D50 SERIES

DIGITAL READOUTS

Operation Manual

(Version 3.0)

Dear consumer：

Thank you for buying the D50 multifunctional Digital Readout (DRO) products manufactured by our company. This kind of DRO is widely used on the machine tools such as milling machines, lathes, electric discharge machines, grinding machines, etc. and detecting equipments, as well as in the positional and auxiliary processing of manual operation.

Safety Precautions：

In order to prevent electric shock or fire disasters, the DRO must be kept dry or not be splashed directly by the cooling liquid.In the case that the DRO emits smoke or peculiar smell, pull out the power plugs immediately to prevent fire disasters and electric shock. Then contact our company or the dealers, do not try to repair it by yourself.

The DRO is connected with the grating ruler or other displacement sensors to form the precise measuring system. Special attention should be paid when using the measuring system, and do protect the connection between the grating ruler and DRO from damage to avoid measuring errors.

Do not repair and modify the measuring devices of DRO by yourself, otherwise the failure, fault or damage will be caused. If any abnormality occurs, please contact our company or the dealers.

When the sensors (such as grating rulers, magnetic grating rulers, rotary encoders) used with the DRO device are damaged, do not use other brand products to replace the damaged ones, for the products of each company have different features, index, interface and modes. Please replace the damaged sensors under the professional's guidance; otherwise it is liable to cause damage to the DRO device.

CE ISO9001

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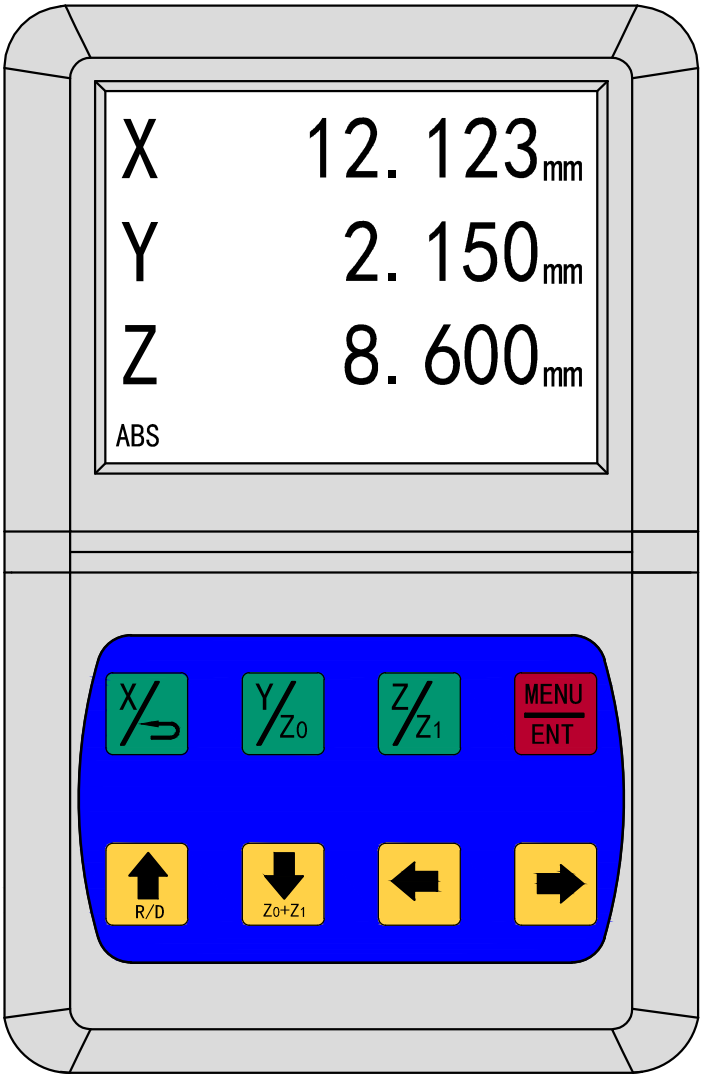
Introduction

1.1 D50 Introduction

D50 series multi-function DRO is equiped with LCD screen.

D50-2V:2 axis DRO applys to 2 axis Milling machine,Grinding machine,Lathe and other applications which need the 2 axis measuring system.

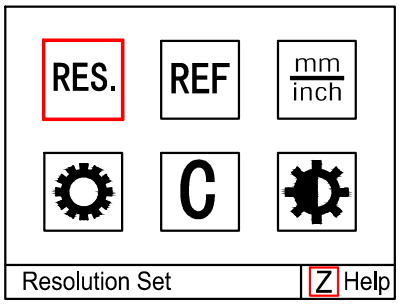
D50-3V:3 axis DRO applys to 3 axis Milling machine,Lathe and other applications which need the 3 axis measuring system



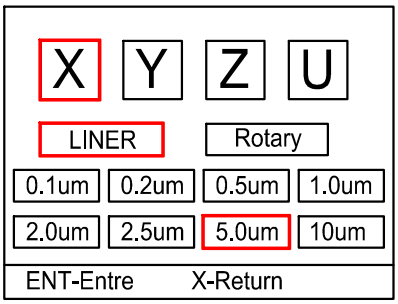
2. System Parameters Setting

2. System Parameters Setting

After turning on the DRO and entering the working interface,press MENU/ENT to enter the menu,by pressing R/D Z0-Z1 ◄ ► to select the RES. , and then press MENU/ENT to enter the system parameter setting.



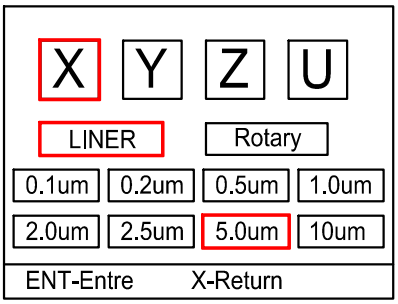
Function menu interface



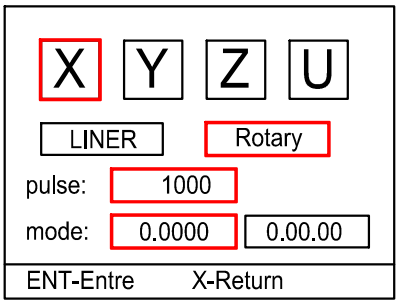
System parameter setting interface

2.1: Encoder type selection (LINER stands for a linear displacement transducer matching the axis. Rotary stands for a rotary encoder matching the axis);

Select the RES. in the function menu,and then press MENU/ENT to enter the system parameter setting interface.By pressing ◄ ► to choose the corresponding axis,the red icon indicates the current setting for this axis.After choosing the axis,press the MENU/ENT to enter the encoder selection.At this moment,the current encoder icon will start to blink,then press ◄ ► to choose the target encoder.LINER indicates the linear encoder,Rotary indicates the rotary encoder for this axis.After setting well,press the MENU/ENT to enter the resolution setting.



