

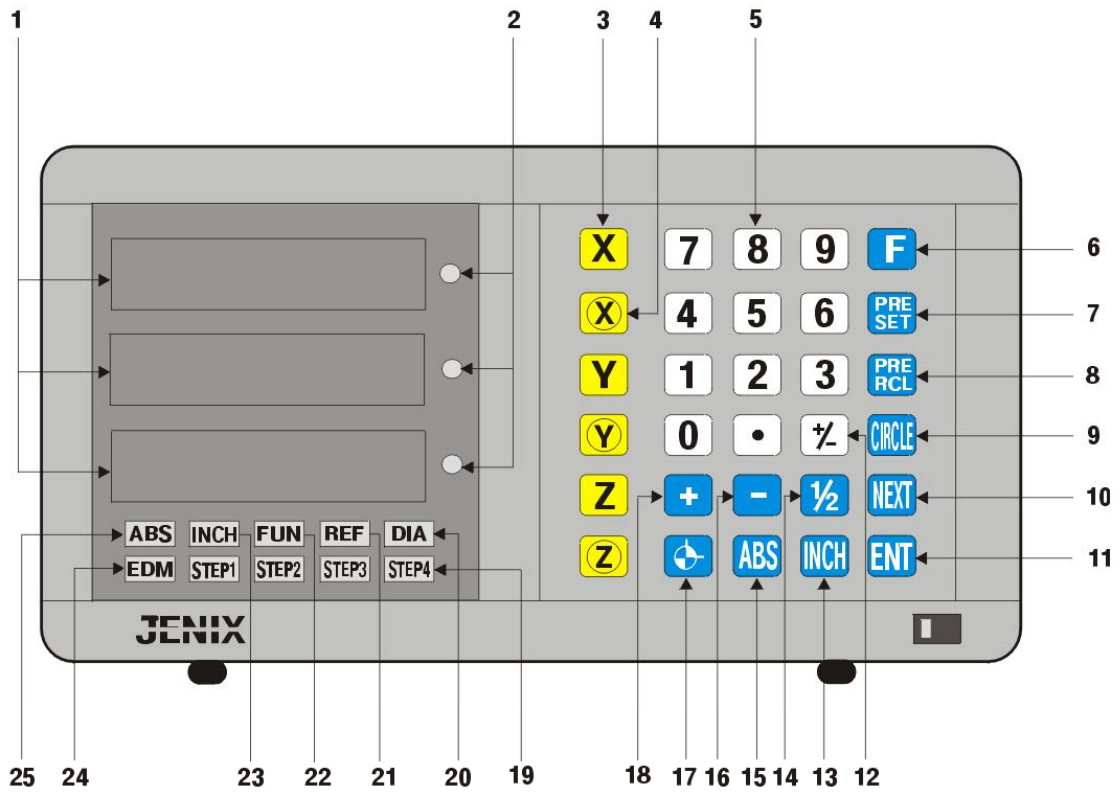
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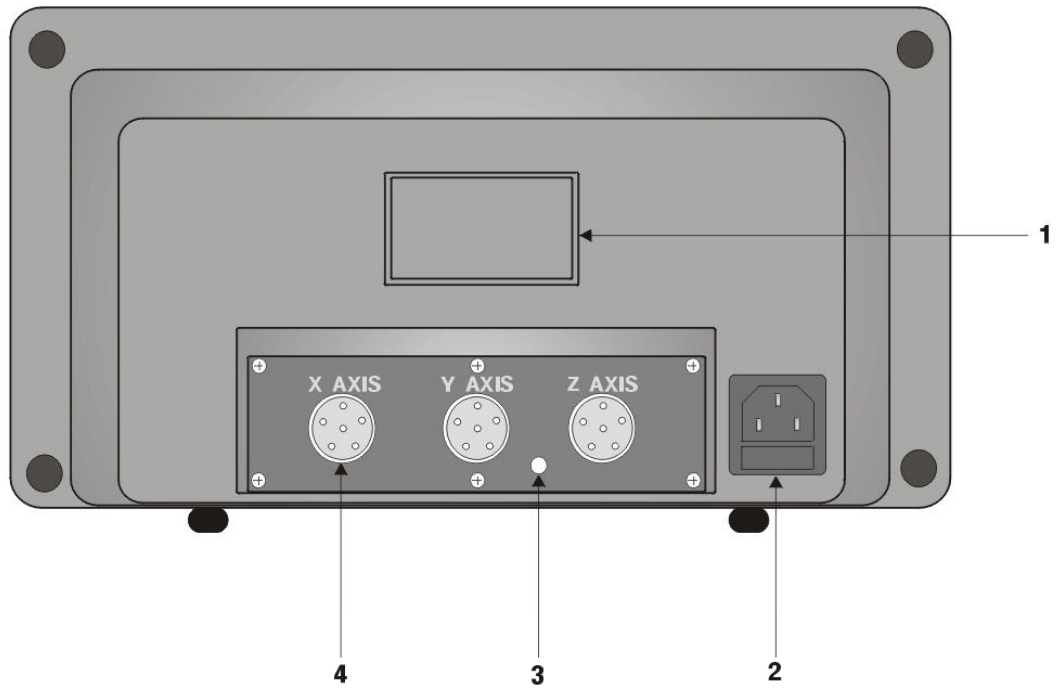
1. Explanation of front panel



- 1. Display
- 2. Axis lamp
- 3. Axis select key
- 4. Axis zero key
- 5. Number key
- 6. Function key
- 7. Preset key
- 8. Preset recall key
- 9. Circle key
- 10. Next key
- 11. Enter key
- 12. Reverse key

- 13. MM/INCH selector key
- 14. Half divide key
- 15. INCR/ABS selector key
- 16. Subtraction key
- 17. Reference key
- 18. Add key
- 19. Step lamp
- 20. DIA/RAD lamp
- 21. Reference lamp
- 22. Function lamp
- 23. INCH lamp
- 24. EDM lamp
- 25. ABS lamp

2. Explanation of rear panel



1. Warning notice
2. Fuse and power source
3. Ground
4. Scale connector

3. Operation and function

1. Basic operation

Key operation is as follows:

- 1) Select function or axis.
- 2) Select function.
- 3) Input Number.
- 4) Press "ENTER" key.



2. Preset

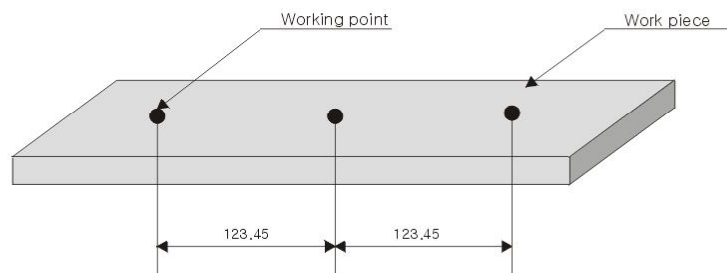
Use this function when you input number and when you wish to process of definite length continuously.



Key operation is as follows:



EX) Input "123.450" and wish to use this value continuously.



- Preset the number of "123.45".

< Figure 1 >

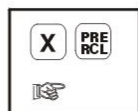


3. Preset recall

Use this function when you wish continuous working after recalling the already input number.

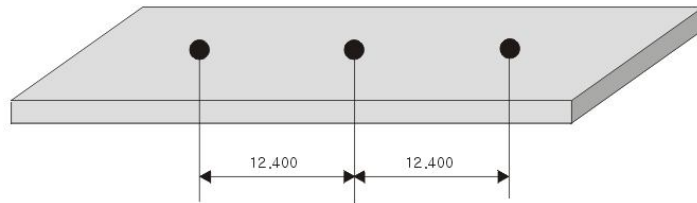


Key operation is as follows:





EX) In case you wish to make three holes with the pitch of 12.400.



< Figure 2 >

- Preset the number of "12.400".



- Move X-axis to the point of "0.000" and finish .
- Precall already input number.



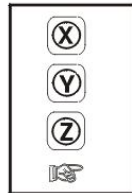
With using Precall function, you can bring out the same number and use continuously.

4. DISPLAY ZERO

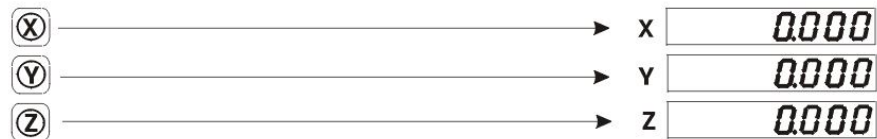


Use this function in case you wish all axis zero or each axis zero.

Key operation is as follows:



- All axes zero



- One axis zero

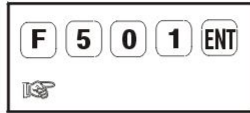


5. Initialize

This is the setting process of initializing for display counter.
Every function will be not functional when initializing except for "Rate" function.



Key operation is as follows:

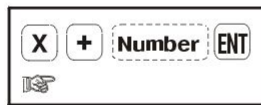


6. Add

This is the function of adding a certain numeral in status of present number displayed.



Key operation is as follows:



EX) In case you wish to add "13.000" on present numeral of 123.450" of X-axis.

Present number displayed is "123.450" on X-axis. \longrightarrow X 123.450

- Add "13.000".

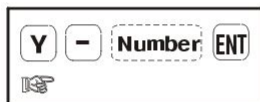
 \longrightarrow X 136.450

7. Subtract



Use this function in case you wish to subtract certain number from present number displayed.

Key operation is as follows:.



EX) In case you wish to subtract "14.000" from present "327.450" of Y-axis..

Present number displayed is "327.450" on Y-axis. \longrightarrow Y 327.450

- Subtract "14.000".

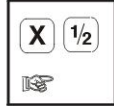
 \longrightarrow Y 313.450

8. Half divide

In case you wish to know the center point of the moved distance when you move from one point to another point and also wish to process on the center point.



Key operation is as follows:



EX) You wish to make a hole on the center point after you move to "12.400" from one point.

Present position is "12.400" on X- axis. \longrightarrow X 12.400

- Divide half the value of "12.400".



9. MM/INCH Conversion

Use when you wish to use by "INCH" as a measuring unit.




- When "INCH" lamp is not "ON", it is on "MM".
- When you wish to change from MM to INCH, you press "INCH" key.
- When you wish to change from INCH to MM, you press "INCH" key again.



Key operation is as follows:



10. ABS/INCR Conversion

- 1) ABS can be used when you want to fix one point as ABS point of work-piece.
- 2) ABS can be input up to 10 points. And ABS input number is 0 through 9.
- 3) When ABS lamp is not "ON", it is processed as "INCR".
- 4) When you press "ABS", ABS lamp is "ON" and applied to ABS.
- 5) When you use "ABS", key operating will be limited and only operative keys are ,  and , other keys are not operative.

1) Inputting ABS Position number and ABS numeral

(1) How to input number for ABS



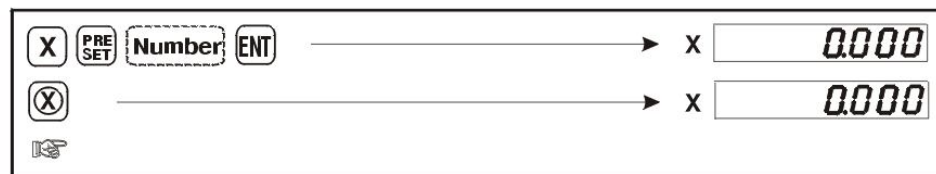
Key operation is as follows:



(2) How to input numeral for ABS



Key operation is as follows:



EX) At X-axis, ABS position number is 2 and input 0.000 and 15.000

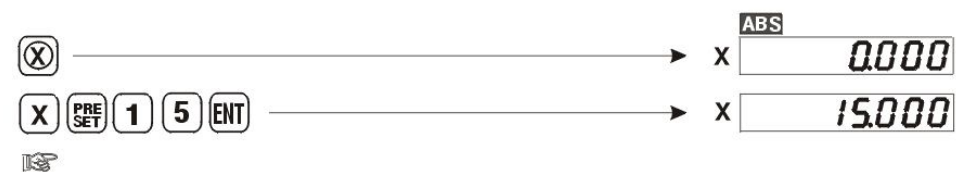
① Press **F**, when ABS lamp is ON.



② Input "2" as a ABS position number.



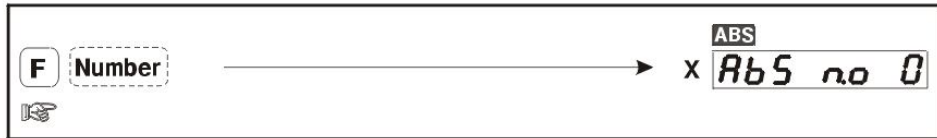
③ Input "0.000" or "15.000" at X-axis.



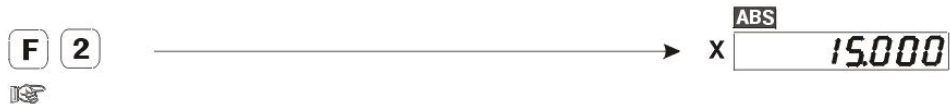
2) Confirmation of ABS positioning



Key operation is as follows: (ABS lamp should be ON.)



