Daily Maintenance for Model BS-60050EBS Electron Beam Gun for Evaporation

JEOL DATUM LTD.

Daily maintenance for the BS-60050EBS Electron Beam Gun is hereby described

BS-60050EBS

EB-Gun Power Supply

Maintenance for Electron Beam Gun

(1) Some notes

(2) Structure of electron beam gun

(3) Points of the maintenance

For the components that need frequent cleaning

1. Maintenance at the chamber leakage
2. Maintenance for the grid assembly
3. Maintenance for the anode

Other maintenance

4. Maintenance for the grid assembly unit
5. Maintenance for the pole piece
6. Maintenance for the coil
7. Maintenance for the high voltage part

(1) Some notes

1. Turn off the EB-Gun Power Supply when you work

- When you touch the electron gun for filament change, cleaning and so on, make sure to turn off the circuit breaker located in front of EB-Gun power supply
- If two or more EB-guns are connected to the chamber, make sure to turn off the circuit breakers of all EB-Gun power supplies

*You will receive no electric shock when you touch the electron gun if the circuit breaker is turned off

(1) Some notes

2. When you use a wire brush

- Use a wire brush of nonmagnetic material (brass brush etc.)

  As the magnet attracts a wire brush of magnetic material, remove all loose or fallen out wires beforehand if it is in use

3. When sand blast is applied for cleaning

- Do not apply sand blast to resin section of scan coil
- Do not apply sand blast to O-ring surface
- Do not apply sand blast to V-shape groove for insert of filament

*If sand blast is applied to pole piece, its thin coating will peel off but it will be no influential to the performance

(1) Some notes

4. When you use a sand paper , apply the type #240

5. Wipe off the polished parts with alcoholic solvent

6. Use screws of nonmagnetic material (made of SUS)

7. Do not place magnetic material or magnet near by the electron gun

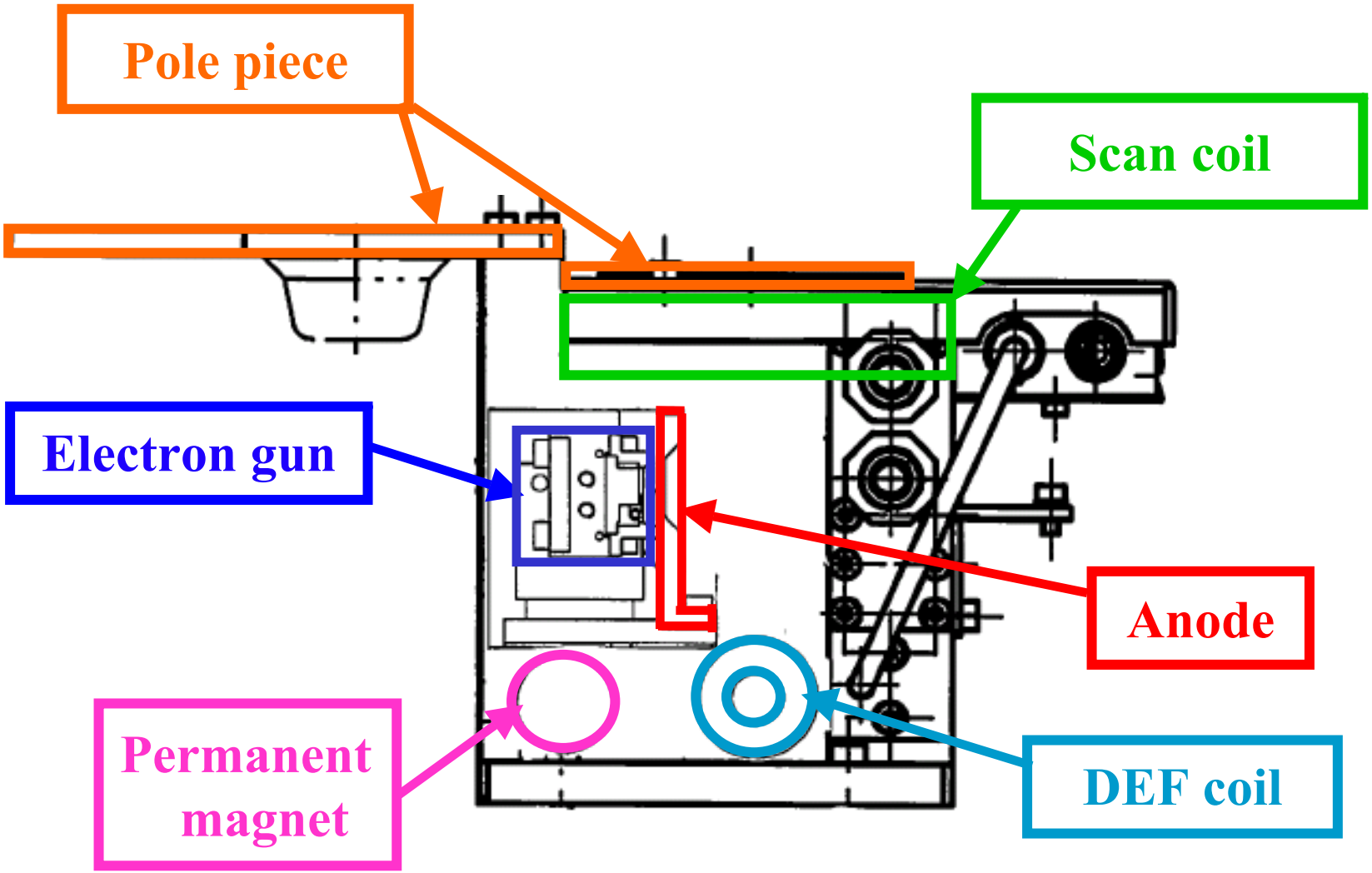
・If magnetic material such as iron or material that generates magnetic field is placed near the electron gun,

*it may affect the electron beam position or shape to fluctuate

8. Handle the grid assembly and its surrounding for the maintenance after they completely cool down to avoid burn injury.

(2) Structure of the Electron Beam Gun

Model : BS-60050EBS



(2) Structure of the Electron Beam Gun

Model : BS-60050EBS

Pole piece	To narrow down the beam (magnetic material)
Scan coil	To make the beam scan
Anode	To draw the electron beam out
Electron gun	To generate the electron beam. High voltage from –2KV to –10KV will be applied
Permanent magnet	A magnet to turn the beam by 270°
DEF coil	A coil to adjust the magnetic field

(3) Points of the maintenance

(For the components that need frequent leaning)

1. Maintenance at the chamber leakage

・Clean the evaporation dust caused by the electron beam passage, with a vacuum cleaner at every time when you leak the chamber.

*Piled up evaporation dust will cause an abnormal discharge.

・Also remove and clean with a vacuum cleaner the evaporated material adhered to the pole piece and cover or evaporated dust dropped down to near the EB-Gun.

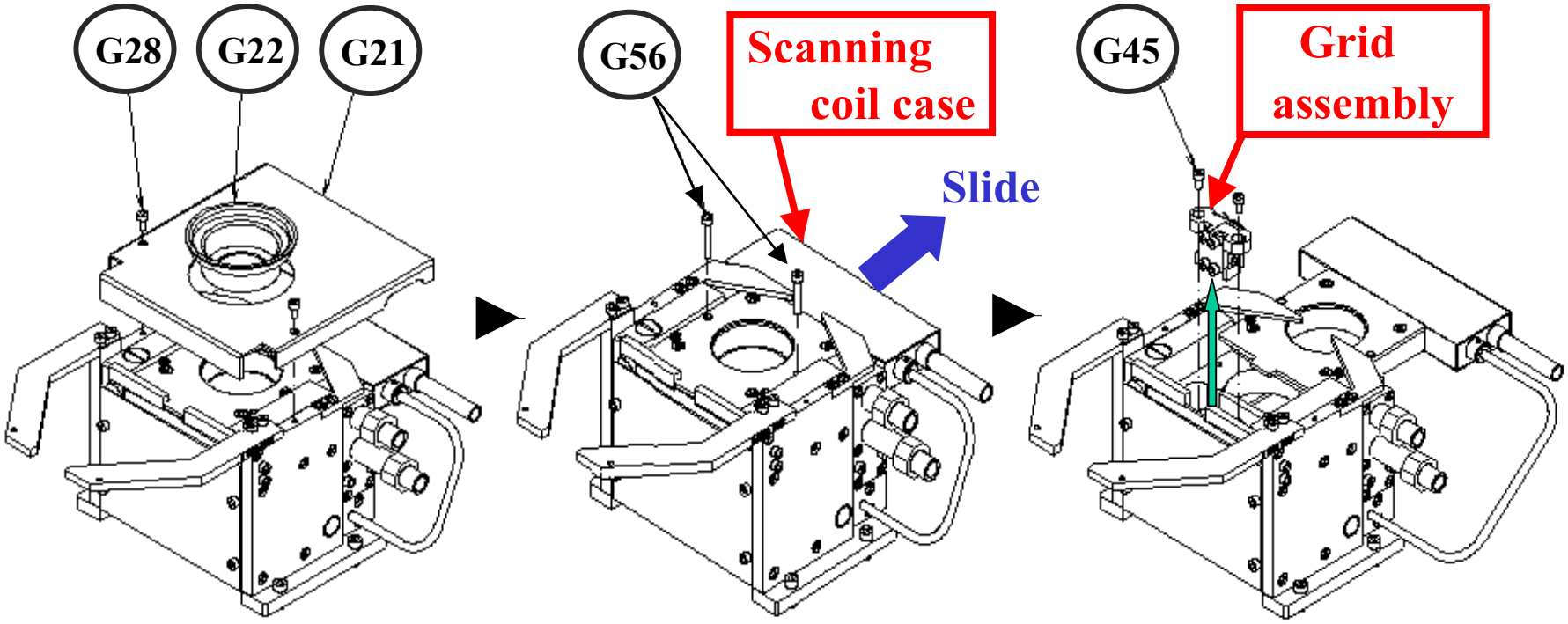
*If any magnetic material such as iron is evaporated, remove it.

