INSIZE

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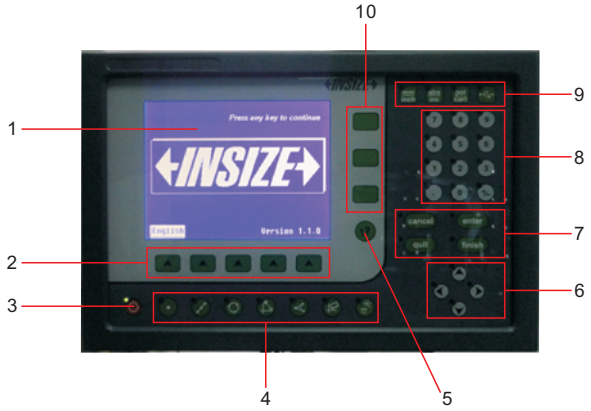
ISP-A1000/A1000E
PROFILE PROJECTOR
OPERATION MANUAL

V0

INSIZE

Description

1 Key functions:



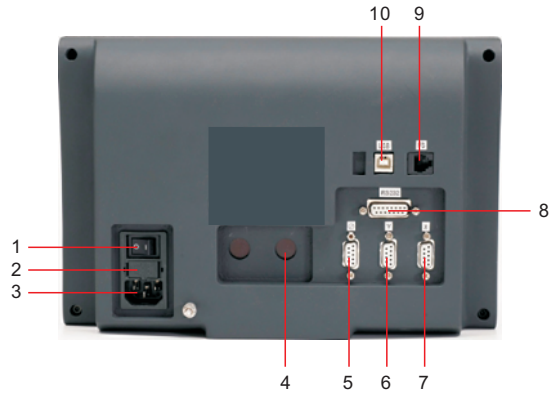
1. LCD Display 2. Soft Keys 3. LCD Standby On / Off Key 4. Feature Measurement Keys 5. Help Keys 6. Arrow Keys For Navigation 7. Utility Keys 8. Numeric / Function Keys 9. Coordinate And Unit Switch Buttons 10. Axis Reset Keys

- Inch / mm Key
- Absolute / Increment Key
- Polar / Cartesian Key
- Point Feature key
- Line Feature Key
- Circle feature key
- Distance Feature Key
- Angle Feature Key
- Skew Feature Key
- Wonder Feature Key
- Point create function
- Line create function
- Circle create function
- Arc create function
- Construct

2. The surfaces of optical parts should be kept clean. They should not be touched with hands. If any dirt, oil fleck or dust are found on the surfaces, they should be removed with soft brushes, or they should be removed with clean linen or lens paper soaked in methyl benzol or in a mixture of alcohol and ether. Try to rub the optical surfaces as less as possible.
3. The instrument should not be operated with a big force. All bare metal surfaces of the instrument and the accessories should be wiped clean and coated with protection grease after operation.
4. When work-piece with larger diameter is to be measured, take down objectives 50x and 100x and place them into the accessory box.
5. Objectives, guides and condenser have higher precision. They should not be dismantled optionally. If it is necessary, they should be sent to the specialized factories for repair.

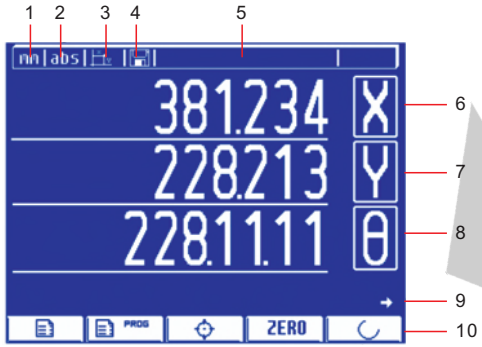
 Cross Hair measurement
 Automatic Edge Detector measurement (ISP-A1000E)
CCW Counter clock wise direction
CW Clock wise direction
DDDEC Degree Decimal mode (90.0000°)
DDMMSS Degree Minutes Seconds display mode (90°.00'.00'')
 Contrast level increase
 Contrast level decrease
 Select
 Exit
 Open
 Yes
 No
 On (Disable)
 Off (Enable)
 Auto edge detection setup (ISP-A1000E)
 Engineering Setup
 View Results
 Delete Selected Result
 Delete all result
 Program menu
 Tolerance option
 Print Result Buffer
 Repeat Function
 Centre-Near-Far Key. Visible only when result is constructed Distance Either from two lines or two circles.
Center Center Distance between two circles or lines
Far Nearest Distance between two circles or lines
Near Farthest Distance between two circles or lines

