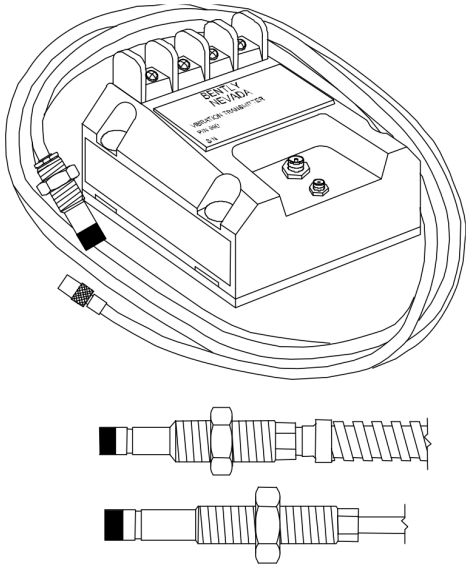
991 Thrust Transmitter

Datasheet

Cordant™

141618 Rev. R



Description

The 991 Thrust Transmitter is intended primarily for the original equipment manufacturers (OEMs) of centrifugal air compressors or small pumps, motors, or fans who prefer to provide a simple 4 to 20 mA proportional axial displacement (thrust) signal as the input to their machinery control system. The transmitter is a 2-wire, loop-powered device that accepts input from our 3300 NSv proximity probe and its matching extension cable (available in 5 m and 7 m system length options). The transmitter conditions the signal into appropriate engineering units proportional to the shaft's axial position[1], and provides it as a 4 to 20 mA industry-standard signal for input to the control system where machinery protection alarming and logic occurs[2].

The 991 transmitter provides the following notable features:

- Integrated Proximitor Sensor requires no external unit
- Non-isolated PROX OUT and COM terminals plus a coaxial connector provide a dynamic vibration and gap voltage signal output for diagnostics[3].
- Non-interacting zero and span potentiometers under the Transmitter label supports loop adjustment.
- Test Input pin allows quick verification of loop signal output, using a variable DC voltage source as the input.
- A Power-up Inhibit circuit eliminates signal errors due to line voltage transients.
- A Not OK/Signal Defeat circuit prevents high outputs or false alarms due to a faulty proximity probe or loose connection.
- Choice of DIN-rail clips or bulkhead mounting screws as standard options simplifies mounting.
- Potted construction for high humidity (up to 100% condensing) environments.
- Compatibility with 3300 NSv proximity probe allows transducer installation in small areas with minimal

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Baker Hughes

clearance, typical of centrifugal air compressors.

Notes:

1. Probe adjustment and range are critical in thrust position measurements. Incorrect probe gap settings may prevent the transmitter from reaching full-scale in either the normal or counter directions (no machinery monitoring). For proper adjustment, follow the instructions in the manual.
2. Thrust transmitters have many limitations when compared to a continuous monitoring system. They are a practical solution in some applications for measuring rotor axial position and are a valuable tool for trending thrust readings. While the transmitter is capable of alarming on thrust position and non-OK checking, monitor functions such as Timed OK channel defeat, Danger Bypass, and Trip Multiply cannot be used. In addition, PLCs attached to the thrust transmitter are not suitable for plant-wide diagnostic systems such as System 1 or Rule Paks.
3. The 991 Vibration Transmitter's PROX OUT coaxial connector provides a non-isolated dynamic transducer signal for machinery diagnostics. You can connect this signal directly to battery-powered or isolated test equipment to diagnose machinery problems. However, since the PROX OUT signal is not isolated from the 4 to 20 mA loop signal, an interface is available (and strongly recommended) for signal isolation. The 990/991 Test Adapter conditions the 990 Transmitter's PROX OUT signal for use with ac-powered test equipment. The adapter also inverts and isolates the 990's transducer signal, making it suitable for equipment such as oscilloscopes and analyzers, and preserving industry-standard conventions for signal polarity. We strongly recommend that you use this test adapter for all applications to maintain isolation between test equipment and the loop signal, and to maintain machinery protection integrity.