Linear encoder interface



Rotary encoder interface

2.2: Resolution setting（Set resolution for the corresponding encoder）

For linear encoder, set the resolution as follows:

Fixed resolution selection: 0.1um, 0.2um, 0.5um, 1um, 2um, 2.5um, 5um and 10um.

When the encoder selected as the linear encoder,press MENU/ENT to enter the resolution setting,then the column will start to blink.At this moment,press ◄ ► to select the target resolution.After setting well,press MENU/ENT to exit the resolution setting.

2.3:Rotary encoder parameter setting(pulse for the encoder's pulse number,mode for encoder's displaying mode)

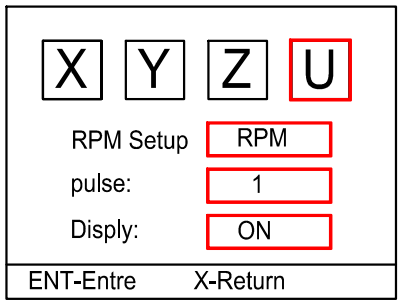
Press MENU ENT to enter the resolution setting after the encoder type selected as the rotary encoder.When setting the resolution of the rotary encoder,please follow its pulse number.Different rotary encoder has different pulse number.

When inputting the resolution,the data start to blink,by press the R/D Zo+Z1 to choose the right data,and then press the ◄ ► to choose the numeric digits.After setting well,press the MENU ENT to enter the displaying mode.0.0000 indicates the degree displaying,0.00.00 indicates degree,minute,second displaying,press the ◄ ► to switch.After setting well,press the MENU ENT to exit the resolution setting.

2.4 RPM setting

Select the RES. in the function menu,press MENU ENT to enter the system parameter setting.By pressing ◄ ► to select the U axis,and then press the MENU ENT to enter the RPM setting.

Pulse indicates the pulse number when the spindle rotates a complete circle.Press the R/D Zo+Z1 to choose the pulse number.The maximum pulse can be set is 36.After setting well,press MENU ENT to enter the RPM ON-OFF interface.It can be switched by press R/D Zo+Z1 . After all these parameter be set well,press MENU ENT to exit the RPM setting.

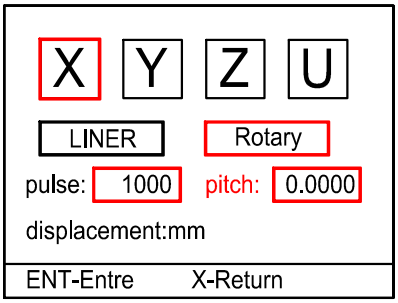


RPM setting interface

2.5 Rotary encoder measure displacement

Using rotary encoder to measure displacement, you need input the rotary encoder lines and screw pitch data. First enter system parameter setting,select the axis which is using rotary encoder, and select the encoder type to "Rotary". Press MENU ENT to enter, press ◄ ► to select measure displacement "Pitch"("Pulse" is measure angle). After setting press ENT to input rotary encoder lines, press ◄ ► input the data. After input the lines press MENU ENT to save the data and enter input screw pitch, also press R/D Zo+Z1 to input the data. After finish all the setting press MENU ENT to save the setting, press MENU ENT again to exit system parameter setting .

Rotary encoder measure displacement interface



3. Basic Functions

3.1 Zeroing, data recovery

Function: Operator could zero the displayed coordinate at any position.

Example 1: Zero the displayed value of X axis at the current position.

Press X/⊃ key to zero the displayed data of X axis;
Press Y/Z0 key to zero the displayed data of Y axis;
Press Z/Z1 key to zero the displayed data of Z axis;

Data recovery

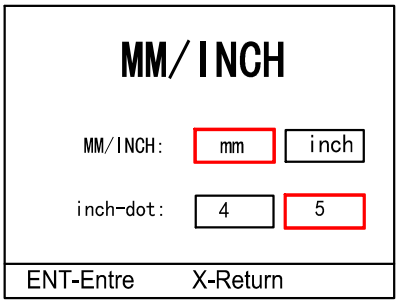
Function: Recover the data which has been zeroed by mistake at any position.

Example 2: Realize the data recovery of X axis.

Press X/⊃ key to recover the displayed data of X axis;
Press Y/Z0 key to recover the displayed data of Y axis;
Press Z/Z1 key to recover the displayed data of Z axis;

3.2 Display in Metric/British units

Select the mm/inch in the function menu,press MENU/ENT to enter the Metrics and British units setting. Press ← → to select the Metric unit or British unit.If the unit selected as the Metric,then press the MENU/ENT to exit the setting.If the unit selected as the British,then press MENU/ENT to enter the decimal points setting.By press the ← → to select,4 indicates there are 4 digits behind the decimal point,5 indicates there are 5 digits behind the decimal point.After setting well, press the MENU/ENT to exit.



The Metric and British unit setting interface

Note:The default is 5 digits behind the decimal point.

3.3Coordinate inputting

Function:This function allows the operator to set the current position as any value.

Under ABS,INC or SDM mode,press the X/⊃ with no stop until the data start to blink to enter the coordinate inputting for X axis.Press the ↑ R/D ↓ Z0+Z1 to choose the data,and then press ← → to switch to next digit for setting.After setting well,press MENU/ENT to exit the coordinate inputting.

Under ABS,INC or SDM mode,press the Y/Z0 with no stop until the data start to blink to enter the coordinate inputting for Y axis.

Under ABS,INC or SDM mode,press the Z/Z1 with no stop until the data start to blink to enter the coordinate inputting for Z axis.

3.4 ABS/INC Coordinates

Function: DRO provides two sets of standard coordinate display value, namely ABS (absolute) and INC (relative) coordinates. The operator could store the reference zero point of work piece at ABS coordinate, and convert ABS coordinate to INC coordinate for machining. Zeroing at any position at INC coordinate won't affect the length value relative to the reference zero point of work piece at ABS coordinate, which shall be stored during the whole machining process and could be checked whenever necessary.

