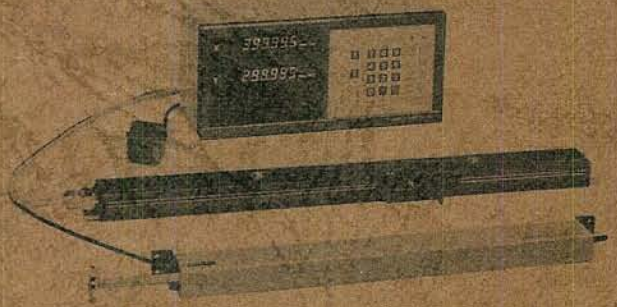
DIGITAL POSITIONING SYSTEMS

SOKKI
ELECTRONICS

INSTRUCTION MANUAL FOR DISPLAY UNIT

DU200 SERIES
DU400 SERIES



SOKKI ELECTRONICS CORPORATION

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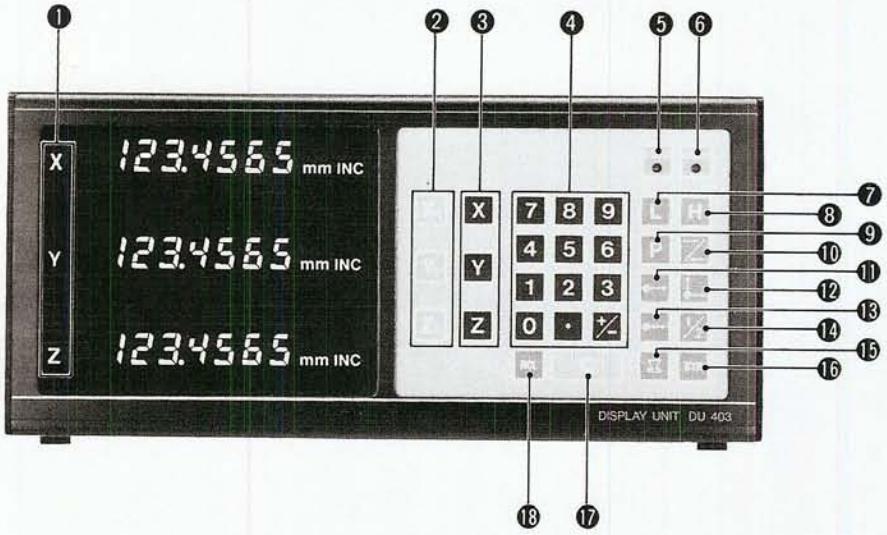
[2] NAMES AND FUNCTIONS OF PARTS AND INSTALLATION PRECAUTIONS

1. FRONT PANEL



❶ X-axis display tube
Y-axis display tube
Z-axis display tube

❷ Axis reset key [Xc][Yc][Zc] :
Clears display and function on each axis.

❸ Axis select key [X][Y][Z] :
Selects axis for key entry.

❹ Numeral setting keys [0] ~ [9][·][+/-]

❺ LOAD lamp:
Lights when the LOAD function using the touch probe or the absolute zero point is being used.

❻ HOLD lamp:
Lights when the HOLD function using the touch probe or the absolute zero point is being used.

❼ LOAD key [L] :
Used when performing the LOAD function with the touch probe or the absolute zero point.

❽ HOLD key [H] :
Used when performing the HOLD function with the touch probe or the absolute zero point.

❾ Preset key [P] :
Used when presetting numerals on the selected axis.

❿ INC/ABS mode selector key [Z] :
Used when checking the absolute value on the selected axis.

⓫ ABS positioning key [⊶] :

Used to set the position in relation to the datum point.

⓬ Datum point setting key [⊾]

⓭ INC positioning key [⊶] :

Used to set the position in relation to the present position.

⓮ 1/2 key [½] :

Used to center the workpiece or to halve the displayed value.

⓯ Absolute zero point key [⊼] :

Used when performing the absolute zero point function.

⓰ Store key [STR] :

Used when storing the absolute zero point.

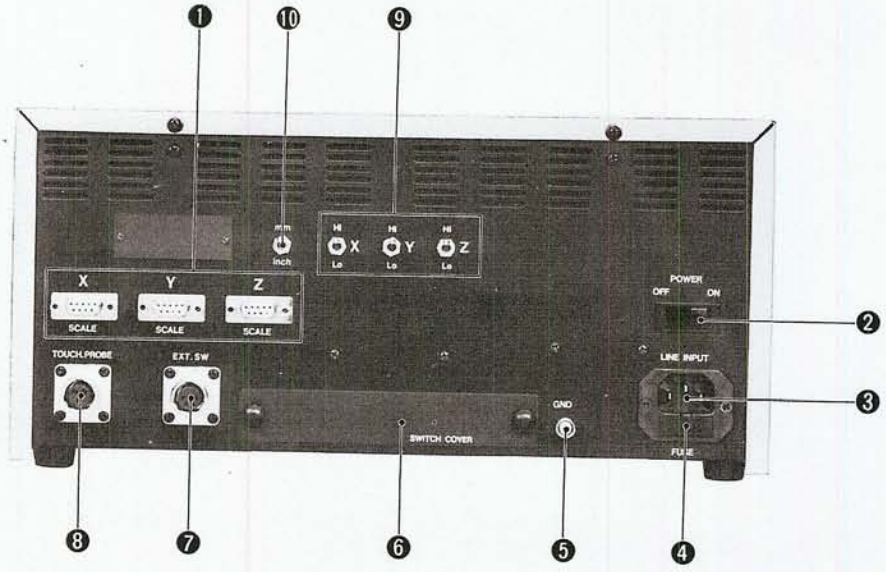
⓱ Clear key [C] :

Clears entry of numerals and function keys.

