

D50 SERIES

**DIGITAL READOUTS**

**Operation Manual**

(Version 2.0)

**Dear consumer:**

Thank you for buying the 2V/3V 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.



ISO9001

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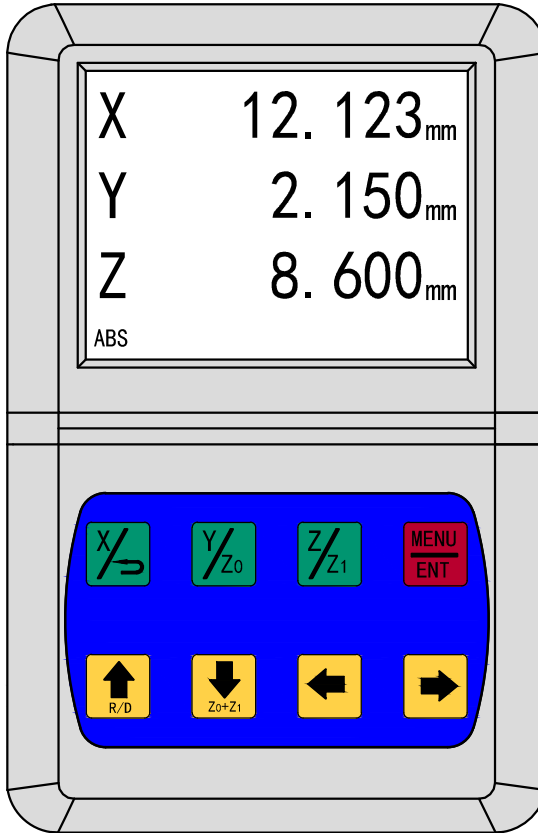
# Introduction

### 1.1 D50 Introduction

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

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








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

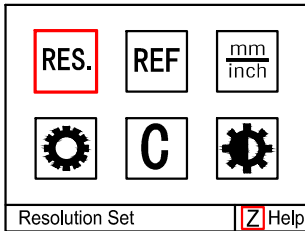


## **2. System Parameters Setting**

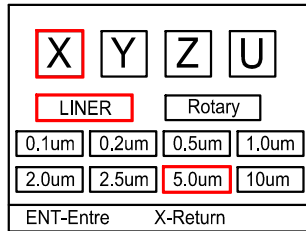
## 2. System Parameters Setting

### 2. System Parameters Setting

After turning on the DRO and entering the working interface, press  to enter the menu, by pressing     to select the , and then press  to enter the system parameter setting.











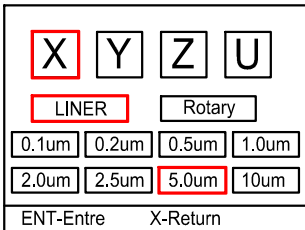
Function menu interface



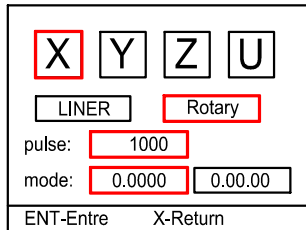
System parameter setting interface

#### 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  in the function menu, and then press  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  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  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  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  to exit the resolution setting.








## 2. System Parameters Setting







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

Press  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   to choose the right data, and then press the   to choose the numeric digits. After setting well, press the  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  to exit the resolution setting.

### 2.4 RPM setting

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

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

X	Y	Z	U
RPM Setup		RPM	
pulse:		1	
Disply:		ON	
ENT-Entre		X-Return	




RPM setting 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  key to zero the displayed data of X axis;
- Press  key to zero the displayed data of Y axis;
- Press  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  key to recover the displayed data of X axis;
- Press  key to recover the displayed data of Y axis;
- Press  key to recover the displayed data of Z axis;

#### 3.2 Display in Metric/British units

Select the  in the function menu, press  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  to exit the setting. If the unit selected as the British, then press  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  to exit.







<b>MM/ INCH</b>	
MM/ INCH:	<div style="display: inline-block; border: 1px solid black; padding: 2px 10px;">mm</div> <div style="display: inline-block; border: 1px solid black; padding: 2px 10px; margin-left: 20px;">inch</div>
inch-dot:	<div style="display: inline-block; border: 1px solid black; padding: 2px 10px;">4</div> <div style="display: inline-block; border: 1px solid black; padding: 2px 10px; margin-left: 20px;">5</div>
<div style="display: flex; justify-content: space-between; padding: 5px;"> <span>ENT-Entre</span> <span>X-Return</span> </div>	

The Metric and British unit setting interface

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

#### 3.3 Coordinate inputting

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



Under ABS, INC or SDM mode, press the  with no stop until the data start to blink to enter the coordinate inputting for X axis. Press the   to choose the data, and then press   to switch to next digit for setting. After setting well, press  to exit the coordinate inputting.