When the DRO is under the ABS,INC or SDM mode,press the ⬅ ➡ to switch.

3.5 1/2 function

Function: DRO provides automatic centre find function which divides the current displayed position by 2 and sets the zero point at the centre of work piece.

When the DRO is under the ABS,INC or SDM mode,press R/D to enter the 1/2 function.Press X/2 Y/Z0 Z/Z1 to half the value on the corresponding axis.
Half the value on the X axis,press the R/D to enter the 1/2 function,then press the X/2 .
Half the value on the Y axis,press the R/D to enter the 1/2 function,then press the Y/Z0 .
Half the value on the Z axis,press the R/D to enter the 1/2 function,then press the Z/Z1 .

3.6 Diamete/radius Conversion

(Applicable to D50 lathe DROs)

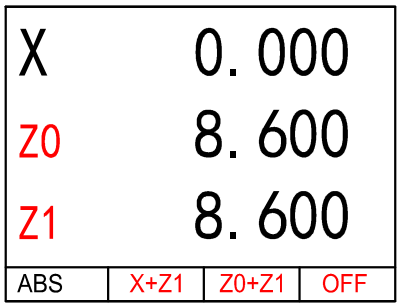
Function Introduction

When the DRO set as the Lathe mode, Z0+Z1 has special function.Press the R/D first,and then press the Z0+Z1 .The the X axis will display the diameter,the color of X axis column will change to red. If press the R/D and then Z0+Z1 again,the displaying on axis will change to radius.The red color of the X axis column will disappear.

Switch radius to diameter on Y axis,press the R/D and then Z0+Z1 ,the displaying on Y axis will be diameter.
Switch radius to diameter on Z axis,press the R/D and then Z0+Z1 ,the displaying on Z axis will be diameter.

3.7 Z0 + Z1 X + Z1 function (3 axis lathe machine function)

When the DRO is used as a 3 axis lathe machine, press Z0+Z1 enter combined axis function, press ⬅ ➡ select X + Z1 Z0 + Z1 or turn off the combined axis function, when you done of the select press MENU ENT to exit the combined axis function and save the setting. When the combined axis function start to work, the axis was combined icon turning to red, and when you turn off the function the icon turning back.



Function interface

3.8 200 sets of auxiliary zero location:

Function:

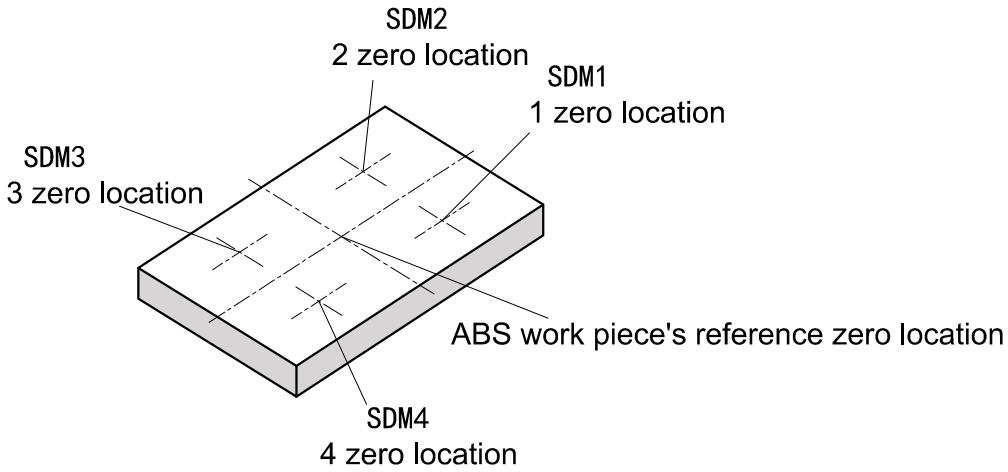
Typical grating DRO only provides two groups of coordinates, namely ABS/INC. But in most of the daily machining occasions, operators always find it not enough, especially in die machining or small batch machining. The DRO provides 200 sets of auxiliary zero location (SDM) function to compensate for the shortage of the ABS/INC function. But SDM is not just a simple additional INC coordinate, it has the following difference compared to ABS/INC.

1. INC zero location is completely independent. Regardless of any change in ABS zero location, INC zero location will never change. But the zero location of SDM is relative to ABS, which means when ABS zero location changes, all the SDM zero locations shall change correspondingly.

2. The distance of SDM relative to ABS coordinate could be entered by keys directly, which is both fast and precise.

Applications of SDM in sub zero point:

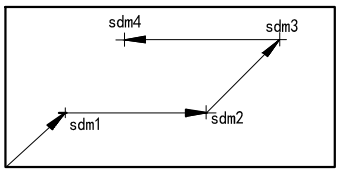
Operators could set each sub zero location on the work piece in the SDM auxiliary zero location coordinates.



Press ⬅ key or ➡ key to convert to SDM auxiliary zero location directly without returning to ABS coordinate.

Applications of SDM in small batch machining

SDM function could store batch of working point positions in SDM zero location. Operators could enter all the working points to the DRO at once. Alternatively, operators could also input the working points into SDM of DRO when machining the first work piece. Afterwards they only need to adjust the reference zero location of the subsequent work pieces in ABS coordinate. As the SDM zero locations correspond to these of ABS, all the working point shall recur by SDM zero locations.



ABSzero

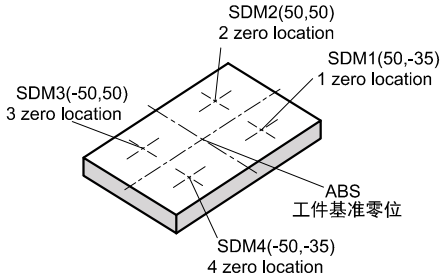
Reference of work piece (0.000)

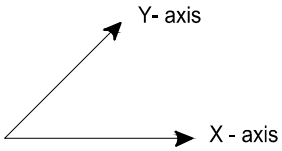
Input the required coordinate value under SDM state according to SDM or press ⬅ and ➡ keys to turn to each SDM auxiliary zero location. Move the machine until each SDM coordinate displays 0, which is the position of each working point.