⓲ Recall key [RCL] :

Used to recall the absolute zero point.

2. REAR PANEL



❶ X-axis scale input connector
Y-axis scale input connector
Z-axis scale input connector

❷ POWER switch

❸ LINE INPUT

❹ Fuse holder:
Midget fuse 2A F-7142 (2A).

❺ Ground terminal

❻ Parameter switch cover:
Removed to set parameter switches for various modes.

❼ EXT SW:
Connector with remote switch for using [Xc] [Yc] [Zc] and [RCL] keys.

❽ Touch probe input:
Connection for the optional touch probe.

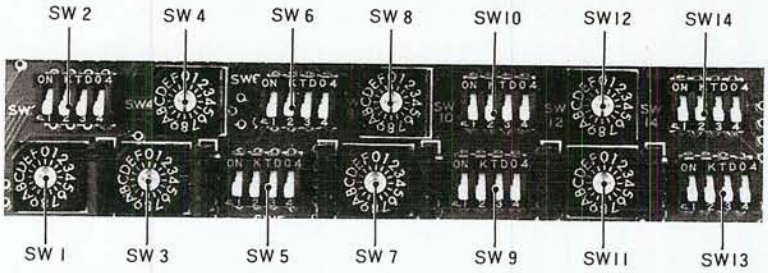
❾ Display resolution selector switch:
Resolution is selectable by the outer switch on the rear panel of the display unit.
Hi: 0.5μm (DU400), 5μm (DU200)
Lo: 1μm (DU400), 10μm (DU200)

❿ Inch/mm selector switch:
When the position of this switch is changed, all stored data of datum points, absolute zero point, machine zero point and machining program must be changed to the appropriate system of measurement.

3. PARAMETER SWITCHES

Located under cover on rear panel.

Used to set resolution of X-, Y- and Z-axis, polarity, lost motion compensation and linear error compensation.



SW1: Do not alter setting of this switch.

SW2: Do not alter setting of this switch.

SW2–1	ON	inch
	OFF	mm

Note: Turn the power off before setting the inch/mm selector switch.

SW3: X-axis linear error compensation value setting.

SW7: Y-axis linear error compensation value setting.

SW11: Z-axis linear error compensation value setting.

SW4: X-axis lost motion compensation value setting.

SW8: Y-axis lost motion compensation value setting.

SW12: Z-axis lost motion compensation value setting.

SW6: X-axis linear error/lost motion compensation sign and magnitude setting.

SW10: Y-axis linear error/lost motion compensation sign and magnitude setting.

SW14: Z-axis linear error/lost motion compensation sign and magnitude setting.

Refer to section [5] for linear error/lost motion compensation.

SW5: Selection of X-axis resolution, sign, diameter display, and travelling direction.

SW9: Selection of Y-axis resolution, sign, diameter display, and travelling direction.

SW13: Selection of Z-axis resolution, sign, diameter display, and travelling direction.

◎ Display resolution selection

Set of parameter switches

SW5 (X-axis) SW9 (Y-axis) SW13 (Z-axis)

1	ON	Low (Note 1)	Resolution
	OFF	Outer (Note 2)	
2	ON	–	Polarity (Note 3)
	OFF	+	
3	ON	Diameter	Diameter (Note 4)
	OFF	Standard	
4	ON	–	Travelling Direction (Note 5)
	OFF	+	

Note 1: Low: 10μm (DU200) or 1μm (DU400) is set without using the ❾ outer resolution selector switch.

Note 2: Outer: Display resolution selectable by the ❾ outer resolution selector switch.

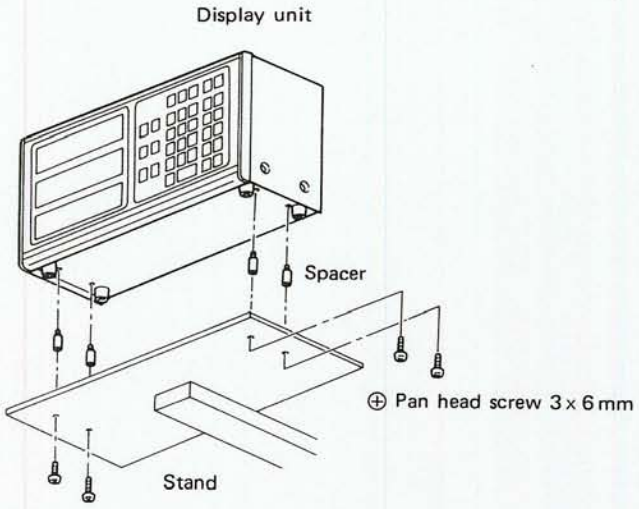
Note 3: Polarity: The display sign of + or – can be selectable according to a direction of the scale.

Note 4: Diameter/Radious: Displays double length of the actual travelling distance.

Note 5: Travelling Direction: Select travelling direction to detect the zero point.

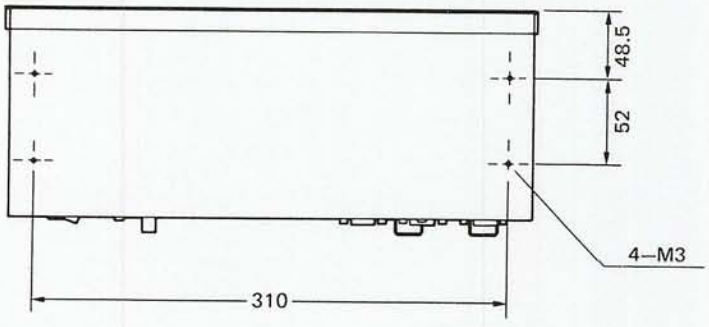
4. INSTALLATION PRECAUTIONS

- Use a power supply in the range of 90 to 130V AC, 50/60 Hz (200 to 260V AC, 50/60 Hz). Never use a higher voltage.
- Ground the unit to the machine.
- Install the signal and unit power cables at a distance from the machine power cable.
- Do not expose to coolant, swarf, etc.
- Maintain the ambient temperature in the range of 0° to 40°C (32° to 104°F). Do not expose to radiation from direct sunlight or other heat source.
- Mount the display unit on the stand (option) with screws provided.