Specifications

Unless otherwise noted, the following specifications apply at +22°C (+72°F) using a 3300 NSv Probe and Extension Cable, and an AISI 4140 steel target.

Electrical

Input	Accepts one non-contacting 3300 NSv Proximity Probe and extension cable.
Power	Requires +12 to +35 Vdc input at the transmitter terminal.
4 to 20 mA Signal Output	4 to 20 mAdc over specified full-scale range in 2-wire configuration.
4 to 20 mA Loop Accuracy	Within ±1.5% over specified full scale range (typical). Accuracy is rated from the TEST signal input to the voltage measured across a 250 Ω loop resistance.
Maximum Loop Resistance	1,000 Ω including cable at 35 Vdc.
Current Limiting	23 mA typical.
Zero and Span	Non-interacting external adjustments.
Not OK/Signal Defeat	Signal output will go to less than 3.6 mA within 100 µs after a Not OK condition occurs. Signal output is restored within 0.1 seconds after the Not OK condition is removed.
Proximitor Sensor Output	Compatible with ungrounded, portable test equipment. When using grounded, ac-powered test equipment, use the 122115-01 Test Adapter for signal isolation.
Output Impedance	Prox Out has a 10 kΩ output impedance calibrated for a 10 MΩ load.
Linear Range	0.25 to 1.65 mm (10 to 65 mils) for Prox Out. Suitable for 0.6-0-0.6 mm or 25-0-25 mils current loop linear ranges.
Prox Out Incremental Scale Factor	7.87 mV/µm (200 mV/mil) ±6.5% typical including interchangeability errors when measured in increments of 0.25 mm (10 mils) over the linear range using a flat 30 mm (1.2 inch) target.
Temperature Stability	Incremental scale factor remains within ±10% of 7.87 mV/µm (200 mV/mil) from 0°C to +70°C (+32°F to +158°F).
Minimum target size	9.5 mm (0.375 in) diameter.
Leadwire Length	Proximitor Sensor Output (BNC connector), maximum cable distance is 3 meters (10 feet).
Non-Hazardous, Zone 2 or Div 2 Hazardous area locations	13 km (8 miles) maximum between transmitter and receiving device for signal output.

Environmental Limits

Transmitter Temperature	
Operating Temperature	-35°C to +85°C (-31°F to +185°F)
Storage Temperature	-51°C to +100°C (-60°F to +212°F).
Probe Temperature	
Operating Temperature	-52°C to +177°C (-62°F to +351°F)

Storage Temperature	-52°C to +177°C (-62°F to +351°F)
Relative Humidity	100% condensing, non-submerged, with protection of coaxial connectors.

Mechanical

Transducer Tip Material	Polyphenylene sulfide (PPS).
Transducer Case Material	AISI 303 or 304 Stainless Steel (SST).
Probe Cable	75Ω coaxial, fluoroethylene propylene (FEP) insulated.
Cable Armor (optional)	Flexible AISI 302 SST with optional FEP outer jacket.
Tensile Strength	222 N (50 lbf) probe case to probe lead, maximum.
Transmitter Weight	0.43 kg (0.9 lbm).
Total System Weight	0.82 kg (1.8 lbm) typical.

Thread Engagement Limits

Probe Case Thread	Maximum Length of Thread Engagement
1/4-28	0.375 in
3/8-24	0.563 in
M8x1	12 mm
M10x1	15 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.

When drilling and tapping a mounting hole **for a 1/4-28 probe**, a **#3 or larger tap drill** is recommended.

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.

