

# SM/MD/DF series

Miniature displacement sensors

## SM



- ▶ Rugged construction
- ▶ Short body length
- ▶ Good performance

SM sensors cover two standard types in two measurement ranges  $\pm 1$ mm and  $\pm 3$ mm. They are designed for measuring displacement in applications where infinite resolution and precise repeatability is required in a very small size.

The coils are wound on a PPS (40% GL) former and housed in a stainless steel case. The epoxy bonded construction makes the device suitable for operation in wet and oily environments and in applications with high levels of mechanical stress.

The core carrier assembly moves friction free within the sensor, an alternative option where the core is provided threaded at both ends is available allowing the user to manufacture their own carrier interface. Recommended carrier material is titanium.

## MD



- ▶ Small diameter
- ▶ Right angle cable outlet option
- ▶ Low core weight
- ▶ Screened cable

The small case diameter (6mm and 8mm) allows for easy installation in confined spaces. A right angle output facility is available as a retrofit for the 8mm version.

The low core weight makes this range ideal for use in low inertia systems. Cross talk is prevented by the screened cable, which also allows for multiple use of these sensors in close proximity.

## DF



- ▶ Measurement range to 10mm
- ▶ High Output
- ▶ Excellent repeatability
- ▶ Low power

The DF dc miniature displacement sensor has a friction-free core and the DFg has a free guided core incorporating Delrin bearings. All types incorporate a linear variable differential transformer (LVDT) as the measuring source together with oscillator, demodulator and filter providing a self-contained unit accepting a DC input and providing a DC output relative to armature position.

With high linearity and low mass of moving parts, these are ideally suited to applications in civil, mechanical, chemical and production engineering. Also, when mounted in a suitable load-sensitive member such as a proof ring or diaphragm, they can provide load or pressure measurement.

| Sensor   |                                     |         |         |             |           |         |          |             |            |         |  |
|--|-------------------------------------|---------|---------|-------------|-----------|---------|----------|-------------|------------|---------|--|
| LVDT with Free Core                                  | SM1                                 | SM3     | M6D1    | MD1         | MD2.5     | MD5     | MD10     | -           |            |         |  |
| Half Bridge (HB) with Free Core                      | -                                   |         | M6DH1   | MD1H        | MD2.5H    | MD5H    | MD10H    | -           |            |         |  |
| DC Output with Free Core                             |                                     |         |         |             |           |         |          | DF1         | DF2.5      | DF5     |  |
| DC Output with Guided Core                           |                                     |         |         |             |           |         |          | DFg1        | DFg2.5     | DFg5    |  |
| Measurement  |                                     |         |         |             |           |         |          |             |            |         |  |
| Measurement Range (mm)                               | $\pm 1$                             | $\pm 3$ | $\pm 1$ | $\pm 1$     | $\pm 2.5$ | $\pm 5$ | $\pm 10$ | $\pm 1$     | $\pm 2.5$  | $\pm 5$ |  |
| Linearity (% FSO)                                    | 0.25                                |         | -       |             |           |         |          | 0.30        |            |         |  |
| Linearity (% Reading)                                | -                                   |         | 0.5     |             |           |         |          | -           |            |         |  |
| Resolution $\mu\text{m}^1$                           | <0.1                                |         |         |             |           |         |          | <0.2        | see Note 1 |         |  |
| Temperature Coefficients (%FSO/ $^{\circ}\text{C}$ ) | <0.03%                              |         | <0.01%  |             |           |         |          | <0.025%     |            |         |  |
| Mechanical   |                                     |         |         |             |           |         |          |             |            |         |  |
| Body diameter (mm)                                   | 9.52                                |         | 6h6     |             | 8h6       |         |          | 19.0        |            |         |  |
| Case Material  | 400 Stainless Steel                 |         |         |             |           |         |          |             |            |         |  |
| Cable Type   | PU                                  |         |         |             |           |         |          |             |            |         |  |
| Standard cable Length (m)                            | 0.5                                 |         | 2       |             |           |         | 3        |             |            |         |  |
| Standard cable Style                                 | A                                   |         |         | B           |           |         |          |             |            |         |  |
| Nominal Mass (g)                                     | 6.0                                 | 8.0     | 2.6     | 5.0         | 7.6       | 8.5     | 13.0     | 26.0        | 26.0       | 30.0    |  |
| Nominal Mass of Moving Parts (g)                     | 0.50                                | 1.50    | 0.10    | 0.20        |           | 0.30    | 0.70     | 1.00        | 1.00       | 1.20    |  |
| Environment  |                                     |         |         |             |           |         |          |             |            |         |  |
| Operating Temperature ( $^{\circ}\text{C}$ )         | -40 to +85                          |         |         | -10 to +80  |           |         |          | -5 to +70   |            |         |  |
| Storage Temperature ( $^{\circ}\text{C}$ )           | -40 to +100                         |         |         | -40 to +105 |           |         |          | -10 to +80  |            |         |  |
| Sealing  | Splash Proof                        |         |         |             |           |         |          |             |            |         |  |
| Electrical Interface                                 |                                     |         |         |             |           |         |          |             |            |         |  |
| Energising Voltage                                   | 1-10 (Vrms)                         |         |         |             |           |         |          | 17-24 (VDC) |            |         |  |
| Energising (LVDT) Current at 5kHz (mA/V)             | 3.8                                 | 1.8     | 3.0     | 1.8         | 2.0       | 1.0     | 0.6      | -           |            |         |  |
| Energising Current (HB) at 10kHz (mA/V)              | -                                   |         | 1.2     | 1.0         | -         | 1.2     | -        | -           |            |         |  |
| Energising Current (DC) at 10V (mA)                  | -                                   |         |         |             |           |         |          | 10          | 13         |         |  |
| frequency Response (-3db) Hz                         | Depends on Conditioning Electronics |         |         |             |           |         |          | 50          | 75         |         |  |
| Sensitivity at 10VDC $\pm 10\%$ mV/V/mm              | -                                   |         |         |             |           |         |          | 75          | 54         |         |  |
| Sensitivity at 5kHz $\pm 10\%$ mV/V/mm               | 142                                 | 136     | 269     | 210         | 150       | 105     | 33       | -           |            |         |  |
| Sensitivity (HB) at 10kHz $\pm 10\%$ mV/V/mm         | -                                   |         | 88      | 83          | 82        | 51      | 33       | -           |            |         |  |

Note 1: Resolution specification is only applicable to ORBIT digital sensors. The resolution of LVDT sensors is effectively infinite and is only limited by the conditioning electronics.

**Cable Style A** comprises of individual twisted cores  
**Cable Style B** comprises a sheathed and screened cable

Also see...

Dimensions and drawings

Page 38 ▶