EX) Confirm that ABS position number is "2" and input number is "15.000" at X-axis.

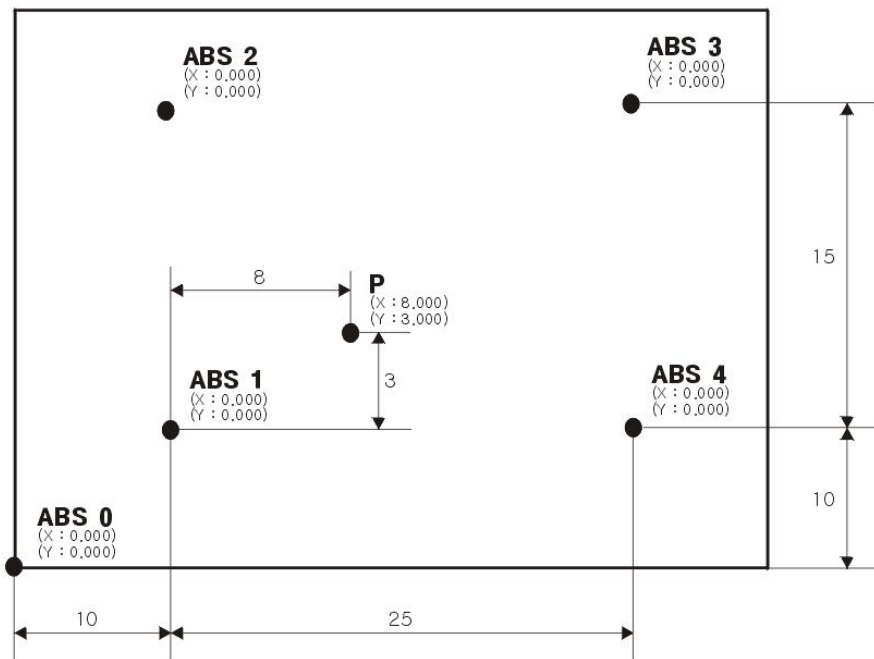


3) Example of ABS positioning

(1) Example of ABS input



EX) In case of setting 5 points for ABS.



< Figure 3 >

- The method of ABS setting positioning for "<Figure 3> is as follows. (Under the condition of ABS lamp is ON)

① Set the position of ABS 0. (Input "0" under ABS lamp is on)

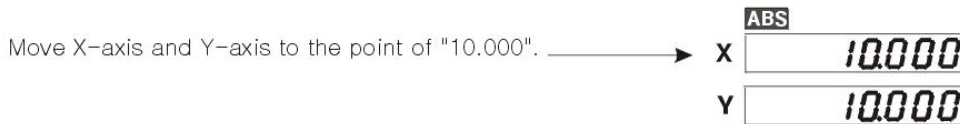


⇒ Input "0.000" into each X-axis and Y-axis.



② Set the positon of ABS 1.

⇒ Move X-axis and Y-axis to the point of each "10.000" for setting ABS 1.



⇒ Input "1" under ABS lamp is ON.



⇒ Input "0.000" into each X axis and Y axis.



③ Set the position of ABS 2.

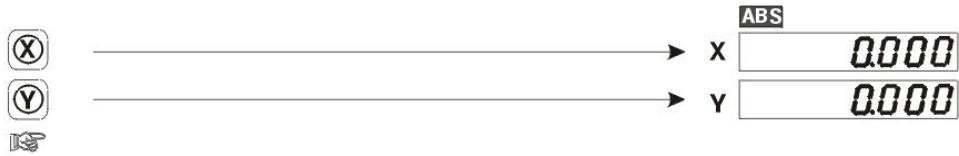
⇒ Move Y axis to the point of "15.000" for setting ABS 2.



⇒ Input "2" under ABS lamp is ON.



⇒ Input "0.000" into each X-axis and Y-axis.



④ **Set the position of ABS 3.**

⇒ Move X-axis to the point of "25.000" for setting ABS 3.



⇒ Input "3" under ABS lamp is ON.

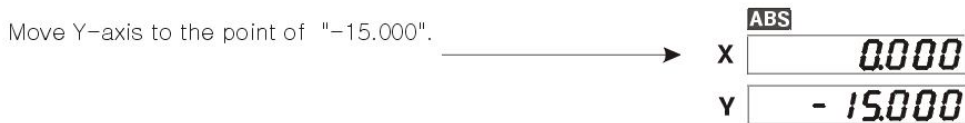


⇒ Input "0.000" into each X and Y axes.



⑤ **Set the position of ABS 4.**

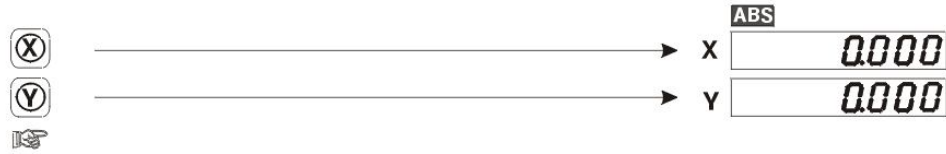
⇒ Move Y-axis to the point of "-15.000" for setting ABS 4.



⇒ Input "4" under ABS lamp is ON.



⇒ Input "0.000" into each X and Y-axis..



You can set ABS by 10 points like the step written above.

(2) Example of confirmation of ABS input



EX) At <Figure 3>, you want to find ABS 1 position from a certain point "P",
(Only when there is a certain point of "P" under ABS lamp is OFF)

⇒ Input "1" under ABS lamp is ON.



Then it shows "8.000" at X axis, Y axis "3.000".

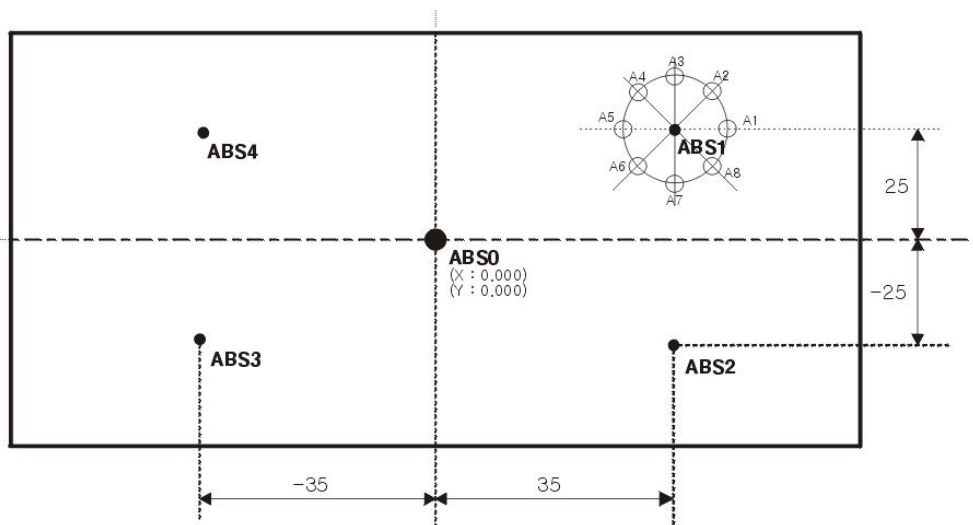


⇒ After that, move X-axis and Y-axis to each "0.000" and you can find the position of ABS 1,
Likewise, you can find the points from ABS 0~ABS 4.

(3) Example of positioning of sub-datum point from datum point



EX) In case of processing four sub-datum point(ABS 1~ABS 4) from Datum point like <figure 4>.



< Figure 4 >

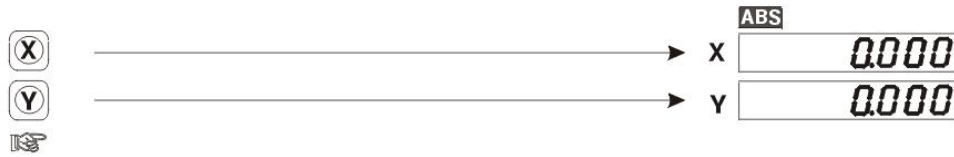
• **Setting steps for pointing ABS like <Figure 4> is as follows;
(Under the condition of ABS lamp ON)**

① **Method of setting the position of ABS 0**

⇒ Input "0" under ABS lamp ON.



⇒ Input "0.000" at X-axis and Y-axis.

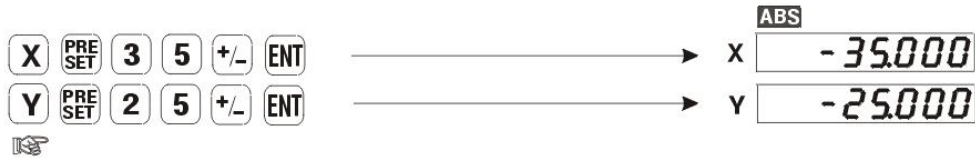


② **Method of setting the position of ABS 1**

⇒ Input "1" under ABS lamp ON.



⇒ Input X : -35.000, Y : -25.000

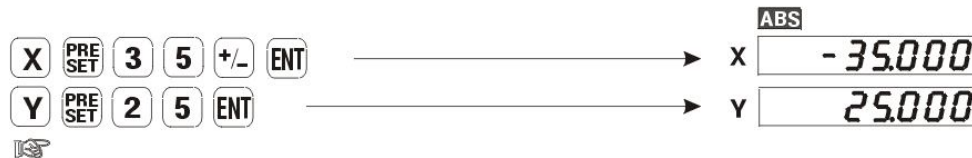


③ **Method of setting the position of ABS 2**

⇒ Input "2" under ABS lamp ON.



⇒ Input X : -35.000, Y : 25.000

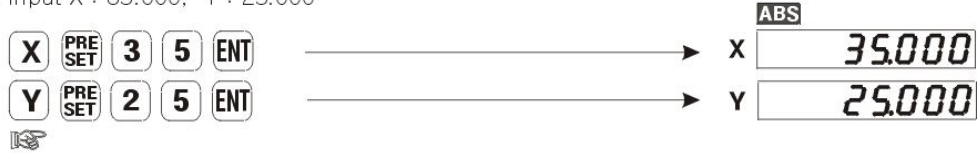


④ Method of setting the position of ABS 3

⇒ Input "3" under ABS lamp ON.



⇒ Input X : 35.000, Y : 25.000

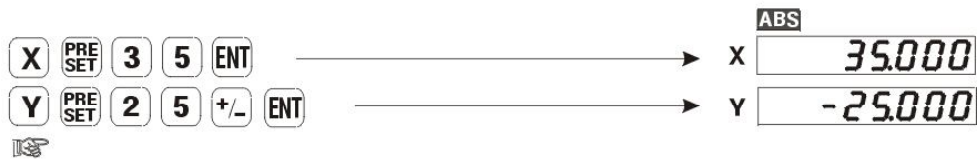


⑤ Method of setting the position of ABS 4

Input "4" under ABS lamp ON.



⇒ Input X : 35.000, Y : -25.000



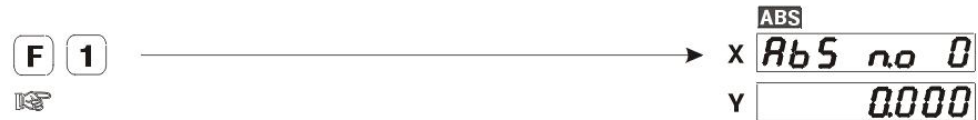
You can set the point of ABS from ABS 0 through ABS 4.

(4) Example of confirmation of sub-datum point from datum point.

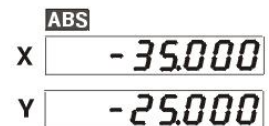


EX) In case you want to find sub-datum point of ABS 1 at <Figure 4>.

⇒ Call out the point of ABS 1 under ABS lamp ON.



⇒ It displays X : "-35.000", Y : -25.000.



11. Function key

⇒ Move X-axis and Y-axis to the point each "0.000".

Move X-axis and Y-axis to each "0.000". →

| | | |
|---|------------|-------|
| | ABS | |
| X | | 0.000 |
| Y | | 0.000 |

Above example is to find the point of ABS 1 and you can find and recall sub-datum points by operating with same method from ABS 2 to ABS 4. And you can process A1~A8 respectively find, based on the point of ABS 1 at the sub-datum point ABS 1.

"F" key has following 11 functions.

- ① Display zero
- ② Memory in/out
- ③ Memory clear
- ④ Lathe function (adding value of Y-axis and Z axis)
- ⑤ Double counting (used in lathe function - DIA)
- ⑥ Initialize
- ⑦ Circle divide and altering axis dividing
- ⑧ Changing resolution
- ⑨ Altering axis direction
- ⑩ Rate
- ⑪ Display check

1) Display zero

Display zero is same as described in page-6.

