



# Displacement Sensor

## Model 8739, 8740, 8741

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## 1. Introduction

Displacement transducers based on the LVDT principle are robust precision sensors. Please be sure to follow the instructions below to take full advantage of the specified accuracy.

## 2. Preparations for use

### 2.1 Unpacking

- Inspect the sensor carefully for damage.

If you suspect that the unit has been damaged during shipping, notify the delivery company within 72 hours. Keep all packaging materials for inspection by the representative of the manufacturer or delivery company.

- Only transport the model 8739, 8740 and 8741 sensors in their original packaging or in packaging of equivalent quality.

### 2.2 Grounding and potential connection

All connecting wires of the sensor models 8740 and 8741 are electrically insulated from the sensor body.

For the 8739 and 8741 sensors, which have a plug-in electrical cable, the cable shield is connected to the connector shell.

For sensors with a wire lead, the cable shield is not connected.

For the external electronics unit housed in the tubular package, the cable shield is connected to the tubular case.

### 2.3 Storage

- The sensors of the models 8739, 8740 and 8741 have to be stored under the following conditions only:
  - dry
  - no condensation
  - temperature between 0 °C and 60 °C

**Note:**

- Provided the storage conditions have been observed, no special steps need to be taken after storage and prior to commissioning.

## 3. Principle of operation

Inductive displacement transducers of model 8739, 8740 and 8741 contain a linear differential transformer (LVDT). In addition transducers of model 8740 and 8741 contain a carrier frequency instrumentation amplifier (CFA) comprising oscillator, demodulator, filter and amplifier, housed and encapsulated in a single package. For transducer of model 8739 an IN-LINE Amplifier is intergrated in the cable.

### 3.1 Design of the linear differential transformer

The linear differential transformer is composed of a primary coil and two secondary coils. The secondary coils are positioned symmetrically about the primary coil and connected in opposition (see Fig.1). A moveable ferromagnetic core in the form of a sliding shaft is located inside these coils.

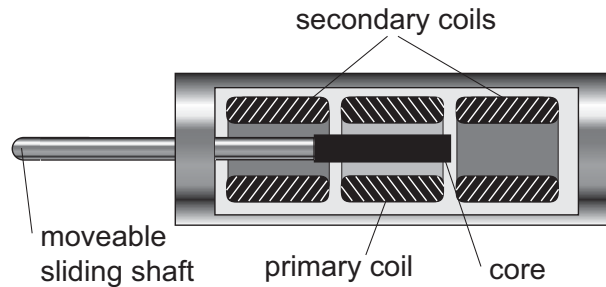


Figure 1: Schematic of the linear differential-transformer (LVDT)

### 3.2 How the differential transformer works

As the ferromagnetic core moves, it changes the coupling inductance between the primary coil and the two secondary coils according to its position. As a result of the change in inductance, the core induces a position-dependent alternating voltage in the coils. The (integral) electronics unit demodulates, filters and amplifies this voltage to provide a DC voltage at the sensor output that is proportional to the position.

For model 8739 displacement transducers, the electronics are packaged in a tubular aluminum case (25 mm x 114 mm). This "IN-LINE electronics" package has high-strength PG cable glands at each end to provide IP67 protection.

#### Note:

For model 8739 sensors, you can disconnect the IN-LINE amplifier from the sensor at the plug-in connector. Each of these amplifiers is matched to a specific sensor, however. Therefore replacing them with components from other measuring chains will introduce significant measurement errors.

## 4. Installation

### 4.1 Surrounding mechanical parts and fixing

- Ensure that the sensor is aligned precisely.

The displacement to be measured must lie precisely along the sensor axis. The accuracy of the measurement depends on the parallelism achieved during assembly; the mounting bracket should be designed and machined in such a way that the parallelism of the measuring head to the surface achieved during assembly is kept within 0.3 mm/100 mm.

- Avoid lateral movements or forces.

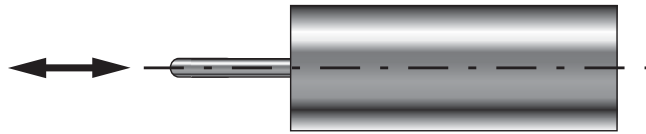


Figure 2: The displacement to be measured must lie along the axis of symmetry.

The mount used to hold the sensor in place (clamping collar, mounting sleeve or the like) affects the sensor sensitivity. It introduces additional magnetic damping, which alters the symmetry of the internal magnetic field.

- Always check the material used in the fitting elements and select a suitable type of fixture.  
Only use fitting elements that are made of a **non-ferromagnetic** material. We recommend brass, aluminum or plastic.

#### 4.1.1 Adaptation

##### Mounting the sliding shaft, 8740

With model 8740 sensors, you have the option of screwing the sliding shaft onto the object being measured. The M2 threaded section is provided for this purpose. This thread also helps you to position the sliding shaft correctly.

The sensor is supplied with two securing nuts.



#### **Caution!**

**Risk of damage!**

**The sliding shaft and the two nuts must only be hand-tightened.**

#### 4.1.2 Mounting the sensor

##### Mounting model 8739

- Use one of the following fixing brackets to mount the model 8739 sensor:
  - 8739-Z003
  - 8739-Z004
  - 8739-Z005

We recommend using two brackets for larger measuring ranges. In this case, position the two brackets symmetrically about the center of the sensor housing.

- **Hand-tighten** the clamping screw on the bracket.



