TRIMOS

TVM

User's manual Mini-Vertical TVM301/301G/601/601G

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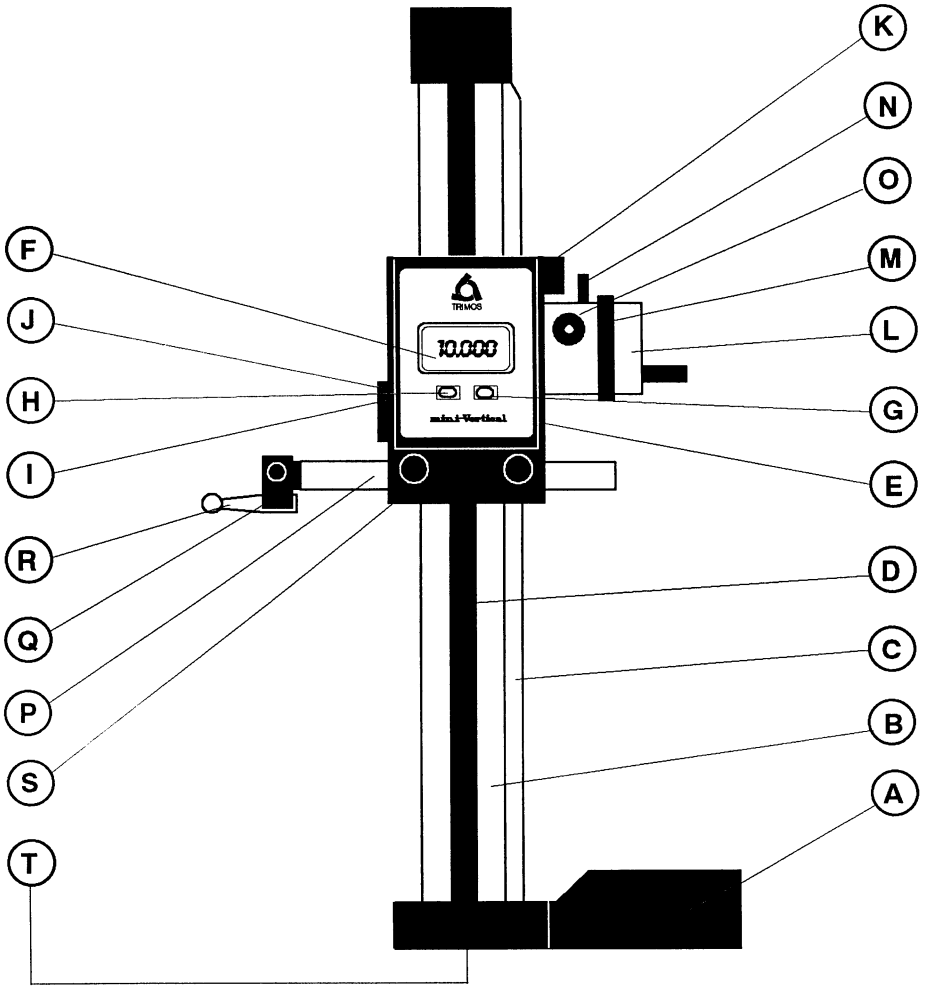
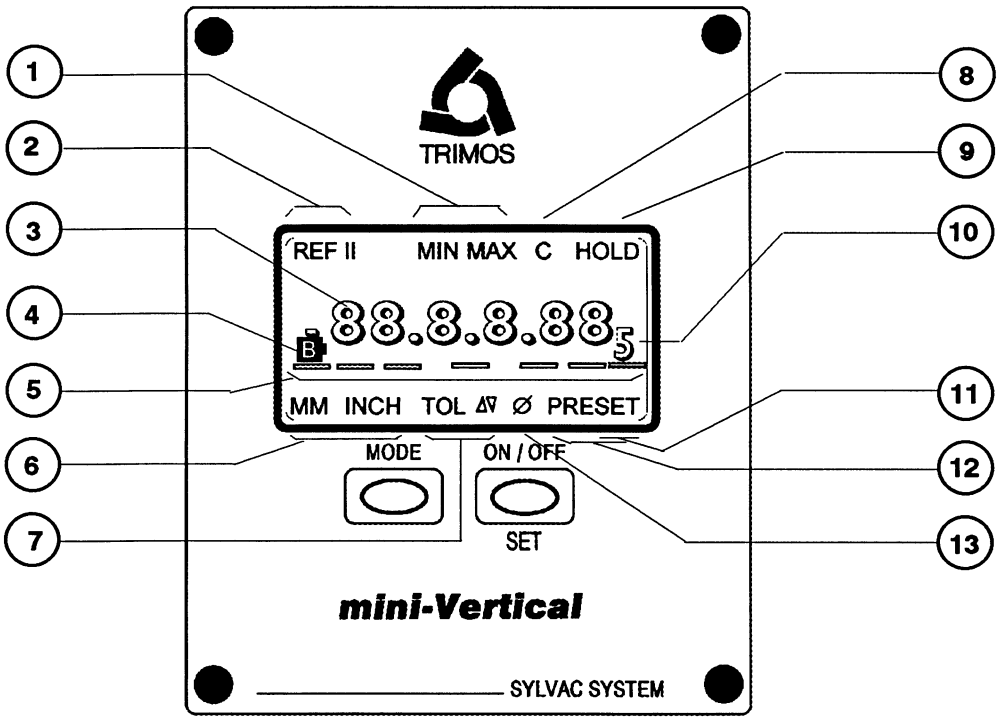
I. 1 Instrument construction



A. Cast iron base of functional design (hammered finish lacquer coating).
Alternatively a granite base can be supplied.
B. Measuring column, of hard chromed steel and precision ground.
C. Guide bar.
D. Protected scale. Patented **SYLVAC** measuring system.
E. Measuring carriage (its movement is axially controlled by ball races) containing the Sylvac electronic display unit, a handwheel and a probe holder location. (balanced by a counterweight).
F. LCD digital display.
G. **ON/OFF** and **SET** switch.
H. **MODE** selector switch.
I. Battery compartment (battery: 1x3V,lithium).
J. Data output (opto coupler RS232C).
K. Locking knob (to lock the measuring carriage during the scribing process).
L. Handwheel for easy displacement of the measuring carriage.
M. Pre-load ring for setting of a constant measuring force in either direction.
N. Locking lever when using fine adjustment screw.
O. Fine adjustment screw.
P. Interchangeble probe holder (TVM1) with connector (TVM1.1) to fix various accessories.
Q. Connector (TVM1.1) having 8mm/.315" location bore.
R. Interchangeable probes.
S. Knurled knobs to fix the probe holder in position.
T. Locking screw to fix counter weight during transport.

II. 1 Functions of the display



1. MIN/MAX function indicator
2. Reference (REF I or II) indicator
3. Indication of value
4. Battery life warning display (B)
5. Cursor for PRESET and TOL input
6. Measuring unit (MM/INCH) indicator
7. Tolerance (TOL) mode indicator
8. Indication of non-active (locked) display (C)
9. HOLD function indicator
10. Display in inch mode of .0005" or .00005"
11. PRESET mode indicator and input of tolerance values (SET)
12. PRESET mode indicator
13. Two (o) times factor indicator

III. 1 Specifications

	TVM301/301G	TVM601/TVM601G
Measuring range	0 - 320mm/0 - 12.6"	0 - 620mm/0 - 24.4"
Resolution	0.01mm/0.001mm or .0005"/.00005"	0.01mm/0.001mm or .0005"/.00005"
Accuracy	20µm/.0008"	30µm/.0012"
Repeatability	5µm/.0002" (+/-2s)	5µm/.0002" (+/-2s)
Squareness (measuring direction) error max.	0.02mm/,0008"	0.03mm/.0012"
Max. displacement speed of meas. carriage	1m /sec. (40"/sec.)	1m /sec. (40"/sec.)
Number of measurements per second:		
Normal measuring mode:	12 measurements/sec	
Using min/max mode:	>20 measurements/sec	
Using tolerance mode:	10 measurements/sec	
Measuring force	approx. 3N	
Measuring units	metric/inch. (direct conversion)	
Measuring system	Patented SYLVAC measuring system	
Digital Display	LCD display : sign (-), 6 digits (7 in inch mode), height of digits: 8.5mm/.33", indication of active functions	
Power supply	1 lithium battery, 3 V, type CR2032, capacité 190 mAh.	
Type of batteries to be used	Toshiba CR2032 Maxell CR2032 Renata B/CR2032 Sanyo CR2032 Ucar CR2032 Panasonic CR2032 Rayovac CR2032 Varta CR2032	
Power consumption	80µA	
Battery life	1 year if normally used (approx. 2000 hours a year) When "B" is displayed, the remaining battery life will be slightly more than a day of use. (To protect our environment, please recycle the battery)	
Working temperature	+5 to +40°C / +41 to 104 F	
Data output	RS232 compatible	
Interface	RS232 compatible interface cable with opto-electronic coupler	