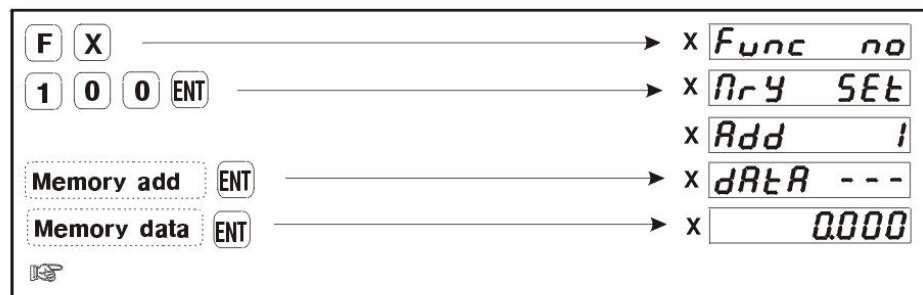
2) Memory in / out

Input number(memory data) you want in advance and then process continuous work by using it. Maximum input memory each axis is 50.

(1) Memory in



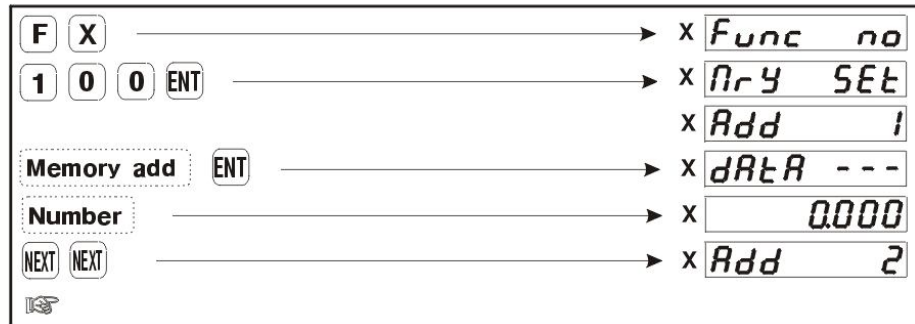
Key operation is as follows:



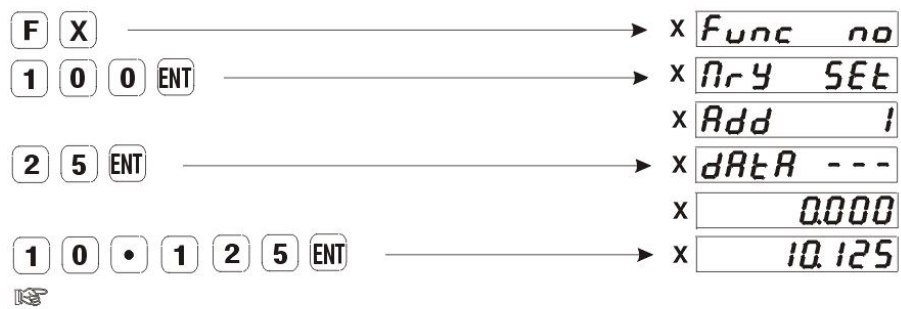
<Reference> When you need to input several "Memory data" continuously, press **NEXT** twice after inputting memory data. Then it leads you to next memory column to input next memory data. If you finish inputting "memory data", you must press **ENT** key.



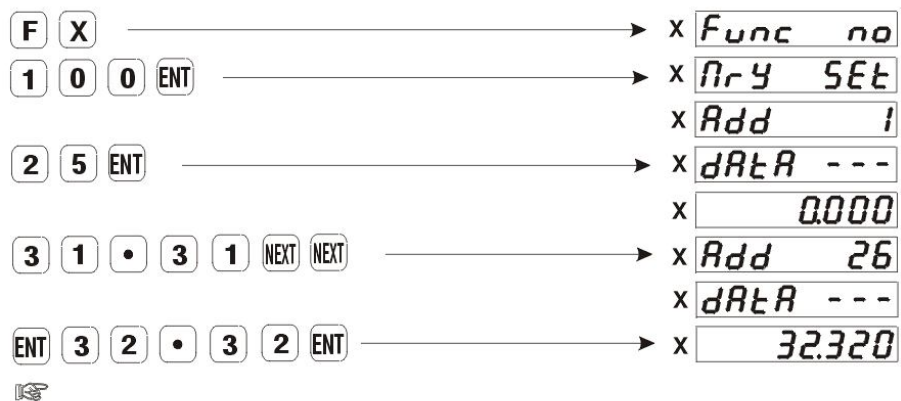
In case of continuous input,



EX) Input "10.125" on memory address number 25 at X-axis.



EX) When you want to input "31.310" in memory address at X-axis, and you want to input continuous data, "32.320" at memory address, 26, at X-axis,

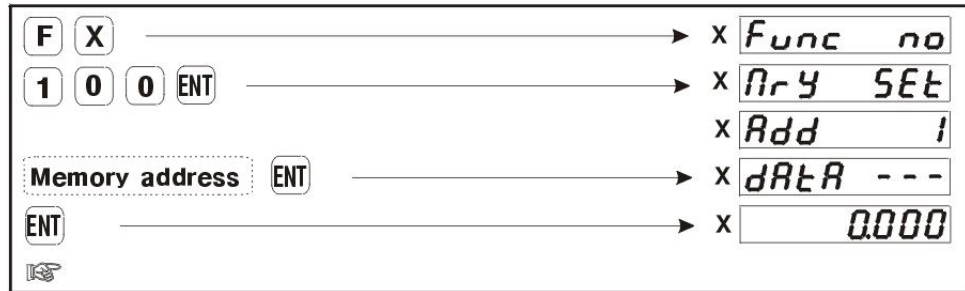


(2) Memory recall

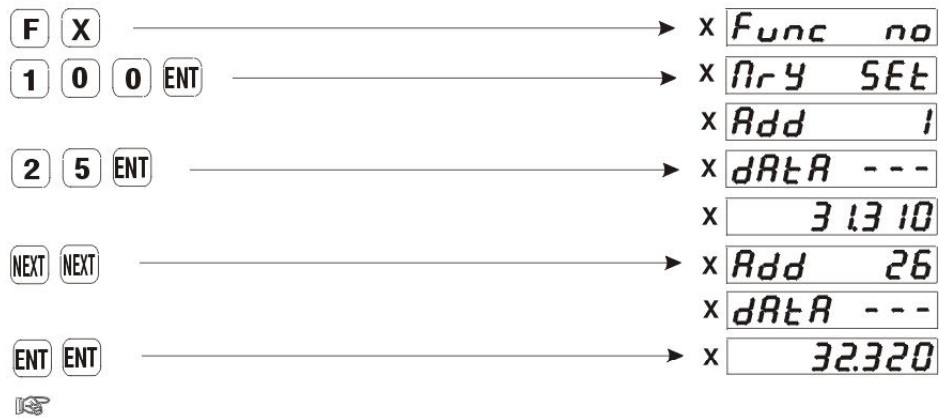
It is used when you wish to recall number which is already memory-in.



The key operation is as follows:



EX) If you want to recall memory address, 25 and its number, "31.310" and also want to recall memory address, 26 and its number, "32.320".

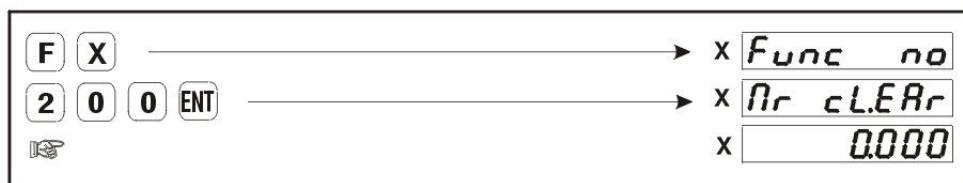


3) Clear memory

It is used to clear the data which is already memory-in.
 (Be cautious to use this function since datas from "0" through "49" will be cleared.)



Key operation is as follows:



< Remark > When you want to clear a certain memory data at one memory address, you can use "Memory In" function and input "0.000".

4) Lathe function (Sum-up value of Y and Z axis)



Key operation is as follows:

| | | | |
|-------------------------------------|---|---|---------|
| F 3 0 0 | → | X | Fno 300 |
| | | Y | 0.000 |
| | | Z | .nor |
| NEXT | → | X | Fno 300 |
| | | Y | 0.000 |
| | | Z | LRt hE |
| ENT | → | X | 0.000 |
| | | Y | 0.000 |
| | | Z | LRt hE |

- When you use this function, Z-axis is automatically not operated and the feed value of Z axis is summed with the feed value of Y-axis and shows the total summed value of two axes on Y axis.
- In this function, if you input a certain value into Y axis, using **PRE SET**, the value of Z axis comes to "0.000".
- In this function, if you move "Z" axis, its value will be summed up and displayed at Y-axis.
- ABS can be operated, even in this function.



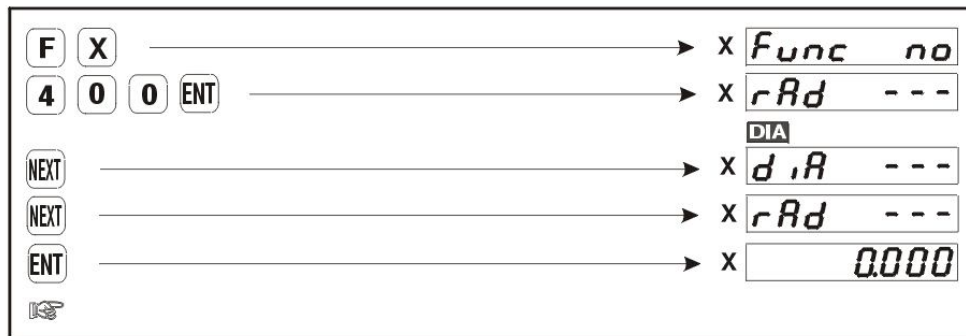
EX) If the value of Y and Z axis are each Y=2.340, Z=1.235, the value of Y axis is as follows:

| | | | |
|-------------------------------------|---|---|---------|
| | | X | 0.000 |
| | | Y | 12.340 |
| | | Z | 1.235 |
| F 3 0 0 | → | X | Fno 300 |
| | | Y | 12.340 |
| | | Z | .nor |
| NEXT | → | X | Fno 300 |
| | | Y | 12.340 |
| | | Z | LRt hE |
| ENT | → | X | 0.000 |
| | | Y | 13.575 |
| | | Z | LRt hE |

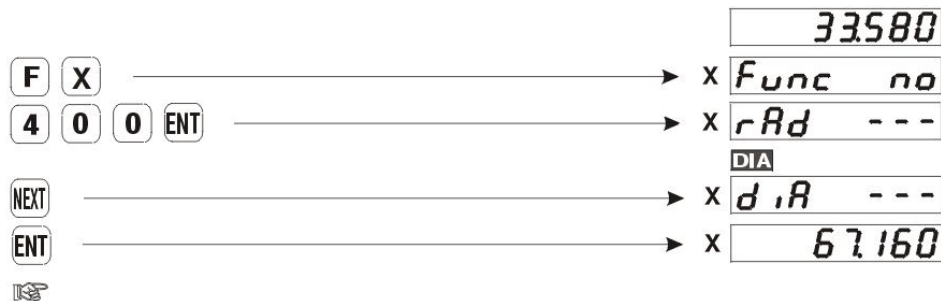
5) Counting double (used in lathe function - DIA)



Key operation is as follows:



EX) When X-axis value is "33.580" at "RAD", when you change to DIA, value will be doubled as follows:



6) Initialize

The function of "Initialize" is same as Page-7.

7) Circle divide and altering axis for division

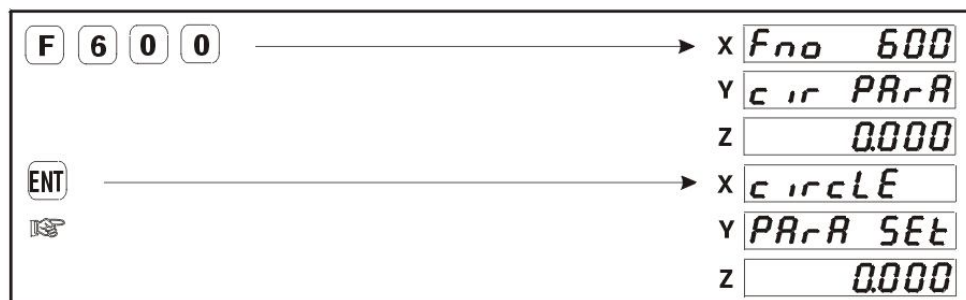
This has five conditions as follows:

- ① When setting X and Y axis for Circle division,
- ② When setting X and Z axis for Circle division,
- ③ When setting Y and Z axis for Circle division,
- ④ When setting DIA/RAD for Circle division,
- ⑤ Divide circle.

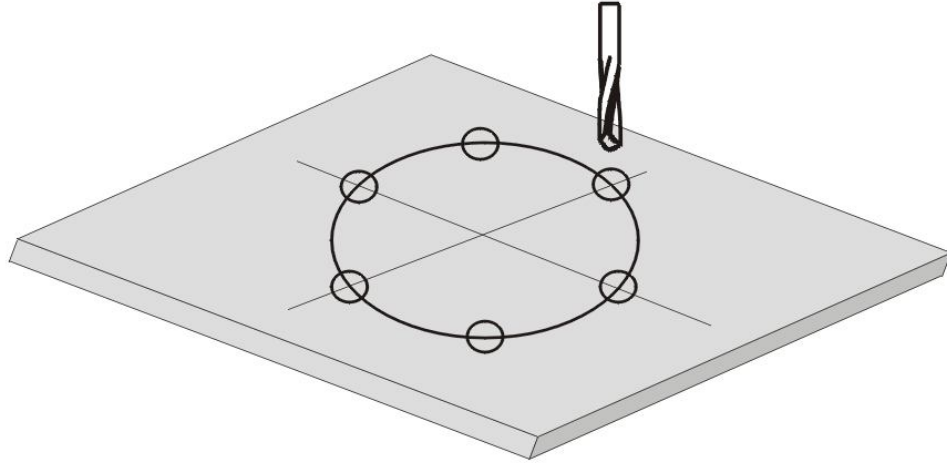
(1) In case of setting to X, Y axes.