Figure 3: 8739 with angle bracket

**Note:**

If you use two fixing brackets, both brackets must be made of the same material. **Only** use fixing brackets that are made of a **non-ferromagnetic** material (we recommend brass, aluminum or plastic). Both brackets must fix the sensor in the same manner. Only hand-tighten the fixing screw on the bracket.

**Mounting model 8740 or model 8741**

- Use one of the following mounting blocks to mount the model 8740 and 8741 sensors:
  - 8740-Z002
  - 8740-Z003

We recommend using two brackets for larger measuring ranges. In this case, position the two brackets symmetrically about the center of the sensor housing

- Tighten the clamping screw on the bracket **no more than hand-tight**.

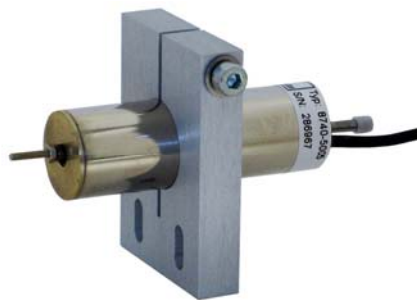


Figure 4: Fixing the 8740 sensor using the 8740-Z002 mount

burster präzisionsmesstechnik offers a threaded sleeve for the sensors (8739-Z004 with M12 x 1.75 x 45 mm and 8740-Z004 with M24 x 1.5 x 45 mm). This threaded sleeve is also available to purchase later as an extra part to fit your sensor. The sleeve comes with two matching nuts.



**Caution!**

**Risk of damage!**

**Maximum tightening torque for both nuts on the threaded sleeve: 70 Nm**

- Position the threaded sleeve at the front of the sensor.  
The end of the thread must lie flush with the sensor housing at the sliding shaft end (measuring end) of the sensor.
- Secure the threaded sleeve with a high-strength adhesive.



Figure 5: 8741 with optional -V302 threaded sleeve

## 4.2 Electrical system and instrumentation

**Note:**

The model 8739, 8740 and 8741 sensors are protected against polarity reversal.

- Follow the principles of electrical instrumentation when connecting the displacement sensor.
- When fitting the sensor, pay particular attention to:
  - the routing of the signal cables
  - the connection of analog ground to the measurement input (signal 0 V)
  - the connection to the signal processing instruments
  - the voltage supply connection
- Avoid ground loops.

**Note:**

If you install several sensors close together, the alternating fields of these sensors may influence each other. Isolate every sensor from each other using covers with adequate thickness.

Circumstances vary for each particular measurement setup. Hence the circuit diagram (Figure 6:) should be viewed as an example only.

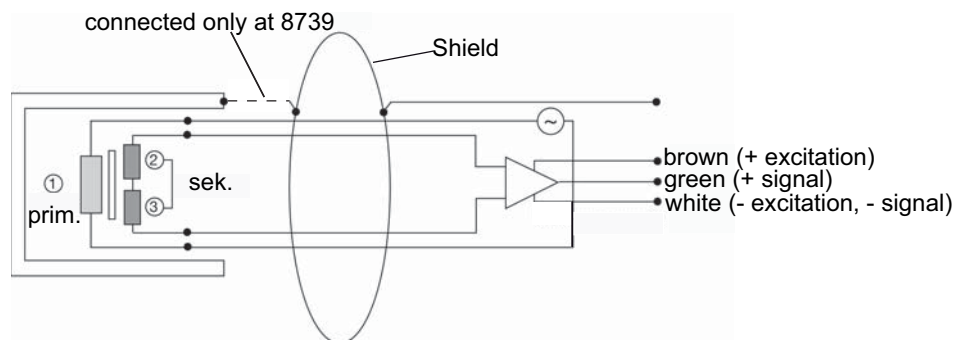


Figure 6: example of wiring

**Note:**

For model 8739 displacement sensors, you can disconnect the IN-LINE amplifier from the displacement transducer at the plug-in connector. Each of these amplifiers is matched to a specific displacement transducer, however. Therefore replacing them with components from other measuring chains will introduce significant measurement errors.

## Changing the cable length

Changing the cable length always affects the sensitivity of a calibrated measuring chain.

- You must therefore recalibrate the measuring chain comprising sensor and IN-LINE amplifier.

**Note:**

Thanks to common mode rejection, the carrier frequency instrumentation amplifier (CFA) is practically immune to electrical interference. Nevertheless, high-intensity interference will affect the measurement. This can be identified by a fluctuating signal when the sensor is still in the zero position.

## 5. Measuring chain adjustment

The sensors of the models 8739, 8740 and 8741 are calibrated ex works. Because of this, every sensor has an individual test and calibration report.

However, you basically have to align every following electronic to the particular sensor. After this adjustment you have done a basic adjustment of the measuring chain.

When calibrating the sensors (8739, 8740 and 8741), clamp the sensors in a clamping collar that is made of a **non-ferromagnetic material** (we recommend brass, aluminum or plastic). Only hand-tighten the screws.

## **5.1 Adjustment with a physical magnitude**

### **Function**

The sensor is subjected to a known physical magnitude. In this way, the calibration is carried out over the entire measuring chain, consisting of the sensor and display device or amplifier.

### **Adjustment**

- Remove any load from the sensor.
- Adjust the zero.
- Load the sensor with a known reference weight.
- Adjust the reference scale value.

If desired, we can prepare factory calibration or recalibration certificates for the sensor or for the entire measuring chain.

These measurements are carried out at the factory on measurement installations.

We check the sensor in 5 % or 10 % steps, during factory calibration.

## **6. Note**

### **Exclusion of warranty liability for operating manuals**

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