

MINIATURE DRILL POINTER

FOR THINNING

MDP-15

OPERATION MANUAL

Version 2 2000.12

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1. Features

This drill pointer was developed for regrinding of Primary surface as well as thinning of small diameter drill bits.

By equipping the auto index and automatic table traverse function as well as CCD camera and monitor, work productivity is increased.

2. Specification

1)Drills	Drill diameter	$\Phi 0.3\text{mm}$ - $\Phi 0.6\text{mm}$
	Point angle	118° - 140°
	Primary face angle	14° - 20° (Primary wheel)
	Thinning wheel angle	0° - 40°
2)Grinding wheels	Diamond wheel	$\Phi 75$
	Primary wheel	#1500
	Thinning wheel	#1000
3)Motor	Wheel Motor	Induction Motor 60WDCBL 7200rpm
	Index Motor	Step Motor
	Table Stroke Motor	Induction Motor 15W 30rpm
	Thinning Table Motor	Induction Motor 3W 48rpm
4)Semi-Automatic Type		
5)Power Source		AC100V (Use 110V or 220V Transformer)
6)Machine Dimensions and Weight		390(W) x 590(H) x 690(D) mm 70kgs

3. Unpacking

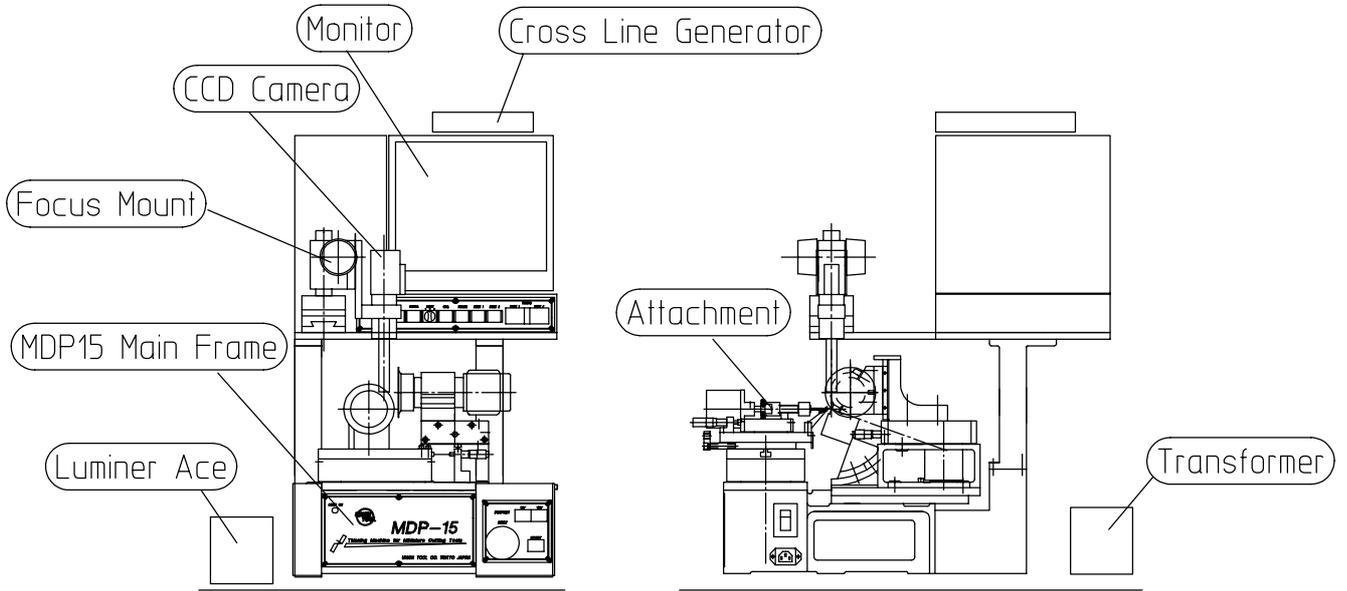
Check that the following items are in the box after unpacking.

1. MDP-15 Frame (Cover and Wheels are included)	1
2. Attachment	1 Set
3. Crossline Generator	1
4. Focus Mount	1
5. Monitor	1
6. CCD Camera	1
7. Luminer Ace	1
8. Power cord	1
9. Standard Accessories	1 Set
10. Transformer (110V,220V)	1
11. MDP-15 Instruction Manual	1pcs

