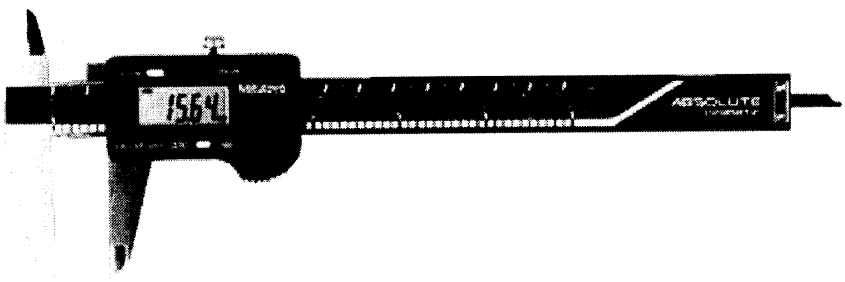
SERIES 500 Economy type Digimatic ABSolute Caliper

Prev Page



Features

- ✓Large LCD display
- ✓Imperial/Metric conversion
- ✓Origin Setting
- ✓Zero setting/ABSolute featur
- ✓Error free with no overspeed
- ✓Incorporates Quadri feature
- ✓Lock nut
- ✓Solar powered model availabl

Accuracy

± 0.02mm

Measurement applications

Easy to read LCD display for quick accurate 4-way Quadri measurement.

Series 500 Metric/Imperial model (Without data output)

Range	No.	Resolution
150mm/6"	500-191U	0.01mm/0.0005"

Additional Features Explai

ABS ABSolute Precision Functi

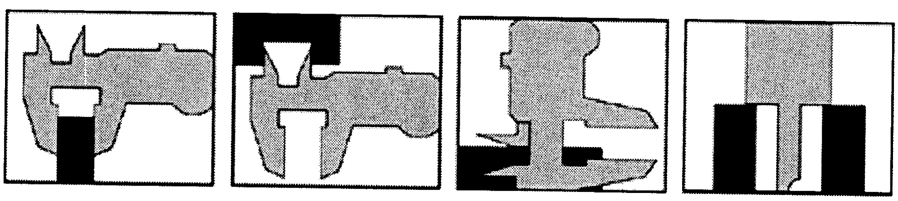
Quadri Function

Technical Drawing

Quadri Feature
Page 1 of 1

Quadri Feature

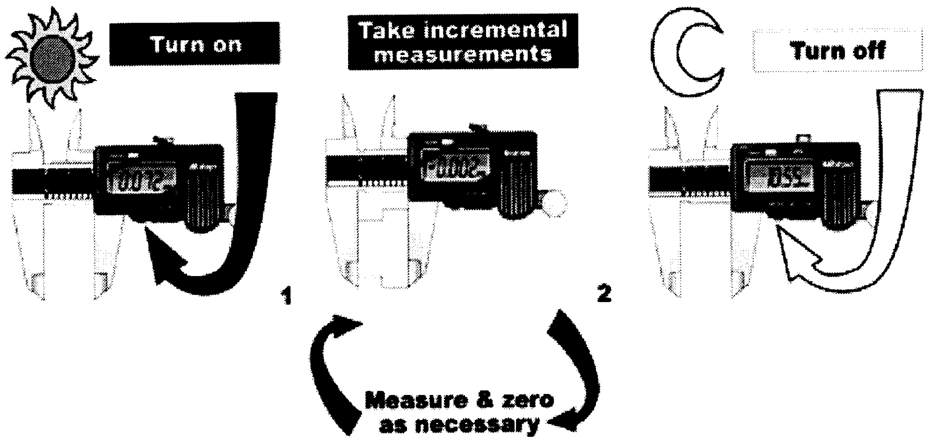
The Quadri Feature allows four ways of measuring. When a workpiece measurement is being taken, this feature allows exactly the same meqasurement result to be given in each of the four measurement methods.



External measurement | Internal measurement | Step measurement | Depth measurement

ABS ABSolute Precision Function

The origin point once set is permanent until changed, regardless of whether the power is on or off (unless battery is removed). This function means overspeed errors are a thing of the past. Incremental mode can be engaged for complete flexibility of Go/No Go measurement.



Detailed Technical Information

The absolute electrostatic capacitance encoder that Mitutoyo developed is configured as shown in Fig. 1.