SDM application examples:

If you need set 4 auxiliary zero locations on the work piece (from SDM1 to SDM4), two methods are available:

1. Zeroing in place.
2. Input each SDM coordinate by pressing keys directly.





Method I: Zeroing in place

At first set the reference zero location of the work piece in ABS coordinate and move the table to each SDM zero location directly, then turn to SDM Zeroing and memorize the zero location.

Method 2: Enter SDM coordinate by pressing keys directly

The method of inputting SDM coordinate by pressing keys directly: At first set the reference zero location of the work piece in ABS coordinate and move the machine table to ABS zero point, then input all the SDM zero location coordinates in once at this position.

3.9 Power Off Memory Function

In case of sudden powering off during machining process, DRO provides data storage module which could store the coordinate and data before powering off. When DRO is powered on again, all the data before powering off will recover automatically.

3.10 Linear compensation

Function: Linear error compensation function is used to correct the system errors of the grating ruler measurement system linearly.

Note: the calculation formula of correction coefficient is:

Correction coefficient S = （L - L1）/（L / 1000）mm/m

L: Stands for the actual measured length (mm)

L1: Stands for the displayed value (mm) on the DRO

S: Stands for correction coefficient (mm/m)

(+ indicating lengthening and – indicating shortening)

Compensation range: - 1.9 mm/m to + 1.9 mm/m

Example: The actual length of the machine's X axis table is 1000.000mm and the displayed value on the DRO is 999.880mm. The correction coefficient is calculated as follows:

S = （1000.000 - 999.880）/（1000.000 / 1000.000）= 0.120

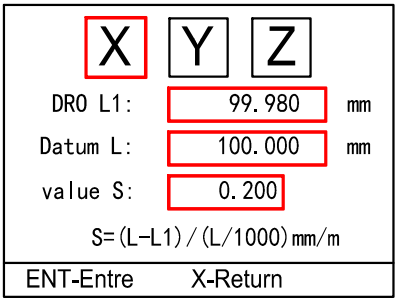
The steps for the linear compensation:

The linear compensation has 2 ways to proceed the compensation.

Turn on the DRO to enter the working interface,then press the MENU ENT to enter the function menu,by pressing R/D Zi+Z1 to select the C ,and then press MENU ENT again to enter the linear compensation function.By pressing the to select the XYZ axis,and then press the MENU ENT to enter the compensation for the corresponding axis.

Way 1:Measuring way compensation.

After choosing the axis well,press MENU ENT to enter the measuring status.Move the linear scale to the actual length position,and then input the actual length.Press the MENU ENT ,at this moment the DRO will calculate the compensation value automatically.



Way 2:Direct Compensation

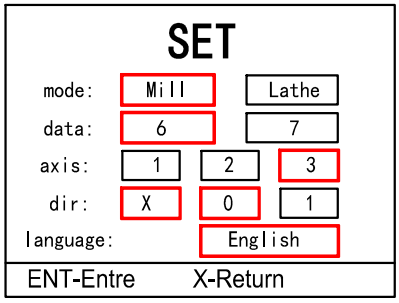
If operator know the compensation value,press MENU ENT to enter the measuring status.Then press the MENU ENT to enter the compensation inputting value.At this moment,the column will start to blink.The following step is to input the compensation value.After inputting well,press MENU ENT to confirm,then press MENU ENT again to save and exit the linear compensation.

Note:If the displayed value is input,the DRO cannot enter the linear compensation function.Please zero the corresponding value,then enter this function.The linear compensation function only can be entered under the ABS or INC mode.

3.11 Mode setting (Mill or Lathe)

When the DRO login into the working interface after turning on,press the MENU ENT to enter the function menu.By pressing R/D Z0+Z1 to select the ,and then press the MENU ENT to enter the setting.The column will start to blink,press the to choose.Mill indicates the milling machine mode.Lathe indicates the Lathe mode.After choosing well,press the MENU ENT to save and enter the Numeric digits setting.

3.12 Numeric digits setting



Select the in the function menu,and then press MENU ENT to enter the setting menu.Press the MENU ENT twice to proceed the setting.The data column will start to blink at this moment.And then by pressing to choose.6 indicates there will be 6 numeric digits displayed on XYZ axis.7 indicates that there will be 7 numeric digits displayed on all axis.After choosing well,press the MENU ENT to save and enter the axis number setting.

3.13 Axis number setting

Select the in the function menu,and then press MENU ENT to enter the setting menu.Press the MENU ENT three times to proceed the setting.The axis column will start to blink at this moment.And then by pressing to choose.After setting well press MENU ENT to save and enter the counting direction setting. Note 2 axis DRO is only optional for 1 axis or 2 axis.

3.14 counting direction setting

Select the in the function menu,and then press MENU ENT to enter the setting menu.Press the MENU ENT four times to proceed the setting.The dir column will start to blink at this moment.And then by pressing to choose.O indicates positive counting direction ,1 indicates negative counting direction.Select XYZ by pressing R/D Z0+Z1 After setting well press MENU ENT to save and enter the language setting.

3.15 Language setting

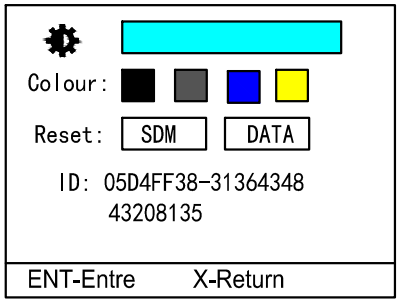
Select the in the function menu,and then press MENU ENT to enter the setting menu.Press the MENU ENT five times to proceed the setting.The language column will start to blink at this moment.And then by pressing R/D Z0+Z1 to choose.After setting well,press MENU ENT to save and exit the setting menu.

3.16 Brightness setting

Select the in the function menu,and then press MENU ENT to enter the setting menu.The brightness column will start to blink at this moment.By pressing the to set the brightness.After setting well,press the MENU ENT to save and enter the background color setting.

3.17 Background color setting

Select the ⚙ in the function menu, and then press MENU ENT to enter the setting menu. Press MENU ENT again,the Color column will start to blink.By pressing ← → to set the color.After setting well,press MENU ENT to save and exit.



The background color is optional for 4 modes.
Mode 1:Black lettering on white background
Mode 2:Green lettering on black background
Mode 3:Blue lettering on white background
Mode 4:Yellow lettering on Blue background.

3.18 Full zeroing the 200 groups of SDM coordinates

Function:To clear all the 200 groups of the SDM coordinatescoordinates.

