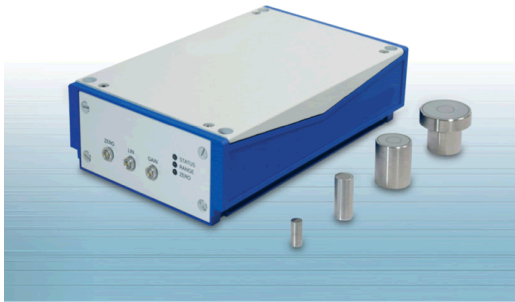


M63 Distance sensor



- Extreme high resolution
- True non contact measurement
- Unmatched temperature stability
- Any target, even insulators

The operating principle of non-contact capacitive displacement measurement used by the M system (capacitive Non-Contact Displacement Transducer) is based on the ideal parallel plate capacitor. The two plate electrodes are formed by the sensor and the opposing target. The capacitance of the capacitor is proportional to the distance between the capacitor electrodes; an adjustable compensating voltage is simultaneously generated in the amplifier electronics. After demodulation of both AC voltages, the difference is amplified and output as an analogue signal.

The high linearity is in the measuring principle

The M system evaluates the reactance X_c of the capacitor which changes strictly in proportion to the distance:

$$X_c = \frac{1}{j \cdot \omega \cdot C}$$

$$\text{capacitance } C = \epsilon_r \cdot \epsilon_0 \cdot \frac{\text{area}}{\text{distance}}$$

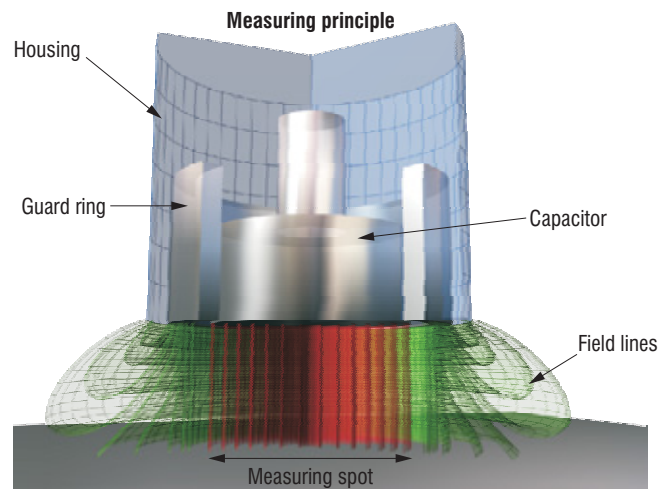
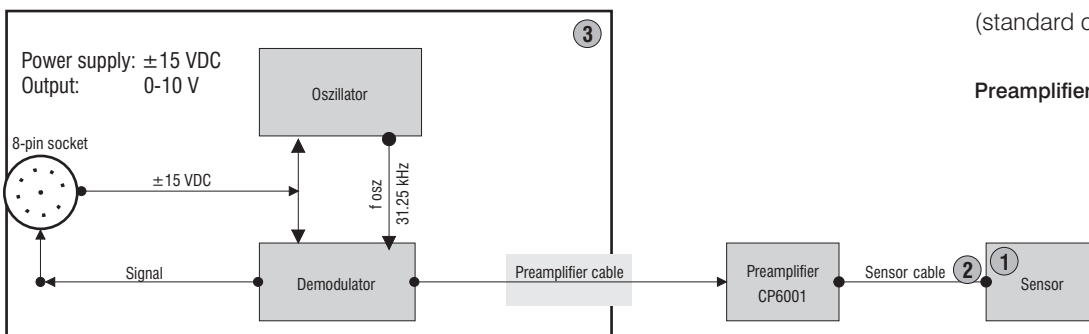
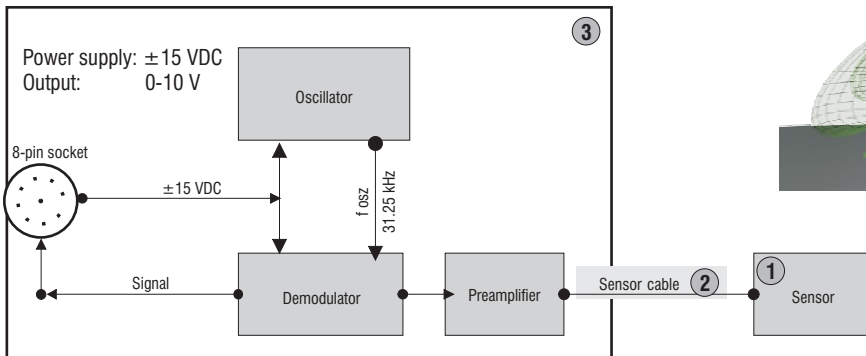
$$X_c = \text{constant} \cdot \text{distance}$$

This theoretical relationship is put into practice by constructing the sensors as guard ring capacitors.