2 Back panel:



1. ON/OFF Switch 2. Spare Fuse (250VAC, 800mA) 3. Power Inlet Point 4. Connector for Edge Detector (Optional) 5. Rotary Encoder Input 6. Y Linear Encoder Input 7. X Linear Encoder Input 8. Printer Interface 9. Foot Switch connector 10. USB Connector

3 Layout of the Screen:

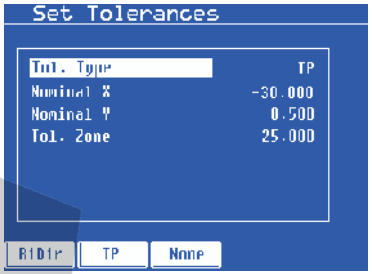


1. Unit
2. Measurement Mode
3. Coordinate System
4. Permenent Storage
5. Message Window
6. X Axis
7. Y Axis
8. Angular display
9. Scroll Soft Key status
10. Soft Key

Setup

The setup can be accessed by pressing the followed by key . The user will be prompted for password. The password is “98563”. Use [ ]or [ ] key to scroll within the menu.

1 Point Tolerance:
Highlight the desired point feature from the result list. Press { } key and then Press { TP } key.



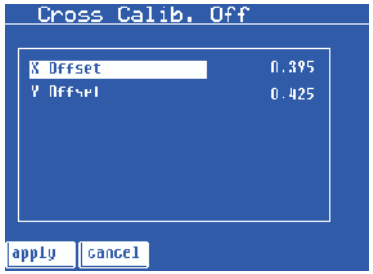
Enter the nominal values for X and Y co-ordinates. Also enter the tolerance zone.
Tolerance zone is the radius within which the point should be located. If the point is located outside the zone, tolerance fails.
Press { BiDir } key then enter the nominal values for X and Y co-ordinates. Also enter the +/− values for each nominal value.
Limits allow the user to set upper and lower limits on a value.
For example, a nominal value of 10.3250 might have an upper limit of 10.3260 and a lower limit of 10.3240. For example, if a part drawing gives a +/- tolerance of 0.005, simply enter 0.005 in the plus and minus fields.
After set press { Apply } key. The result of tolerance Pass or Fail is shown for the selected feature.

2 Use the same way to set Tolerance for line, angle, circle and distance.

Maintenance

1 The projector is a kind of precision optical instrument. Attention should be paid to its maintenance so as to guarantee the precision and lengthen life of the instrument. The instrument should be installed in a clean room, the temperature of which should be maintained at 20° ± 5℃. The relative humidity of the room should not exceed 60% so as to prevent the optical parts and reflecting mirror from molding and to keep the high quality of the image.

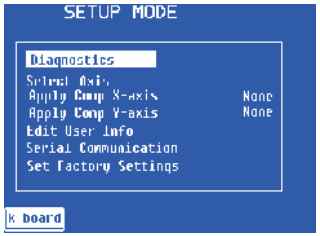
Cross hair and mounted edge detector probe may have physical position offsets, hence to obtain accurate results; we must do the cross calibration process for every magnifications.
If we don't execute cross cal, and if we probe a circle by cross hair and by edge detector, in both cases, we will get diameter equal but centre coordinates will be different.
In this mode the user has to probe a circle using Edge detector and again probe the same circle using cross hair. The result of Cross calibration is displayed as shown below.



3. Save the changes and exit Edge detector calibration.
4. Measurements using Edge Detector mode:
For performing feature measurements using Edge detector, select Edge mode by pressing { } soft key in DRO mode.
Now press any feature key and probe points using Edge detector.
Rest procedure remains same as explained in Geometric Feature Measurement chapter.

Tolerance

Tolerance helps users maximize productivity. A tolerance is an acceptable deviation from the nominal specification of a part. For example, a pin might have a nominal diameter of 5.000 mm. Without tolerance, only pins with a diameter of .5.000 mm are acceptable. This means that pins that measure 4.999 mm or 5.001 must be rejected. With tolerance an acceptable deviation from the nominal specification is defined. For example, the diameter of 5.000 mm might have a tolerance of +/- .05. This means that pins as small as 4.950 mm and as large as 5.050 mm are acceptable.



- No. of Axis: Selects the no. of axes to display.
- Annot Bck/ Annot Fwd: Selects Forward annotation or Backward annotation.
- Annotation points: This is used to set Annotation points for each measurements.
- Relational parameter: This is used for Wonder function.
- Sleep Mode Time(Min): DRO stand-by Time to save power.
- Key Beep Enable: Enables / disables beep on every key press.
- Program Lock: Enables / Disables new Programs.
- Persist Memory: Enables / Disables Permanent storage of result memory.
- Diagnostics: Keyboard diagnostic.
- Select Axis: Axis specific settings.
- Apply Comp X-axis: X axis calibration selection:
None – No calibration;
L.comp – Linear compensation;
S.Comp – Segmented error;
compensation;
Grid – Grid Compensation.
- Apply Comp Y-axis: X axis calibration selection:
None – No calibration;
L.comp – Linear compensation;
S.Comp – Segmented error;
compensation;
Grid – Grid Compensation.
- Edit User info: Enables user to set user information like Customer Name, Machine Name and Operator Name.
- Serial Communication: Enables the user to set the Serial communications parameters.

