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.

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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.

	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

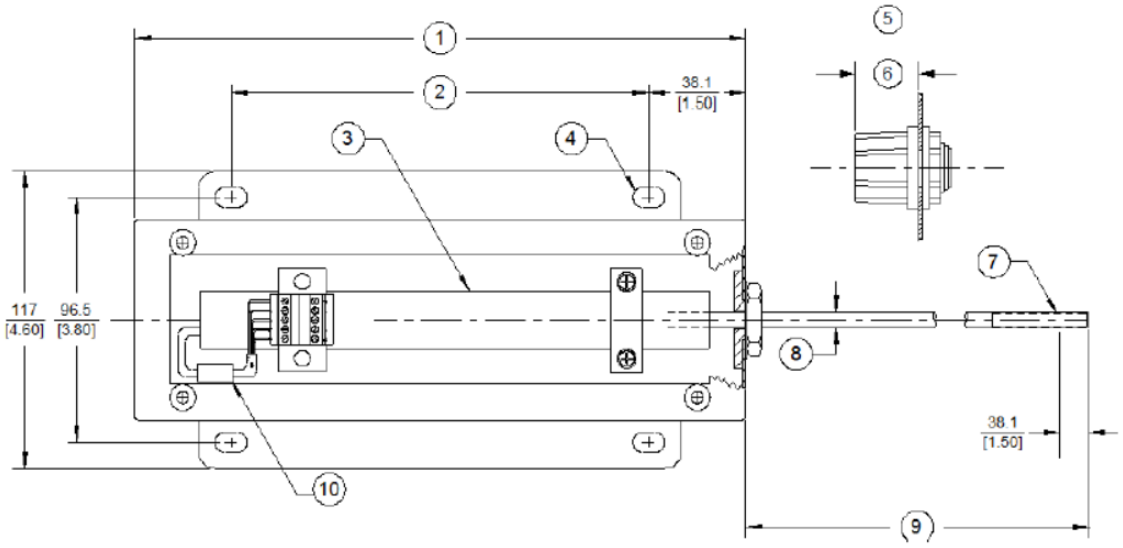
Body Length	
135613-01 and -11	171 mm (6.75 in)
135613-02 and -12	209 mm (8.24 in)
135613-03 and -13	297.4 mm (11.71 in)
Body Diameter	19.2 mm (0.75 in), all models
Body End to Null Center	
135613-01 and -11	65.4 mm (2.57 in)
135613-02 and -12	84.3 mm (3.32 in)
135613-03 and -13	129 mm (5.07 in)
Core 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
Supplied Hardware	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

Graphs and Figures

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

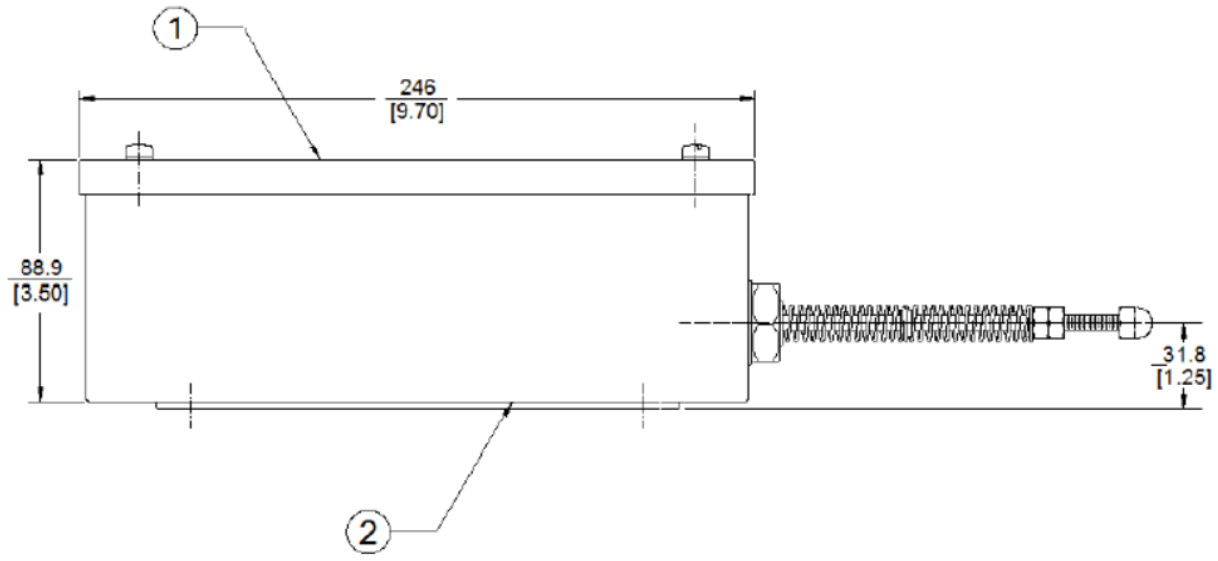


1. Dimension “B” See 135613-AA Dimensions in Millimetres [Inches] on the next page.
2. Dimension “A”
3. LVDT
4. 7.92 mm x 12.7 mm [0.312 in x 0.500 in] oval, 4 places
5. 1/2-inch conduit fitting, supplied but not installed
6. External protrusion, 20.6 mm [0.81 in]
7. 1/4-20 UNC-2A
8. 4.7 mm [0.187 in] 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)

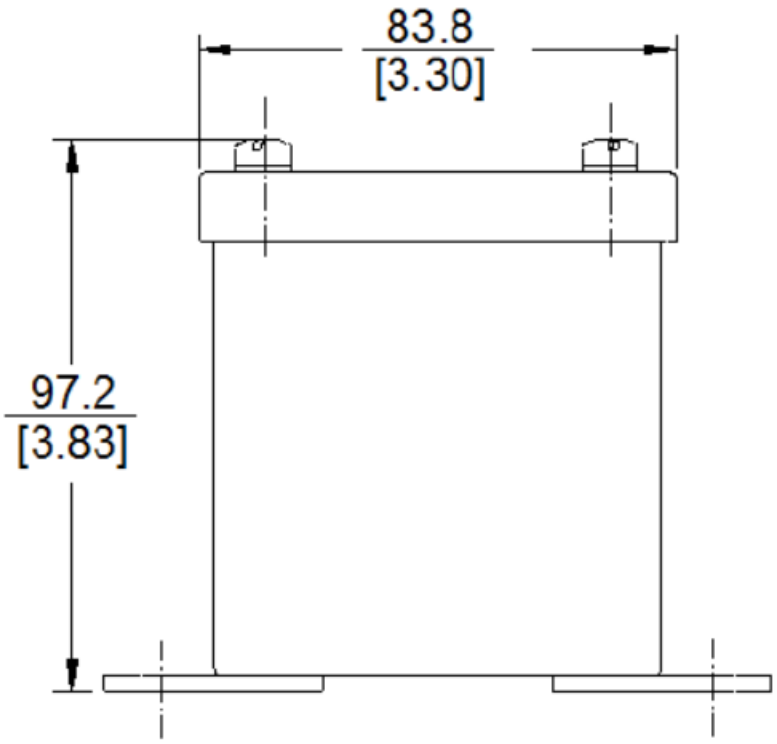


Figure 3: 135613-AA Dimensional Drawing (End View)