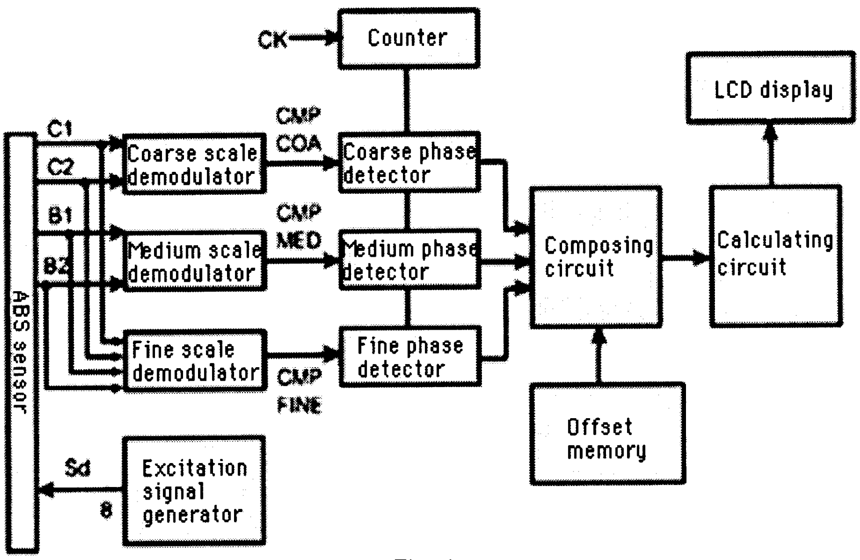
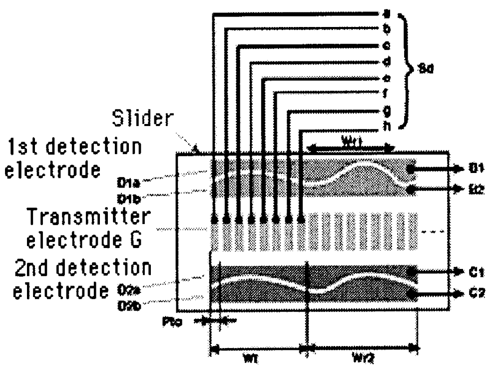


Fig. 1

The ABS sensor in Fig. 1 consists of a main scale and a slider which slides along the main scale, as shown in Fig. 2. The sensor detects changes in capacitive-coupling between the electrodes arranged on the slider and main scale, and takes this detected change as the change in positional displacement.



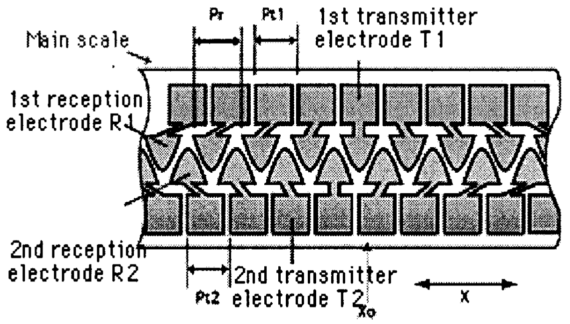


Fig. 2

The transmitter electrode G is arrayed on the slider at a specified pitch Pto and is capacitive-coupled to the 1st reception electrode R1 and the 2nd reception electrode R2 arrayed at a pitch Pr on the main scale. R1 and R2 are connected to the transmitter electrodes T1 and T2 which are spaced longitudinally along the array at pitches Pt1 and Pt2. T1 and T2 are capacitive-coupled respectively to the 1st detection electrodes D1a & D1b and the 2nd detection electrodes D2a & D2b on the slider.
G is a series of electrodes in which each electrode is connected to evry eighth electrode constituting an array of 8 electrodes. This electrode array is supplied with an 8-phase periodic signal in which each phase is shiffed by 45 degree, as the drive signal Sd. This drive signal Sd is chopped by a high frequency pulse into the signal shown in Fig. 3, and is generated and output from the excitation signal generator in Fig. 1. The pitch Wt of the electric field pattern created when the drive signal Sd is supplied to G is 8 times the pitch Pto of the G itself. This pitch Wt is set as an N times (e.g.N=3) of the pitch Pr of R1 and R2. In this way, an N pieces (e.g.N=3) of R1 and R2 electrodes are always capacitive-coupled to the arrayes of eight electrodes G. R1 and R2 are triangular (or sin waveform) in shape and arrayed so that the electrodes are in mesh with one another. The phase of the signal received by each R1 and R2 is determined by the capacitive-coupling area between G and the respective R1 or R2 as the function of the relative position of the slider and main scale.

