

# 24765 and 135613 Case Expansion Transducer Systems

## Datasheet

Bently Nevada Machinery Condition Monitoring

141598 Rev. K

### Description

#### Thermal Case Growth Measurements in Large Turbines



An important position measurement in Turbine Supervisory Instrumentation (TSI) is case expansion. Case expansion (sometimes referred to as shell expansion) is the thermal growth of the machine case as it expands during machine startup and on-line operations. The case expansion transducer system is typically mounted on the foundation at the opposite end from where the turbine casing is attached to the foundation and provides information about the growth of the machine case relative to the foundation.

Case expansion is a parameter that you should use a dual transducer arrangement to measure. This arrangement provides information about the position of the sliding feet on the machine case. A condition that obstructs or jams one foot could distort the case and damage the machine. The dual case expansion transducer configuration in conjunction with the 3300 or 3500 monitors provides an alarm for this condition. The high temperature dual case expansion transducer configuration is compatible only with the 3500/45 Position Monitor.

Case expansion measurements also enable you to determine whether machine conditions are exceeding expected temperature growth differentials. This is primarily a startup parameter that determines whether the machine casing and rotor grow thermally at nearly the same rate. Different rates of thermal growth can cause the rotating and stationary parts of the machine to rub.

The case expansion transducer assembly consists of a linear variable differential transformer (LVDT), which is housed in a weatherproof, protective enclosure.

CE

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## How a Case Expansion Transducer Works

The case expansion transducer system uses the LVDT to measure the machine case thermal growth.

A rod on the LVDT connects to the machine. As the machine case grows, the rod moves inside the LVDT and changes the signal in the LVDT. The transducer electronically conditions the signal and outputs it to a monitor for display and alarms.

The High Temperature Case Expansion Transducer is designed to meet TYPE 4 requirements.

## Specifications

### 24765 dc LVDT Assembly

#### Electrical

Input Power	+24 Vdc, 30 mA minimum
Scale Factor	
24765-01	0.346 V/mm (8.79 V/in).
24765-02	0.404 V/mm (10.25 V/in).
24765-03	0.143 V/mm (3.63 V/in).
Linear Range	
24765-01	± 12.7 mm (±0.5 in).
24765-02	± 25.4 mm (±1.00 in).
24765-03	± 51 mm (±2.00 in).
-3 dB Frequency	
24765-01	20 Hz
24765-02	15 Hz
24765-03	10 Hz
Output Impedance	7 kΩ. nominal, all models
Minimum Load Resistance	
24765-01	50 kΩ
24765-02	100 kΩ
24765-03	200 kΩ

#### Output

Ripple	< 1% full scale
Linearity	± 0.5% full-range
Stability	0.125% full-scale
Scale Factor Temperature Coefficient	0.07%/°C (0.04%/°F)

#### Environmental Limits

Operating Temperature	-18 °C to +71 °C (0 °F to +160 °F).
Storage Temperature	-54 °C to +93° C (-65 °F to +200 °F).
Shock	250 g for 11 ms
Vibration	10 g @ 0 to 2 kHz

#### Construction

Body	Series 400 magnetic stainless steel
Coil	Laminated glass epoxy
Lead Wire	25 AWG stranded copper, Teflon-insulated, 31 cm (12 in)

#### Mechanical

Height	88.9 mm (3.50 in).	
Width	117 mm (4.60 in).	
Length	24765-01 and -02	241 mm (9.50 in)
	24765-03	328 mm (12.90 in)
Weight	24765-01 and -02	2.3 kg (5.0 lbs)
	24765-03	2.7 kg (6.0 lbs)
Thread	6-40 UNF-2B core end 1/4-20 UNC-2A machine end	
Plunger Length	As required for application. Refer to the Dimensional Drawings section of this datasheet for fully	

	extended dimensions.
Diameter	6.4 mm (0.25 in)

## Dimensions

Body Length	
24765-01	171 mm (6.75 in)
24765-02	206 mm (8.1 in)
24765-03	292 mm (11.5 in)
Body Diameter	20.6 mm (0.812 in), all models
Body End to Null Center	
24765-01	69.3 mm (2.73 in)
24765-02	86.6 mm (3.41 in)
24765-03	127 mm (4.99 in)
Core Length	
24765-01	80 mm (3.15 in)
24765-02	108.00 mm (4.25 in)
24765-03	135 mm (5.30 in)
Core Diameter	6.4 mm (0.25 in), all models

## 135613 dc LVDT

### High Temperature Case Expansion Transducer System

#### Electrical

Input Power	+13.5 to +26 Vdc unregulated, 30 mA minimum
Voltage	+1 to +6 Vdc, all models
Output Noise	<10 mV



When operated in the presence of



high-level RF energy, the 135613 High Temperature DC-LVDT may experience output fluctuation up to 7% (of full scale voltage) deviation from the nominal voltage.

