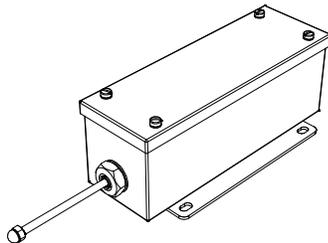


Case Expansion Transducer Systems

Bently Nevada* Asset Condition Monitoring

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.

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

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:	25.4 mm (1.00 in).
24765-02:	50.8 mm (2.00 in).
24765-03:	101.6 mm (4.00 in).

-3 dB Frequency

24765-01:	20 Hz.
24765-02:	15 Hz.
24765-03:	10 Hz.

Linearity

±0.5% full-range.

Stability

0.125% full-scale.

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).

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

10-32 UNC-2B core end
10-32 UNC-2A machine end.

135613 dc LVDT High Temperature Case Expansion Transducer System

Electrical

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

Specifications and Ordering Information
Part Number 141598-01
Rev. E (02/10)

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.

Note: 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).

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

10-32 UNC-2B core end

10-32 UNC-2A machine end.

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

Ordering Information

Case Expansion Transducer Assembly (dc) 24765-AXX-BXX

A: Linear Range Option

- 01 25.4 mm (1.00 in)
- 02 50.8 mm (2.00 in)
- 03 101.6 mm (4.00 in)

B: Spring Option

- 00 Without spring return
- 01 With spring return

High Temperature Case Expansion Transducer Assembly (dc)

135613 -AXX -BXX

A: Linear Range Option

- 01 25.4 mm (1.0 in) with a 127 mm (5.00 in) rod
- 02 50.8 mm (2.0 in) with a 152.4 mm (6.00 in) rod
- 03 101.6 mm (4.00 in) with a 228.6 mm (9.00 in) rod
- 11 25.4 mm (1.00 in) with a 304.8 mm (12.0 in) rod
- 12 50.8 mm (2.00 in) with a 304.8 mm (12.0 in) rod
- 13 101.6 mm (4.00 in) with a 304.8 mm (12.0 in) rod

B: Spring Option

- 00 Without spring return

Specifications and Ordering Information
Part Number 141598-01
Rev. E (02/10)

