INSTRUCTION MANUAL

Digital Tape Extensometer
Model SME 2330

SENSORS & MEASUREMENTS ENTERPRISES
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DIGITAL TAPE EXTENSOMETER (MODEL SME 2330)

1. SPECIFICATION :

Measurement Range	:	0.7 meter to 10, 15 or 30 meters.
Least Reading	:	0.01 mm (Digital Display)
Accuracy	:	0.1 mm
Dimension	:	Instrument case 60cm x 25 cm x 9 cm.
Accessories	:	* Eye bolts.
	:	* Bore hole anchor.
	:	* Calibration jig.
Spares	:	Suitable perforated tape 10 to 30 meter.

2. GENERAL INFORMATION:

PURPOSE:

The SME Digital Tape Extensometer (Model SME 2330) is a reliable instrument and designed to measure accurately the changes in the distance between two measurement points. The distance be anything between 0.7 meter to 10, 15 or 30 meters apart. The coarse measurement is done with the help of a equidistance perforated punched tape and the fine measurement is done on a digital vernior of range 0-50 mm with 0.01 mm lease count. The digital vernior range is 25 mm.The measurement accuracy 0.1mm can be easily achieved with a little practice in data measurement.

CONSTRUCTION:

The basic details of construction are shown in fig.1. The construction includes the main body made of corrosion proof anodized aluminum alloy. One end of the instrument comprises of a tape clipping shaft or spring loaded plunger through cylindrical spring housing. Housing has a window through which a marker moves to check all measurement at fixed tension to eliminate sagging error of the tape. All data are taken when two aligning marks considers accurately to each other. One mark is provided on spring loaded plunger which moves through spring housing while the other mark is provided on spring housing window. Tape locating pin is also mounted on spring loaded plunger. The other end of the tape extensometer is comprises of a internal threaded housing through which a threaded shaft moves to make fine adjustment on a digital vernier. A knurled cap is provided for smooth movement of shaft. A measurement window on the body of the main housing is provided for seeing the fine measurement of digital vernier .

3. INSTALLATION AND MEASUREMENT PROCEDURE:

Reference anchors are installed at the measuring points between which measurements are to be taken. Reference anchors may be either groutable type or expandable anchor type. Basically for measurement an eye bolt is needed which is provided with both groutable type or expandable type anchors on which the tape extensometer can be hooked. For installation of expandable anchors a hole of EX sixe (38 mm), 15 cms, deep is drilled and the same can also be used for groutable anchors. In case of expandable anchors first the anchors are installed and then the eye bolts are screwed and locked in position, where as in case of groutable anchor type a 18 mm tor steel rod is welded to eyebolt outside the hole. Once the anchors are installed measurement can be followed as given below:-

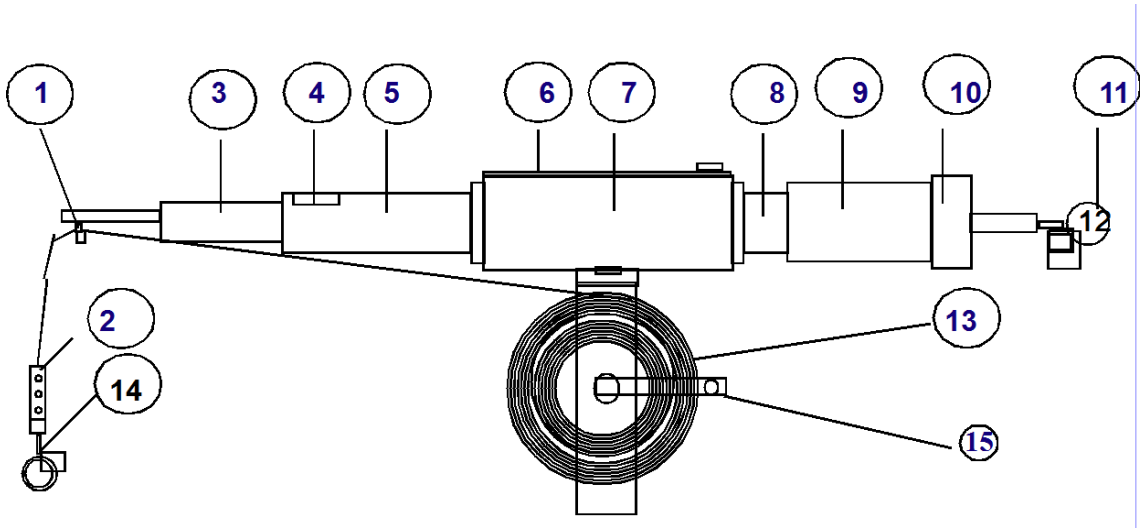
(i) Remove the tape extensometer from the box and unscrew the knurled cap completely (Don't try to further unscrew once it reaches to the end of digital vernier range i.e. 26.00mmPlace the hook of tape at any one eye bolt of reference anchor.