Key operation is as follows:



- Like the above, if you input **CIRCLE**, axis-setting lamp will be "ON".
The number of maximum division is 10,000.
You can set axes for circle division as follows:



(2) In case of setting to X, Z axis,

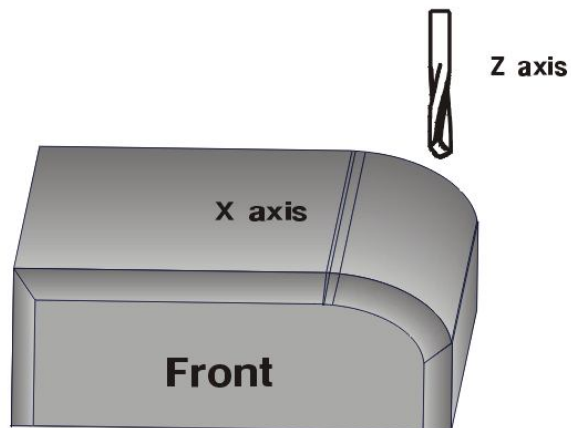


Key operation is as follows:

| | | | | | | | |
|------------|----------|----------|----------|---|---|--------|------|
| F | 6 | 0 | 1 | → | X | Fno | 601 |
| | | | | | Y | cir | PRR |
| | | | | | Z | | 0000 |
| ENT | | | | → | X | cirCLE | |
| | | | | | Y | | 0000 |
| | | | | | Z | PRR | SEt |



The lamps of X, Y axes is "ON" if you press **CIRCLE** key like the above.
The number of maximum circle division is 10,000.
You can set axes for circle division like the following.



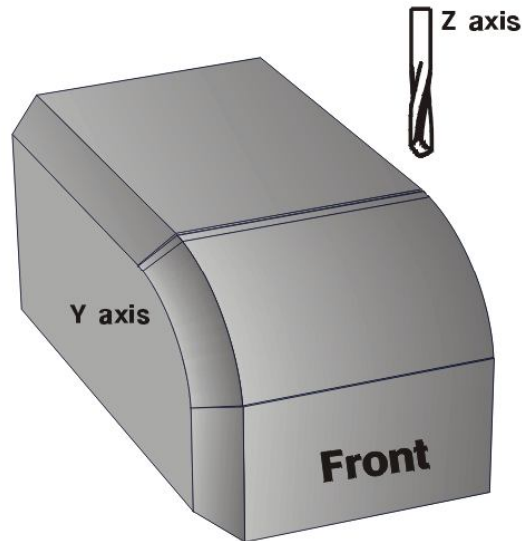
(3) In case of setting to Y, Z axes,



Key operation is as follows:.



- The lamps of X, Y axes is "ON" if you press **CIRCLE** key like the above.
The number of maximum circle division is 10,000.



(4) In case of changing to DIA/RAD



Key operation is as follows:



① If display shows as below, it is set as "DIA".



② If display shows as below, it is set as "RAD".



Like the above, you can set to DIA or RAD as you want and divide circle. And the product is originally set at "RAD".

(5) Circle divide

It is used to divide circle from a certain center point.

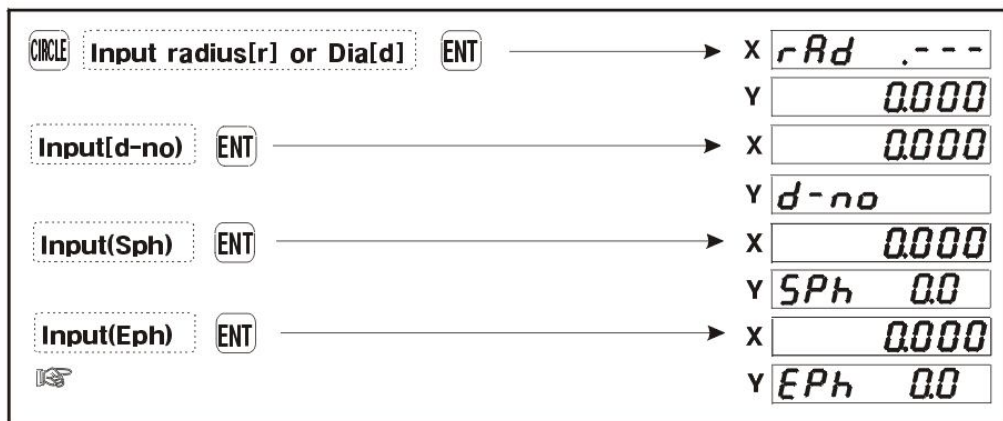
⇒ It needs four conditions like the following when you do "Circle divide".

- ① Radius : r (or Diameter : d)
- ② Number of division : d-no
- ③ Divided starting angle : Sph
- ④ Divided last angle : Eph

⇒ Maximum ranging rating is as follows:

- ① Radius (r) or Diameter (d) : 9999.95(mm)
- ② Number of division "d-no" : Max 9999
- ③ Starting/Last angel : Possible under first decimal point
EX)10.54 → wrong 25.5 → right

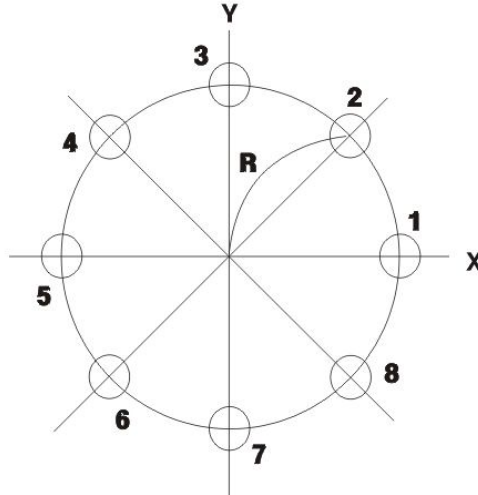
Key operation is as follows:





EX) When you divide circle like the following conditions:

Radius(r) = 10.0
 Number of divide($d-no$) = 8
 Starting angle(Sph) = 0.0
 Last angle(Eph) = 360.0
 In case of X, Y axis



⇒ Key operation is as follows:

| | | | |
|------------------|---|---|-----------------|
| CIRCLE | → | X | rAd .--- |
| | | Y | 0.000 |
| 1 0 ENT | → | X | 10.000 |
| | | Y | d-no |
| 8 ENT | → | X | 10.000 |
| | | Y | SPh 0.0 |
| 0 ENT | → | X | 10.000 |
| | | Y | EPh 0.0 |
| 3 6 0 ENT | → | X | 10.000 |
| | | Y | 0.000 |

⇒ You can divide circle like the following steps.

① When you move X-axis to 0.000, it will be 1st hole.

| | | |
|--|---|--------|
| | X | 10.000 |
| | Y | 0.000 |

NEXT NEXT →

| | | |
|--|---|--------|
| | X | -2.935 |
| | Y | 7.070 |

② When you move until X : 0.000, Y-axis, it will be 2nd hole.

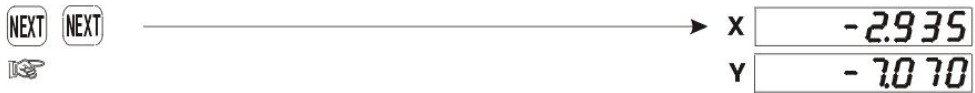
NEXT NEXT →

| | | |
|--|---|--------|
| | X | -7.075 |
| | Y | 2.930 |

③ When you move until X : 0.000, Y-axis, it will be 3rd hole.



④ When you move until X : 0.000, Y-axis, it will be 4th hole.



⑤ When you move until X : 0.000, Y-axis, it will be 5th hole.



⑥ When you move until X : 0.000, Y-axis, it will be 6th hole.



⑦ When you move until X : 0.000, Y-axis, it will be 7th hole.



⑧ When you move until X : 0.000, Y-axis, it will be 8th hole.

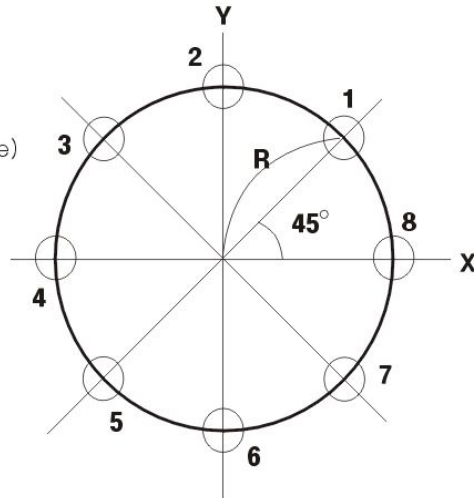
- < Note >
- Process of circle divide is fulfilled with the direction of "counter clock wise".
 - If starting angle is more than 0.0° and divided angle is 360° , last angle is calculated as follows : But if divided angle is less than 360° it is exceptional case.

$$\text{Last angle} = \text{divided angle}(360^\circ) + \text{Starting angle}$$



EX) When you divide circle like the following conditions:

Radius(r) = 20.0
 Number of divide($d-no$) = 8
 Starting angle(Sph) = 45.0°
 Last angle(Eph) = $360.0^\circ + 45.0^\circ$
 (Last angle = divided angle + starting angle)
 In case of X, Y axes for circle divide



⇒ Key operation is as follows:

| | | | |
|------------------|---|---|-----------------|
| CIRCLE | → | X | rAd .--- |
| | | Y | 0.000 |
| 2 0 ENT | → | X | 20.000 |
| | | Y | d-no |
| 8 ENT | → | X | 20.000 |
| | | Y | SPh 00 |
| 4 5 ENT | → | X | 20.000 |
| | | Y | EPh 00 |
| 4 0 5 ENT | → | X | 14.140 |
| | | Y | 14.140 |

⇒ You can divide circle like the following steps.

| | |
|---|--------|
| X | 14.140 |
| Y | 14.140 |

① When you move until X : 0.000, Y : 0.000, it will be 1st hole.

| | | | |
|------------------|---|---|----------|
| NEXT NEXT | → | X | - 14.140 |
| | | Y | 5.860 |

② When you move until X : 0.000, Y : 0.000, it will be 2nd hole.

| | | | |
|------------------|---|---|----------|
| NEXT NEXT | → | X | - 14.140 |
| | | Y | - 5.860 |

③ When you move until X : 0.000, Y : 0.000, it will be 3rd hole.



④ When you move until X : 0.000, Y : 0.000, it will be 4th hole.



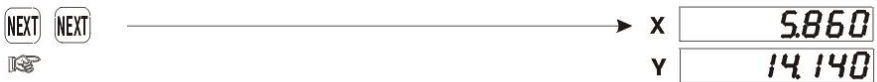
⑤ When you move until X : 0.000, Y : 0.000, it will be 5th hole.



⑥ When you move until X : 0.000, Y : 0.000, it will be 6th hole.



⑦ When you move until X : 0.000, Y : 0.000, it will be 7th hole.



⑧ When you move until X : 0.000, Y : 0.000, it will be 8th hole.

