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MACHINE TOOL

I N D E X

CHAPTER 1	SPECIFICATIONS	3
1-1	Machine	
1-2	Power supply	
1-3	Dielectric tank	
1-4	Standard accessories	
1-5	Optional accessories	
CHAPTER 2	UNPACKING	5
CHAPTER 3	TRANSPORTATION	6
CHAPTER 4	OPERATION SITE	8
4-1	Operating site	
4-2	Machine installation diagram	
4-3	Appointments required	
4-4	Horizontal adjustment	
4-5	Degreasing	
CHAPTER 5	INSTALLATION.....	10
5-1	Dielectric	
5-2	Power supply unit connections	

CHAPTER 6 BRINGING MACHINE ON LINE **14**

6-1 Dielectric circuit

CHAPTER 7 DIELECTRIC CIRCULATION INSTRUCTION **14**

CHAPTER 8 MACHINE OPERATION **16**

8-1 Up-Down movement of workhead

8-2 X-Y Movement of work table

8-3 Work tank

8-4 Machine start

8-5 Edge finder

8-6 System 3R-Accessories for standard EDMing

8-7 Electrical centering

8-8 Depth stop

8-9 Closing work tank door

8-10 Flushing

8-11 Setting control panel

CHAPTER 9 MAINTENANCE CLEANING & LUBRICATION **26**

9-1 Fluid level check

9-2 Lubrication

9-3 Cleaning

1. SPECIFICATIONS

1-1 Machine

TECHNICAL DATA	-M30E	M50E
Work tank dimension	700x435x230 mm	850x500x300 mm
Table dimension	460x280 mm	600x350 mm
X-travel and setting accuracy	250 mm/ 0.01 mm	300 mm/ 0.01mm
Y-travel and setting accuracy	200 mm/ 0.01 mm	200 mm/ 0.01 mm
Z-travel servo controlled and setting accuracy	200 mm/ 0.005 mm	200 mm/ 0.005 mm
Backslide travel and setting accuracy	200 mm/ 0.01 mm	200 mm/ 0.01 mm
Maximum table-quill distance	400 mm	550 mm
Maximum electrode weight	30 KGS	50 KGS
Maximum table loading	300 KGS	500 KGS

1-2 Power supply

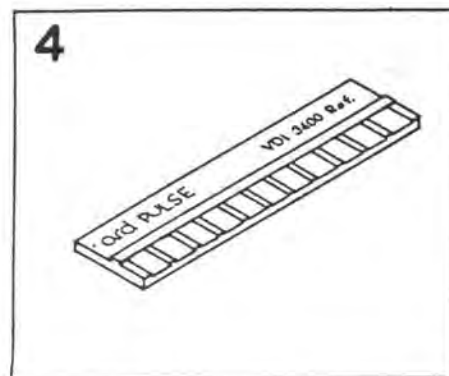
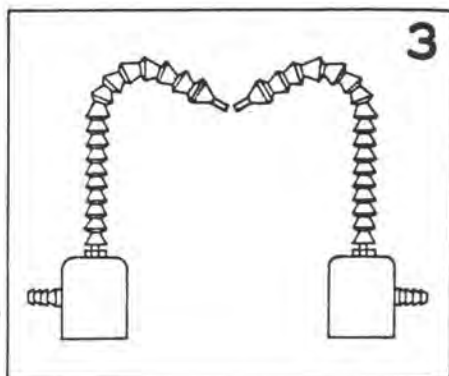
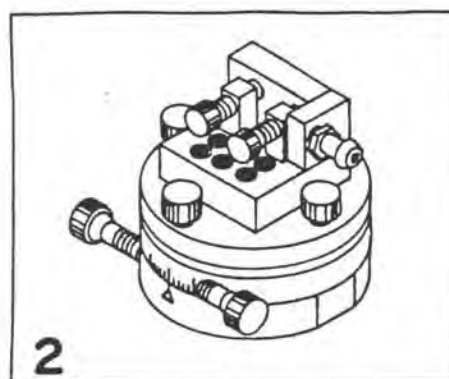
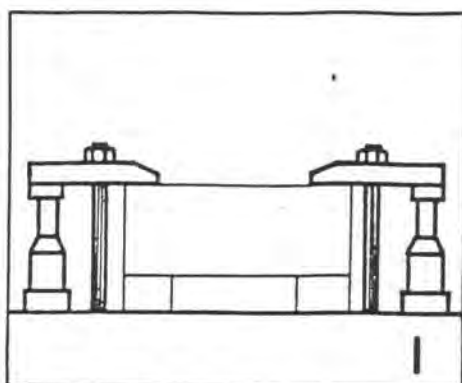
TECHNICAL DATA	M30	M50
Nominal current	30 A	45 A
Connected rating	4 KVA	5.5 KVA
Input voltage	220/380/440 V	220/380/440 V
Max. stock removal rate	200 mm ³ /min	300 mm ³ /min
Best surface roughness	Ra 0.33 μ m	Ra 0.33 μ m
Best electrode wearing rate	0.2%	0.2%

1-3 Dielectric tank

TECHNICAL DATA	M30E	M50E
Capacity	200 litre	300 litre
Filters	3 pcs.	4 pcs.

1-4 STANDARD ACCESSORIES

- | | |
|--------------------------|---------|
| 1. Work piece clamp | one set |
| 2. Magnetic flushing set | two pcs |
| 3. Electrode holder | one pc |
| 4. Surface Finish Scale | one pc |



1-5 OPTIONAL ACCESSORIES

1. Dielectric cooling
2. Permanent magnetic chuck
3. System 3R toolings
4. Erowa ITS tooling system



gsd

5. INSTALLATION

5-1 DIELECTRIC TANK

1. Using the supplies hose connect the working tank and the Dielectric tank. (Fig.1)

2. Add dielectric fluid to the filter tank. The capacity is about:

Model M30E 200 Liters (52 US Gallons)

Model M50E 300 Liters (79 US Gallons)

3. The following dielectric fluids are recommended, though others of equivalent may be used.

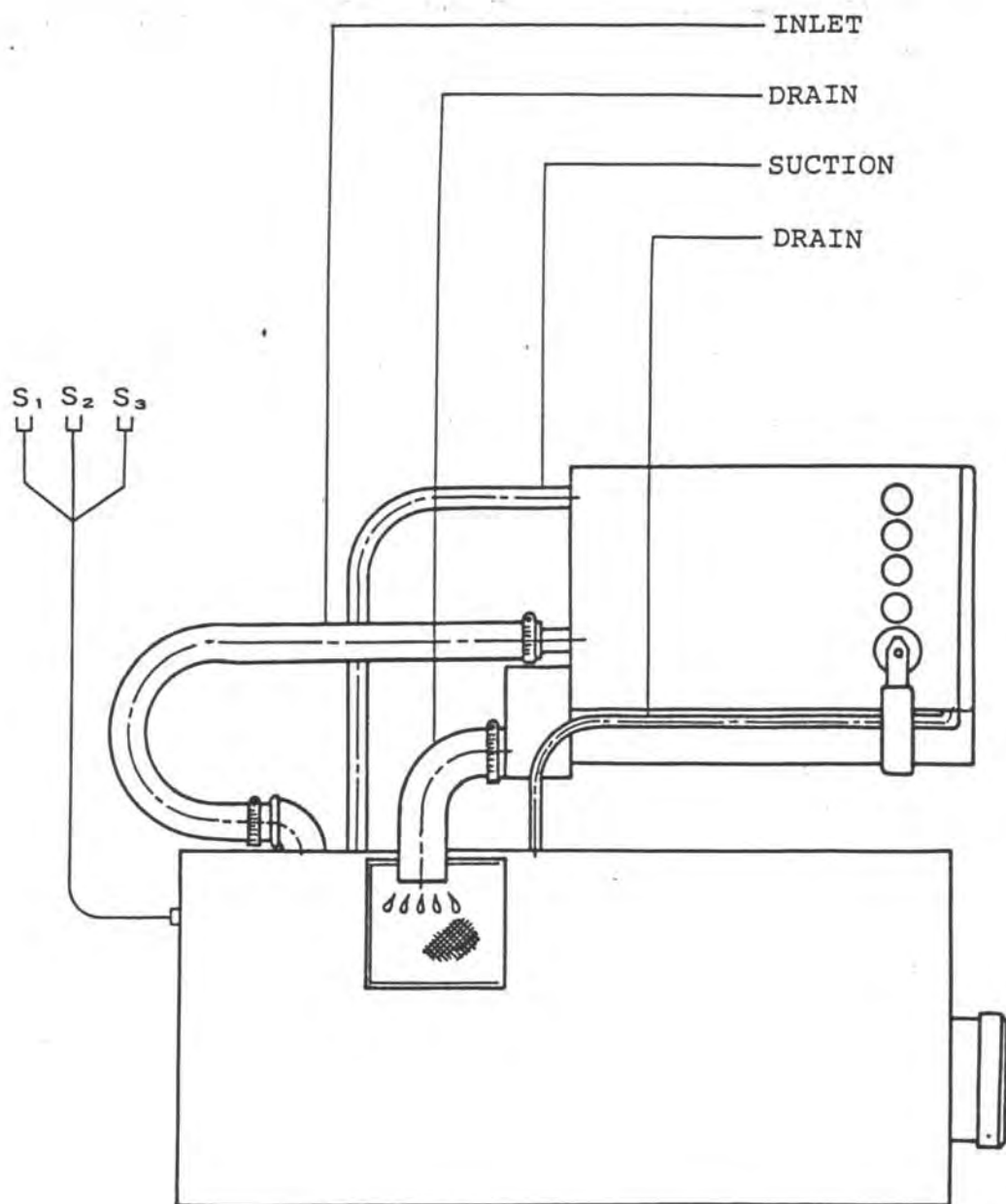
CPCKEROSENE

CHEVRONEDM 71

CASTROLHONILO - 401 / ALMACUT 400

ESSOMENTOR - 28 / BAYOL 35

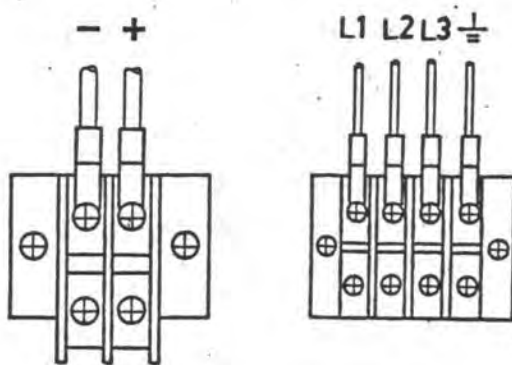
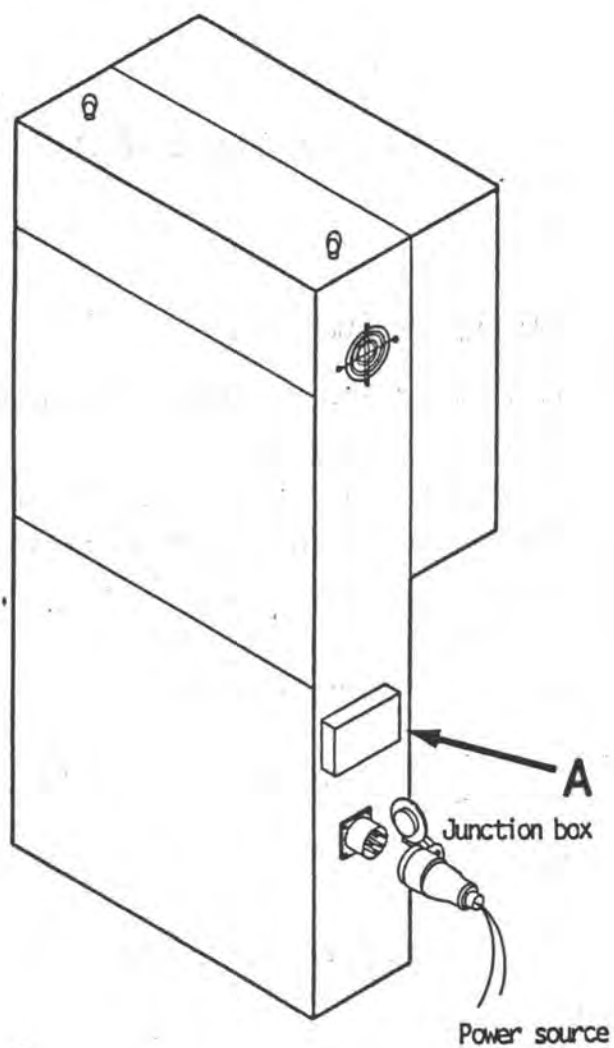
4. Connection of the power supply. (Refer to paragraph 5-2)



(Fig. 1)

5-2 CONNECTION OF THE GENERATOR AND MACHINE :

1. Connect "+", "-" polarity pin to the workhead.
2. Connect 4p terminal "L1" , "L2", "L3", " $\frac{1}{\equiv}$ " with control cable of pump.



Detail A

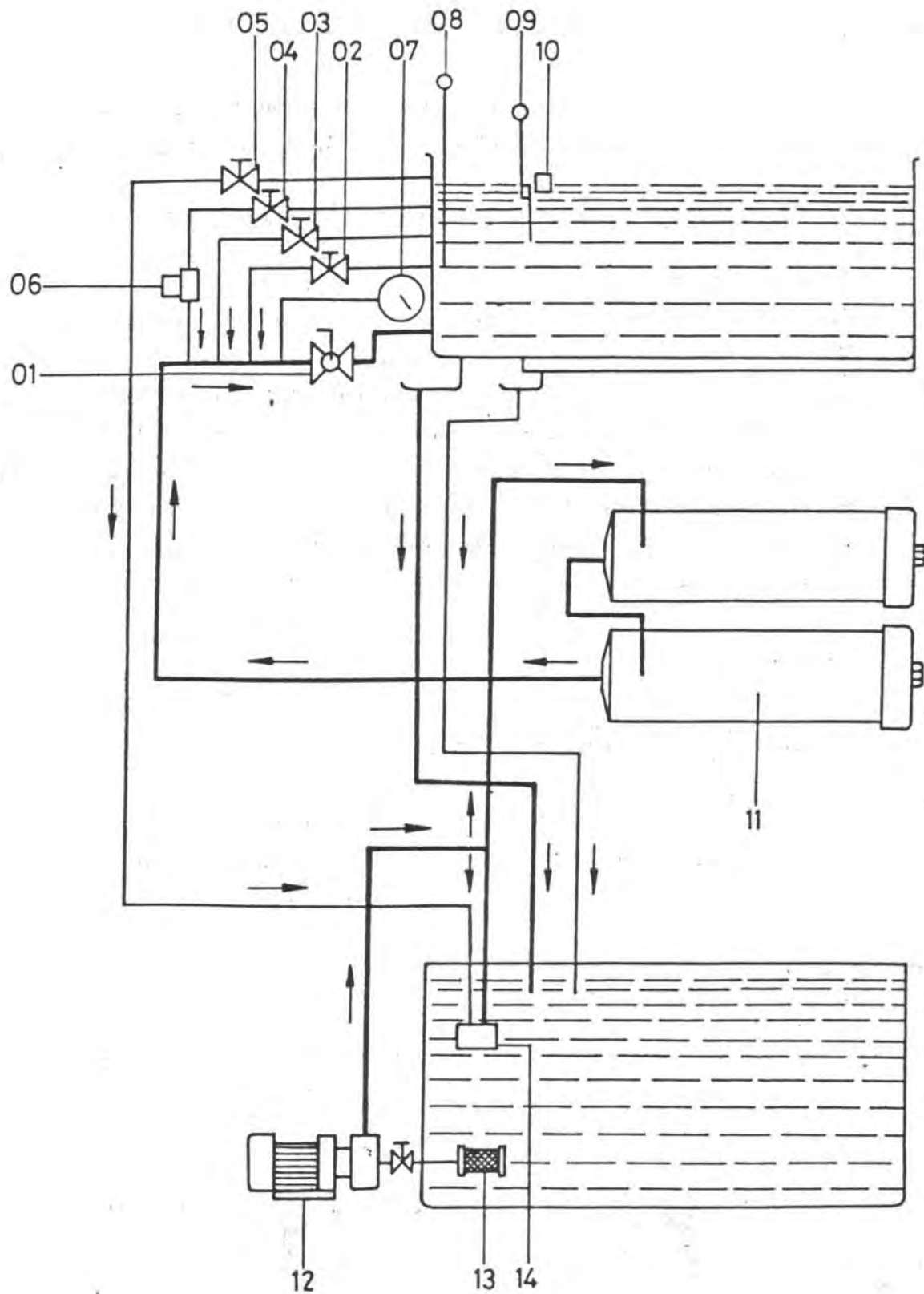
6. BRINGING MACHINE ON LINE

6-1 CHECK THE DIELECTRIC CIRCUIT

1. Close the work tank doors, close the flow cock, close the drain grain gate, open the inlet valve.
2. Turn on mainswitch, push the fluid pump switch on.
3. Ensure inlet pump is rotating in the right direction.
4. Check suction.
5. Check injection.
6. Turn on the synchronous flushing.