- Set Factory Settings: All the engineering settings are set to factory default parameters.
- Configure Footswitch: Enables the user to assign any key from keyboard to footswitch 1 and 2.

X, Y Liner Setup

- Scale Resolution: Sets the scale (encoder) resolution (0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50μm).
- Display Resolution: Sets the display resolution (0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50μm).
- Axis Direction: Sets encoder counting direction.
- Machine ref: Sets machine reference for the axis.

Z Angular Axis

- Count per Revoln (CPR): In case of auto, the DRO calculates the counts between the two index marks and calculates the CPR automatically. In case of manual selection the user needs to enter the CPR value.
- Resolution (Deg): Selects the display resolution for the angular axis (0.5, 0.2, 0.1, 0.05, 0.01, 0.005, 0.001, 0.0005°).
- Axis Direction: Sets encoder counting direction (CW or CCW).
- Count Mode: Selects the counting mode (Rollover or Continues).
- Machine Ref: Sets machine reference for the axis.
- Display Mode: Selects the display units: DDMMSS or DDDEC.
- Axis Lock: Enables / Disables the angular axis position settings.

Axis Calibration

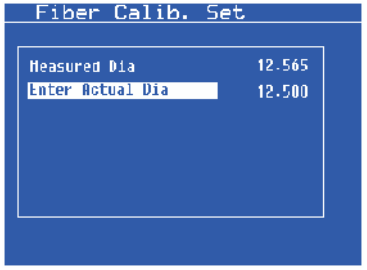
Axis calibration is required to compensate for errors arising due to wear and tear in machine, encoder misalignment etc. Each axis can be calibrated for Linear Errors or Segmented errors as applicable.

- Screen Gain (<10000) – This sets the gain of the amplifier. The gain depends on the magnification and the light source. Adjust this such that the Screen intensity on light region displays counts above 3000 counts to 4000. In case of higher magnifications where the counts doesn't reach the required value even if the gain is set to 100, then minimum of 2000 counts should be ensured for good results. Press {Set}key to set the gain value.
- Now bring the screen sensor in the light region and press {teach} key.
- Now move the screen sensor in to dark region. Press {teach} key to teach dark to the DRO. Here note that the counts in the dark region are less than that in the light region.

  NOTE: Every time the light intensity changes it is recommended to teach light and dark region to the DRO for proper measurements. No need to change the gain of the system.
- Now perform Edge calibration. In this mode the selection is provided for bore or shaft measurements. If the user wants to check bore jobs he has to perform bore calibration using F.O. Edge detection prior to measurements.

  NOTE: It is mandatory to calibrate the type of job either bore or shaft prior to measurements using F.O. Edge detection.

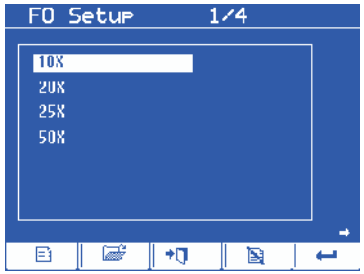
  Now probe the circle as per procedure explained earlier. Press [finish] key to complete the measurement. Following screen is displayed.



Now enter the standard diameter of the circle. The DRO will calculate the calibration factor and apply it during the measurements by Edge detector.

2. Cross Calibration:
The cross calibration function eliminates the difference between

DRO mode press {☼} key to enter Edge detector calibration. Following screen will be displayed.

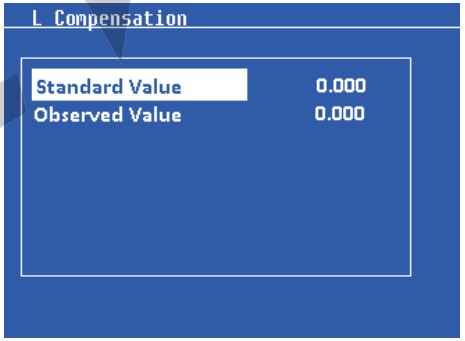


The Setup depends on the magnification and the light intensity. DRO allows the user to save up to 10 magnifications. These magnifications can be recalled any time when the magnification on the machine is changed. Following soft keys are available on this screen:

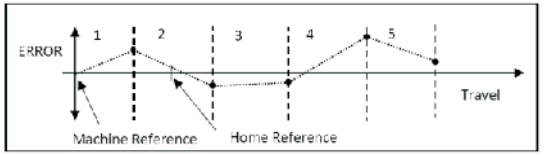
- Using this option a new magnification setup can be saved. The user is asked to enter the name of magnification level by displaying the data entry screen. On entering the name the DRO displays FO setup.
- Open the selected magnification setup. The DRO will display the Setup for the selected magnification as shown below:
- Exit from the setup.
- Delete the selected magnification setup.
- Use the setup parameter for the selected magnification.
- Using this the selected magnification level can be renamed.