ATEX

ATEX Directive 2014/34/EU

RoHS

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

ABS 2009 Steel Vessels Rules

1-1-4/7.7,4-8-3/1.11.1,4-9-7/13

India - Battery EPR Marking

GE Oil & Gas India Private Limited

EPR Certificate No.: 1.1595372902047E+20

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, Division 1, Groups A-D, T4
Class I, Division 2, Groups A-D, T4
Class I, Zone 0 AEx ia IIC T4 Ga
Class I, Zone 2 AEx ec IIC T4 Gc
Ex ia IIC T4 Ga
Ex ec IIC T4 Gc
-30°C ≤Ta ≤ +85°C

ATEX/IECEx

II 1 G
Ex ia IIC T4 Ga
T4 @ Ta = -30°C to +85°C

II 3 G
Ex ec IIC T4 Gc
T4 @ Ta= -30°C to + 85°C

Entity Parameters	
Zone 2	
Power Supply: 28 V	
Zone 0/1	
Terminal blocks E1-E2 “Power supply 4-20 mA”	Connector J3 "Probe"
Ui [28 V]	Uo [28 V]
Ii [120 mA]	Io [100 mA]
Pi [0.84 W]	Po [0.84 W]
Ci [20 nF]	Co [1.5 nF]
Li [10 µH]	Lo [610 µH]

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.

991-AA-BB-CC-DD

A: Full-scale Option	
06	0.6-0-0.6 mm
25	25-0-25 mils
B: System Length Option	
50	5.0 meters (16.4 feet)
70	7.0 meters (23.0 feet)
C: Mounting Option	
01	35 mm DIN-rail clips
02	Bulkhead screws
03	DIN clips and screws
D: Agency Approval Option	
00	Not required
01	CSA Division 2
05	CSA Division 2, ATEX Zone 0, ATEX Zone 2 and includes ABS maritime approval

3300 NSv Proximity Probes

Part Number-AA-BB-CC-DD-EE

330901	3300 NSv Probe, 1/4-28 UNF thread, without armor.
330902	3300 NSv Probe, 1/4-28 UNF thread, with armor.
330908	3300 NSv Probe, 3/8-24 UNF thread, without armor.
330909	3300 NSv Probe, 3/8-24 UNF thread, with armor.
A: Unthreaded Length Option	

Unthreaded length must be at least 0.7 in less than the case length.

Order in increments of 0.1 in
Length configurations:
Minimum length: 0 in
Maximum length: 9.2 in
Example: **04** 0.4 in
B: Case Length Option
Order in increments of 0.1 in
Threaded length configurations:
Minimum length: 0.8 in
Maximum length: 9.9 in
Example: **35** 3.5 in
C: Total Length Option

05	0.5 meter (1.67 feet)
10	1.0 meter (3.25 feet)
50	5.0 meters (16.4 feet)
70	7.0 meters (23 feet)
D: Connector Option	
01	Miniature coaxial ClickLoc connector with connector protector, standard cable
02	Miniature coaxial ClickLoc connector, standard cable

11	Miniature coaxial ClickLoc connector with connector protector, FluidLoc cable
12	Miniature coaxial ClickLoc connector attached, FluidLoc cable
E: Agency Approval Option	
00	Not required
05	Multiple Approvals (CSA NRTL/C and BASEEFA/CENELEC, which includes CSA Division 2)

3300 NSv Probes, Metric

Part Number-AA-BB-CC-DD-EE

330903	3300 NSv Probe, M8 x 1 thread, without armor.
330904	3300 NSv Probe, M8 x 1 thread, with armor.
330905	3300 NSv Probe, M10 x 1 thread, without armor.
330910	3300 NSv Probe, M10 x 1 thread, with armor.
A: Unthreaded Length Option	

Unthreaded length must be at least 20 mm less than the case length.