8) Changing Resolution

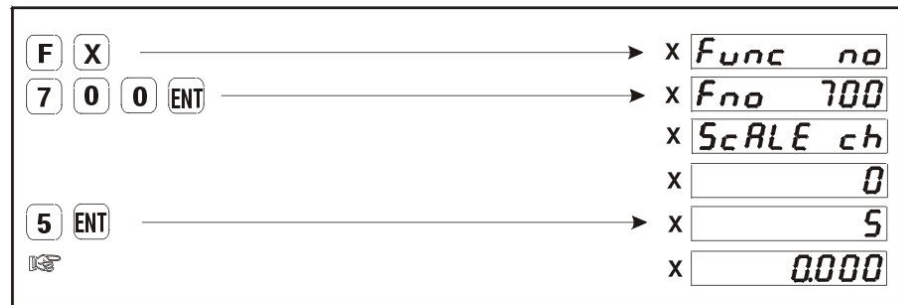
Changing resolution function has four options as follows:

- ① 5/1000mm resolution
- ② 1/1000mm resolution
- ③ 5/100mm resolution
- ④ 1/100mm resolution

(1) 5/1000 Resolution



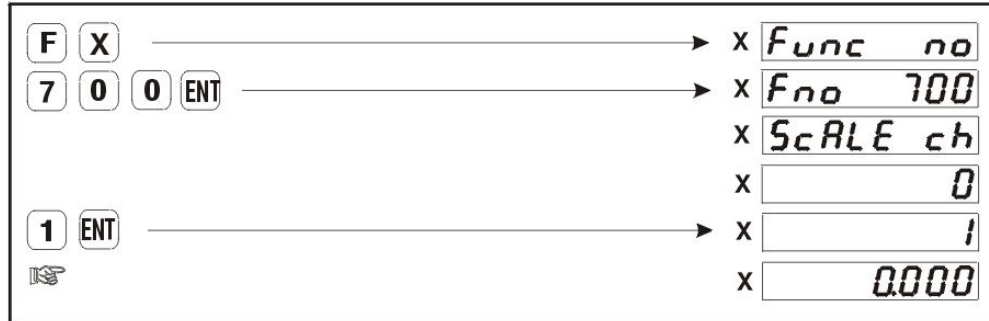
Key operation is as follows:



(2) 1/1000 Resolution



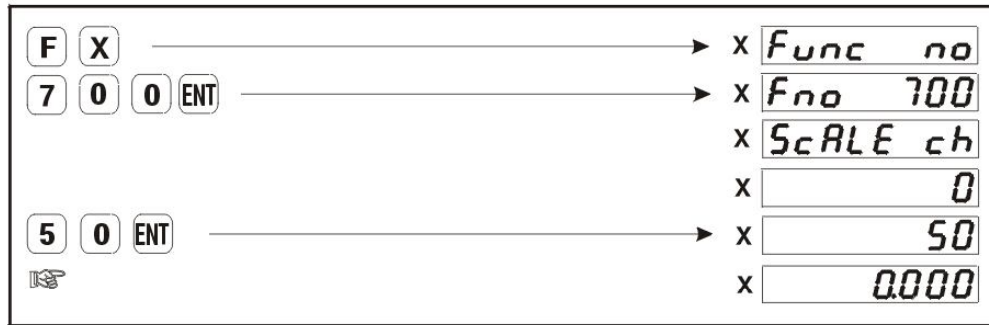
Key operation is as follows:



(3) 5/100 Resolution



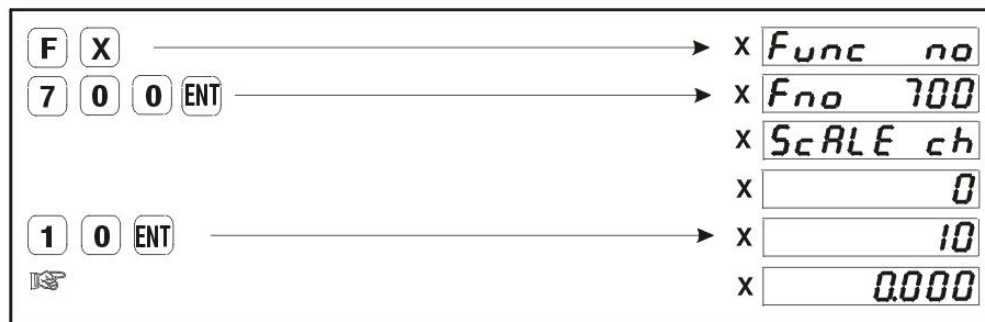
Key operation is as follows:



(4) 1/100 Resolution



Key operation is as follows:

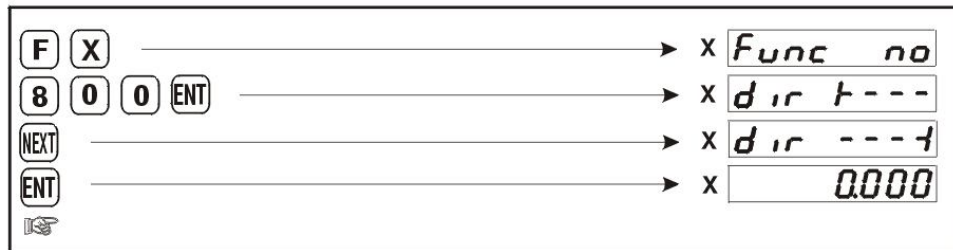


9) Altering axis direction

It is used when you change +/- direction of axis.



Key operation is as follows:

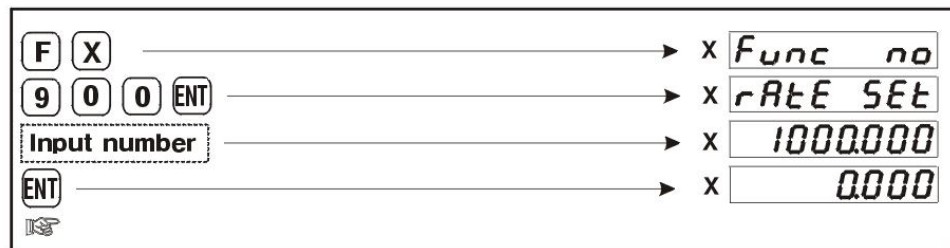


10) Rate

- It can be displayed according to magnification you require against actual length.
- It can be applied to rotary encoder.
- Usually, magnification is "1.000000".
- Allowable range is from 0.000001 ~ 9.999999 and have accuracy under 6th of decimal point.
- If the rate is set as "0.000000", display counter does not display.



Key operation is as follows:



< Note > If the rate is "0.000000", the value does not change and shows as it was, even though we move a certain axis.

EX) When you change rate of X axis, "1.000000" to "0.996000",



⇒ Rate compensation method

$$C = \frac{A}{M}$$

A : Actual length
M : Measured length
C : Compensation rate



EX) When actual length : 100mm, Measured length : 100.4mm, compensation rate as follows:

$$\frac{100}{100.4} = 0.996$$



EX) When actual length : 100mm, measured length : 99.96mm, compensation rate as follows:

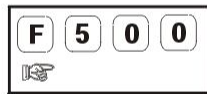
$$\frac{100}{99.96} = 1.0004$$

11) Display check

It is used to check defects at FND(seven segment) of the display.



Key operation is as follows:



12.Reference Key

When worker moves a bed of machine inadvertently or there is a sudden power failure, it is used to find datum(reference) point again.

How to use is as follows:

- ① Memorize or input reference point.
- ② Recall reference point.
- ③ Move to reference point.

1) Memorize reference point

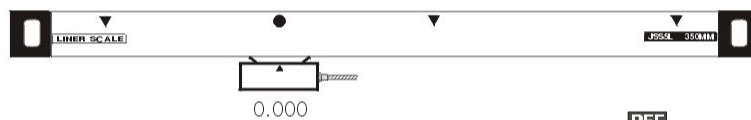
Key operation is as follows:

- ① Make a starting point to "0.000" in status of Reference key, , on.
- ② Move left or right from the starting point until when a certain lamp of axis chosen is on.
- ③ Press key.

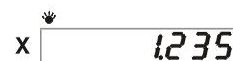
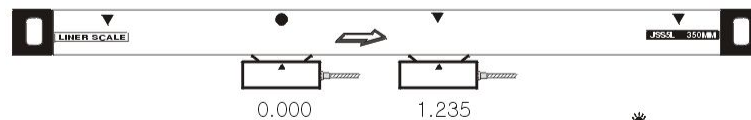


EX) You can memorize starting point like the following steps:

- ① Make a starting point to "0.000" in status of Reference key ON.



- ② Move left or right from the starting point until when a certain lamp of axis chosen is on.



- ③ Press **PRE SET** key when lamp of a certain axis is ON.



2) Recall reference point

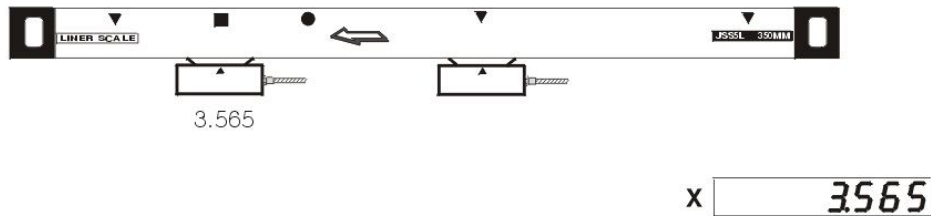
You can recall reference point as the following steps:

- ① Move to nearby reference point.
- ② Press **REF** key.
- ③ Move left or right from the starting point until when a certain lamp of axis chosen is on.
- ④ Press **PRE RCL** key.

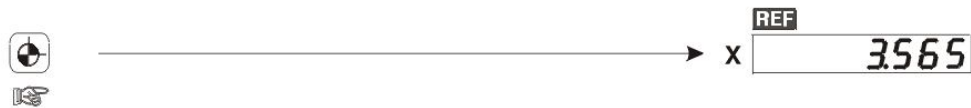


EX) You can recall reference point like the following steps:

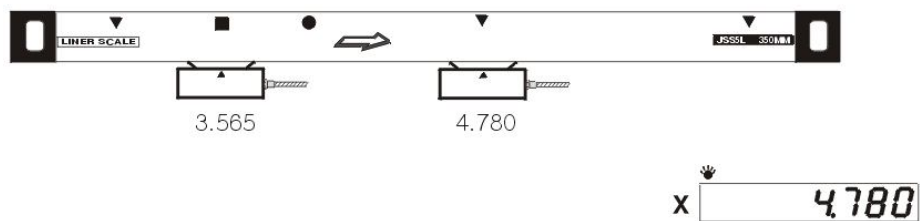
- ① Move to nearby reference point.



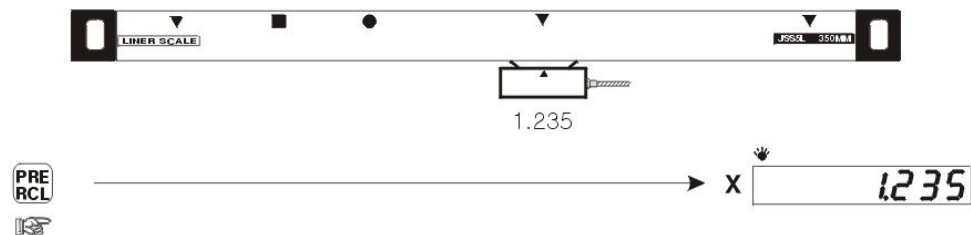
- ② Press **REF** key.



- ③ Move left or right from the starting point until when a certain lamp of axis chosen is on.

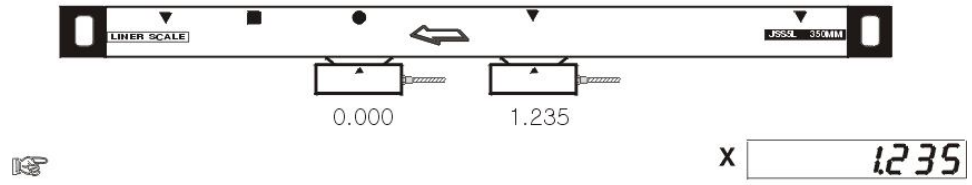


- ④ Press **PRE RCL** key when a lamp of certain axis is ON.



3) Find reference point

Move a certain axis to the point of "0.000".



4. EDM

1. Basic operation

Option keys used in EDM is as follows:

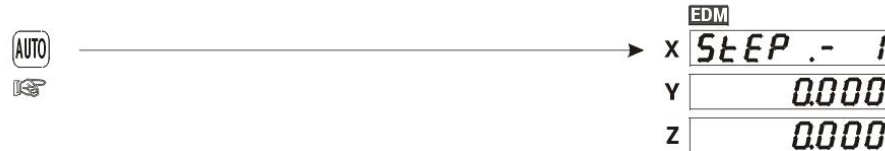
- ① **EDM** key : Used when you change to EDM mode.
- ② **AUTO** key : Used when inputting numbers in STEP.
- ③ **NEXT** key : Used to move to next STEP, ex) STEP-1 to STEP-2 or STEP -3 to STEP-4.
- ④ **ENT** key : Used when completion of input from STEP-1 to STEP-4.

Other keys except **EDM**, **AUTO**, **NEXT**, **ENT**, Numerical key, decimal point() and (+/-) key are not operative.

- ① **EDM** key : This is the key to change to EDM mode. If you press **EDM**, lamp of **EDM** is ON.



- ② **AUTO** key : This is the key to input numbers in STEP.



- ③ **NEXT** key : This is the key to move to next STEP. Ex) STEP-1 to STEP-2 or STEP -3 to STEP-4.



< Note > You must press this key to do next process of electric discharging after one cycle of electric discharging. If you press this key, the lamp of STEP is ON.

- ④ **ENT** key : This is the key to complete process after inputting in STEP.



- ⑤ At EDM mode, when you want to input number, each axis will display as follows:

X-axis : It shows from STEP-1 through STEP-4.

Y-axis : It is place for inputting numbers. (Input numbers are displayed)

- ⑥ When discharging workpiece after inputting number in STEP, each axis shows as follows:

X axis : It displays numbers input in STEP.