01 With spring return

127 mm (5.0 in) rod

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

135941-02

152.4 mm (6.0 in) rod

Accessories

135941-03

TW8029327

228.6 mm (9.0 in) rod

**DC-LVDT and Housing Assembly
Installation Manual**

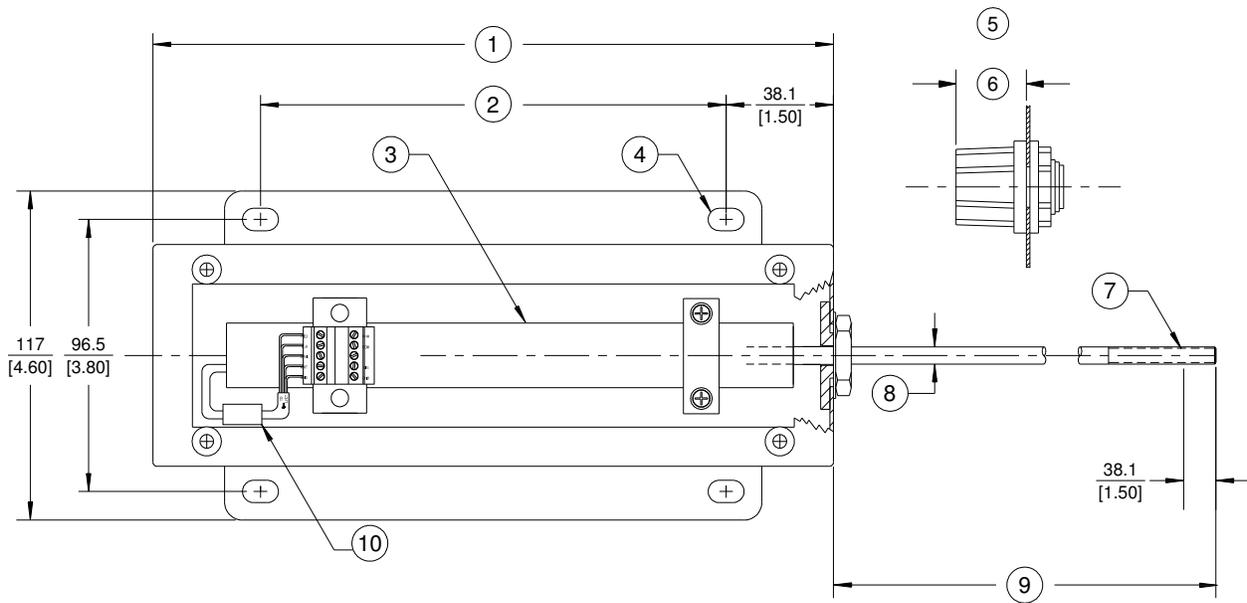
135941-04

304.8 mm (12.0 in) rod

135941-01

Graphs and Figures

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



1. Dimension "B" (refer to Table 1)
2. Dimension "A" (refer to Table 1)
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. 10-24 UNC-2A
8. 4.7 mm [0.187 in] diameter
9. Dimension "C", fully extended position (refer to Table 1)
10. Ferrite Bead

Figure 1: 135613-AXX Dimensional Drawing (Top View)

Table 1: 135613-AXX 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]

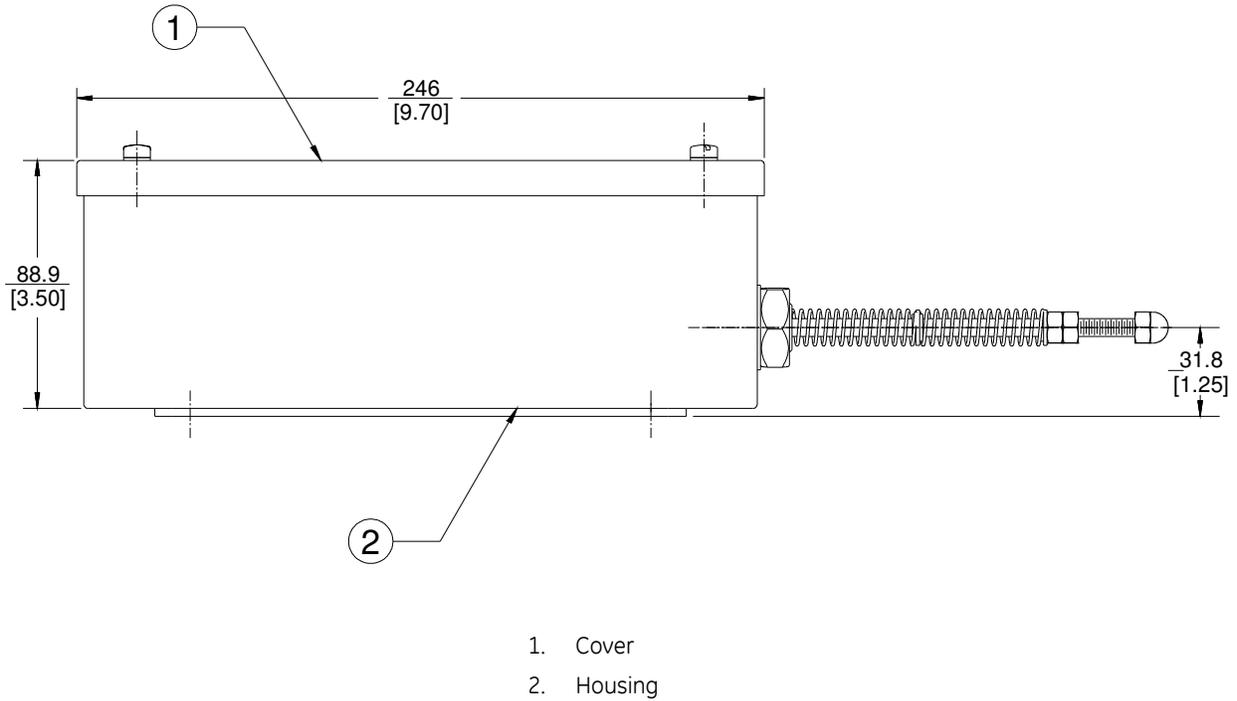


Figure 2: 135613-AXX Dimensional Drawing (Side Views)

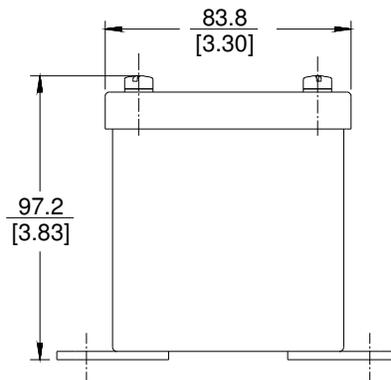


Figure 3: 135613-AXX Dimensional Drawing (End View)

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