Select the ⚙ in the function menu,and then press MENU ENT to enter the setting menu.Press the MENU ENT again,the color lettering start to blink.By pressing the R/D Zo+Z1 to choose between Color and Reset.The Reset should be chosen there,and press MENU ENT to enter the full zero of the SDM.By pressing ← → to choose SDM and then press the MENU ENT to clear all the 200 groups of the SDM coordinates.

Note:It may take a while for this process.

3.19 Factory reset

Function:To clear all the parameter settings in the DRO

Select the ⚙ in the function menu,and then press MENU ENT to enter the setting menu.Press the MENU ENT again,the color lettering start to blink.By pressing the R/D Zo+Z1 to choose between Color and Reset.The Reset should be chosen there,and then press the MENU ENT to enter the factory reset.By pressing ← → to choose the Data. After choosing well,press the MENU ENT to clear all the settings.

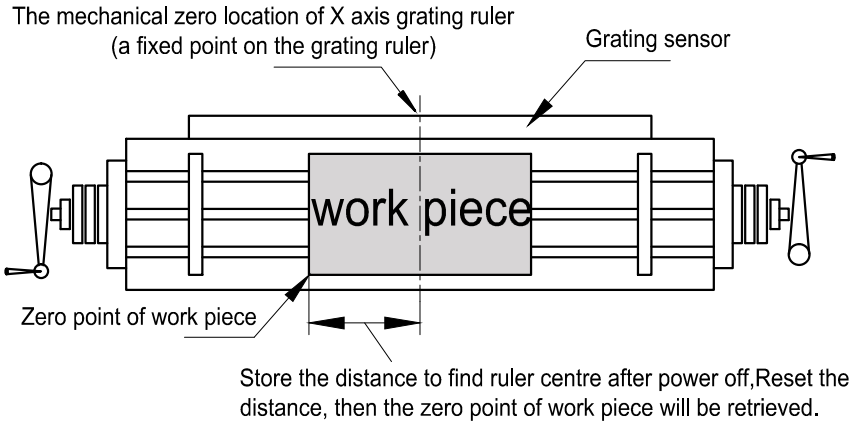
Note:It may take a while for this factory reset process,please wait with patience.After finishing this process,the DRO will turn on again automatically.

3.20 Ruler storage function:

Function: In daily machining process, we often encounter such situations as power failure or machining couldn't be finished in one day. If losing the machining zero point, we have to retrieve the zero point of work piece which is troublesome. What's more serious is that there's always errors in retrieving the zero point of work piece by touching, which may cause errors to the parts machined afterwards. DRO provides ruler storage function.

It stores the zero point of work piece by using the zero location of grating ruler, which enables the operator to find the zero point easily after power off without retrieving the zero point by touching.

Example: Take the X axis for example:



Note: The ruler storage function in our DRO is the most advanced and easiest to use in the DRO market. Each time the operator uses functions which may affect the zero point such as Zeroing, finding centre and inputting coordinate under ABS coordinate, DRO will store the distance between zero point of work piece and ruler centre. So the operator only need operate under the ABS coordinate to set the origin before either switching on the DRO or machining (the work piece hasn't been clamped onto the table). Through which the DRO will record the zero location of the ruler. Then DRO will deal with other storage processes without bothering the operator.

3.20.1 Ruler storage function (set the origin):

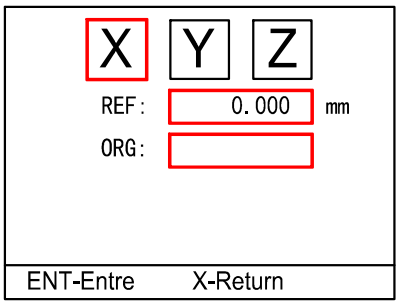
Function: When machining a complex work piece, its zero point couldn't lose under the cases of power off or failing to finish machining in one day. In this case we could set the origin under the ABS coordinate state of DRO to store the origin of the work piece into DRO. DRO will memorize the distance between the zero point of new work piece and ruler centre during all the operations of resetting the work piece's zero point under ABS coordinate such as Zeroing, finding centre and inputting coordinate so as to retrieve the work piece's zero point after power off or closing ruler.

Step 1:Enter the REF function,choose the axis which will find the reference point on.

Press the MENU ENT after turning on the DRO.Select the REF by pressing the R/D Z0+Z1 .And then press the MENU ENT to enter the REF function.Choose the axis among XYZ by pressing the .Press the MENU ENT to choose between REF and ORG.

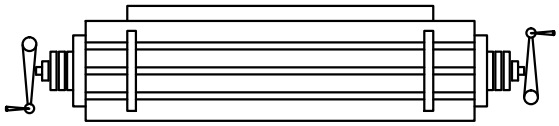
Step 2:Choose REF to set the original point.

After choosing the axis,press MENU ENT .The lettering of REF will start to blink.To select between the REF and ORG by pressing R/D Zo+Z1 .The REF should be chosen there, and then press the MENU ENT to search.The REF column will start to blink at this moment.

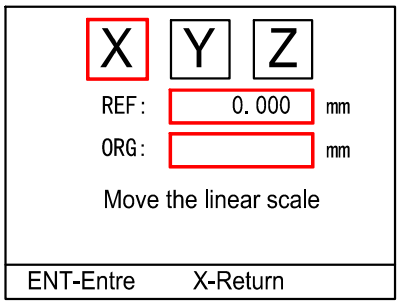


Note: Select REF for ruler storage function (find the grating ruler's zero location)
Select OGR for retrieving the work piece's coordinate origin (retrieve the work piece's coordinate origin)

Step 3: Turn the hand wheel on X direction of the machine tool and move the table, then DRO will search for the machine zero point of grating ruler on X axis. When the machine zero point is fixed, the buzzer will ring once and the information window will promptly display: X-axis Complete. Repeat step 2 and 3 to complete the ruler storage function of Y and Z axis.



Turn the machine tool to find the grating ruler's zero location



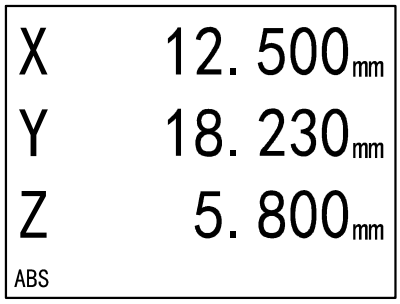
Step 4: Press X key to exit ruler search function and back to he machining interface.