Y axis : In case of setting Dn – It displays the lowest value out of value of movement of Z-axis.
(The lowest value of Z-axis)

In case of setting Up – It displays the highest value out of value of movement of Z-axis.
(The highest value of Z-axis)

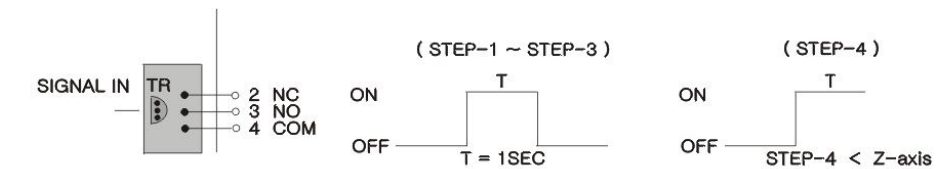
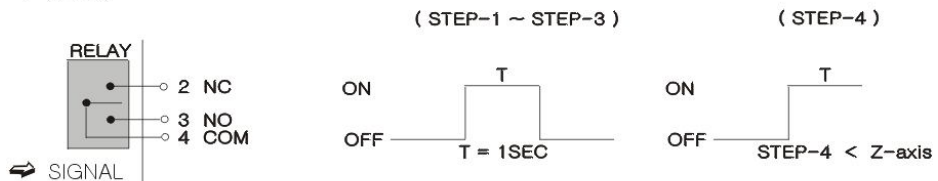
- ⑦ You must press the key, **NEXT**, for next electric discharging, after finishing one cycle of electric discharging and the lamp of STEP must be ON for electric discharging.

- ⑧ If number is input only into one STEP, the lamp of STEP1 is ON. If numbers are input more than one STEP, each lamp of STEP will be ON.
- ⑨ Even if numbers are input into STEP randomly, it automatically memorize from the lowest to the highest with order.

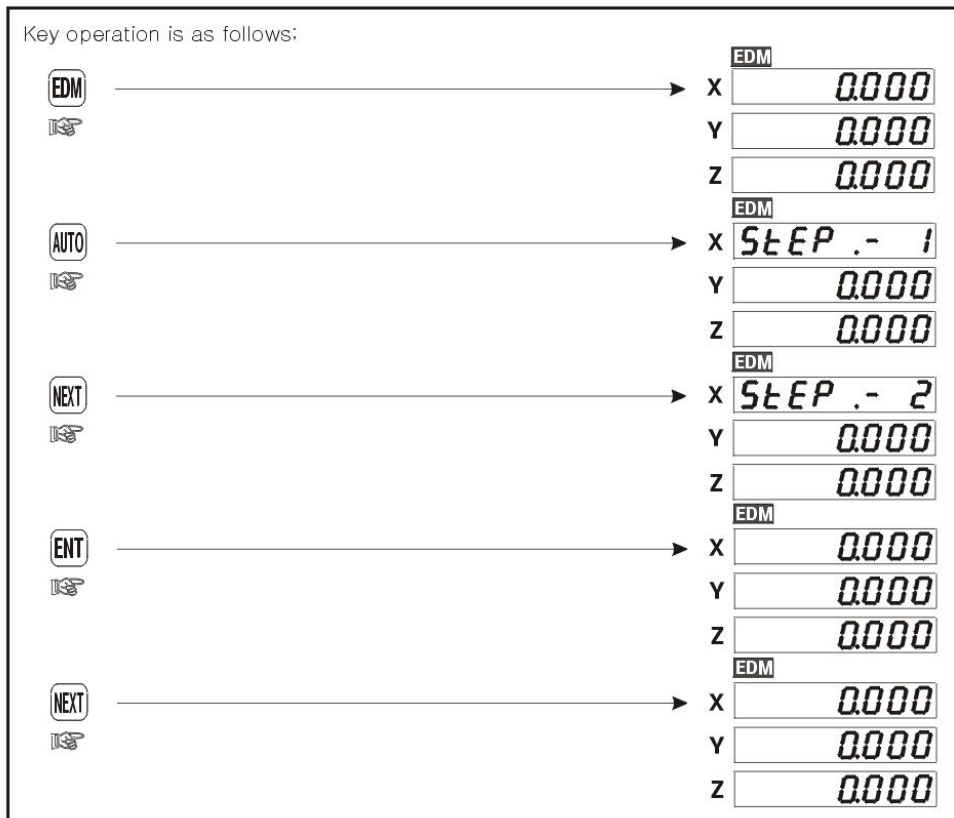
2. Output

From STEP-1 to STEP-3, output signal is activated one time during one(1) second. At final STEP-4, if Z-axis(electrode) value is higher(Up set) or lower(Dn set) than last STEP, it continuously move.

⇒ RELAY



3.Key input & example



4. Direction altering

This is used when you wish to alter direction of discharging.

EX) When you wish to change value of Z-axis.

- ① In case that the value of coming down get close to MINUS(coming down to (-))
 - You can alter it into PLUS(altering it into (+))
- ② In case that the value of coming down get close to PLUS(coming down to (+))
 - You can alter it into MINUS(altering it into(-))



Key operation is as follows:

When it is set UP,

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|------|---|-----|-------|---|------|------|---|-----|------|---|-----|-------|---|------|------|---|--|-------|---|--|-------|---|--|-------|
| <p>F 5 0 2</p> <p></p> <p>NEXT</p> <p></p> <p>ENT</p> <p></p> | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>.dn-</td></tr> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>.uP-</td></tr> <tr><td>X</td><td></td><td>0.000</td></tr> <tr><td>Y</td><td></td><td>0.000</td></tr> <tr><td>Z</td><td></td><td>0.000</td></tr> </table> | X | Fno | .502 | Y | Edn | d.ir0 | Z | d.ir | .dn- | X | Fno | .502 | Y | Edn | d.ir0 | Z | d.ir | .uP- | X | | 0.000 | Y | | 0.000 | Z | | 0.000 |
| X | Fno | .502 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | Edn | d.ir0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | d.ir | .dn- | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | Fno | .502 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | Edn | d.ir0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | d.ir | .uP- | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | | 0.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | | 0.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | | 0.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

When it is set DN,

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|------|---|-----|-------|---|------|------|---|-----|------|---|-----|-------|---|------|------|---|--|-------|---|--|-------|---|--|-------|
| <p>F 5 0 2</p> <p></p> <p>NEXT</p> <p></p> <p>ENT</p> <p></p> | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>.uP-</td></tr> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>.dn-</td></tr> <tr><td>X</td><td></td><td>0.000</td></tr> <tr><td>Y</td><td></td><td>0.000</td></tr> <tr><td>Z</td><td></td><td>0.000</td></tr> </table> | X | Fno | .502 | Y | Edn | d.ir0 | Z | d.ir | .uP- | X | Fno | .502 | Y | Edn | d.ir0 | Z | d.ir | .dn- | X | | 0.000 | Y | | 0.000 | Z | | 0.000 |
| X | Fno | .502 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | Edn | d.ir0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | d.ir | .uP- | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | Fno | .502 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | Edn | d.ir0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | d.ir | .dn- | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | | 0.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | | 0.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | | 0.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

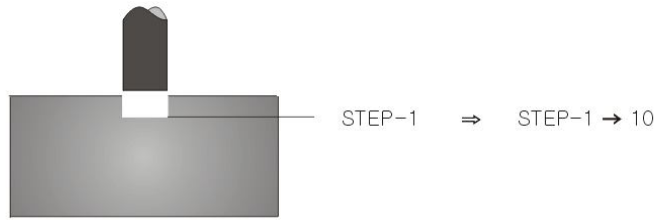
- When Z-axis is coming down to MINUS(-), you must set DN, if reverse, you must set UP.

(After setting Up or Dn, you must move from STEP-1 to STEP-4 with use of **NEXT** key for confirmation of setting and proper work)

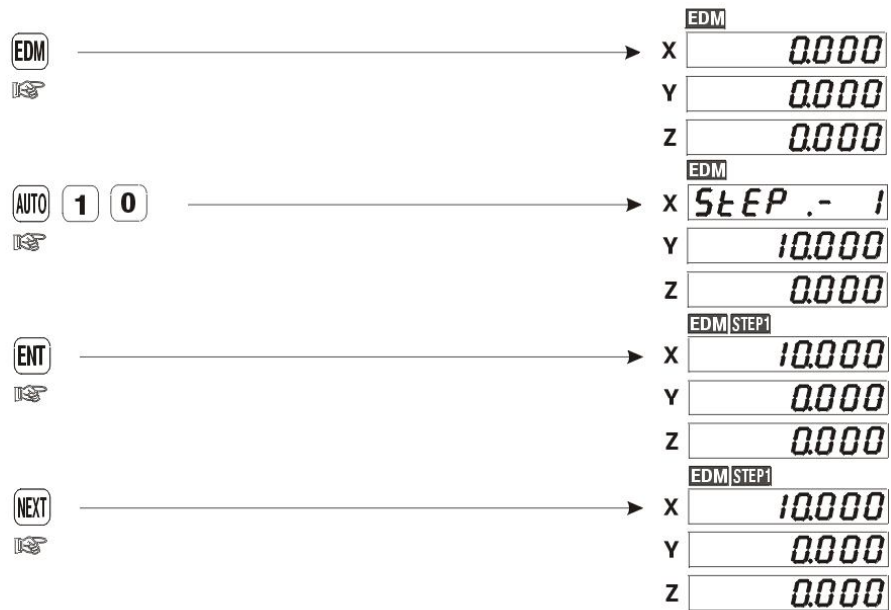
5. EXAMPLE



EX 1) In case that you want to process electric discharging like the following picture.



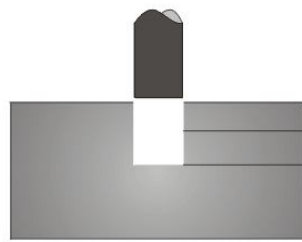
⇒ You can memorize number like the following steps:



- Like the example above, in case of STEP-1=10, the numbers memorized from STEP-2 to STEP-4 is as follows:
 STEP-1 = 10
 STEP-2 = 10
 STEP-3 = 10
 STEP-4 = 10
 And only the lamp of STEP1 is ON.



EX 2) In case that you wish to process electric discharging like the following picture:



STEP-1 ⇒ STEP-1 → 10
STEP-2 ⇒ STEP-2 → 20

⇒ You can memorize numbers like following steps:

| | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><th style="text-align: left;">EDM</th></tr> <tr><td>X</td></tr> <tr><td>Y</td></tr> <tr><td>Z</td></tr> </table> | EDM | X | Y | Z | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|---|
| EDM | | | | | | | | | |
| X | | | | | | | | | |
| Y | | | | | | | | | |
| Z | | | | | | | | | |
| <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="text-align: center;">AUTO</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td></tr> </table> | AUTO | 1 | 0 | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><th style="text-align: left;">EDM</th></tr> <tr><td>X</td></tr> <tr><td>Y</td></tr> <tr><td>Z</td></tr> </table> | EDM | X | Y | Z |
| AUTO | 1 | 0 | | | | | | | |
| EDM | | | | | | | | | |
| X | | | | | | | | | |
| Y | | | | | | | | | |
| Z | | | | | | | | | |
| <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="text-align: center;">NEXT</td><td style="text-align: center;">2</td><td style="text-align: center;">0</td></tr> </table> | NEXT | 2 | 0 | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><th style="text-align: left;">EDM</th></tr> <tr><td>X</td></tr> <tr><td>Y</td></tr> <tr><td>Z</td></tr> </table> | EDM | X | Y | Z |
| NEXT | 2 | 0 | | | | | | | |
| EDM | | | | | | | | | |
| X | | | | | | | | | |
| Y | | | | | | | | | |
| Z | | | | | | | | | |
| | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><th style="text-align: left;">EDM STEP1 STEP2</th></tr> <tr><td>X</td></tr> <tr><td>Y</td></tr> <tr><td>Z</td></tr> </table> | EDM STEP1 STEP2 | X | Y | Z | | | |
| EDM STEP1 STEP2 | | | | | | | | | |
| X | | | | | | | | | |
| Y | | | | | | | | | |
| Z | | | | | | | | | |
| <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="text-align: center;">NEXT</td></tr> </table> | NEXT | → | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><th style="text-align: left;">EDM STEP1 STEP2</th></tr> <tr><td>X</td></tr> <tr><td>Y</td></tr> <tr><td>Z</td></tr> </table> | EDM STEP1 STEP2 | X | Y | Z | | |
| NEXT | | | | | | | | | |
| EDM STEP1 STEP2 | | | | | | | | | |
| X | | | | | | | | | |
| Y | | | | | | | | | |
| Z | | | | | | | | | |

● As example above, in case STEP-1 = 10, STEP-2 = 20, numbers memorized from STEP-3 to STEP-4 is as follows:

STEP-1 = 10

STEP-2 = 20

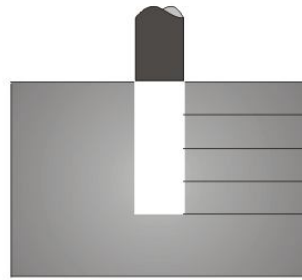
STEP-3 = 20

STEP-4 = 20

And only two lamps of STEP1 and STEP2 are ON.