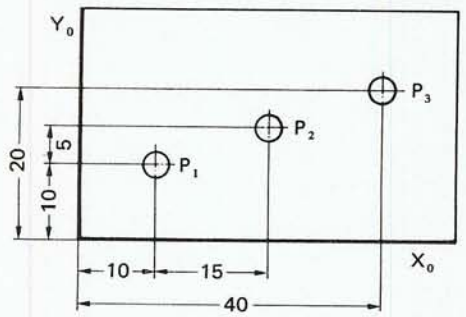
Dimension for mounting hole of display unit

(Unit: mm)



[3] OPERATION

Following are step by step instructions for a simple drilling job as shown below:



① Turn on the power to the display unit. All segments will light briefly as shown at right. This indicates that all functions are operating normally.

Press any of [Xc] [Yc] [Zc] keys to start.

The display shows the value before the switch is off. Depress [Xc], [Yc] or [Zc] again to display 0.000 mm INC.

X . . . . . .mm
Y . . . . . .mm

X 12.345 mm INC
Y 67.890 mm INC

② Setting of the datum points X_0.

Determine the X-axis datum plane by machining the workpiece. Set the datum point X_0 after subtracting the tool radius.

[X] [+/-] [5] [⌐]

Key in the tool radius.

X -5.000 mm ABS
Y mm INC

In the same way, determine the Y-axis datum plane by machining the workpiece and set the datum point Y_0 after subtracting the tool radius.

[Y] [+/-] [5] [⌐]

Key in the tool radius.

X mm ABS
Y -5.000 mm ABS

This completes the datum point settings.

③ Positioning of the target point P_1.

Key in the X and Y dimensions from the drawing.

[X] [1] [0] [⌐]

[Y] [1] [0] [⌐]

X -15.000 mm INC
Y -15.000 mm INC

↑ The set values are added to the present values.

The displayed values indicate that the present position is −15 mm away from the P_1 position in the X- and Y-axes.

Feed the machine table so that the X and Y displays become "0". A buzzer sounds one count before "0" to warn of completion of the P_1 positioning.

X 0.000 mm INC
Y 0.000 mm INC

④ Positioning of the target point P_2.

[X] [1] [5] [⊶]

[Y] [5] [⊶]

As the target position P_2 is entered in relation to the present point P_1, use the incremental positioning key [⊶] instead of the absolute positioning key [⊷].

Proceed as in ③.

X −15.000 mm INC

Y −5.000 mm INC

X 0.000 mm INC

Y 0.000 mm INC

⑤ Positioning of the target point P_3.

[X] [4] [0] [⊷]

[Y] [2] [0] [⊷]

As the target position P_3 is entered in relation to the datum point, use the [⊷] key instead of the [⊶] key.

The displayed values are the values after subtracting the present value from the setting value.

Proceed as in ③.

This completes the positioning of points P_1 to P_3.

To repeat the same job, it is not necessary to repeat procedures ① and ②, as the workpiece can be exactly positioned using a masterpiece. It is necessary only to enter the P_1 position.

If the tool is positioned at P (60, 30) after the above procedure, the display indicates the values as shown at right.

(This is the values after subtracting the P_3 values from the present position values.)

Set the values as shown at right for drilling the P_1 position of the 2nd workpiece.

(The display indicates the values after subtracting the P_1 values from the present position values.)

Proceed as for the first job.

X −15.000 mm INC

Y −5.000 mm INC

X 20.000 mm INC

Y 10.000 mm INC

X 50.000 mm INC

Y 20.000 mm INC

These instructions allow you to perform the machining operation. The following section [4] will explain in detail the principles behind each operation.

[4] BASIC OPERATION

1. OUTLINE OF OPERATION

(1) ABS Coordinate Display and INC Coordinate Display

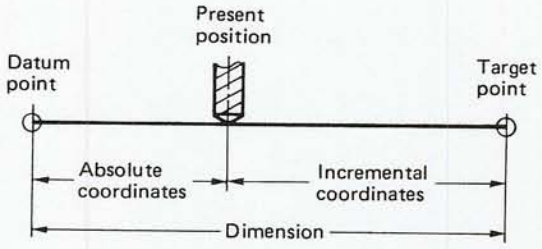
This unit provides ABS (absolute) coordinate display and INC (incremental) coordinate display.

ABS coordinate display:

For displaying a distance from the datum point set by depressing the [L] key, on basis of the absolute zero point, or by the touch probe.

INC coordinate display:

For displaying a distance from the target point to the present point when positioning by use of the [⊶], [⊶] and [P] keys.



- The distance between the datum point and the target point is usually specified on the machining drawing.
- The position of the target point is set by depressing the [⊶], [⊶] and [P] keys.
  INC coordinate is reset by depressing the [Xc], [Yc] and [Zc] keys.
- Selection between ABS coordinate display and INC coordinate display is performed by depressing the [X], [Y] or [Z] and [Z] keys.
  By using this function, the distance from the datum point to the present position can be obtained at any time throughout the machining job in combination of the incremental positioning [⊶] and the absolute positioning [⊶].