#### Scale Factor

135613-01 and -11	0.20 V/mm (5.0 V/in)
135613-02 and -12	0.10 V/mm (2.5 V/in)
135613-03 and -13	0.049 V/mm (1.25 V/in)

#### Linear Range

135613-01 and -11	25.4 mm (1.00 in)
135613-02 and -12	50.8 mm (2.00 in)
135613-03 and -13	101.6 mm (4.00 in)

#### -3 dB Frequency

135613-01 and -11	200 Hz (typical)
135613-02 and -12	200 Hz (typical)
135613-03 and -13	200 Hz (typical)

Stability	0.125% full-scale
Non-Linearity	Less than 0.25% full-scale
Temperature Coefficient	0.05%/°C (0.028%/°F) maximum



When operated in the presence of high-level RF energy, the 135613 transducer may experience output fluctuation up to 7% (of full scale voltage) deviation from the nominal voltage.

## Environmental Limits

Operating Temperature	-25 °C to +85 °C (-13 °F to +185 °F)
Storage Temperature	-55 °C to +125 °C (-67 °F to +257 °F)
Shock	250 g for 11 ms-
Vibration	10 g @ 0 to 2 kHz

## Mechanical

Height	88.9 mm (3.50 in)
Width	117 mm (4.60 in)
Length	
135613-01, -02, -11 and -12	241 mm (9.50 in)
135613-03 and -13	328 mm (12.90 in)
Weight	
135613-01, -02, -11 and -12	2.3 kg (5.0 lbs)
135613-03 and -13	2.7 kg (6.0 lbs)
Thread	6-40 UNF-2B core end 1/4-20 UNC-2A machine end

## Dimensions

Body Length	
135613-01 and -11	171 mm (6.75 in)
135613-02 and -12	209 mm (8.24 in)
135613-03 and -13	297.4 mm (11.71 in)
Body Diameter	19.2 mm (0.75 in), all models
Body End to Null Center	
135613-01 and -11	65.4 mm (2.57 in)

135613-02 and -12	84.3 mm (3.32 in)
135613-03 and -13	129 mm (5.07 in)
Core Length	
135613-01 and -11	87.6 mm (3.45 in)
135613-02 and -12	87.6 mm (3.45 in)
135613-03 and -13	135 mm (5.30 in)
Core Diameter	4.8 mm (0.19 in), all models

## Housing Assembly

### Design Specification

24765 LVDT	NEMA 3
135613 LVDT	NEMA 4
Mounting Fastener Locations	Optional, per user requirements
<b>Supplied Hardware</b>	4 housing mounting 1/4-20 UNC bolts, lock washers, and flat washers  2 10-24 nuts, lock washers, and flat washers on end of LVDT extension rod.  1/2-inch conduit fitting

## 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

EN 61000-6-2 (2005)

EN 61000-6-4 (2007) +A1: 2011

EMC Directive 2014/30/EU

### RoHS

RoHS Directive 2011/65/EU

## Ordering Information



For the detailed listing of country and product specific approvals, refer to the *Approvals Quick Reference Guide* (108M1756) available from [Bently.com](https://www.bently.com).