7. DIELECTRIC CIRCULATION INSTRUCTION

- | | | |
|------|---|--------------------------------------|
| 01 - |  | Work tank inlet valve. |
| 02 - |  | Continuous injection cock. |
| 03 - |  | Continuous injection cock. |
| 04 - |  | Synchronous flushing cock. |
| 05 - |  | Suction cock. |
| 06 - | | Synchronous flushing solenoid valve. |
| 07 - | | Pressure gauge. |
| 08 - | | Drain gate. |
| 09 - | | Overflow control gate. |
| 10 - | | Overflow safety protection system. |
| 11 - | | Dual filter system. |
| 12 - | | Circulation pump. |
| 13 - | | First filter. |
| 14 - | | Suction system. |



8-1 UP & DOWN MOVEMENT OF THE WORK HEAD

Push the buttons (as figure 01) to move work head up and down.
Backslide by turning handle wheel on the left side of the column.

8-2 LONGITUDINAL AND TRANSVERSE ADJUSTMENT OF THE WORKING TABLE

Engage transverse adjustment hand wheel locking pin (02).
Then turn hand wheel to achieve desired transverse position.
When position achieve, release band wheel locking pin to prevent accidental change of position. Then engage table lock (03).
For longitudinal adjustment release the longitudinal lock (05) if necessary. Engage hand wheel locking pin (04) in the longitudinal adjustment hand wheel on the right side of the table and turn the wheel until desired longitudinal position is reached, then pull hand wheel locking pin and re-engage longitudinal lock (05).

8-3 WORK TANK

Refer to chapter 7 dielectric Circuit Instructions.

Dielectric fluid level control gate (06).

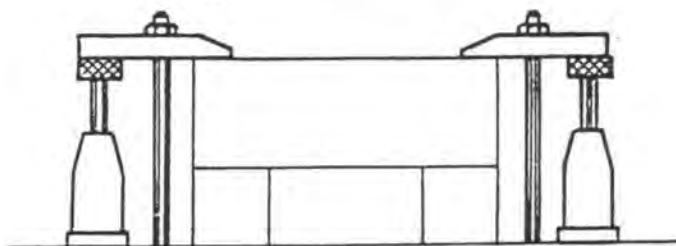
Dielectric fluid drain gate (07).

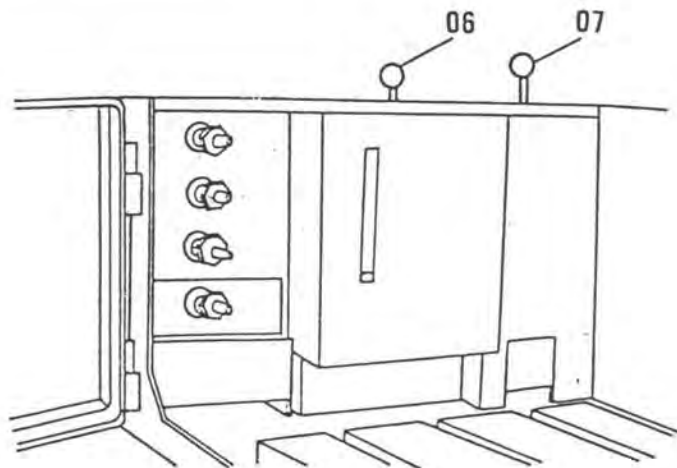
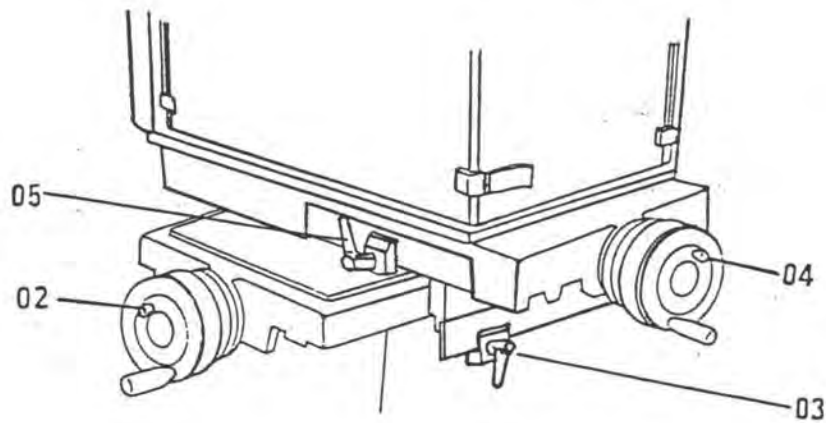
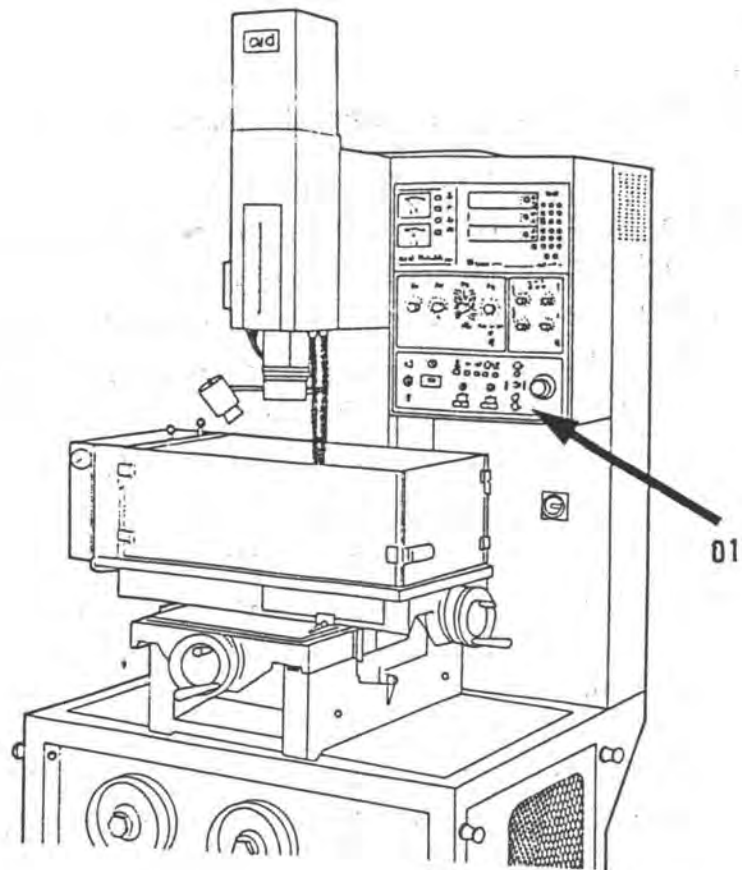
Attention: When spark erosion operation is finished and dielectric tank completely drained, open working tank door to prevent distortion of the door gasket.

8-4. MACHINE START

(A) Clamping work piece on the table

There is a clamp located inside the work tank for the purpose of securing the work piece.





B. Left-right centering of the magnetic chuck (arrow 4).

C. Left-right vertical angle adjustment (Fig.1)

Carefully slide the alignment bar into the magnetic chuck, aligning with left side and rear alignment surfaces.

When alignment bar is in place, turn on magnetic magnetic current-switch (left side of work head) - set up an indicator gauge on the work table such that it's tip touches the alignment bar in the proper manner. Lift and lower the work-head. If properly aligned, the indicator will not move. If there is indicator movement, the knurled screw located on the swivel seat above the magnetic chuck should be turned until the indicator remains steady through out the up-down travel of the alignment bar.

D. Installation of electrode (Fig.2)

Place the electrode in the electrode holder and tighten the locking screw. Follow the Procedures outlined in steps (B) & (C) above to align the electrode with the work piece.

8-5 EDGE FINDER (Refer to page 23, Fig.1)

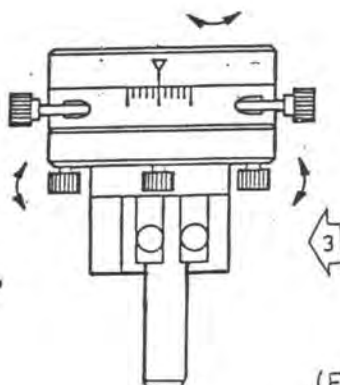
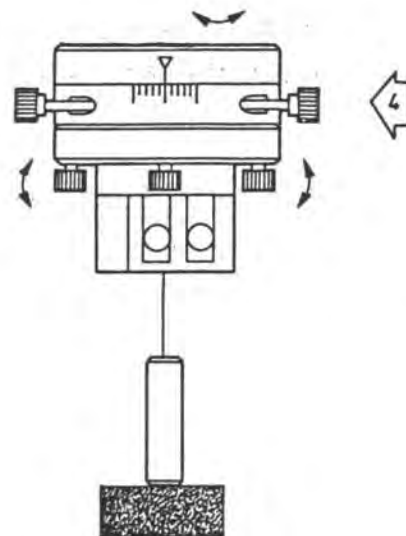
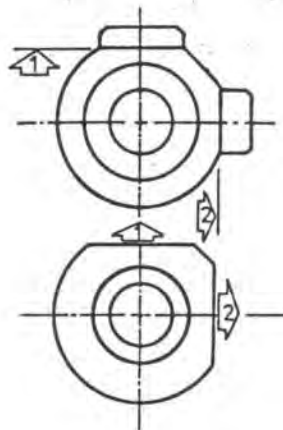
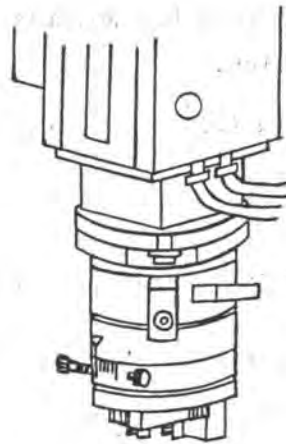
A. Turn on power unit switch and turn AT switch at  position. Turn on buzzer switch.

B. Using the hand wheels, move the work table in the longitudinal and transverse planes such that when the electrode is fully lowered, it will not touch the work piece. Then, using the red push button, lower the electrode to the lowest depth. It will then be possible to use the hand wheels to move the work table, causing the electrode to contact the nearest part of the work piece. You will then hear the horn. Upon hearing the horn, set the digital scale at zero and turn the head head wheel moving the electrode out of contact with the work piece.

Repeat this operation a couple of times to ensure that zero is set accurately.

After setting the first co-ordination, set the other one using the same procedure.

C. Raise the electrode and center it at the desired machining position "L".



(Fig. 2)



(Fig. 1)

8-6 SYSTEM 3R - ACCESSORIES FOR STANDARD EDMING

A. 3R & 7 Electromagnetic Chuck

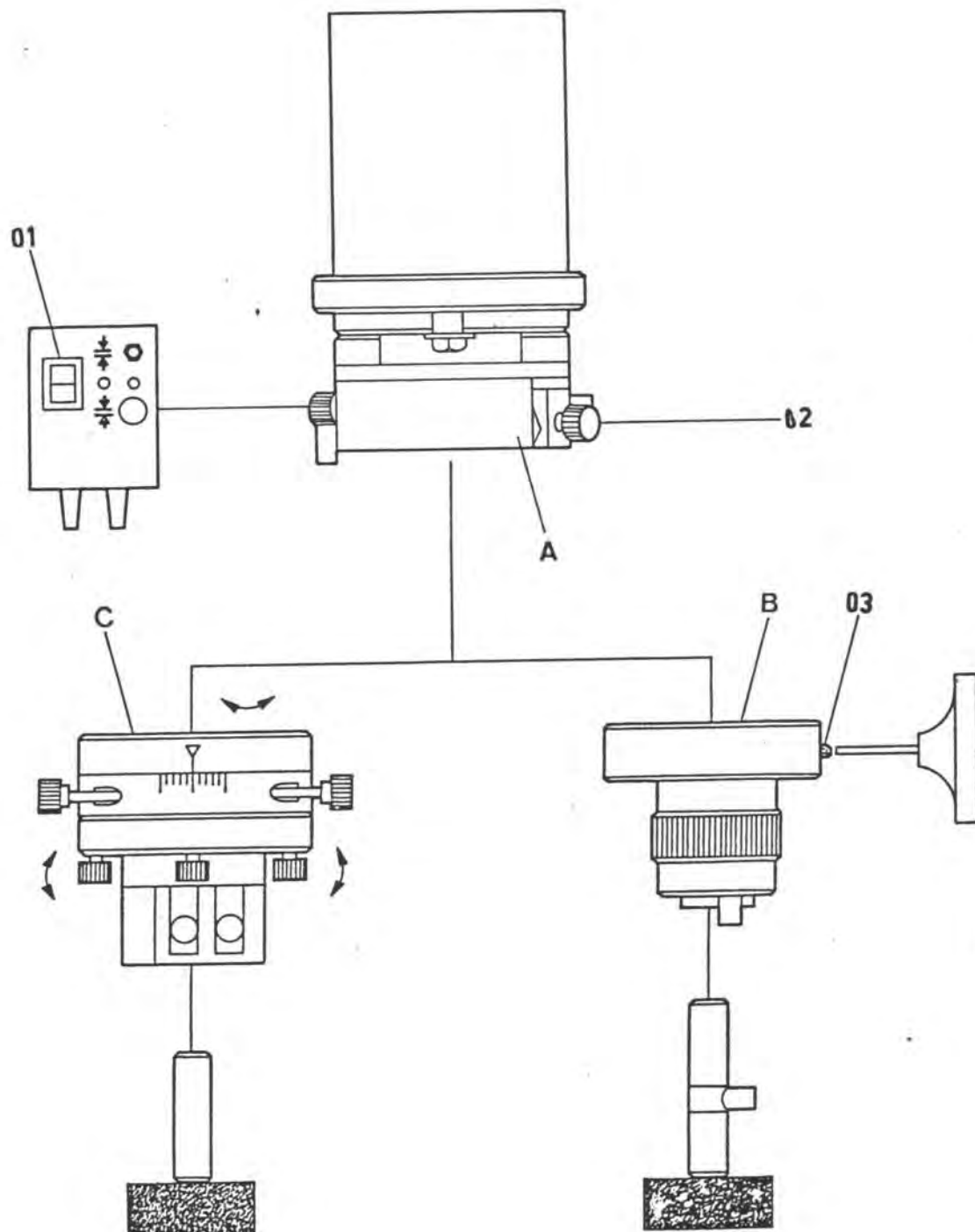
1. The control unit (01) has magnetic and demagnetic controlling function.
2. Locking the screw (02) - To avoid the electrode holder fallen down when power-off.

B. 3R-321-4X90° Hydraulic Quick Clamp Holder (Optional)

1. Mounting 20 ϕ standard electrode holder.
2. Locking the screw (03).

C. ARD K-09

Using on standardless electrode to control the right-left and horizontal adjustment, also can be used with 3R-6 & 7.

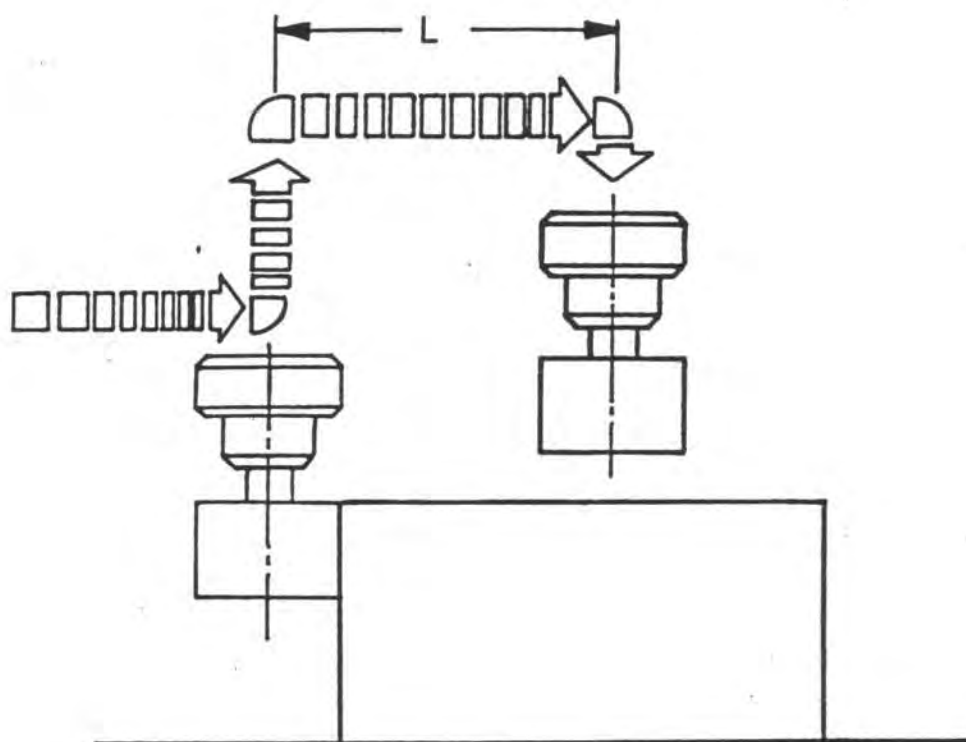


8-7 ELECTRICAL CENTERING

Use the method of finding edge co-ordinates outlined in 8-5 (B) to locate the electrical center position.

8-8 DEPTH STOP

1. Adjust the Z-travel according with Z-axis display of digital readout. Set the maximum Z-travel after turning on the machine.
2. Push on  switch to lower the workhead to approx distance of 5mm above work piece, atop and push on the discharge switch  to approach the work piece.
3. Zeroing the Z-axis value on the digital readout, then enter the desired depth in positive value (for example: 10mm) and turn the discharge switch on to start machining.
4. When the negative signal "-" displays on the Z-axis display, machine will stop automatically.