3.20.2 Retrieve the work piece's origin:

Function: When machining a complex work piece, the zero point gets lost because of sudden power off. After the power is connected, we couldn't keep on machining until we retrieve the work piece's zero point. Note that we couldn't move the machine by this time. When DRO's self-checking finishes, ABS coordinate (not necessary if DRO is already under ABS coordinate when switched on). By this time we need to record the data of X, Y and Z axis under the current ABS mode. Detailed operating steps are shown below.

Step 1: Record the data of X, Y and Z axis under ABS mode when DRO completes self-checking:

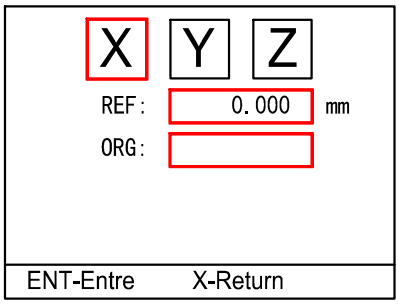
Example: If DRO completes switch-on self-checking under ABS mode
X axis is 12.500 Y axis is 18.230 Z axis is 5.800 .



Note: DRO couldn't deal with the data of X, Y and Z axis automatically, so they need to be recorded to find the zero point.

Step 2:Enter the REF function,choose the axis which will find the reference point on.

Press the MENU ENT after turning on the DRO.Select the REF by pressing the R/D Z0+Z1 .And then press the MENU ENT to enter the REF function.Choose the axis among XYZ by pressing the XYZ.Press the MENU ENT to choose between REF and ORG.

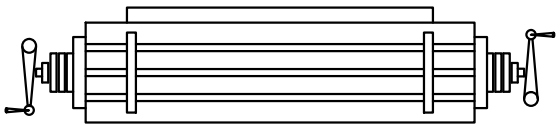


Step 3:Select ORG to find back the original point.

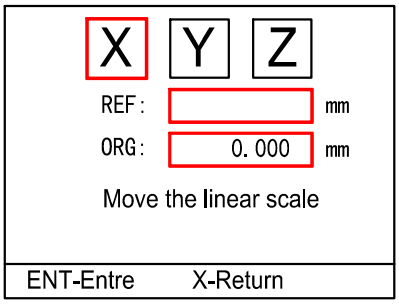
After choosing the axis,press MENU ENT .The lettering of REF will start to blink.To select between the REF and ORG by pressing R/D Z0+Z1 .
The ORG should be chosen there,and then press the MENU ENT to search.The REF column will start to blink at this moment.

Note: Select REF for ruler storage function (find the grating ruler's zero location)
Select OGR for retrieving the work piece's coordinate origin (retrieve the work piece's coordinate origin)

Step 4: Turn the hand wheel on X direction of the machine and move the table, then DRO will find for the machine zero point of grating ruler on X axis. When the zero point is found, the buzzer will ring once and the information window will promptly display: X-axis Complete. Repeat step 2 and 3 to complete retrieving the work piece's origin of Y and Z axis.



Turn the machine tool to find the grating ruler's zero location



Step 5: After searching the work piece's origins on X, Y and Z axis, turn the machine under ABS coordinate state. When the coordinates of X, Y and Z axis are the ABS coordinates recorded at power-on self-checking, this point is the one when machining stopped at last power off and we could go on machining the unfinished work piece.

Step 6:Press  key to exit the ruler tracking number function.

Note: Retrieve the work piece's origin. The data couldn't be recovered until the origin is set before machining.

4.1 PLD Function

(Applicable to the machine tools: 2M, 3M milling machines and Electric Discharge Machines)

We have two ways to realize the PLD function.

Way 1: Length way (L-LEN, the distance from the starting hole center to the ending hole center)

Way 2: Step way (L-STEP, the distance between two adjacent holes)

PLD input parameters:

L-LEN:

LENGTH - - oblique line overall length (the distance from the starting hole to the ending hole, as shown in figure B)

ANGLE - - oblique line angle (as shown in figure A)

No HOLE - hole number (as shown in figure B)

L-STEP:

STEP - - - - pitch-row length (the distance between two adjacent hole centers, as shown in figure B)

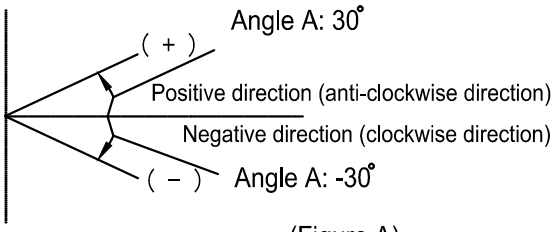
ANGLE - - oblique line angle (as shown in figure A)

No HOLE - hole number (as shown in figure B)

Example: as shown in the right figure

Figure A:

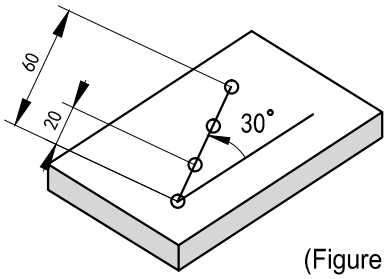
The angle refers to the position direction of the oblique line on the coordinate plane. The anti-clockwise direction is the positive direction, and the clockwise direction is the negative direction.



(Figure A)

Figure B:

oblique line: 60mm
oblique line angle: 30mm
pitch-row: 20mm
holes: 4



(Figure B)

Example 1: How to set

Step 1: Move the tool to the start hole position

Press MENU ENT enter function menu, press ↑ R/D ↓ Z0+Z1 ← → select PLD function

Press MENU ENT enter PLD function

4.1 PLD Function

Step 2: Select work plane (PLANE)

Press R/D Zo+Z1 to choose “PLANE”, press MENU ENT to select, press Y/Zo to select work plane, after setting that, press MENU ENT to save

(Only 3 axis DRO have this step, 2 axis DRO just have XY plane, so don’t need to select the plane, you can skip to next step)

Step 3: Machining way selection

Press R/D Zo+Z1 to choose “WAY”, press MENU ENT to select, press Y/Zo to machining way selection, after setting that, press MENU ENT to save

Length way (L-LEN, the distance from the starting hole center to the ending hole center)

Step way (L-STEP, the distance between two adjacent holes)

Step 4: Input length

Press R/D Zo+Z1 to choose “LENGTH” , press MENU ENT to select, press R/D Zo+Z1 ← → input the data, after finished that press MENU ENT to save.