EX 3) In case that you wish to process electric discharging like the following picture:



| | | |
|--------|---|-------------|
| STEP-1 | ⇒ | STEP-1 → 5 |
| STEP-2 | ⇒ | STEP-1 → 10 |
| STEP-3 | ⇒ | STEP-2 → 15 |
| STEP-4 | ⇒ | STEP-3 → 20 |

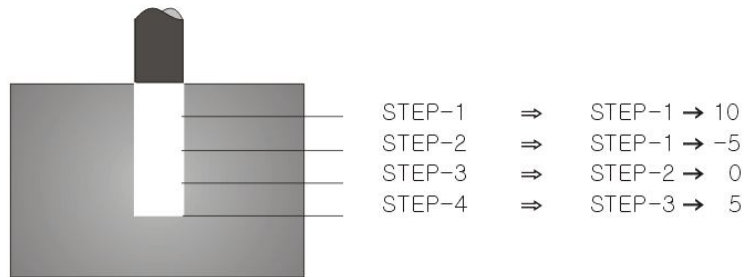
⇒ You can memorize numbers like the following steps:

| | | |
|-------------------------------|---|--------------------------------------------|
| EDM [EDM] | → | X EDM 0.000 |
| | | Y 0.000 |
| | | Z 0.000 |
| AUTO 5 [AUTO] 5 | → | X EDM STEP .- 1 |
| | | Y 5.000 |
| | | Z 0.000 |
| NEXT 1 0 [NEXT] 1 0 | → | X EDM STEP .- 2 |
| | | Y 10.000 |
| | | Z 0.000 |
| NEXT 1 5 [NEXT] 1 5 | → | X EDM STEP .- 3 |
| | | Y 15.000 |
| | | Z 0.000 |
| NEXT 2 0 [NEXT] 2 0 | → | X EDM STEP .- 4 |
| | | Y 20.000 |
| | | Z 0.000 |
| ENT [ENT] | → | X EDM STEP1 STEP2 STEP3 STEP4 5.000 |
| | | Y 0.000 |
| | | Z 0.000 |
| NEXT [NEXT] | → | X EDM STEP1 STEP2 STEP3 STEP4 5.000 |
| | | Y 0.000 |
| | | Z 0.000 |

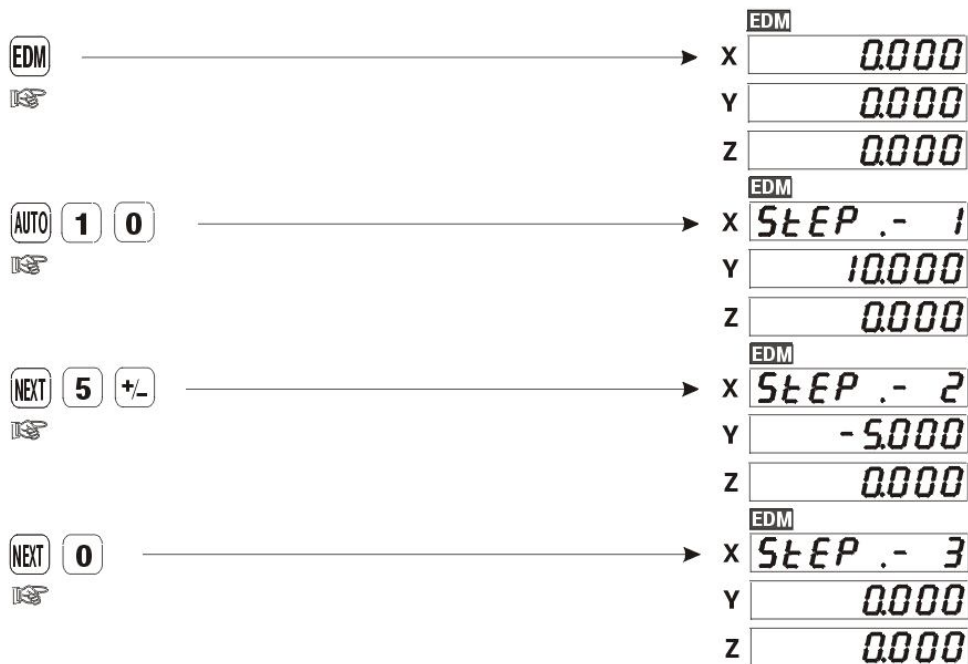
- Like the example 3), numbers from STEP-1 to STEP-4 are memorized as follows:
 STEP-1 = 5
 STEP-2 = 10
 STEP-3 = 15
 STEP-4 = 20
 All lamps from STEP1 to STEP4 are ON.
- The number displayed in X-axis is the value memorized in STEP-1. Like the picture below, if the value of Z-axis is bigger than that of X-axis after the start of process, 1st output signal is activated. At the same time, STEP-2 value is automatically indicated at X-axis and the lamp of STEP1 is OFF. This process can be done with the condition of "Up set". With this method, if you process up to STEP4, this is the end of one cycle for processing. And if you want to process again for the accurate processing, output signal is activated only at STEP-4 position and lamp is in status of OFF.
- In case you want to move to process at other position, you must press **(NEXT)** key.
 At this time, the value of Z-axis must be lower than STEP-1 and the lamp will be ON. (In case of setting by "Up") And you can operate only after lamp of STEP is ON.



EX 4) In case you wish to process electric discharging with random input of number to STEPS.



⇒ You can memorize number like the following steps:





- Like above Ex4), the numbers input from STEP-1 to STEP-4 are memorized as follows:
 STEP-1 = -5
 STEP-2 = 0
 STEP-3 = 5
 STEP-4 = 10
 The lamps from STEP1 to STEP4 are all ON.
 Numbers can be memorized in order regardless of order of input.

6. Normal value - tracking

It is used when you want to know the status of NORMAL in present status of EDM. And you can look each value of X, Y axes in status of NORMAL. (you must press **F** in status of EDM). You can see the value of X, Y axis in status of NORMAL if you press **F** key.



Key operation is as follows:



5. INSTALLATION

1) Installation place and precaution

- ① Grounding of the display counter should be done for safety.
- ② To prevent malfunction, please do not put electrical appliance aside which may cause noise.
- ③ Prevent inflow of cutting fluids and dirt into inside of scale.
- ④ Select the installation position near the object to be measured or the workpiece as possible to ensure the high accuracy.
- ⑤ Care must be taken so that the scale is not bent or twisted on installation.
- ⑥ Avoid installing the unit in a place where the environmental conditions change drastically due to high electric field, temperature change, etc.
- ⑦ It is recommended to put a protective cover on the scale to prevent the scale from break during the process.
- ⑧ Mount the scale so that the head carrier faces down or sideways.

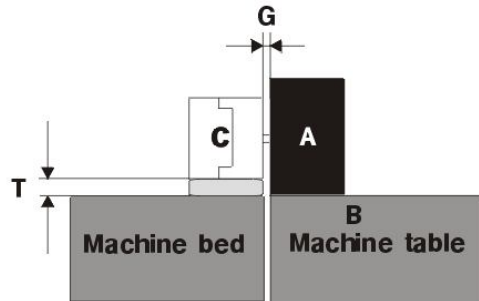


Tools required for installation

Electric drill
Drill : $\varnothing 3.5$, $\varnothing 4.3$, $\varnothing 5.2$
Tab : M4, M5, M6
Dial gauge : 1/100mm
Tab handle
⊕ Screwdriver
Wrench set

2) Mounting accuracy

Mount the unit parallel with machine axis within the following limits:



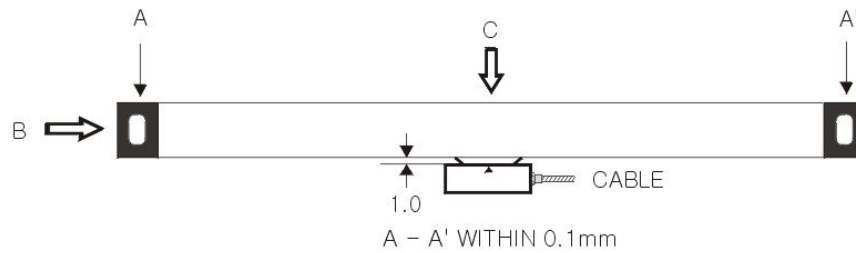
A : Scale measuring surface
 B : Scale mounting surface
 C : Head
 G : Proper space between scale and head
 T : Space between head and machine bed

● The following gap should be maintained.

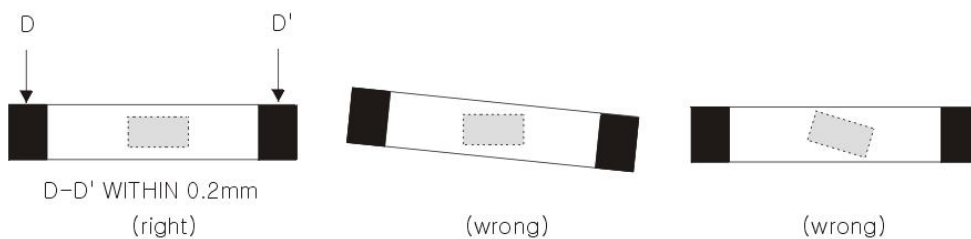
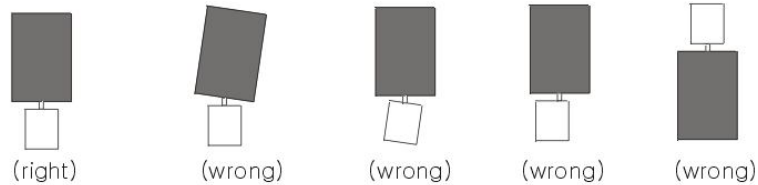
Parallel line gap : (0.1mm >)

T : 3.5mm \pm 0.1mm \rightarrow JSM

0mm \pm 0.1mm \rightarrow JSS



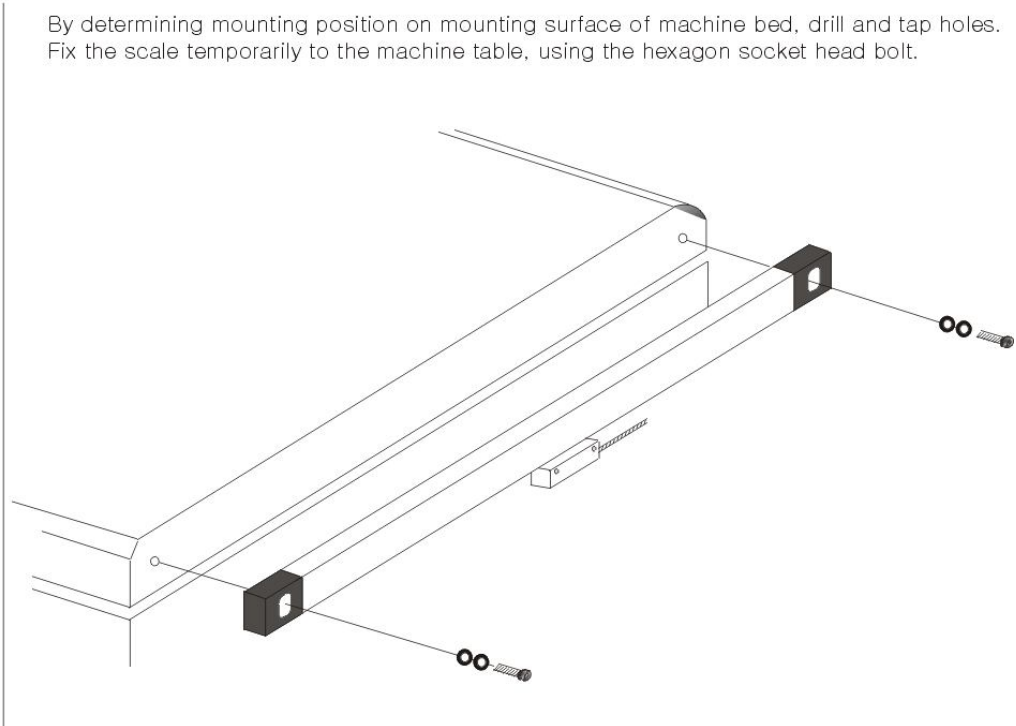
● Install like the following pictures:



3) Scale mounting

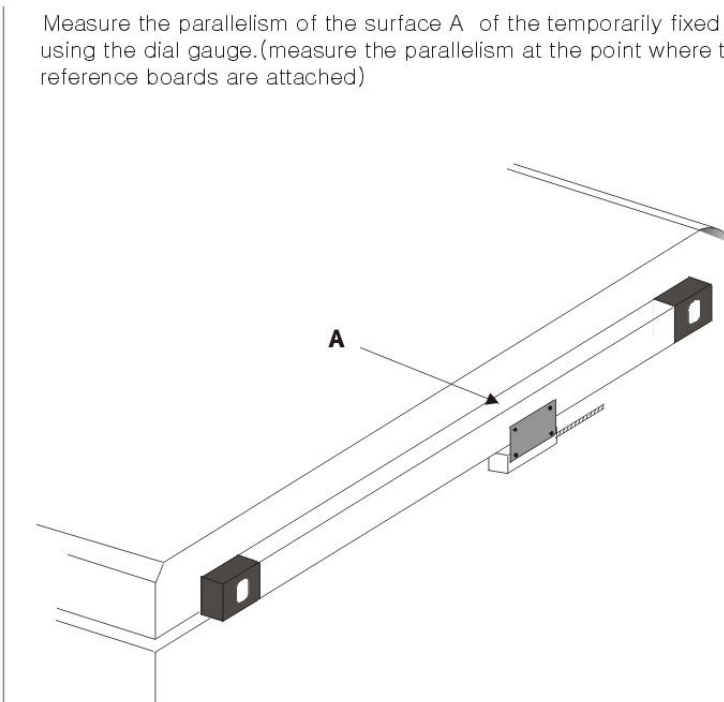
(1) Positioning, Drilling, Temporary fixing

By determining mounting position on mounting surface of machine bed, drill and tap holes. Fix the scale temporarily to the machine table, using the hexagon socket head bolt.



