DIGITAL   READOUTS

VM600

Operation   Manual

VM600-2   DRO for 2 axes

VM600-3   DRO for 3 axes

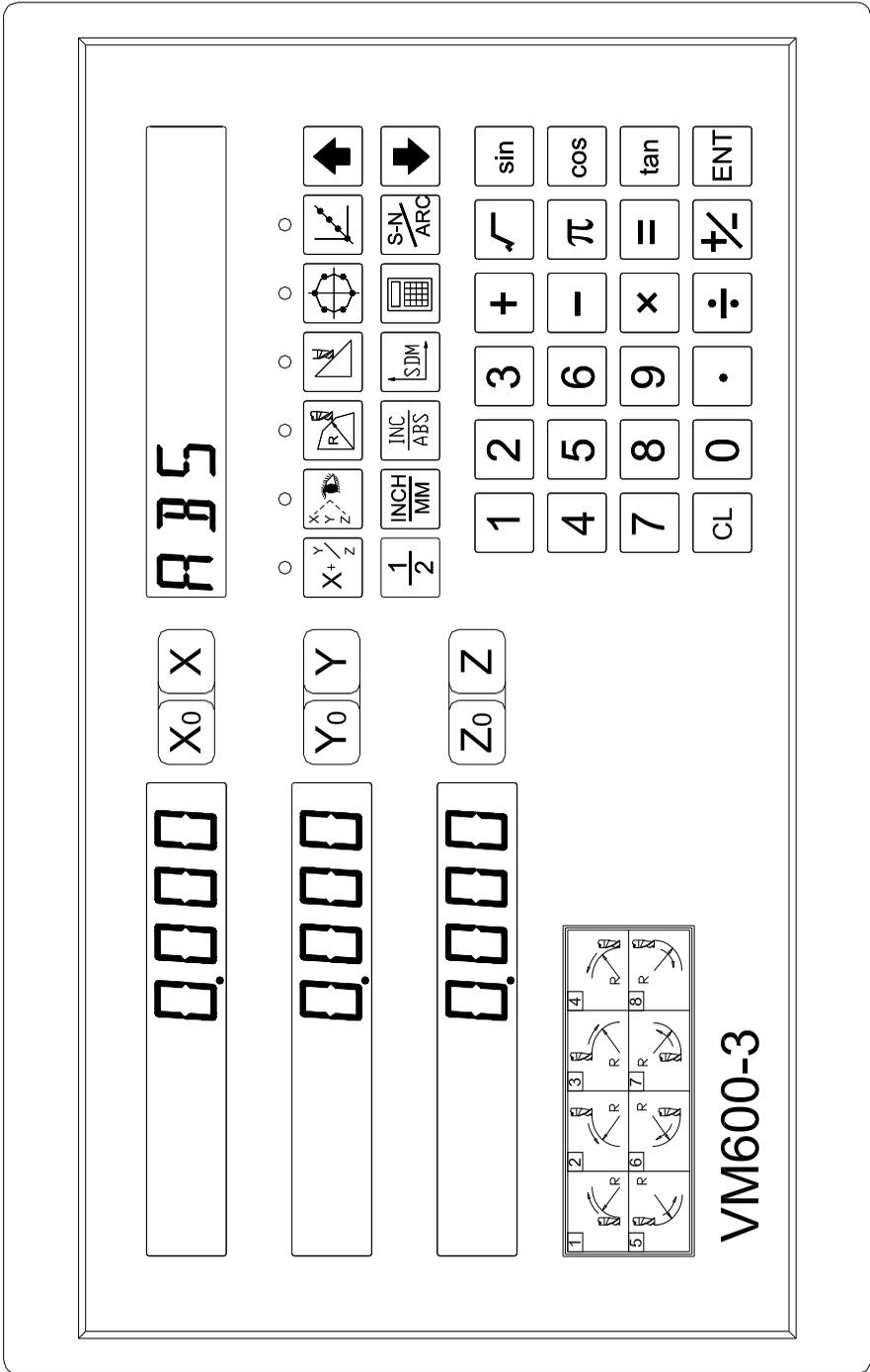VM600-4   DRO for 4 axes

VM600-E   DRO for EDM(Little Pore)

Contents

Chapter 1   Brief Introduction

Back Panel(1)

39,5

4＊MØ6

28

2＊Ø6,5

71

59

14

L(350MM)

OFF

ON

100-240V 3A

W
RS232

Z

Pri
EDM

Y

IO

X

Back Panel(2)

290

184,82

Description of Key Function

KEY MARK	FUNCTION
X_0 Y_0 Z_0 W_0	Zero selected axis.
X Y Z W	Select axis to operate.
INCH/MM	Inch/Metric Switch
1/2	Center Finding
INC/ABS	ABS/IINC Switch
SDM	SDM Switch
0 – 9	Numeric Key
•	Decimal Point
+/-	+/- Sign
ENT	Enter
CL	Clearing
or or	Temporary Quit（Leave processing temporarily to return normal display state.）
🖩	Calculator
S-N/ARC	1: Calculate inverse trigonometric unction in calculating function. 2 :Enter No. of SDM coordinate.
Sin Cos Tan	Trigonometric Function
+ − X ÷ =	Add: Decrease: Multiple: Divide
√	Square root or square.
π	Enter circumference ratio.
⊞	Set parameters of EDM. （(*VM600-E)*）
🔲	Enter EDM processing. (*VM600-E*)
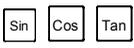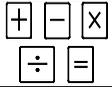
KEY MARK	FUNCTION
⊕	Process holes displayed equally on a circle.
⟋	Process holes displayed equally on a line.
◩	Simple R cutting function（**VM600-2、 VM600-3)**）
◪	Process a slope. （**VM600-2、 VM600-3)**）
X+Y or X+Z/2 or Z+W	Enter or exit lathe function.
⬆ ⬇	Stroll up or down to select.

1.1   Interface

A   Linear Scale Interface

1) 9PD Connector
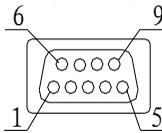
PIN	NAME
1	+5V
2	0V
3	A
4	B
5-9	NC

2) 15PD Connector
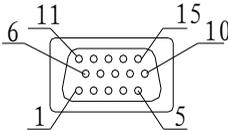
PIN	NAME
1	+5V
2	0V
3	A
4	B
5-15	NC

3) 7Pin Connector
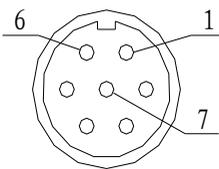
PIN	NAME
1	OV
2	NC
3	A
4	B
5	+5V
6	NC
7	FG

B   RS232 Interface
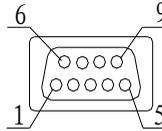
PIN	NAME
1	NC
2	TXD
3	RXD
4	NC
5	GND

C   EDM Interface
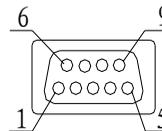
PIN	NAME
1	NC
2	COMMON
3	NORMAL CLOSE
4	ST+
5	IN+
6	NORMAL OPEN
7	NC
8	ST-
9	IN-

1.2 Coordinate System

VM600 DRO is an instrument which can measure position of work piece when processing. Coordinate system must be definite first for more efficiency and accuracy.
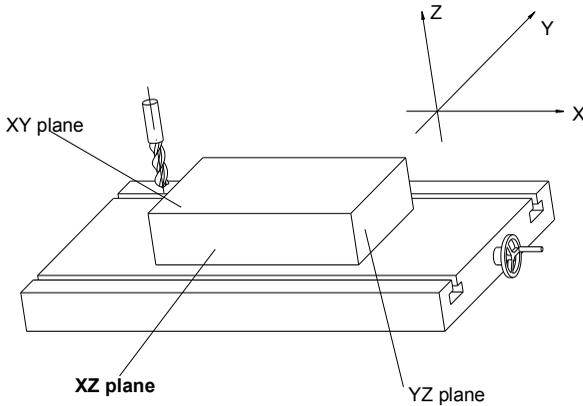
In horizontal plane, the X axis is parallel with the operator; Y axis is perpendicular to X axis. Z-axis is perpendicular to horizontal plane. Positive direction of axis is set as the figure. It also can be changed as customer.

The value of one point position is the distance relative to the origin of coordinate.

For a work-piece as Figure A, the value of each point position is as the Figure B when point O is the origin of coordinate.

Fig A

Fig B
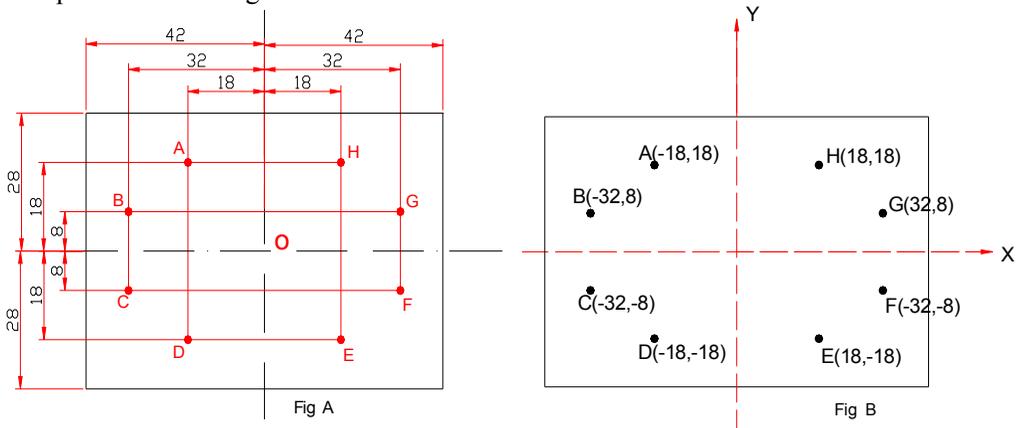
Chapter 2   BASIC OPERATION

2.1   Power on

Function: Power on then VM600 enter normal display state.