8-9 CLOSE WORK TANK DOOR (Fig.1)

8-10 Open fluid inlet by moving inlet lever to (Fig.2) horizontal position, Push the controll panel's pump switch on to start the flow of fluid. When fluid submerges the work piece to a depth of approx 20mm, close the fluid inlet. There are 4 flushing modes - refer to technology section (Fig.3)

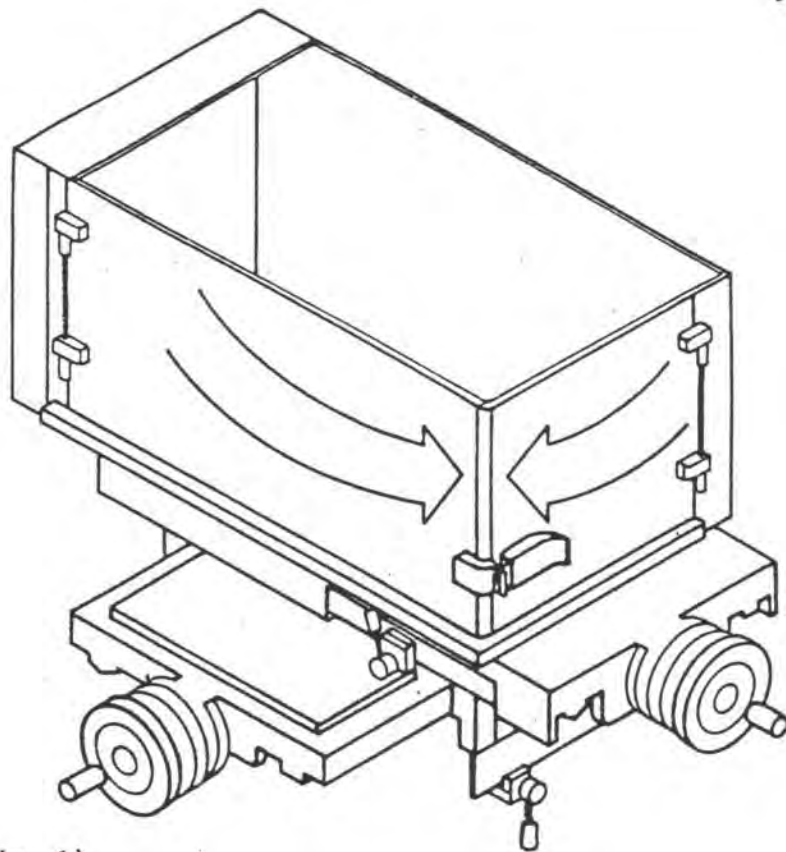
- Suction
- Continuous injection
- Pulsed injection synchronized with pulsation of the electrode.
- Injection and suction combined.

The flush cock controls the flushing action, either strong or weak.

Attention: When machining, the dielectric fluid level must be maintained between 20 and 50mm over the surface of the work piece.

8-11 SETTING THE CONTROL PANEL AFTER FOLLOWING THE PRECEEDING STEPS.

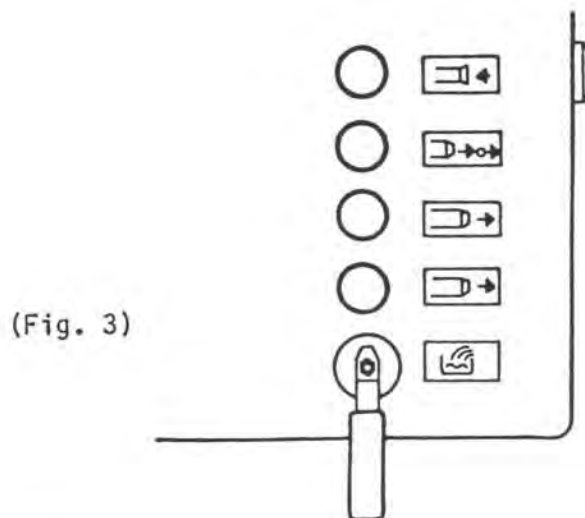
Refer to the POWER SUPPLY CONTROL PANELL INSTRUCTION.



(Fig. 1)



(Fig. 2)



(Fig. 3)

9. MAINTENANCE, CLEANING AND LUBRICATION

- 9-1 Dielectric fluid levels must be checked at least once a month.
(add same type fluid if necessary)

9-2 LUBRICATION (Fig.1)

On the right of column is a 650 c.c. hand operated (pull type) oiler that supplies oil through a duct to the working table guide. If the machine is in daily use, the working surfaces should be lubricated at least once a week to ensure smooth operation. We recommend use of either of the lubrication oils listed below, or their equivalents:

SHELL TONNA OIL 68
GULF GULF 59

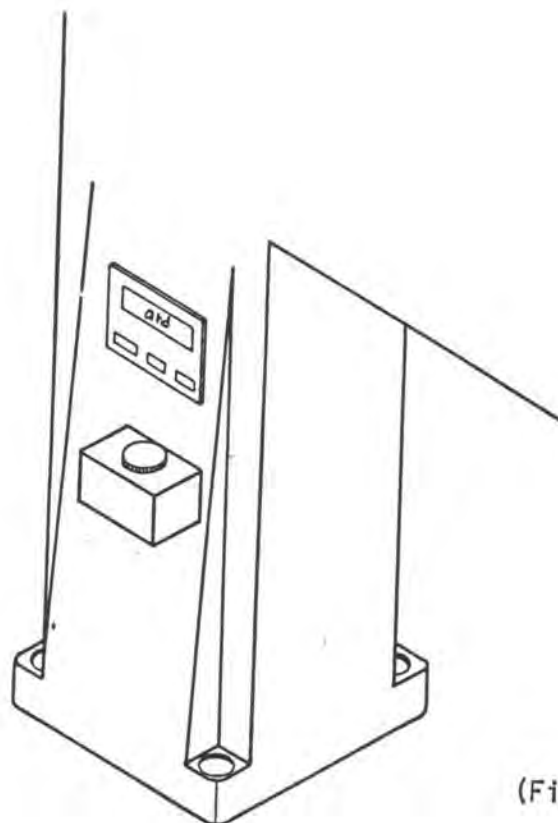
9-3 CLEANING (Fig.2)

Dielectric fluid filters replacement. Between 600-1000 hours of operation, the dielectric fluid filters must be changed. (Operation time of filter may vary, depending on material removal) Follow the following cleaning procedures:

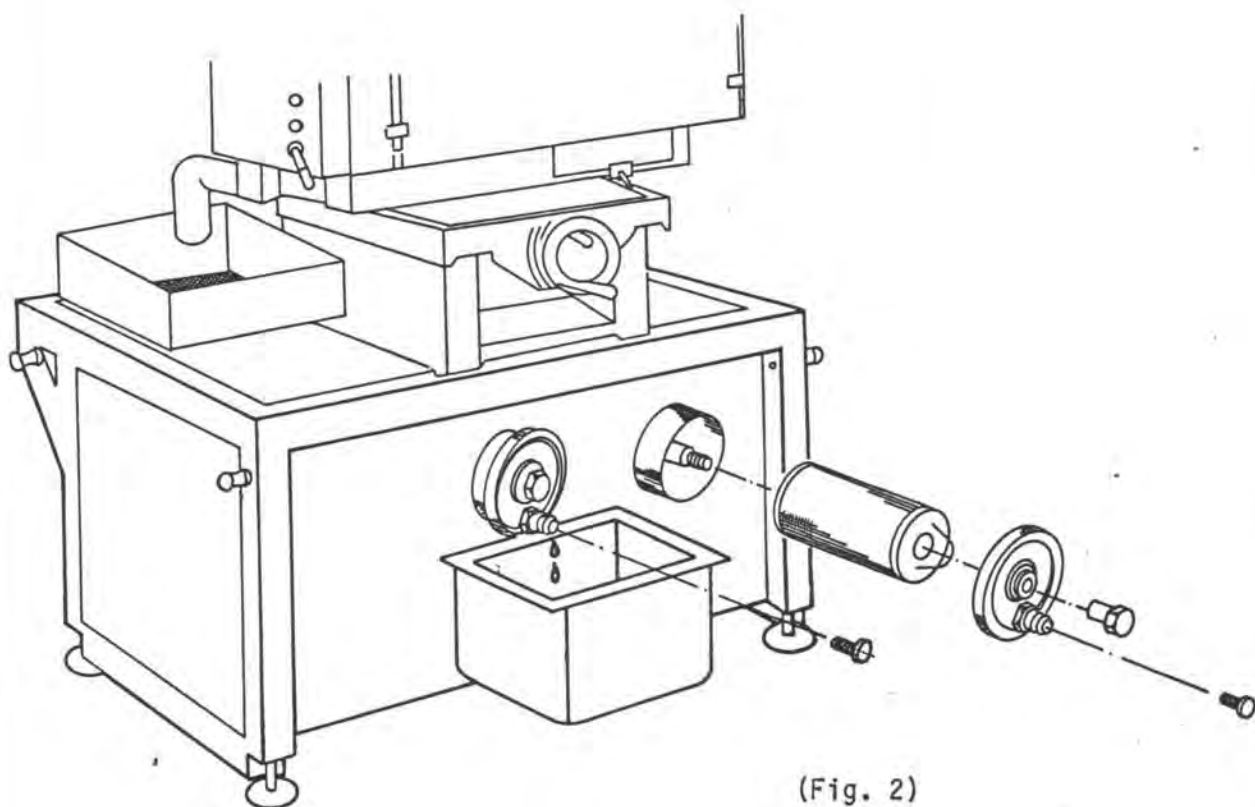
- Place a pail on the floor below the filters. It should be large enough to receive both of filters. Otherwise withdrawal of the filters will cause floor contamination. Unscrew drain plug, and empty fluid in filter cartridge. unscrew the filter cover nuts and remove the covers carefully. (Some fluid stays in cartridge)
Pull out the filters and replace new filters. (Fig.1)

Dielectric replacement:

- Prepare empty drums or tanks sufficient to receive all of the dielectric fluid. Then turn on valve to drain out the fluid.



(Fig. 1)



(Fig. 2)

POWER SUPPLY UNIT

P30
P60 POWER SUPPLY UNIT

CHAPTER 1	ART POWER SUPPLY INTRODUCTION	2
CHAPTER 2	EDM PRINCIPLES AND TECHNOLOGY	3
CHAPTER 3	ELECTRODE MATERIAL	5
3-1	Electrode materials characteristics	
3-2	Electrode methods of production	
CHAPTER 4	EDM APPLICATION	8
CHAPTER 5	M30E,M50E CONTROL PANEL	11
5-1	"BT" high voltage amperage control knob	
5-2	"AT" low voltage amperage control knob	
5-3	"PA" pulse duration knob	
5-4	"PB" interval knob	
5-5	Servo sensitivity adjustment knob	
5-6	Discharge gap adjustment knob	
5-7	Work head vertical movement adjustment knob	
5-8	Option function for bad flushing	
5-9	Indicator lamp	
5-10	Other switches with indicator lamp	
5-11	Other push buttons	
5-12	Buzzer and discharge timer	
5-13	Main switch & Emergency stop	
5-14	Working light operation manual Lighting equipment both for operating and alarming use	
5-15	Against fire alarm system	
CHAPTER 6	P30, P60 APPLICATION NOTE	29
CHAPTER 7	CAUTION FOR SELF-SERVICE	53

1. ART POWER SUPPLY INTRODUCTION

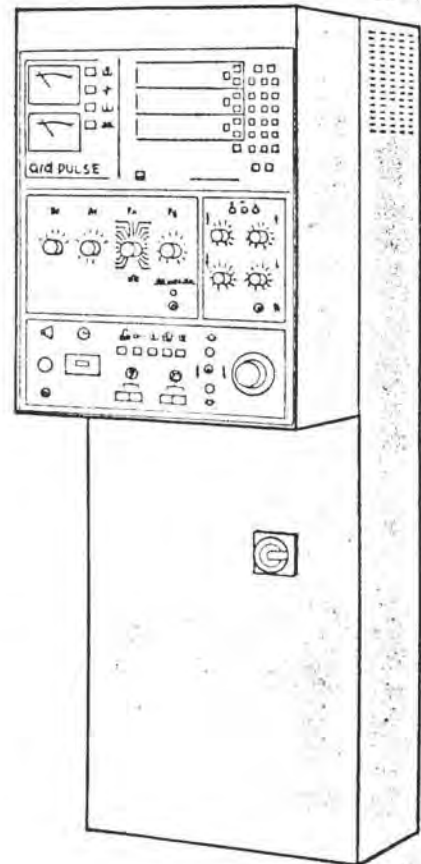
ART is producing two power supply units, the P30 and 45 for machine model M30E/M50E both of which were designed by electronic experts. Using the latest micro processors we have been able to produce machines that feature expanded automatic control and monitor during EDM process that result in much greater efficiency.

There are three voltage selections 90, 160, 230, . Range of current is 1.5A, 3A, 4.5A, 6A, 9A, 12A, 15A, 21A, 30A, 45A.

DURATION 2 Usec 1800 Usec
INTERVAL 2 Usec 900 Usec

The design features an automatic monitoring system and protects against current surges. Transistor is protected against overloads and temperature control. When properly grounded the power supply unit will not produce shocks or other electrical problems. The operation will be safe.

Our EDM is composed of Japanese, American, and European made parts and all are of standard design. Replacement is easy. We employ enhancement quality control methods and test each machine for approx 120 hours before shipping.



2. EDM PRINCIPLES AND TECHNOLOGY

Electrical discharge occurs in a tank filled with dielectric fluid. The object to be cut or machined, is called the work piece. The cutting tool is an electrode. Both are submerged in the dielectric fluid and separated by a very small gap.

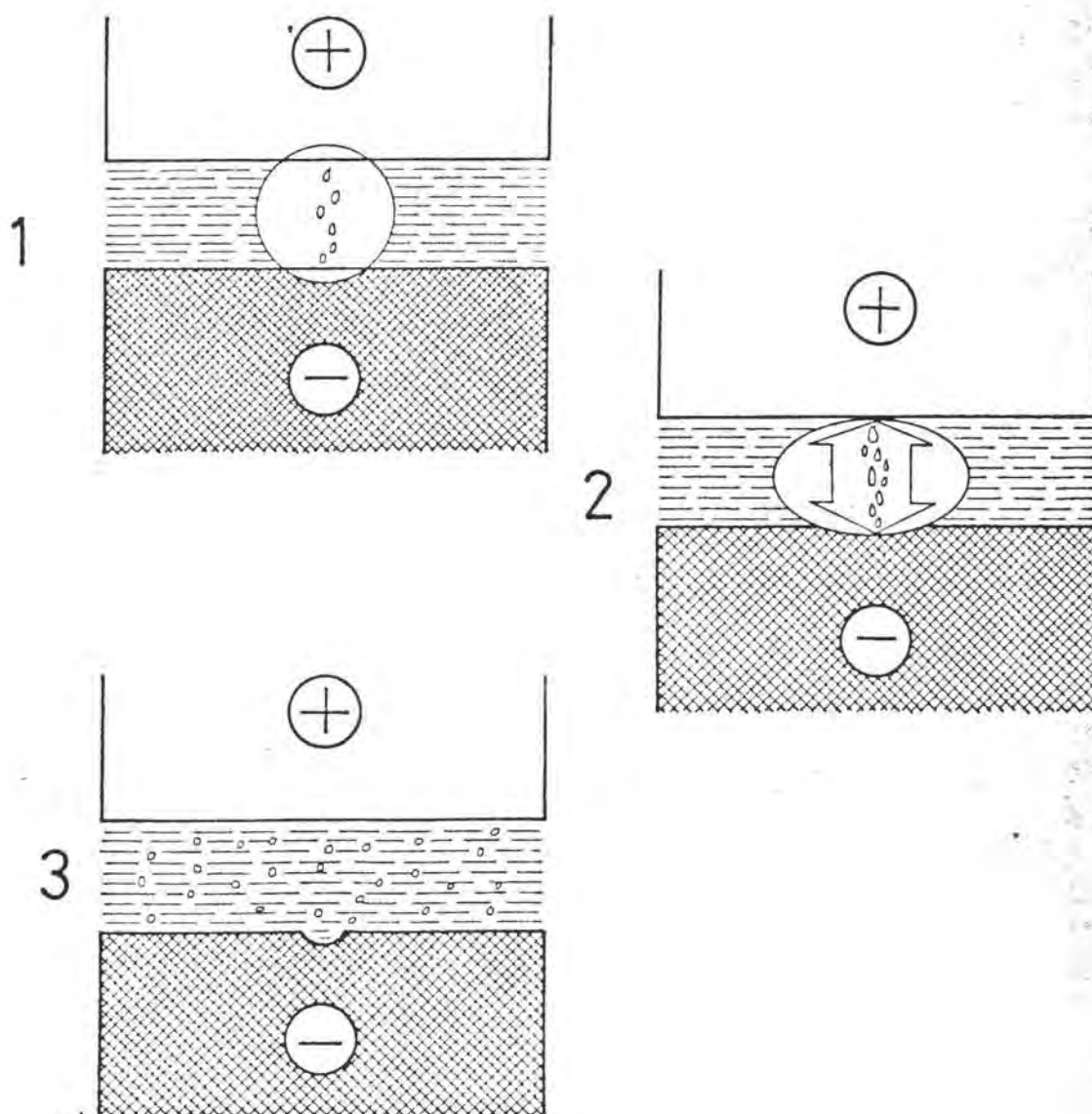
During machining, power flows to the work pieces and the electrode creating a strong electrical potential. Due to the gap between the two and the insulator flooding it, there is no spark or arc, but the servo mechanism continues to reduce the gap until a spark occurs. Actually a period of around one second long is enough for several thousand sparks.