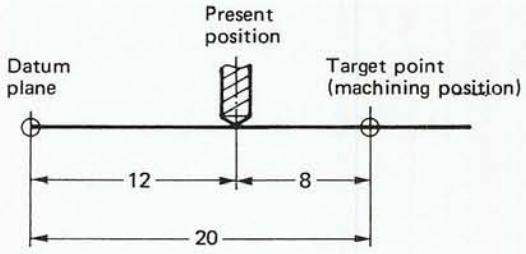
Present display	x	0.000 INC
Depress the [X] and [Z] keys.		↓
ABS coordinate display	x	-30.000 ABS
Depress the [X] and [Z] keys again.		↓
Returns to the original display.	x	0.000 INC

(2) Zero Chasing Positioning

Pick up the dimension specified on the drawing and input the dimension by pressing the [⊶] and [⊶] keys. The distance between the target point (machining position) and the present position (tool position) is displayed in INC coordinate display mode.

The tool can be easily brought to the machining position by moving the machine table until the display shows zero.

This is zero chasing positioning.



The present position of the tool is 12 mm away from the datum point.

⬇

Input the dimension from the datum point to the target point, 20 mm.

[X] [2] [0] [⊶]

⬇

The distance from the target point to the present position, −8 mm, is displayed.

⬇

When the displayed value, −8 mm, becomes zero, positioning is completed.

(3) Positioning Operation

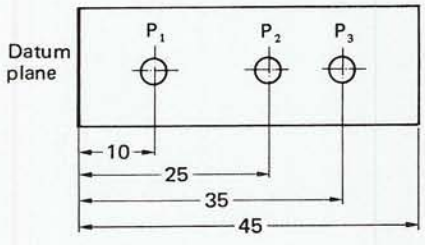
Three positioning operations are available according to nature of machining job.

① Absolute positioning [⊶]

② Incremental positioning [⊶]

③ Preset positioning [P]

1) Absolute positioning



The dimensions are entered based on the distance from the datum plane as shown above.
For positioning the above dimensions:

Setting of the datum point (see the section 4-2.).
Set the datum point manually or by the touch probe.

[X] [0] [⊶] [X] [+/−] [5] [L]

⬇

P_1 positioning. [X] [1] [0] [⊷]

⬇

Positioning is completed by moving the tool so that the displayed value becomes zero.

⬇

P_2 positioning. [X] [2] [5] [⊷]

⬇

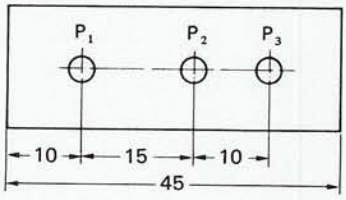
Displayed value → zero. Positioning is completed.

⬇

Same for P_3 positioning.

In the above method, the machining dimensions are input, using the [⊷] key, for positioning. This is the absolute positioning.

2) Incremental positioning



The dimensions are entered in series based on the increased distance from the previous point as shown above.

For positioning the above dimensions:

Setting of the datum point (see the section 4-2.).
Set the datum point manually or by the touch probe.
[X] [0] [⊷] [X] [+/-] [5] [L]

⬇

P_1 positioning. [X] [1] [0] [⊷]

⬇

Positioning is completed by moving the tool so that the displayed value becomes zero.

⬇

P_2 positioning. [X] [1] [5] [⊷]

⬇

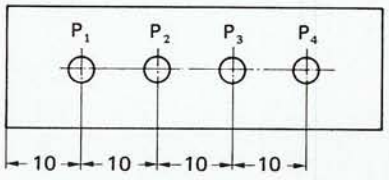
Displayed value → zero. Positioning is completed.

⬇

Same for P_3 positioning.

In the above method, the machining dimensions are input, using the [⊷] key, for positioning. This is the incremental positioning.

○ Pitch positioning



In case of the incremental positioning, the entered machining dimension is stored in a memory unless a new dimension is entered.

For pitch machining as shown above, input the P_1 machining dimension, 10 mm. It is unnecessary to reenter the dimensions for P_2 to P_4 positionings.

Setting of the datum point (see the section 4-2.).
Set the datum point manually or by the touch probe.
[X][0][⊷] [X][+/-][5][L]

⬇

P_1 positioning. [X][+/-][1][0][⊷]

Fositioning is completed by moving the tool so that the displayed value becomes zero.

⬇

P_2 positioning. [X][⊷][⊷]

⬇

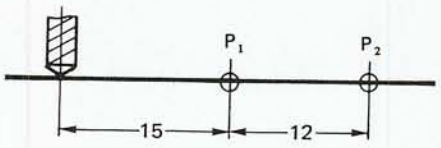
Displayed value → zero. Positioning is completed.

⬇

Same for P_3 and P_4 positioning.

3) Preset positioning

Input the dimensions on the drawing through a keyboard, using the preset function.



P_1 positioning. [X] [+/-] [1] [5] [P]

Input the distance between P_1 and the present position, −15 mm.

⬇

Positioning is completed by moving the tool so that the displayed value, −15 mm, becomes zero.

⬇

P_2 positioning. [X] [+/-] [1] [2] [P]

⬇

Displayed value → zero. Positioning is completed.

To perform the preset positioning, input the travel distance between the target point and the present position (sign is reversed) and position the target point by zero chasing. If an error occurs from P_1 positioning, the P_1 error may be accumulated when −12.000 mm is input for P_2 positioning.

(4) 1/2 Key

The following operations are possible by using the halving key [1/2].

① The centering of workpiece is possible by using the load and hold functions for the touch probe in combination with the above key (see the section about the touch probe).

② In INC mode display, the displayed value is halved.

INC mode display. Display: 35.000 mm INC

⬇

The displayed value is halved.

[X] [1/2] Display: 17.500 mm INC

③ The entered data is halved.

[X] [3] [5] [1/2] [P] Display: 17.500 mm INC

Preset a half of 35.