It can memorize the following parameter after power on.

A.   The scale position where power off;

B.   ABS/INC/SDM mode;

C.   Metric/Imperial mode;

NOTE: Normal display state

The state DRO automatically enters after on or exit from "STEUP". In normal display state, X window, Y window,Z window and W window displays the current value of   X axis, Y axis, Z axis and W axis separately. The message window displays "ABS", "INC" or "SDM XXX" (indicate the Number of SDM coordinate, with a range of 000—499).When user switch among ABS/INC/SDM, MM/INCH, DRO will not leave this state. When you enter Calculator   function, input data to X (or Y or Z or W) axis, function of searching the Reference point (RI) of the linear scale or special function (BHC: BHL: ARC: SLOPE PROCESSING and EDM function): DRO is not in the normal display state.

2.2   Zeroing

Function: Zero the designated axis in normal display state. Zeroing is used to set the current point as datum point.

NOTE:

1. *The axes can be zeroed in ABS/INC/SDM states;*

2. *When zero in ABS coordinate, INC display value is cleared simultaneously. Zeroing in INC coordinate has no effect on ABS and SDM display value.*

3. *Press the zero key of the same axis will cancel above zero operation if the scale kept still after zero.*

2.3   Preset Data to designed axis

Function**:** Preset a value to current position for a designed axis in normal display state.

NOTE:

1. *Axis can be preset in ABS/INC/SDM state.*
2. *In SDM state, input mode "0" means that the display value is equal to the enter value; input mode "1" means that the display value is equal to the negative of enter value.*

 Example: Machine the work-piece from the A to B
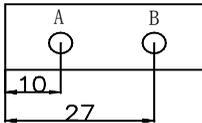
STEPS:

1.   Move the machine table, and align the lathe tool to A.
2.   Return normal display state;
3.   Press⟨X⟩→⟨1⟩→⟨0⟩→⟨ENT⟩, which means the preset data is "10";

    If incorrect value is inputted: press ⟨AC⟩ to cancel and input again;

    NOTE: If in SDM state and SDM input mode is "1", ⟨+/-⟩ needn't be inputted.

    Otherwise ⟨+/-⟩ must be inputted.

4.   Moving the machine table until "27.000" is displayed in X window.
     Now it is the position of B.
5.   Y axis, Z axis,W axis can be preset in the same way.

2.4   Toggle display unit between mm and inch

Function**:**   Length can be displayed either in "mm" (metric) or "inch" (imperial).

12

Display unit can be toggled between mm and inch.

Example**:** Display value toggle from mm to inch

STEPS:

1. DRO returns normal display state.

   ⇒
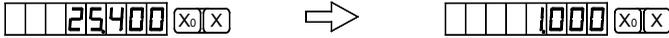
Press [INCH/MM], the display unit is inch now.

2. It is invalid to toggle between mm and inch while axis is encoder.

2.5　　Mid-point Calculation

Function**:** Set the center of work piece as datum by halving the displayed value.

Example: Set the center of rectangle as datum as the right
figure.
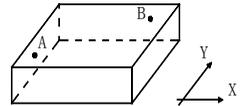
STEPS:

1. Place the work piece on the machine table

2. DRO returns normal display state, move machine table and align the lathe tool with point A; Press [X₀] to zero X axis, press [Y₀] to zero Y axis;
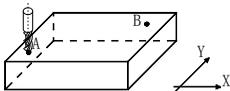
3. Align lathe tool with point B by moving machine table;

Press [1/2], [X] in turn to halve the X axis display value;

Press [1/2], [Y] in turn to halve the Y axis display value;
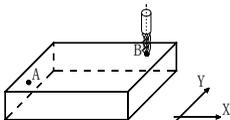
4. Move the machine table until "0.000" is displayed in X window and Y

window. The position (where the lathe tool is) is the work-piece's center.
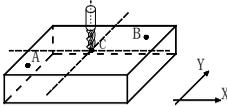
NOTE: *1.*   *If you do other operation after axis half, please press* $\boxed{\frac{1}{2}}$, $\boxed{X_0}$ *will cancel*

above operation, and X-axis display value return to normal.

2.   *It is invalid to mid-point calculation while axis is encoder.*

2.6   Absolute / Incremental / 500 groups SDM

Function: The VM600 series DRO has 3 display modes: the absolute mode (ABS);
the incremental mode (INC) and 500 groups Second Data Memory
(SDM) with the range of 000 to499.

1.   Zero point of work-piece is set at the origin point of ABS coordinate;

2   The relative distance between datum of ABS and SDM remains unchanged
when ABS datum is changed.

3.   If one point in ABS is zeroed, the point in INC is zeroed automatically; yet
if one point in INC is zeroed, the point in ABS will remain unchanged.

I.   **toggle among ABS/INC/SDM coordinate**

These three display modes can be changed only in normal display state.

Press key$\boxed{\substack{INC \\ ABS}}$ $\boxed{SDM}$ or $\boxed{\Uparrow}\boxed{\Downarrow}$,   the display modes can be changed between

ABS、INC and SDM

II.   **Set the new number of SDM in SDM mode**

STEPS:

1.   Enter SDM mode;

2.   Press key$\boxed{\substack{S-N \\ ARC}}$, message window flashes, waiting for inputting a new
number of SDM;

3.   Enter a new number. for example, enter $\boxed{8}$ $\boxed{8}$.

4. Press $\boxed{\text{ENT}}$ or $\boxed{\text{\tiny ARC}}$, then the message window stops flashing and the number of SDM is changed to 88.

III: Increase/Decrease the SDM number

DRO return normal display state with the display mode SDM, press $\boxed{\uparrow}$ to decrease the number of SDM by 1; press $\boxed{\downarrow}$ to increase the number of SDM by 1.

2.7 Clear All SDM Datum

Function**:** Clear the Datum of all SDM 0 - 499. After clearing, the display value in SDM coordinate is equal to the value in ABS coordinate.

STEPS:

1. Return normal display state;

2. Press $\boxed{\text{SDM}}$ and $\boxed{\text{AC}}$ simultaneously for 2 seconds, and the message window displays "CLS SDM" and flashes, which means it is clearing now. About ten seconds later, the clearing is completed and "CLS OK" is displayed in message window temporary and DRO return normal display state.

2.8 Lathe Function

As the right figure, if two scales are installed in one axis, the position of the work-piece should be the sum of these two values (X+Y) in this direction. It is called lathe function.

lathe mode 0: normal display (the lathe function is disabled).

DRO for 2 axes and 3 axes:

A. lathe mode 1:

X window value = the value of X axis position + the value of Y axis position.

B. lathe mode 2:

X window value = the value of X axis position + the value of Z axis position.

DRO for 4 axes：

A. lathe mode 1:

Z window value = the value of Z axis position + the value of W axis position.

STEPS:

1. Set the lathe mode in initial system settings;

2. In normal display state press [X+Y] (two axes display) or [X+Y/Z] (three axes display) or [Z+W] (four axes display) to enter lathe function. Then the LED of the lathe function will be on *(If the lathe mode is 0, the lathe function is disabled and the LED is off)*;

3. In lathe state, press [X+Y] (two axes display) or [X+Y/Z] (three axes display) or [Z+W] (four axes display) to exit the lathe function: and the LED turns off.

Example: DRO for 2 axes and 3 axes:

A. If in normal display state: the value of the position is as the right.

```
|    |    |1|0|0|0|  X₀ X
|    |    |2|0|0|0|  Y₀ Y
|    |    |3|0|0|0|  Z₀ Z
```
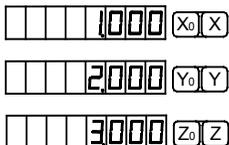
B. In lathe mode 1, the DRO will display as the following:

X window display value = value of X axis position + value of Y axis position

$$\boxed{\quad\quad\quad 3000} \; \text{(X}_0\text{)(X)}$$

$$\boxed{\quad\quad\quad 2000} \; \text{(Y}_0\text{)(Y)}$$

$$\boxed{\quad\quad\quad 3000} \; \text{(Z}_0\text{)(Z)}$$
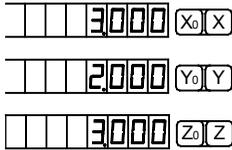
C.   In lathe mode 2, the DRO will display as the following:

X window display value = value of X axis position + value of Z axis position

$$\boxed{\quad\quad\quad 4000} \; \text{(X}_0\text{)(X)}$$

$$\boxed{\quad\quad\quad 2000} \; \text{(Y}_0\text{)(Y)}$$

$$\boxed{\quad\quad\quad 3000} \; \text{(Z}_0\text{)(Z)}$$

Example : DRO for 4 axes:

$$\boxed{\quad\quad\quad 1000} \; \text{(X}_0\text{)(X)} \qquad\qquad \boxed{\quad\quad\quad 1000} \; \text{(X}_0\text{)(X)}$$

$$\boxed{\quad\quad\quad 2000} \; \text{(Y}_0\text{)(Y)} \quad\Rightarrow\quad \boxed{\quad\quad\quad 2000} \; \text{(Y}_0\text{)(Y)}$$

$$\boxed{\quad\quad\quad 3000} \; \text{(Z}_0\text{)(Z)} \qquad\qquad \boxed{\quad\quad\quad 7000} \; \text{(Z}_0\text{)(Z)}$$

$$\boxed{\quad\quad\quad 4000} \; \text{(W}_0\text{)(W)} \qquad\qquad \boxed{\quad\quad\quad 4000} \; \text{(W}_0\text{)(W)}$$
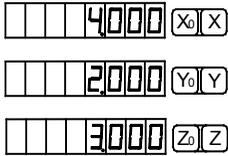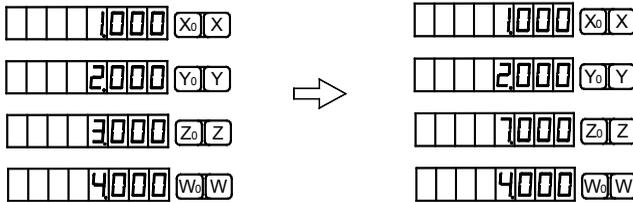
2.9   Filter display value

When machine a work-piece by grinder, the display value varies quickly due to the vibration of grinder. User can't see display value clearly. VM600 series DRO provides display value filter function to disable the quake change of display value.