(2) Mounting

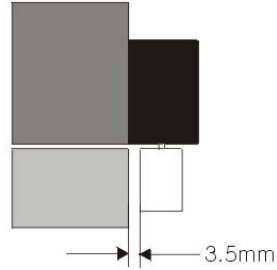
Measure the parallelism of the surface A of the temporarily fixed scale to the machine axis, using the dial gauge. (measure the parallelism at the point where the alignment marks or the reference boards are attached)



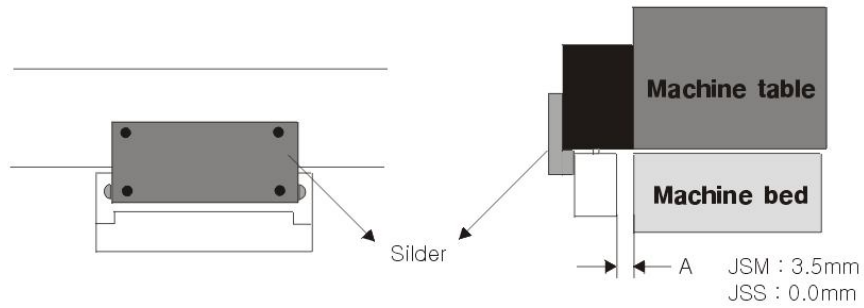
(3) Head carrier mounting

When the scale is attached directly to the table, the thickness of the attachment should be $3.5 \pm 0.1\text{mm}$ (It is recommended to use shim washer for the adjustment of the thickness)

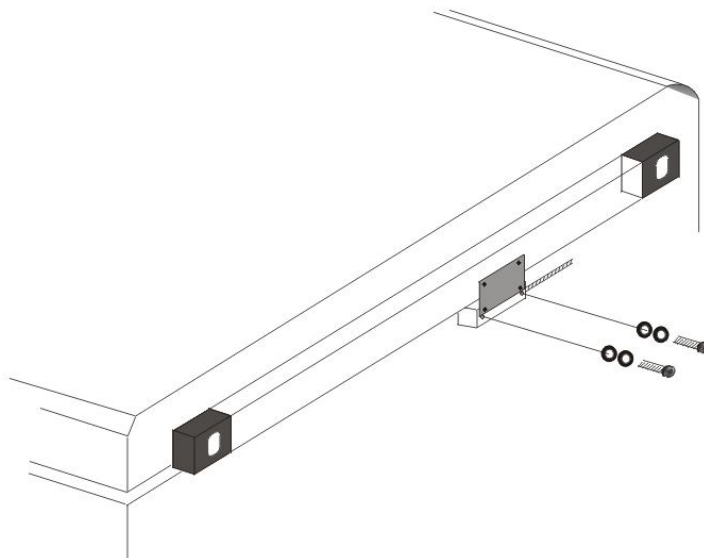
► In case of JSM



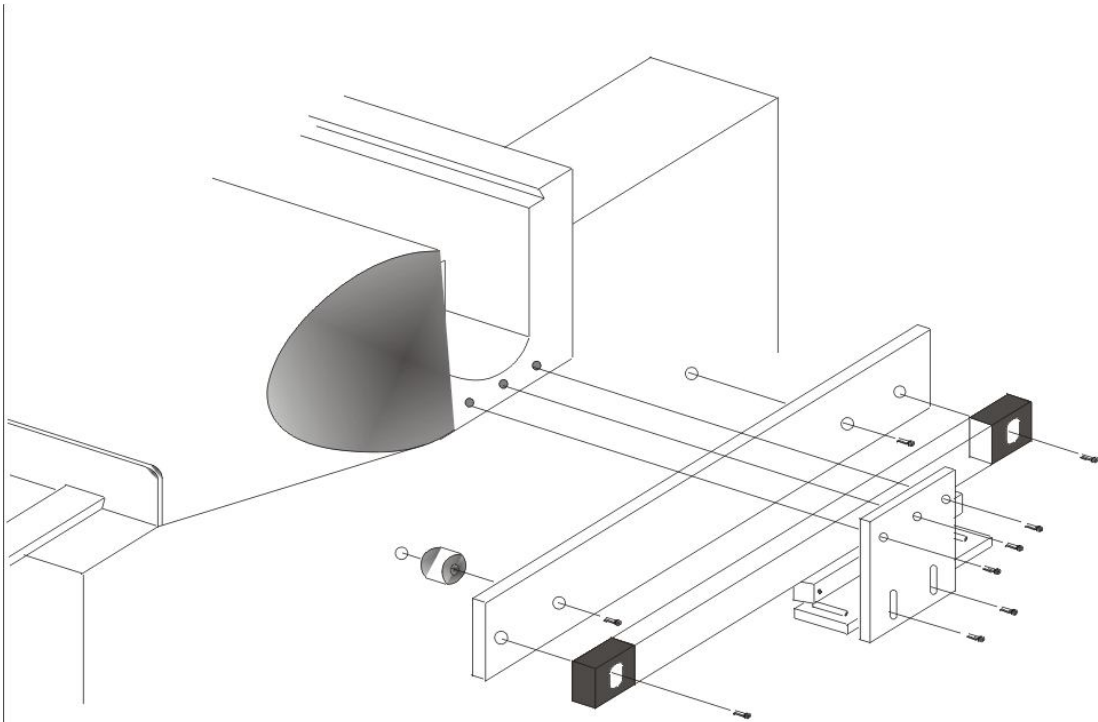
- Remove two screws/bolts to the slider that fasten head parts so that the head carrier is separated from the scale.



- After the attachment is prepared, move the head carrier to the desired mounting position and drill the mounting holes at the mounting position of the machine bed.



- With a mark at the end of scale as a datum line, gap between head and scale should be equal.



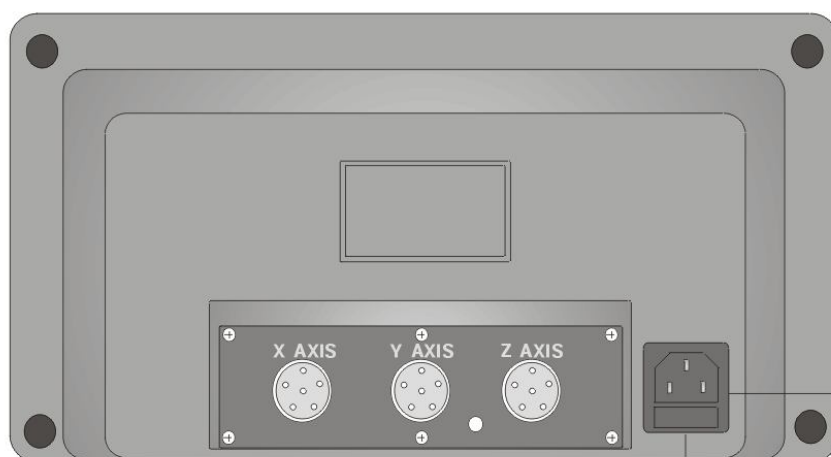
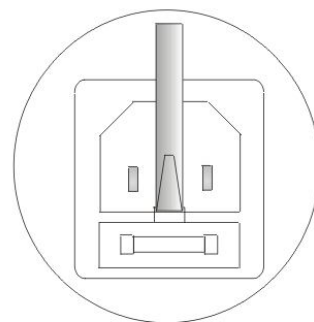
6. Trouble shooting

| SYMPTOM | SOLUTION |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ▶ Counter is not energized.(no-power) | <ul style="list-style-type: none"> ● Check power supply cord. ● Confirm fuse blown off. ● Check if the power cord connection loose. |
| ▶ Fuse blown off so often | <ul style="list-style-type: none"> ● Check inflow of fluid into keyboard. ● Disconnect scale connector from counter and check ● Apply for A/S if there is no problem regardless of the above. |
| ▶ Power ON but displays are blank. | <ul style="list-style-type: none"> ● Check inflow of fluid into key board. ● Disconnect scale connector from counter and check. ● Confirm it the connection is alright. |
| ▶ Poor accuracy | <ul style="list-style-type: none"> ● Check connectionbetween scale and counter. ● Check if the mounting bolts are loosened. ● Compare checking result after changing defected sclae to normal scale. ● Check if dirts, cutting fluids or others be stick into scale. Prevent them from getting into so that accuracy is as good as it is. ● Check if machine has backlash. ● Check if scale is damaged from impact or twist. |
| ▶ Number does not change even after moving scale. | <ul style="list-style-type: none"> ● Check the rate. ● Rate should be "1000000". ● Check the connection between counter and scale <p style="text-align: center;"> F X 9 0 0 ENT 1 • 0 ENT </p> |
| ▶ One axis among three axes is not operating. | <ul style="list-style-type: none"> ● Change defected scale to normal scale an then check |
| ▶ On display, "DIA" lamp is ON. | <ul style="list-style-type: none"> ● Using lathe function, change it to "RAD" function. <p style="text-align: center;"> F X 4 0 0 ENT NEXT NEXT NEXT ENT </p> |
| ▶ Display shows doubled number. | <ul style="list-style-type: none"> ● Check "RATE". ● Rate should be "1000000". <p style="text-align: center;"> F X 9 0 0 ENT 1 • 0 ENT </p> <ul style="list-style-type: none"> ● Check the lamp of "DIA" and change it as follows: <p style="text-align: center;"> F X 4 0 0 ENT NEXT NEXT NEXT ENT </p> |
| ▶ Error occur with no matter of machine | <ul style="list-style-type: none"> ● Compensate with "RATE" function. $C = \frac{A}{M}$ <p>EX) $\frac{300}{299.100} = 1.003009$</p> <p>EX) $\frac{200}{200.050} = 0.999750$</p> |
| ▶ Remark | <ul style="list-style-type: none"> ● Prevent cutting fluids from getting into keyboard to avoid errors. ● Be cautious not to inflow cutting oil and dirts into scale |

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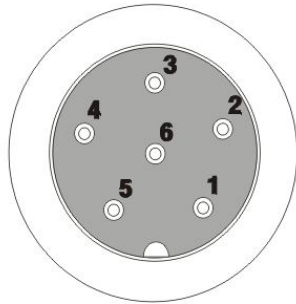
7. Fuse change

If you wish to change FUSE for 250V 2A, use kind of driver and pull it over like the drawing.

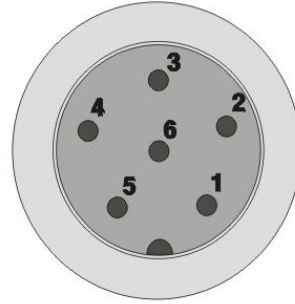


Voltage range : 110V ~ 220V
Capacity for fuse : 2A

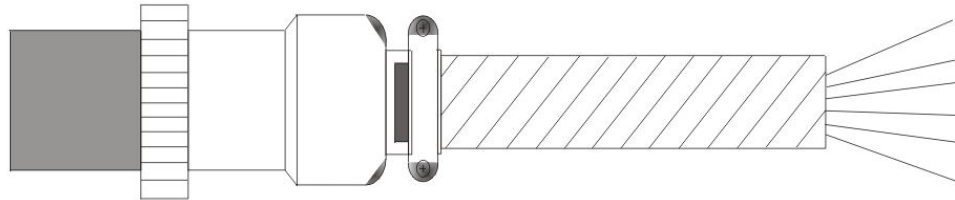
8. Connection drawing of counter and scale, pin assignment



COUNTER
 1 PIN : + (+5V)
 2 PIN : A
 3 PIN : B
 4 PIN : Z
 5 PIN : - (0V)
 6 PIN : SHIELD

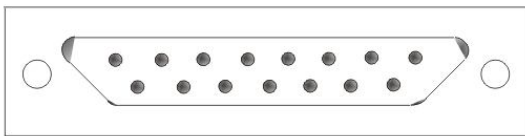


SCALE
 1 PIN : + (+5V)
 2 PIN : A
 3 PIN : B
 4 PIN : Z
 5 PIN : - (0V)
 6 PIN : SHIELD

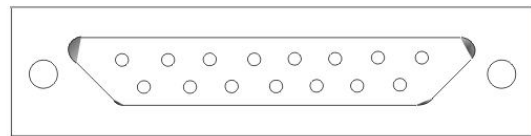


SCALE
 1 RED : + (+5V)
 2 YELLOW : A (+4.2V)
 3 WHITE : B (+4.2V)
 4 GREEN : Z (+0.4V)
 5 BLACK : - (+0V)
 6 BLUE : SHIELD (GND)

※ EDM Signal



COUNTER
 2 PIN : A (YELLOW)
 3 PIN : B (RED)
 4 PIN : COM (WHITE)



SCALE
 2 PIN : A (WHITE)
 3 PIN : B (GREEN)
 4 PIN : COM (BLACK)