At the point when the spark occurs, the current is converted to heat and the work piece is strongly heated. If the current is interrupted. The discharge channel explosively evaporates, carrying away melted material from the work piece. This leaves a small crater. Should discharge resume the crater will grow removing more and more material. Since there is no contact between cutting tool and work piece and no physical force applied the shape which is cut will exactly match the shape of the electrode.

Now we'll try to understand the physical characteristics of EDM. When voltage is applied to the electrode and the workpiece an electrical field forms as the voltage builds up. Conductive particles present in the fluid collect when the field is strong and form a bridge or discharge channel. At the same time negative particles are emitted from the electrode which impact neutral particles in discharge channel and split forming positive particles. This is called impact ionization. The negative flow toward the positive and the positives flow toward the negative and electrical current is established. Current increases to the maximum, temperature and pressure peak (temperatures are around $10,000^{\circ}\text{C}$) and vapor bubble expands greatly.

When current is interrupted the discharge particles collapse and the vapor bubble evaporates. The dielectric fluid cools the high temperature metal and flushes away the particles. Some graphite and gas is produced as a break down product from the fluid.

Now we understand the principles and physical characteristics of EDN. There are many factors that influence EDM efficiency. For example, polarity selection; matching of amperage and duration. Electrode wear may vary from 0.3% to 99.77% depending on those factors. Careful control of those variables gap, polarity, amperage, duration is essential to be sure of machining at maximum efficiency.



3. ELECTRODE MATERIAL

Theoretically any material which is a good electrical conductor can be used. Materials with the highest melting point and the lowest electrical resistivity are in theory the best. Cost analysis show that in EDM, electrode cost is critical factor so selection of electrode material, the quantity and the method of manufacture are all important and need careful consideration.

Electrode materials can be divided as follows:

- Silver tungsten
- Copper tungsten
- Copper graphites (Combination of metallic and non-metallic materials)
- Chromium copper
- Electrolytic copper
- Graphites (Non-metallic materials)
- Brass
- Aluminium alloy
- Steel

Of all the above, electrolytic copper is the most popular. Silver tungsten, copper tungsten are both quite expensive, so their use is limited to very small high precision parts. After cost, the most important factors in electrode selection are low wear and ease of electrode manufacturing.

Graphite features low electrode wear and high removal rate but due to low density, it breaks easily.

Graphite is best employed when fine finish is not required.

Steel can be used as an electrode but efficiency is lower than copper or graphite. Its most important EDM application is in the machining of split lines plastic mold and die casting dies. In these cases, the upper part of the mold or die is used as the electrode.

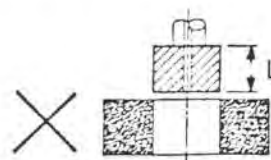
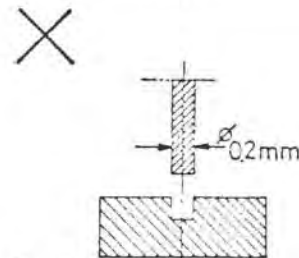
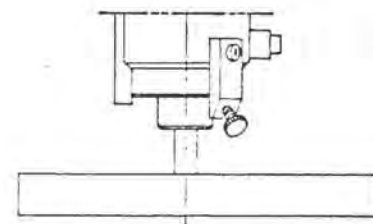
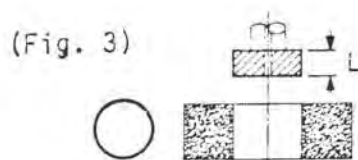
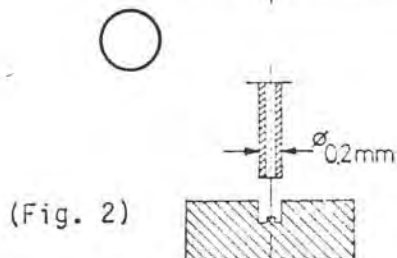
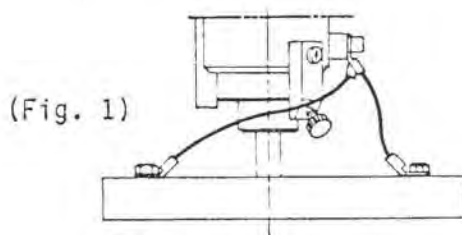
3-1 ELECTRODE MATERIALS CHARACTERISTICS

ELECTRODE MATERIAL	MELTING POINT	RESISTIVITY $\Omega\text{mm}^2/\text{m}$	DENSITY g/m^3
SILVER TUNGSTEN		0.048	0.016
COPPER TUNGSTEN		0.055	0.015
COPPER GRAPHITES		0.04	0.027
CHROMIUM COPPER		0.0236	0.0081
ELECTROLYTIC COPPER	1083	0.0167	0.0089
GRAPHITES	3700	0.085 - 0.015	0.0015 - 0.0018
BRONZE	1060		0.082
STEEL	1539	0.0971	0.0087

3-2 ELECTRODE METHODE OF PRODUCTION

- Traditional machining methods such as turning, milling, shaping, grinding, engravingetc.
- Stamping or conining.
- Extrusion or drawing.
- Galvanic plating.

1. The above methods of production are all suitable. Selection of one depends on electrode material.
In designing an electrode, special attention should be paid to flushing of particles so as to ensure high removal rate.
2. If the electrode shape is very complex or convoluted, it may be produced in two parts.
3. Irregular shapes must be centered on easily measure axis.
4. Long, thin electrodes must be installed with current supplied to the ends as well as the center thereby ensuring even discharge over whole length. (Fig. 1)
5. Small diameter hole require pipe electrode to ensure high efficiency in flushing and draining. (Fig. 2)
6. For through the-hole machining ensure work head electrode is thin. Thick electrodes impede particle discharge. (Fig. 3)



4. EDM APPLICATION

4-1 EDM applications depends on a skilled operator that analyses all the EDM factors to produce high quality work.

- Electrode material
- Workpiece material
- Electrode volume
- Surface roughness
- Spark gap
- Electrode wear
- Removal rate

The above factors are explained in the technology section.

4-2 During sparking (discharge) the gap area must be continuous flushed to clean off particles and residue.

4-3 If flushing and draining of the cavity is not good enough, increase the servo to higher setting. To get fine finish, the vertical movement must be very fast. (pause / work)

4-4 To achieve low or no electrode wear! Start with a low discharge amperage, and as soon as the whole area of electrode contacts the work pieces, increase amperage. This will protect sharp corner or angles.

4-5 To set servo sensitivity bear in mind sensitivity depends on current; when current low, no amplitude but high sensitivity.

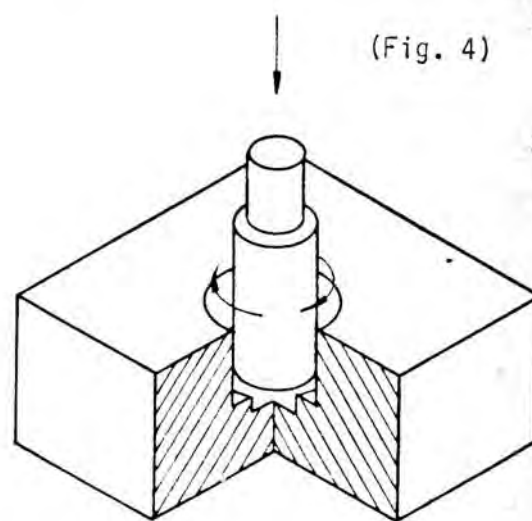
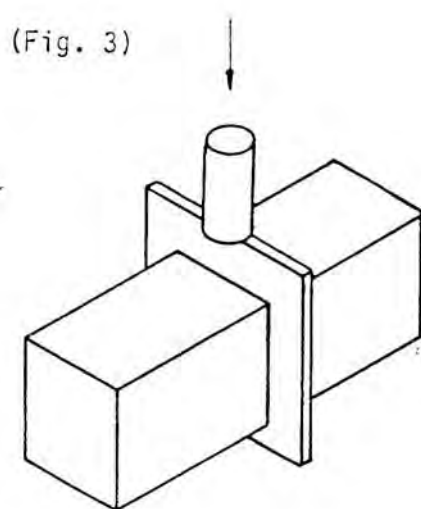
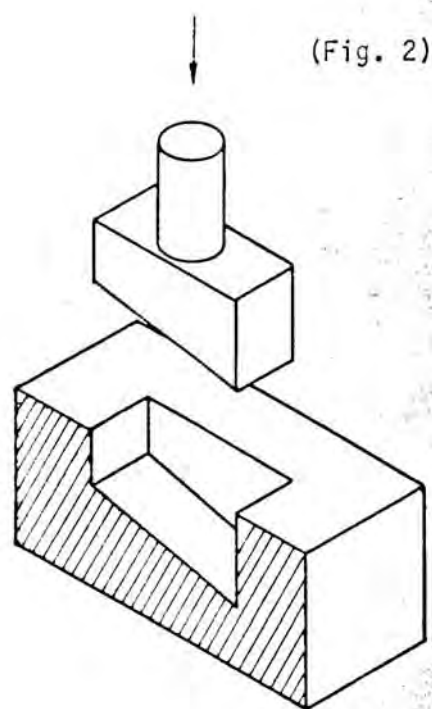
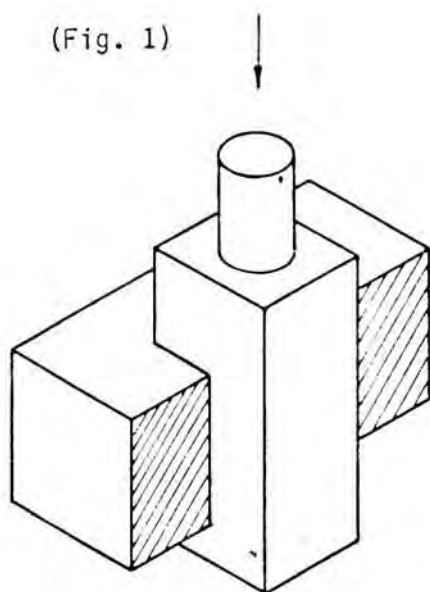
4-6 Know and understand the discharge process.
-- Refer to page 9.

4-7 DISCHARGE OPERATION PROCESS

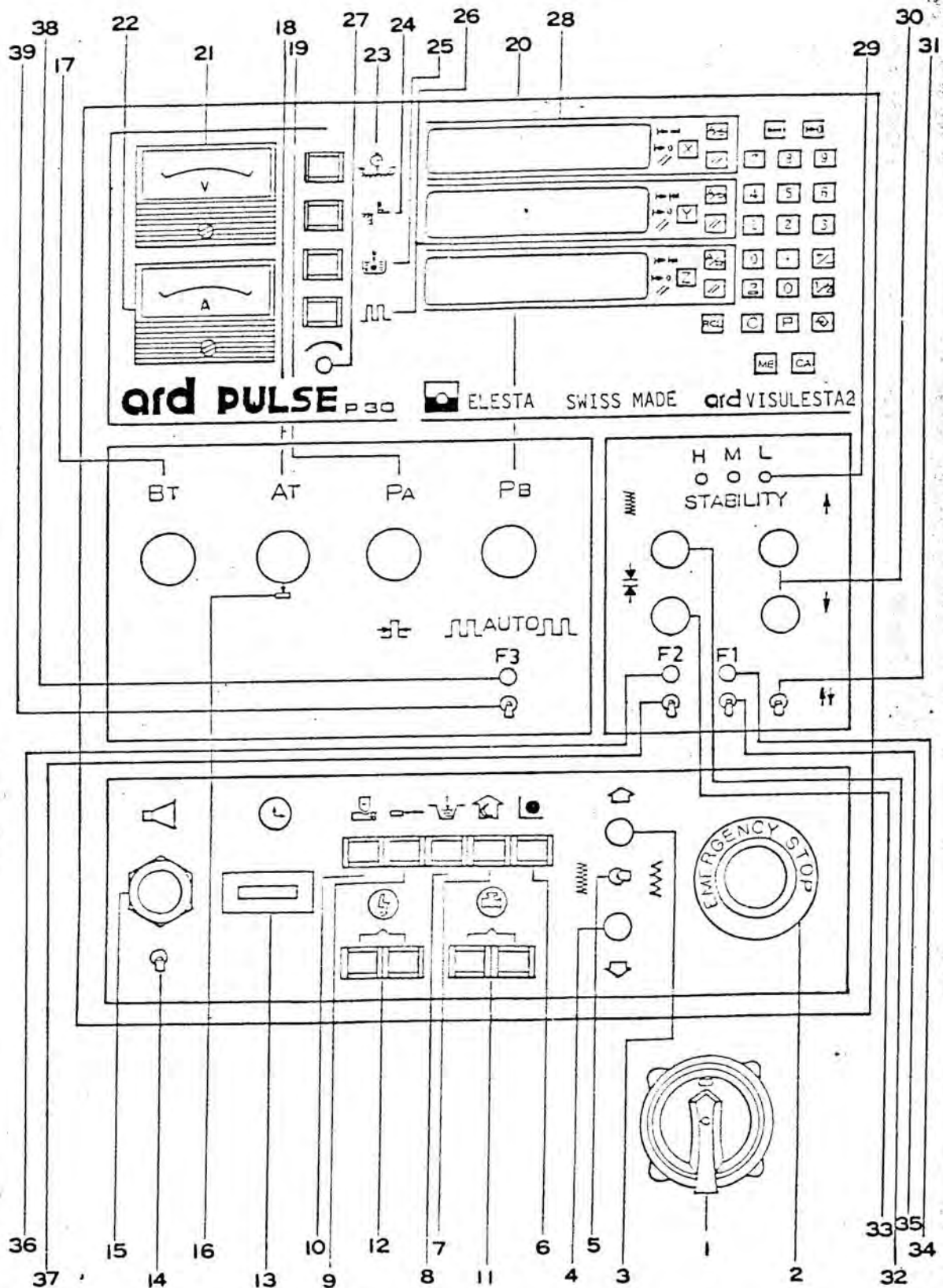
- Main switch "ON".
- Electrode zero verticle angle and at position zero.
- Polarity, amperage "AT", duration "PA", interval "PB".
- Set servo sensitivity, gap voltage.
- Set synchronous flushing switch and overflow control switch & work head lift control.
- Use the manual control to lower the workhead to the workpiece.
- Dielectric pump "ON".
Adjust overflow gate.
- Discharge switch "ON".

4-8 CATEGORIES OF EDM

- Sinking by EDM (Fig.1 & Fig.2)
- Cutting by EDM (Fig.3)
- Grinding by EDM (Fig.4)

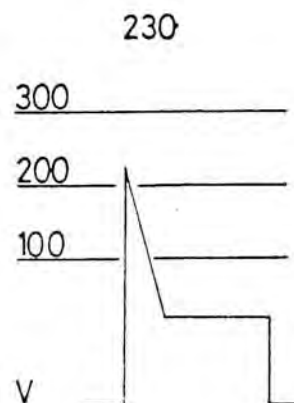
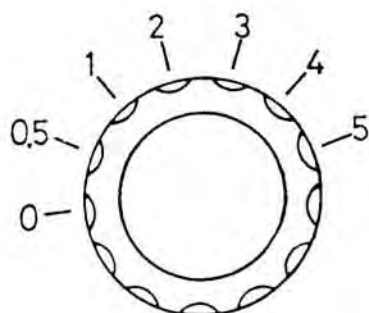


5. M30E, M50E CONTROL PANEL



1. MAIN SWITCH
2. EMERGENCY STOP
3. WORKHEAD LIFT SWITCH
4. WORKHEAD DOWN SWITCH
5. LIFT-DOWN SPEED CHANGE SWITCH
6. SERVO MOTOR STOP CONTROL
7. SLEEP SWITCH
8. OVER FLOW CONTROL
9. AUTOMATIC SYNCHRONOUS FLUSHING CONTROL
10. POLARITY REVERSE CONTROL SWITCH
11. DIELECTRIC FLUID PUMP SWITCH
12. DISCHARGE SWITCH
13. DISCHARGE TIMER
14. BUZZER TOGGLE SWITCH
15. BUZZER
16. PRESET DEPTH ZEROING
17. "BT" HIGH AMPERAGE CONTROL KNOB
18. "AT" LOW AMPERAGE CONTROL KNOB
19. "PA" PULSE DURATION KNOB
20. "PB" INTERVAL KNOB
21. VOLTMETER
22. AMMETER
23. AUTOMATIC DEPTH INDICATOR LAMP
24. EDGE FINDING INDICATOR LAMP
25. TEMPERATURE CONTROL INDICATOR LAMP
26. ARC INDICATOR LAMP
27. ARC SENSITIVITY ADJUST SWITCH
28. DIGITAL READOUT AND KEYS
29. "STABILITY" MONITORING INDICATOR LAMP
30. WORKHEAD VERTICAL MOVEMENT ADJUSTMENT KNOB
31. TOGGLE SWITCH TO CONTROL 30
32. SERVO SENSITIVITY ADJUSTMENT KNOB
33. DISCHARGE GAP CONTROL KNOB
34. LED FOR SWITCH F1
35. "F1" HIGH-SPEED SERVO TOGGLE SWITCH
36. LED FOR SWITCH F2
37. "F2" PROFILE PARTICLE FLUSHING TOGGLE SWITCH
38. LED FOR SWITCH F3
39. "F3" AUTO OFF-TIME ADJUST TOGGLE SWITCH

5-1 "BT" HIGH VOLTAGE AMPERAGE CONTROL KNOB

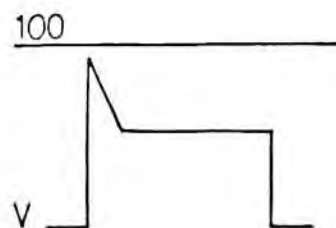
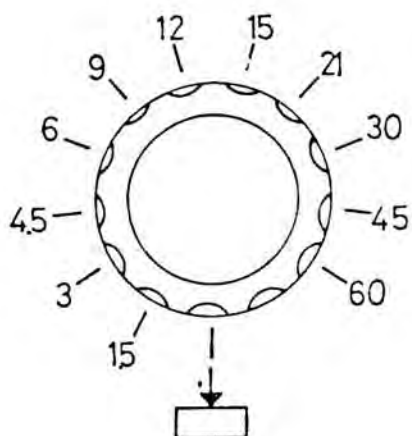


These values (low amperage) are only used for fine precision work.

