EXPERIMENT -12

STUDY AND CALIBRATION OF LVDT TRANDUCER FOR DISPLACEMENT MEASUREMENT

Aim:

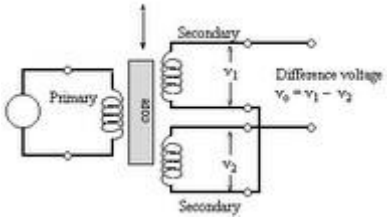
To Calibrate Linear variable differential transformer (LVDT) for the performance using micrometer.

Apparatus:

LVDT, Digital Indicator, Micrometer.

Theory:

LVDT consists of a cylindrical former where it is surrounded by a one primary winding in the center of the former and two secondary windings at the sides. The number of turns in both the secondary windings are equal, but they are opposite to each other, ie., if the left secondary windings is in the clockwise direction, the right secondary windings will be in the anti-clockwise direction, hence the net output voltages will be the difference in voltages between the two secondary coil. The two secondary coil is represented as S_1 and S_2. Esteem iron core is placed in the center of the cylindrical former which can move in to and fro motion as shown in the figure.



Principle:

LVDT works on the principle of mutual induction, and the displacement which is a non-electrical energy is converted into an electrical energy. This transducer converts linear motion to a voltage signal.

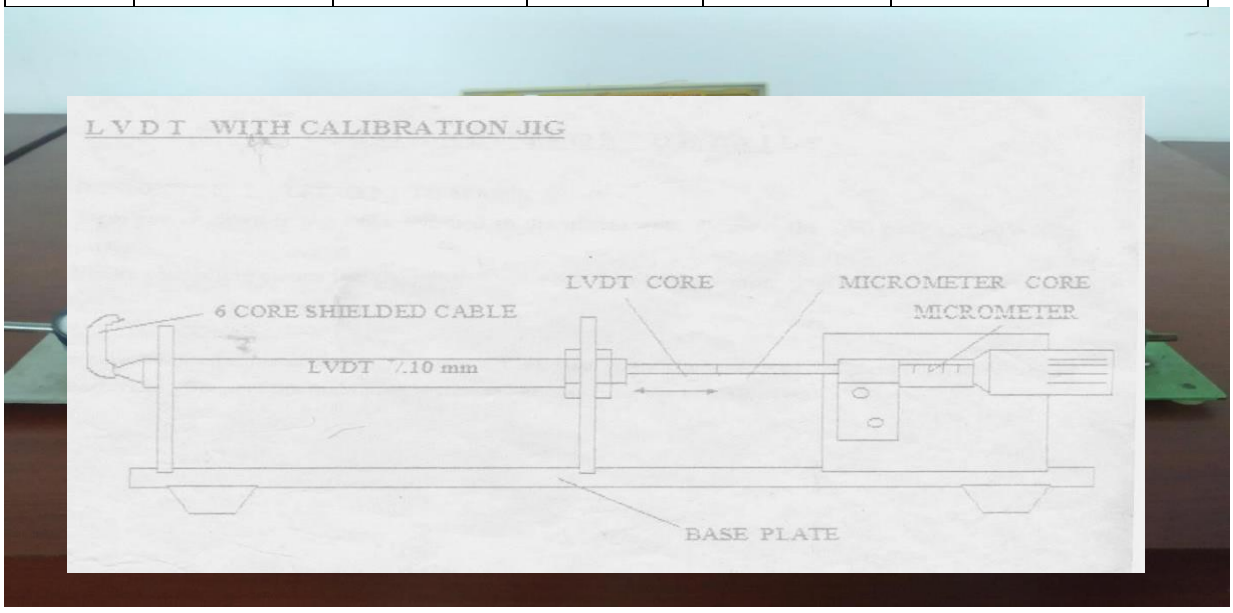
S P E C I F I C I A T I O N S

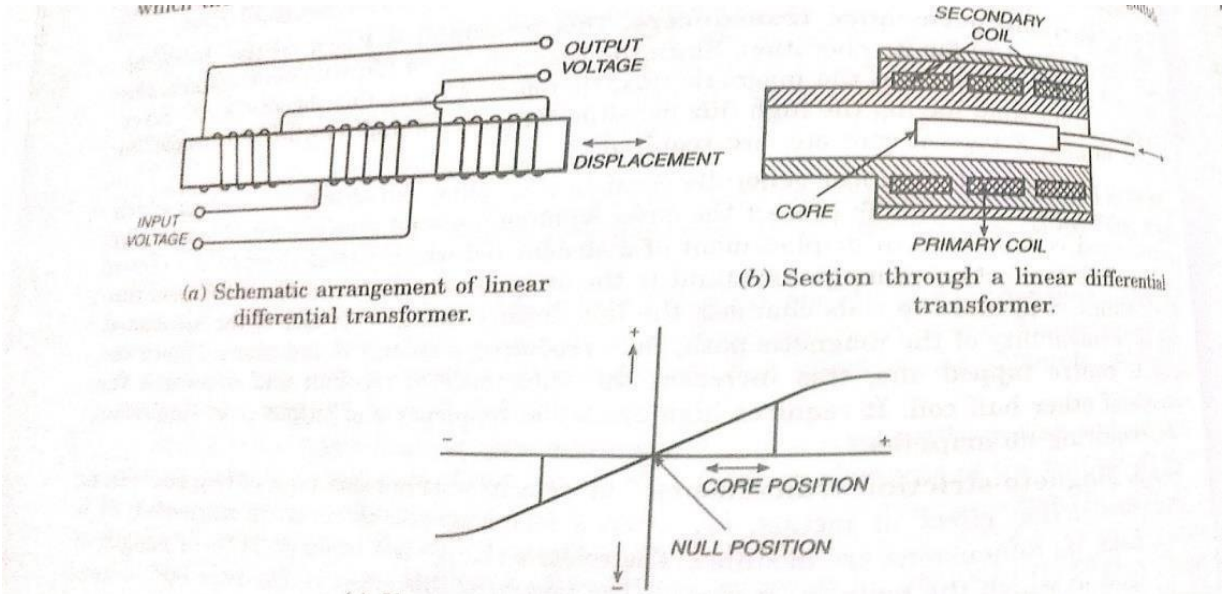
INDICATOR

DISPLAY : ½ digit seven segment red LED display of Range 200mV for full scale deflection.
OPERATING TEMPERATURE : $+10^0$ c to 55^0C
ZERO ADJUSTMENT : Front panel through Potentiometer
SENSTIVITY : 0.1 mm
SYSTEMINACCURACY : 1%
REPEATABILITY:1%
CONNECTION :Through 6 core shielded cable within connector.
FUSE : 250mA fast glow
type. POWER : 230 V +/- 10%,
50Hz

Display for +ve side:(Anti clockwise rotation): Pull Position

No	Actual Ra Reading, (mm)	Measured Reading,Rm (mm)	Error = (Rm - Ra) (mm)	Correction= (Ra - Rm) (mm)	Absolute %Error= [(Rm - Ra) / Rm] * 100
1	+ 0.5	+ 0.4	- 0.10	+ 0.10	25.00 %





(a) Schematic arrangement of linear differential transformer.