(ii) Unreal the tape slowly and move towards other reference anchor until the other reference anchor is reached. The fixed hook of the tape extensometer is then hooked around second reference anchor.

(iii) Pull the tape and locate the best possible hole in the tape locating pin.
Please note that if correct hole has been chosen it will be possible to achieve correct tension on the tape while still being within the range of the dial vernier. At this stage give proper holding support to tape extensometer, otherwise naturally it will cause mark ably sag to tape and will also create high friction to spring loaded plunger and its spring housing.

(v) Now holding the tape extensometer with proper support in one hand start tightening the knurled cap with free hand to adjust the tape tension. Go on tightening the knurled cap until marks on spring load plunger is accurately in alignment with index mark on spring housing window (It has about 20 mm-movement). For correct alignment please go through figure 2 of this manual. When the correct tension is applied to the tape, the two marks will be in one line and at this position the two reference points will be directly in the axis of tape extensometer. Please note while reaching near to alignment always move nurled cap very slow so as it should never cross the marking line. If by mistake the two marks are crossed each other, never align the marks by just unscrewing the nut a little and aligning the two marks. Please note that once if even by mistake you are crossing over the aligning marks always loose the knurled cap and bring the shaft mark behind housing mark at least by 2 mm and now again realign it with proper care. During alignment no up- ward or downward pressure should be applied. Hand should only just to support the tape extensometer.

Detail diagram of digital tape Extensometer



S.N.	Item
1.	Tape clipping pin
2.	Hook holder
3.	Spring loaded plunger
4.	Tension Window
5.	Spring housing
6.	Display window

S.N	Item
7.	Main housing
8.	Threaded shaft
9.	Threaded Housing
10.	Knurled cap
11.	Fixed hook
12.	Tape holder