STEP:

1.   Enter display value filter function.
     In normal display state, press $\boxed{\frac{S-N}{ARC}}$ and $\boxed{ENT}$ simultaneously, enter display value filter function.

2.   Exit display value filter function.
     Press $\boxed{\frac{S-N}{ARC}}$, exit display value filter function.

17

Chapter3 500groups SDM coordinate

VM600 has three display modes: the absolute mode (ABS), the incremental mode (INC) and the 500 groups second data memory (SDM 0—SDM499).

ABS datum of the work-piece is set at the beginning of the processing and the 500 group SDM is set relative to ABS coordinate.

500 group SDM coordinate can be divided into several segments, and every segment stores data of one work-piece. If one segment has 20 groups SDM coordinate, DRO can be divided into 25 segments and can store data of 25 work-pieces.

SDM 000 ------ SDM 019 data of the first work-piece

SDM 020 ------ SDM 039 data of the second work-piece

……

SDM 460 ------ SDM479 data of 24th work-piece

SDM480 ------ SDM499 data of 25th work-piece

Example**:** The ABS datum is the center point O, the pointA, B, C, D needed processing are set as datum of SDM 000 —SDM 003.
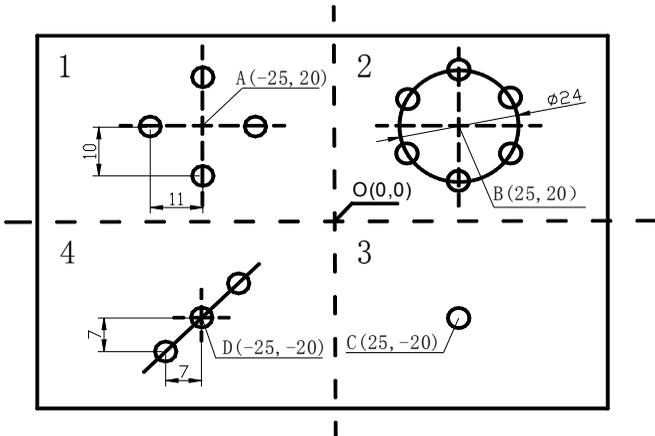
Two ways to set SDM coordinates:

1) Zeroing at the current point.

2) Presetting datum of SDM coordinate.

3.1 Zeroing at the Current Point

At first set the center point of the work-piece as the origin of the ABS, then align the lathe tool with point A, B, C, D by moving the machine table and zero them. It is the position to process where the "0.00" appears in X window, Y window by moving the machine table whether in ABS or in SDM coordinate.

STEPS:

1. Set the center of rectangular point O as the datum of ABS

   Make line L1 parallel with X axis: line L2 parallel with Y axis.

   When position lathe tool to point O

   Zero X axis and Y axis in SDM 000;

   Zero X axis and Y axis in SDM 001;

   Zero X axis and Y axis in SDM 002;

   Zero X axis and Y axis in SDM 003;
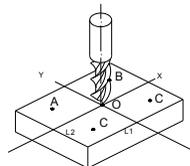
2. Set the point A as the datum of SDM 000.

   SDM 000: align the lathe tool with point A and zero X axis,

   Y axis. DRO displays as the right.
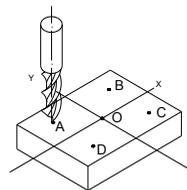
   Press [X₀] 、[Y₀]

3. Set the point B as the datum of SDM 001.

   In SDM 001 and align the lathe tool with point B, then zero

   X axis, Y axis. DRO displays as the right:
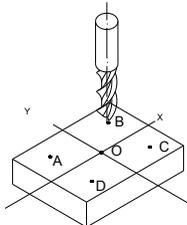
   Press [X₀] 、[Y₀]

4. Set the point C as the origin of SDM 002.

   In SDM 002, align the lathe tool with point G, and zero X

   axis, Y axis. DRO displays as the right.
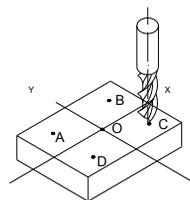
   Press [X₀] 、[Y₀]

5. Set the point D as the origin of SDM 003.

In SDM 003, align the lathe tool with point D, and zero X axis, Y axis. DRO displays as the right.

Press $\boxed{X_0}$、$\boxed{Y_0}$
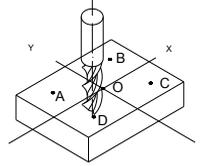
6. Machine the work-piece according to the preset SDM coordinate;

7. Machine another work-piece according to the same blueprint. You only need set the center point as the datum of ABS. It is not necessary to set SDM coordinate again, as SDM can be set automatically. Point A, B, C, and D is the zero point of SDM 000, SDM 001, SDM 002, and SDM 003 respectively. Point can be machined when enter corresponding SDM coordinate and "0.000" appears in screen by moving machine table. This function can save great plenty of time in production.

3.2 Preset datum of SDM Coordinate

Compared with the way of zeroing at current point, the another way (presetting datum of SDM coordinate) can set zero point of SDM more accurately and quickly without moving the machine table.
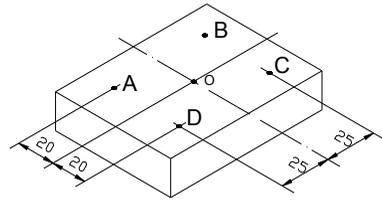
As the figure showed right, center point is the datum of ABS, the position of point A, B,C, D is (-25, 20), (25, 20), (25, -20), (-25, -20) in ABS coordinate.

A   Enter SDM 000 and preset the position of point O as (25, -20), which means the point A is the datum of SDM 000;

B   Enter SDM 001, preset the position of point O as (-25, -20), which means the point B is the datum of SDM 001;

C   Enter SDM 002 and set the position of point O as (-25, 20), which means the point C is the datum of SDM 002;

D   Enter SDM 003, preset the position of point O as (25, 20), witch means the point D is the datum of SDM 003;

Pay attention that the preset value is negative to the actual value of position in

ABS. If set "SDM DIR" as "1" in initial system settings, the caution is not necessary. The value DRO accepts is equal to the negative of the enter value.

STEPS:

1. Set "SDM DIR" as "1" in initial system settings;
2. Set the center point of the work-piece as the datum of ABS;

    Line L1 is parallel to X axis, line L2 is parallel to Y axis.

    Move machine table; align the milling cutter with point O.

    The machine table remain still while presetting;
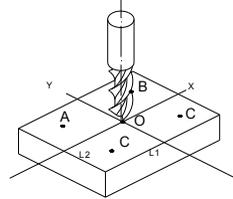
3. Set point A as the datum of SDM 000;

    Enter SDM 000.

    The position of point A is (-25, 20), press.

    $\boxed{X} \rightarrow \boxed{2} \rightarrow \boxed{5} \rightarrow \boxed{+/-} \rightarrow \boxed{ENT}$ - ⊓⊓ 25000 Ⓧ₀Ⓧ SDM ⊓⊓⊓ 0

    $\boxed{Y} \rightarrow \boxed{2} \rightarrow \boxed{0} \rightarrow \boxed{ENT}$ ⊓⊓⊓ 20000 Ⓨ₀Ⓨ

4. Set point B as the datum of SDM 001;

    Enter SDM 001.

    The position of point B is (25, 20), press

    $\boxed{X} \rightarrow \boxed{2} \rightarrow \boxed{5} \rightarrow \boxed{ENT}$ ⊓⊓⊓ 25000 Ⓧ₀Ⓧ SDM ⊓⊓⊓ 0

    $\boxed{Y} \rightarrow \boxed{2} \rightarrow \boxed{0} \rightarrow \boxed{ENT}$ ⊓⊓⊓ 20000 Ⓨ₀Ⓨ

5. Set point C as the datum of SDM 002;

    Enter SDM 002.

    The position of C is (25, -20), press

    $\boxed{X} \rightarrow \boxed{2} \rightarrow \boxed{5} \rightarrow \boxed{ENT}$ ⊓⊓⊓ 25000 Ⓧ₀Ⓧ SDM ⊓⊓⊓ 0

    $\boxed{Y} \rightarrow \boxed{2} \rightarrow \boxed{0} \rightarrow \boxed{+/-} \rightarrow \boxed{ENT}$ - ⊓⊓ 20000 Ⓨ₀Ⓨ

6. Set point D as the datum of SDM 003;

    Enter SDM 003

    The position of point D is (-25, -20), press

    $\boxed{X} \rightarrow \boxed{2} \rightarrow \boxed{5} \rightarrow \boxed{+/-} \rightarrow \boxed{ENT}$ - ⊓⊓ 25000 Ⓧ₀Ⓧ SDM ⊓⊓⊓ 0

    $\boxed{Y} \rightarrow \boxed{2} \rightarrow \boxed{0} \rightarrow \boxed{+/-} \rightarrow \boxed{ENT}$ - ⊓⊓ 20000 Ⓨ₀Ⓨ

Chapter 4   SPECIAL FUNCTIONS

VM600 series DRO has special function as the following except measuring and positioning:

> Bolt Hole Circle (BHC);
>
> Bolt Holt Line (BHL);
>
> ARC Processing (only for VM600-2, VM600-3);
>
> Slope Processing (only for VM600-2, VM600-3);
>
> Electrode discharging machining (EDM, only for VM600-E);

Please refer **Coordinate System** (in Chapter 1) before reading this section.