(3) Points of the maintenance

(For the components that need frequent leaning)

2-a. Disassembly of the grid assembly

1. Remove the screw bolts (G28) and the covers (G21･G22)
2. Remove the screw bolts (G56) and let the scanning coil case slide
3. Remove the screw bolts (G45) and pull out the grid assembly

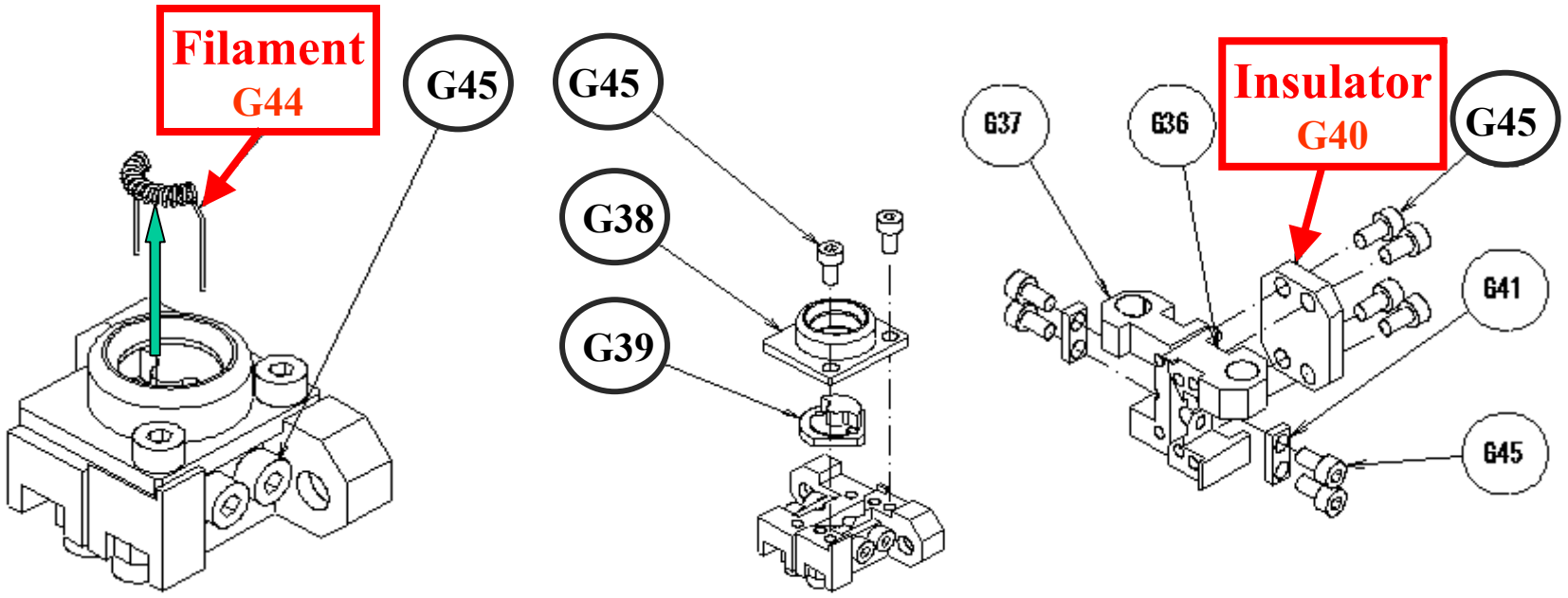


(3) Points of the maintenance

(For the components that need frequent leaning)

2-a. Disassembly of the grid assembly

4. Loosen the screw bolts (G45) and draw out the filament (G44)
5. Remove the screw bolts (G45) and the grids (G38･G39)
6. Remove the four screw bolts (G45) and the support (G41)
7. Remove the four screw bolts (G45) and the insulator (G40)



(3) Points of the maintenance

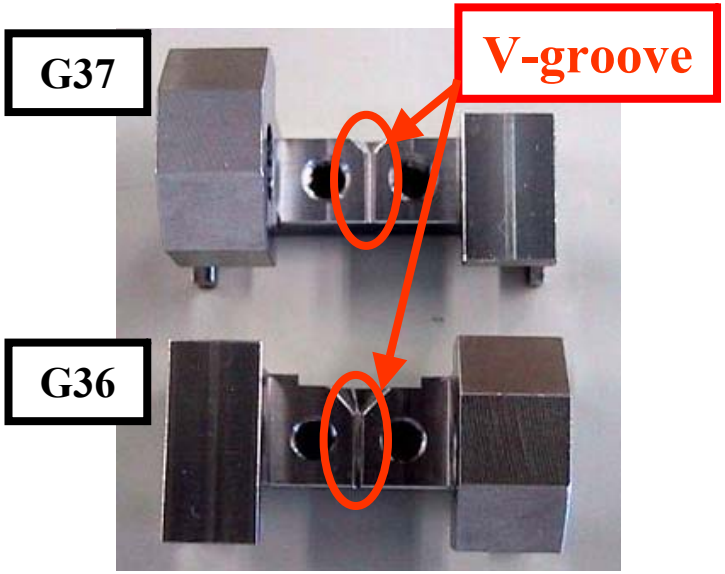
(For the components that need frequent leaning)

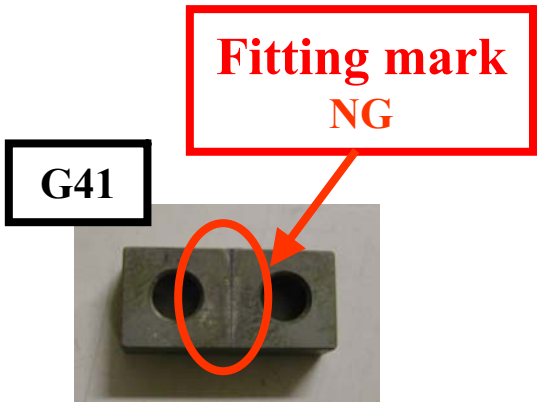
2-b. Cleaning the grid assembly

・Get the dirt out of the grid (G38), holders (G36・G37), and support (G41) with a sand paper or scotch bright

*Cleaning of the V-grooving on the holder should be minimized to restrain the wear

*Polish the support (G41) so that no filament fitting marks remain





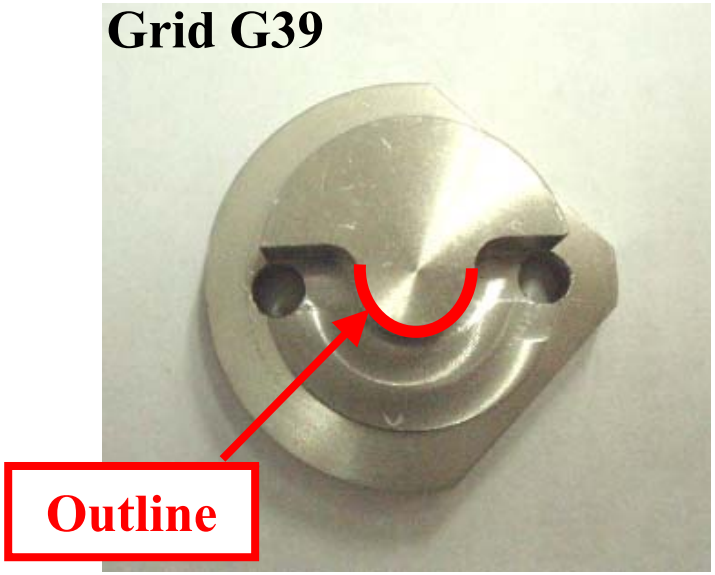
(3) Points of the maintenance

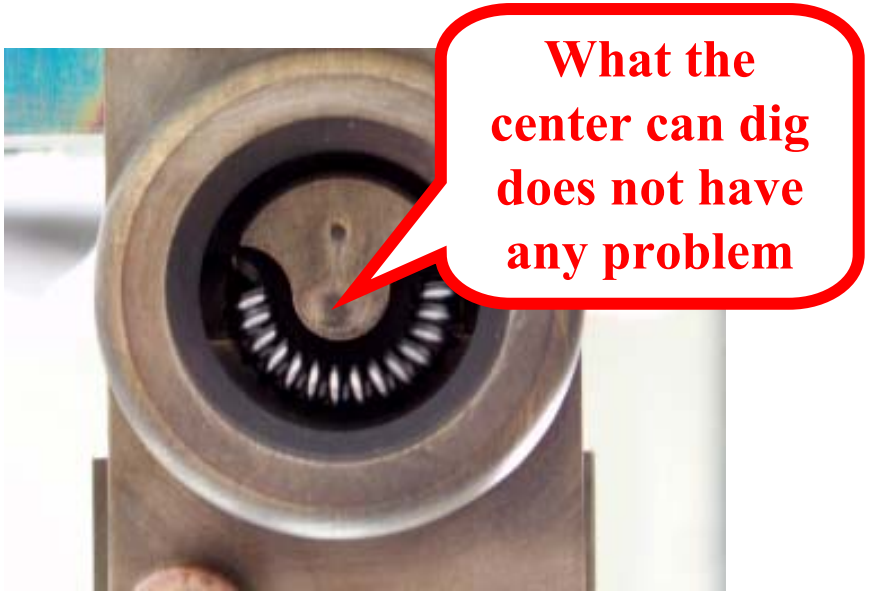
(For the components that need frequent leaning)

2-b. Cleaning the grid assembly

- Get the dirt out of the grid (G39) with a sand paper or scotch bright
- When the outline (red line) of the grid (G39) transforms it, change it for a new article

*When an outline transforms it, beam shape changes





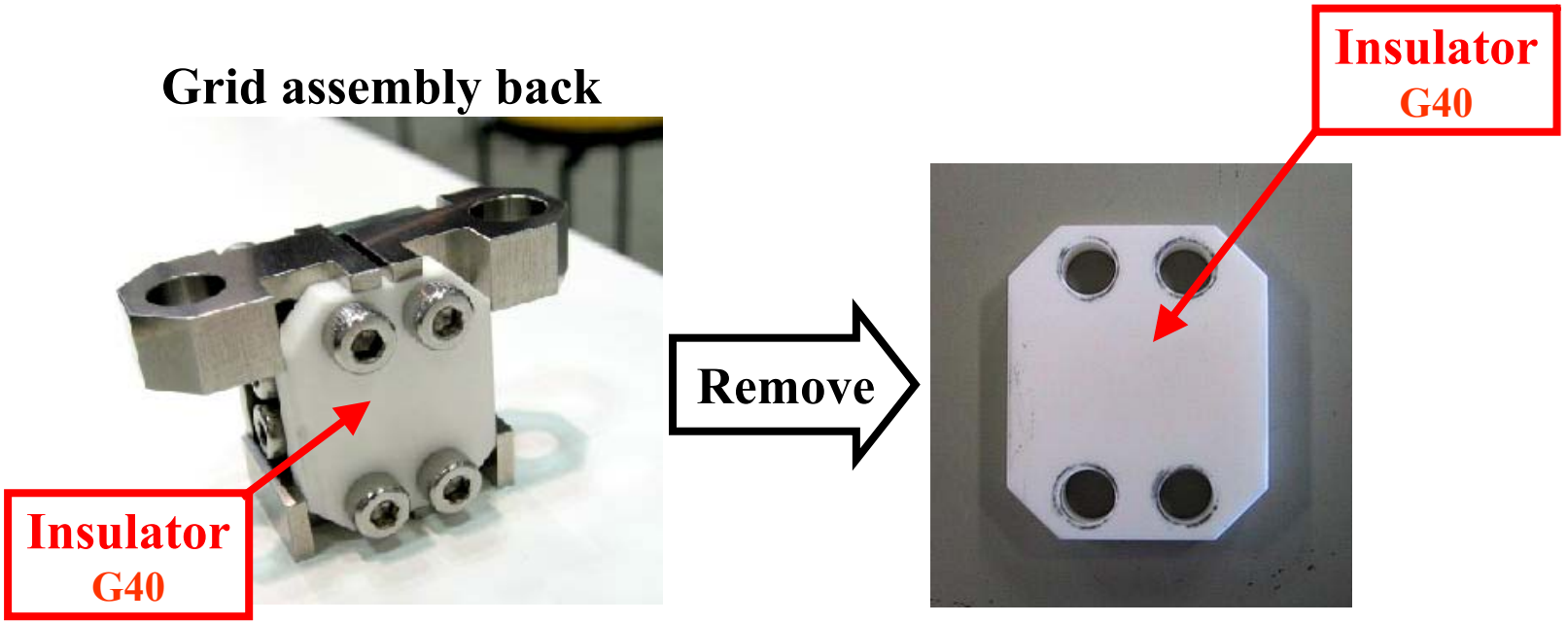
(3) Points of the maintenance

(For the components that need frequent leaning)