Step 5: Input angle

Press R/D Zo+Z1 to choose “ANGLE” , press MENU ENT to select, press R/D Zo+Z1 ← → input the data, after finished that press MENU ENT to save.

Step 6: Input hole number

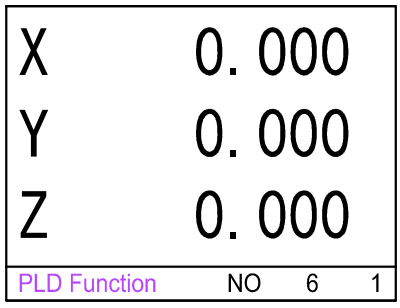
Press R/D Zo+Z1 to choose “NO HOLE” , press MENU ENT to select, press R/D Zo+Z1 ← → input the data, after finished that press MENU ENT to save.

Step 7: Finished input the data press MENU ENT enter processing status, and screen display first hole’s position.

Step 8: Press the ← key to display the position of the next machining point, then move the machine tool until the axis displays zero, indicating the position of the second machining point, and press the X/Y key to exit the function of punching on an oblique line anytime.

PLD Function	
PLANE:	LIEN-XY
WAY:	L-LEN
LENGTH:	50.000
ANGLE:	30.000
NO HOLE:	6
ENT-Entre	↑↓ - Select

PLD function setting interface

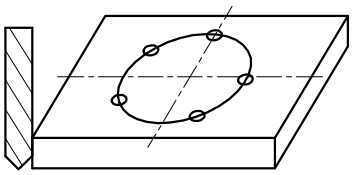


PLD function processing interface

4.2: PCD Function

(Applicable to machine tools: 2M and 3M milling machines and EDM)

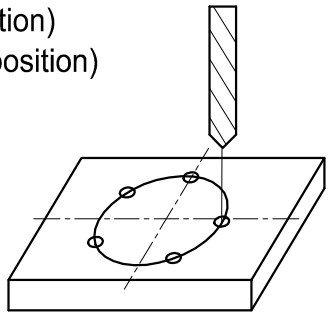
This function is used for dividing the arc equally, such as the equally distributed holes on the drilling flange.



Function:

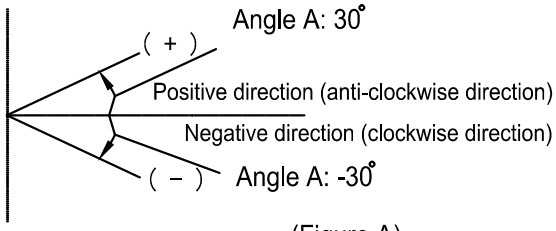
The DRO offers the tool positioning function of drilling equally divided holes on the circumference. Operators only need to input the relevant machining parameters according to the provided information, then the system will calculate the position coordinates of holes immediately and set the hole position to zero point (0.000, 0.000) temporarily. Operators only need to input the following six parameters.

PCD-XY	plane selection
CT-POS X	circle center coordinate
CT-POS Y	circle center coordinate
DIA	arc diameter
ST-ANG	starting angle (angle of 1st hole position)
ED-ANG	ending angle (angle of the last hole position)
No HOLE	hole number



The DRO automatically calculates the position of every equally divided hole on the circumference and sets position of every hole to zero point. Operators only need to press the ⬅ and ➡ keys to select which hole to be reached on the circumference, then move the machine tool until the DRO displays (0.000), i.e. the hole position is reached.

Note: The angle direction is shown in the right figure.



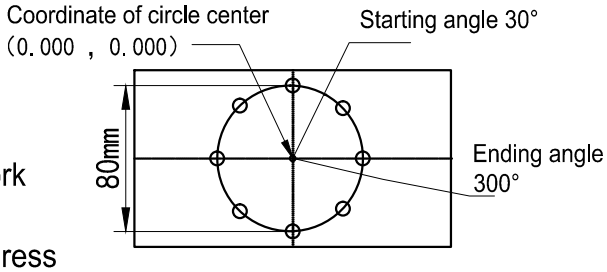
(Figure A)

Example: Machining for the Work Pieces as shown in the Figure

PCD-XY - - plane XY
CT-POS X - - - coordinate of circle center X=0.000
CT-POS Y - - - coordinate of circle center Y=0.000
DIA - - - - - - 80mm arc diameter
ST-ANG - - - starting angle 0°
ED-ANG - - - ending angle 360°

4.2 PCD Function

No HOLE - - 9 holes
Note:the 1st hole will be superposition with the 9th hole.



Step 1: Find the central position of the work piece, and Set the tool.
Press MENU ENT enter function menu, press R/D Z0+Z1 ← → select PLD function Press MENU ENT enter PCD function

Step 2: Select work plane (PLANE)
Press R/D Z0+Z1 to choose “PLANE”, press MENU ENT to select, press Y/Z0 to select work plane, after setting that, press MENU ENT to save
(Only 3 axis DRO have this step, 2 axis DRO just have XY plane, so don’t need to select the plane, you can skip to next step)

Step 3: Enter coordinate of circle center (CT-POS X = 0)
Press R/D Z0+Z1 to choose “CT-POS X” , press MENU ENT to select, press R/D Z0+Z1 ← → input the data, after finished that press MENU ENT to save.

Step 4: Enter coordinate of circle center (CT-POS Y = 0)
Press R/D Z0+Z1 to choose “CT-POS Y” , press MENU ENT to select, press R/D Z0+Z1 ← → input the data, after finished that press MENU ENT to save.

Step 5: Input diameter (DIA = 80)

Step 6: Input starting angle(ST-ANG = 0)

Step 7: Input ending angle(ED-ANG = 360°)

Step 8: Input hole number (NO HOLE = 9)

Step 9: Enter the machining state
Finished input the data press MENU ENT enter processing status, and screen display first hole’s position.

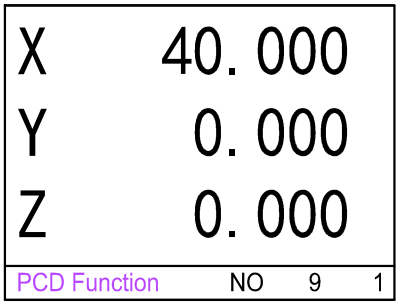
Step 10: Move the machine tool until the axis displays zero, i.e. the first point position is reached. Press the ← key to display next machining point position, and move the machine tool until the axis displays zero.