Under ABS, INC or SDM mode, press the  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  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  to enter the 1/2 function. Press    to half the value on the corresponding axis.  
Half the value on the X axis, press the  to enter the 1/2 function, then press the .  
Half the value on the Y axis, press the  to enter the 1/2 function, then press the .  
Half the value on the Z axis, press the  to enter the 1/2 function, then press the .



#### 3.6 Diamete/radius Conversion

(Applicable to D50 lathe DROs)

Function Introduction



When the DRO set as the Lathe mode,  has special function. Press the  first, and then press the . The X axis will display the diameter, the color of X axis column will change to red. If press the  and then  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  and then , the displaying on Y axis will be diameter.

Switch radius to diameter on Z axis, press the  and then , the displaying on Z axis will be diameter.

#### 3.7 Z0+Z1 function (apply to 3 axis lathe)

Function Introduction

When the DRO used on 3 axis lathe, we can combine the value of Z0 and Z1, the combined value will display on Z0 axis. Press , then the combined value of Z0 and Z1 will display on the Z0 axis. The column color of Z0 and Z1 will change to red. Press  again, the red color of both axis will disappear, the displayed value on both axis will come back to normal.

#### 3.8 200 sets of auxiliary zero location:

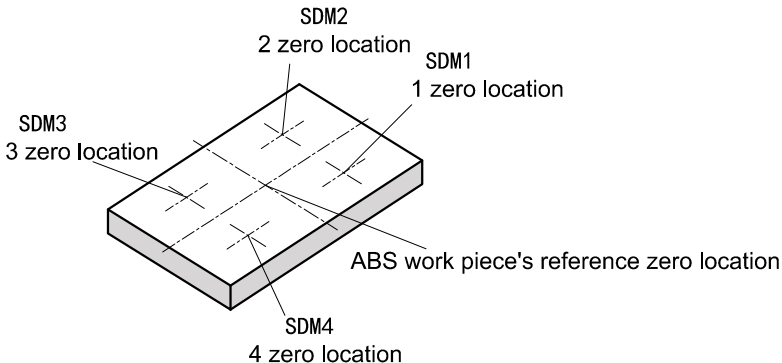
Function:



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.

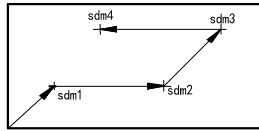


Press  key or  key to convert to SDM auxiliary zero location directly without returning to ABS coordinate.

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.

### 3. Basic Functions



ABSzero

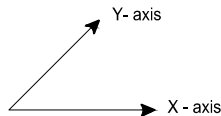
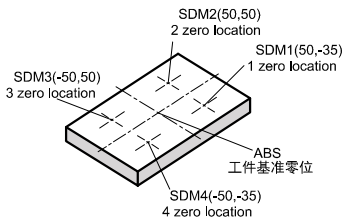
Reference of work piece (0.000)

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 1: 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. Basic Functions

#### 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  to enter the function menu, by pressing     to select the , and then press  again to enter the linear compensation function. By pressing the   to select the XYZ axis, and then press the  to enter the compensation for the corresponding axis.

Way 1: Measuring way compensation.

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

	X	Y	Z
DRO L1:	99.980		
Datum L:	100.000		
value S:	0.200		
$S = (L - L1) / (L / 1000)$ mm/m			
ENT-Entre		X-Return	











Way 2: Direct Compensation

If operator know the compensation value, press  to enter the measuring status. Then press the  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  to confirm, then press  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. Basic Functions

#### 3.11 Mode setting (Mill or Lathe)







When the DRO login into the working interface after turning on,press the  to enter the function menu.By pressing     to select the ,and then press the  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  to save and enter the Numeric digits setting.

#### 3.12 Numeric digits setting









Select the  in the function menu,and then press  to enter the setting menu.Press the  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  to save and enter the axis number setting.

SET	
mode:	<div>Mill</div> <div>Lathe</div>
data:	<div>6</div> <div>7</div>
axis:	<div>1</div> <div>2</div> <div>3</div>
dir:	<div>X</div> <div>0</div> <div>1</div>
language:	<div>English</div>
ENT-Entre    X-Return	







#### 3.13 Axis number setting

Select the  in the function menu,and then press  to enter the setting menu.Press the  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  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  to enter the setting menu.Press the  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   After setting well press  to save and enter the language setting.