Dimensions

TVM with cast iron base:		
Total height:	513mm/20.2"	813mm/32"
Length and width of the base:	180x102mm/7.08"x4.02"	200x140mm/7.87"x5.52"
Weight	6.2kg/13.67lbs	10.5kg/23.15lbs
TVM with granite base:		
Total height:	558mm/22"	858mm/33.78"
Dimensions of granite base:	200x300mm/7.87"x11.8"	200x300mm/7.87"x11.8"
Surface accuracy:	grade I (5µm/.0002")	grade I (5µm/.0002")
Weight	14kg/30.87"	18.3kg/40.4lbs

IV. 1 Delivery

The Trimos Mini-Vertical is supplied as follows:

- Instrument according to specifications including a main probe holder, length: 150mm/5.9" (**TVM1**) with connector (**TVM1.1**) having a 8mm location bore and one ball probe dia. 8mm/ .315" (**TVM2**).
- 1 battery (lithium,3V) - Protection cover
- Instructions for use - Test and guarantee certificate

The instrument is supplied in a specially designed shockproof box and protected against dirt and dust by a protective cover. Whenever the instrument is transported, the original packing should be used.

DURING EACH TRANSIT THE COUNTER WEIGHT MUST BE LOCKED USING THE LOCKING SCREW (T). NEVER TURN THE INSTRUMENT UPSIDE DOWN (MORE THAN 90°) .

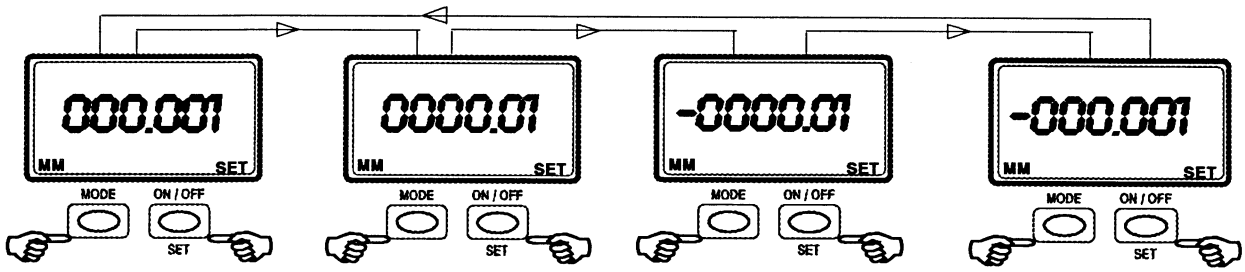
V. 2 Setting up

- Unpack the instrument, incline it. **NEVER TURN IT UPSIDE DOWN !**
- Release the counter weight locking screw (T) under the base (or under the granite base).
- Position the instrument on a measuring table.
- Clean the instrument using fine oil (do not lubricate the scale).
- Position the probe holder (P) and a probe (R) and lock it using the knurled knobs (S).
- Unlock the measuring carriage (E) by turning the locking knob (K) counter clockwise.
- Remove the rubber collar.
- Switch the digital display on (**ON**).- Check the movement of the measuring carriage by turning the crank of the handwheel (L) and check whether all the digits light up .

VI. 1 Measuring

VI.1.1 Setting of the measurement direction and the required resolution

- Lock the measuring carriage using the locking lever (**N**) of the handwheel to activate the fiine adjustment screw (**O**).
- Press **MODE** and **ON/OFF** key simultaneously.



- The digital display changes the resolution and then the measuring direction every second the keys are held. If you have obtained the required modes, release the keys.
  000.001 = negative direction and resolution of 1um. **0000.01** = negative direction and resolution of 10um.
  -000.010 = positive direction and resolution of 10um. **-000.001** = positive direction and resolution of 1um.
- The instrument is supplied in **-000.001** mode. These set parameters are memorized by the electronic and will be recalled each time the instrument is switched OFF and ON again.

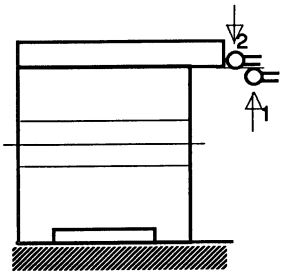
VI. 1.2 Measuring using rigid probes

of heights, distances, gaps, diameters (I.D. and O.D.), etc.

TO OBTAIN REPEATITIVE MEASUREMENTS, THE CONSTANT MEASURING FORCE MUST BE ACTIVATED.

- By turning the pre-load ring (**M**) counter clockwise to its stop, the measuring pressure will be set in downwards direction.
- By turning the pre-load ring (**M**) clockwise to its stop, the measuring pressure will be set in upwards direction.
- With the pre-load ring in neutral position, the measuring carriage is in a free state.

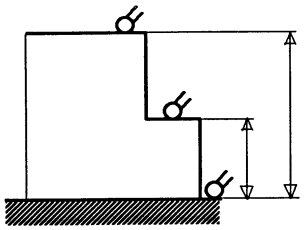
Most of the measurements require the **DETERMINATION OF THE PROBE CONSTANT** (dimension of the probe in use, deflections of its shaft caused by setting the measuring force). This probe constant is measured using the setting gauge **TVM 50**.



- Set the probe on surface **1**.
- Set measuring force in a downwards direction.
- Press **SET** key (zero).
- Remove measuring force.

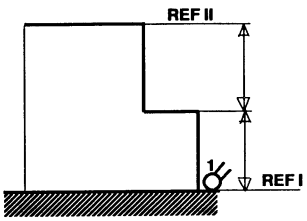
- Set probe from bottom on surface **2**
- Set measuring pressure in an upwards direction.
- The probe constant will be displayed.

VI. 1.3 Measuring of flat surfaces

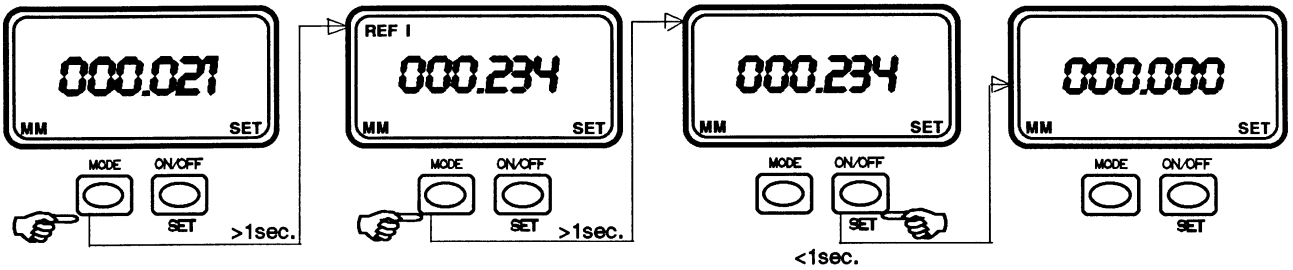


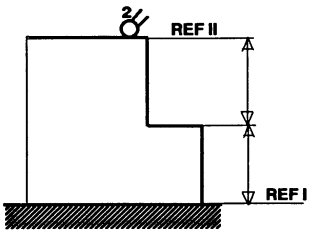
- Set the probe on the reference surface (plate or gauge block).
- Set measuring force in a downwards direction.
- Press **SET** key (zero).
- Remove measuring force.
- Set probe on the next surface.
- Set measuring force in a downwards direction.
- Value of distance will be displayed.
- Remove measuring force, etc.