Order in increments of 10 mm
Untreaded length configurations:
Minimum length: 0 mm
Maximum length: 230 mm
Example: **06** 60 mm
B: Case Length Option
Order in increments of 10 mm
Minimum length: 20 mm
Maximum length: 250 mm
Example: **25** 250 mm
C: Total Length Option

05	0.5 meter (1.67 feet)
10	1.0 meter (3.25 feet)
50	5.0 meters (16.4 feet)
70	7.0 meters (23 feet)
D: Connector Option	
01	Miniature coaxial ClickLoc connector with connector protector, standard cable
02	Miniature coaxial ClickLoc connector, standard cable
11	Miniature coaxial ClickLoc connector with connector protector, FluidLoc cable
12	Miniature coaxial ClickLoc connector attached, FluidLoc cable
E: Agency Approval Option	
00	Not required
05	Multiple Approvals (CSA NRTL/C and BASEEFA/CENELEC, which includes CSA Division 2)

3300 NSv Reverse Mount Probe

330906-02-12-CC-DD-EE, 3/8-24 UNF threads

330907-05-30-CC-DD-EE, M10 x 1 UNF threads

C: Total Length Option	
05	0.5 meter (1.67 feet)
10	1.0 meter (3.25 feet)

50	5.0 meters (16.4 feet)
70	7.0 meters (23 feet)
D: Connector Option	
02	Miniature coaxial ClickLoc connector, standard cable
12	Miniature coaxial ClickLoc connector attached, FluidLoc cable
E: Agency Approval Option	
00	Not required
05	Multiple Approvals (CSA NRTL/C and BASEEFA/CENELEC, which includes CSA Division 2)

Extension Cable

330930-AAA-BB-CC

A: Cable Length Option	
040	4.0 meters (13.1 feet)
045	4.5 meters (14.8 feet)
060	6.0 meters (19.7 feet)
065	6.5 meters (21.3 feet)
B: Armor Option	
00	Without stainless steel armor
01	With FEP covered stainless steel armor
02	With stainless steel armor
03	Without stainless steel armor, with connector protector
04	With FEP covered stainless steel armor and connector protector
05	With stainless steel armor and connector protector

C: Agency Approval Option	
00	Not required
05	Multiple Approvals (CSA NRTL/C and BASEEFA/CENELEC (which includes CSA Division 2)

Accessories

122115-01	990/991 Test Adapter. Package includes: 990/991 Test Adapter, 9V battery, Universal ac Adapter, Power Cord (North American), User Guide and Soft Carrying Case. The 990/991 Test Adapter inverts and isolates the PROX OUT signal from the 991 Transmitter so you can connect 991 Transmitters to ac-powered diagnostic equipment. The Adapter modifies the PROX OUT signal so that it matches our Proximitor Sensor signals by performing these functions: • Shifts the phase of the PROX OUT signal by 180° by changing the voltage from positive to negative • Isolates the transmitter from diagnostic equipment so that equipment with different grounds does not affect the transmitter's 4-20 mA loop signal • Reduces noise in the surrounding area from affecting the PROX OUT signal The 990/991 Test Adapter provides the following benefits: • Small size and weight for portable operation • Battery or ac adapter power options • Automatic shutoff circuit that powers down the unit when the battery is low • 2 channels, so that you can display an orbit for XY probe configurations.

990/991 Test Adapter Accessories

123266-01	Coaxial Cable Kit. Includes 4 cables with length of 1.5 meters (5 feet) each.
02211505	Single coaxial cable with length of 1.5 meters (5 feet).

990/991 Test Adapter Spare Parts

01810700	Battery (9 V alkaline).
02270056	AC adapter. Has universal ac input to 9 volts dc output. Input is 108 to 132 Vac with 120 Vac nominal, or 207 to 253 Vac with 240 Vac nominal.
02198937	Power cord (for North American ac power outlet).
123133	User Guide.