#### 3.15 Language setting







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

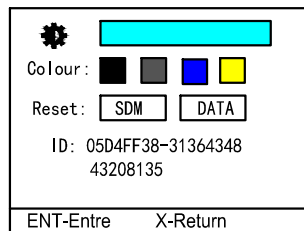
#### 3.16 Brightness setting

Select the  in the function menu,and then press  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  to save and enter the background color setting.



#### 3.17 Background color setting










Select the  in the function menu, and then press  to enter the setting menu. Press  again, the Color column will start to blink. By pressing   to set the color. After setting well, press  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 coordinates.

Select the  in the function menu, and then press  to enter the setting menu. Press the  again, the color lettering start to blink. By pressing the   to choose between Color and Reset. The Reset should be chosen there, and press  to enter the full zero of the SDM. By pressing   to choose SDM and then press the  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  to enter the setting menu. Press the  again, the color lettering start to blink. By pressing the   to choose between Color and Reset. The Reset should be chosen there, and then press the  to enter the factory reset. By pressing   to choose the Data. After choosing well, press the  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.

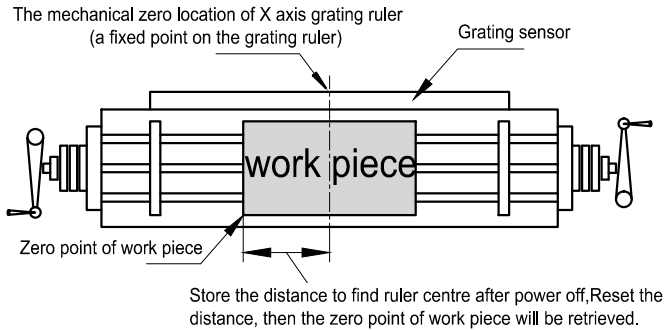
#### 3.20 Ruler storage function:

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.

### 3. Basic Functions

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  after turning on the DRO. Select the  by pressing the    . And then press the  to enter the REF function. Choose the axis among XYZ by pressing the XYZ. Press the  to choose between REF and ORG.

### 3. Basic Functions

Step 2: Choose REF to set the original point.

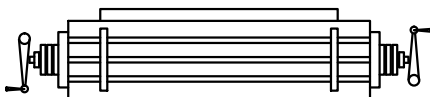
After choosing the axis, press . The lettering of REF will start to blink. To select between the REF and ORG by pressing  . The REF should be chosen there, and then press the  to search. The REF column will start to blink at this moment.

<b>X</b>	<b>Y</b>	<b>Z</b>
REF: <input type="text" value="0.000"/>	mm	
ORG: <input type="text"/>		
ENT-Entre    X-Return		

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

<b>X</b>	<b>Y</b>	<b>Z</b>
REF: <input type="text" value="0.000"/>	mm	
ORG: <input type="text"/>	mm	
Move the linear scale		
ENT-Entre    X-Return		

Step 4: Press  key to exit ruler search function and back to the 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:

### 3. Basic Functions









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.


X	12.500 <sub>mm</sub>
Y	18.230 <sub>mm</sub>
Z	5.800 <sub>mm</sub>
ABS	




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

Press the  after turning on the  
DRO. Select the  by pressing the  
    . And then press the  to enter the REF function. Choose the axis  
among XYZ by pressing the XYZ. Press the  
 to choose between REF and ORG.

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

After choosing the axis, press  . The  
lettering of REF will start to blink. To select  
between the REF and ORG by pressing   .

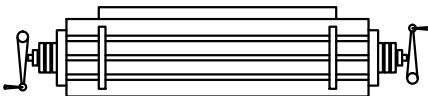
The ORG should be chosen there, and then press the  to search. The REF column  
will start to blink at this moment.

		
REF: <input type="text" value="0.000"/>	mm	
ORG: <input type="text"/>		
ENT-Entre X-Return		




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

		
REF: <input type="text"/>	mm	
ORG: <input type="text" value="0.000"/>	mm	
Move the linear scale		
ENT-Entre X-Return		

### 3. Basic Functions

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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.

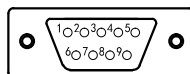
Note: Retrieve the work piece's origin. The data couldn't be recovered until the origin is set before machining.