VI. 1.4 Measuring of flat surfaces using two references (REFI and REFII)

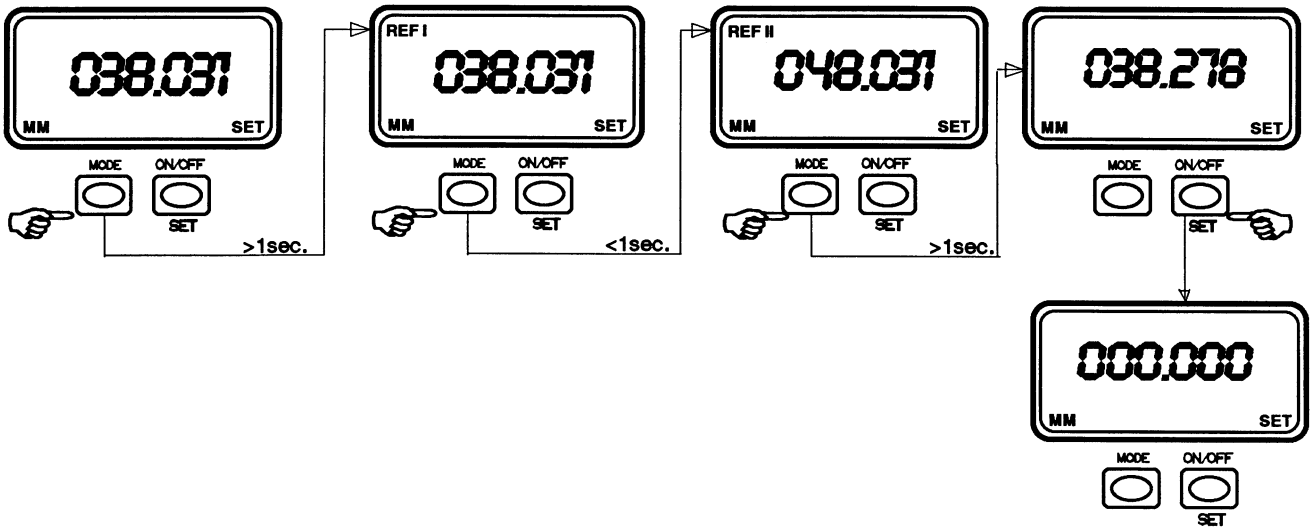


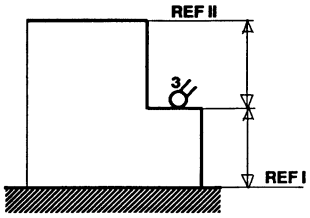
- Set the probe on surface **1.**
- Set measuring force in a downwards direction.
- Press **MODE** key a little longer than 1 second (>1sec.).
- Make sure you are in **REF I** mode.
- Press **MODE** key a little longer than 1second (>1sec.).
- Press **SET** key (zero).
- **REF I** is now set at zero (first reference)



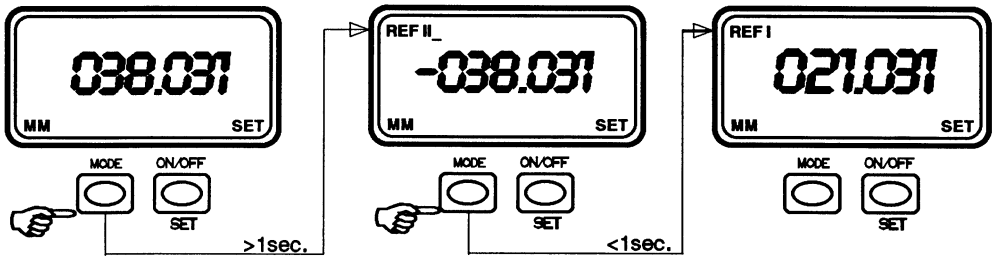


- Set probe on surface **2.**
- Set measuring force in a downwards direction.
- Press **MODE** key a little longer than 1 second (>1sec.).
- Make sure you are in **REF I** mode.
- Press **MODE** key a little less than 1 second (<1sec.).
- **REF II** will be displayed.
- Press **MODE** key a little longer than 1second (>1sec.).
- Press **SET** key (zero).
- **REF II** is now set at zero.



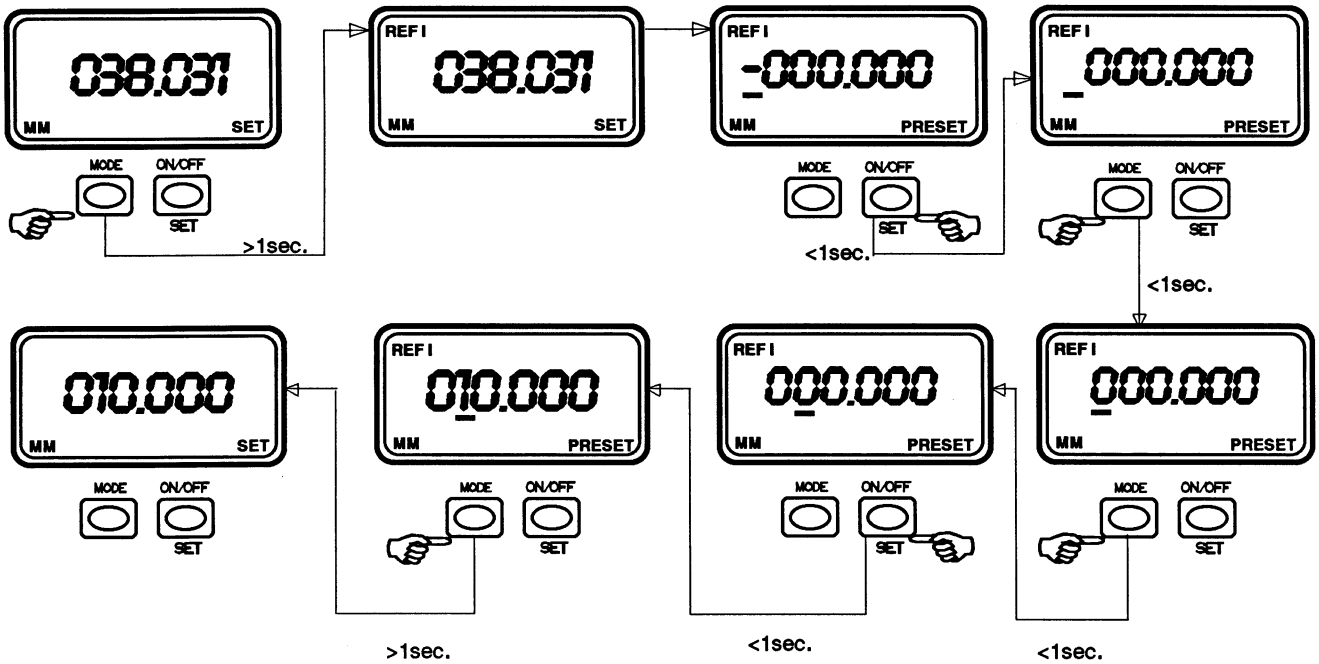


- Set the probe on surface **3.**
- Set measuring force in a downwards direction.
- Press **MODE** key a little longer than 1 second (>1sec.).
- You are in **REF II** mode and the displayed value is the one starting from **REF II** (zero).
- Press **MODE** key a little less than 1 second (<1sec.).
- Back to **REF I.** The displayed value is the one starting from **REF I** (zero).

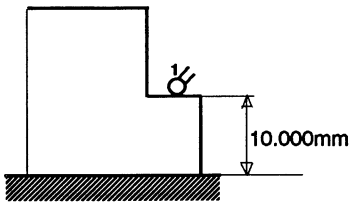


VI. 1.5 Measuring using one reference and PRESET input

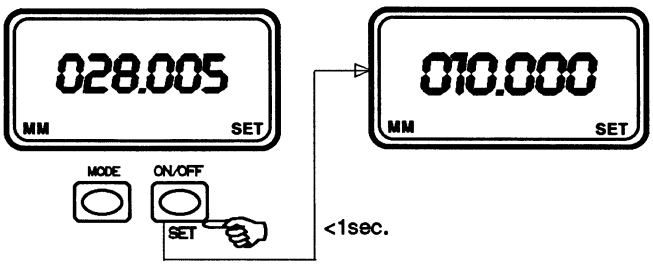
- Lock the measuring carriage in position using knob (**K**).
- Press **MODE** key a little longer than 1 second (>1sec.) until **PRESET** mode will be displayed.
- Release the **MODE** key at this moment.
- Press **SET** key to change the + or - sign (< 1sec.). A cursor is displayed.



- Press **MODE** key less than 1 second (<1 sec.).
- Press **MODE** key less than 1 second (<1 sec.) The cursor moves from one to the other digit.
- Press **SET** key (<1 sec.) to introduce a number, e.g. **1**.
- Press **MODE** key longer than 1second (>1sec.). Back into measuring mode which includes now a memorized value in **REF I.**
- Release the locking knob (**K**).