230 : 230 voltage discharge

POSITION	AMPERAGE
0	0A
0.5	0.5A
1	1A
2	2A
3	3A
4	4A
5	5A

5-2 "AT" LOW VOLTAGE AMPERAGE CONTROL KNOB



 : Low power position for use in centering & setting of depth.

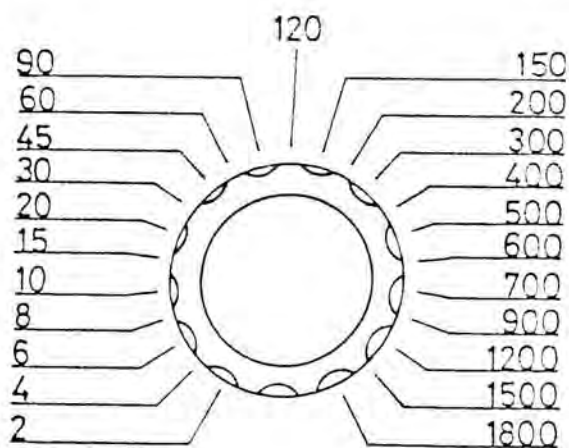
AT : 90 voltage discharge

POSITION	AMPERAGE	POSITION	AMPERAGE
1.5	1.5A	15	15A
3	3A	21	21A
4.5	4.5A	30	30A
6	6A	45	45A
9	9A	60	60A
12	12A		

Surface / power ratio table:

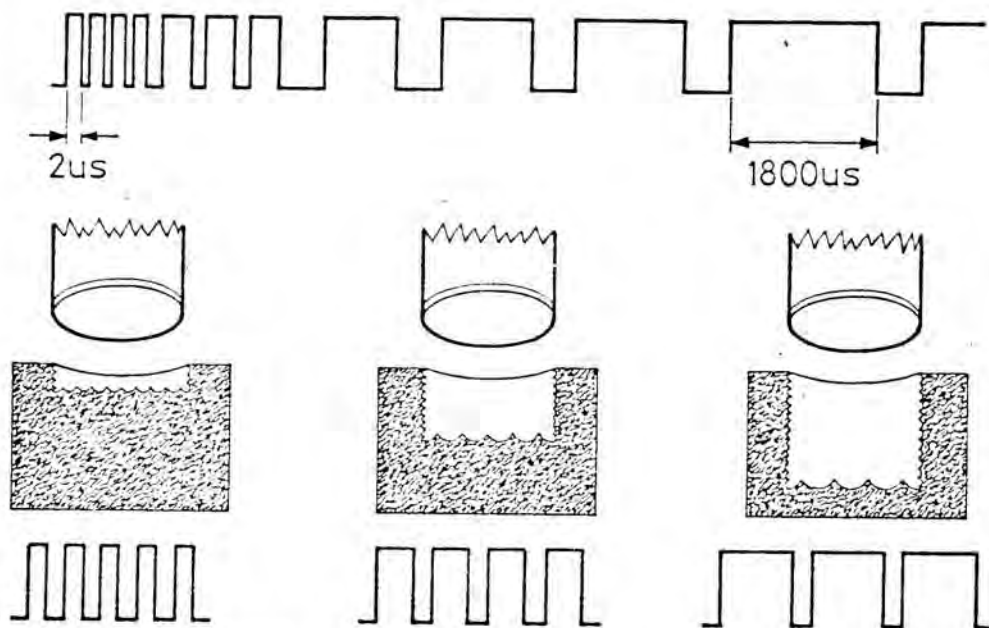
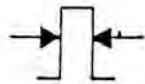
SURFACE AREA	POWER VALUE REFERENCE	
	Cu+ Cuw+ (ELECTRODES)	Gr+ Gr- (ELECTRODES)
0mm ² ~ 10mm ²	3A ~ 6A	3A ~ 6A
10mm ² ~ 25mm ²	6A ~ 12A	6A ~ 12A
25 mm ² ~ 100mm ²	12A ~ 21A	12A ~ 21A
100mm ² ~ 400mm ²	12A ~ 45A	21A ~ 45A
400mm ² ~ 1600mm ²	21A ~ 60A	45A ~ 60A
1600mm ² ~ 6400mm ²	21A ~ 60A	60A ~ 120A
6400mm ²	21A ~ 60A	120A

5-3 "PA" PULSE DURATION KNOB



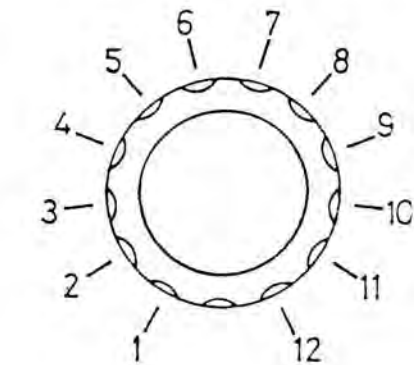
ON TIME

2= 2us	45= 45us	500= 500us
4= 4us	60= 60us	600= 600us
6= 6us	90= 90us	700= 700us
8= 8us	120=120us	900= 900us
10=10us	150=150us	1200=1200us
15=15us	200=200us	1500=1500us
20=20us	300=300us	1800=1800us
30=30us	400=400us	



1. Set appropriate duration & amperage to produce the desired finish. Min 2us at the "AT" setting, you can reach Rmax 6-9um, Max 1800us at that setting you can reach Rmax 90-120um.
2. With the duration greater than 40us, duration & amperage can be matched in direct ratio permitting machining with no electrode wear. When duration is short, and current high, electrode wear increases.
3. Since different metallic materials have different characteristics, it's necessary to use different duration setting according to the table.

5-4 "PB" INTERVAL KNOB

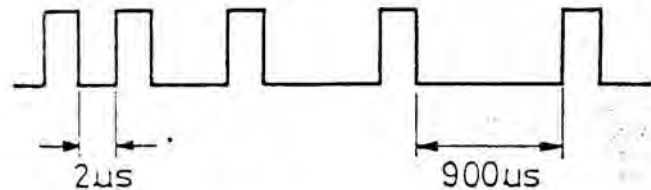


OFF TIME

1= 2us	7= 60us
2= 4us	8= 90us
3= 6us	9=150us
4=10us	10=300us
5=20us	11=500us
6=30us	12=900us



AUTO

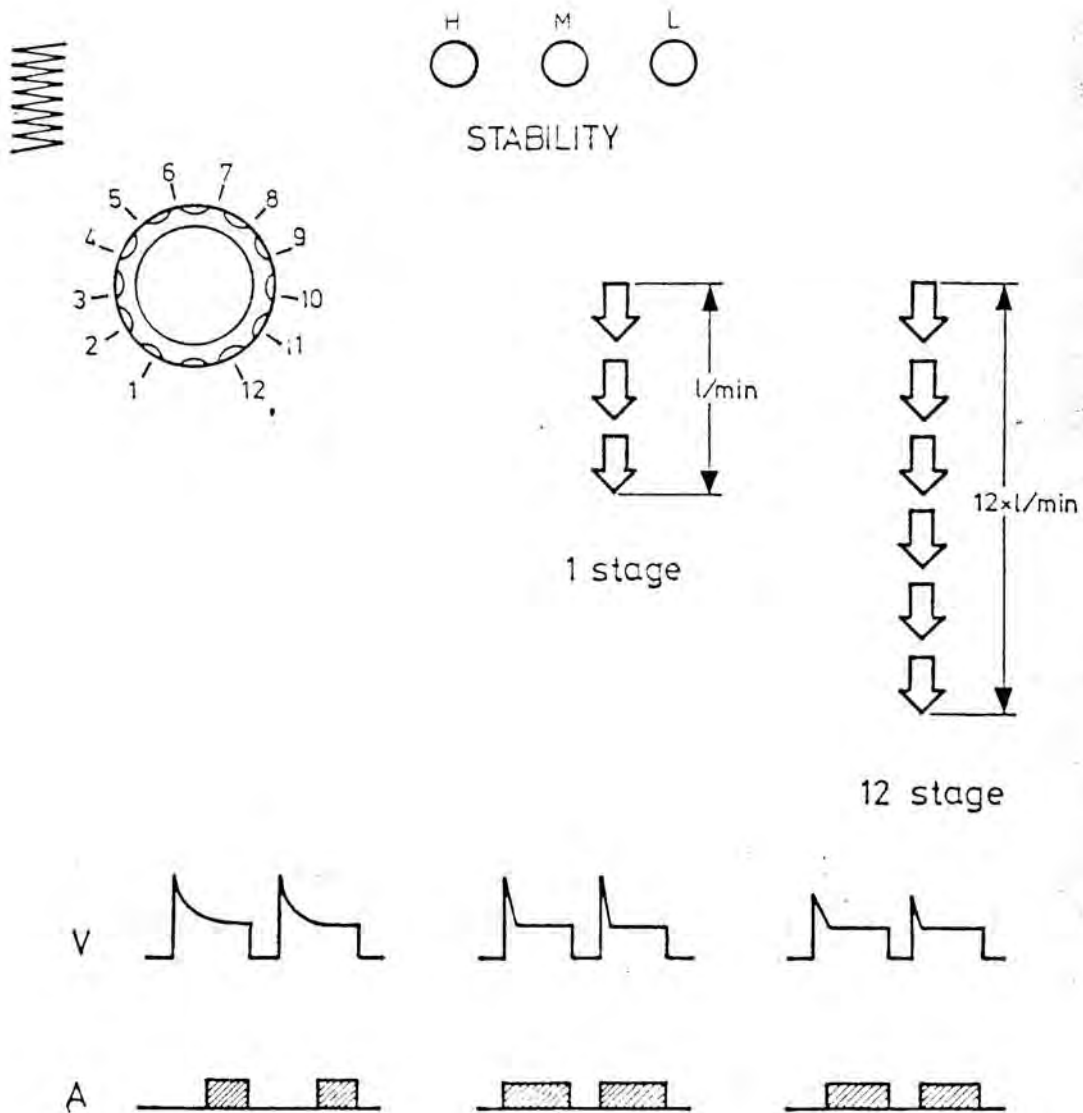


INTERVAL AUTOMATIC SWITCH

If trouble such as short circuit occurs in spark gap. Pulse interval will extend automatically until the trouble is eliminated.

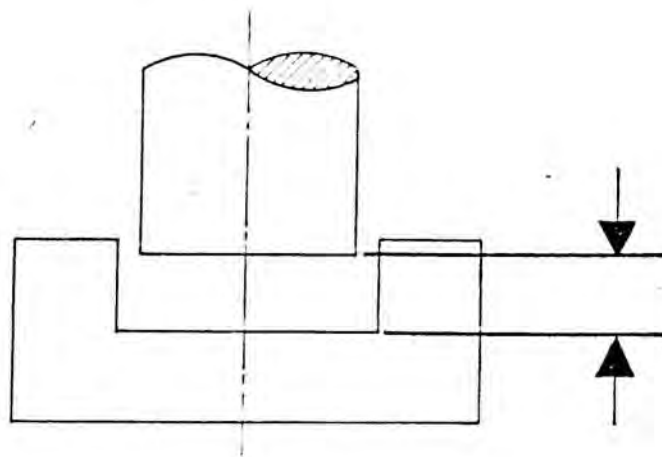
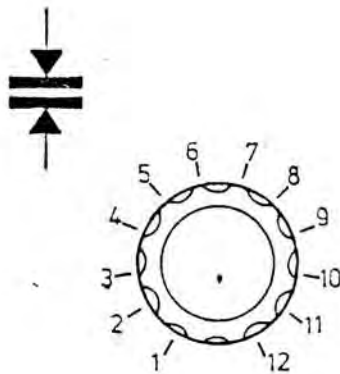
1. Interval PB is the time between pulses off time when no impact ionization occurs and dielectric conditions are re-established. Usually when the discharge is stable and interval is short, efficiency is high and a protective coating will form on the electrode. If the flushing is poor, particals are not removed and machining efficiency decreases. So, it's necessary to set the servo to raise the electrode periodically to permit flushing.
2. No matter whether interval is short and amperage high or interval long and amperage low, the voltage must not change.
3. The length of interval must be set according to the materials characteristic to ensure the highest efficiency.
4. PB knob functions:
 - (1) Adjust PB knob to first position and on-time ratios are automatically regulated according to on-time requirements.
NOTE: For normal and stable machining always leave PB knob at first position.
 - (2) If machining is unstable then adjust PB knob manually to increase off-time.
 - (3) When amperage is too low for corresponding electrode frontal area, adjust PB knob to increase off-time, use the table on page 14 of the reference manual as a guide.

5-5 SERVO SENSITIVITY ADJUSTMENT KNOB



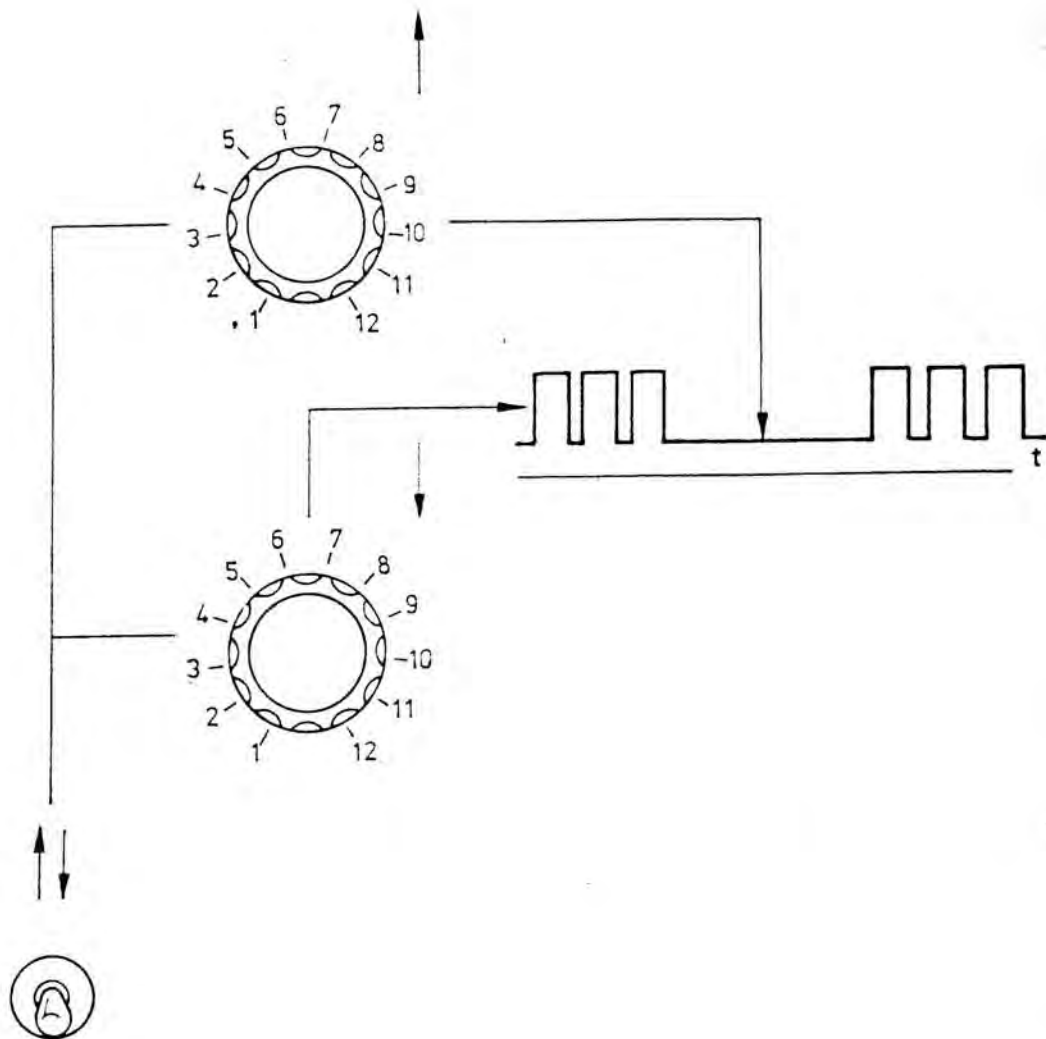
1. Servo's adjustment must be synchronized with discharge duration. When the indicator is steady synchronization has been achieved.
2. The servo monitors the discharge gap during discharge. Maintaining the proper gap is one of the most important factors in EDM. So, we have very carefully designed this system to enable the most difficult work to be performed.