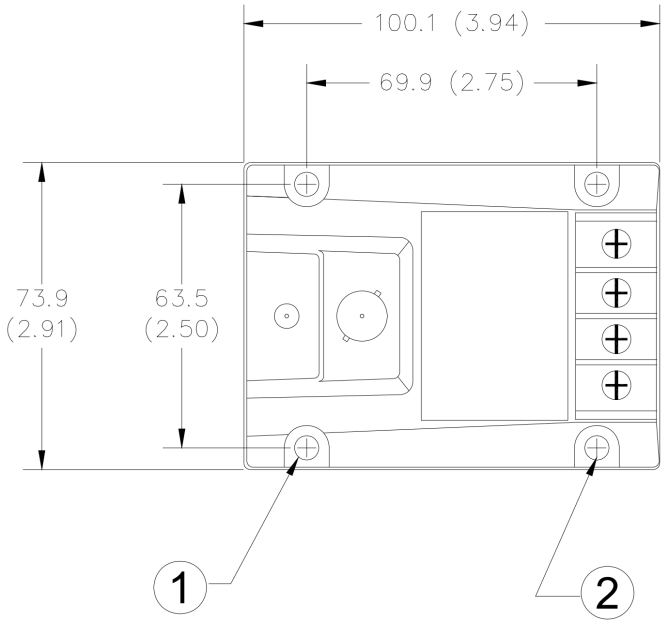
Probe and Transmitter Accessories

02173006	Bulk Cable (specify length in feet). 1.0 mm^2 (18 AWG), 2-conductor, twisted, shielded cable used for the 4 to 20 mA loop. Also used for the PROX OUT signal on the 991 Transmitter's terminal strip.
123655	990 and 991 Transmitter Systems Installation Guide
330153-05	Cable Connector Kit. Package Includes 1 set of 75 Ω miniature male and female connectors, shrink tubing and 3300 Isolator Seal for protection of coaxial connectors.

163356	Connector Crimp Tool Kit. Includes one set of 75 Ω ClickLoc inserts and connector installation instructions. Supplied with carrying case.
330951-01	991 Mounting Screws (spares). Contains 4 screws.
284726	DIN rail mounting kit. Installed on the 990 Transmitter to allow mounting on 35 mm DIN rail

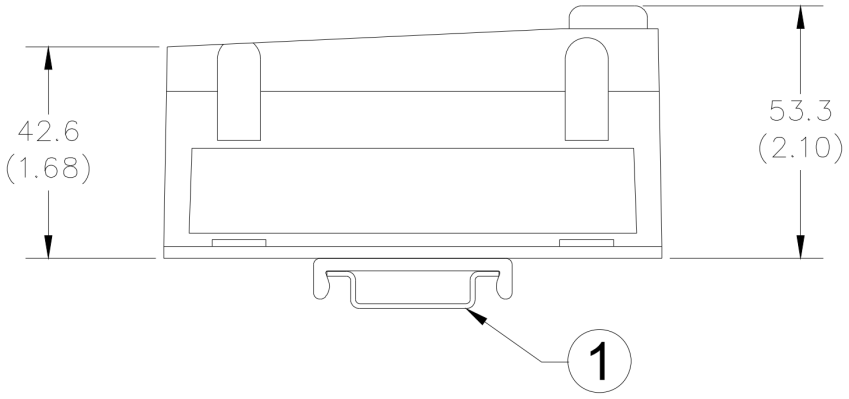
Graphs and Figures

Note: All dimensions shown in millimeters (inches) unless noted otherwise.