4. Installation and Hook up

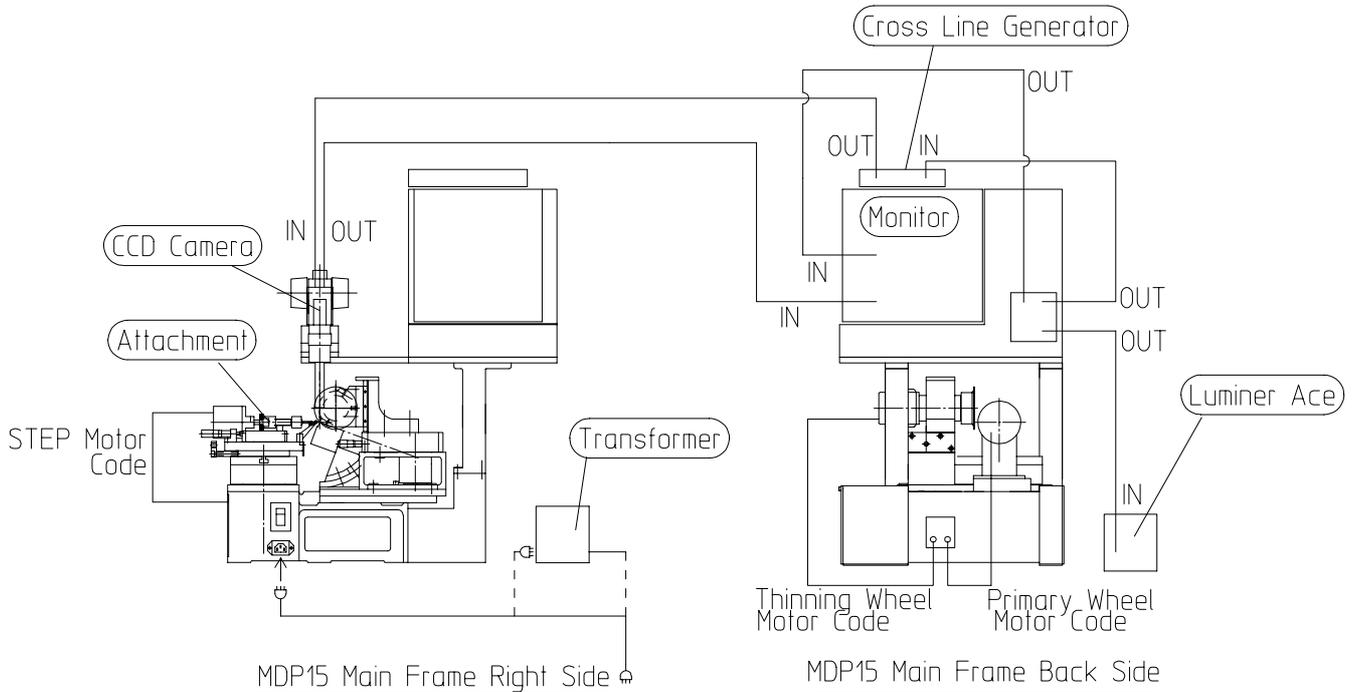
4-1. Installation

With the UNION Tool MDP-15, it is not necessary install the machine on a completely level surface. All machine parts should be placed as below.



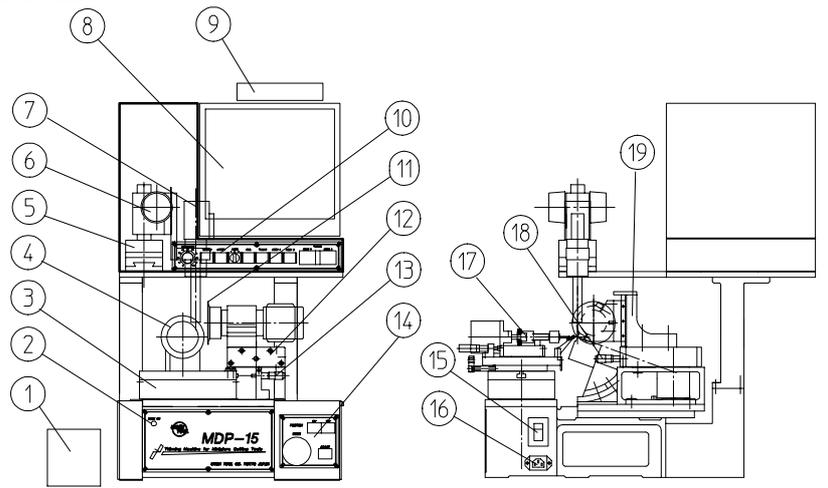
4-2. Hook up

Hook up the connector cables and codes, and insert the power code to main power socket.