### Case Expansion Transducer Assembly (dc)

#### 24765-AA-BB

##### A: Linear Range Option

01	25.4 mm (1.0 in)
02	0.8 mm (2.0 in)
03	101.6 mm (4.0 in)

##### B: Spring Option

00	Without spring return
01	With spring return

### High Temperature Case Expansion Transducer Assembly (dc)

#### 135613 -AA-BB

##### A: Linear Range Option

01	25.4 mm (1.0 in) with a 127 mm (5.00) rod
02	50.8 mm (2.0 in) with a 152.4 mm (6.00) rod
03	101.6 mm (4.0 in) with a 228.6 mm (9.00) rod
11	25.4 mm (1.0 in) with a 304.8 mm (12.0 in) rod
12	50.8 mm (2.0 in) with a 304.8 mm (12.00) rod
13	101.6 mm (4.0 in) with a 228.6 mm (9.00) rod

##### B: Spring Option

00	Without spring return
01	With spring return



Spring Option 01 only available with Linear Range Options 01, 02, & 03

## Accessories

135941-01	127 mm (5.0 in) rod
135941-02	152.4 mm (6.0 in) rod
135941-03	228.6 mm (9.0 in) rod
135941-04	304.8 mm (12.0 in) rod
285741	Ferrite Bead



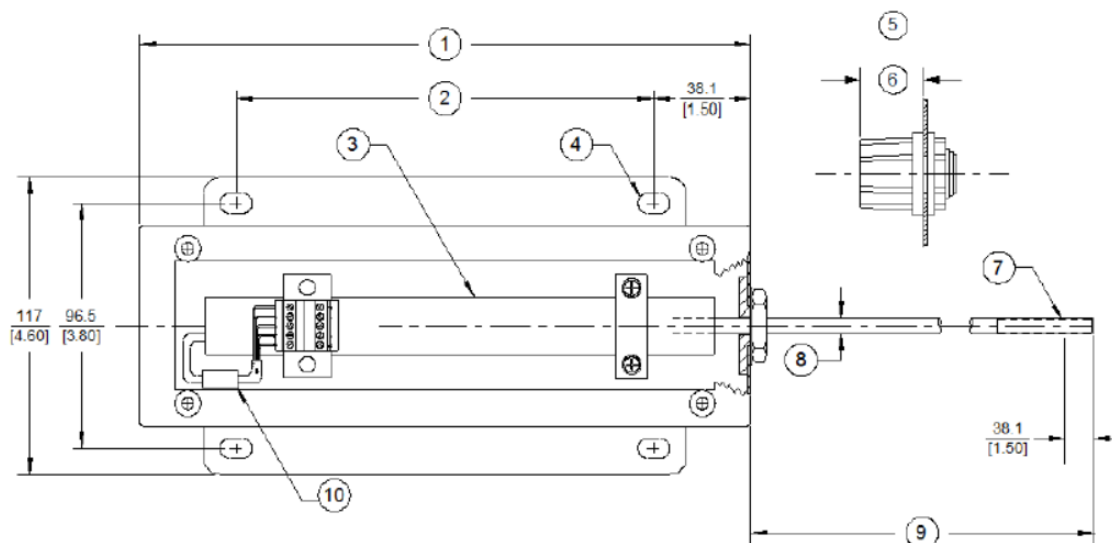
Ferrite bead required on transducer end of field wiring for CE installations.

For more information on this product, please refer to the DC-LVDT and Housing Assembly User Guide (document TW8029327).

## Graphs and Figures



All dimensions shown in millimetres [inches] except as noted.