Following are the FO Setup parameters and their significance:

1. Linear Error Correction (L. Comp/LEC) :
In this mode place a slip gauge of standard length on the X-Y table. Align it properly for calibration.
Now bring cross hair to one of the edge of slip. Reset the axis. Now move the crosshair to other end of the slip and note down the display reading. Now enter the Linear compensation mode for that axis by selecting {L. Comp} at “Apply Comp X Axis”.
Enter the standard value as the slip value and the observed value using the numeric keys on keyboard. Press [Enter] to confirm. The DRO will calculate the linear calibration factor and stores into its memory. The user can edit this calibration factor by changing the observed value or the standard value in the same mode. After doing this you may check the axis performance by measuring different slips and confirm the accuracy.

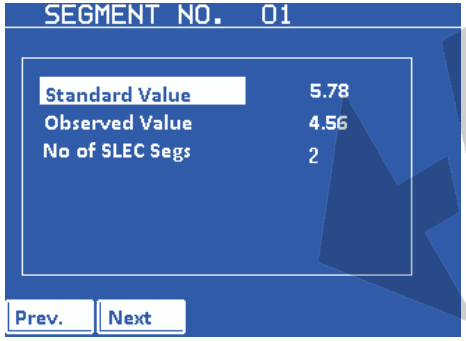


2. Segmented Error Correction (S.Comp / SLEC):
Segmented Linear Error Compensation (SLEC) is used when the results of the comparison with a reference standard shows non-linear error. In SLEC the entire axis travel is divided into user defined segments. The error in each segment is compensated with a single correction factor. Each correction point is measured with respect to the starting point. This starting point is usually set close to the end of the scale. This starting point can coincide with the absolute datum point or Home reference.



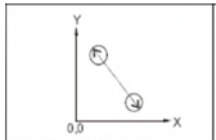
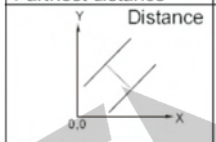
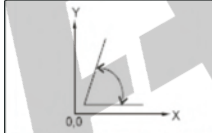
Calibration Procedure:

- Perform Machine reference in the axis settings. After performing machine reference do not set or reset the axis till the complete SLEC calibration is complete.
- Divide the travel into user defined segments.
- Enter into standard measurement mode (DRO mode).
- Note down all the standard values and the observed values for each segment.
- Enter the setup mode and select {S.Comp} for the respective axis.
- Start entering the standard values and observed values one by one.
- Press {Next} every time the values for that segment are entered.
- Press [Enter] to complete the SLEC entry.
- On pressing the [Enter] key all the entered segments are stored and the SLEC compensation is applied to that axis.
- The “No. of SLEC Segs” Indicate the maximum no. of segments entered prior to this entry.



Calibration Edit Procedure:

- Select the {S.Comp}key for the respective axis which is to be edited.
- Select the required segment by pressing {Next}.
- Enter the new Standard and observed values and select the next segment by pressing {Next}.
- When all the segments are complete press [Enter] key.

 Farthest distance	[ ] Key	Two points, a point and line, a point and circle, a line and circle	Farthest distancebetween two selected features.
 between two lines	[ ] Key	Two Lines	Perpendicular distance between first line and a point on second.
 The Angle and vertex of two lines	[ ] Key	The two lines. The vertex will appear as a point	The Angle formed by intersection of two selected line.

Edge Detector(For ISP-A5000E)

Optical Edge detection can be used with DRO to increase throughput rates, increase measurement accuracy, improve measurement consistency and reduce operator fatigue. In this mode after selecting a point the user is not required to press [enter] key but the point is probed automatically as the sensor travels from either Light to Dark or Dark to Light region.