2-b. Cleaning the grid assembly

・Polish the insulator (G40)

*If an insulator is broken, change it for a new article

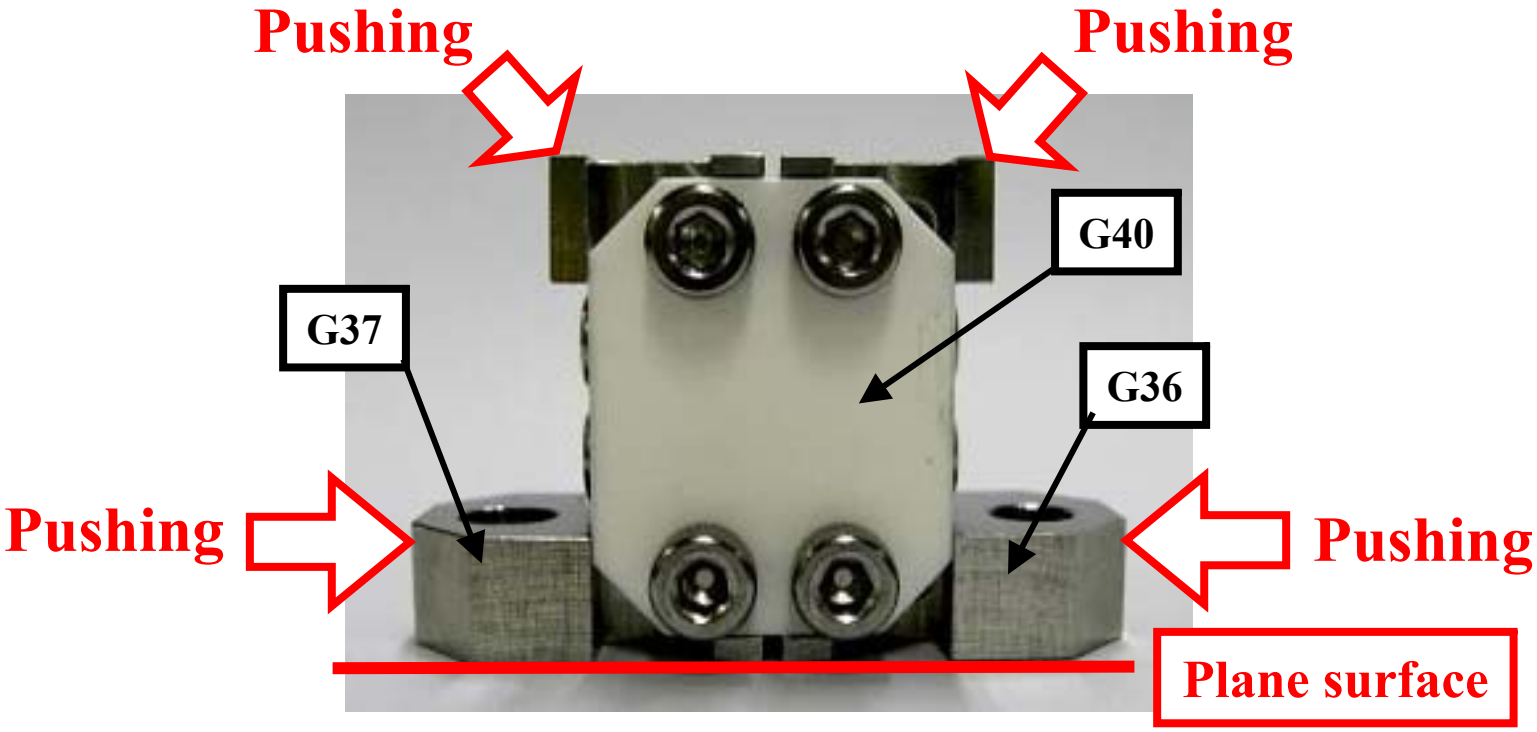


(3) Points of the maintenance

(For the components that need frequent leaning)

2-c. Attention the grid assembly assembling

・Place the insulator (G40) and holders (G36・G37) on the plane surface and fix them with four screw bolts while you push them to the directions of the red arrows as shown below



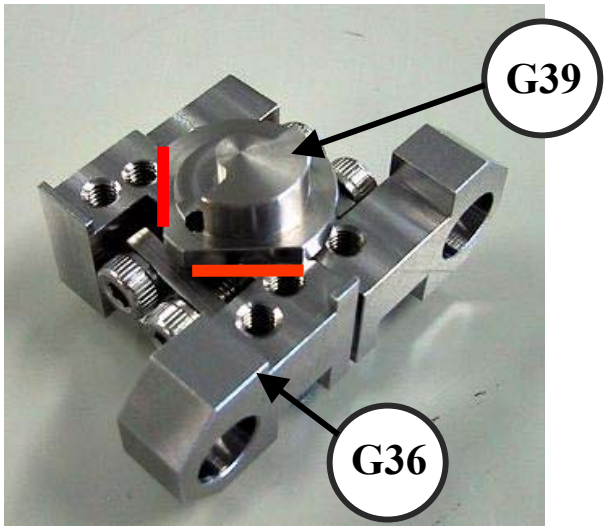
(3) Points of the maintenance

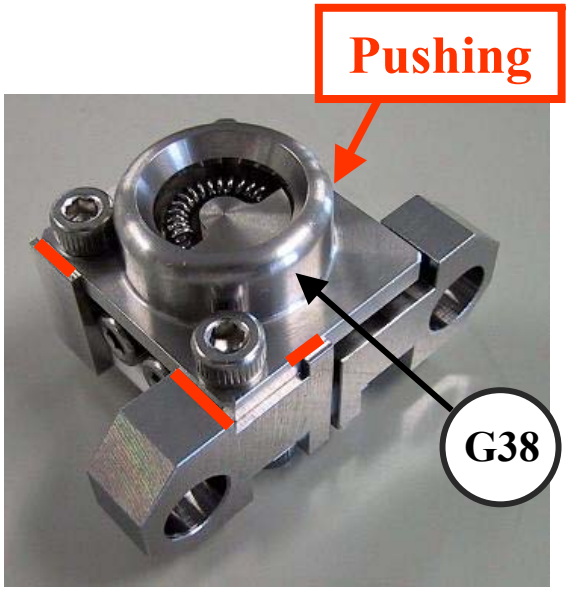
(For the components that need frequent leaning)

2-c. Attention the grid assembly assembling

- Fit the grid (G39) to the odd-shaped lines (red lines shown below) of the holder (G36) to be fixed
- Fix the grid (G38) with screw bolts pushing it firmly to the inner side face of the holder (G36)

*If they are assembled improperly, it will cause distortion to the filament and beam shape changes





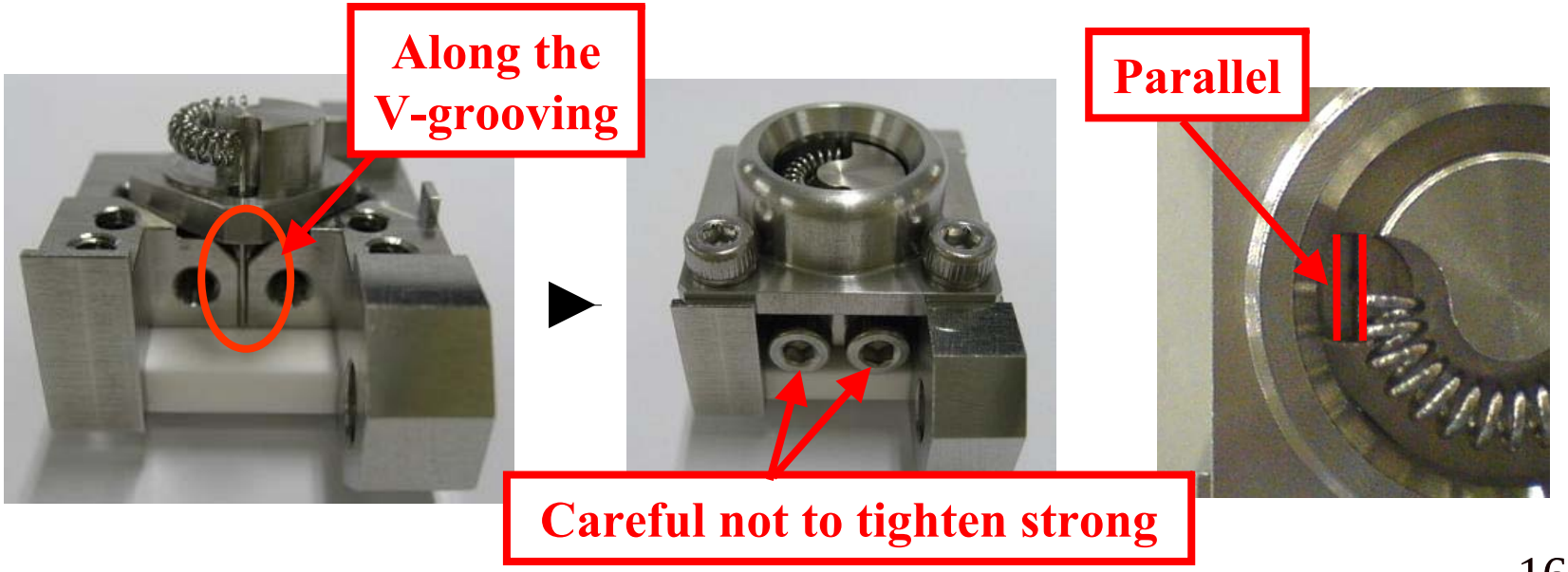
(3) Points of the maintenance

(For the components that need frequent leaning)

2-c. Attention the grid assembly assembling

- To mount the filament, push down the terminal along the V-grooving of the holder until it contacts the insulator (G40) in the bottom
- Mount the support (G41) in parallel with the holder

*When you fix filament with the support (G41), be careful not to tighten the screw bolts (G45) too strongly (to avoid galling)