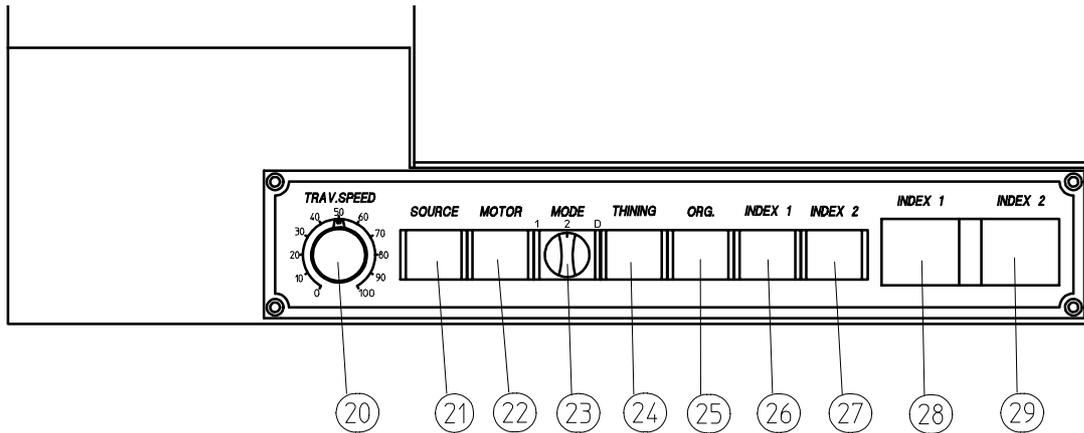
5. Parts Name and Function

5-1. MDP-15 Main Frame



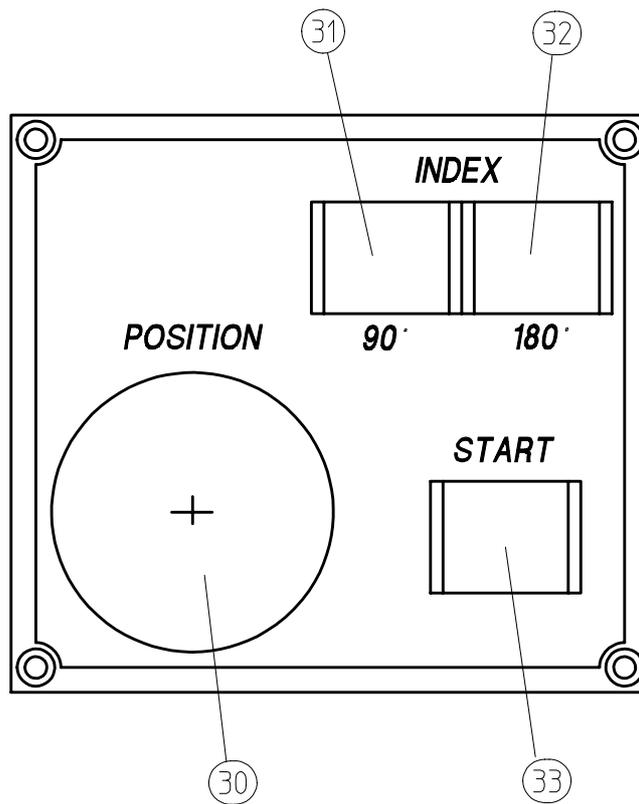
1	Luminer Ace	Illuminated the drill point.
2	Index Motor Connector	Connect the code of Index motor
3	Automatic Traverse Table	Used for the advance of the index assembly during pointing.
4	Primary Wheel	Used for grinding the primary face.
5	X-Y Stage	Used for cross hair line adjustment on monitor.
6	Focus Mount	Focus the CCD Camera.
7	CCD Camera	Magnifies the drill point.
8	Monitor	Monitor the picture of CCD Camera.
9	Cross Hair Line Generator	Generate the cross hair line in the monitor.
10	Operation Panel (1)	Refer to Operation Panel (1)
11	Thinning Wheel	Used for thinning..
12	Thinning Depth Table	Used to advance thinning wheel.
13	Traverse Table Micrometer	Used to adjust the position of thinning.
14	Operation Panel (2)	Refer to Operation Panel (2)
15	Main Power Switch	Turns main power on and off.
16	Main Power Socket	Socket for the main power code.
17	Attachment	Refer to Attachment assembly.
18	Thinning Depth Micrometer	Used to adjust the depth of the thinning wheel.
19	Thinning Wheel Slide	Used for up and down of thinning wheel.