5-6 DISCHARGE GAP ADJUSTMENT KNOB



1. Gap average voltage is about 60V.
Gap average voltage is about 40V.
2. Is suitable for fine finish over large areas or deep holes where finishing is very difficult.
Gap is smaller but the current is greater efficiency is high and it's suitable for normal work.

5-7 WORKHEAD VERTICAL MOVEMENT ADJUSTMENT KNOB



1. Switch on servo pulse for high efficiency particle discharge.
2. When servo begins upward movement the power is shut off to prevent sparking.

5-8 OPTION FUNCTION FOR BAD FLUSHING

F3



F2

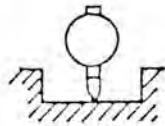
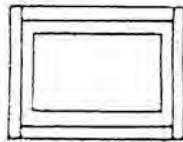


F1

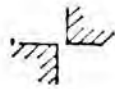
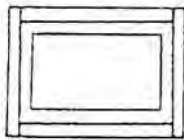


- F1 High-speed servo switch for deep hole machining.
F2 Profile particle flushing switch for anti-arc.
F3 Auto off-time adjustment switch for anti-arc.

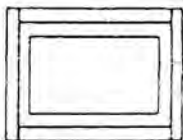
5-9 INDICATOR LAMP



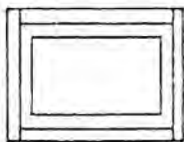
- (1) The depth indicator lamp lights when preset machining depth is reached. The buzzer may also be used.



- (2) The edge finder lamp lights when the electrode contacts the workpiece, the buzzer may also be used.



- (3) Illumination of this lamp indicates temperature has risen too high and the machine will stop discharging.

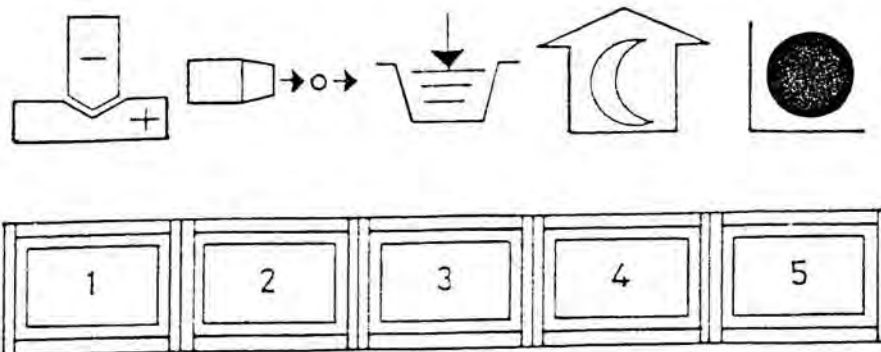


- (4) The discharge will be disable, whenever the gap short condition over a time period with the adjusting switch on.



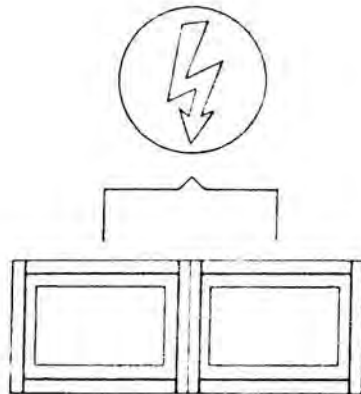
- (5) Turn on the switch to start monitoring arc. Turn to right direction to increase the sensitivity.

5-10 OTHER SWITCHES WITH INDICATOR LAMP

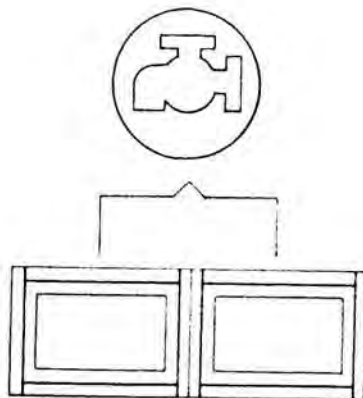


1. Polarity lamp, when ON the electrode's polarity is negative and the work piece is positive. When OFF the electrode is positive and the work piece is negative. Polarity selection depends on characteristics of the work piece.
2. When ON servo movement is synchronized with flushing. This indicator should be used when the desired depth is great to ensure adequate flushing.
3. The over flow lamp shall be ON when over flow control is not in operation.
4. Automatic stop light if ON, it will stop discharge and lift the workhead when the preset depth is reached.
5. Locking of work spindle in any presetted Z position.

5-11 OTHER PUSH BUTTONS



Push on switch to start discharging and timer. Machine stops discharging when fluid level too low, temperature too high, depth reach or arc happen.

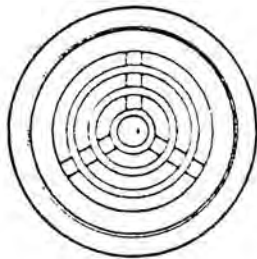


Push ON, OFF switch to start or stop pump.

5-12 BUZZER AND DISCHARGE TIMER



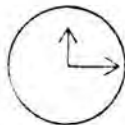
BUZZER



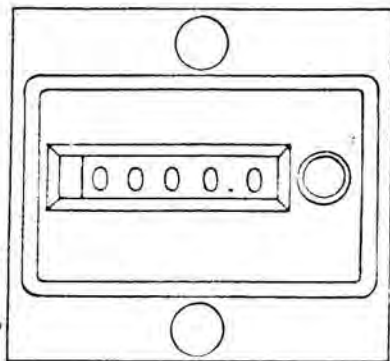
1



0



Usually the switch is at 1 position. When using electronic edge finder it shall be at 0 position.



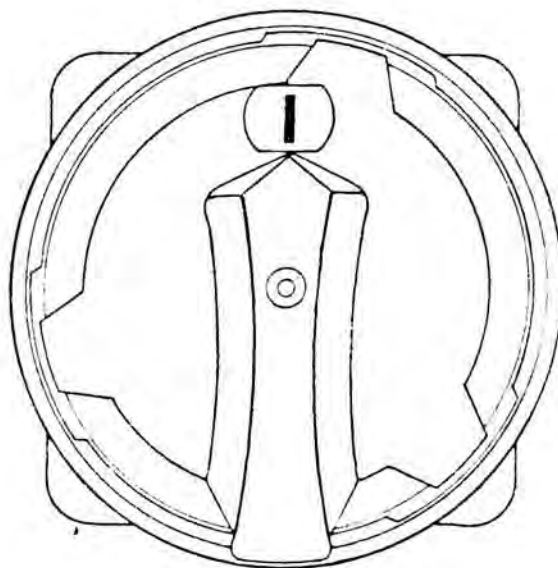
DISCHARGE TIMER

5-13 MAIN SWITCH & EMERGENCY STOP



EMERGENCY STOP

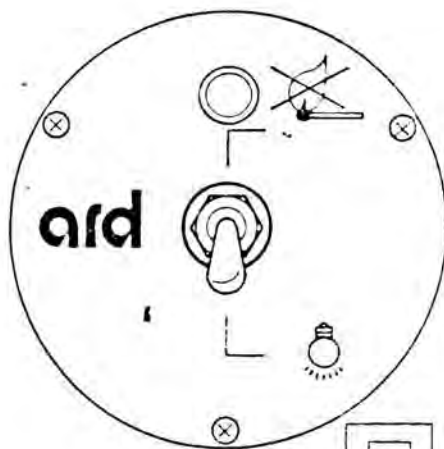
This red mushroom switch
off all control circuits,
while all the indicator
lamps are still on.



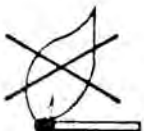
MAIN SWITCH

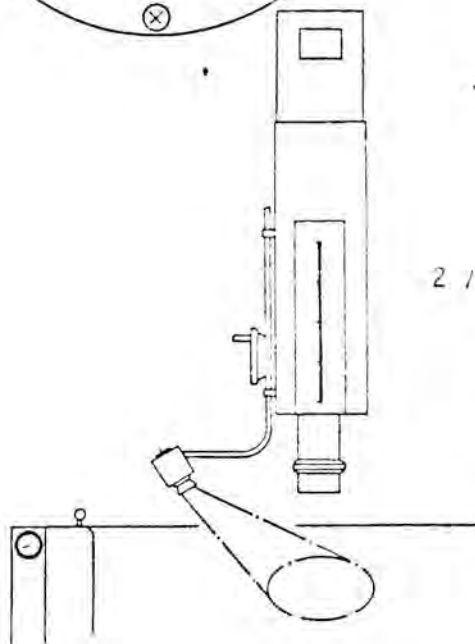
5-14 WORKING LIGHT OPERATION MANUAL

Lighting equipment both for operating and alarming use.



1/ Indicators:

- a.  Alarm Indicator
- b.  Lighting Switch



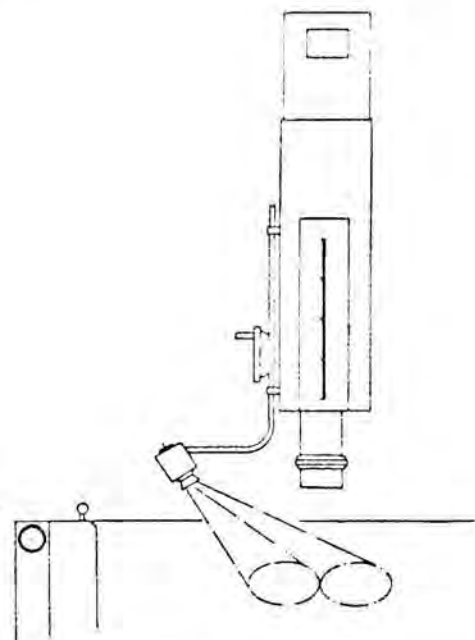
2 / Operational Instruction:

A. For lighting use:

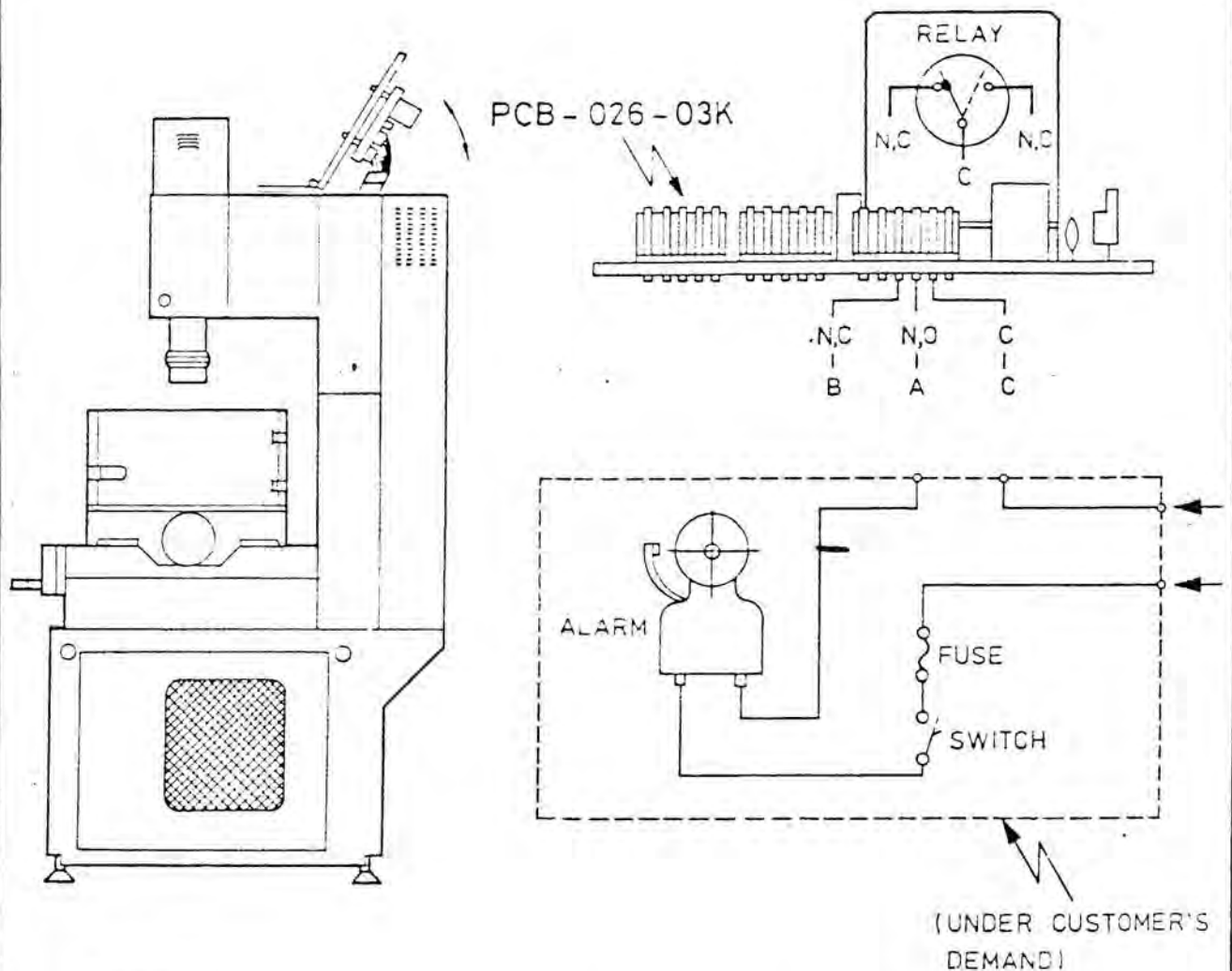
- a. Turn to light position.
- b. Alarm indicator is then shot off.

B. For fire alarm use:

- a. Turn to fire alarm position.
- b. Alarm indicator light comes on in case of a fire. It will cut off the power source immediately and sound "BEEP" alarm.
- c. To reset the machine to working condition, reset switch to light position and then return to fire alarm position.
- d. The fire extinguisher could only be used one time and can be re-used if filled with required material.



5-15 AGAINST FIRE ALARM SYSTEM
(UNDER CUSTOMER'S DEMAND)



Features:

1. This system may allow the operator to adopt a alarm system for himself and through the connector A. B. C. one may line the system to other locations (see dotted lines). If switched on, in case of a fire when the operator is not on or near the machine this system sound main alarm.
2. This system is connected parallel to the fire alarm lamp only activated if fire alarm on. Power capacity is AC 250V 10A Max.
Connection A. B. C. only used for switching, these is power output and it therefore needs a power source.

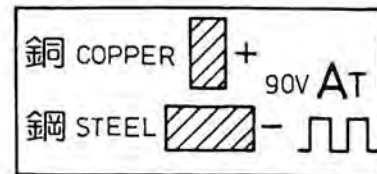
P30 P60 APPLICATION NOTE

INDEX

1. (90V) ELECTROLYTIC COPPER(+) — STEEL 28
2. (90V) GRAPHITE(+) — STEEL 35
3. (160V) ELECTROLYTIC COPPER(+) — STEEL 40
4. (260V) ELECTROLYTIC COPPER(-) — STEEL 41
5. (90V) COPPER TUNGSTEN(-) — TUNGSTEN CARBIDE 42
6. (90V) ELECTROLYTIC COPPER (-) — COPPER 43
7. (260V,90V) STEEL — STEEL 44
8. (260V,90V) ELECTROLYTIC COPPER(+) — STEEL 45

SURFACE FINISH IN EDM

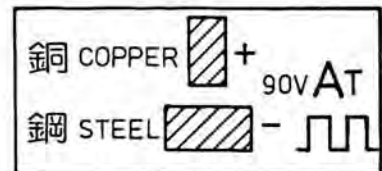
ARD SAMPLE (VDI 3400)	Ra μ m
12	= 0.40
15	= 0.56
18	= 0.80
21	= 1.12
24	= 1.60
27	= 2.24
30	= 3.15
33	= 4.50
36	= 6.30
39	= 9.00
42	= 12.5
45	= 18.0



試驗條件 TEST CONDITION

電極材料 ELECTRODE	: 電解銅 ELECTROLYTIC COPPER
電極極性 POLARITY ELECTRODE	: 正極 POSITIVE
工件材料 WORKPIECE	: 鋼 STEEL
加工液 DIELECTRIC	: 煤油(中國石油) CPC KEROSENE
噴流 INJECTION	: 0.5kg/cm ²
試驗面積 TEST AREA	: 20φmm

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板 (粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進 度 STOCK REMOVAL mm ³ /min	細間隙 mm 2×G1	粗間隙 mm 2×G2
------------------------------	-----------------------	------------------------	---------------------	--	-----------------------	--	-------------------	-------------------

1.5	2	1	50	20	8	0.5	0.036	0.046
1.5	4	1	50	21	6.5	0.7	0.038	0.050
1.5	6	1	50	21	5	1.0	0.040	0.052
1.5	8	1	50	22	4	1.5	0.042	0.054
1.5	10	1	50	23	3	2	0.046	0.060
1.5	15	1	50	24	2.5	3	0.050	0.066
1.5	20	1	50	25	2	3.5	0.056	0.074
1.5	30	1	50	26	1.5	3	0.060	0.080
1.5	45	1	50	27	0.5	2	0.065	0.087
1.5	60	1	50	28	-	1.5	0.070	0.095

3	2	1	45	22	12	1	0.045	0.060
3	4	1	45	23	10	2	0.048	0.063
3	6	1	45	24	9	2.8	0.050	0.065
3	8	1	45	24	7	4	0.052	0.070
3	10	1	45	25	6	5	0.055	0.073
3	15	1	45	26	4.5	7	0.060	0.080
3	20	1	45	27	2.5	8	0.065	0.087
3	30	1	45	28	1.5	8.5	0.070	0.095
3	45	1	45	29	0.8	7	0.075	0.103
3	60	1	45	30	0.5	6	0.080	0.112
3	90	1	45	31	-	4.5	0.085	0.120
3	120	1	45	32	-	3	0.090	0.130

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

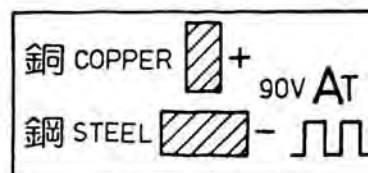
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface.

