: AEx/Ex nA IIC T4/T5 Gc; Class I, Division 2, Groups A, B, C, and D; Class I, Zone 2: AEx/Ex ec IIC T4/T5 Gc; Class I, Division 2, Groups A, B, C, and D; T5 @ Ta= -55°C to + 40°C T4 @ Ta= -55°C to + 80°C

3300 XL Probe

ia When installed with intrinsically safe zener barriers per drawing 141092 or when installed with galvanic isolators.	Class I, Zone 0: AEx/Ex ia IIC T5...T1 Ga; Class 1, Groups A, B. C, and D, Class II, Groups E, F, and G, Class III; (see Temperature Schedule table to follow)
nA, ec When installed with non-incendive circuit connected per drawing 140979.	Class I, Zone 2: AEx/Ex nA IIC T5...T1 Gc; Class 1, Division 2, Groups A, B, C, D; Class 1, Zone 2: AEx/Ex ec IIC T5...T1 Gc; Class I, Division 2, Groups A, B, C, and D; (see Temperature Schedule table to follow)

ATEX/IECEx

3300 XL Proximitor Sensor

ia	II 1 G Ex ia IIC T4/T5 Ga Ex ia IIIC T90C/T105C Dc For EPL Dc: T105C @ Ta = -55°C to 100°C T90C @ Ta = -55°C to +85°C Ui= -28V / Uo= -28V Ii= 140mA / Io= 140mA Pi= 0.91W / Po= 0.742W Ci- 47nF / Co= 1.5nF Li= 1460µH / Lo= 610µH
nA,ec	II 3 G Ex nA IIC T4/T5 Gc Ex ec IIC T4/T5 Gc Ui= -28V / Ii= 140 mA T5 @ Ta= -55˚C to + 40˚C T4 @ Ta= -55 ˚C to + 80˚C

3300 XL Probe

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

<table>
<tr><td>ia</td><td>II 1 G
Ex ia IIC T5...T1 Ga,
(see Temperature Schedule table to follow)
Ex ia IIIC T90°C ... T280°C Dc
For EPL Dc:<table><tr><td>Ui= -28V</td><td>Ci = 1.5 nF</td></tr><tr><td>Ii = 140 mA</td><td>Li =610 µH</td></tr><tr><td>Pi = 0.91 W</td><td></td></tr></table></td></tr>
<tr><td>nA,ec</td><td>II 3 G
Ex nA IIC T5...T1 Gc,
Ex ec IIC T5...T1 Gc,
(see Temperature Schedule table to follow)<table><tr><td>Ui= -28V</td><td>Ii= 140 mA</td></tr></table></td></tr>
</table>

Temperature Schedule

Temperature Classification	Ambient Temperature (Probe Only)
For EPL Ga and Gc	
T1	-55°C to +232°C
T2	-55°C to +177°C
T3	-55°C to +120°C
T4	-55°C to +80°C
T5	-55°C to +40°C
For EPL Dc	
T280°C @ Ta	-55°C to +232°C
T225°C @ Ta	-55°C to +177°C
T170°C @ Ta	-55C to +120°C
T130°C @ Ta	-55°C to +80°C
T105°C @ Ta	-55°C to +100°C
T90°C @ Ta	-55°C to +40°C

Hazardous Area Conditions of Safe Use

cNRTLus:

ia

Install per Bently Nevada drawing 141092.

nA, ec

Install per Bently Nevada drawing 140979.

ATEX/IECEx:

ia

Install per Bently Nevada drawing 141092.

nA, ec

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

Ordering Information

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.

3300 XL 50 mm Proximity Probe

330876-AA-BB-CC-DD

A: Probe Case Type Option	
0 1	½-20 Thread
0 2	M14x1.5 Thread
0 3	Smooth 1.99 in dia - Side Exit
B: Total Length Option	
1 0	1.0 meter (3.3 feet)
5 0	5.0 meters (16.4 feet)
9 0	9.0 meters (29.5 feet) Five meter probes are designed for use with the five meter Proximitor Sensor only.
C: ArmorOption	
0 0	High Temperature FluidLoc Cable
0 1	High Temperature FluidLoc Cable with Armor
D: Agency Approval Option	
0 0	No Approvals
0 5	Multiple Approvals

3300 XL 50 mm Proximitor Sensor

330878-AA-BB

A: Total Length and Mounting Option	
5 0	5.0 meters (16.4 feet) system length, panel mount
5 1	5.0 meters (16.4 feet) system length, DIN mount
9 0	9.0 meters (29.5 feet) system length, panel mount
9 1	9.0 meters (29.5 feet) system length, DIN mount
B: Agency Approval Option	
0 0	No Approvals
0 5	Multiple Approvals

3300 XL 50 mm Extension Cable

330877-AAA-BB-CC

Make sure that the extension cable length and the probe length, when added together, equal the Proximitor Sensor total length.