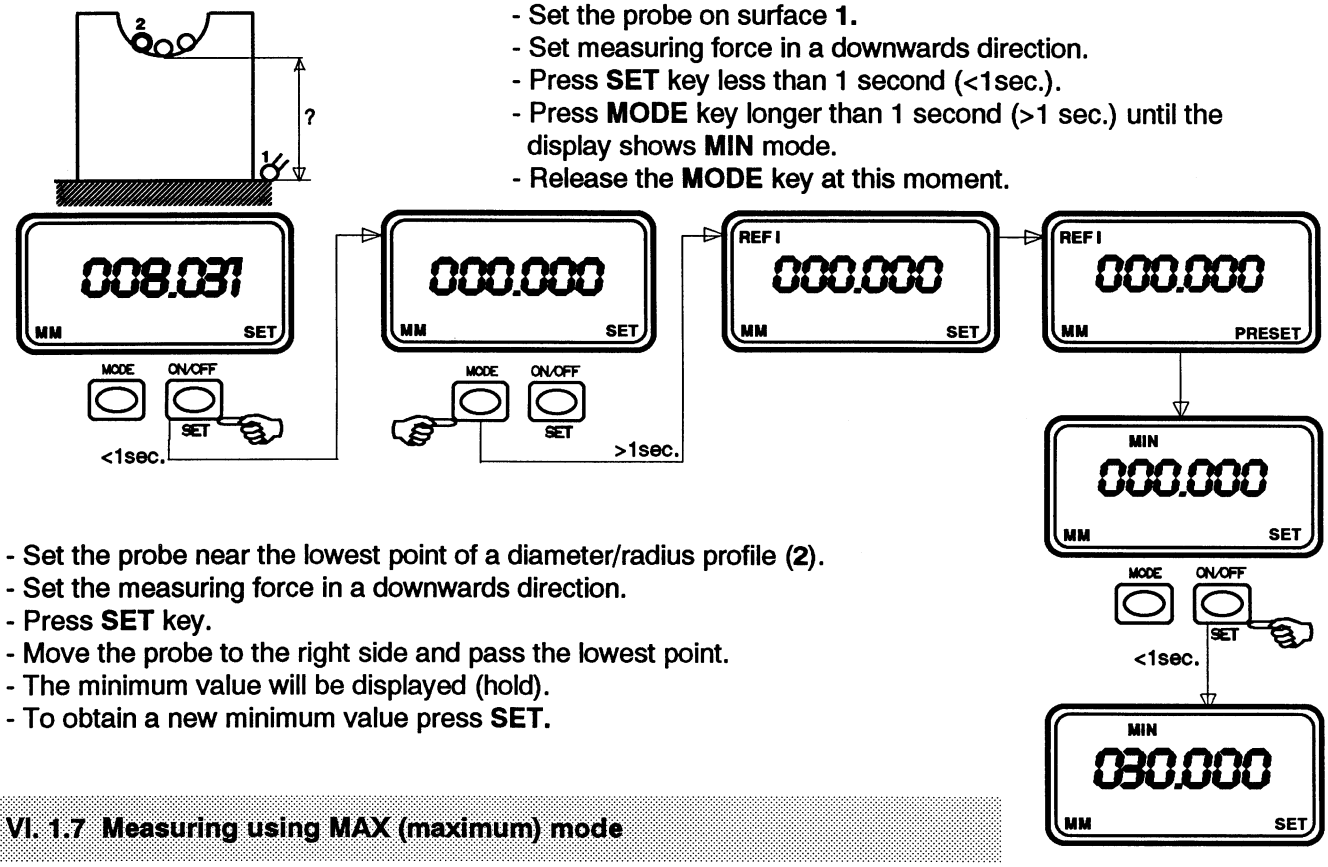


- Set the probe on surface **1.**
- Set measuring force in a downwards direction.
- Press **SET** key less than 1 second (< 1 sec.).



NOTE:
- To introduce a preset value in **REF II** proceed as for REF I.

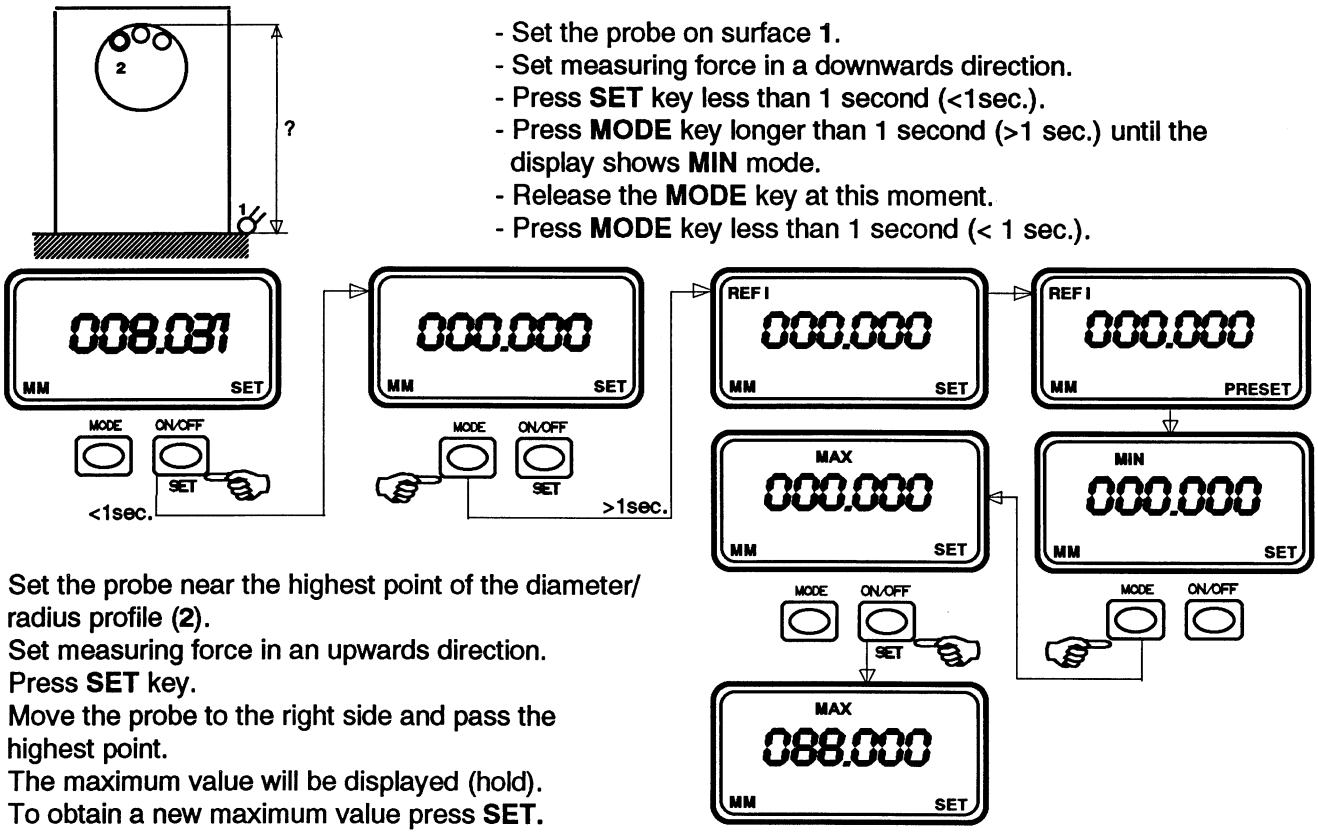
VI. 1.6 Measuring using MIN (minimum) mode



- Set the probe on surface **1.**
- Set measuring force in a downwards direction.
- Press **SET** key less than 1 second (<1sec.).
- Press **MODE** key longer than 1 second (>1 sec.) until the display shows **MIN** mode.
- Release the **MODE** key at this moment.

- Set the probe near the lowest point of a diameter/radius profile (**2**).
- Set the measuring force in a downwards direction.
- Press **SET** key.
- Move the probe to the right side and pass the lowest point.
- The minimum value will be displayed (hold).
- To obtain a new minimum value press **SET.**

VI. 1.7 Measuring using MAX (maximum) mode



- Set the probe on surface **1.**
- Set measuring force in a downwards direction.
- Press **SET** key less than 1 second (<1sec.).
- Press **MODE** key longer than 1 second (>1 sec.) until the display shows **MIN** mode.
- Release the **MODE** key at this moment.
- Press **MODE** key less than 1 second (< 1 sec.).

- Set the probe near the highest point of the diameter/ radius profile (**2**).
- Set measuring force in an upwards direction.
- Press **SET** key.
- Move the probe to the right side and pass the highest point.
- The maximum value will be displayed (hold).
- To obtain a new maximum value press **SET.**
  THE ALREADY DETERMINED PROBE CONSTANT MUST BE ADDED.