If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板 (粗細度) ARD NDI 3400 SAMPLE	消耗 比 WEAR RATE %	進 度 STOCK REMOVAL mm ³ /min	細間隙 mm 2xG1	粗間隙 mm 2xG2
45	2	1	40	23	21	1.7	0.050	0.064
45	4	1	40	24	19	2	0.054	0.070
45	6	1	40	25	16	4.5	0.058	0.076
45	8	1	40	25	14	8	0.062	0.080
45	10	1	40	26	10	9	0.065	0.085
45	15	1	40	27	7	16	0.073	0.095
45	20	1	40	28	5	19	0.075	0.100
45	30	1	40	29	3	22	0.080	0.105
45	45	1	40	30	1.5	24	0.085	0.110
45	60	1	40	31	1.2	21	0.095	0.130
45	90	1	40	32	0.8	17	0.100	0.140
45	120	1	40	32	0.5	12	0.110	0.150
45	150	1	40	33	-	10	0.120	0.165
45	200	1	40	34	-	8	0.130	0.180
6	2	1	40	24	35	25	0.056	0.072
6	4	1	40	25	28	4	0.060	0.078
6	6	1	40	25	24	6	0.065	0.083
6	8	1	40	26	20	13	0.068	0.086
6	10	1	40	26	13	18	0.070	0.090
6	15	1	40	27	10	20	0.075	0.095
6	20	1	40	29	5.5	23	0.080	0.108
6	30	1	40	30	4.0	26	0.090	0.122
6	45	1	40	31	2.5	29	0.100	0.135
6	60	1	40	32	2.0	30	0.110	0.150
6	90	1	40	33	1.0	25	0.115	0.160
6	120	1	40	33	0.8	22	0.120	0.165
6	150	1	40	34	0.5	18	0.130	0.180
6	200	1	40	35	-	15	0.140	0.196

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

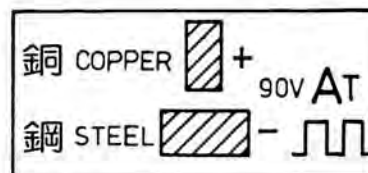
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min	細間隙 mm 2×G1	粗間隙 mm 2×G2
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9	10	1	40	27	21	20	0.075	0.097
9	15	1	40	28	16	28	0.080	0.105
9	20	1	40	30	10	34	0.085	0.117
9	30	1	40	31	6	38	0.095	0.130
9	45	1	40	32	45	42	0.105	0.145
9	60	1	40	33	3.0	45	0.115	0.160
9	90	1	40	34	2.0	47	0.125	0.175
9	120	1	40	35	1.5	44	0.135	0.191
9	150	1	40	36	1.0	40	0.150	0.213
9	200	1	40	37	-	37	0.160	0.230

12	10	1	35	28	23	25	0.080	0.150
12	15	1	35	29	18	38	0.085	0.113
12	20	1	35	30	13	47	0.090	0.122
12	30	1	35	32	8	55	0.100	0.140
12	45	1	35	33	6	62	0.110	0.155
12	60	1	35	34	4	67	0.120	0.170
12	90	1	35	35	3	72	0.130	0.186
12	120	1	35	36	2	70	0.140	0.203
12	150	1	35	37	1.5	66	0.155	0.225
12	200	1	35	38	0.5	63	0.170	0.246
12	300	1	35	39	-	60	0.180	0.270
12	400	1	35	40	-	55	0.195	0.295

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

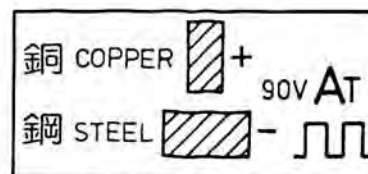
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min	細間隙 mm 2×G1	粗間隙 mm 2×G2
15	10	1	35	29	25	35	0.085	0.113
15	15	1	35	30	20	50	0.090	0.122
15	20	1	35	31	16	76	0.100	0.135
15	30	1	35	33	10	85	0.110	0.150
15	45	1	35	34	7	91	0.120	0.170
15	60	1	35	35	5	95	0.130	0.186
15	90	1	35	36	3.8	97	0.140	0.203
15	120	1	35	37	2.5	100	0.150	0.220
15	150	1	35	38	1.5	105	0.165	0.245
15	200	1	35	39	1.0	96	0.180	0.265
15	300	1	35	40	0.5	92	0.195	0.295
15	400	1	35	41	-	88	0.210	0.322
15	500	1	35	42	-	76	0.225	0.350
21	10	1	35	30	28	48	0.095	0.127
21	15	1	35	31	24	92	0.105	0.140
21	20	1	35	32	19	98	0.115	0.155
21	30	1	35	33	15	115	0.128	0.175
21	45	1	35	35	10	138	0.140	0.196
21	60	1	35	36	8	145	0.155	0.218
21	90	1	35	37	5	147	0.165	0.238
21	120	1	35	38	4	150	0.175	0.257
21	150	1	35	39	3	155	0.190	0.280
21	200	1	35	40	1.5	150	0.205	0.305
21	300	1	35	41	1.0	150	0.220	0.330
21	400	1	35	42	0.5	135	0.235	0.355
21	500	1	35	43	0.3	130	0.245	0.370
21	600	1	35	43	-	115	0.270	0.410

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

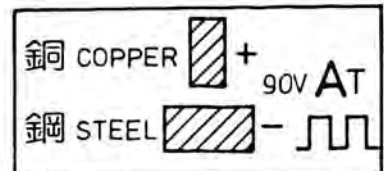
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

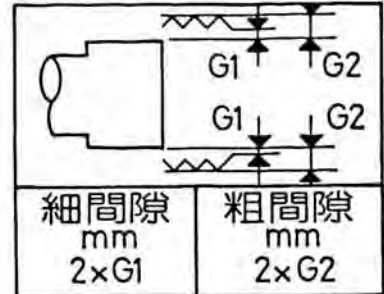
If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min
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30	10	1	35	31	32	70	0.110	0.145
30	15	1	35	32	27	125	0.115	0.155
30	20	1	35	33	22	130	0.125	0.170
30	30	1	35	34	18	165	0.140	0.190
30	45	1	35	36	15	185	0.155	0.218
30	60	1	35	37	12	205	0.170	0.240
30	90	1	35	38	9	210	0.185	0.265
30	120	1	35	39	7.5	215	0.200	0.290
30	150	1	35	40	6	220	0.215	0.315
30	200	1	35	41	3.5	220	0.230	0.332
30	300	1	35	42	2	230	0.240	0.366
30	400	1	35	43	1	220	0.255	0.395
30	500	1	35	44	0.5	210	0.270	0.430
30	600	1	35	44	0.5	205	0.285	0.445
30	700	1	35	45	0.5	200	0.300	0.480
30	900	1	35	46	0.5	200	0.330	0.530

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

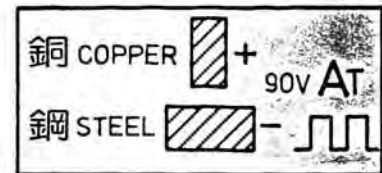
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be setted on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min	細間隙 mm 2xG1	粗間隙 mm 2xG2
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45	10	1	35	32	35	130	0.125	0.165
45	15	1	35	33	32	165	0.130	0.175
45	20	1	35	34	30	190	0.140	0.190
45	30	1	35	35	25	240	0.155	0.211
45	45	1	35	37	20	290	0.170	0.240
45	60	1	35	38	16	320	0.185	0.265
45	90	1	35	39	13	340	0.200	0.290
45	120	1	35	40	10	350	0.215	0.315
45	150	1	35	41	8	360	0.230	0.332
45	200	1	35	42	6	370	0.250	0.376
45	300	1	35	43	4	370	0.270	0.410
45	400	1	35	44	2.5	360	0.290	0.450
45	500	1	35	45	1.5	350	0.310	0.490
45	600	1	35	46	1.0	340	0.325	0.525
45	700	1	35	47	0.8	330	0.340	0.560
45	900	1	35	49	0.5	310	0.380	0.620

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

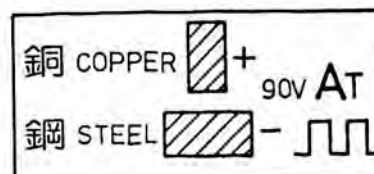
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

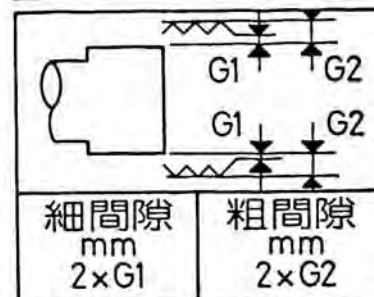
If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min
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60	10	1	35	33	38	180	0.140	0.185
60	15	1	35	34	34	240	0.145	0.195
60	20	1	35	35	28	290	0.150	0.206
60	30	1	35	36	25	340	0.165	0.228
60	45	1	35	38	22	380	0.185	0.265
60	60	1	35	39	18	420	0.200	0.290
60	90	1	35	40	15	440	0.220	0.320
60	120	1	35	41	12	460	0.235	0.337
60	150	1	35	42	10	470	0.250	0.376
60	200	1	35	43	7	480	0.265	0.405
60	300	1	35	44	4	465	0.285	0.445
60	400	1	35	45	2	460	0.300	0.480
60	500	1	35	46	1	450	0.325	0.525
60	600	1	35	47	0.5	435	0.340	0.560
60	700	1	35	48	0.5	420	0.360	0.600
60	900	1	35	50	0.5	400	0.400	0.660
60	1800	1	35	52	0.5	350	0.480	0.740

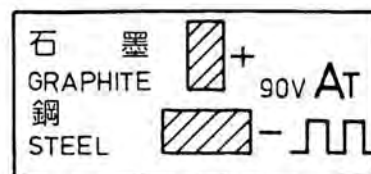
NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

If power is increased beyond normal setting, reduce PB setting (4-12).

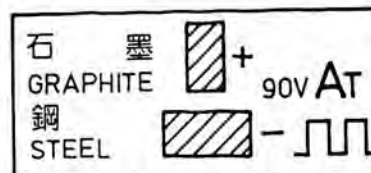
Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).



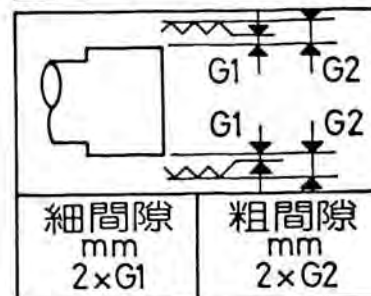
試 驗 條 件 TEST CONDITION

電極材料 ELECTRODE	: 石 墨 GRAPHITE
電 極 極 性 POLARITY ELECTRODE	: 正 極 POSITIVE
工件材料 WORKPIECE	: 鋼 STEEL
加 工 液 DIELECTRIC	: 煤油(中國石油) CPC KEROSENE
試驗面積 TEST AREA	: 20 ϕ mm

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min
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6	2	1	40	24	37	20	0.048	0.064
6	4	1	40	25	34	25	0.051	0.069
6	6	1	40	27	31	43	0.055	0.075
6	8	1	40	28	25	68	0.066	0.087
6	10	1	40	29	20	95	0.070	0.098
6	15	1	40	30	16	15	0.078	0.110
6	20	1	40	31	10	21	0.086	0.121
6	30	1	40	32	6	20	0.098	0.137
6	45	1	40	33	2	19	0.105	0.150
6	60	1	40	33	1.0	17	0.114	0.162
6	90	1	40	34	0.5	15	0.125	0.180

9	2	1	40	25	32	52	0.055	0.075
9	4	1	40	26	28	65	0.057	0.078
9	6	1	40	28	25	78	0.062	0.084
9	8	1	40	29	20	105	0.068	0.096
9	10	1	40	30	18	12	0.072	0.102
9	15	1	40	31	14	20	0.080	0.115
9	20	1	40	32	8	27	0.090	0.126
9	30	1	40	33	5	38	0.105	0.138
9	45	1	40	34	1.8	41	0.117	0.162
9	60	1	40	35	1.0	42	0.120	0.168
9	90	1	40	36	0.5	40	0.135	0.182
9	120	1	40	37	-	32	0.150	0.205
9	150	1	40	38	-	27	0.165	0.220

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

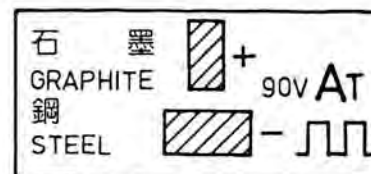
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

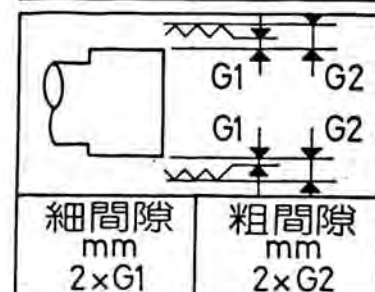
P30 放電操作明細表 P60 APPLICATION NOTE



電 流 AT	放電時間 ON TIME PA
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休息時間 OFF TIME PB	電壓表 VOLTAGE V
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樣板 (粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進 度 STOCK REMOVAL mm ³ / min
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12	10	1	40	30	18	32	0.082	0.114
12	15	1	40	31	14	41	0.087	0.125
12	20	1	40	32	10	50	0.096	0.140
12	30	1	40	34	7	58	0.110	0.152
12	45	1	40	35	4.5	65	0.120	0.174
12	60	1	40	36	3.2	60	0.130	0.182
12	30	1	40	37	2.0	55	0.145	0.195
12	120	1	40	38	1.5	52	0.155	0.220
12	150	1	40	39	0.8	49	0.170	0.245
12	200	1	40	41	-	44	0.185	0.275

15	10	1	40	31	16	37	0.084	0.118
15	15	1	40	32	12	48	0.090	0.130
15	20	1	40	33	9	60	0.098	0.147
15	30	1	40	35	6	68	0.115	0.160
15	45	1	40	36	4	85	0.130	0.180
15	60	1	40	37	3	90	0.140	0.195
15	90	1	40	38	1.5	82	0.155	0.210
15	120	1	40	39	0.8	78	0.165	0.228
15	150	1	40	40	0.5	72	0.175	0.255
15	200	1	40	41	-	64	0.190	0.280
15	300	1	40	42	-	52	0.210	0.310

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

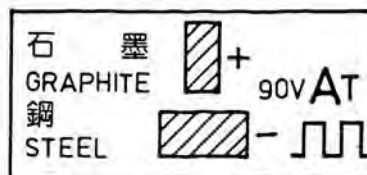
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface.