Step 11: Press the X/5 key to exit the PCD function anytime.

4.2 PCD Function

PCD Function	
PLANE:	LIEN-XY
CT-POS X:	0.000
CT-POS Y:	0.000
DIA:	80.000
ST-ANG:	0.000
ED-ANG:	30.000
NO HOLE:	9
ENT-Entre	↑ ↓ - Select

PLD function setting interface



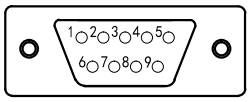
PLD function processing interface

5. Appendix

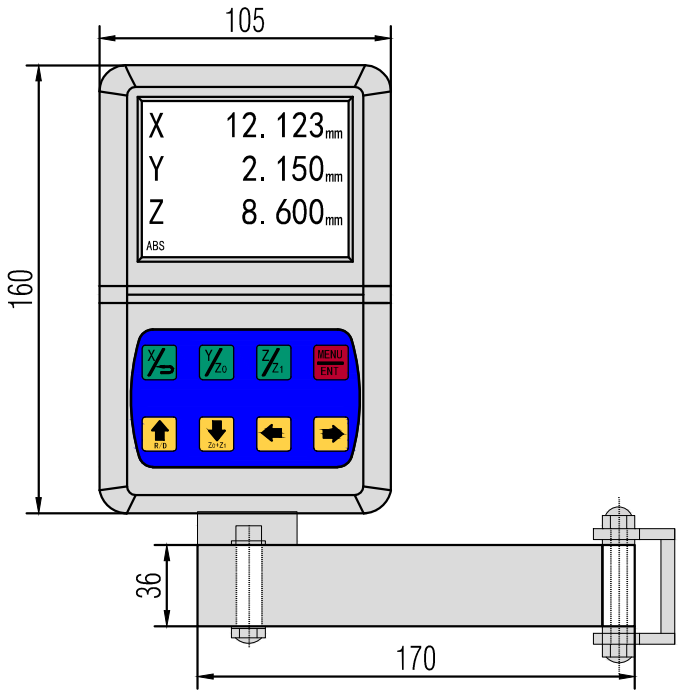
5.1 Notices for Usage:

1. Supply voltage: AC 80 V - - 260 V, 50 - - 60 Hz
2. Power: 5 W
3. Operating temperature: -10℃- - 60℃
4. Storage temperature: -30℃- - 70℃
5. Relative humidity (RH): <90% (25)>
6. Screen dimension:.3.5
7. Axis to be displayed : 1 axis, 2-axis , 3-axis
8. Input signal allowed by the DRO: RS422/TTL
9. Allowable input signal frequency: < 2 MHz
10. Length resolution: 0.1 um, 0.2 um, 0.5 um, 1 um, 2 um, 2.5 um, 5 um and 10 um
11. Minimum resolution of angle display: 0.0001/ pulse
12. Weight: 0.4 KG
13. Volume size: 160 x 105 x 67 (mm)
14. Interface definition of the grating ruler: (DB 9-pins socket)

Pin	1	2	3	4	5	6	7	8	9
signal	A-	0V	B-	PE	R-	A	+5V	B	R



5.2 Installation Figure



5.3 Troubleshooting

The following troubleshootings are just the preliminary methods. If the problems still exist, please do not dismantle the DRO by yourself, but contact our company or the dealers for help in time.

Faults	Fault Causes	Solutions
The DRO doesn't display anything	1. The power is not on ? 2. The power switch is not closed ? 3. The supply voltage is not appropriate 4. The internal supply of the grating ruler is in short circuit.	1. Check whether the power line and power plug are plugged in. 2. Close the power switch. 3. Make sure the supply voltage between 85V-265V. 4. Pull out the connector of the grating ruler.
One axis of the DRO doesn't count	1. Operate the machine after swapping with the grating ruler of another axis. 2. Some special functions of the DRO are being used.	1. If counting, it's the fault of the grating ruler; if not, it's the fault of the DRO. 2. Exit the special function
The counting of DRO is not accurate (it can't zero)	1. The grating ruler isn't installed according to the requirements or the accuracy is not enough. 2. After being used for a long time, the vibration of the machine tool makes the fixed reading head or the screws loosen. 3. The accuracy of the machine tool is not good. 4. The DRO resolution isn't consistent with the grating ruler.	1. Reinstall the grating ruler and adjust the level. 2. Tighten all the fixed screws. 3. Overhaul the machine tool. 4. Reset the DRO resolution.
The counting of DRO is in error,The displayed operation distance isn't consistent with the actual distance	1. The machine tool and the DRO shell are not connected to earth. 2. The accuracy of the machine tool is not good. 3. The running speed of the machine tool is too fast. 4. The grating ruler isn't installed according to the requirements and the accuracy is not enough. 5. The DRO resolution isn't consistent with the grating ruler. 6. The operating size unit is not consistent with the displayed Metric/British units. 7. The linear error compensation setting of the DRO is not appropriate. 8. The grating ruler exceeds the operating range of length or the read head is broken.	1. Connect the machine tool and the DRO shell to earth. 2. Overhaul the machine tool. 3. Reduce the running speed of the machine tool. 4. Reinstall the grating ruler and adjust the level. 5. Reset the DRO resolution. 6. Switch the displayed Metric/British units. 7. Reset the linear error compensation of the DRO. 8. Repair the grating ruler.

Faults	Fault Causes	Solutions
The grating ruler doesn't count	1. The grating ruler exceeds the operating range of length or the read head is broken. 2. The read head of grating ruler rubs the ruler shell leading to the aluminum scraps accumulated. 3. The gap between the read head of grating ruler and the ruler body is too wide. 4. The metal tubes of the grating ruler are damaged, which causing the short circuit or disconnection in internal wiring.	1. Repair the grating ruler 2. Repair the grating ruler 3. Repair the grating ruler 4. Repair the grating ruler
The grating ruler doesn't count sometimes	1. The small box of the grating ruler is separated from the steel ball. 2. The grating glass in the read head of the grating ruler is abraded. 3. There is dirt on the grating glass in the shell of the grating ruler. 4. The elasticity of small box spring in the read head of the grating ruler is not enough.	1. Repair the grating ruler 2. Repair the grating ruler 3. Repair the grating ruler 4. Repair the grating ruler