4.1   Bolt Hole Circle

Function description:

VM600 series DRO has the function of BOLT HOLE CIRCLE (BHC) .This function can simplify the pressing of multiple holes which are attributed equally around the circumference of a circle. The DRO will guide operator to enter the following parameters:
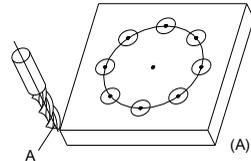
RADIUS	Radius of circle
ST.ANGLE	Starting angle that the center of the first hole on the circle
END.ANGLE	Ending angle that the center of the last hole on the circle
HOLE NUM	Hole number
DIRECT	Angle direction.

Angle has two directions: counterclockwise and clockwise. "0" indicates that it is counterclockwise from ST.ANGLE to END.ANGLE; "1" indicates it is clockwise from ST.ANGLE to END.ANGLE. As the following figure, the ST.ANGLE is 0º,

END.ANG is 240º. The figure (B) illustrates the arc while angle direction is counterclockwise; figure (C) illustrates the arc while angle direction is clockwise.

(B)   (C)
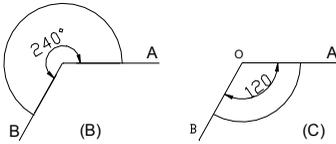
As figure (D) illustrates, machine a hole every 45 deg from 0º ~ 225º. Parameters are as the following:

RADIUS	20
ST.ANGLE	45
END.ANGLE	225
HOL NUM	5
DIRECT	0

(D)
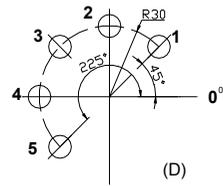
NOTE: If ST.ANGLE equals END.ANGLE, the holes are attributed equally around the whole circumference.

The positions of the hole center are calculated automatically after input all parameters. Press ⬇️⬆️ to choose the hole No. and move the machine table until the "0.000" appears in X window, Y window. It is the position to process a hole.

Example: Machine holes on circumference as the figure (E).

RADIUS	100mm
ST.ANGLE	0º
END.ANGLE	315º
HOLE NUM	8
DIRECT	0

(E)
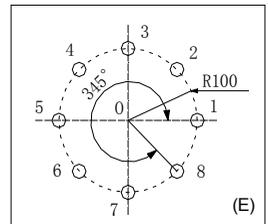
STEPS:

1. Set display unit to metric in normal state;
    Move the machine table until the machine tool is aligned with the center of the circle, then zero X axis, Y axis.

(F)
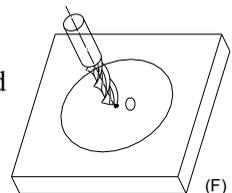
2. Press ⊕ to enter Bolt Hole Circle function.

24

If all parameters have been set, press $\boxed{\text{ENT}}$ to process directly.

3. Input radius

   Y window displays the formerly preset radius; message window displays "RADIUS".

   Press $\boxed{1} \rightarrow \boxed{0} \rightarrow \boxed{0} \rightarrow \boxed{\text{ENT}}$ in turn.

   |||||||||ⓍⓍ**RADIUS**||
   |||||||**100**ⓎⓎ
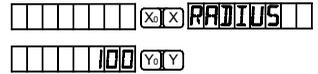
4. Input ST.ANGLE

   Message window displays "ST.ANGLE"; Y window displays the former preset starting angle.

   Press $\boxed{0} \rightarrow \boxed{\text{ENT}}$ in turn;
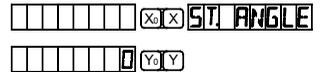
   |||||||ⓍⓍ**ST. ANGLE**
   ||||||||**0**ⓎⓎ

5. Input ending angle

   Message window displays "END.ANGLE"; Y window displays the former angle

   Press $\boxed{3} \rightarrow \boxed{1} \rightarrow \boxed{5} \rightarrow \boxed{\text{ENT}}$ in turn.

   |||||||ⓍⓍ**ENDANGLE**
   |||||**315**ⓎⓎ
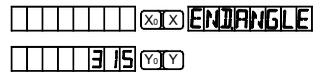
6. Input the number of hole.

   Message window displays "HOLE NUM"; Y window displays the former number.

   Press $\boxed{8} \rightarrow \boxed{\text{ENT}}$ in turn.

   |||||||ⓍⓍ**HOLE NUM**
   |||||||**8**ⓎⓎ
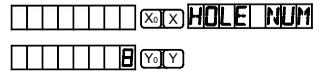
7. Input angle direction.

   Message window displays "DIRECT", Y window displays the former preset direction;

   Press $\boxed{0} \rightarrow \boxed{\text{ENT}}$ in turn;

   |||||||ⓍⓍ**DIRECT**||
   |||||||**0**ⓎⓎ
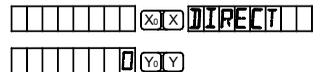
8. Message window displays "HOLE 1";

   It is the position of the first hole to punch where the "0.000" is displayed in X window and Y window by moving the machine table.

   ||||**0000**ⓍⓍ**HOLE**|||**1**
   ||||**0000**ⓎⓎ
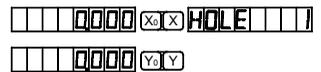
9. After finishing the first hole, press $\boxed{\downarrow}$

   Message window displays "HOLE 2";

   Move the machine table, the "0.000" is displayed in X window and Y window. It is the position of the second hole.

   ||||**0000**ⓍⓍ**HOLE**|||**2**
   ||||**0000**ⓎⓎ

   NOTE: Press $\boxed{\downarrow}$ or $\boxed{\uparrow}$ to change holes number.

25

10. Process the holes 3rd –6th in the same way.

11. After processing all holes, press ⊕ to return normal display state.

NOTE: **In the course of BOLT HOLE CIRCLE processing, pressing** ▱ **(two axes display)** ▱ **(three axes display) or** ▱ **(four axes display) can leave BOLT HOLE CIRCLE function temporarily and return normal display state in order to check the position. And press** ▱ **(two axes display)** ▱ **(three axes display) or** ▱ **(four axes display) again to return BOLT HOLE CIRCLE function.**

4.2 Bolt Hole Line

Function: VM600 series DRO provides BOLT HOLE LINE (BHL) function. This function can simplify the processing multiple holes whose centers are attributed equally on one line.

The following parameters are needed to be input:

LINE DIS   Line distance (distance between the center of first hole and the center of the last hole)

LINE ANG   Line angle (angle between the line and the positive X axis)

HOLE NUM   Number of holes

DRO will calculate the positions of the hole after all the parameters have been entered. Press ⬇or⬆ to select the No. of hole and move the machine until "0.000" is displayed in X window and Y window. It is the position of hole to machine.

Example:

LINE DIS	45mm
LINE ANG	30º
HOLE NUM	4
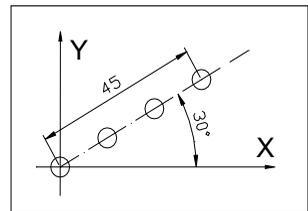
STEPS:

1. Set display unit to metric

Move the machine table until the machine tool is aligned with the center point of the first hole, and zero X axis, Y axis.

26

2. Press ⬚ to enter BOLT HOLE LINE function;

   If all parameters have been entered, press ENT to start processing directly.

3. Input line distance.

   Y window displays the former preset line distance, and the message window

   displays "LINE DIS". ⬚⬚⬚⬚⬚⬚⬚⬚ X₀X **LINE DIS**

   Press 4→5→ENT in turn; ⬚⬚⬚⬚⬚⬚ **45** Y₀Y
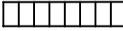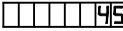
4. Input line angle.

   The message window displays "LINE ANG"; Y window displays the former

   preset line angle. ⬚⬚⬚⬚⬚⬚⬚⬚ X₀X **LINE ANG**
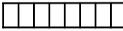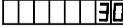
   Press 3→0→ENT in turn. ⬚⬚⬚⬚⬚⬚ **30** Y₀Y

5. Input the number of hole.

   Message window displays "HOLE NUM", Y window displays the former

   preset hole number. ⬚⬚⬚⬚⬚⬚⬚ X₀X **HOLE NUM**

   Press 4→ENT in turn, processing begins. ⬚⬚⬚⬚⬚⬚ **4** Y₀Y
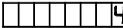
6. Message window displays "HOLE 1";

   Move the machine table until "0.000"appears in X ⬚⬚⬚⬚ **0.000** X₀X **HOLE** ⬚⬚⬚ **1**

   window and Y window, it is the center of the first ⬚⬚⬚ **0.000** Y₀Y

   hole to punch.
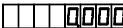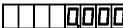
7. After finishing the first hole, press ⬇, and the message window displays

   "HOLE 2";

   Move the machine table until "0.000" appears in X ⬚⬚⬚⬚ **0.000** X₀X **HOLE** ⬚⬚ **2**

   and Y window, and then you can punch the second ⬚⬚⬚⬚ **0.000** Y₀Y

   hole at this point.

   NOTE: Press ⬇ or ⬆ to transform among holes.