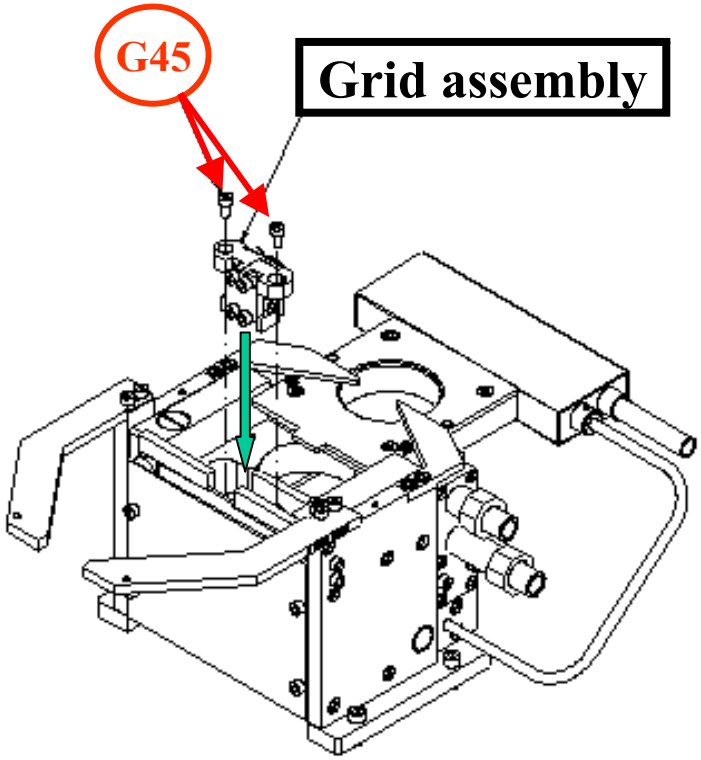


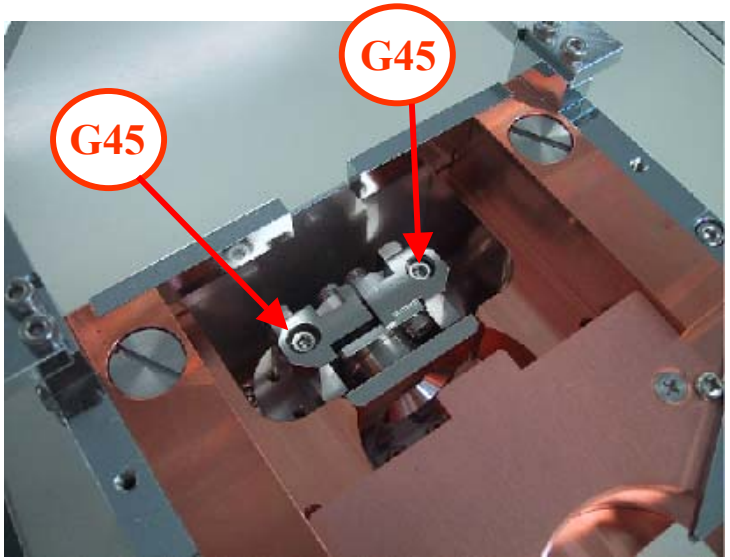
(3) Points of the maintenance

(For the components that need frequent leaning)

2-c. Attention the grid assembly assembling

- When you fix the grid assembly , be careful not to tighten the screw bolts (G45) too strongly (to avoid galling)



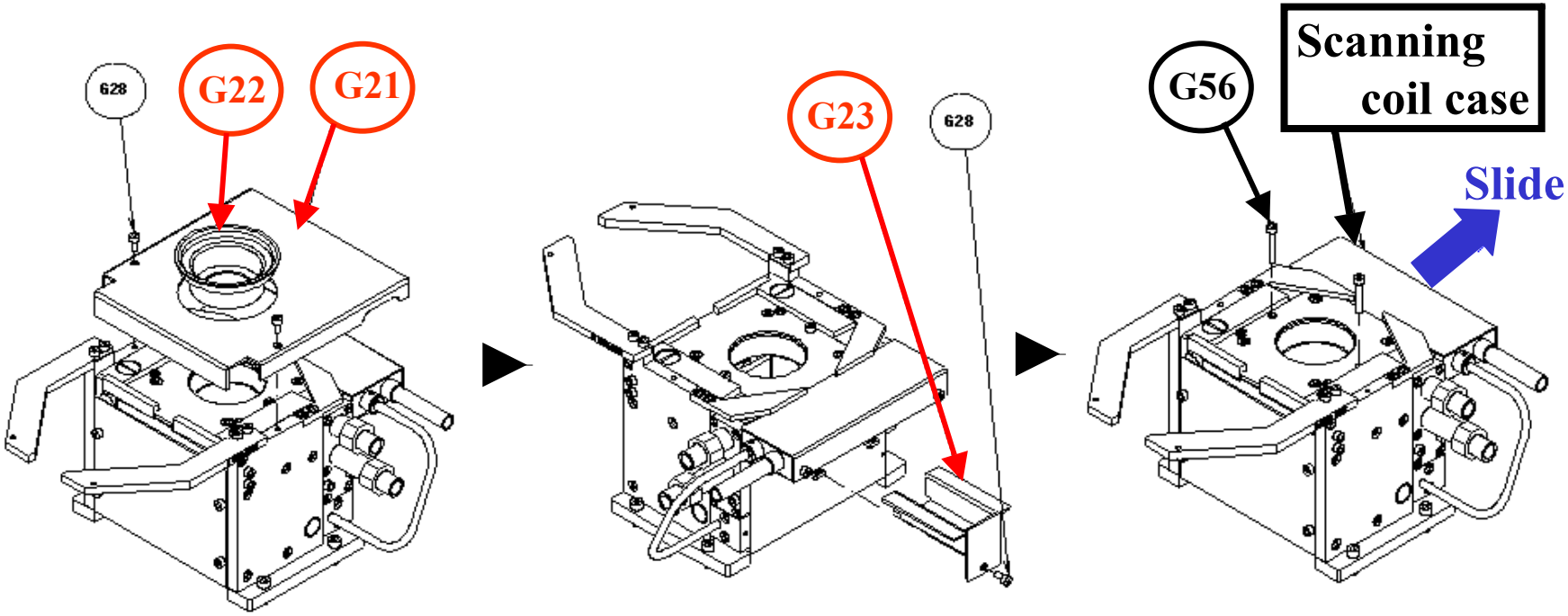


(3) Points of the maintenance

(For the components that need frequent leaning)

3-a. Maintenance for the anode (Disassembly)

1. Remove the covers (G21･G22)
2. Remove the cover (G23)
3. Remove the screw bolts (G56) and let the scanning coil case slide



(3) Points of the maintenance

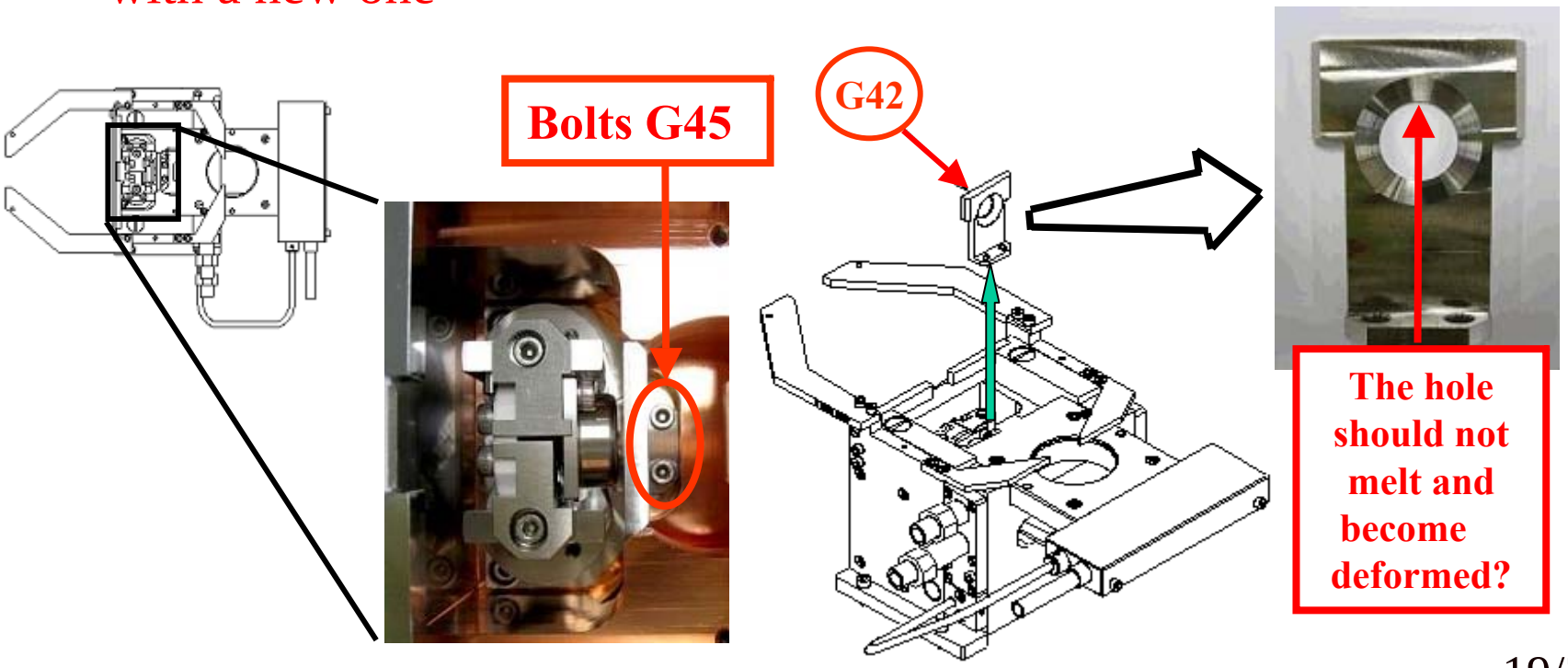
(For the components that need frequent leaning)

3-a. Maintenance for the anode (Disassembly)