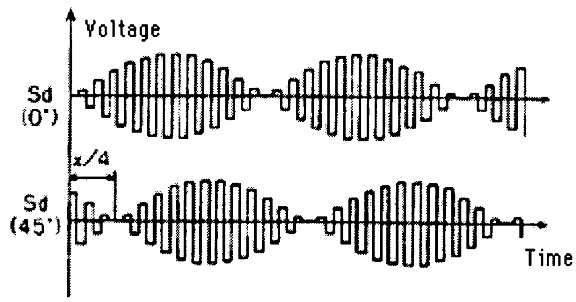


Fig. 3

If R1 and R2 are arranged at the same pitch as T1 and T2, D1a, D1b, D2a and D2b detect a periodic signal that is repeated every time the main scale X position changes only the pitch Pr. However, so that this ABS sensor is capable of detecting coarse, medium and fine displacement, T1 and T2 are actually deviated D1 and D2 with respect to R1 and R2. The deviation D1 and D2 can be expressed as follows, using a function for calculating the distance x in the measurement direction from their respective reference positions x0.
D1(x)=(Pr-Pt1)x/Pr
D2(x)=(Pr-Pt2)x/Pr

In this way, if T1 and T2 are deviated with respect to R1 and R2 and a waveform of a pitch Wr1 (e.g.: 3Pt1) and Wr2 (e.g.: 3Pt2) is created by the 1st detection electrodes (D1a & D1b) and the 2nd detection electrodes (D2a & D2b), it is possible to measure the demodulated detection signal of the 2nd detection electrode array using the drive signal phase shown in Fig. 3. And, from the 2nd electrode array, it is possible to obtain a detection signal (B1 & B2, C1 & C2) in which the small period Pr of the R1 and R2 is superimposed on the large period PrXWt/(Pr - Pt2) and PrXWt/(Pr-Pt1) corresponding to the deviations D1 (x) and D2 (x), as shown in Fig. 4.

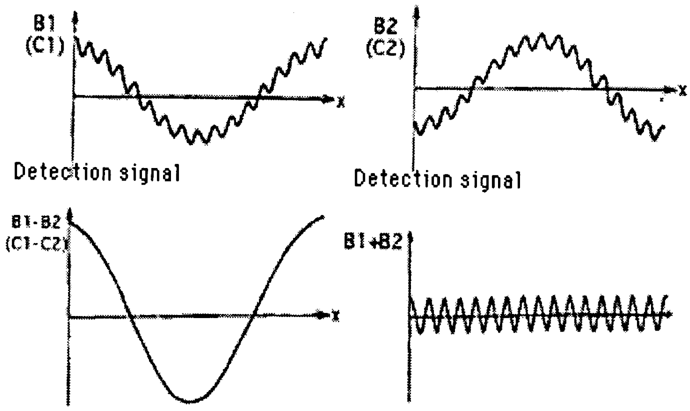


Fig. 4

Here, when the large and small periods are separated using the below equations, the detection signals are obtained from each of the coarse, medium and fine scales.
C1-C2 (Coarse scale)
B1-B2 (Medium scale)
B1+B2 (Fine scale)

The truth of the matter is that, because the drive signal Sd is a periodic signal without a specially fixed phase, a phase signal CMP of a short waveform that carries the phase data in the edge is generated when the signal from the ABS sensor is processed by the coarse, medium and fine scale demodulators shown in Fig. 1. In these scale demodulators, position data is converted into phase after undergoing a series of processing at the drive signal Sd chopping frequency, such as sampling, mixing, low band filtering and binary coding.

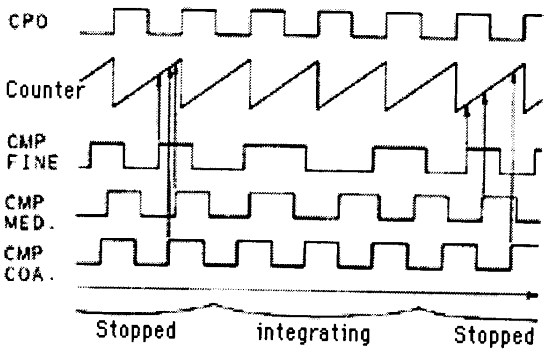


Fig. 5