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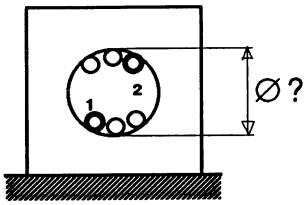
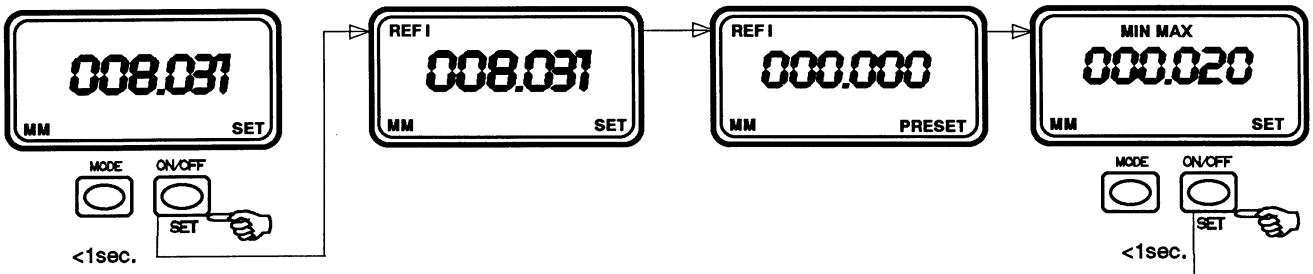
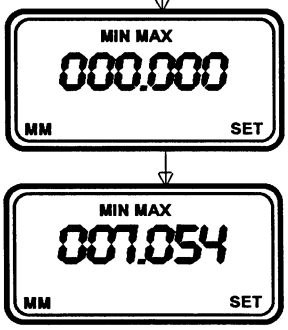
VI. 1.8 Measuring using MIN/MAX (minimum-maximum/Delta) mode

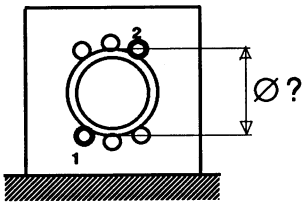


- Set the probe near the lowest point of the diameter profile (**1**).
- Set the measuring force in a downwards direction.
- Press **MODE** key longer than 1 second (>1sec.) until the display shows **MIN MAX** mode.
- Release the **MODE** key at this moment.
- Press **SET** key less than 1 second (<1sec.).
- Move the probe to the right side and pass the lowest point.

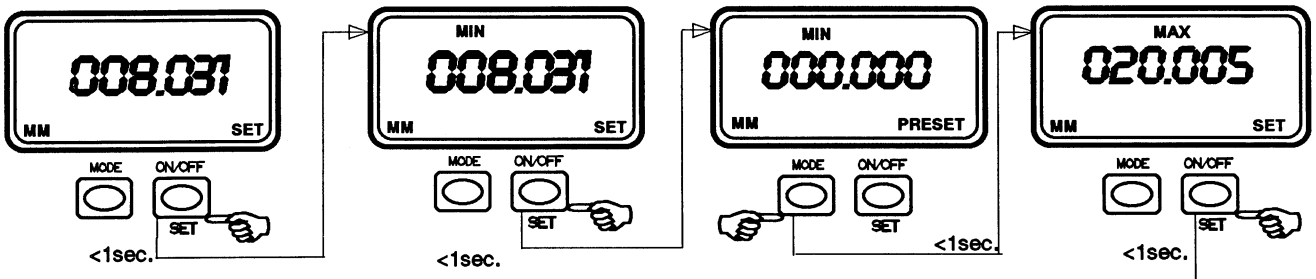


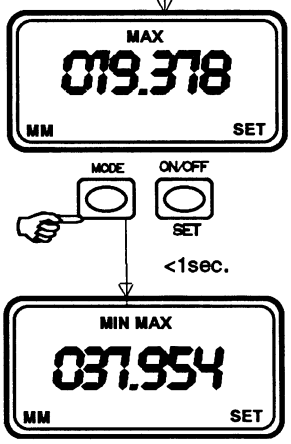


- Set the probe near the highest point of the diameter profile (**2**).
- Set the measuring force in an upwards direction.
- Move the probe to the left side and pass the highest point.
- The diameter value will be displayed.
- **THE ALREADY DETERMINED PROBE CONSTANT MUST BE ADDED.**



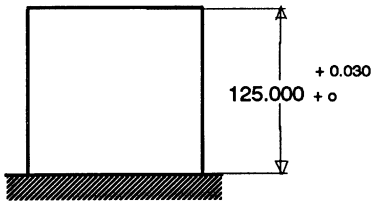
- Set the probe near the lowest point of the diameter profile (**1**).
- Set measuring force in an upwards direction.
- Press **MODE** key longer than 1 second (>1sec.) until the display shows **MIN** mode.
- Release the **MODE** key at this moment.



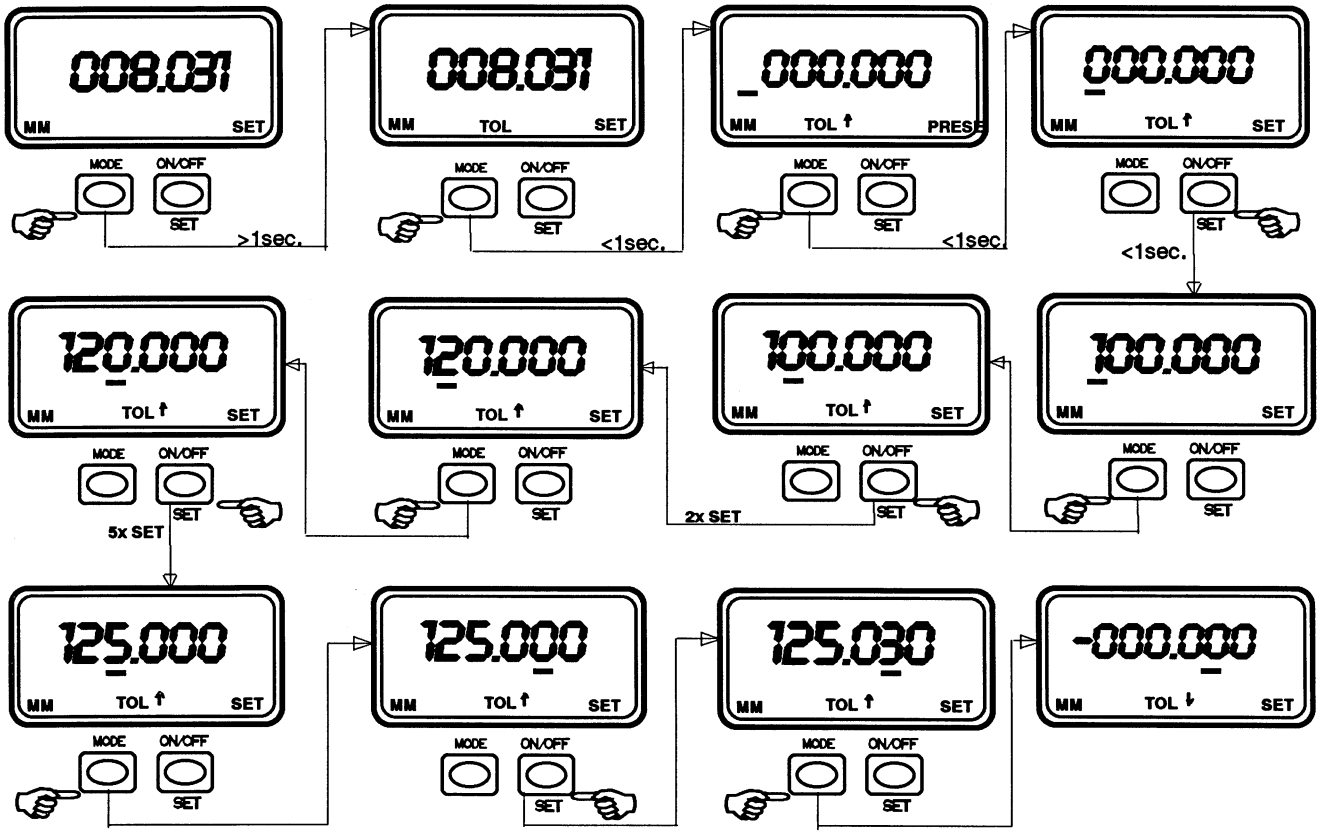


- Press **SET** key.
- Move the probe to the right side and pass the lowest point.
- Set the probe near the highest point of the diameter profile (**2**).
- Press **MODE** key less than 1 second (< 1sec.) until **MAX** mode is displayed.
- Press **SET** key.
- Set measuring force in a downwards direction.
- Move the probe to the left side and pass the highest point.
- Press **MODE** key less than 1 sec. (< 1 sec.) until **MIN MAX** mode is displayed
- The diameter value will be displayed..
- **THE ALREADY DETERMINED PROBE CONSTANT MUST BE SUBTRACTED.**

VI. 1.9 Measuring using the TOL (tolerance input) mode



- Lock the measuring carriage in position using the knob (**K**).
- Press **MODE** key longer than 1second (> 1 sec.) until the display shows **TOL** mode.
- Release the **MODE** at this moment.
- Press **MODE** key less than 1second (<1sec.).