4. Remove the screw bolts (G45) and the anode (G42)

*If dust remains in anode, it will cause an abnormal discharge

*If the anode hole melts and becomes deformed, replace the anode with a new one



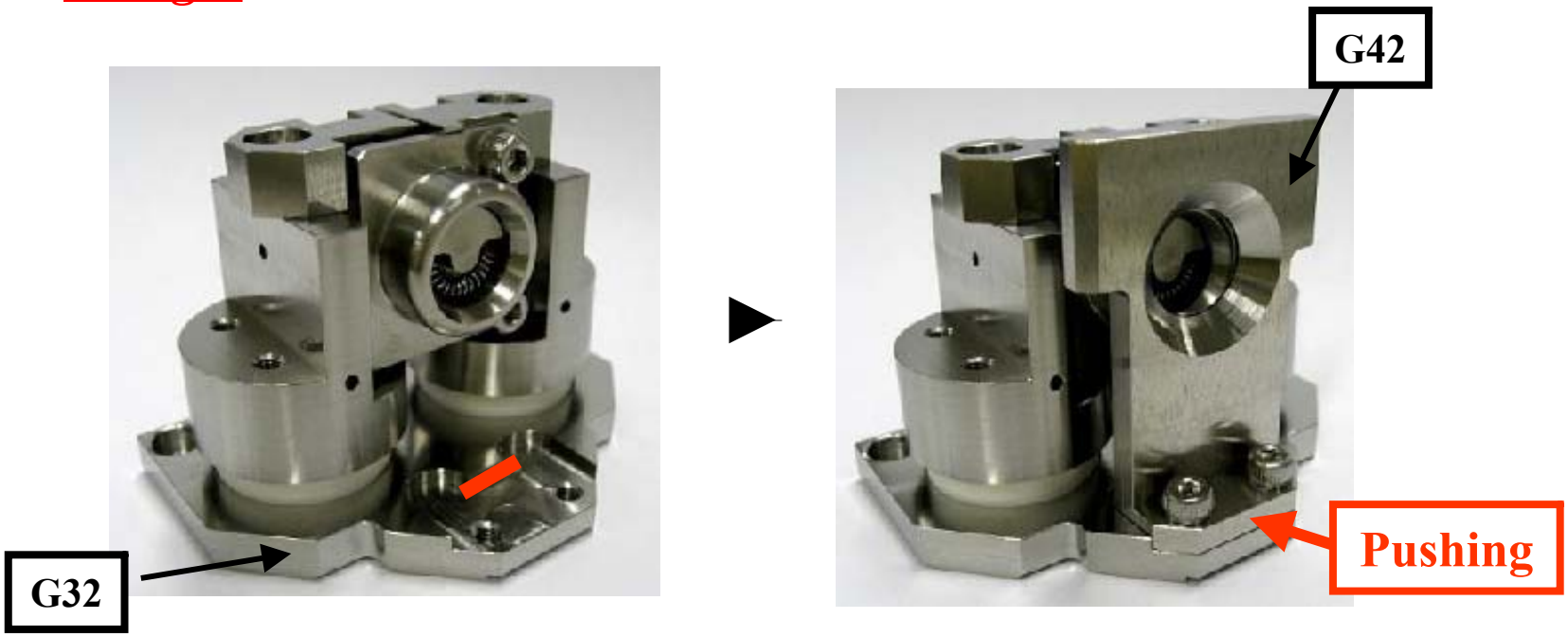
(3) Points of the maintenance

(For the components that need frequent leaning)

3-b. Maintenance for the anode (Assembling)

- Fix the anode (G42) with screw bolts pushing it firmly to the inner side face of the base (G32)

*If the assembling position of the anode is bad, a beam position changes

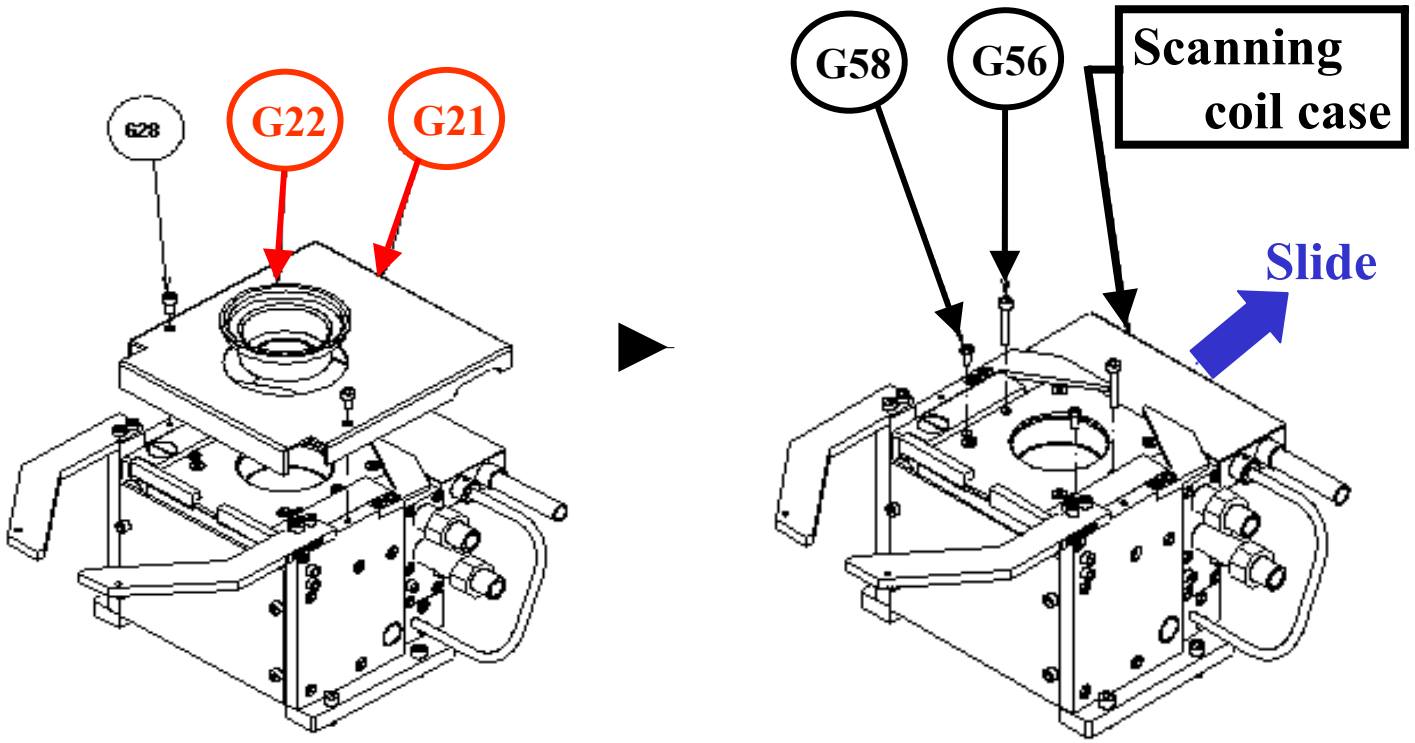


(3) Points of the maintenance (Other maintenance)

4-a. Disassembly and the cleaning of the grid assembly unit

1. Remove the covers (G21・G22)
2. Remove the screw bolts (G56・G58) and the scanning coil case

*If a dirt becomes terrible, please clean every grid assembly unit

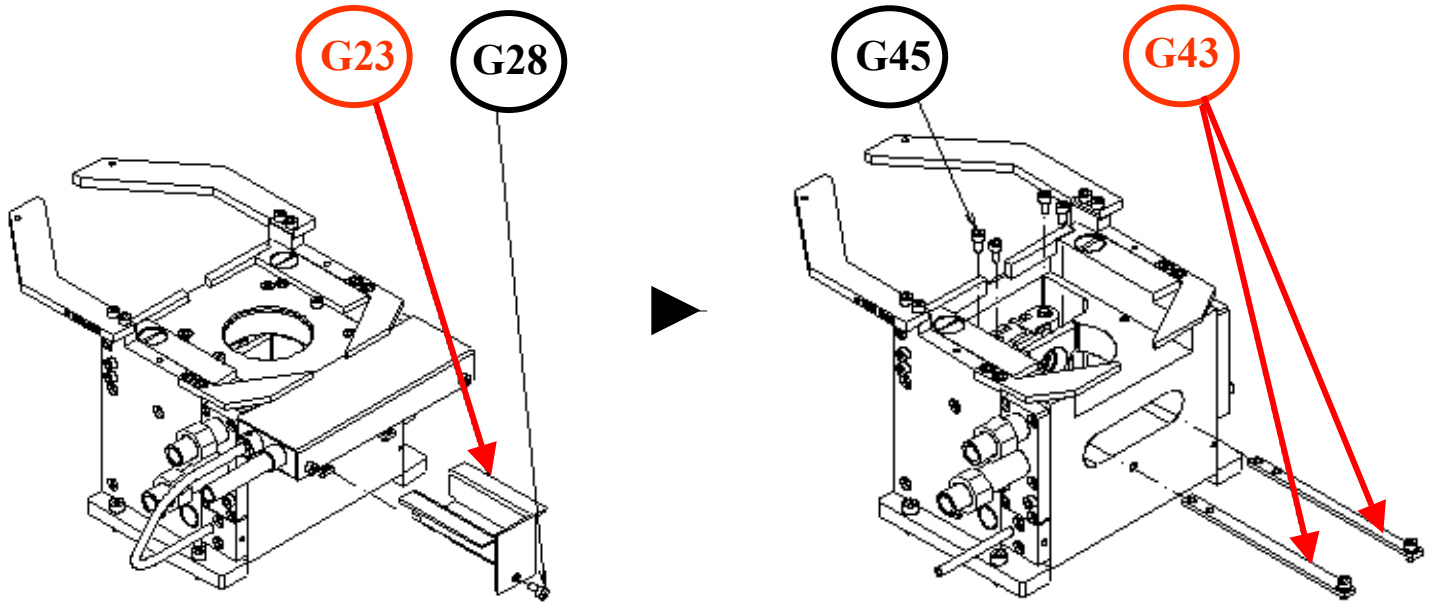


(3) Points of the maintenance (Other maintenance)

4-a. Disassembly and the cleaning of the grid assembly unit

3. Remove the screw bolts (G28) and the cover (G23)
4. Remove the high voltage lead wire(copper wire)from a plate (G43)
5. Remove the screw bolts (G45) and the plate (G43)