2. DATUM POINT SETTING

The following three methods are available for setting the datum point.

① Manual setting of the machining datum point
② Setting of the machining datum point by using the touch probe
③ Setting of the machining datum point based on the absolute zero point

(1) Manual Setting of the Machining Datum Point

Move the tool to the machining datum point and operate as follows.

[X] [↳] } : When setting the present position as the datum point.
[X] [0] [↳] }

[X] [1] [2] [↳] : When setting the datum point by adding the off-set value (12).

(2) Setting of the Machining Datum Point by using the Touch Probe (see the section about Touch Probe)

(3) Setting of the Machining Datum Point Based on the Absolute Zero Point

Once the distance between the machining datum point and the absolute zero point is stored in the memory, the machining datum point can be set without using the touch probe even after the power is once turned off.

① Set the datum point manually or by the touch probe after moving the tool to the machining datum point.

> Manual: [X] [0] [↳]
> Touch probe: [X] [+/-] [5] [L]
> (−5 is the radius of the touch probe.)

② Measuring of the distance between the machining datum point and the absolute zero point.

> [X] [⇄] [H] : HOLD lamp flickers.

⬇

> Move the tool to pass the absolute zero point.

⬇

> HOLD lamp lights and the displayed value is fixed.

⬇

> The fixed displayed value (distance between the machining datum point and the absolute zero point) is stored in the memory.
> Depress the [STR] key.

⬇

Completion.

③ Recall of the machining datum point by using the absolute zero point.

Recall the stored distance between the absolute zero point and the datum point.

[X] [Σ] [RCL]

⬇

(The distance is recalled and displayed.)

⬇

Press the [L] key (LOAD lamp flickers), and move the tool to pass the absolute zero point.

⬇

(LOAD lamp is off and counting starts.)

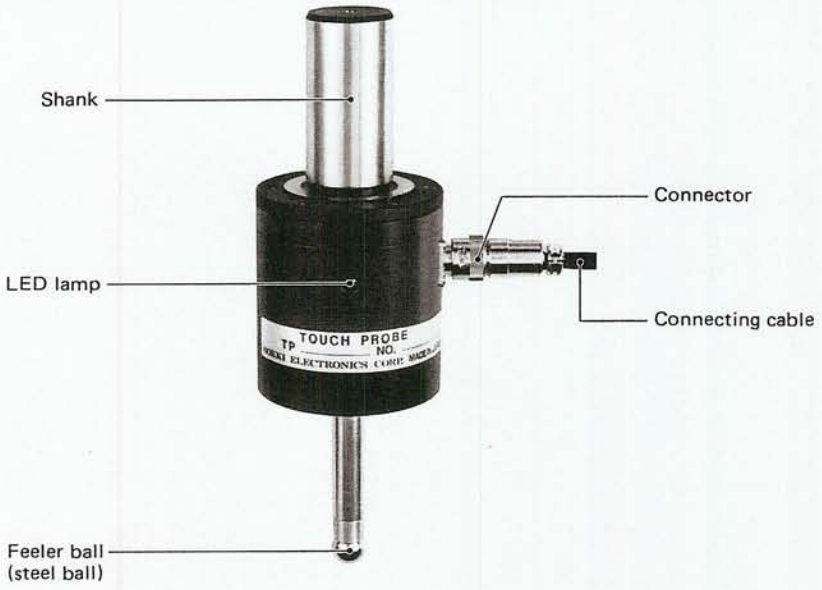
⬇

The position where the displayed value becomes zero is the recalled machining datum point.

3. HOW TO USE THE TOUCH PROBE

The touch probe TP series enables the vertical and horizontal three-dimensional measurement of the workpiece for accurate positioning of the datum plane.
It can be used for various dimensional measurements such as the machining dimension from the datum plane, centering, step difference and depth.

(1) Names and Function of Parts



- Shank:
  For chucking to the machine tool spindle.
- Connector:
  For connecting the touch probe with the display unit by cable.
- LED lamp:
  Lights at the moment when the feeler ball touches the workpiece. A buzzer buzzes at the same time.
- Feeler ball:
  A steel ball of ϕ10 mm which touches the workpiece.
  The spring-retained semi-fixed type which has movement allowance of 3 mm in vertical and ±5 mm in horizontal directions.

(2) Measurement by the Touch Probe

1) LOAD function by using the touch probe

In the LOAD function, counting starts at the moment when the feeler ball touches the workpiece.

The position where the displayed value becomes zero is the datum point.

○ Setting of the machining datum point.

Put the touch probe to the tool.

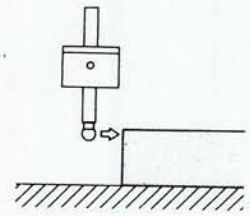
⬇

Set the feeler ball radius to −5 mm.

[X] [+/−] [5] [L]

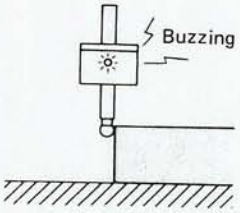
⬇

Move the tool until the feeler ball touches the datum plane of the workpiece.



⬇

The buzzer buzzes, LED lights and counting starts.



2) HOLD function by using the touch probe

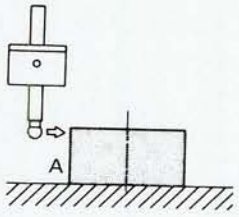
In the HOLD function, counting continues until the feeler ball touches the workpiece and stops at the moment of touch.

○ Setting of the outer diameter of the workpiece.

Set the datum plane A (by use of LOAD function).

[X] [+/−] [1] [0] [L]

Set the diameter of the touch probe, to −10 mm.



⬇

Move the tool until the feeler ball touches the datum plane A.