(b) Section through a linear differential transformer.

The experiment can be carried out for both +ve and –ve sides.

1. Connect the power cable to 230V, 50Hz to mains and switch on the instrument.

2. Make the display to read zero(000) by using zero knob.

3. Connect the LVDT cable pins to the instrument with proper color code.

4. Makethedisplaytoreadzerobyrotatingthemicrometer.Thisiscallednull balancing and note down the micrometer reading.

5. Give the displacement of 5mm by rotating the micrometer from the null position either clockwise or anticlockwise.

6. Then display will be read5.00mm.if not adjust the display by using Calknob. Now the instrument is calibrated.

7. Again rotate the micrometer to null position and from the retake down the reading in steps of 1m,.
   that is on both the sides.

8. Plot the graph micrometer reading v/s display reading (Actual reading v/s Measured reading)

Observations:

Range of Micrometer. : ----------
Least count of Micrometer. : ---
------- Linearity Range of LVDT.
: ----------
Least count of LVDT. : ----------
Initial reading of Indicator (null position): Micrometer reading at null position.
Parameter relations:
1. R
a
=Actual Reading (Pressure gauge reading)
2. Rm=Measured Reading (Indicator reading)
3. Error (E)=Rm- R
a
4. A b s o l u t e %Error= (Error/ Actual reading)*100
Specimen calculations:
Considering the first observation, the specimen calculations are as follows.
Actual Reading, Ra = + 0.5 mm
Measured Reading, Rm = + 0.4 mm
Error = R
m -R
a = + 0.4 – 0.5 = - 0.1 mm

Correction = - Error = R

a -R

m = + 0.5 – 0.4 = + 0.1 mm

Absolute %Error = [(R

m -R

a) / R

m] * 100 = (0.4 – 0.5)*100/0.4 = 25.00 %

Tabular column:

Display for –ve side: (clockwise rotation): Push Position

Sl.no	Actual Reading,Ra (mm)	Measured Reading, Rm (mm)	Error= (Rm - Ra) (mm)	Correction= (Ra - Rm) (mm)	Absolute %Error= |[(Rm - Ra) / Rm] * 100|
1				nm)	
2					
3					
4	- 2.0	2.1	- 0.10	+ 0.10	76 %