Measuring channel consists of:

- 1 - a capacitive displacement sensor
- 2 - a sensor cable
- 3 - signal conditioning electronics

Block diagram



Special calibration

If sensor cable length ≠ 1 m, special calibration is required (standard cable length is 1 m)

Preamplifier



Specification		Sensor	0.05	02	05	1	1HP	2	3	5	10
Measuring range	el. cond. (metal)	mm	0.05	0.2	0.5	1	1	2	3	5	10
	insulator ¹	mm (appr.)	—	0.4	1	2	2	4	6	10	20
Extended range ²	el. cond. (metal)	mm	0.1	0.4	1	2	2	4	6	10	20
Linearity	≤0.2 % FSO	μm	0.1	0.4	1	2	2	4	6	10	20
Resolution ⁴	stat. ³ up to 2 Hz	μm	0.0005	0.002	0.005	0.01	0.01	0.02	0.03	0.05	0.1
	dyn. up to 8 kHz	μm	0.005	0.02	0.05	0.1	0.1	0.2	0.3	0.5	1
Sensor outer diameter		mm	6	6	8	10	10	20	30	40	60
Weight		g	2	2	3.5	7.1	7.1	61	95	120	230
Active measuring area (diameter)		ømm	1.3	2.3	3.9	5.5	5.5	7.9	9.8	12.6	17.8
Guard ring width		mm	0.8	1	1.4	1.5	1.5	4	8.1	11.8	18.1
Min. diameter of target	el. cond. (metal)	mm	3	5	7	9	9	17	27	37	57
	insulator	mm	—	7	10	12	12	24	36	48	72
Temperature stability (sensor)	zero	μm/°C	0.06	0.06	0.06	0.17	0.06	0.17	0.17	0.17	0.17
	sensitivity	ppm/°C	11	11	11	30	11	30	30	30	30
Temperature stability (electronics)		≤0.01 % FSO / °C									
Long term stability ⁵		≤0.02 % FSO / month									
Sensitivity		V/mm	200	50	20	10	10	5	3.33	2	1
Output	voltage	0 - 10 VDC (max. 10 mA short circuit proof)									
	current	4...20 mA									
Power supply		±15 VDC (±2 %) / ±150 mA									
Bandwidth		8 kHz (-3 dB)									
Temperature range	sensors	-50 to +200 °C									
	sensor cable	-50 to +150 °C									
	electronics	+10 to +50 °C									
Air humidity	sensors	5 to 95 % (non condensing)									
Electromagnetic compatibility (EMC)		DIN EN 61326 Spurious emission									
		DIN EN 61000-6-2 Immunity to interference									
Protection class	electronics & sensors	IP 54									

FSO = Full Scale Output

1) The measuring range for insulators is approximate and depends on the relative dielectric constant of the insulator

2) Factory setting with reduced specs

3) With low pass filter

4) Referring to el. conductor (metal)