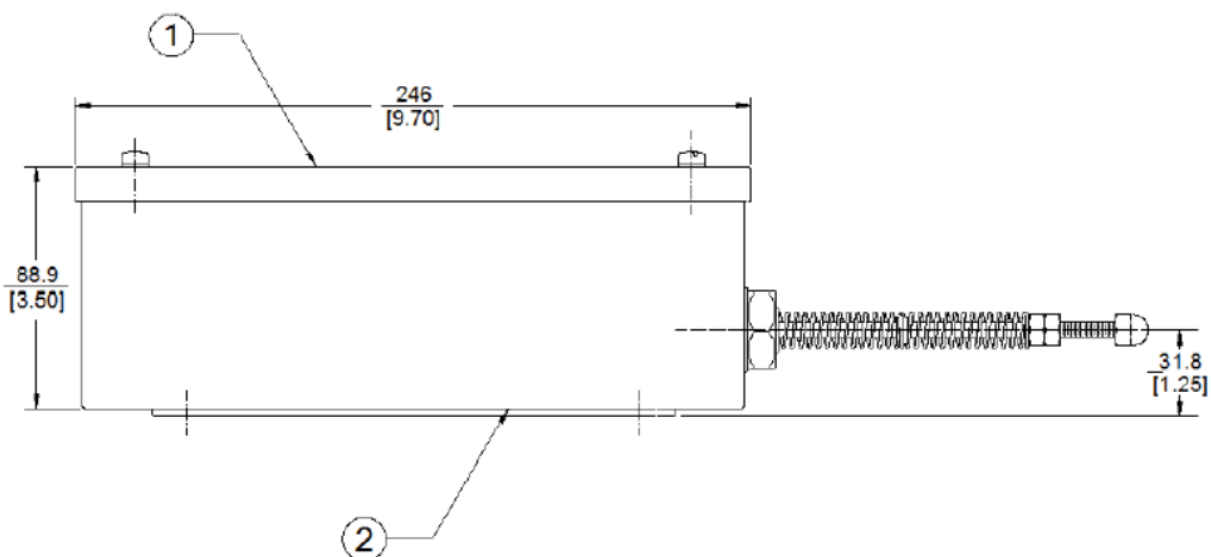
1. Dimension "B" [See 135613-AA Dimensions in Millimetres \[Inches\] on the next page.](#)
2. Dimension "A"
3. LVDT
4. 7.92 mm x 12.7 mm [0.312 in x 0.500 in] oval, 4 places
5. 1/2-inch conduit fitting, supplied but not installed
6. External protrusion, 20.6 mm [0.81 in]
7. 1/4-20 UNC-2A
8. 4.7 mm [0.187 in] diameter
9. Dimension "C", fully extended position
10. Ferrite Bead

**Figure 1: 135613-AA Dimensional Drawing (Top View)**



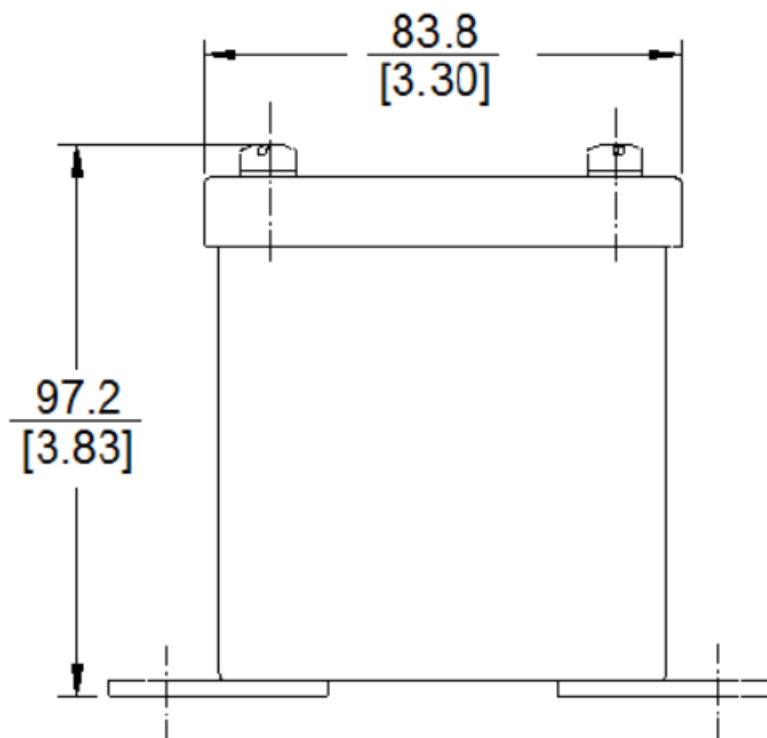
**Table 1: 135613-AA Dimensions in Millimetres [Inches]**

Linear Range Option	Dimension "A"	Dimension "B"	Dimension "C"
-01	165 [6.50]	241 [9.50]	100.3 [3.95]
-02	165 [6.50]	241 [9.50]	120.6 [4.75]
-03	251 [9.90]	327.7 [12.90]	196.8 [7.75]
-11	165 [6.50]	241 [9.50]	280 [11.02]
-12	165 [6.50]	241 [9.50]	270 [10.63]
-13	251 [9.90]	327.7 [12.90]	272 [10.71]



1. Cover
2. Housing

**Figure 2: 135613-AA Dimensional Drawing (Side Views)**



**Figure 3: 135613-AA Dimensional Drawing (End View)**

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