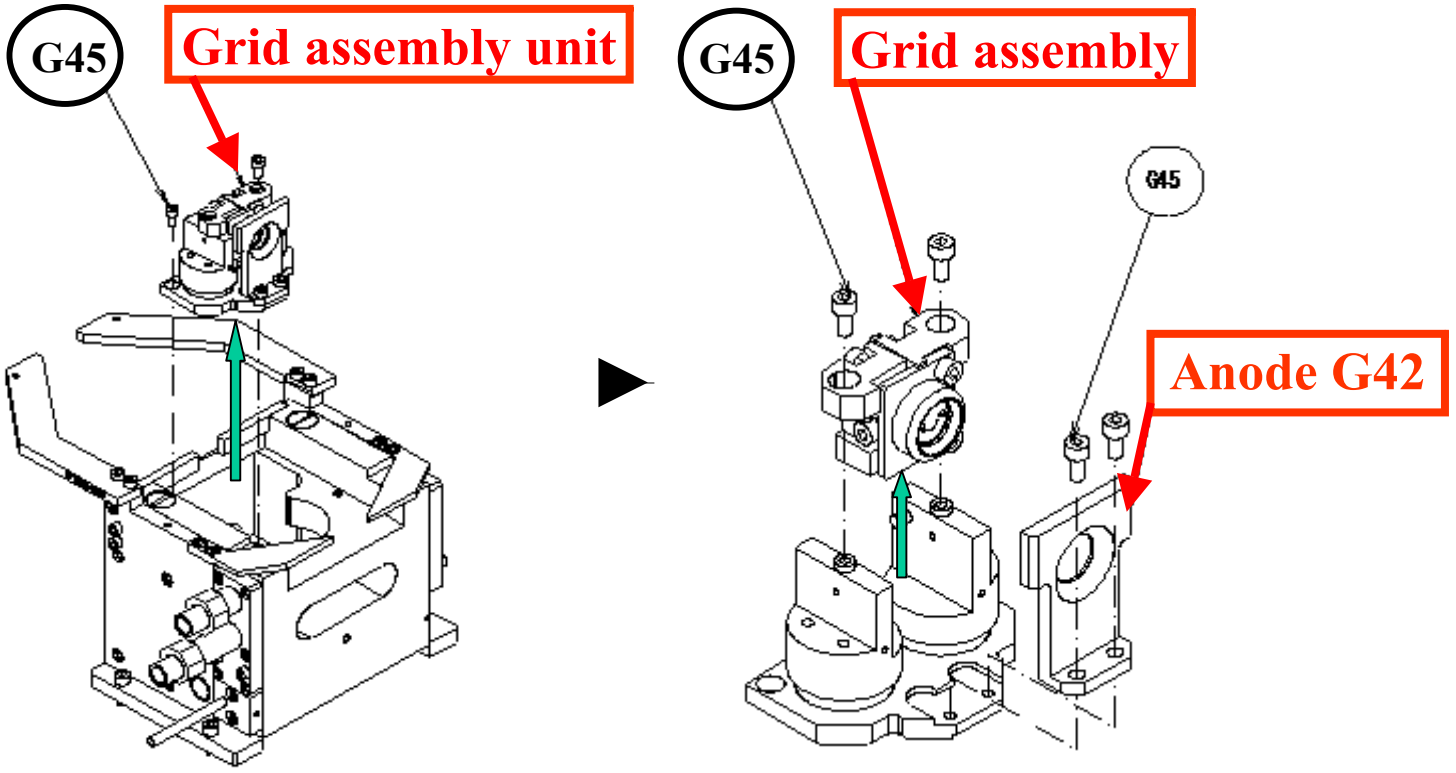
*Get the dirt out of the plate (G43) with a sand paper or scotch bright



(3) Points of the maintenance (Other maintenance)

4-a. Disassembly and the cleaning of the grid assembly unit

6. Remove the screw bolts (G45) and draw out the grid assembly unit
7. Remove the grid assembly and the anode (G42)



(3) Points of the maintenance (Other maintenance)

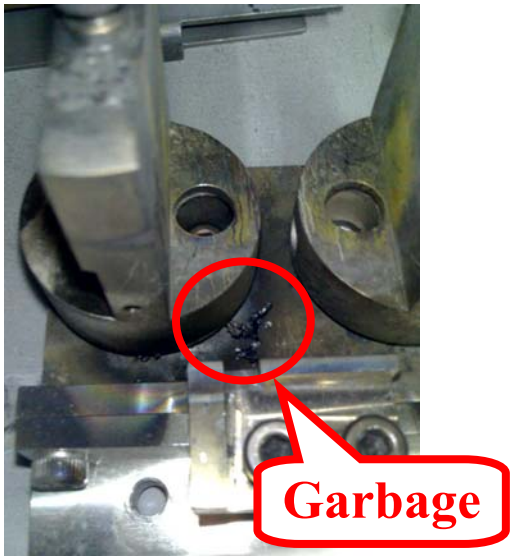
4-a. Disassembly and the cleaning of the grid assembly unit

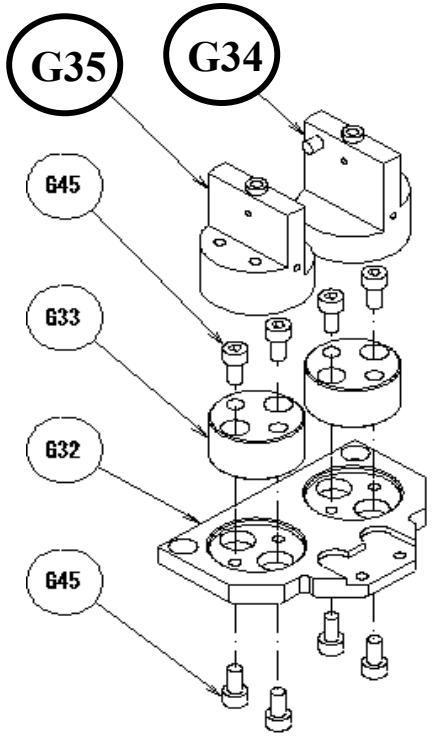
8. Remove the holders (G34･G35) and clean it

*Get the dirt out of the sand paper or scotch bright

*Clean the garbage which accumulated under a holder

Defectiveness example



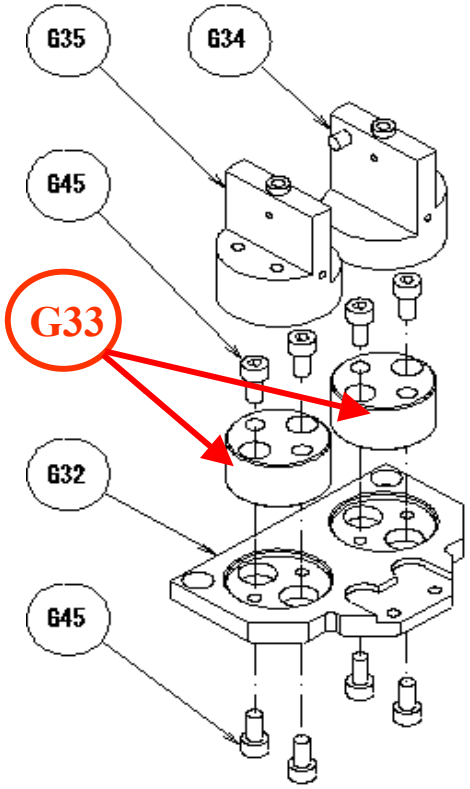


(3) Points of the maintenance (Other maintenance)

4-a. Disassembly and the cleaning of the grid assembly unit

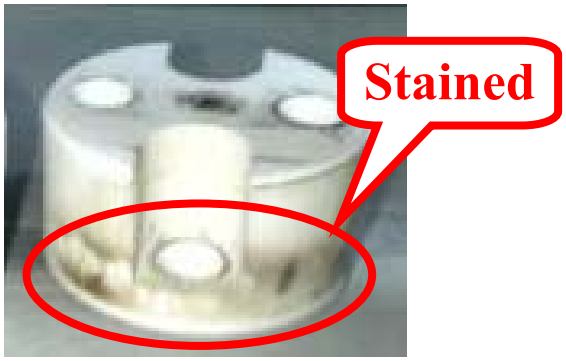
9. Remove the insulator (G33) and clean it becomes the white

*The holder position is determined by the upper and lower planes of the insulator (G33). If the position cannot be determined due to the wear, replace the insulator with a new one



Right

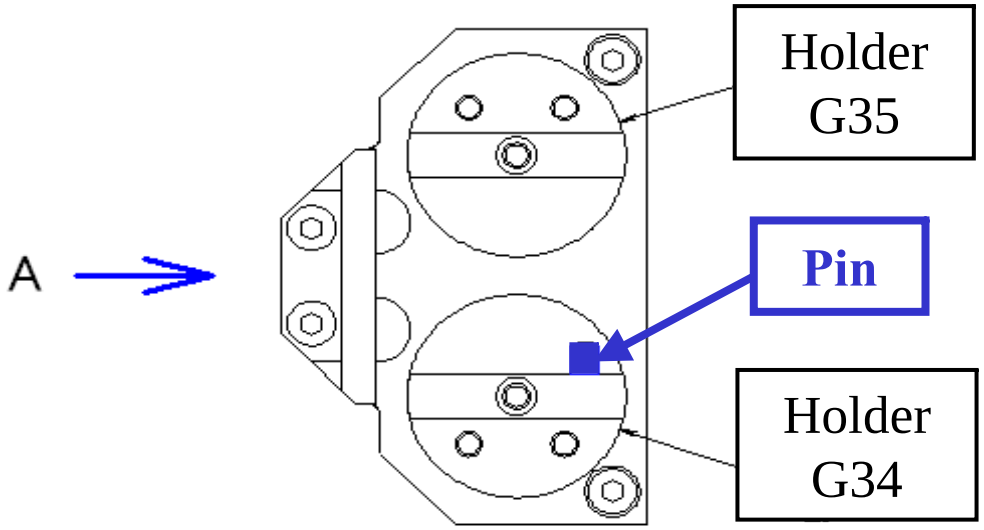
Wrong



(3) Points of the maintenance (Other maintenance)

4-b. Attention the grid assembly unit assembling

- After the cleaning, assemble the unit with the reverse order of the steps for disassembling
- When you fix the holders (G34・G35) to the base (G32), be careful that you should distinguish between left and right holders.
  When you look at the holders from the direction A, the pin should be located in the right side



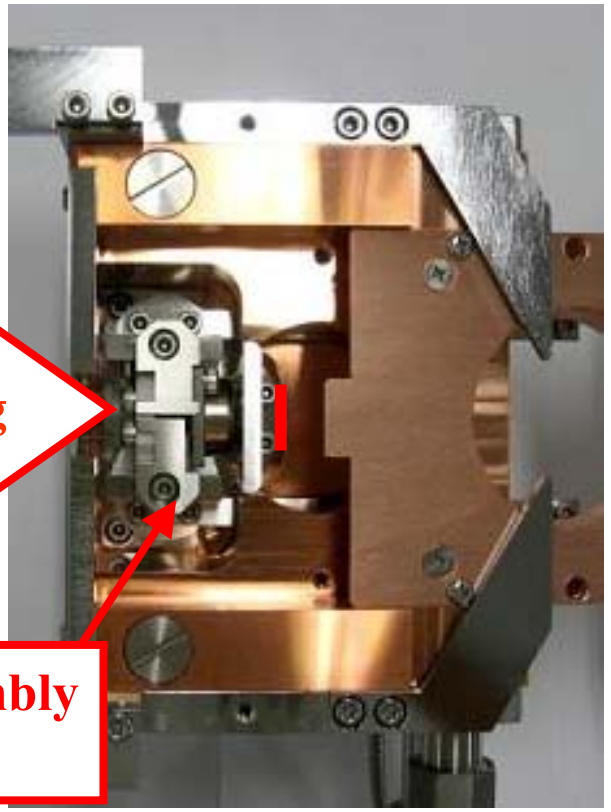
(3) Points of the maintenance (Other maintenance)

4-b. Attention the grid assembly unit assembling

・When you mount the grid assembly unit to the main body, fit it to the groove of the main body and fix by pushing it to the arrow direction as shown below