5-2. Operation Panel (1)



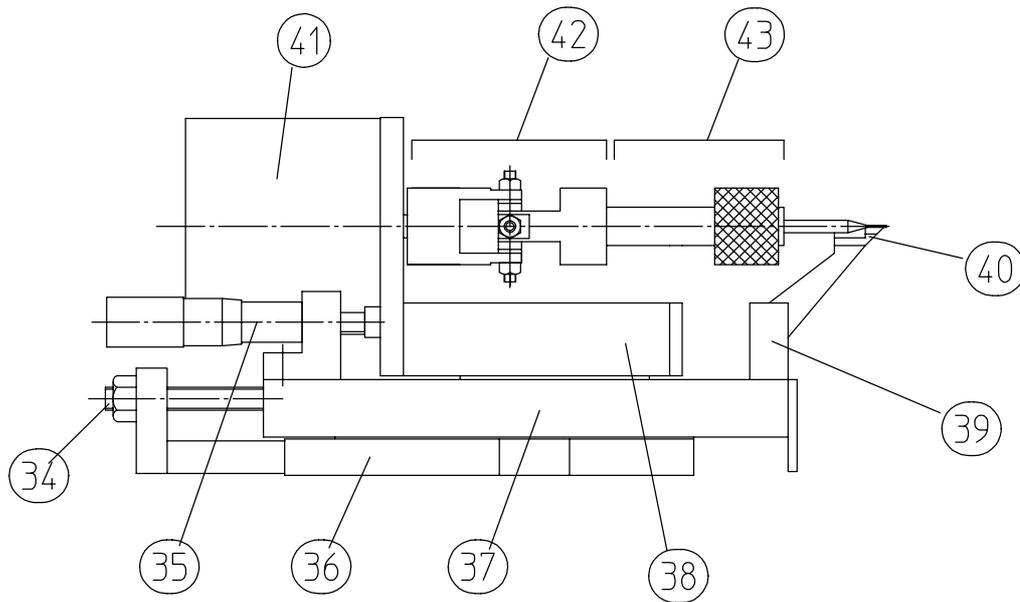
20	TRAV. SPEED	Controls table advance speed when pointing and dressing.
21	SOURCE	Illuminated when the power switch is turned on.
22	MOTOR	Turns the primary wheel motor as well as the thinning wheel motor on and off.
23	MODE	Used to select the desired mode of operation <ol style="list-style-type: none"> 1. Automatic operation of grinding primary face as well as thinning. 2. Thinning cycle only 3. Dressing cycle Traverse the table successively without turning thinning wheel.
24	THINNING	Advance the thinning wheel by manual. (one cycle)
25	ORG.	Return the drill to the original position after rotating it with Index 1 or Index 2.
26	INDEX 1	Rotate the drill to a certain amount fixed by Index 1 (COUNTER)
27	INDEX 2	Rotate the drill to a certain amount fixed by Index 2 (COUNTER)
28	INDEX 1 (COUNTER)	Adjust the amount of rotation (Index 1) (800 count / 1rev.)
29	INDEX 2 (COUNTER)	Adjust the amount of rotation (Index 2) (800 count / 1rev.)

5-3. Operation Panel (2)



30	POSITION	Rotates the drill for pointing.
31	90° INDEX	Index the drill 90°
32	180° INDEX	Index the drill 180°
33	START	Starts the pointing cycle as well as dressing cycle. Push this button after chucking and cross hair adjustment.

5-4. Universal Attachment



34	Table Advance Adjustment Screw	Used to adjust table advance amount.
35	Grinding Micrometer	Controls the grinding amount. It changes the position of the drill in the drill well and not the quill assembly.
36	Index Assy. Attachment Base	The base attaches to the MDP-15 table.
37	Attachment Base Slide Table	Slides back and forth to adjust the position of the entire index assembly. This normally will not be moved during operation.
38	Grinding Regulator Slide Table	Allows for the regulation of the grinding amount.
39	Drill Well Holder	Provides a base for the drill well which holds the drill in place during pointing.
40	Drill Well	Holds the drill in place during pointing and can easily be changed for different diameters.
41	Quill Assy. Motor	Rotates drill.
42	Universal Joint	Connects the motor to the collet.
43	Collet	Holds the shank of the drill during pointing.

6. Operation

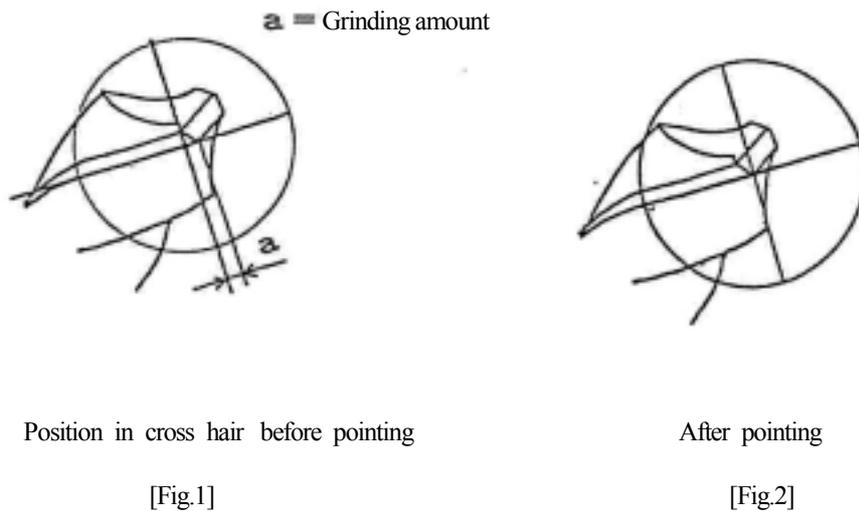
The drill chips and dust will spread in the air when grinding.