8. Process the holes 3rd –6th in the same way.

9. Press ⬚ to return normal display state when finishing processing.

   NOTE:

   In the course of BHL processing, you can press ⬚ (two axes display) ⬚ (three axes display) or ⬚ (four axes display)to leave this function temporarily and return normal display of X, Y, Z axis in order to check the position which the DRO calculated. Then press ⬚ (two axes display) ⬚ (three axes display) or ⬚ (four axes display)again to return BHL function.

4.3　ARC Processing

This function is only for VM600-2, VM600-3.

It is waste to using numerical control lathe to process arc in the simple product or small production. This function makes it convenient to process arc with normal lathe. Parameter "MAX CUT" is the arc length each process. The smaller the MAX CUT, the more smooth the arc plane and the longer processing time.

A. Process XZ, YZ plane

There are 8 modes as the following when processing arc in XZ or YZ plane:
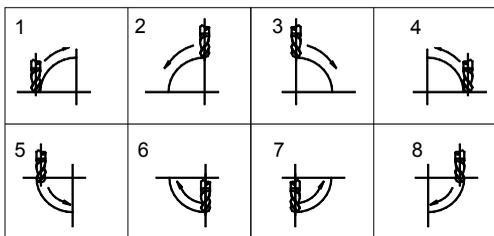
Tool compensation direction(when process XY plane)

Internal ARC processing(T-TOOL)　External ARC processing(T+TOOL)
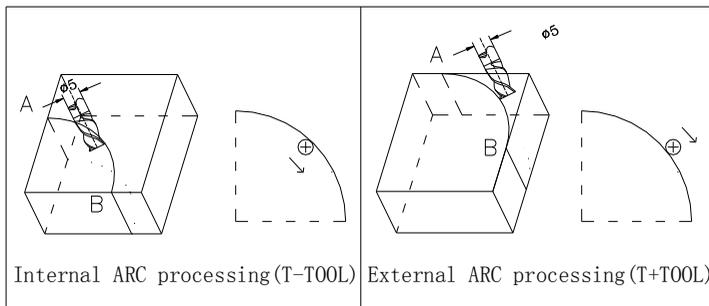
Milling cutter may be flat-bottomed or arc-bottomed. If flat-bottomed, set the tool diameter as 0;

B. Process XY plane

DRO provides the above 8 modes in processing XY plane. The milling cutter is perpendicular to the machine plane. DRO has internal ARC processing and external ARC processing for each type:

External　　T +TOOL:

Internal　　T - TOOL.

Set the tool radius according to the actual milling cutter when process XY plane.

Enter the following data for ARC processing:

TYPE 1 - 8	Mode of the ARC processing
T+TOOL / T-TOOL	Selection between T + TOOL / T - TOOL
	(This parameter is only for XY plane)
RADIUS	The radius of ARC that is to be processed
TOOL DIA	Tool diameter
MAX CUT	Feed step

Example 1:

Process an arc AB of 90°from point A to point B as the figure.
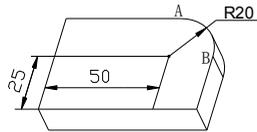
Parameters are as the following:

Machine plane	XY
ARC mode type	3
T + TOOL	
RADIUS	20mm
TOOL DIA	5mm
MAX CUT	1mm
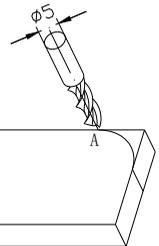
STEPS:

1. Set display unit is metric

2. Move the machine table until the lathe tool is aligned with point A, then zero X axis and Y axis;

   <div align="right">⎢⎢⎢⎢ 0000 Ⓧ₀Ⓧ ABS ⎢⎢⎢⎢</div>
   <div align="right">⎢⎢⎢⎢ 0000 Ⓨ₀Ⓨ</div>

3. Enter ARC processing state;

   Press 🖾 to enter ARC processing state.

   If all parameters have been set: press ᴱᴺᵀ to process directly.

4. Select machine plane;

   Press X→ᴱᴺᵀ to select XY.

   <div align="right">⎢⎢⎢⎢⎢⎢⎢⎢ Ⓧ₀Ⓧ SIMA ⎢ ˣⱼY ⎢</div>
   <div align="right">⎢⎢⎢⎢⎢⎢⎢ Ⓨ₀Ⓨ</div>

   NOTE: X *indicates XY plane;*

   Y *indicates YZ plane;*

   Z *indicates ZX plane;*

   You can also press ᔕ⁻ˣ꜀ₐᵣ꜀ *to switch plane among XY plane, YZ plane and ZX plane.*

5. Select processing mode:

   Message window displays "TYPE 1-8", and Y window displays the former

processing mode;

Press $\boxed{3} \rightarrow \boxed{\text{ENT}}$ in turn to select mode 3, and then enter ARC type;

⌗⌗⌗⌗⌗⌗⌗⌗⌗⌧⌧Ⓧ TYPE 1-B
⌗⌗⌗⌗⌗⌗⌗3ⓎⓎ
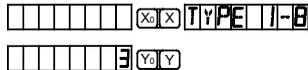
6. Select T + TOOL mode:

Press $\boxed{+} \rightarrow \boxed{\text{ENT}}$ to select the external arc processing;
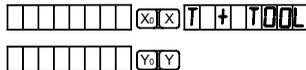
⌗⌗⌗⌗⌗⌗⌗⌧Ⓧ T + TOOL
⌗⌗⌗⌗⌗⌗⌗ⓎⓎ

NOTE: $\boxed{+}$ *indicates T + TOOL mode (external arc processing);*

$\boxed{-}$ *indicates T – TOOL mode (internal arc processing).*

7. Set ARC radius

Message window displays "RADIUS", and Y window displays the former arc radius;

Press $\boxed{2} \rightarrow \boxed{0} \rightarrow \boxed{\text{ENT}}$ in turn to input the arc radius.

⌗⌗⌗⌗⌗⌗⌗⌧Ⓧ RADIUS ⌗
⌗⌗⌗⌗⌗⌗20ⓎⓎ

8. Set Tool diameter.

Message window displays "TOOL DIA";

Y window displays the former preset diameter

Press $\boxed{5} \rightarrow \boxed{\text{ENT}}$ in turn to enter the tool diameter.

⌗⌗⌗⌗⌗⌗⌗⌧Ⓧ TOOL DIA
⌗⌗⌗⌗⌗⌗5ⓎⓎ

9. Set the feed step.

Message window displays "MAX CUT";

Y window displays the former feed step.

Press $\boxed{1} \rightarrow \boxed{\text{ENT}}$ in turn to input the feed step.

⌗⌗⌗⌗⌗⌗⌗⌧Ⓧ MAX CUT ⌗
⌗⌗⌗⌗⌗⌗1ⓎⓎ
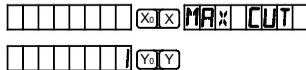
10. Process ARC

Message window displays "POIN 1". Process when the "0.000" appears in X window and Y window. Then you have finished the first point. Press $\boxed{\downarrow}$ to switch to the second point and repeat the same step. Process in this way until the message window displays "POIN 74". Pressing $\boxed{\uparrow}$ or $\boxed{\downarrow}$ can select processing point.
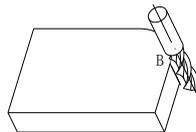
11. Press $\boxed{\text{⊠}}$ to exit ARC processing after machining is over.

NOTE:

● *In the ARC process, pressing $\boxed{\text{≈}}$ (two axes display) $\boxed{\text{≈}}$ (three axes display) or $\boxed{\text{≈}}$ (four axes display) can leave this function temporarily to return normal display of X, Y, and Z axis in order or check the position the DRO has calculated. Press $\boxed{\text{≈}}$ (two axes display) $\boxed{\text{≈}}$ (three axes display) or $\boxed{\text{≈}}$ (four axes display) to return*

ARC function.

● *Processing* ⬆*or*⬇ *can switch among the parameters in the course of the presetting parameter.*

Example 2:

Process the ARC EF as the figure from point E to point F.

Parameters are set as following:

    Machine plane: XZ

    TYPE: 4

    RADIUS: Actual radius of the arc

    TOOL DIA: 0 (flat-bottomed tool)

    MAX CUT: preset as the costumer
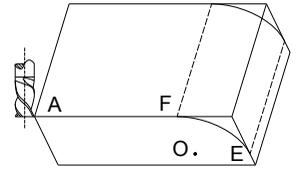
Example 3:

Process the ARC DE as the figure from point D

to point   E.   Parameters are as the following:

    Machine plane: XZ

    TYPE: 6

    RADIUS: Actual radius of the arc

    TOOL DIA: Actual value (actual tool)

    MAX CUT: preset as the costumer
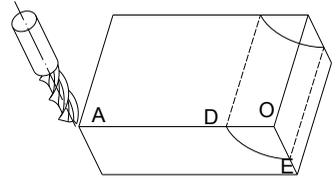
Example 4:

Process the ARC DE as the figure from point D to point E.

    Parameters are as the following:

    Machine plane: YZ

    TYPE: 7

    RADIUS: Actual radius of the arc

    TOOL DIA: Actual value (actual tool)

    MAX CUT: preset as the costumer

NOTE: For VM600-2, it is not installed with Z-axis, please press ⬆*or*⬇ *to simulate position of Z-axis,* ⬆ *simulate moving to the former process point, and* ⬇ *simulate moving to the next process point.*

31
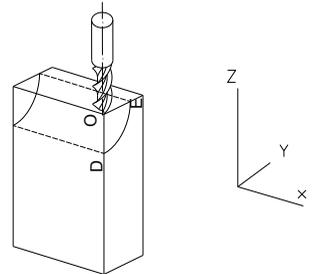
Steps:

    1:   set "STEP MODE" as "Z STEP" in setup mode, and set Z-axis dial (default value is 2.5mm);

    2:   Before machining, at first, align lathe with the beginning point Z of R, zero Z axis;

    3:   In machining process, message window displays simulate height of Z axis, which indicates simulate height of Z axis while machining;

    As right figure, while machining XZ plane, X window display position of X axis, X axis is finished when displaying "0.000" in X window; In Y window, the former 2 number indicates number of dial, and the following 5 number indicates scale number of dial, which means that machining to this scale for current point.