*To mount the unit to the main body, be careful not to suck in the dust

pushing this aspect

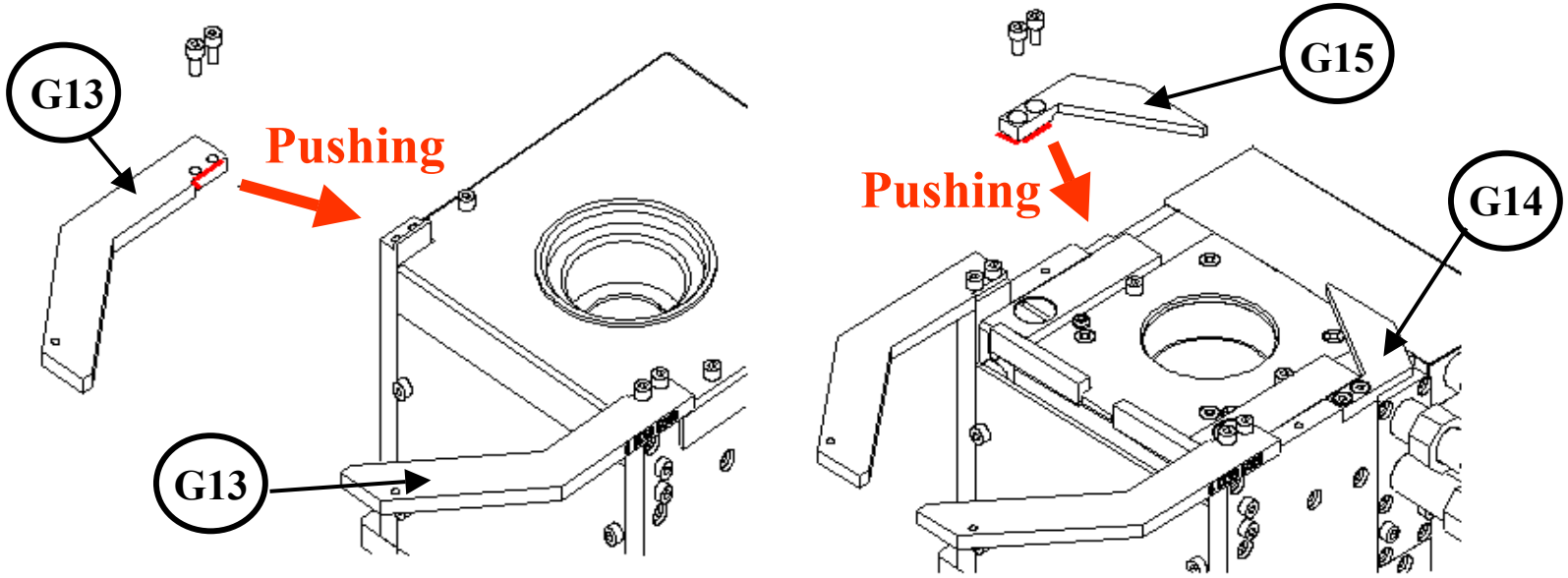


(3) Points of the maintenance (Other maintenance)

5. Maintenance for the pole piece

- When you clean the electron gun, clean the pole peace (G13・G14・G15) too
- When you assemble the pole piece, make sure to check the parallel along the standard (red lines shown below)

*If not fixed in parallel, beam position or shape will fluctuate

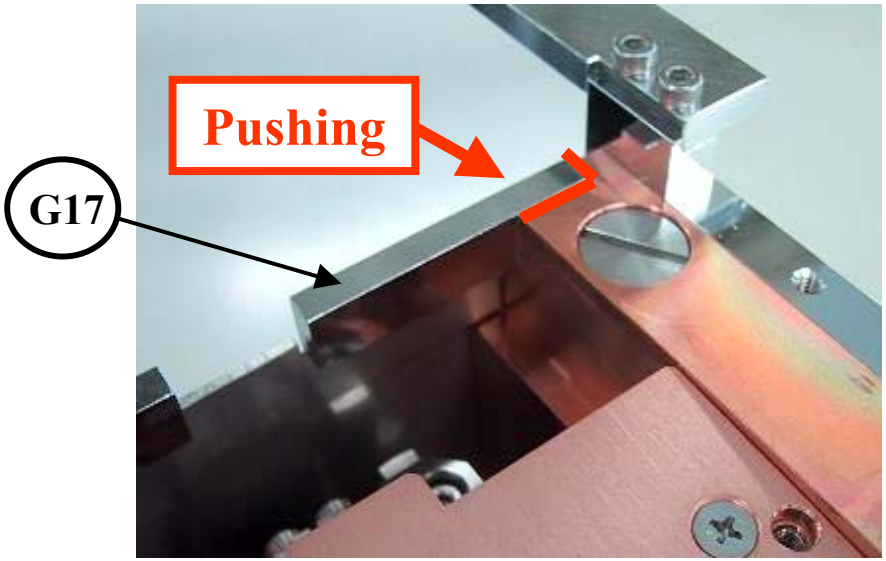


(3) Points of the maintenance (Other maintenance)

5. Maintenance for the pole piece

- When you clean the electron gun, clean the pole peace (G17) too
- When you assemble the pole piece, make sure to check the parallel along the standard (red lines shown below)

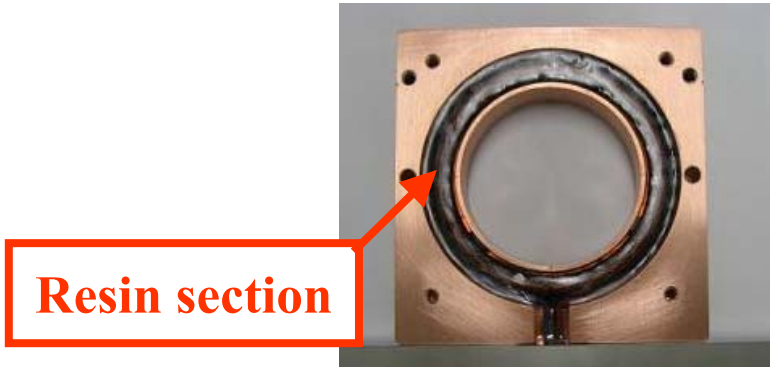
*If not fixed in parallel, beam position or shape will fluctuate

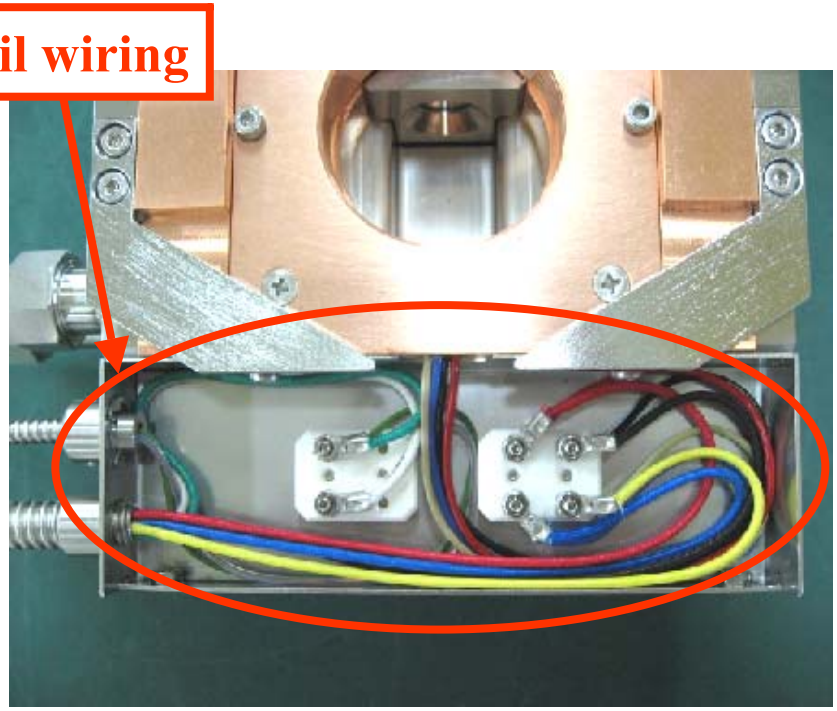


(3) Points of the maintenance (Other maintenance)

6. Maintenance for the coil

- Give a check that coil lead wires are not broken or damaged
  If damaged, insulate it with a heat-resistant tape
- Give a check that wiring inside the terminal box is not loose
- Clean the evaporation dust which invaded in the inside of the coil
- If resin section of coil is cracked, it is not problem to the function





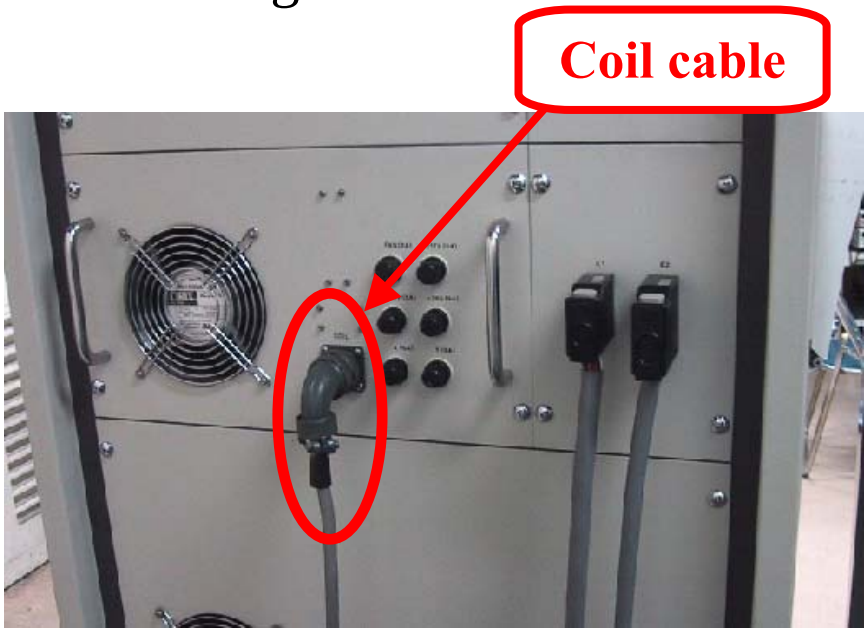
(3) Points of the maintenance (Other maintenance)

6. Maintenance for the coil

- After the maintenance of the coil, measure the resistance figures and check the coil is wired properly
- Remove the "Coil" cable located in the rear of EB-Gun power supply and measure the resistance figures

a. Coil connector resistance

b. Grounding resistance

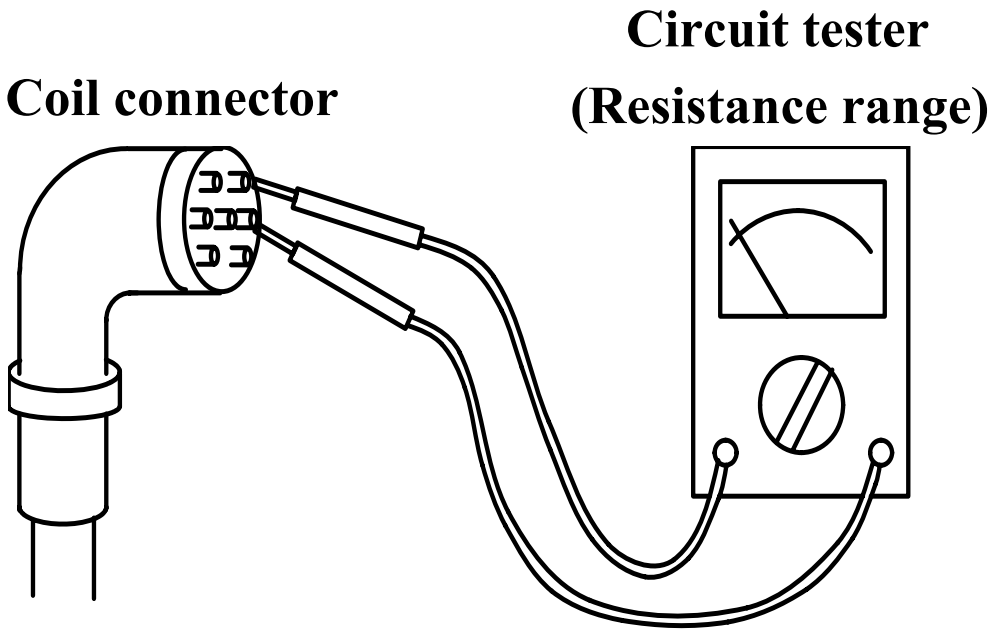


(3) Points of the maintenance (Other maintenance)