Therefore, please wear a dustproof mask or set dustproofing device.

Moreover, please ventilate the air in the grinding room every 2 hours periodically.

6-1. Machine Installation

- 1) Initial set up (Refer to 6-2)
- 2) Turn the power switch (15) on the right side of the main frame on.
SOURCE lamp is illuminated.
- 3) Push the motor button (22). The button should now be illuminated and the wheels should also be rotating.
- 4) Pointing process (Refer to 6-3)
- 5) Select the appropriate mode with the mode change switch (23).
- 6) Set the table speed adjustment dial (20).
- 7) Insert the drill into the collet.
- 8) Control grinding amount (Refer to Fig.1).
- 9) Level positioning (Refer to Fig.1).
- 10) Press the Start button (33). The button should now be illuminated.
- 11) When the pointing cycle is finished, the start button should no longer be illuminated.



6-2. Initial Set up -1

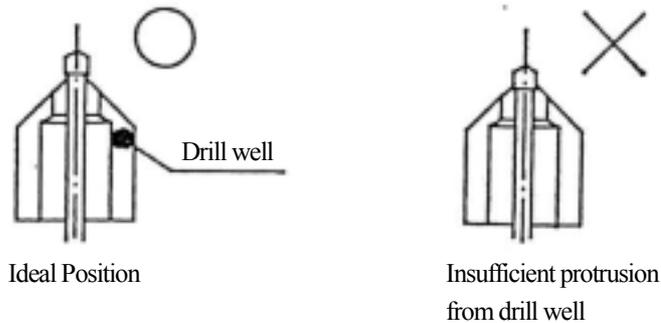
- 1) Setting the primary face angle.
Locate and loosen the 2 allen bolts on the motor housing which hold the motor housing in place. Next rotate the motor housing adjustment screws counterclockwise until the desired angle is achieved. Then retighten them.
- 2) Setting the point angle
Align the quill assembly attachment plate to the appropriate angle on the MDP-15 table.

$$\text{Desired point angle} = \frac{180^\circ - \text{point angle}}{2}$$

- 3) Drill well installation.
Select the drill well that corresponds with the drill diameter to be pointed.

6-3. Initial Set up - 2

- 1) Press the motor button (22).
- 2) Insert the drill into collet chuck.
Pull the cover on top of collet chuck and while opening the collet chuck, insert the drill to the end.
- 3) Adjustment of drill for pointing.
With grinding micrometer(35), adjust the amount of drill that protrudes from the drill well.
The ideal quantity extending from the drill well is usually very small, however when repointing UC type drill bits, make sure that the entire head protrudes from the drill well.



- 4) Pointing well positioning (The thinning wheel should be sufficiently backward)
 - a. Adjust the drill close to the position (Fig.1) at the middle of the screen of the monitor.
 - b. Input 200 to Index 1 counter (28), and push the Index 1 button to rotate the drill 90°
 - c. Select 3(Dressing mode) of mode selection switch.
 - d. Set TRAV. Speed (20) to 0.
 - e. Push Start (33), and the start button should be illuminated.
 - f. Turn the table speed adjustment dial (20) clockwise until the Automatic traverse table (3) begins to move to right. Once the point the drill bit is at the middle of the primary wheel width, turn the table speed adjustment dial to 0 and stop the table.
 - g. Turn the table advance adjustment screw (34) until the secondary wheel makes contact with the drill point.
 - h. Confirm that the secondary wheel has the drill point. (Swarf appears)
 - i. Retighten the table advance adjustment screw (34) over the pointing position of the primary wheel.
 - j. Turn the TRAV. Speed (20) clockwise to move the table to the original position.
- 5) Cross hair adjustment
 - a. Press the Index 1(26) and ORG.(25) at the same time to rotate the drill to the position as Fig.1.
 - b. With X-Y stage (5) adjust the cross hair line as Fig.2.
*Align cross hair with the edge of the primary face and the margin.