    While machining YZ plane, Y window display position of Y axis, and when this window displays "0.000", which indicates the machining is finished in Y direction; In X window, the former 2 number indicates number of dial, and the following 5 number indicates scale number of dial, which means that machining to this scale for current point.

$12 \times 2.5 + 1 = 31$
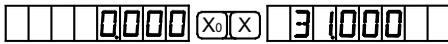
4.4   Slope Processing

This function is only for VM600-2, VM600-3.

Function: This function can calculate the position of every processing point automatically in processing slope. Only the following parameters need to be inputted:

    INCLE: Set machine plane XY, YZ or XZ plane

    INCL.ANG: the inclination angle of the slope

    MAX CUT: the slope length each time processing
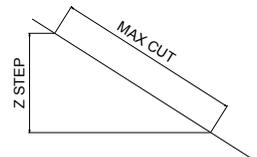
NOTE: Z STEP and MAX.CUT are defined as the figure.

    DRO will calculate the position of each processing on the slope automatically when all parameters have been input. Press $\boxed{\uparrow}$ or $\boxed{\downarrow}$ to select the processing point

and process until "0.000" appears in the window.
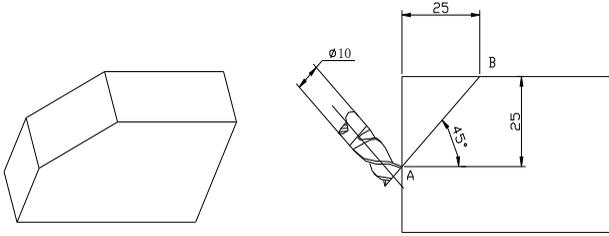
Example 1:

　　Process the slope AB as the figure. The parameters are as ollowing:

INCLE:	XZ
INCL.ANG	45°
MAX.CUT	1mm

STEPS:

1. Set display unit to metric;

    Set the SLOP.MODE 1 in initial system settings.

    NOTE:　If the third parameter isn't Z STEP, set the SLOP.MODE 0.

    Move the machine table until the lathe tool is aligned with the starting point A, then zero X axis and Z axis.

    Press $\boxed{X_0}$, $\boxed{Z_0}$ in normal display state.

2. Press $\boxed{\text{N}}$ to enter slop processing

    Press $\boxed{\text{ENT}}$ to start processing directly if all parameter have been set.

3. Select machine plane.

    Press $\boxed{Z}$→$\boxed{\text{ENT}}$ in turn to select the XY plane.　　　　$\boxed{\text{INCL　ZX}}$

    NOTE: Press $\boxed{X}$ indicates XY plane;

    Press $\boxed{Y}$ indicates YZ plane;

    Press $\boxed{Z}$ indicates ZX plane;

    You can also press $\boxed{\text{S-N/ARC}}$ to switch among XY plane, YZ plane or ZX plane.

4. Enter INCL.ANG.

    Message window displays "INCL ANG"; Y window displays the former

    INCL.ANG.

    Press $\boxed{4}$→$\boxed{5}$→$\boxed{\text{ENT}}$ in turn.
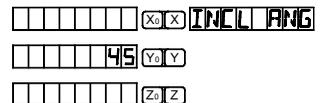
5. Enter MAX.CUT.

Message window displays "MAX CUT"; Y window displays the former MAX.CUT.
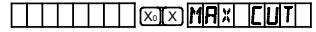
Press $\boxed{1} \rightarrow \boxed{\text{ENT}}$ in turn;

6. Processing
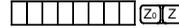
Message window displays "POIN 1";

Processes slop when the "0.000" appears; then press ⬇ to process the next point.

7. Press ⬆ or ⬇ to select point.

8. Press ⬚ to return normal display state after processing is over.

NOTE: For VM600-2, it is not installed with Z-axis, please press ⬆ or ⬇ to simulate position of Z-axis, ⬆ simulate moving to the former process point, and ⬇ simulate moving to the next process point.

Steps:

1: Set Z axis dial in internal system setup;

2: Before machining, align the start point Z point with lathe, then set Z axis as "0.000";

3. While machining XZ plane, X window display position of X axis, X axis is finished when"0.000" appears in X window; In Y window, the former 2 number indicates number of dial, and the following 5 number indicates scale number of dial, which means that machining to this scale for current point.While machining YZ plane, Y window display position of Y axis, and when this window displays "0.000", which indicates the machining is finished in Y direction; In X window, the former 2 number indicates number of dial, and the following 5 number indicates scale number of dial, which means that machining to this scale for current point.

In slope processing, operator can press ⬚ (two axes display) ⬚ (three axes display) or ⬚ (four axes display) to exit, return to normal display, making use of this you can confirm position of DRO. And then press⬚ (two axes display) ⬚ (three axes display) or ⬚ (four axes display) return to slope processing.

Chapter 5   EDM

(ELECTRICAL DISCHARGE MACHINING)

NOTE: Only VM600-E provides EDM function.

DRO will send out a signal and machining will stop as soon as the display value is equal to the expectant .

VM6000E is equipped with 7 EDM modes:

MODE 1   manual mode 1

MODE 2   automatic mode 1

MODE 3   manual mode 2

MODE 4   manual mode 3

MODE 5   manual mode 4

MODE 6   automatic mode 2

MODE 7   automatic mode 3

MODE 8   automatic mode 4
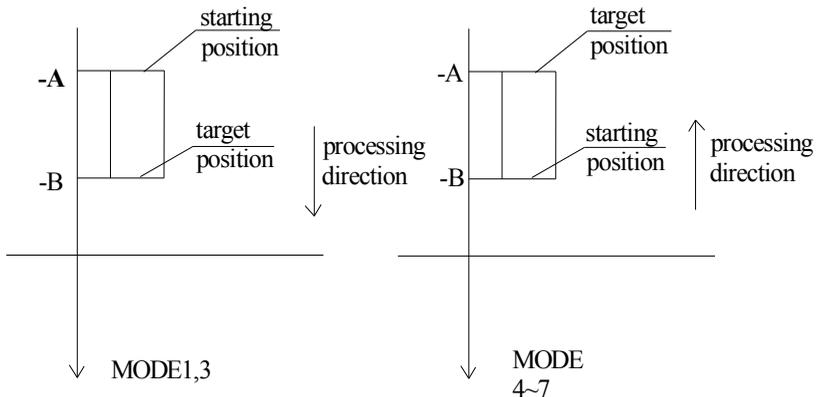
Fig 1 : Difference among EDM modes

EDM mode is set in initial system settings.

NOTE: Pay attention to the relay mode.

Table 1: the difference between 8 EDM modes: (X: No have; √: Have; ↑: Up; ↓: Down)

EDM MODE	Edge detect	Direction of machining as depth is minus	Exit EDM after machine first hole	Z axis direction
1	X	↓	√	↓
2	√	No minus depth	X	↓
3	X	↓	X	↓
4	X	↑	√	↓
5	X	↑	X	↓
6	√	↓(No plus depth)	X	↑
7	√	↓	X	↑
8	√	No minus depth	X	↓

Positive direction of Z axis is down except mode 6: which means the display value will increase with the increasing depth during machining.
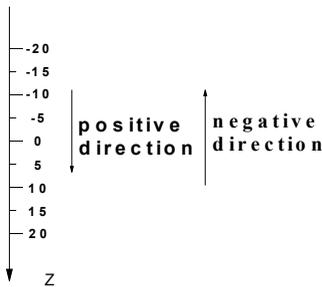
Fig.2
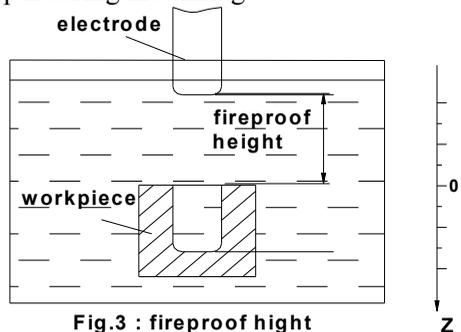
Fig.3 : fireproof hight

VM600-E provides fireproof function. During EDM, charcoal will be produced on the machined surface. With accumulating charcoal, the electrode will beyond liquid level, which could lead a fire. If fireproof height is set, EDM will stop, the DRO will send an alarm and fire is avoided.

5.1   Setting EDM Parameters

The following parameters must be set before EDM is done:

    A   Depth of machining (EDM DEEP)

    B   Fireproof height (EDM HOME)

    C   Electrode compensation (EDM.COMP if DEEP COMP is active)

    D   EDM mode (EDM MODE)

    E   Relay mode (RELAY MODE)

    F   Disable/Enable electrode compensation (DEEP.COMP)

A, B, C can be set by pressing [⊞] in normal display state; D, E, F can be set in initial system settings, and they are modified rarely. If the DEEP.COM is set as "0", electrode compensation is not taken into consideration; if it is set as "1", the value of electrode compensation can be set in parameter setting, and electrode compensation should be taken into consideration during machining.
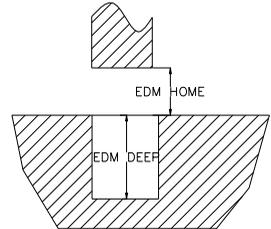
Fig.4 : EDM.DEEP

Example:

        EDM depth (EDM DEEP)   25.5mm

        Fireproof height (EDM HOME)   5.0mm

        Electrode compensation (EDM.COMP)   0.1mm

STEPS:

1.   Set EDM COMP as "1" in initial system settings to enable electrode compensation;

2.   Return normal display state, and then set display unit is to metric;

3.   Input EDM parameters.

    Press [⊞], the Y window displays the former depth;

    Input depth by pressing [2]→[5]→[•]→[5]→[ENT]
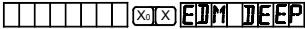
4.   The Y window displays the former fireproof height

    Input the fireproof height.