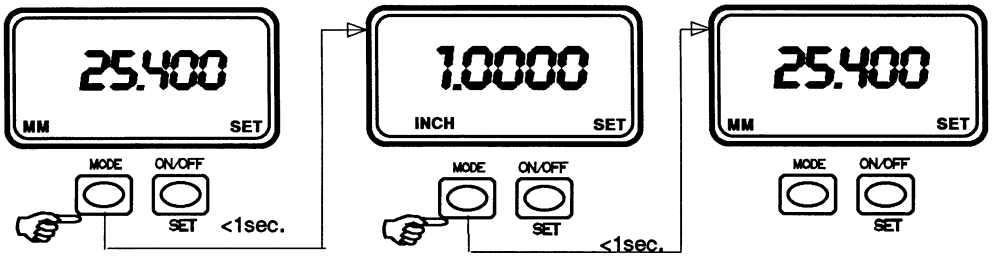
- Press **MODE** key less than 1second (< 1 sec.) until the cursor moves under the first digit.
- Press **SET** key less than 1 second to introduce the number **1** (125.030mm).
- Press **MODE** key less than 1second (< 1 sec.) until the cursor moves under the second digit.
- Press **SET** key two times less than 1second to introduce the number **2** (125.030mm).
- Continue until the preset value is completed.
- Press **MODE** key longer than 1 second (>1sec.) to introduce the lower tolerance value.
- Proceed as already explained for introduction of the upper tolerance value.
- Press **MODE** key longer than 1 second (>1 sec.) to quit the **TOL** mode.
- The tolerance values are now memorized..

MEASURING IN MODE TOL:

- Set the display to zero in normal measuring mode (**SET** key).
- Press **MODE** key until the display shows **TOL** mode.
- Carry out the required measurement.
- The display indicates by showing an arrow:
  - in an upwards direction => over the upper limit
  - in a downwards direction => under the lower limit
  - without arrow => the measured value is in tolerance

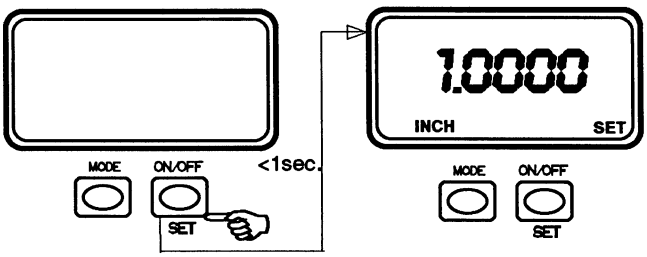
VI. 1.10 Metric/inch conversion (direct conversion)

- Press **MODE** key less than 1second (< 1 sec.).
- The display indicates "inch" measuring mode.
- Press **MODE** less than 1 second (< 1 sec.).
- The display indicates metric (mm) measuring mode.

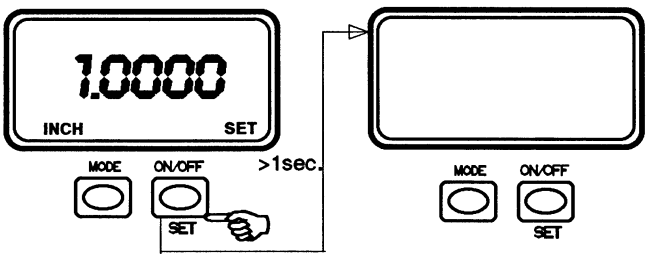


VI. 1.11 ON/OFF (power connection-disconnection)

- Power connection = **ON.**
- Press **ON/OFF** key less than 1second (< 1 sec.).
- The display is active.



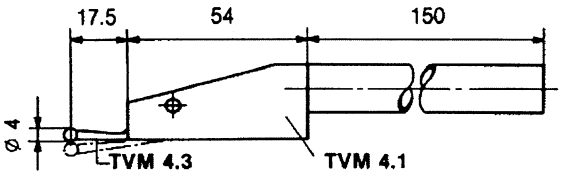
- Power disconnection = **OFF**
- Press **ON/OFF** key longer than 1second (> 1 sec.).
- The display is not activated.
- The instrument is switched OFF on the last active measuring mode.



VII. 1 Optional accessories

VII. 1.1 Measuring using bi-directional probe TVM4

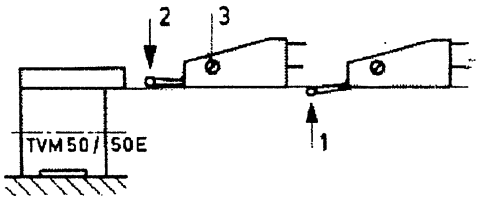
The bi-directional probe will be mounted instead of the probe holder (**P**) and locked using the knurled knobs (**S**).



NOTE : The probe body must be fixed to allow true vertical movement of the probe, otherwise incorrect values will result.
- Set the lateral part of the probe body against a square surface for parallel adjustment.
- Lock the knurled knobs (**O**).

VII. 1.2 Calibration of the bi- directional probe TVM4

- Set the probe first from below onto surface **1**, Run through the free travel.
- Set measuring force in an upwards direction.
- Press **SET key** (zero setting).
- Remove measuring force.
- Set the probe from above onto surface **2**.
- Set measuring force in a downwards direction.
- A value will be displayed.



If this value does not correspond to "zero", turn the adjustment screw (**3**) until the display shows "zero" (000.000). Leave the locking screw of the adjustment screw (bottom of screw 3) slightly tightened.
- Repeat the checking/setting procedure.

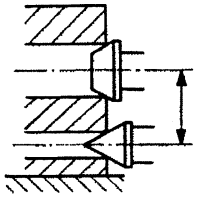
NOTE : Measuring from the bottom upwards, the bi-directional probe has a free travel which corresponds to the diameter of the ball.
This free travel must be passed before setting the measuring force.

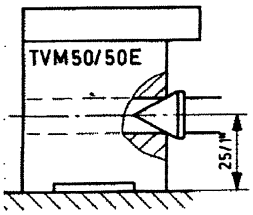
NOTE : THERE IS NO ADDING OR SUBTRACTING OF THE PROBE CONSTANT WHEN MEASURING WITH THE BI-DIRECTIONAL PROBE, as opposed to measurements with rigid probes.
The probe constant is compensated by the free travel of the ball which corresponds to the diameter of the ball.

VII. 1.3 Measuring centerline distances using centering cones

The cone holder TVM5.1 is mounted instead of the standard probe holder (**P**) and locked using the knurled knobs (**S**).
- The carriage movement is in a free state.
  The measuring force is not required.
- Select the appropriate cone and position it into the holder.
- Set the cone into the reference bore (or into the bore of the setting gauge TVM50/TVM50E).
- Press **SET** key (zero setting or preset input).
- Set cone into the next bore.
- the value of the centerline distance will be displayed.

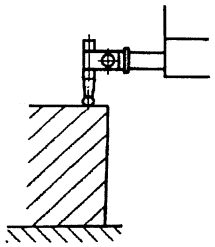
Interchange cones according to the bore sizes.





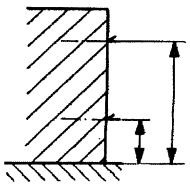
VII. 1.4 Checking of parallelism

- Mount appropriate ball probe..
- Set the probe on the surface to be checked.
- Set measuring force in a downwards direction.
- Press **SET** key (zero setting)
- Pass over the surface
- Values will be displayed



VII. 1.5 Scribing using the scriber TVM3

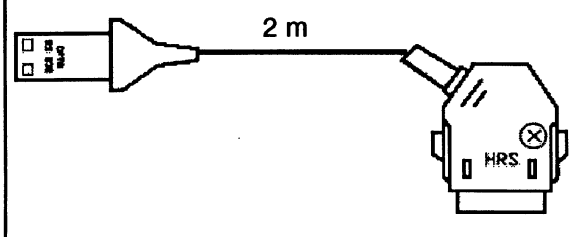
- Fix the scriber TVM3 on the standard probe holder.
- Set the scriber on a reference surface.
  Do not activate the measuring force.
- Press **SET** key (zero setting or preset input)
- Move the measuring carriage (**E**) until the approximate required value is displayed.
- Lock the measuring carriage using the locking lever (**N**) of the handwheel.
- Set the required value by turning the fine adjustment screw (**O**).
- Tighten firmly the locking knob (**K**).
- Marking of the required distance.