6) Grinding primary face

- a. Set the grinding depth 0.02mm with the grinding micrometer (35).
- b. Using Position (23) handle, align cross hair line with the margin.
- c. Set Mode (23) to 1.
- d. Turn TRAV. Speed (20) to 60% and push Start button (30) to start grinding the primary face.
- e. Remove the drill from the collet, and measure the point angle.

The point angle is larger	-----	Decrease the number of Index 1 counter.
The point angle is smaller	-----	Increase the number of Index 1 counter.
- f. After chocking the drill bit and cross hair line adjustment, set the grinding depth 0.02mm with the grinding micrometer (35) and grind the primary face again.
- g. Repeat the above steps until getting an appropriate point angle.

7) Thinning

- a. Set Mode (23) to 2.
- b. Push Index 1 (26) to rotate the drill bit.
- c. Push Start (33) clockwise until the table begins to move to the right until it reaches to the traverse table micrometer (13).
- d. Input
- e. Push Thinning (24) switch to move the thinning wheel back and forward.
- f. Using traverse table micrometer (13), advance the thinning wheel forward.
- g. Adjusting the position of the drill bit with traverse table micrometer (13), repeat e and f until the thinning wheel makes contact with the drill point.
- h. After the thinning wheel making contact with the drill point, push Index 2 (27) and ORG. (25) at the same time to rotate the drill bit to the position as it was before thinning.
- i. Push Start (33) to return the traverse table to the original position.
- j. Push Index 1 (26) and ORG. (25) at the same time to rotate the drill bit to the original position.

8) Drill point Analysis

- a. Set Mode (23) to 1.
- b. Set the grinding depth 0.02mm with the grinding micrometer (35).
- c. Using Position (23) handle, align cross hair with the margin.
- d. Push Start button (33) to start the operation.

- e. Remove the drill from the collet, and check the point geometries.
- f. Check the drill
- g. Repeat the above steps until getting an appropriate point geometries.

Index Index 2 Counter

Shape Shape of Diamond wheel

Position Traverse table micrometer (thinning wheel)

Depth Thinning depth micrometer

9) Thinning cycle operation

After getting appropriate point geometries, push start button (33) to start thinning cycle.

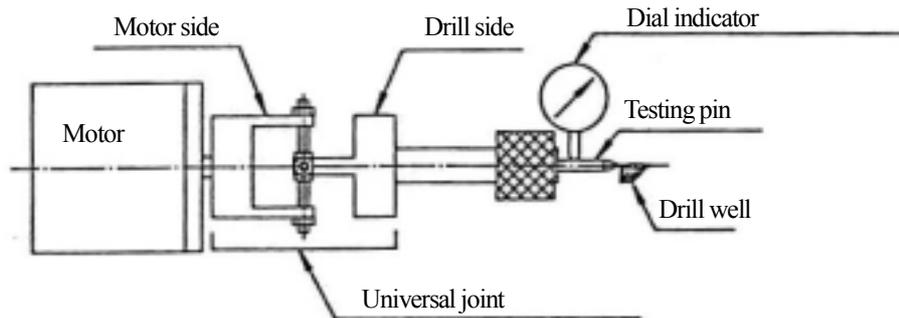
7. Maintenance

7-1. Adjustment of universal joint

Equipments required:

1. Dial indicator (1 μ m or 2 μ m resolution)
2. Magnet stand
3. Precision ground testing pin (Standard accessory: Φ 1.0mm)
4. 1.5mm allen wrench (Standard accessory)
5. 5.5mm wrench (Standard accessory)

1) Preliminary check

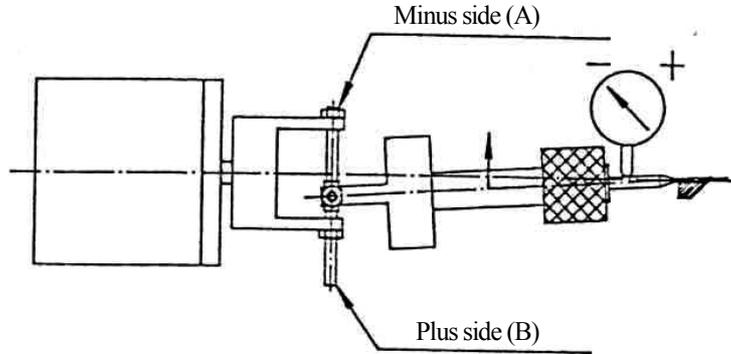


- a. Insert the testing pin into the collet.
Use a drill well that fits the pin and make sure that both the collet and the drill well are free of any dirt.
- b. Attach the dial indicator stand to the table.
Place the dial indicator 5 to 10mm from the collet.
- c. Check the scale deflection.
Turn the drill and check for any deflection on the scale.
After turning the drill for one revolution, if the deflection is within 5 μ m, adjustment of inconcentricity is not necessary.
- d. Check Play
Even if the adjustment of inconcentricity is properly done, there may be a rare case that the universal joints have play. Hold the universal joints at the motor side and the drill side with both hands and see if there is play by moving it up, down, left and right. When there is play, you will know it from the touch and sound. In this case, you need to tighten the bolt firmly. After that, check the movement once again.