- **Fiber-optic cables cannot be bent to a radius less than one inch without degrading performance. Be careful to prevent bending or pinching the cables.**
- **Fiber-optic cables cannot be exposed to temperature higher than 70 degrees Celsius without degrading performance.**
- **Use of C.V.T. (Constant Voltage Transformer) is recommended for better performance of edge detection circuit as fluctuations may cause intensity variations on the screen.**

1. Edge Detector Calibration:
Before using Edge detector for measurements it is necessary to calibrate it. It is necessary to calibrate the DRO prior to this calibration. Mount the demonstration slide on to the X-Y table. In

TO GET A CIRCLE	PRESS	THEN SELECT	RESULT
A Best fit Circle	[ ] Key	Combination of multiple circle or points	A best fit circle passing through centers of selected features.
Calculated Circle	[ ] Key	The point and a distance	A Circle with given point as centre and radius equal to given Distance.
An offset circle	[ ] Key	The circle and a distance	Circle with radius equal to selected circle with centre offset by given distance.
TO DETERMINE A DISTANCE	**PRESS**	**THEN SELECT**	**RESULT**
A Straight line distance	[ ] Key	Two points, a point and line, a point and circle, a line and circle	Perpendicular distance between selected features.
min, max and centre distance between two circle centers	[ ] Key	Two circles	Distance between centers of two selected circles.
Nearest distance	[ ] Key	Two circles, a circle and a line, a circle and a point	Nearest distancebetween two selected features.

◆ The changes will get saved in the memory and are applied.

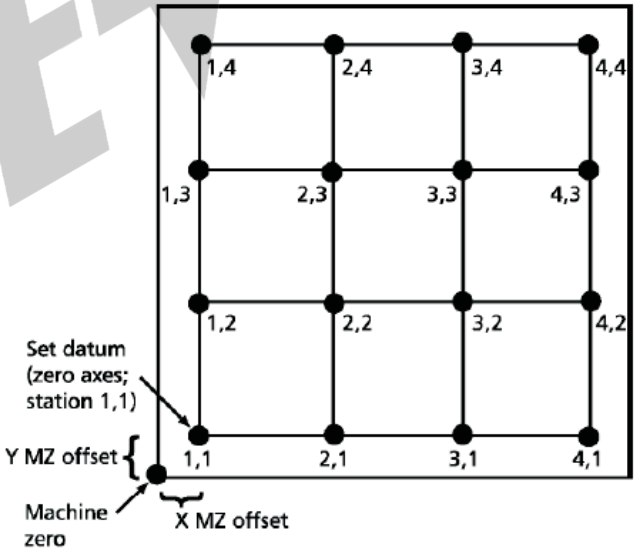
The user will have to perform machine reference on every power ON if SLEC is selected for an axis.

3 Grid Calibration:

It is also referred to as Non Linear Error correction (NLEC).

In this the entire measurement area is divided in to a grid. Each grid cell compensates for variation with its own error correction coefficient. It is mandatory to set the machine reference for each axis before NLEC.

Specify the nominal and measured X and Y coordinates from the standard during the setup process. NLEC requires a repeatable machine zero defined on startup.



Machine Reference

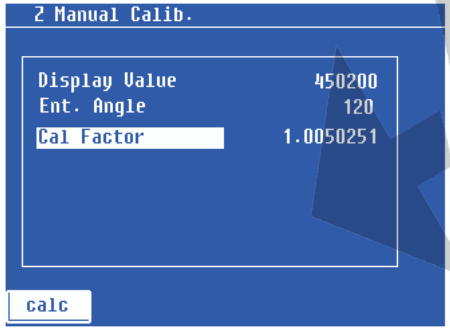
Here the Machine reference can be set forthe selected axis. The standard reference output from the encoder is used for referencing. This is used only in case Segmented Linear compensation is to selected.

Calibration Procedure:

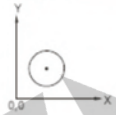
- Keep the encoder position near to the desired reference on the encoder.
- Press { ↵ }key in “Machine Ref.” in axis settings. “Homing”Message is shown on the screen.
- Pass the reference mark on the encoder. Here the DRO will reset the axis on the reference mark.
- Go to the machine reference position and press { Set }key. Normally this is the start position of the segnments

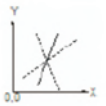
Calibration procedure for Z (Angular) Axis

1. Manual Calibration of Z axis:
User can calibrate angular axis manually by pressing manual softkey. Display value will show counts of respective rotation. User will enter angle of rotation in seconds. Now user can calculate calibration factor by pressing calc softkey.After calibration press [Enter] to save the calibration factor. Press [Cancel] if the user wishes to exit without saving.

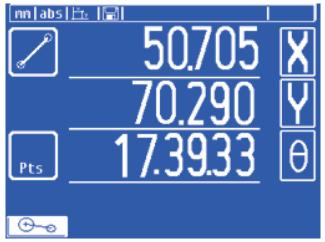


2. Auto Calibration of Z axis:
User can calibrate the angular axis automatically by selecting the { Auto }key. The DRO waits for two complete rotations of the encoder and then calculates the calibration factor by calculating the counts between the two reference marks on the encoder. To calibrate the Z axis using auto mode requires only one condition that it must have only one reference mark for each rotation.

