

# PRODUCT DATA

## Capacitive Transducer MM-0004

### Uses

- Contact-free displacement detection
- Vibration measurement
- Triggering device for stroboscopes, oscilloscopes, etc.
- Mechanical event calculation, or calculation of time between events, with electronic counter

### Features

- No physical contact with structure under test
- Negligible static and dynamic influence on test specimen
- Small mechanical dimensions
- High sensitivity
- No interaction with magnetic transducers
- No influence from magnetic fields
- Operating temperatures up to 250°C (480°F)



### Description

Capacitive Transducer MM-0004 is a contact-free displacement-sensitive pickup. Its application is where mechanical motion must be detected without loading the test specimen. The transducer should be used with Preamplifier Type 2669 which receives its necessary supply voltage when connected to Power Supply Type 2804 or 2807, or to a Brüel & Kjær measuring amplifier or frequency analyzer.

The capacitive transducer consists of a gold-plated electrode which is shielded by the housing to prevent stray capacitance from influencing the measurements. A double-screened cable connects MM-0004 to the preamplifier. The conductor and outer screen of this cable carry the signal while the inner screen is connected to the internal shield (guard ring) of the preamplifier. This means that the cable capacity has no influence on the measurements and the transducer is only loaded by the very high input impedance of the preamplifier (10 G $\Omega$ ).

When the capacitive transducer is mounted with the plane of the electrode parallel to and at a suitable distance from the test

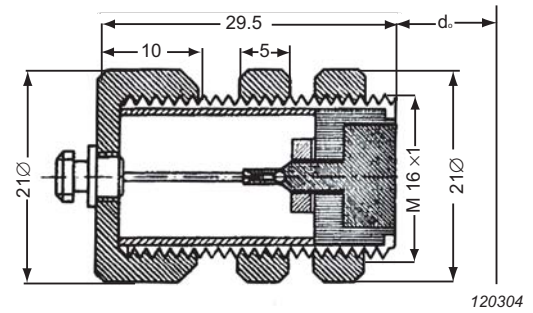
specimen, an air-gap capacitor is formed that is charged by the polarization voltage (200 V) of the preamplifier. When the plate distance ( $d_0$ ) changes due to vibrations, an alternating voltage occurs proportional to the vibration displacement. A static attraction between the electrodes exists due to the voltage differential across them. This force is very small (approximately 56  $\mu$ N with a 0.5 mm gap), so the influence on measurements will be negligible.

The distance between the transducers and the test specimen is not critical. A distance of approximately ten times the test specimen displacement is satisfactory in most cases.

If the test object to be measured upon is made from a non-conducting material, the other electrode of the air-gap capacitor can be made. One end of a thin metal foil is fixed to the vibrating object while the other end is electrically connected to the housing of the transducer via a clamping arrangement.

**Fig. 1**

Cross section of the capacitive transducer with indication of the main dimensions in millimetres



## Specifications – Capacitive Transducer MM-0004

### SENSITIVITY

Inversely proportional to the square of the distance ( $d_0$ ) between the electrode of MM-0004 and the test specimen

**Typically:** 0.9 V RMS  $d_0 = 0.5$  mm and peak-to-peak displacement 0.1 mm

### FREQUENCY RANGE

20 Hz to 200 kHz

### CAPACITANCE

Inversely proportional to  $d_0$

**Typically:** 1.5 pF at  $d_0 = 0.5$  mm

### STATIC FORCE

Inversely proportional to the square of  $d_0$ .

**Typically:** 56  $\mu$ N at  $d_0 = 0.5$  mm

### WORKING TEMPERATURE (CONTINUOUS)

Max. 250°C (480°F)

### DISTORTION

Inversely proportional to  $d_0$

Therefore  $d_0$  should be more than 10 times the maximum displacement and not less than 0.5 mm to keep distortion below 5%

### POLARIZATION VOLTAGE

200 V

### ELECTRODE AREA

0.78 cm<sup>2</sup> (0.121 in<sup>2</sup>)

### WEIGHT (EXCL. CABLE)

46.9 g (1.66 oz)



Compliance with EMC Directive and Low Voltage Directive of the EU  
Compliance with the EMC requirements of Australia and New Zealand.

## Ordering Information

### MM-0004 Capacitive Transducer

includes the following accessories:

- Cable AO-0054

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