## 4. Appendix

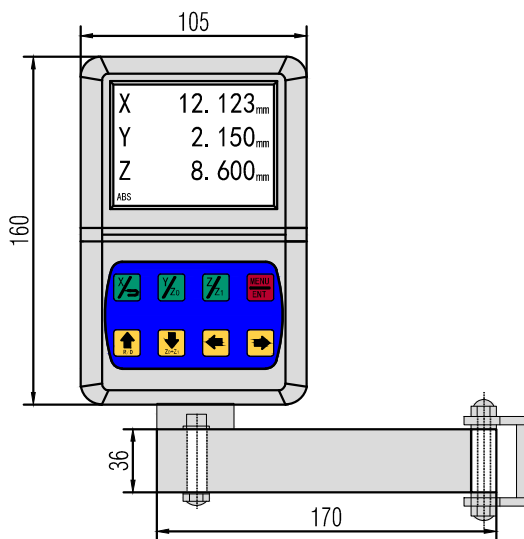
### 4.1 Notices for Usage:

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



### 4.2 Installation Figure



## 4. Appendix

### 4.3 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	<ol style="list-style-type: none"><li>1. The power is not on ?</li><li>2. The power switch is not closed ?</li><li>3. The supply voltage is not appropriate</li><li>4. The internal supply of the grating ruler is in short circuit.</li></ol>	<ol style="list-style-type: none"><li>1. Check whether the power line and power plug are plugged in.</li><li>2. Close the power switch.</li><li>3. Make sure the supply voltage between 85V-265V.</li><li>4. Pull out the connector of the grating ruler.</li></ol>
One axis of the DRO doesn't count	<ol style="list-style-type: none"><li>1. Operate the machine after swapping with the grating ruler of another axis.</li><li>2. Some special functions of the DRO are being used.</li></ol>	<ol style="list-style-type: none"><li>1. If counting, it's the fault of the grating ruler; if not, it's the fault of the DRO.</li><li>2. Exit the special function</li></ol>
The counting of DRO is not accurate (it can't zero)	<ol style="list-style-type: none"><li>1. The grating ruler isn't installed according to the requirements or the accuracy is not enough.</li><li>2. After being used for a long time, the vibration of the machine tool makes the fixed reading head or the screws loosen.</li><li>3. The accuracy of the machine tool is not good.</li><li>4. The DRO resolution isn't consistent with the grating ruler.</li></ol>	<ol style="list-style-type: none"><li>1. Reinstall the grating ruler and adjust the level.</li><li>2. Tighten all the fixed screws.</li><li>3. Overhaul the machine tool.</li><li>4. Reset the DRO resolution.</li></ol>
The counting of DRO is in error, The displayed operation distance isn't consistent with the actual distance	<ol style="list-style-type: none"><li>1. The machine tool and the DRO shell are not connected to earth.</li><li>2. The accuracy of the machine tool is not good.</li><li>3. The running speed of the machine tool is too fast.</li><li>4. The grating ruler isn't installed according to the requirements and the accuracy is not enough.</li><li>5. The DRO resolution isn't consistent with the grating ruler.</li><li>6. The operating size unit is not consistent with the displayed Metric/British units.</li><li>7. The linear error compensation setting of the DRO is not appropriate.</li><li>8. The grating ruler exceeds the operating range of length or the read head is broken.</li></ol>	<ol style="list-style-type: none"><li>1. Connect the machine tool and the DRO shell to earth.</li><li>2. Overhaul the machine tool.</li><li>3. Reduce the running speed of the machine tool.</li><li>4. Reinstall the grating ruler and adjust the level.</li><li>5. Reset the DRO resolution.</li><li>6. Switch the displayed Metric/British units.</li><li>7. Reset the linear error compensation of the DRO.</li><li>8. Repair the grating ruler.</li></ol>

## 4. Appendix

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Faults	Fault Causes	Solutions
The grating ruler doesn't count	<ol style="list-style-type: none"><li>1. The grating ruler exceeds the operating range of length or the read head is broken.</li><li>2. The read head of grating ruler rubs the ruler shell leading to the aluminum scraps accumulated.</li><li>3. The gap between the read head of grating ruler and the ruler body is too wide.</li><li>4. The metal tubes of the grating ruler are damaged, which causing the short circuit or disconnection in internal wiring.</li></ol>	<ol style="list-style-type: none"><li>1. Repair the grating ruler</li><li>2. Repair the grating ruler</li><li>3. Repair the grating ruler</li><li>4. Repair the grating ruler</li></ol>
The grating ruler doesn't count sometimes	<ol style="list-style-type: none"><li>1. The small box of the grating ruler is separated from the steel ball.</li><li>2. The grating glass in the read head of the grating ruler is abraded.</li><li>3. There is dirt on the grating glass in the shell of the grating ruler.</li><li>4. The elasticity of small box spring in the read head of the grating ruler is not enough.</li></ol>	<ol style="list-style-type: none"><li>1. Repair the grating ruler</li><li>2. Repair the grating ruler</li><li>3. Repair the grating ruler</li><li>4. Repair the grating ruler</li></ol>