    Press [5]→[ENT]
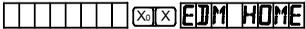
5: The Y window displays the value of former electrode compensation;

    Input the new value.

    Press [0]→[•]→[1]→[ENT]
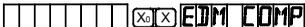
6: Press [⊞] to return normal display state.

5.2   EDM machining

Return normal display state: then press to start machining after all EDM parameters have been set. VM600E provides 8 EDM modes to deal with different requirements。

Chapter 6   CALCULATOR FUNCTION

VM600 provides arithmetic operation such as plus, minus, multiply and divide, which convenient for operator to processing work piece according to the drawing.

- **Enter and exit Calculator Function**

  In normal display state: press ▦ to enter calculator function

  In calculator state: press ▦ to exit calculator function

- **Calculating Example**

Example 1:   2+30×2-6/2= 59

2 → + → 3 → 0 → × → 2 → − → 6 → ÷ → 2 → =

Example 2： $345 + 2 \times \sin^{-1}(-0.5) = 285$

3 → 4 → 5 → + → 2 → × → 0 → • → 5 → ± → $\frac{S-N}{ARC}$ → Sin → =
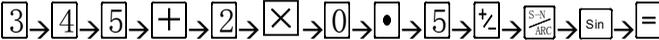
NOTE:

1. *If incorrect data is inputted, press* CL *to cancel and input again.*
2. *Error would occur when calculating incorrectly, such as "0" is used as divisor or proceeding arcsine when absolute value is more than 1. In this case, the message window will display "ERR…" You can cancel this error message by pressing* CL *and input data again.*
3. *The absolute value of inputted data and calculated result should be in the range of 0.000001 to 9999999, otherwise it can't be displayed.*

● **Transferring the Calculated Results to Selected Axis**

After calculating is finished, user can

press X_0、Y_0、Z_0、W_0、 to transfer the calculated result to X,Y,Z,W axis, then the window   will display this value.

● **Transferring the Current Display Value in Window to Calculator**

In calculator state:

Press X、Y、Z、W to transfer the display value in X,Y,Z,W window to calculator.

Chapter 7   INITIAL SYSTEM

Function:

Set various parameters according to actual operation.

Parameter Items:

SEL SYS	Setting the number of linear scale
DIRECT	Setting positive direction for counter
LIN COMP	Setting linear compensation
R OR D	Radius/Diameter Mode
Z DIAL	Setting Z axis Dial（VM600-2、VM600-3）
RESOLUTE	Setting the resolution of scale
SDM DIR	Setting the input mode of SDM
RELAY.MOD	Setting relay mode（VM600-E）
EDM MODE	Setting EDM mode（VM600-E）
DEEP.COMP	Enable/Disable the electrode compensation（VM600-E）
SLOP.MODE	Setting the slope machining mode（VM600-2、M600-3）
STEP.MODE	Select the step mode in ARC processing（VM600-2、VM600-3）
LATH.MODE	Setting the lathe mode（VM600-2、M600-3 、M600-4）
AXIS.TYPE	Setting the type of axis（VM600-2、M600-3 、M600-4）
ANGE.MODE	Select the angle display mode（VM600-2、M600-3 、M600-4）
ANGE.TYPE	Select the angle display type（VM600-2、M600-3 、M600-4）
ALL CLS	Clearing all customer setting and return default setting
EXIT	Exit setup

NOTE: what you have changed (except "ALL.CLS") would not been saved if you quit

"SETUP" (initial system settings) without selecting "EXIT" item.

7.1   Enter/Exit Initial System Settings

Press ⬛ to enter initial system setting after DRO powers on in 1 second: then "SETUP" displays in message window. Press ⬇ or ⬆ to select the item you want to change.

If you want to quit initial settings: press ⬇ or ⬆until "EXIT" appears in message window and press⬛.

7.2   Setting the type of DRO（SEL   SYS）

Because VM600 series DROs (two axes or three axes DRO) share the same software and their functions have some differences. DRO type must be set before use. ALL CLS has no effect on type of   DRO.

"2" means the DRO type is VM600-2;

"3" means the DRO type is VM600-3

7.3   Setting Positive Direction for Counter

If the linear scale is installed as the figure (facing operators):

Direction "0" means the display value will increase when scale moves from right to left and decrease when scale moves from left to right.

Direction "1" means the display value will increase when scale moves from left to right and decrease when scale moves from right to left.

The counting direction of the scale is set by the erector, and the operator had better not change it.

Default: 0
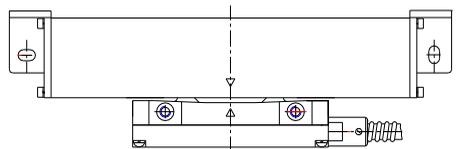
7.4 Setting Linear Compensation (LIN COMP)

Definition

Linear error: There is always an error between actual measure value and standard value. If it is distributed around the scale travel linearly, the error is defined as linear error. For example, the scale valid length is 400mm.if the measure value is 400mm and the standard value is 400.040mm: There is a $\triangle L$ of 40μm. If 40μm is distributed around the scale linearly, there is a $\triangle L$ of 10μm when the scale travels 100mm; a $\triangle L$ of 20μm when the scale travels 200mm; a $\triangle L$ of 30μm when the scale travels 300mm.

Linear compensation: Compensate the linear error to make display value equals to standard value.

> *NOTE:*   *The linear compensation is set by erector. Operator had better not change it, or the accuracy of linear scale will be worse.*

Default coefficient: 0

7.4.1 Manually compensate

The calculation of compensation coefficient:

$$coefficient = \frac{(measurement - standard\ value) \times 1000,000}{standard\ value}$$

Example:

Measurement   400.000mm

Standard value   400.040mm

Compensation value   (400.000 - 400.040) X 1000, 000 / 400 = -100

Unit: μm/m;

Set linear error compensation: X axis is 100; Y axis is 50; Z axis is −100.

STEPS:

1. Enter "SETUP", then press 🔽 or 🔼 until message window displays "LIN COMP".

2. Press ENT,

X window, Y window, Z window displays the former linear error

compensation coefficient separately.

Message window displays "SEL AXIS" which indicates that the next step is to select axis.

3. Select axis

Press $\boxed{X}$ to select X axis.

NOTE: Press $\boxed{X}$ to select X axis. Data in X window flashes which indicating that you can input the linear error compensation for X axis;

Press $\boxed{Y}$ to select Y axis. Data in Y window flashes which indicating that you can input the linear error compensation for Y axis;

Press $\boxed{Z}$ to select Z axis. Data in Z window flashes which indicating that you can input the linear error compensation for Z axis;

Message window displays "ENTR.PPM", indicating it is waiting for a data to be inputted.

4. Press $\boxed{1}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\text{ENT}}$ in turn;

If incorrect number is input, press $\boxed{\text{AC}}$ to cancel and input again.

5. Input the error compensation coefficient for Y axis;

Press $\boxed{Y}$ $\boxed{5}$ $\boxed{0}$ $\boxed{\text{ENT}}$ in turn;

Input the error compensation coefficient for Z axis;

Press $\boxed{Z}$ $\boxed{1}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\text{±}}$ $\boxed{\text{ENT}}$ in turn.

6. Press $\boxed{\text{ENT}}$ to confirm your setting and exit linear error compensation setup.

7.4.2 **Automatic compensation**

Operating steps (Take the X axis as example)

1. Touch-hold " X " button for 3 seconds, enter into the mode of X axis automatic compensation, the X axis blinks.

2. As shown in the figure, put the standard gauge blocks on top of the workbench, move X axis to align with the A plane, press the " X₀ " key, and reset.
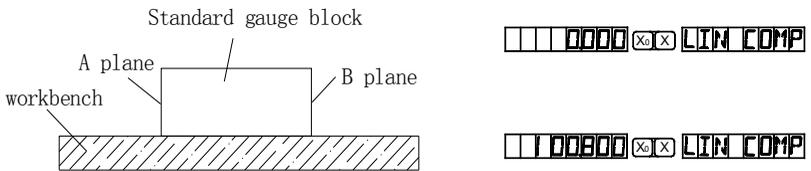
3. Move X axis to align with the B plane, press the " ENT " key, deputy window will show "SET OK", then the linear compensation of X axis finished

NOTE:

- *Standard gauge block must be integer times of 10 mm (for example: 10 mm, 20 mm, 30 mm...). If not, please manually compensate.*

- *During automatic compensation, pressing the AC key can exit automatic compensation function, and the previous compensation value will not change.*

- *INC and SDM coordinates cannot automatically compensate, inch system cannot automatically compensate, only under the ABS and metric system, can enter into automatic compensation function.*

- *After compensation, values can be checked in internal parameter set.*

7.4.3 **Encoder compensation**

Under the condition of number axis types are encoder:

After the encoder rotating a circle, if the angle is not 360 °, but larger or smaller than 360 °, you will need to compensate the encoder.