VIII. 1 Printing and data-processing (OPTO-RS)

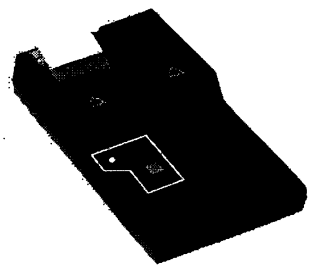
VIII.1.1 Printing data using printer EDP5000SE

Required items



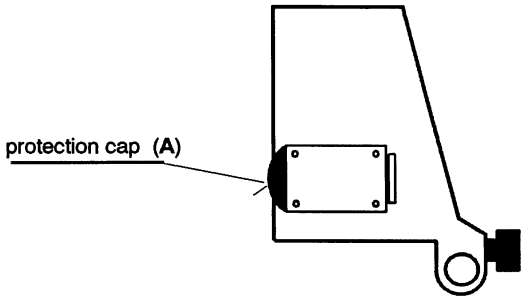
Opto-RS connection cable (EDP5000SE/H)

Code number : **TVM.O-EDP**

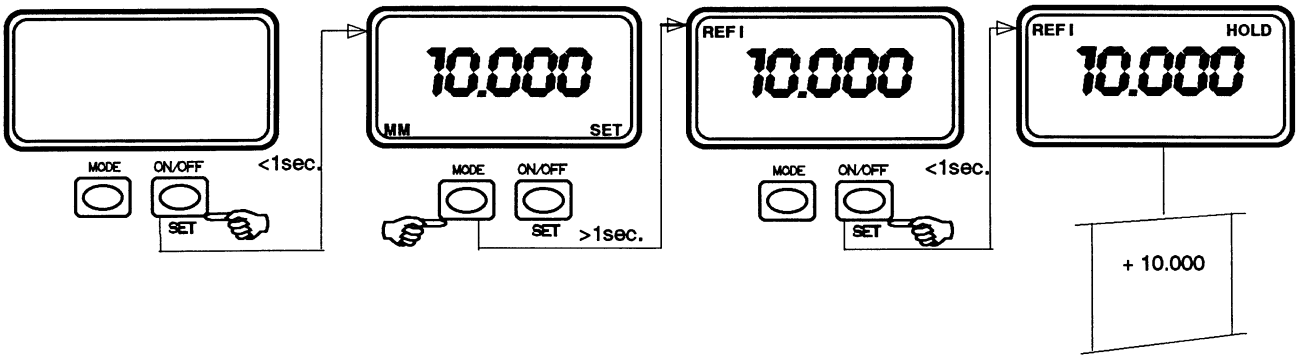


15 col. printer including foot pedal (EDP4006) and 1 set of batteries (BAT.EDP) - (without statistics)
Code number : **EDP5000SE**

- The OPTO-RS data output is situated at the left side of the instrument.
- Remove the protection cap (**A**).
- Insert the Opto plug (diodes facing to the instrument side).
- Connect the Hirose plug to the printer.
- Switch "ON" the instrument.



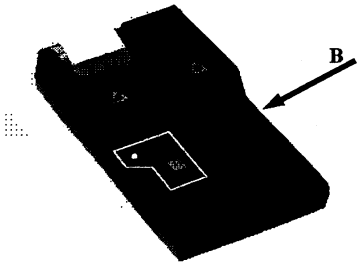
VIII. 1.2 Printing using the TVM keyboard

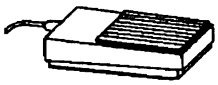


- Press **ON/OFF** key less than 1 second (< 1 sec.).
- Press **MODE** key longer than 1 second (> 1 sec.) until the display shows e.g.**REF I** mode.
- Press **SET** key less than 1 second (< 1 sec.) until the display shows **HOLD** mode and sends the data to the printer.
- Sending of datas using the keyboard is only possible in following measuring modes : **REF I, REF II, MIN, MAX, MIN/MAX, TOL.**

VIII.1.3 Printing using a foot pedal with printer EDP 5000SE

- Connect the foot pedal to the printer (**B**).
- Press foot pedal.
- Sending of data using the foot pedal is possible in the following measuring modes:
  MEASURE NORMAL, REF I, REF II, MIN/MAX and TOL



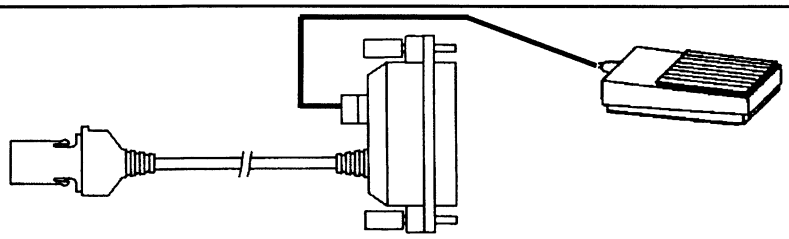


VIII.2.1 Printing of data requiring statistics using printer EDP 5000H

- Same as EDP 5000SE but with statistics.
- For manipulation, refer to instructions for use of this printer EDP 5000H.

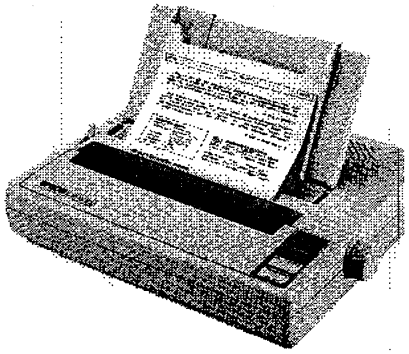
Code number: **EDP 5000H**

VIII.3.1 Printing of data using 80 col. printer (RS232C serial input)



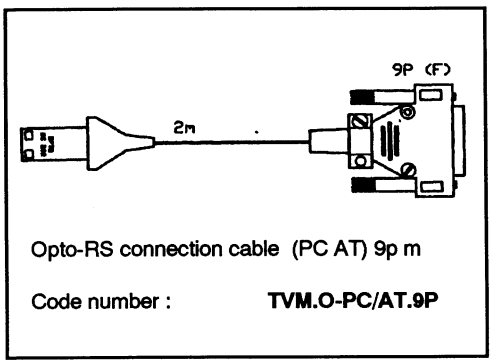
Opto-RS connection cable (printer RS232 serial input) and foot pedal

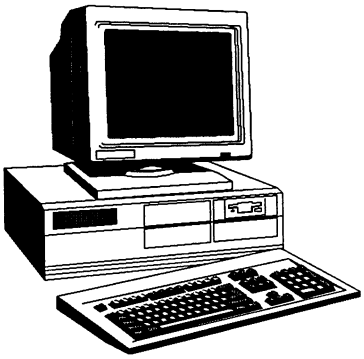
Code number : **TVM.O-IMP.25P**



- Set parameters of printer to : **4800 Bds, even parity, 7 ASCII bits, 2 stop bits.**
- Set printer to : **CR** (Carriage Return) and **LF** (Line Feed).
- Connect the printer (including the foot pedal) to the instrument.
- Press foot pedal.
- Measured value will be printed.

VIII.4.1 Printing and data-processing using PC.





VIII.4.2 Data transmission from the instrument to the PC (simplex)

- Connect the OPTO-RS (PC AT) cable to the serial port of the PC.
- Switch "ON" the instrument and the PC.
- Use as example following program in Microsoft Basic:

```
10 ON ERROR GOTO 60
20 OPEN"COM1:4800,E,7,2,CS,DS,CD,PE" AS#1
30 LINE INPUT#1,A$
40 PRINT "DATA : ",A$
50 GOTO 30
60 RESUME 30
70 END
```

- Start the program (RUN or F2)
- Press **SET** key in **REFI /REFII** mode.
- The value will be displayed on the PC.

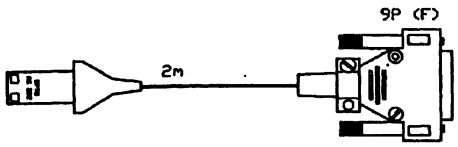
VIII.4.3 Data transmission from the PC to the instrument (simplex)

- Connect the OPTO-RS (PC AT) cable to the serial port of the PC
- Switch "ON" the instrument and the PC.
- Use as example following program in Microsoft Basic:

```
10 ON ERROR GOTO 60
30 PORTRS=&H3FC
40 DTROFF=&HA:DTRON=&HB
50 OPEN"COM1:4800,E,7,2,CS,DS,CD,PE" AS#1
60 LINE INPUT#1,A$
70 PRINT "DATA : ",A$
80 OUT PORTRS,DTROFF
90 FOR I=1 TO 3500: NEXT I
100 OUT PORTRS,DTRON
110 GOTO 60
120 END
130 RESUME 70
```

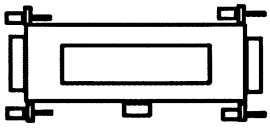
- Start the program (RUN or F2). Values are continuously read by the PC.