 An offset point	[ ] Key	A point and a distance	A point from given point with an offset equal to given distance.
 Center point of a circle	[ ] Key	The Circle	Point Result at the Centre of selected Circle.
 Average point	[ ] Key	Multiple points	Average point Of selected point results.

TO GET A LINE	PRESS	THEN SELECT	RESULT
 A Bestfit line	[ ] Key	Combination of multiple circle or points	A best fit line Passing through centers of circle.
 An offset line (parallel line)	[ ] Key	The line and a distance	A line parallel to given line at given distance apart.
 A bisector line	[ ] Key	Any two lines	A line bisects the angle formed by two selected lines.

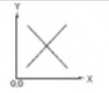
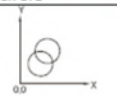
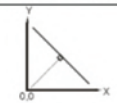
◆ Press [ ] key which displays the list of measured features.



◆ Scroll using the navigation keys and press {}key to select the feature. On pressing the [ ] will select the previous result automatically.

◆ Press [finish] key to complete the construction and calculate the result.

Different types of construction:

TO GET A POINT	PRESS	THEN SELECT	RESULT
 Intersection of two lines	[ ] Key	Line 1 and Line2	Point of Intersection of two Selected Lines.
 Intersection of a line and circle	[ ] Key	The Line and Circle	One Point of intersection line and circle.
 Intersection of two circles	[ ] Key	The two Circles **"If there is no intersection then "No Intersection" will be displayed**	One Point of intersection of two selected circles.
TO GET A POINT	**PRESS**	**THEN SELECT**	**RESULT**
 The point on a line closest to the datum	[ ] Key	The Line	Point :- The intersect of the line and the perpendicular from datum to the line.

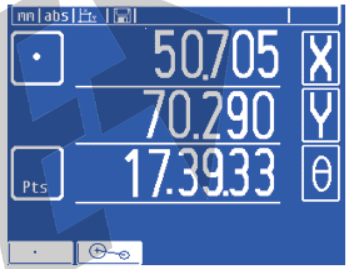
Measurement

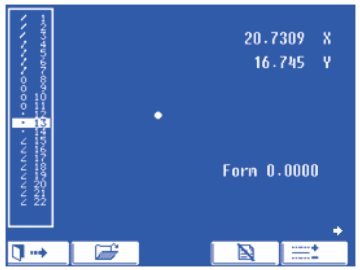
1 Point Measurement:

◆ Press [ ] key to measure a point.

◆ Now move the X-Y table near to the desired point. Match cross hair on the point and press [enter] key.

◆ Take more points or if sufficient points are taken press [finish] key.





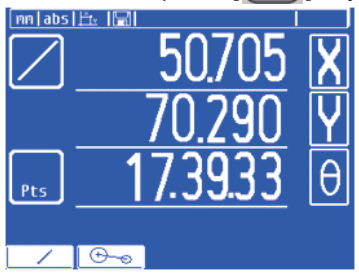
2 Line Measurement:

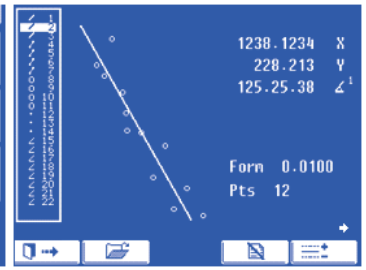
A line can be measured by selecting between 2 to 20 points.

◆ Press [ ] key to measure a line.

◆ Now target a point on the line and match cross hair on it. Press [enter] key.

◆ Now in similar manner probe sufficient points to form a best fit line. And then press [finish] key.



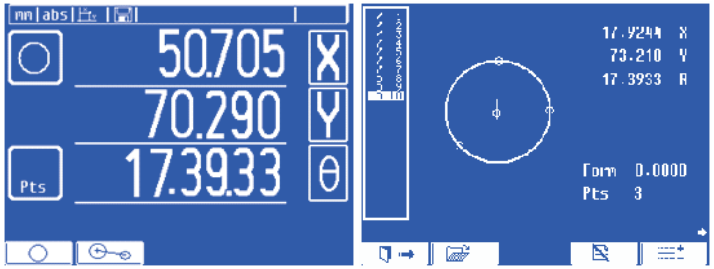


3 Circle Measurement:

A circle can be measured by selecting between 3 to 30 points.

◆ Press [ ] key to measure a circle.