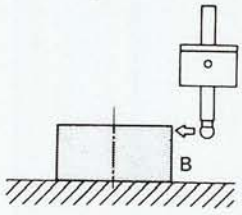
(The buzzer beeps, LED lights and counting starts.)

⬇

Measure the distance to the point B.

[X] [H]

(Counting continues until the feeler ball touches the plan B. As soon as it touches, the buzzer buzzes, LED lights and counting stops.)

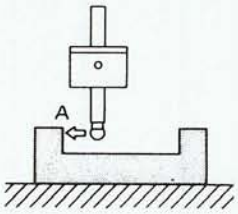


⬇

The displayed value at which counting stops is the outer diameter of the workpiece.

○ Setting of the inner diameter of the workpiece.

Set the datum point A (by use of LOAD function):
[X] [1] [0] [L]
Set the diameter of the touch probe, to 10 mm.

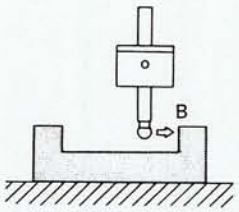


⬇

Touch the feeler ball with the plane A.

⬇

Measure the distance to the point B.
[X] [H]



⬇

Touch the feeler ball with the plane B.

⬇

The displayed value at which counting stops is the inner diameter of the workpiece.

○ Centering of the workpiece.

Measure the outer and inner diameters of the workpiece.

⬇

Press the [½] key.
The halved value is displayed.

⬇

When the displayed value reaches zero, centering is completed.

Since the measurement in the LOAD and HOLD functions by using the touch probe is displayed in the ABS coordinate display mode, the above centering can be used as the machining datum point.

Note: When setting the touch probe radius or diameter, determine the sign according to the direction of the tool movement. (See the section about settings of the outer diameter and inner diameter.)

[5] SETTING OF THE LINEAR ERROR COMPENSATION AND LOST MOTION COMPENSATION

1. LINEAR ERROR COMPENSATION

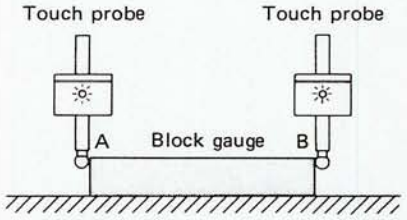
Machine tools possess a linear error due to the deflection peculiar to the individual machine. By measuring the compensation value beforehand and setting the value per meter to the parameter switch, the compensation value can be added to or subtracted from the actually measured value. This function is called linear error compensation.
The value after the linear error compensation is displayed based on the following equation.

$$L_D = ls + \frac{ls}{1000} \cdot k$$

L_D: displayed value
ls: measured value before compensation (mm)
k: compensation value per 1,000 mm

(1) Measurement of the Compensation Value

Put a block gauge having a predetermined length, and measure the length, using the touch probe.



Setting the datum plane A.
[X] [+/-] [1] [0] [L]
(The diameter of the touch probe is subtracted beforehand.)

⬇

Measure the length.
[X] [H]

⬇

Contact the plane B with the touch probe.
The measured value is displayed.

(See the section about the touch probe.)

After measuring the length as described above, find the value for k, using the following equation.

$$k = \frac{L_D - ls}{ls} \times 1000$$

L_D: length of block gauge
ls : measured value
k : linear error compensation value per meter

(2) Setting of the Compensation Value, k

The compensation value, k, is set by the parameter switch on the rear panel.

1) Setting of the absolute value of the compensation value

Set value of SW3 (X-axis), SW7 (Y-axis), SW11 (Z-axis)	SW6-2 (X-axis), SW10-2 (Y-axis), SW14-2 (Z-axis)	
	OFF	ON (double)
0	0μm/m	0μm/m
1	4	8
2	12	24
3	16	32
4	20	40
5	25	50
6	35	70
7	60	120
8	80	160
9	100	200
A	110	220
B	130	260
C	140	280
D	180	360
E	230	460
F	250	500

2) Setting of the sign

Set the sign to the above absolute value as follows.

SW6-1 (X-axis), SW10-1 (Y-axis), SW14-1 (Z-axis)	Sign for the absolute value
ON	−
OFF	+

Example: Input the compensation value, −12μm/m to X-axis.

SW3 Set to 2. } 12μm/m
SW6-2 OFF }
SW6-1 ON −

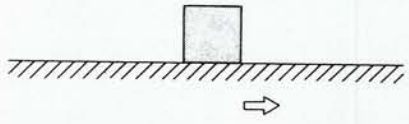
The linear error compensation value, -12μm, for X-axis is set by the above procedures.

2. LOST MOTION COMPENSATION

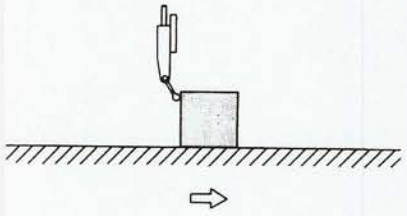
When the direction of scale movement changes, some machine tools yield different values according to the forward direction or backward direction because of yawing of the machine table. This error is compensated by the lost motion compensation. By measuring the compensation value beforehand and setting it to the parameter switch, the value after compensation is displayed.

(1) Measurement of the Lost Motion Compensation Value

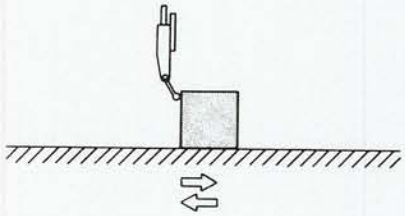
① Put a block gauge on the table and move the table slightly to the right.



② Touch the left side of the block gauge with the probe of the electrical comparator and adjust so that zero point is obtained.
Set the display to zero.