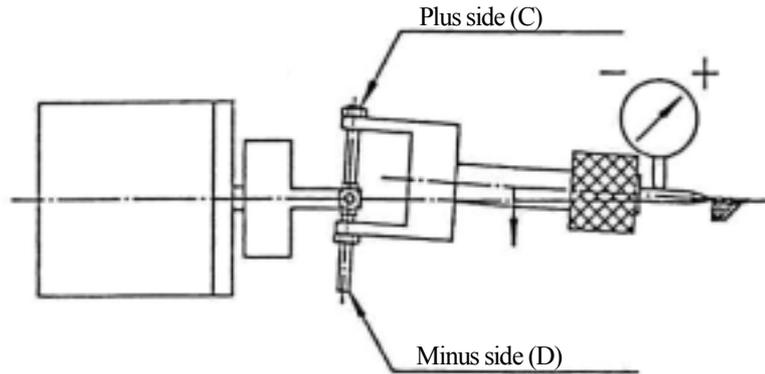
2) Correcting Runout

Correction of runout should be done separately for the motor side of the universal and the drill side of the universal.

(1) How to adjust the universal joint on the motor side



- a. Among the two setting bolts, face up the (-) one on the top. Ignore the scale other than the positions of the two bolts. The bolt facing up is called (A), and the other facing down is called (B).
- b. Loosen (A).
Loosening angle of about 7° eliminates about 0.01mm runout. Adjust it by targeting about 1/2 of difference between (A) and (B).
- c. Tighten the nut for (A).
The nut is for fixing. Tighten it firmly. When tightening the nut, the bolt tends to turn with it. In this case, you need to use a wrench to keep the bolt in position.
- d. Turn the drill for 180° .
(B) is now facing up.
- e. Loosen the nut and tighten the bolt for (B).
Tighten the bolt lightly to eliminate play. Do not yet tighten firmly. It should be different from the normal tightening of the bolt. Later, firmly tighten with a nut.
- f. Repeat the above procedure until the difference between (A) and (B) becomes within $5\mu\text{m}$.

(2) How to adjust the universal joint on the drill side

- a. Among the two setting bolts, face up the (+) one on the top. Ignore the scale other than the positions of the two bolts. The bolt facing up is called (C), and the other facing down is called (D).
- b. Loosen (C).
Loosening angle of about 7° eliminates about 0.01mm runout.
- c. Tighten the nut for (C).
The nut is for fixing. Tighten it firmly avoiding the bolt from turning together with the nut.
- d. Turn the drill for 180° .
(D) comes to the top.
- e. Loosen the nut and tighten the bolt for (D).
Tighten the bolt lightly to eliminate play. Do not yet tighten firmly. It should be different from the normal tightening of the bolt. Later, firmly tighten with a nut.
- f. Repeat the above procedure until the difference between (C) and (D) becomes within $5\mu\text{m}$.

Final Runout Control

If one of the following points is not satisfactory, adjust the runout once again.

- a. When the drill is indexed for more the 360° , is the runout of the whole circle within $5\mu\text{m}$?
- b. Are the bolts tightened too firmly?
When the chuck is put up, does it come down automatically by itself?
When you put the chuck up and down, do you feel any resistance?
- c. Is there play at Universal Joints?
Hold the universal joints at the motor side and the drill side with both hands and see if there is play by moving it up, down, left and right. (When there is play, you will know it from the touch and sound.)
- d. After adjusting the chucking, is the runout within $5\mu\text{m}$?
There is a possibility that runout control occurred due to defect of chucking. See if the runout is within the range after removing the drill and redoing it once again.

8. Trouble Shooting

8-1. Trouble Shooting

	Problem	Cause	Solution
1	No power to the machine.	1)Power code is not connected.	1)Connect power code.
2	The wheel does not Rotate.	1)The motor connection cable is not attached.	1)Connect the motor connection cable.
3	Automatic traverse table (3) does not move.	1)The wheels are not rotating.	1)Turn Motor (22) on.
		2)TRAV. Speed (20) is on 0.	2)Turn the dial to the appropriate speed.
4	Luminer Ace does not work.	1)Light bulb is broken.	1)Replace the light bulb.
		2)Light cable is not connected.	2)Connect the light cable.

8-2. Pinpointing the Source of trouble.