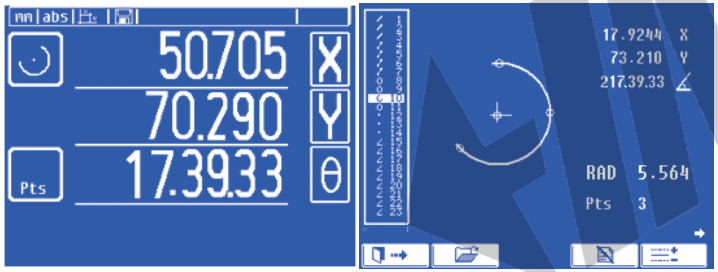
- Now target a point on the circle and match cross hair on it. Press [enter] key.
- Now in similar manner probe sufficient points to form a best fit circle. And then press [finish] key.



4 ARC Measurement:

An arc can be measured by selecting between 3 to 30 points.

- Press { }key to measure a circle.
- Now target a point on the Arc and match cross hair on it. Press [enter]key.
- Now in similar manner probe sufficient points to form a best fit arc. And then press[finish] key.



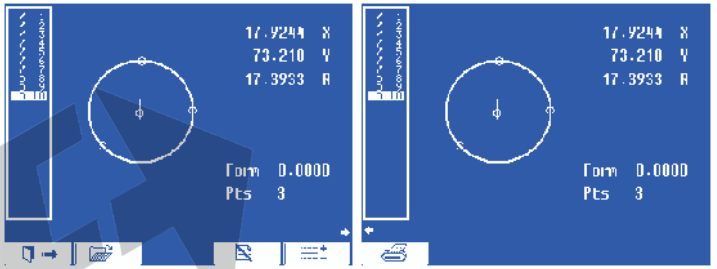
5 Distance Measurement:

Using this feature distance between two points can be measured.

- Press [ ] key to measure distance between two points.
- Now target the required point and match cross hair on it. Press [enter]key.
- Now target the second point. And then press [finish] key. The distance between these two points will be displayed in the result screen.

9 Result Buffer View:

To view a results measured press { } key. A graphical view of results will be displayed. Use up-down arrow keys to move next or previous results one by one or press { } key to recall particular result.



: Exit from result buffer view.

: Visible only if result is Constructed Distance from two circle or two line results. Toggle between Centre-Near-Far distances.

: Delete result. Here the operator is prompted with two options:

: Delete current result;

: Delete all results.

: Tolerance options for current result.

: Recall particular result.

: Print the result buffer via thermal printer(Optional).

10 Construction:

Feature construction is the process of combining existing features to generate a new feature.

New feature can be constructed using existing features that were measured or constructed.

The result of construction is displayed in the result window. Also the user can see the constructed feature graphically. Form is not applicable to constructed features, apart from that these features are same as any measured or probed feature.

Construction Procedure:

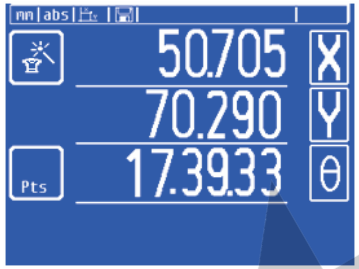
- Press the desired feature which is to be constructed.

Skewing the job is also possible from constructed features. The result of constructed feature should a line, since skew is applied on a probed line.
For example, if a line is constructed from a circle and a line. The result line is the skewed line. And all the measurements are with respect to this line.

8 Wonder Measurement:
Wonder feature helps to minimize key presses during feature measurement. Also it automatically detects which geometrical shape has been probed. This feature can be activated once or repeat.

In SETUP MODE, there is one option, to set “Relational Parameter OFF” or “Relational Parameter ON”.

If we press [ ] key in normal counting mode,. Now if we probe the points (without pressing feature key), and press [finish] key, the DRO will show the result of probed feature.

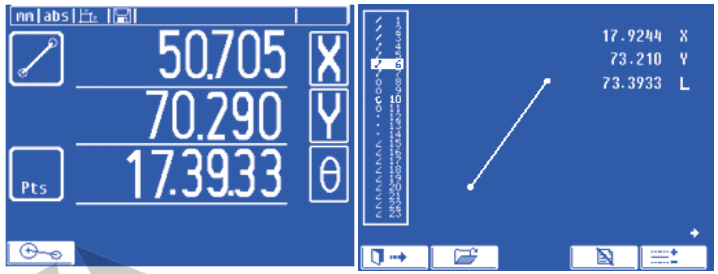


If we want to probe the feature again without pressing feature key, we have to press [ ] key again.

If we press [ ] key twice, symbol will be displayed on the DRO screen at right top corner. Now we can probe the features repeatedly without pressing feature keys.