5) At reference temperature 20 °C and steady state

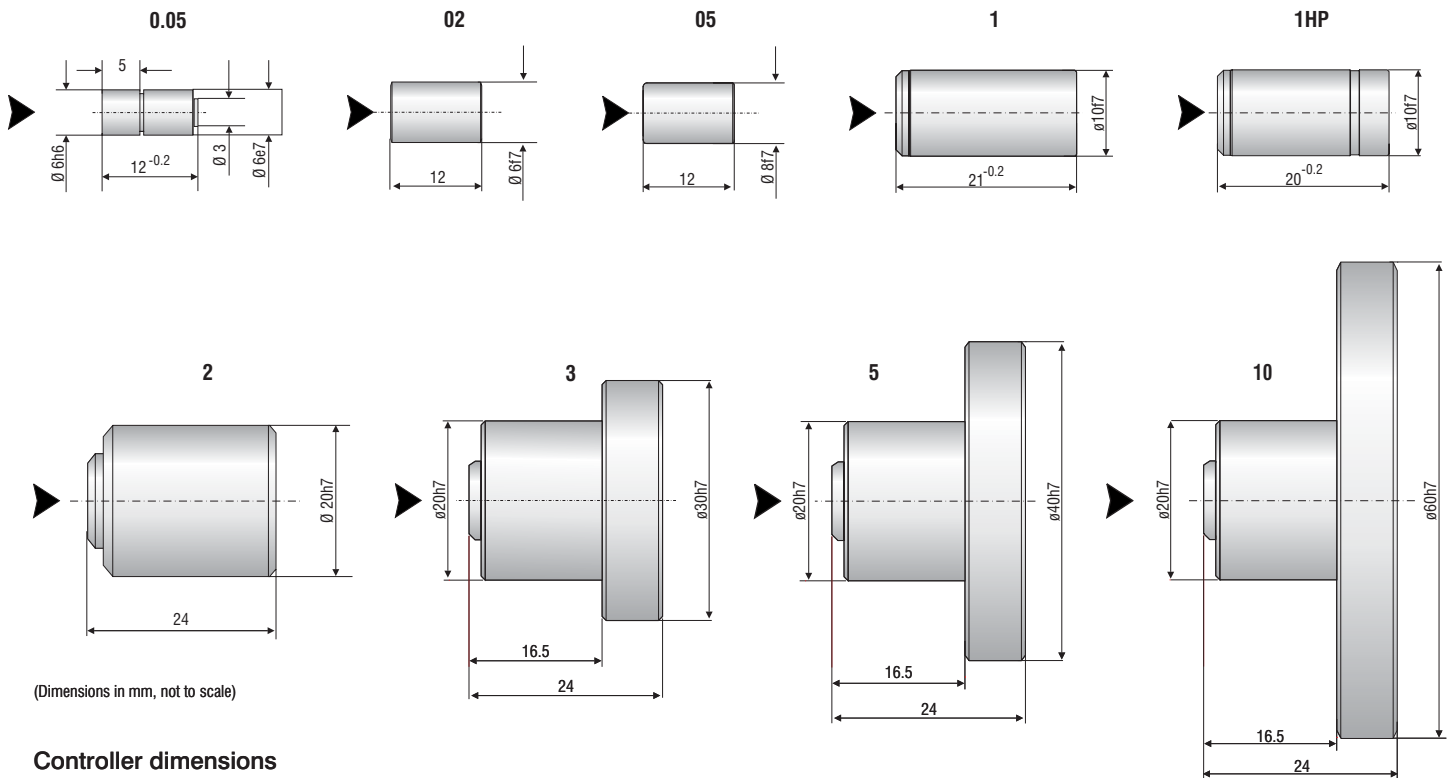
Accessories

Power- and output cable, 3 m long, 8-pin
 Power supply for mounting in cabinets
 Output ±15 VDC / 500 mA,
 Input 90 - 262 VAC

Micrometer calibration fixture
 Range 0 - 2.5 mm
 Division 0.1 μm
 for sensors
 Digital micrometer calibration fixture
 Range 0 - 25 mm
 Adjustable offset (zero), for all sensors

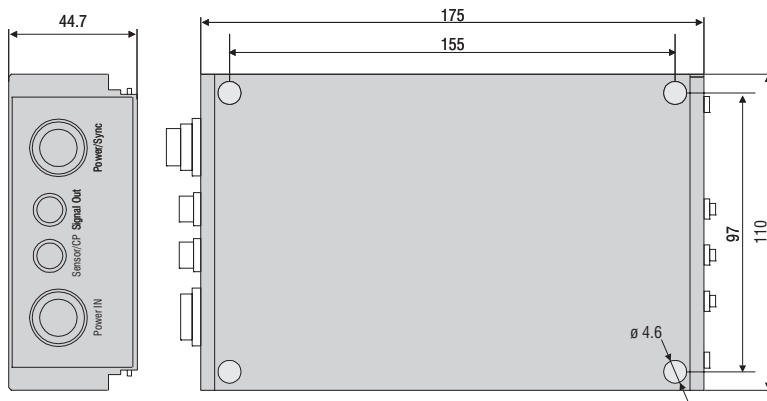
Digital signal processing unit with display for synchronous processing of two channels
 Signal output cable for multi-channel operation
 Supply-/synchronisation cable for multi-channel operation

Sensor dimensions



(Dimensions in mm, not to scale)

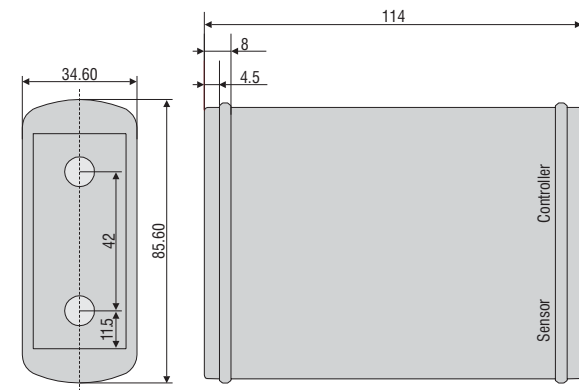
Controller dimensions



connector

Dimension	Fit tolerance (μm)
6h6	0 - 8
6e7	-20 - 32
6f7	-10 - 22
8f7	- 13 - 28
10f7	- 13 - 28
20h7	0 - 21
30h7	0 - 21
40h7	0 - 25
60h7	0 - 30

preamplifier dimensions



(Dimensions in mm, not to scale)

Mounting adapter for