If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min	細間隙 mm 2×G1	粗間隙 mm 2×G2
21	10	1	40	33	12	55	0.090	0.130
21	15	1	40	34	9	75	0.095	0.142
21	20	1	40	35	7	84	0.102	0.158
21	30	1	40	36	4	105	0.115	0.178
21	45	1	40	37	2.5	138	0.132	0.202
21	60	1	40	38	1.5	145	0.150	0.225
21	90	1	40	39	1.0	140	0.165	0.260
21	120	1	40	40	0.8	130	0.175	0.270
21	150	1	40	41	0.3	125	0.200	0.295
21	200	1	40	42	-	105	0.225	0.325
21	300	1	40	43	-	91	0.245	0.350
21	400	1	40	43	-	75	0.270	0.390
30	10	1	40	34	9	82	0.108	0.152
30	15	1	40	35	7	110	0.120	0.175
30	20	1	40	36	5	132	0.135	0.200
30	30	1	40	37	3	150	0.145	0.215
30	45	1	40	38	1.5	185	0.160	0.240
30	60	1	40	39	1.0	190	0.170	0.250
30	90	1	40	40	0.5	210	0.190	0.290
30	120	1	40	41	-	220	0.105	0.300
30	150	1	40	42	-	192	0.220	0.330
30	200	1	40	43	-	185	0.260	0.370
30	300	1	40	43	-	165	0.300	0.425
30	400	1	40	44	-	138	0.330	0.470

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

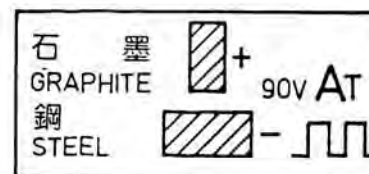
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be setted on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

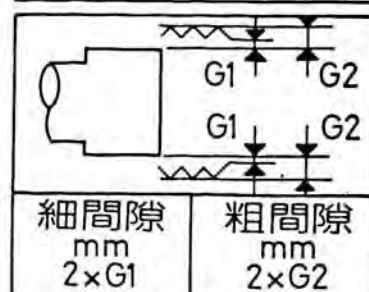
If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min
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45	10	1	40	35	8	130	0.120	0.165
45	15	1	40	36	5	175	0.135	0.190
45	20	1	40	37	3.8	200	0.145	0.205
45	30	1	40	38	2.5	225	0.165	0.235
45	45	1	40	39	1.5	265	0.180	0.270
45	60	1	40	40	1.0	290	0.190	0.285
45	90	1	40	41	0.5	320	0.215	0.305
45	120	1	40	42	0.3	315	0.230	0.335
45	150	1	40	43	0.3	310	0.250	0.375
45	200	1	40	44	0.3	300	0.280	0.400
45	300	1	40	45	0.3	270	0.320	0.460
45	400	1	40	45	0.3	235	0.360	0.540

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

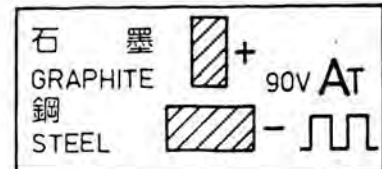
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

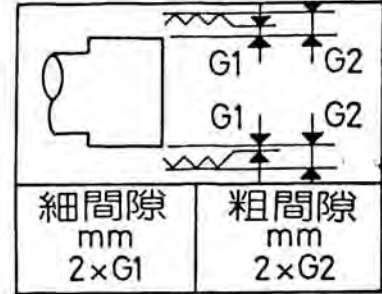
If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS.	放電時間 ON TIME	休息時間 OFF TIME	電壓表 VOLTAGE	樣板(粗細度) ARD (VDI3400)	消耗比 WEAR RATE	進度 STOCK REMOVAL
AT	PA	PB	V	SAM- PLE	%	mm ³ / min



60	10	1	40	36	6	195	0.130	0.185
60	15	1	40	37	4	250	0.145	0.205
60	20	1	40	38	3	270	0.160	0.230
60	30	1	40	39	2	300	0.175	0.255
60	45	1	40	40	1	350	0.200	0.300
60	60	1	40	41	0.5	375	0.215	0.320
60	90	1	40	42	0.3	415	0.235	0.350
60	120	1	40	43	0.3	395	0.260	0.380
60	150	1	40	44	0.3	380	0.295	0.435
60	200	1	40	45	0.3	350	0.330	0.470
60	300	1	40	45	0.3	335	0.370	0.530
60	400	1	40	46	0.3	320	0.410	0.610
60	500	1	40	47	0.3	300	0.450	0.700

NOTE: PB setting test always AT1, if EDM burns unstable, increase PB setting to 2-6 (4us-30us).

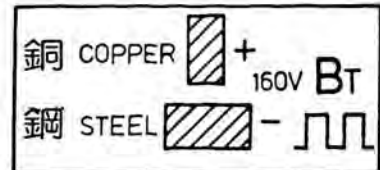
PB setting, when the frontal area of the electrode is smaller than the current POS., that results in the unsteady sparking, please set PB stage to extend and note the gap voltage should be set on 30V-40V for efficiency.

Always select proper AT setting for electrode surface

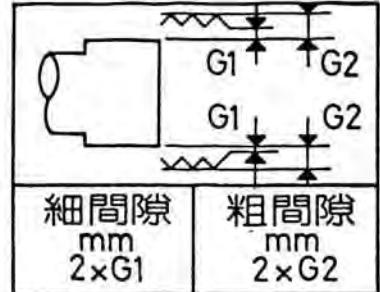
If power is increased beyond normal setting, reduce PB setting (4-12).

Gap voltage should always be set at voltage level given in table (tolerance $\pm 10V$).

P30 放電操作明細表 P60 APPLICATION NOTE

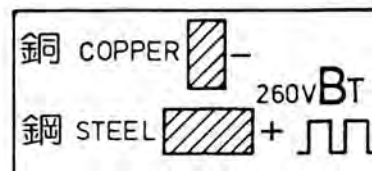


電 流 CURRENT POS. BT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	樣板(粗細度) ARD (VDI3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min	細間隙 mm 2×G1	粗間隙 mm 2×G2
0.5	10	1	80	18	3	< 1	0.042	0.050
1	10	1	80	20	4	< 1	0.045	0.055
1	30	1	80	22	1	1.5	0.048	0.060
1	60	1	80	24	0.5	1.0	0.052	0.068
2	10	1	80	24	6	2.5	0.050	0.066
2	30	1	80	25	1.5	4.5	0.055	0.073
2	60	1	80	26	0.5	3.5	0.067	0.082
3	10	1	80	26	7	4	0.053	0.078
3	30	1	80	28	2.5	6	0.068	0.093
3	60	1	80	29	0.5	5	0.075	0.103
4	10	1	80	27	8.5	5.5	0.058	0.087
4	30	1	80	29	3	7.5	0.072	0.100
4	60	1	80	30	1	6	0.080	0.116
5	10	1	80	28	10	7	0.065	0.093
5	30	1	80	30	4	9	0.075	0.107
5	60	1	80	31	1.5	8	0.080	0.115
5	90	1	80	33	0.5	6.5	0.095	0.141



P30 放電操作明細表 P60 APPLICATION NOTE

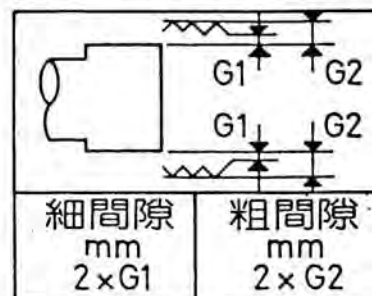
(HI-VOLT)(高壓部份)



電 流	放電時間 CURRENT POS. ON TIME
BT	PA

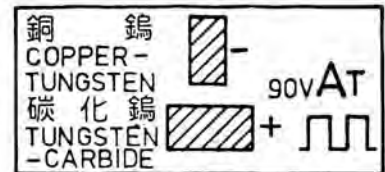
休息時間 OFF TIME	電壓表 VOLTAGE	高壓修飾 MICRO-SPARK
PB	V	

樣板 (粗細度)	消耗比 WEAR RATE	進度 STOCK REMOVAL
SAM- PLE ARD (VDI 3400)	%	mm ³ / min

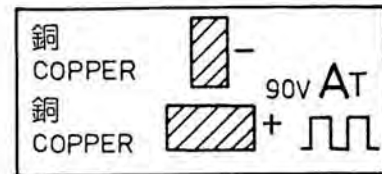


0.5	2	1	150	1	12	25	<1	0.028	0.034
1	2	1	150	2-3	15	26	<1	0.030	0.038
2	2	1	150	4-5	20	28	<1	0.033	0.045
3	2	1	150	6-7	23	30	<1	0.036	0.050
4	2	1	150	8-9	26	31	13	0.042	0.062
5	2	1	150	10-11	29	32	25	0.056	0.084

P30 放電操作明細表 P60 APPLICATION NOTE



電 流 CURRENT POS. AT	放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V	高壓修飾 MICRO-SPARK	樣板 (粗細度) ARD (VDI 3400) SAMPLE	消耗比 WEAR RATE %	進 度 STOCK REMOVAL mm ³ /min	細間隙 mm 2×G1	粗間隙 mm 2×G2
3	2	2	30	11	14	16	1.3	0.036	0.044
4.5	2	2	30	11	16	16	1.8	0.038	0.048
6	2	2	30	11	17	16	2.1	0.041	0.052
6	30	3	30	-	22	20	5.5	0.048	0.060
9	4	2	30	11	19	17	2.6	0.045	0.055
9	30	3	30	-	25	22	8	0.050	0.063
12	4	2	30	11	20	18	4	0.048	0.060
12	30	3	30	-	27	23	11	0.054	0.068
15	4	2	30	11	22	18	5.5	0.050	0.064
15	30	4	30	-	28	23	13	0.058	0.083
21	4	2	30	6	25	18	8	0.056	0.072
21	30	5	30	-	31	25	18	0.065	0.097
30	4	2	30	6	26	18	11	0.060	0.077
30	30	5	30	-	33	26	25	0.080	0.125
45	4	2	30	6	27	18	13	0.068	0.085
45	30	6	30	-	35	27	32	0.094	0.150
60	4	2	30	6	30	18	16	0.080	0.112
60	30	6	30	-	38	27	40	0.110	0.190

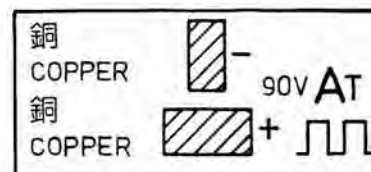


試驗條件

TEST CONDITION

電極材料 ELECTRODE	: 電 解 銅 ELECTROLYTIC COPPER
電 極 極 性 POLARITY ELECTRODE	: 負 極 NEGATIVE
工件材料 WORKPIECE	: 銅 COPPER
加 工 液 DIELECTRIC	: 煤油(中國石油) CPC KEROSENE
噴 流 INJECTION	: 0.5kg/cm^2
試驗面積 TEST AREA	: $20\phi\text{mm}$

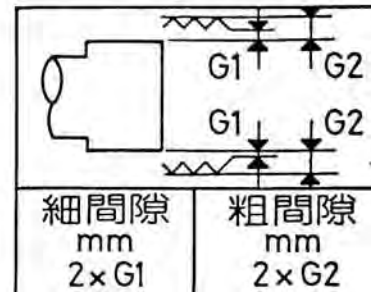
P30 放電操作明細表 P60 APPLICATION NOTE



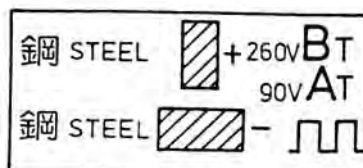
電 流 CURRENT POS. AT	放電時間 ON TIME PA
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休息時間 OFF TIME PB	電壓表 VOLTAGE V
------------------------	---------------------

樣板 (粗細度) ARD (VDI 3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min
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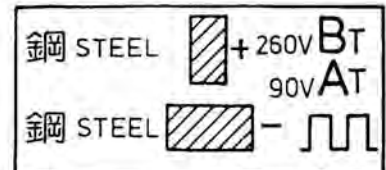
3	2	3	40	18	42	<1	0.050	0.058
45	2	3	40	19	40	<1	0.052	0.061
6	2	3	40	20	38	<1	0.055	0.065
9	2	3	40	22	35	1	0.060	0.072
12	6	4	40	24	30	3.5	0.080	0.096
15	6	4	40	25	27	5.5	0.085	0.103
21	10	5	35	27	23	16	0.100	0.122
30	10	5	35	29	20	27	0.125	0.153
30	15	5	35	30	20	48	0.135	0.167
30	20	6	35	31	25	36	0.150	0.185
45	15	5	35	32	20	65	0.180	0.220
60	15	5	35	33	20	90	0.225	0.270



試驗條件 TEST CONDITION

電極材料 ELECTRODE	： 鋼 STEEL
電 極 極 性 POLARITY ELECTRODE	： 正 極 POSITIVE
工件材料 WORKPIECE	： 鋼 STEEL
加 工 液 DIELECTRIC	： 煤油(中國石油) CPC KEROSENE
噴 流 INJECTION	： 0.5kg/cm ²
試驗面積 TEST AREA	： 20φmm

P30 放電操作明細表 P60 APPLICATION NOTE



高壓
流 BT
HI CURRENT POS.

低壓
流 AT
LOW CURRENT POS.

放電時間
ON TIME
PA

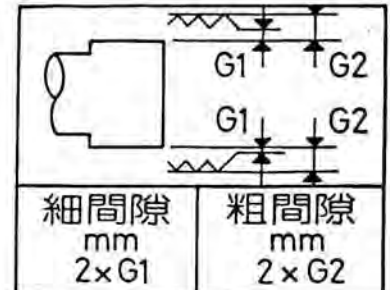
休息時間
OFF TIME
PB

電壓表
VOLTAGE
V

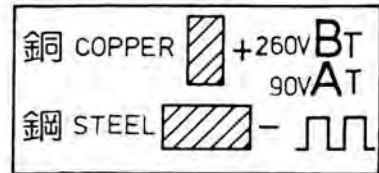
樣板
(粗細度)
ARD (VDI 3400)
SAMPLE

消耗比
WEAR RATE
%

進度
STOCK REMOVAL
mm³/min



0.5	1.5	2	3	80	22	80	< 1	0.040	0.052
1	3	2	3	80	23	65	< 1	0.045	0.059
1	4.5	2	3	80	24	60	0.8	0.050	0.066
1	6	2	3	80	25	55	1.5	0.055	0.073
2	9	2	4	80	26	50	2.0	0.057	0.077
2	12	2	4	80	27	45	3.0	0.060	0.082
3	15	2	4	80	28	42	4.5	0.065	0.090
3	15	6	4	70	31	30	12	0.085	0.120
3	15	10	4	70	32	28	20	0.120	0.160
3	15	15	4	70	33	25	25	0.150	0.195
3	15	20	4	70	34	18	30	0.180	0.230
3	15	30	4	60	35	12	38	0.210	0.266
3	15	45	5	60	36	10	45	0.230	0.293
3	15	60	5	60	37	7	55	0.250	0.320
3	15	90	5	60	38	6	60	0.270	0.350
3	15	120	6	60	39	5	65	0.280	0.370
3	15	150	6	60	40	4.5	65	0.290	0.390
3	15	200	7	60	41	4	70	0.310	0.422
3	15	300	7	60	42	3	72	0.330	0.456
3	15	400	7	60	43	2	75	0.340	0.480
3	15	500	8	60	44	2	75	0.350	0.510
3	21	500	8	60	45	2	90	0.400	0.580
3	30	500	8	60	45	2.5	125	0.450	0.630
3	30	600	8	60	45	2	135	0.470	0.670
5	45	600	9	60	47	3	190	0.540	0.760
5	60	600	9	60	49	3	250	0.620	0.880

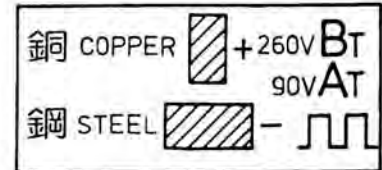


試驗條件

TEST CONDITION

電極材料 ELECTRODE	:	電 解 銅 ELECTROLYTIC COPPER
電 極 極 性 POLARITY ELECTRODE	:	正 極 POSITIVE
工件材料 WORKPIECE	:	鋼 STEEL
加工液 DIELECTRIC	:	煤油(中國石油) CPC KEROSENE
噴 流 INJECTION	:	0.5kg/cm ²
試驗面積 TEST AREA	:	20φmm

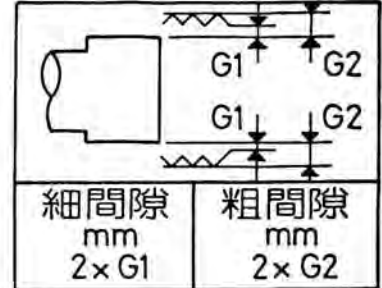
P30 放電操作明細表 P60 APPLICATION NOTE



高壓電流 BT HIGH CURRENT POS.	低壓電流 AT LOW CURRENT POS.
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放電時間 ON TIME PA	休息時間 OFF TIME PB	電壓表 VOLTAGE V
-----------------------	------------------------	---------------------

樣板 (粗細度) ARD (VDI 3400) SAMPLE	消耗比 WEAR RATE %	進度 STOCK REMOVAL mm ³ /min
---	-----------------------	---



0.5	1.5	2	1	60	21	10	0.7	0.045	0.057
0.5	1.5	4	1	60	22	8	1.0	0.050	0.062
0.5	1.5	6	1	60	22	6.5	1.5	0.060	0.072
0.5	1.5	8	1	60	23	5	2.5	0.065	0.079
0.5	1.5	10	1	60	24	4.5	4	0.070	0.086
0.5	1.5	15	1	60	25	3	4.5	0.075	0.093
0.5	1.5	20	1	60	26	2.5	5	0.080	0.100
0.5	1.5	30	1	60	27	2	5	0.085	0.107
0.5	1.5	45	1	60	28	1.5	4	0.090	0.115
0.5	1.5	60	1	60	29	1.0	3	0.092	0.120
0.5	1.5	90	1	60	30	0.5	2	0.095	0.127
0.5	1.5	120	1	60	30	-	1.5	0.100	0.132

0.5	3	2	1	60	23	13	1.5	0.055	0.070
0.5	3	4	1	60	24	12	2.5	0.060	0.075
0.5	3	6	1	60	25	10	3.5	0.062	0.080
0.5	3	8	1	60	25	8.5	5	0.065	0.083
0.5	3	10	1	60	26	7	6.5	0.070	0.090
0.5	3	15	1	60	27	5.5	8	0.075	0.097
0.5	3	20	1	60	28	4	9.5	0.080	0.105
0.5	3	30	1	60	29	2.5	11	0.085	0.113
0.5	3	45	1	60	30	1.5	10	0.095	0.127
0.5	3	60	1	60	31	1.0	8	0.100	0.135
0.5	3	90	1	60	32	0.5	6	0.105	0.145
0.5	3	120	1	60	33	-	5	0.110	0.155



Anotronic-SKM EDMs
Manual, ZNC, CNC



Anotronic-Ocean
EDM Drilling Machines
Manual, ZNC, CNC



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5axis cnc Milling



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- Laser Part marking
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- Design, Manufacture & Sales of EDM & ECM Tooling and Electrodes.
- Multi axis CNC EDM & ECM Sub-Contract Service.
- ECM Sub-Contract Service.
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