Method	Evaluation
Grind the same drill bit with the same parameters several times.	1)If there is variance in point geometries, the machine probably should requires maintenance.
	2)If the same point geometries are consistently produced (even if the geometries are wrong), the machine is order.
Insert drill bit to be checked. Align cross hair and push 180°. Index button.	1)If drill is still aligned after rotating 180°, then the drill is OK.
	2)If drill is still aligned after rotating 360°, then the index is accurate.

9. Others

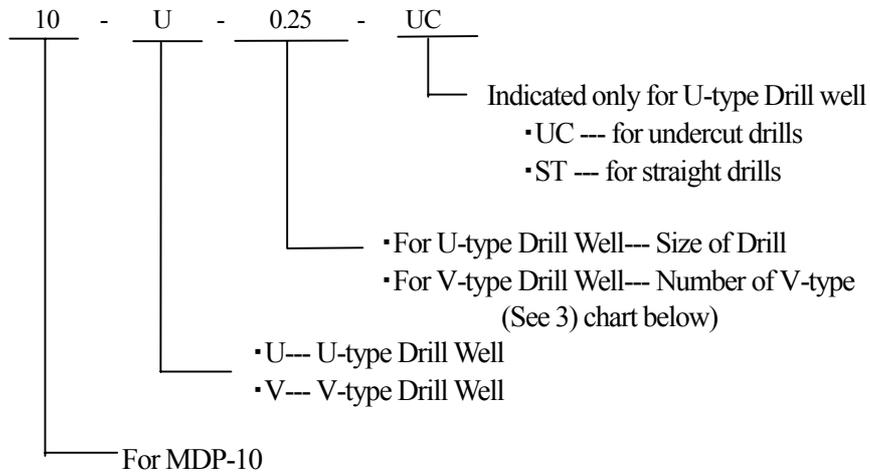
9-1. Drill Well

1) Type of Drill Well

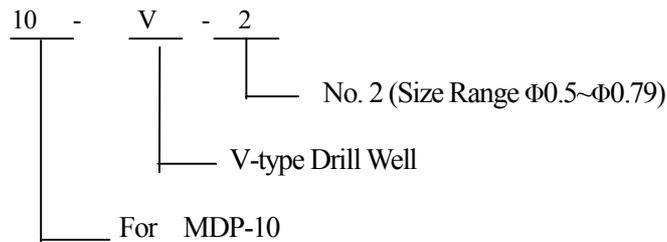
- a. V-type Drill Well: The section of this drill well is 90° V-shape.
This drill well alone can allow for the use of several different sizes of drill bits.
- b. U-type Drill Well: The section of this drill well is U-shape.
This can be used only for one size of drill bit. Since the bit height is fixed, ideal helix angle can be obtained.

2) Indication of Drill Well

Example-1 (U-type Drill well for $\Phi 0.25$ undercut drill)



•Example-2 (V-type Drill well for $\Phi 0.6$ drill)



3) V-type Diameter Size Ranges

Number	Size Range	Indication
1	0.3 ~ 0.49	10-V-1
2	0.5~0.79	10-V-2
3	0.8~1.19	10-V-3
4	1.2~1.69	10-V-4

* There is no distinction between ST and UC for V-type drill well.

4) Marking

a. U-type Drill well

The drill size is marked.

Ex.) 10-U-0.45-ST ---- Marked as [045]
 10-U-0.45-UC ---- Marked as [-045]
 (UC-type is marked with [-])

b. V-type Drill well

Standard accessories ----- Numbers(1, 2, 3, 4) are marked.

Special items ----- The drill size is marked.

c. Marking Position

U-type ----- Outside of the drill well

V-type ----- At the side of fixing nut hole for standard accessory.
 Outside the drill well for special items

9-2. Diamond Wheels

Although the machine comes with the standard diamond wheels: #2000 for the primary face, and #1000 for the thinning wheel), change the number of the diamond wheel depending upon the diameter range.

The mist, which include the chip of GC wheel, will spread in the air when dressing. Therefore, please wear a dustproof mask when dressing. Moreover, please ventilate the air if necessary.

10. Standard Accessory List

1. Diamond wheel installment Tool		1
2. Drill Wells	10-V-1	1
3. Allen wrench set	1.5mm,2mm,2.5mm 3mm,4mm,5mm,6mm,8mm	each 1, total 8
4. Metric wrench set	5.5-7mm,10-12mm,11mm	each 1, total 3
5. 1mm Test blank	Φ1.0	1

Record of Revision

Date	Instruction Manual No.	Content
Dec. 1996	1-122-Y-02-A	Enacted
Dec. 2000	1-122-Y-02-B	2 nd revision. Precautions regarding the chips and dust