Operating steps (Take the X axis as example)

1.   After the encoder rotating a circle, got a value of 359.8°.
2.   Directly input 359.8 °, compensation finished.
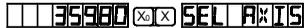
<p align="center">35980 ⊠⊠ SEL AXIS</p>

NOTE: Please refer to section 7.14 before setting encoder compensation value, set the number axis type into the right mode: the encoder

7.5   **Toggle Between R/D Display Mode(R – D MODE)**

In common case, the display value is the distance between lathe tools and the coordinate origin. This display mode is called MODE R. When process cylinder given diameter measurement, diameter is the double distance between lathe tool and coordinate datum. The DRO will display the diameter in MODE D

        "0"：   mode R.
        "1"：   mode D.

Default mode: mode R.

7.6   **Setting Z axis Dial(Z   DIAL)**

Z axis Dial should be set if Z axis is emulated for VM600-2 and only install linear scale for X, Y axis.

Z axis Dial means the distance the Z axis travels when screw runs a revolution.

Default value: 2.5mm

7.7　Setting the Resolution of Scale(RESOLUTE)

Different scale has different resolution. VM600 DRO can connect with 10 kinds of scale, and these resolutions are 0.05µm, 0.1µm, 0.2µm, 0.5µm, 1µm, 2µm, 5µm, 10µm, 20µm, 50µm. The resolution must be set to match the linear scale. This parameter is set by erector, operator had better not change it.

Default resolution:　　5µm

Set the resolution of　X axis　as 1um.

STEPS:

1. Enter "SETUP" and press ⬇ or ⬆ until "RESOLUTE" appears in message window;

   `RESOLUTE`

2. Press ⒠X window displays the former resolution of each axis separately. Message window displays "SEL AXIS", which indicates the next step is to select axis.

   `500 x₀x SEL AXIS`

3. Select axis.

   `100 x₀x SEL AXIS`
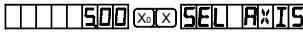
   Press ⬚X⬚ to change the resolution of X

   axis, then data in X windows flashes.
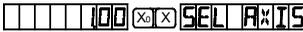
4. Press ⬇ or ⬆ to scroll through 0.05, 0.10, 0.20, 0.50, 1.00, 2.00, 5.00, 10.00, 20.00, 5 0.00. Press ⒠ to select "1.00" when it appears and return "SEL.RXIS" state. Press ⒞ to cancel your selection.

   `100 x₀x SEL AXIS`

5. Set the resolution of Y axis: Z axis by repeating step 3-4.
6. Press ⒠ to exit "RESOLUTE" setup.

7.8　Setting Relay Mode(RELAY.MOD)

The relay will send out an ON/OFF signal when process to target position. EDM.Relay interface has three pins: common, normal close and normal open.VM600E provides

EDM Interface
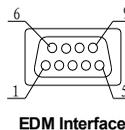
PIN	NAME	COLOR
1	NC	
2	COMMON	ORG
3	CLOSE	BRW
4	NC	
5	IN+	RED
6	OPEN	YEL
9	IN-	BLK

four Relay modes. Operator can set it according to your circuit.

Normal close and common pin:

RELAY MODE	Power ON	ENTER EDM	PROCESS TO TARGET POSITION	EXIT EDM	Power off
1	close	close	open	close	open
2	open	open	close	open	open
3	close	open	close	close	open
4	open	close	open	open	open

Default value: MODE 2.

7.9   Setting the EDM Mode   (EDM   MODE)

VM600 provides 8 EDM modes. For detail information, please refer to chapter five. EDM mode must be set before EDM machining.

Default mode: MODE 1.

7.10 Setting the Input Mode in SDM Coordinate (SDM   DIR)

WE600-E series DRO provides two inputting data mode in SDM coordinate:

MODE 0   (Normal inputting mode): the data the DRO accept equals the inputted data;

MODE 1 (Special inputting mode): the data the DRO accept equals the negative of the inputted number.

Default mode: MODE 0.

7.11 Enable/Disable EDM Depth Compensation (DEEP.COMP)

In EDM machine, deep compensation is no necessary and this function disabled normally. It must be enabled before using it.

0：disable depth compensation.

1：Enable depth compensation.

Default setting: 0

7.12 Setting the Slope Machining Parameter (SLOP.MODE)

Parameter can be set in two ways in slope machining :

A   Set the step of second axis (Z STEP) in one plane: for XY plane, set the step of Y axis; for YZ plane and XZ plane set the step of Z axis.

B   Set MAX CUT.

MODE 1：MAX CUT；

MODE 0：Z STEP，

Default setting: the step of the second axis (Z STEP).

7.13 Setting Lathe Mode (LATH.MODE)

Lathe mode 0: Disable lathe function;

Lathe mode 1: X window display value = the position of X axis + the position of Y axis;

Lathe mode 2: X window display value = the position of X axis + the position of Z axis;

Default mode: disable lathe mode.

Set the lathe as mode 1.

7.14 Toggle between Linear Scale and Rotary Encoder(AXIS.TYPE)

Both linear scale and rotary encoder can be installed in any axis. The linear scale is used to measure distance; the rotary encoder is used to measure angle.

Default: linear scale.

Set rotary encoder in X axis.

STEPS: `AXISTYPE`

1.   Enter "SETUP" and press ⬇ or ⬆ until the message window displays "AXIS.TYPE";

    `LINEA  X₀X SEL AXIS`
    `LINEA  Y₀Y`
2.   Press ENT: `LINEA  Z₀Z`

    X, Y, Z window displays the former type.

    "LINEA" means linear scale.

    "ENCODE" means rotary encoder.   `ENCOdE X₀X SEL AXIS`

    Message window displays "SEL AXIS", which means the next step is to select axis.

3.   SetX axis are installed with rotary

    Press X until display in X window is "ENCODE";

4.   Press ENT to confirm your new set and exit.

    Press CL to cancel your new set and exit.

7.15 Step Mode of ARC(STEP.MODE)

In ARC function, if the plane is not XY, you can setup the step mode. There are two modes. Mode 0 is Z STEP mode and Mode 1 is MAX CUT mode.

Default setting: Z STEP.

7.16 Angle Display Mode (ANGL.MODE)

VM600 provides 3 angle display modes. In Mode 1, the angle is in the range of 0° to 360°; in mode 2, the angle is in the range of -360° to 360°; and in mode 3, the angle is in the range of -180° to 180°.

Default mode: MODE 1.

7.17 Angle display type(ANGL.TYPE)

There are two angle display types for VM600.

TYPE 0: indicate angle display is DD.

TYPE 1: indicate angle display is DMS.

Default value: TYPE 0。

7.18 Load default setup (ALL CLS)

Function: Clear all data except the linear compensation and DRO type. DRO will load default setup for all parameters.

STEPS:

1. Enter "SETUP", then press ⬇ or ⬆ until the message window displays "ALL CLS"; `ALL CLS`

2. Press ENT and message windows display "PASSWORD" indicating the operator to input password. At this moment, `PASSWORD` there are two selections:

   A Press AC to quit "ALL.CLS";

   B Enter the correct password to clear all parameters and load default setup;

3. Input the password;

   Input the Correct password to load default value.

   The message window displays "WAITING", which means the clearing is going on.

51

`--[ ][ ][ ][ ][ ]⊠₀⊠` **WAITING**   `---------⊠₀⊠` **WAITING**
`--[ ][ ][ ][ ][ ]`Y₀Y   `---------`Y₀Y

4.   Return normal display state after loading default setup is finished.

`[ ][ ][ ][ ][ ][ ][ ]⊠₀⊠` **CLEAR O**   `[ ][ ][ ][ ][ ][ ][ ]⊠₀⊠` **ALL CLS**
`[ ][ ][ ][ ][ ][ ][ ]`Y₀Y   `[ ][ ][ ][ ][ ][ ][ ]`Y₀Y

The default setup for all parameters is as following:

> ➢   Counting direction is mode 0;
> ➢   The R/D is mode R ;
> ➢   Z   DIAL = 2.5mm;
> ➢   Resolution = 5μm;
> ➢   EDM mode is MODE 1;
> ➢   Relay mode is mode 0;
> ➢   Input mode in SDM as 0, display value = input value;
> ➢   Deep compensation is disabled;
> ➢   Lathe function   is disabled;
> ➢   Slope machining parameter is Z step;
> ➢   Linear scale is installed for any axis;
> ➢   Angle display mode is mode 1: 0~360;
> ➢   Angle display type is 0: DD;
> ➢   ARC machining parameter is Z step.
> ➢   Baud rate is 9600

Chapter 8   TROUBLE SHOOTING

The following are the easy solvent for troubleshooting. If they can not work: please contact with distributor for more service.

Trouble	Possible Reason	Solvent
No display	A The DRO isn't powered. B AC power voltage is not in the range of 100V to 240V.	A Check the fuse is OK or not. B Check the socket is loose. C Check the input power voltage is in the range of 100V to 240V.
Cover is charged	A Poor grounding is float B Leakage of electricity	Check the lathe and DRO are well grounded.
Display value is doubled	A Improper resolution B Display mode D	A Set proper resolution. B Set display mode R.
No counting	A Poor contact of scale B No scale signal output C Useless of counting function	Exchange scale and check again.
Display value is in disorder	Memory is disorder	A Clear system. B Check compensation is proper.
Erroneous counting	A Poor precision of lathe B Too fast run speed of the lathe C Proper scale precision D Improper resolution is set E Improper linear error compensation F Useless of scale	A Repair lathe. B Reduce the move speed of scale. C Reinstall scale. D Set proper resolution. E Set proper linear error compensation. F Repair or exchange linear scale.