VIII.4.4 Data transmission from the PC (Duplex)



Opto-RS connection cable (PC AT) 9p m

Code number : **TVM.O-PC/AT.9P**



Half duplex adapter

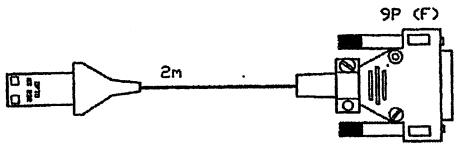
Code number :**TVM.O-AD/H.DUPL**

- Connect the simplex/duplex adapter between the cable and the PC.
- Switch "ON" the instrument and the PC.
- Use as example following program in Microsoft Basic:

```
10 ON ERROR GOTO 3000
20 DELAY = 4:
40 TIMEOUT = 5000
50 PORTRS = &H3F8
60 REQUEST.ADD = PORTRS + 3
70 FOOTPED.INPUT = PORTRS + 6
80 REM "Initialisation du port RS 232"
90 OPEN "COM1:4800,E,7,2,CS,DS,CD,PE " AS#1
100 OUT PORTRS + 4, &HA:
110 REQUEST.ON = INP(REQUEST.ADD) OR &H40
120 REQUEST.OFF =INP(REQUEST.ADD AND &HBF
130 KEY OFF : CLS
140 GOSUB 300:
150 WHILE (INP(FOOTPED.INPUT) AND &H20)
160 WEND
180 PRINT#1,"?"
200 GOSUB 1000
300 REM
310 DEF SEG = &H40
320 A1 = PEEK(&H6C)
330 A2 = A1
340 WHILE (ABS(A2-A1) < DELAY)
350 A2 = PEEK(&H6C)
360 IF (A2 <5) AND (A1 >250) THEN A2= A2 + 256
370 WEND
380 DEF SEG
390 RETURN
1000 REM
1010 I = 0
1020 WHILE (LOC(1)= 0) AND (I < TIMEOUT)
1030 I=I+1
1040 WEND
1050 IF I= TIMEOUT THEN A$ = "NO DATA": RETURN
1090 LINE INPUT#1, A$
2000 RETURN
3000 WHILE LOC(1) <> 0
3020 GET #1,1
3030 WEND
3040 RESUME
3050 END
```

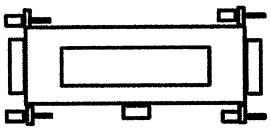
- Start the program (RUN ou F2). Values are continuously read by the PC.

VIII.4.5 Data transmission using a foot pedal (Duplex)



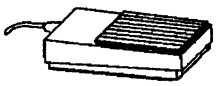
Opto-RS connection cable (PC AT) 9p m

Code number : **TVM.O-PC/AT.9P**



Half duplex adapter

Code number :**TVM.O-AD/H.DUPL**



Foot pedal

Code number : **TELMA31**

- Connect the simplex/duplex adapter between the cable and the PC.
- Connect the foot pedal to the adapter.
- Switch "ON" the Instrument and the PC.
- Use as example following program in Microsoft Basic:

```
10 ON ERROR GOTO 3000
20 DELAY = 4:
40 TIMEOUT = 5000
50 PORTRS = &H3F8
60 REQUEST.ADD = PORTRS + 3
70 FOOTPED.INPUT = PORTRS + 6
80 REM "Initialisation du port RS 232"
90 OPEN "COM1:4800,E,7,2,CS,DS,CD,PE " AS#1
100 OUT PORTRS + 4, &HA:
110 REQUEST.ON = INP(REQUEST.ADD) OR &H40
120 REQUEST.OFF =INP(REQUEST.ADD AND &HBF
130 KEY OFF : CLS
140 GOSUB 300:
150 WHILE (INP(FOOTPED.INPUT) AND &H20) = 0
160 WEND
180 PRINT#1,"?"
200 GOSUB 1000
300 REM
310 DEF SEG = &H40
320 A1 = PEEK(&H6C)
330 A2 = A1
340 WHILE (ABS(A2-A1) < DELAY)
350 A2 = PEEK(&H6C)
360 IF (A2 <5) AND (A1 >250) THEN A2= A2 + 256
370 WEND
380 DEF SEG
390 RETURN
1000 REM
1010 I = 0
1020 WHILE (LOC(1)= 0) AND (I < TIMEOUT)
1030 I=I+1
1040 WEND
1050 IF I= TIMEOUT THEN A$ = "NO DATA": RETURN
1090 LINE INPUT#1, A$
2000 RETURN
3000 WHILE LOC(1) <> 0
3020 GET #1,1
3030 WEND
3040 RESUME
3050 END
```

- Start the program (RUN ou F2). Every time the foot pedal is pressed, the value will be displayed on the screen.

VIII. 5.0 Retro-command syntaxes

Each command consists of 3 characters which may be followed by the function statement (0 or 1) and has to end by the ASCII code <CR>.
The commands can be written in upper or lower case.
Note : Each command is confirmed by the instrument (echo of retro-command)

<NOR>	Set instrument in measuring mode (or in reference mode if key is disabled)
<MOD?>	The instrument transmits its actual function mode (NOR,REF,MIN,MAX,DEL,TOL1)
<STO=>,<STO1>	Disables or activates the HOLD mode
<KEY0>,<KEY1>	Disables or activates the mode key
<RST>	Reset of the instrument to factory default condition
<SET?>	The instrument transmits its current parameters (MM RES2 REF1 etc..) NOTE : B1 battery good B0 change battery
<ID?>	The instrument transmits its identification code : -SY210A : basic instrument -SY210B : instrument reset, min/max with tolérance modes
<OUT0>,<OUT1>	Disables, activates the continuous transmission of the displayed value
<OFF>	Swithes OFF the instrument
<ON>	Swithes ON the instrument
<PRI>,<?>	The instrument transmits the displayed value. NOTE : in TOL mode '<','=','>'.
<CHA+>,<CHA->	Changes the measuring direction
<CHA?>	The instrument transmits the active measuring direction <CHA+>,<CHA->
<CHA*1>,<CHA*2>	Changes the multiplication factor
<MM>,<IN>	Changes the measuring unit
<RES2>,<RES3>	Changes the resolution (<RES2> : 0.001mm, <RES3> : 0.01mm)
<REF1>,<REF2>	Changes the reference
<PRE>	Recalls the preset value
<PRE?>	The instrument transmits the preset value of the active reference
<TOL1>	Activates tolerance mode
<TOL?>	The instrument transmits the value of the tolerance limits
<MIN>,<MAX>,<DEL>	Selects MIN, MAX and (MIN-MAX) mode
<CLE>	Initializes the MIN or MAX mode memory
<PRE+123.45>	
<PRE+0>	Introduction of the preset (for active reference). The value must be preceded by the correct sign "+/-"
<TOL+12.54+11.25>	Introduction of tolerance limits

Error messages :

In case of error, the instrument transmits following messages:

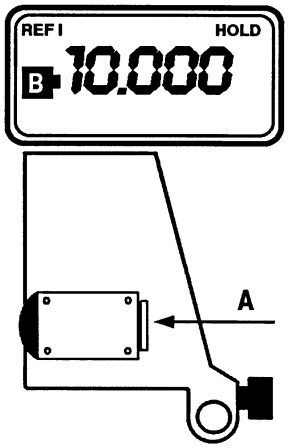
<ERR0>	Refers to a measuring system error. To escape press SET key or use remote command for a new measurement
<ERR1>	Transmission problem. If the error message is repeating, check transmission parameter .
<ERR2>	Command not recognized. syntax error or command not activated

IX. 1 Maintenance

IX. 1.1 Maintenance

- Keep the measuring column (**B**) and the scale (**D**) clean.
- Lubricate the column very lightly using fine oil (viscosity 20), Do not lubricate the scale.
- If the instrument is not in use, switch it **OFF**.
- When moving the instrument from one location to another, carry it only in vertical position.
  NEVER INCLINE THE INSTRUMENT BEYOND THE HORIZONTAL.

IX. 1.2 Replacement of the battery



- Becomes necessary when the **B** is displayed
- Remove the cover of the battery compartement (**A**) and the battery and replace it. Check the polarity (+/-)
- The instrument is automatically reset after replacement of the battery If any error occurs, remove the battery for approx. 30 sec. and insert it again.
- Use only a battery out of the listing on page 5 of this instructions for use.

IX. 1.3 Transport

- If possible, use the original packing.
- Place the instrument in a horizontal position.
  NEVER INCLINE IT MORE !
- Lock the measuring carriage in most upper position using locking knob (**K**).
- Remove the probe holder (**P**).
- Lock the counter weight using the locking screw (**T**).
- Protect the instrument against and dirt using a protective cover.
- Ensure firm location in packing material before transportation.

IX. 1.4 Repairs

All parts of the instrument are interchangeable. Your **TRIMOS** agent has a stock of spare parts or will be able to supply service at short notice.
Please contact the agent in respect of operational problems.

IX. 1.5 Complaints

Trimos can accept any complaints only in case that the instrument has been returned **in clean conditions and packed according to instructions.**