③ Move the table a few millimeters to the right. Then move it back to the left, while touching the left side of the block gauge with the probe of the electrical comparator again. Stop the table at the position where the electrical comparator indicates zero.



The value on the display unit becomes the lost motion compensation value. To set the lost motion value to the parameter switch, change the sign.

Displayed value −0.007 mm → set value +0.007 mm

(2) Setting of the Lost Motion Compensation Value

The compensation value is set by the parameter switch on the rear panel.
(See the section about the Parameter Switch.)

1) Setting of the absolute value of the compensation value

Set values of SW4 (X-axis), SW8 (Y-axis), SW12 (Z-axis)	SW6-4 (X-axis), SW10-4 (Y-axis), SW14-4 (Z-axis)			
	OFF		ON	
	DU200	DU400	DU200	DU400
0	0μm	0μm	0μm	0μm
1	5	0.5	10	1.0
2	15	1.5	30	3.0
3	20	2.0	40	4.0
4	25	2.5	50	5.0
5	35	3.5	70	7.0
6	45	4.5	90	9.0
7	55	5.5	110	11.0
8	75	7.5	150	15.0
9	100	10.0	200	20.0
A	125	12.5	250	25.0
B	175	17.5	350	35.0
C	225	22.5	450	45.0
D	250	25.0	500	50.0
E	275	27.5	550	55.0
F	300	30.0	600	60.0

2) Setting of the sign

Set the sign to the above absolute value as follows.

SW6-3 (X-axis), SW10-3 (Y-axis), SW14-3 (Z-axis)	Sign of the absolute value
ON	−
OFF	+

Example: Input the lost motion compensation value, −0.007 mm, to X-axis.
The display unit, DU400, is used.
When the measured value is −0.007 mm, the set value is +0.007 mm.

SW4	Set to 5.	7μm
SW6-4	ON	
SW6-3	OFF	+

The lost motion compensation value, +0.007 mm, is set to the X-axis by the above procedures.

[6] ERROR DISPLAY AND CLEARING OF THE WRONG OPERATION

1. ERROR DISPLAY

Display	Type of error	Cause
E	Overspeed	When the travelling speed of the scale exceeds the maximum response speed.
F	Overflow	When exceeding the maximum value to be displayed.
E01	Memory back-up error	When the memory is not backed up.
After all the displays light	Power error	During operation, power is interrupted. (The same display as appears when the power is turned on.)
E02	Scale signal error	When the scale signal is not normal.

2. CLEARING OF THE WRONG OPERATION

- Wrong entry of numerals. — Press the [C] key to reenter the correct value.
- Wrong data input by [⊥][P][⟵]. — Reenter the correct data.
- Wrong data input by [⟵]. (12 is input instead of 11.)

  Correct the wrong input [X][1][2][⟵].

  ⬇

  [X][⟵][+/−][⟵]
  The previous input value is cancelled.

  ⬇

  [X][1][1][⟵]
  11 is entered newly.

- The reset key [X_c] is pressed by mistake. — The former data is displayed with [X][⟵].

[7] SPECIFICATIONS

Type and function of the display unit

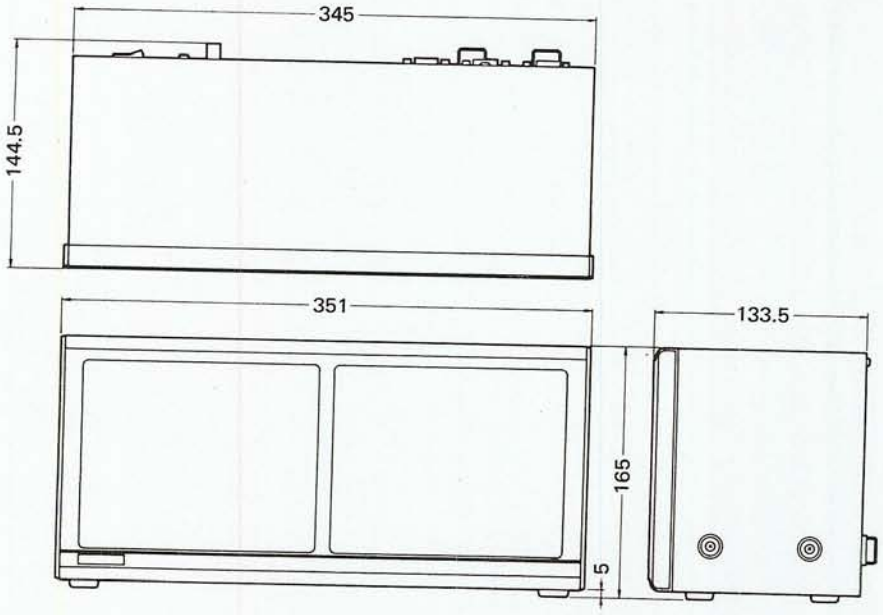
Type	Number of axis	Display resolution	Programming function	Response speed
DU201	1-axis	5μm/10μm selection, diameter display	Provided	75 m/min.
DU202	2-axes	5μm/10μm selection, diameter display	Provided	75 m/min.
DU203	3-axes	5μm/10μm selection, diameter display	Provided	75 m/min.
DU401	1-axis	0.5μm/1μm selection, diameter display	Provided	18 m/min.
DU402	2-axes	0.5μm/1μm selection, diameter display	Provided	18 m/min.
DU403	3-axes	0.5μm/1μm selection, diameter display	Provided	18 m/min.

The absolute zero point function is provided to all the units. The response speed for the absolute zero point function is 6 m/min.