S.N	Item
13.	Punched tape
14.	Tape Hook
15.	Tape Handle

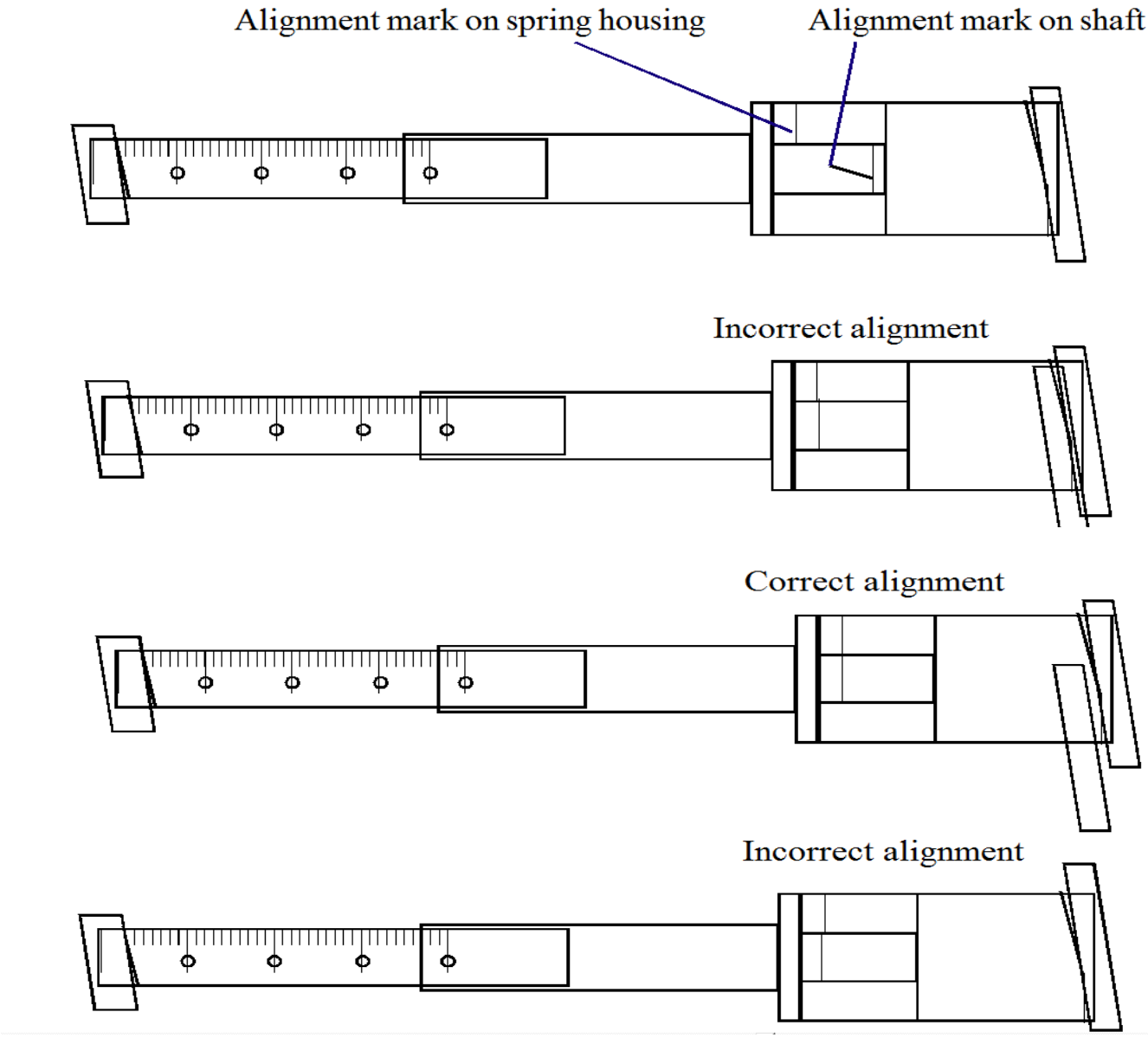
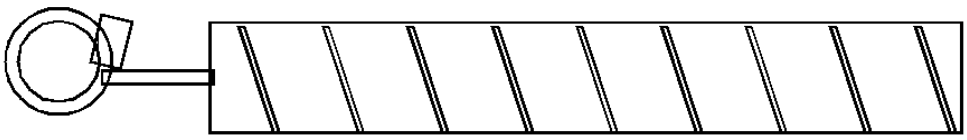


Figure 2. Correct position of index mark or aligmnment mark is shown above



Groutable torr steel anchor

(vi) Once the marks are aligned properly as per instruction, measurement procedure is over and note down the distance between the references anchors as explained below.

* Data of tape in meters & centimeters at tape hole available to read nearest to the spring loaded shaft . (Never note data of punched hole located on the pin).

* Digital vernier data in millimeter .
* For actual measurement subtract digital vernier data from tape data .

For more clarity to understand the above, it is explained below with example . It is also to be noted where the field conditions have a lot of temperature variation a temperature correction factor is also taken into account.

The coefficient of expansion of steel tape is:-

11.6×10^{-6} per deg Cent.

The correction for temperature is positive for rising temperature and negative for falling temperature change.

It will be necessary to select a base line generally the temperature at first measurement or otherwise 0^0C. Once 0^0C is the base line, even first data needs to be corrected. Where as in first case only change in temperature is needed. Generally initial data temperature is taken as base line temperature.

EXAMPLE :

An initial data is taken at 20^0C and a subsequent data is taken at 30^0C.Say at initial data is such that the tape reads 11.48 meters. While the data of digital vernier is 14.19

The above measurement is

11.48 meter
- 14.19 mm

11.46581 meters

Say similarly subsequent measurement is 11.45248 at 30^0C i.e. a increase of temperature of 10^0C from base line temperature. The correction is applied to

11.45 m x 11.6 x 10 x 10^{-6} meter i.e. 0.00133 meter

So at 10^0C temperature increase tape length is increased by 0.00133 meter due to temp.change. So this should be added to data to get actual measurement.

The actual measurement at 20^0C will be

11.45248 + 0.00133 meter
= 11.45381

Therefore actual change in measurement is

= 11.46581 - 11.45381
= 0.012 meter
= 12 millimeter

It indicates that the reference anchors are closed by a distance of 12 millimeters.