A: Cable Length Option	
0 4 0	4.0 meters (13.1 feet)
0 8 0	8.0 meters (26.2 feet)
B: Armor and Cable Option	
3 6	FluidLoc cable
3 7	FluidLoc ext. cable w/ armor
C: Agency Approval Option	
0 0	No Approvals
0 5	Multiple Approvals

Mounting Brackets

Each Sliding Mounting Bracket comes with:

- One sliding plate
- One base plate
- Sliding plate securing bolts with safety wire holes
- Lock washers

The material used for the mounting brackets is T6061-T6 aluminum. Base plate securing bolts are not provided; recommended bolt size is 3/8in or M8 socket head bolts.

3300 XL 50 mm Sliding Probe Bracket and Clamp

330879-AA-BB

A: Probe Clamp Style	
0 1	Left Exit
0 2	Right Exit
0 3	Two clamps (used for CIDE applications)[1]
B: DE Mounting Bracket	
0 0	No Mounting Bracket; Clamp Only (4)
0 1	Single DE Mounting Bracket (2)
0 2	Short CIDE Mounting Bracket (3)
0 3	Long CIDE Mounting Bracket (3)

This bracket is recommended for most installations. While any probe may be used, the smooth side exit probe is most often used with this bracket.

(1) When ordering two clamps, one right exit and one left exit clamp will be provided so that the cables exit from the same side of the CIDE bracket.

(2) The B01 probe mounting bracket option is only available with the A01 or A02 probe clamp style options.

(3) The B02 and B03 probe mounting bracket options are only available with the A03 probe clamp style options.

(4) When replacing 50 mm DE 130713, part number 330879-AA-00 should be ordered. Ordering with BB=00 will prevent unnecessary parts from being ordered with the clamp.

Sliding Mounting Brackets without clamps

131071-01	Single Transducer Mounting Bracket
131030-01	Short Complementary Input Differential Expansion (CIDE) Mounting Bracket
131031-01	Long Complementary Input Differential Expansion (CIDE) Mounting Bracket

Non-sliding Mounting Brackets

167285	Kit, 50 mm Clamp Mount (used with smooth-case side exit or threaded straight exit probes).
167286	Kit, 50 mm Bolt Mount (used only with smooth-case side exit probes).

Verification Kits

Each verification kit comes with:

- a verification kit bracket
- a spindle micrometer with either a 0 to 2 in. or 0 to 50 mm range
- two set screws
- a bracket securing bolt

The material used for the verification kit bracket is T6061-T6 aluminum.

131036-01	Verification Kit, Spindle Micrometer with English Units
131036-02	Verification Kit, Spindle Micrometer with Metric Units

Accessories

173959	3300 XL 50mm User Guide
148722-01	

Extended Range Micrometer Kit

The extended range micrometer kit contains a precision micrometer and a 100 mm (4 inch) AISI 4140 target and is intended for acceptance testing of Bently Nevada extended range transducers. Bracket options are available to hold 8mm – 50mm probes as well as the 50 mm Integral DE transducer.

330187-AA-BB

A: Probe options	
0 1	8 mm to 50 mm probe threaded or smooth cases

B: Micrometer Option	
0 1	Standard English 0-2 inch micrometer
0 2	Standard metric 0-50 mm micrometer

Spares

02120015	Bulk field wire. 1.0 mm^2 (18 AWG), 3 conductor, twisted, shielded cable with drain wire. Specify length in feet.
02173009	Bulk field wire. 1.0 mm^2 (18 AWG), 3 conductor, twisted, shielded cable. Specify length in feet.
138492-01	Replacement panel-mount mounting pad
138493-01	Replacement DIN-mount mounting pad
04310310	3300 XL Proximitor Sensor Panel-mount Screws. Package includes four 6-32 UNC thread forming mounting screws (Supplied standard with 3300 XL Proximitor Housings [3300 XL option]).
03200006	Silicone self-fusing tape. A 9.1 meter (10 yard) roll of silicone tape to protect connectors. It is easy to install and provides excellent electrical isolation and protection from the environment. It is not recommended for use inside the casing of the machine.
40180-02	Connector Protectors. Package contains 10 pairs of connector protectors.
03839410	Male Connector Protector. Placed on the extension cable to connect to the female connector protector on the probe and provide environmental protection of connectors.
03839420	Female Connector Protector. Placed on the probe lead to connect to the male connector protector on the extension cable and provide environmental protection of connectors. Also placed on the extension cable to slide over the Proximitor Sensor connection and protect it from the environment.
330153-10	3300 XL 50 mm Connector Kit. Used on 3300 XL 50 mm probes and extension cables. Contains one male (removable nut) and female ClickLoc connectors, color-coded sleeves and two pieces slit PFA tubing.
163356	Connector Crimp Tool Kit. Includes one set of multi-connector inserts and connector installation instructions. Supplied with carrying case.
173873	High Temperature Cable Zip-Ties. PEEKcable tie is rated for use up to 200 C continuous temperature. Available in bags of 50 zip ties.
174804-01	

Graphs and Figures

Note: All dimensions on figures are in millimeters (inches) unless otherwise specified.