6. Maintenance for the coil

a. How to measure coil connector resistance

Connect a circuit tester between the pins of removed coil connector and measure the resistance as shown below



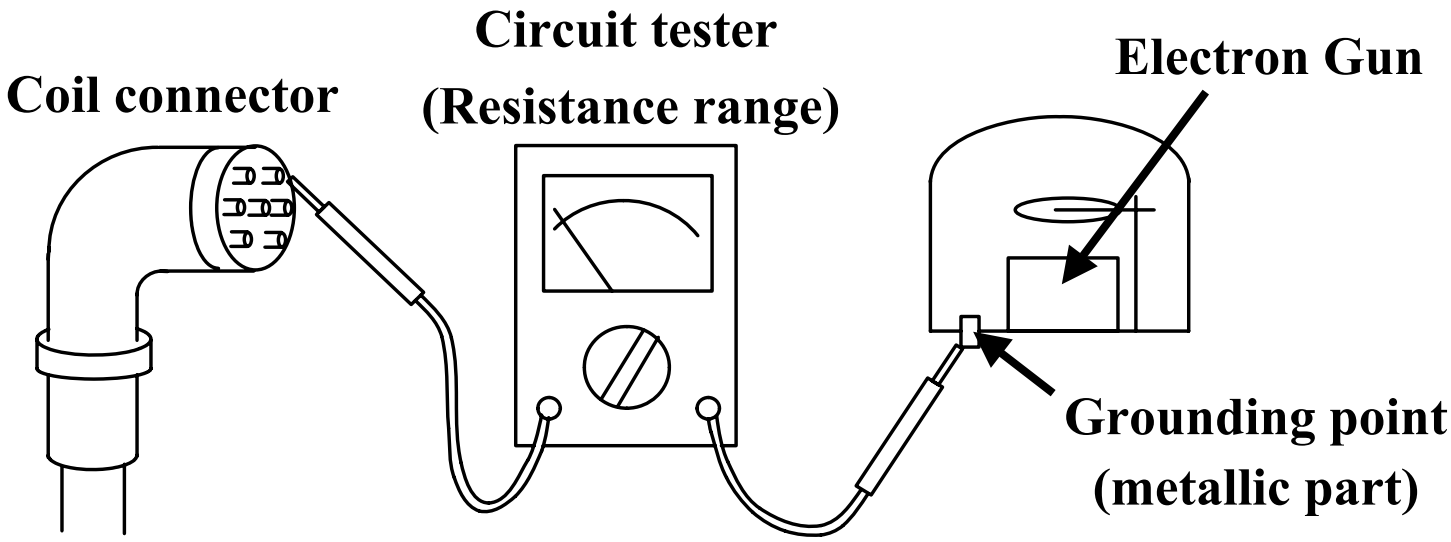
Connector between	Resistor value (Normal)
A and B	6.0 to 7.5 Ω
B and C	Infinite (Not conductive)
C and D	0.5 to 1.5 Ω
D and E	Infinite (Not conductive)
E and F	0.5 to 1.5 Ω
F and A	Infinite (Not conductive)

(3) Points of the maintenance (Other maintenance)

6. Maintenance for the coil

b. How to measure grounding resistance

Connect a circuit tester between a pin of the disconnected coil connector and grounding of the chamber, and measure the resistance as shown

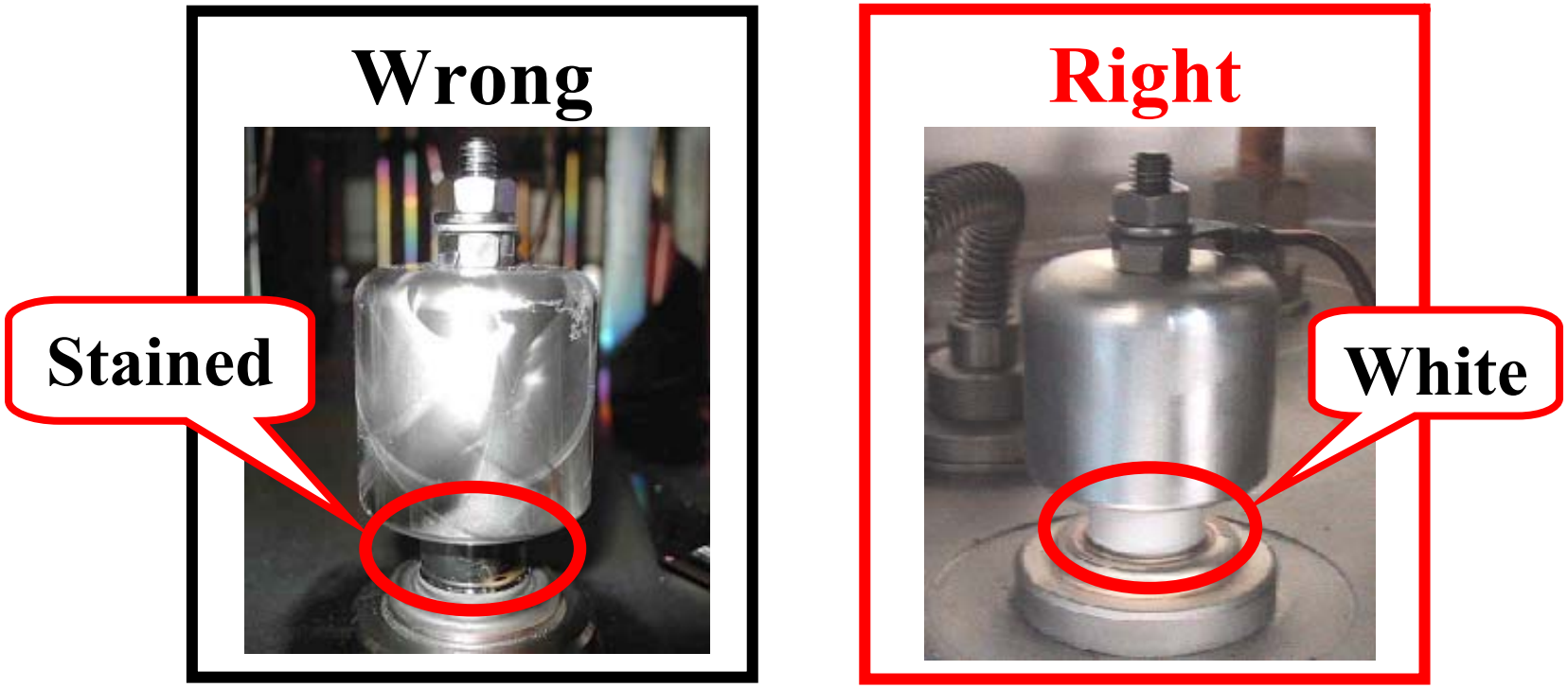


All normal resistances should be infinite (no conduction)

(3) Points of the maintenance (Other maintenance)

7. Maintenance for the High voltage part

- Clean the insulator of H.V terminal and aluminum cap if they are stained (Insulator should be white colored)

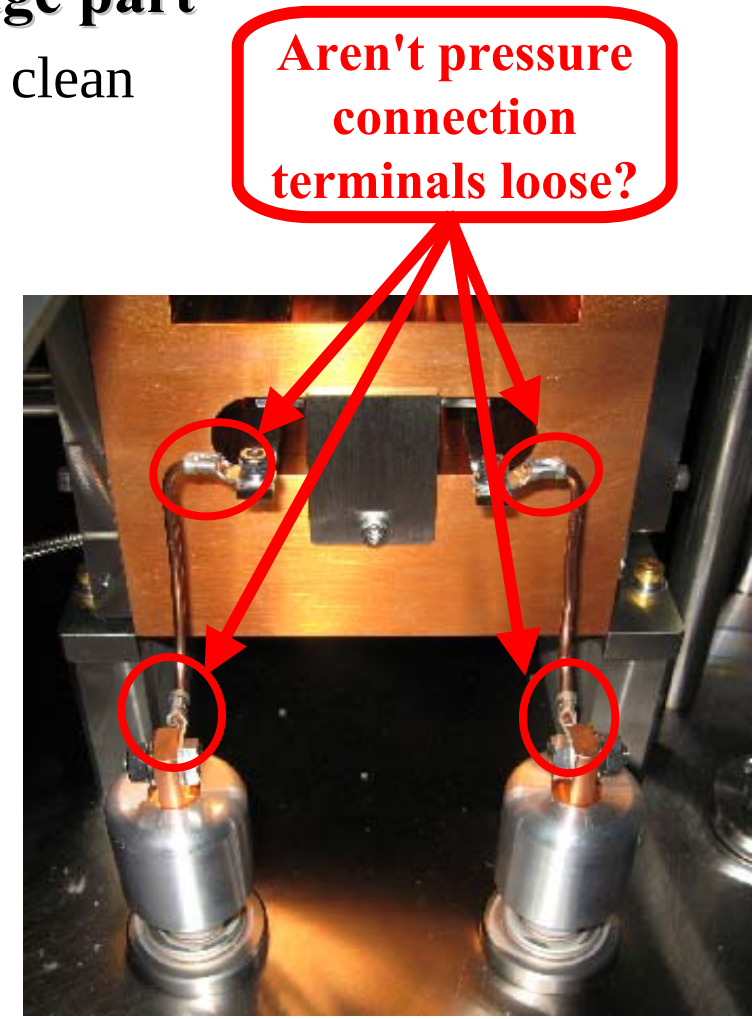


(3) Points of the maintenance (Other maintenance)

7. Maintenance for the High voltage part

- Clean the copper wire whenever you clean the electron gun
- When you clean it, give a check that the pressure connection terminals are not loose. If they are loose, replace them with new ones

*Replace the pressure connection terminals with new ones every year



(3) Points of the maintenance (Other maintenance)

7. Maintenance for the High voltage part

- Use 2 screw wrenches to put on and take off screw nuts of H.V terminal

*If you use only one wrench for nut, insulator of H.V terminal will be overloaded and it will risk the damage or weld crack to the insulator