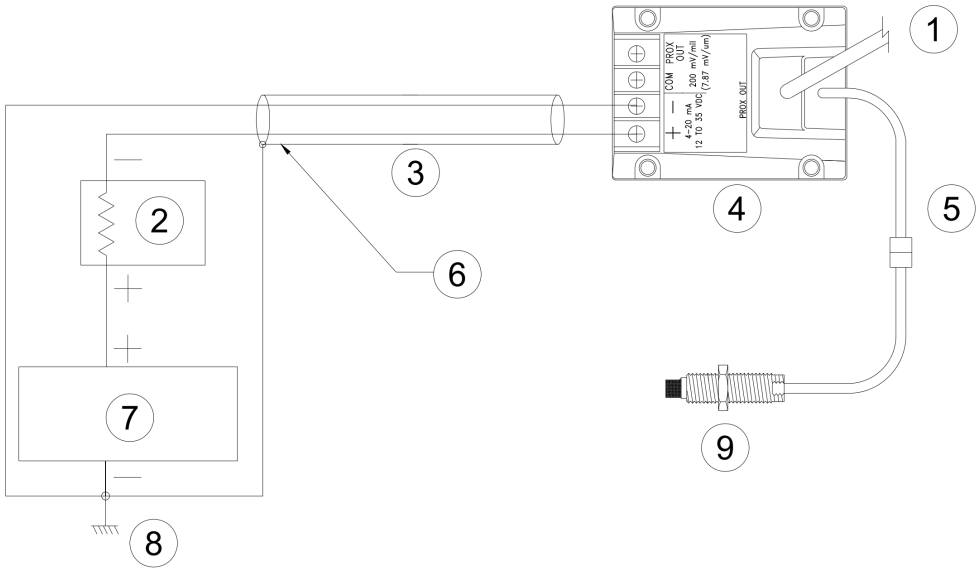
1. Mounting holes, 5.8 mm (0.23 in) diameter, 4 places
2. Bulkhead mount holes, 4 each. 6-32 x 1.326 screws provided when mounting option specified

Figure 1: 991 Thrust Transmitter Dimensions (Top View)



1. 35mm DIN rail DIN mount clips (when DIN rail mounting is specified)

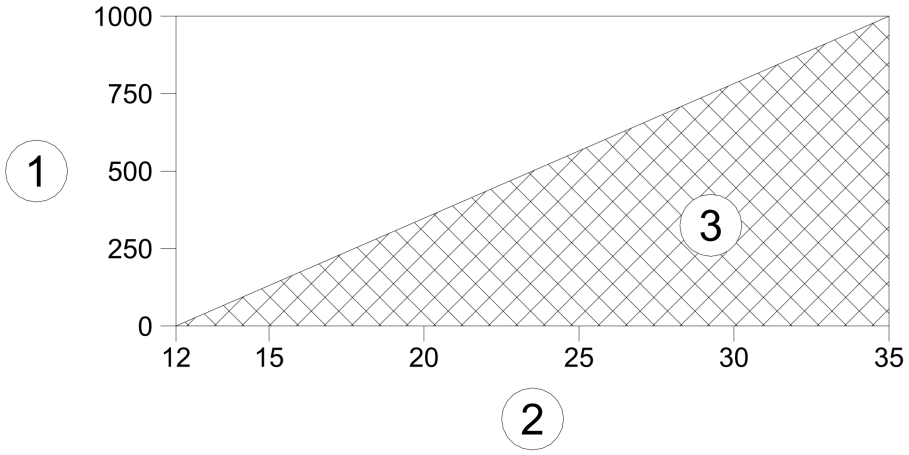
Figure 2: 991 Thrust Transmitter Dimensions (Side View)



1. To test adapter 122115-01
2. Receiver
3. Cable shield
4. Transmitter
5. Extension cable
6. Recommended wiring is shielded, twisted-pair, 1.0 mm (18 AWG) (part number 02173006). Maximum length is 13 km (8 miles).
7. Power supply, V_{PS} = 17 to 35 Vdc
8. Common (ground)
9. Probe

Figure 7: 991 Thrust Transmitter Loop Wiring Connections

The phase of the PROX OUT signal is inverted from the standard for Bently Nevada products. Also, connecting grounded ac-powered equipment to PROX OUT may result in a false alarm. Use test adapter 122115-01 to connect ac equipment to the transmitter. Note that the 122115-01 also inverts the PROX OUT signal.



1. Maximum loop resistance in ohms (R_{LOOP})
2. Power supply voltage (V_{PS})
3. Operating region

Figure 8: 991 Thrust Transmitter Maximum Loop Resistance

R_{LOOP} = 43.5 x (V_{ps} – 12) W maximum. If the maximum loop resistance is exceeded, then the full scale current does not reach 20 mA.