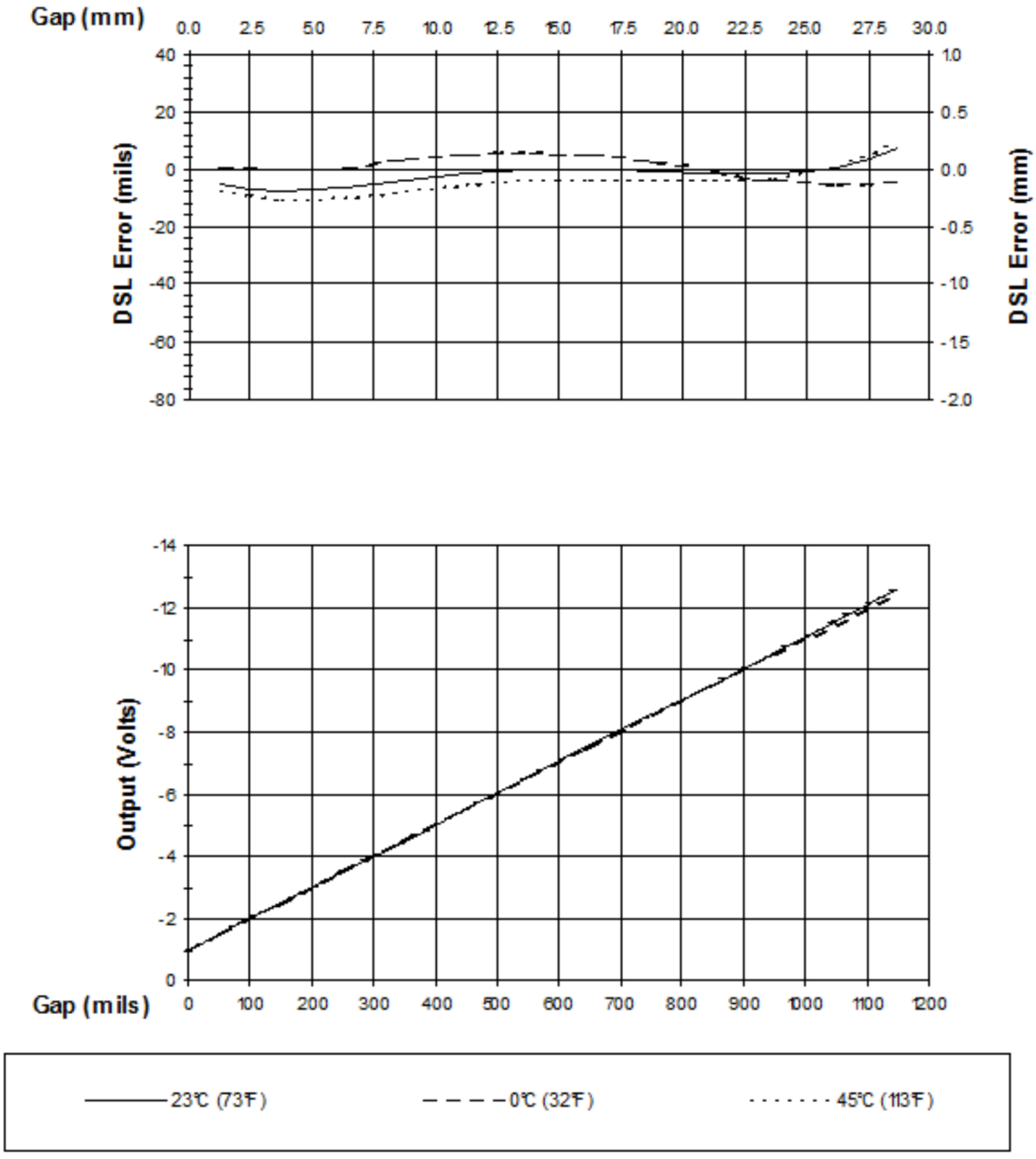


Figure 1: Typical 3300 XL 50 mm 5 m System Over Ambient Testing Range