Specifications	DU200	DU400
Display	Green fluorescent display tube	
Number of digits	7-digits with ± sign	
Reset of each axis	Provided	
Preset	Provided	
Positioning system	Incremental/absolute coordinates, zero chasing system	
Centering function	Provided	
Absolute zero point loading function	Provided	
Touch probe loading and holding function	Provided	
Machining datum point memory	Datum point memory – 1	
Linear error compensation	Provided	
Lost motion compensation	Provided	
Resolution	5μm/10μm selection	0.5μm/1μm selection
Zero chasing	Indicated by buzzer	
Diameter display	Provided	
External reset	Provided	
Absolute coordinate recall function	Provided	
Overspeed alarm	Provided	
Instantaneous power failure alarm	Provided	
Memory back-up	Provided	
Polarity selection	Provided	
Error display	Provided	
Power source	90–130 V AC, 50/60 Hz ($\frac{200–260\text{ V AC,}}{50/60\text{ Hz}}$), 0.2 A	
Size	351 x 160 x 134 mm 3.5 kg	
Ambient temperature	0°–40°C (32°–104°F)	

[8] EXTERNAL VIEW DRAWING

(Unit: mm)



[9] ACCESSORIES

1)	Power cord	1 pc.
2)	Plug	1 pc.
3)	Grounding wire	1 pc.
4)	Spacer	4 pcs.
5)	Screws ⊕ pan head screw 3 x 6 mm	4 pcs.
6)	Axis display label	1 set
7)	Instruction manual	1 copy

1. ERROR DISPLAY

Display	Type of error	
E----------	Overspeed	When the travelling speed of the scale exceeds the maximum response speed.
F----------	Overflow	When exceeding the maximum value to be displayed
E01	Memory back-up error	1 When the power is turned on after not having supplied the power for more than one week. 2 When an instantaneous power failur which can not be noticed by man occurrs during the operation. (Note:Data will not remain in the memory of display unit.)
After all the displays light ----------	Power error	During operation, power is interrupted. (The same display as appears when the power is turned on.)
E02	Scale signal error	When the scale unit is not or is not properly connected with the display unit. (Note:Connect the scale unit properlyafter having turned thepower off, and put the power on again.)

When an error display is indicated, depress the axis reset key to start the opertion from the beginning. In case of power errors, just depress the axis reset key to continue the operation.

[4] ADJUSTMENT OF THE ABSOLUTE ZERO POINT
(for the scale unit with the new display unit)

Adjust the absolute zero point after mounting the scale to the machine.

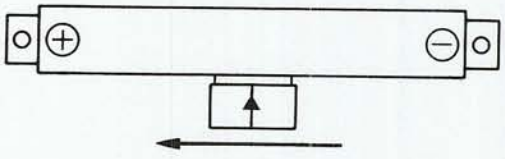
① Remove the parameter switch cover on the rear panel of the display unit. (See the section about the parameter switch in the separate instruction manual for the display unit.)

② Turn the switch 2–4 on. (common to X-, Y- and Z-axis)

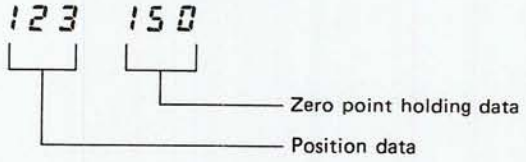
③ Set the axis selection switch 1 as follows.

	SW1 values
X-axis	7
Y-axis	8
Z-axis	9

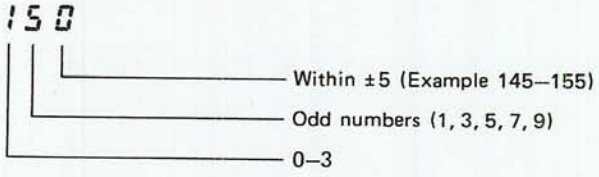
④ The machine table should be travelled only in one direction so as to get better machining accuracy. The absolute zero point is detected when the head carrier passes over the zero point while the machine table is shifted in one direction, + or – direction can be set by the parameter switch of the display unit.
The direction of the following picture is ⊕.



⑤ Turn on the power switch of the display unit. Indicates 2 numbers of 3 figures like the following example:

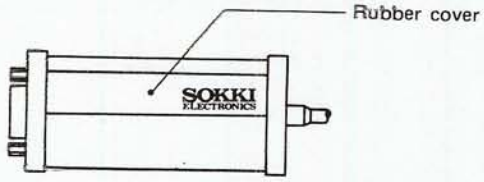


⑥ Move the table to the direction determined in the clause ④ to pass the zero point. A buzzer beeps and the zero point holding data is displayed. Check the data is within the limits specified below:

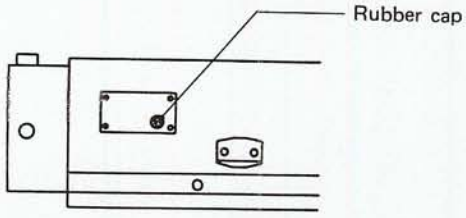


⑦ If the displayed values are out of the above specified range, perform the following procedures.

JS1 · JS3 · JS6



JS5



JS1, JS3, JS6: Remove the rubber cover on the head amplifier. Turn the adjusting knob V5 slightly to the right or left. Move again the table to pass the zero point.

JS5: Remove the rubber cap on the zero point adjusting hole on the head amplifier. Turn the adjusting knob V5 slightly to the right or left. Move again the table to pass the zero point. Repeat the above procedure until the specified holding data is obtained.

When the holding data is not obtained even if the adjusting knob V5 (OFS) is turned more than half revolution, re-check the mounting dimension of the scale unit and head carrier.

⑧ Repeat the above procedures from section ③ to ⑦ for Y and Z axis.

⑨ After the displayed values are within the specified range, turn the SW2–4 off and set the SW1 to 3.

⑩ Upon completion of adjustment, mount the rear panel of the display unit and rubber cap of the zero point adjusting hole.

Turn off the power once before starting measurement.

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