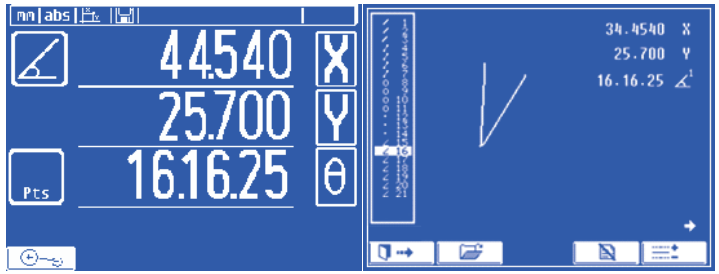
Pressing [quit] key will exit from Wonder feature.

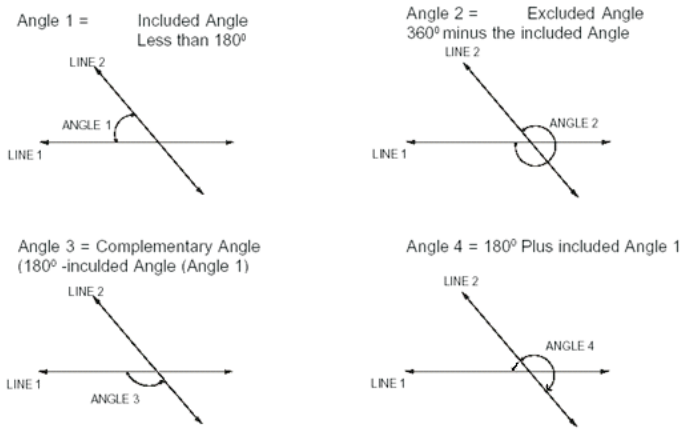
To detect an angle, two main things must be considered while probing the points.
1) There are two limbs of angle and on both limbs; equal number of points must be probed.
2) On either limb, at least three points must be probed.



6 Angle Measurement:
Angles can be measured by probing points between two lines. In this mode the DRO automatically prompts the user to measure 1st line and the 2nd line. Each line can be measured by probing between 2 to 20 points. Accuracy of this measurement is increased if more number of points are probed over greater distances.
After probing both the lines the angle between them is determined by using best fit algorithm.
The measured angle can be displayed in 4 ways. The user can change the angle display using [ ] key of the 3rd axis. The four angle measurement types are as shown below.

- Press [ ] key to measure angle.“Probe Line 1” message will be displayed.
- Now measure 1st line by targeting the required point and match cross hair on it. Press [enter] key.
- Now similarly target more points. And then press [finish] key to end probing line 1. “Probe Line 2” message will be displayed.
- Similarly probe line 2 and press [finish] key. The angle result screen will be displayed.



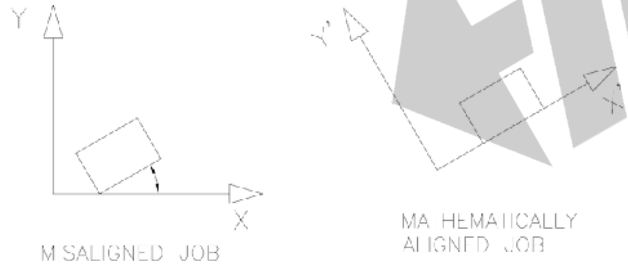


7 Skewing the Job:

During measurement of any part for its dimensions, it is necessary to perfectly align the part on the co-ordinate measuring system. Any misalignment of part will result in inaccurate measurements.

The part to be measured cannot be aligned exactly with co-ordinate measuring system of machine. Therefore it is necessary to skew the Job prior to measurement.

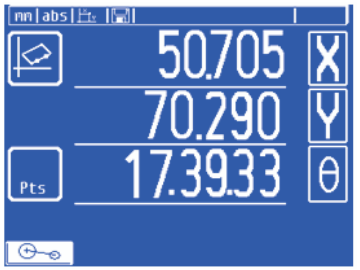
The skew function converts machine co-ordinates to part co-ordinates by electronically compensating for part misalignment.



Note: As shown in the above figure, the part must be placed within 45 degrees of the machine's co-ordinate system.

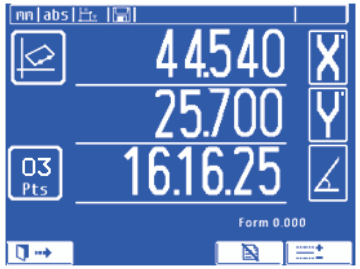
Procedure for skewing the job:

◆ Press [ ] key. Following screen will be displayed.



◆ Now probe line which is to be skewed. Use standard procedure for line measurement. Probing more points will increase the accuracy of skew measurement.

◆ Press [finish] key to complete skew measurement. The result screen is displayed as shown below. Any feature measurement done henceforth will be with respect to skewed co-ordinates. For indication of skew, the X and Y axis labels are represented as shown below.



◆ Pressing [quit] key will exit from skew mode. The DRO will prompt to cancel skew. Now on the DRO functions in normal mode.