4. MAINTENANCE :

Proper care to keep the instrument clean is a must for its long term reliability and life. OILING OF SPRING PLUNGER AND THREADED SHAFT IS NOTRECOMMENDED as it will allow dirt to

adhere to the instrument. The tape should be lightly oiled at intervals and should be properly cared like any
other precision surveying tape. Tape should be protected from being kinked and

extra care should be taken to prevent traffic movement over the tape during use.
While reeling back the tape it should pass through a rag to remove dirt or moist true.

A recalibration on calibration jig at regular interval and a suitable correction through locking and setting nut will further maintain the accuracy of instrument.

5. INSTRUCTION FOR CHANGING THE TAPE ON THE TAPE EXTENSOMETER:-

Remove the old tape by unreeling it and unscrew the end clamping screw on a clean floor. Re-reel it outside and remove it from working place.Un-reel the new tape on the floor and clamp its back end on the reel with clamping screw and put on the reel as earlier. Always a recalibration and resetting of setting nut is recommended after changing a tape.

TAPE EXTENSOMETER CALIBRATION JIG

Tape extensometer calibration jig is required for re- calibration of tape extensometer at regular interval to eliminate the error produces due to work out of internal part during regular use for long time. It is not always necessary to have some error but it is a precaution from user points of view.

DESCRIPTION:
It is an M.S frame with two pillars at a fixed distance. Each pillar is mounted with a hook suitable to hold tape extensometer hooks. These hooks are mounted with nuts at a fixed distance and the same measurement is stamped on the jig to check the calibration of tape extensometer when it is calibrated on the jig any minor correction if required is possible only on tape extensometer .

NEVER TRY CHANGE THE POSITION OF HOOKS PROVIDED ON CALIBRATION JIG.

CALIBRATION PROCEDURE:
Switch on the digital measurement push button provided on the top of instrument. Before starting any measurement always unscrew the fine adjustment nut completely. At this position vernier will read around-2 mm. Fix tape hook on the left hook of the jig and place other hook of the tape extensometer on the other side of the jig hook and fix the punched hold of the tape into the locating pin of the instrument at closest possible hole and slide the positioned over tape. As generally jig is designed for 70.0 cms measurement so the position of punched hole will be 70 cms. Now once the tape is fixed to its position start rotating the fine adjustment nut clock wise and align the alignment mark. You will find that it will always measure 40.00mm on digital vernier so the actual measurement will be:-

Data on tape : 0.68 Meters
Data on digital vernier : 0.020 Meter (20mm)
So the actual measurement : Tape Data + Vernier Data
ie.0.68 + 0.020 Meter =0.70 meters
This can be further cross checked by keeping tape position at 64.00 cms.

TAPE EXTENSOMETER CALIBRATION JIG FOR 750MM FRAME

Tape extensometer calibration jig is required for re- calibration of tape extensometer at regular interval to eliminate the error produces due to work out of internal part during regular use for long time. It is not always necessary to have some error but it is a precaution from user points of view.

DESCRIPTION:
It is an M.S frame with two pillars at a fixed distance. Each pillar is mounted with a hook suitable to hold tape extensometer hooks. These hooks are mounted with nuts at a fixed distance and the same measurement is stamped on the jig to check the calibration of tape extensometer when it is calibrated on the jig any minor correction if required is possible only on tape extensometer .

NEVER TRY TO CHANGE THE POSITION OF HOOKS PROVIDED ON CALIBRATION JIG.

CALIBRATION PROCEDURE:
Switch on the digital measurement push button provided on the top of instrument. Before starting any measurement always unscrew the fine adjustment nut completely. At this position vernier will read around -20 mm. Fix tape hook on the left hook of the jig and place other hook of the tape extensometer on the other side of the jig hook and fix the punched hold of the tape into the locating pin of the instrument at closest possible hole and slide the positioned over tape. As generally jig is designed for 76.0 cms measurement so the position of punched hole will be 76 cms. Now once the tape is fixed to its position start rotating the fine adjustment nut clock wise and align the alignment mark. You will find that it will measure - 20.00mm on digital vernier so the actual measurement will be:-

Data on tape : 0.74 Meters
Data on digital vernier : 0.020 Meter (20mm)
So the actual measurement : Tape Data + Vernier Data
i.e.0.74 + 0.020 Meter =0.76 meters

This can be further cross checked by keeping tape position at 72.00 cms.

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