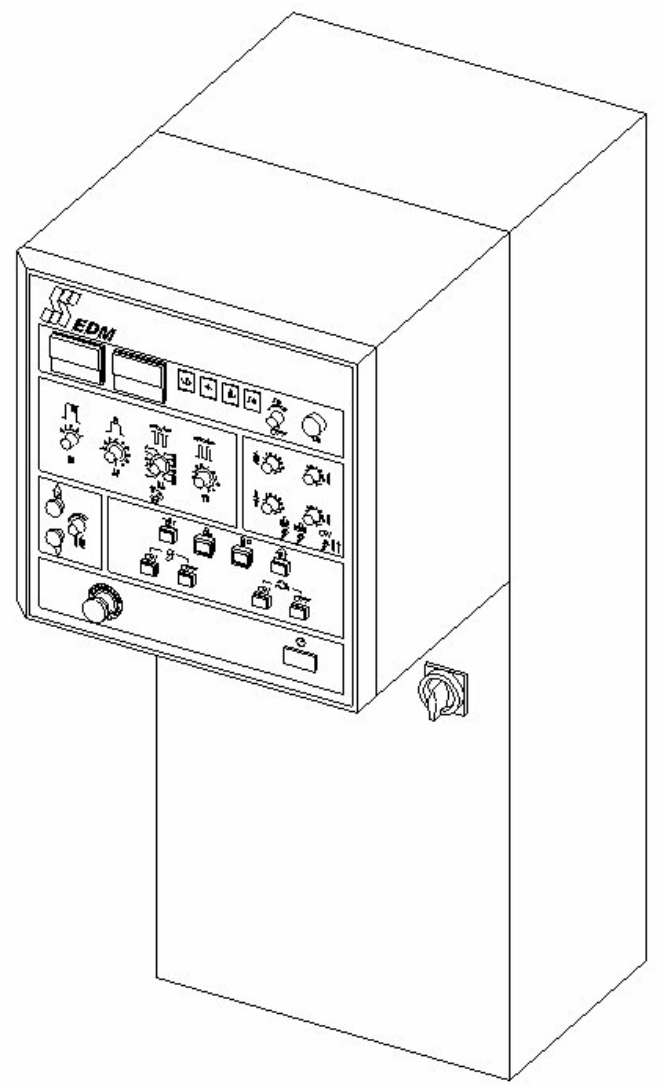
operation manual

E30/45/60/120 GENERATOR

Rev UK1.1b



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30 A 45 A 60 A GENERATOR

ISSUE : JAN. 2001

CHAPTER 1 : INTRODUCTION OF SKM EDM CONTROL SYSTEM

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BASIC FUNCTIONS

- INNOVATIVELY EQUIPED WITH THREE TYPES OF SAFETY DEVICES, HAS AN INFRARED FIRE MONITOR, OIL TEMPERATURE MONITOR, AUTOMATIC FIRE EXTINGUISHER AND MANY OTHER SAFETY DESIGN FEATURES TO PROVIDE DISTANCING FROM FLAMES.

- HAS AN AUTOMATIC SPARKING OFF TIME ADJUSTMENT TO PREVENT CARBON ACCUMULATION AND ELECTRODE WEAR.

- OPTIONAL AMPERAGE TUNING, PROVIDE 30A, 45A, 60A, 90A, 120A OR HIGHER OUTPUT POWER SUPPLY.

- INTERIOR DESIGNED WITH AUTOMATIC DETECTION SYSTEM, AUTOMATICALLY CURRENT PROTECTION CONTROL, TRANSISTOR OVERLOADING PROTECTION, RADIATOR DEVICES AND METAL SHELL GROUNDING DEVICE TO PREVENT MISCELLANEOUS MALFUNCTIONS HAPPENED.

- ELECTRONIC PIECES USE EUROPE, AMERICAN AND JAPENESE PRODUCTS, ALL PIECE ARE COMPLIED WITH STANDARDIZATION AND STRICT TESTING, THEREFORE, IT IS RELIABLE AND EASY TO MAINTAIN.

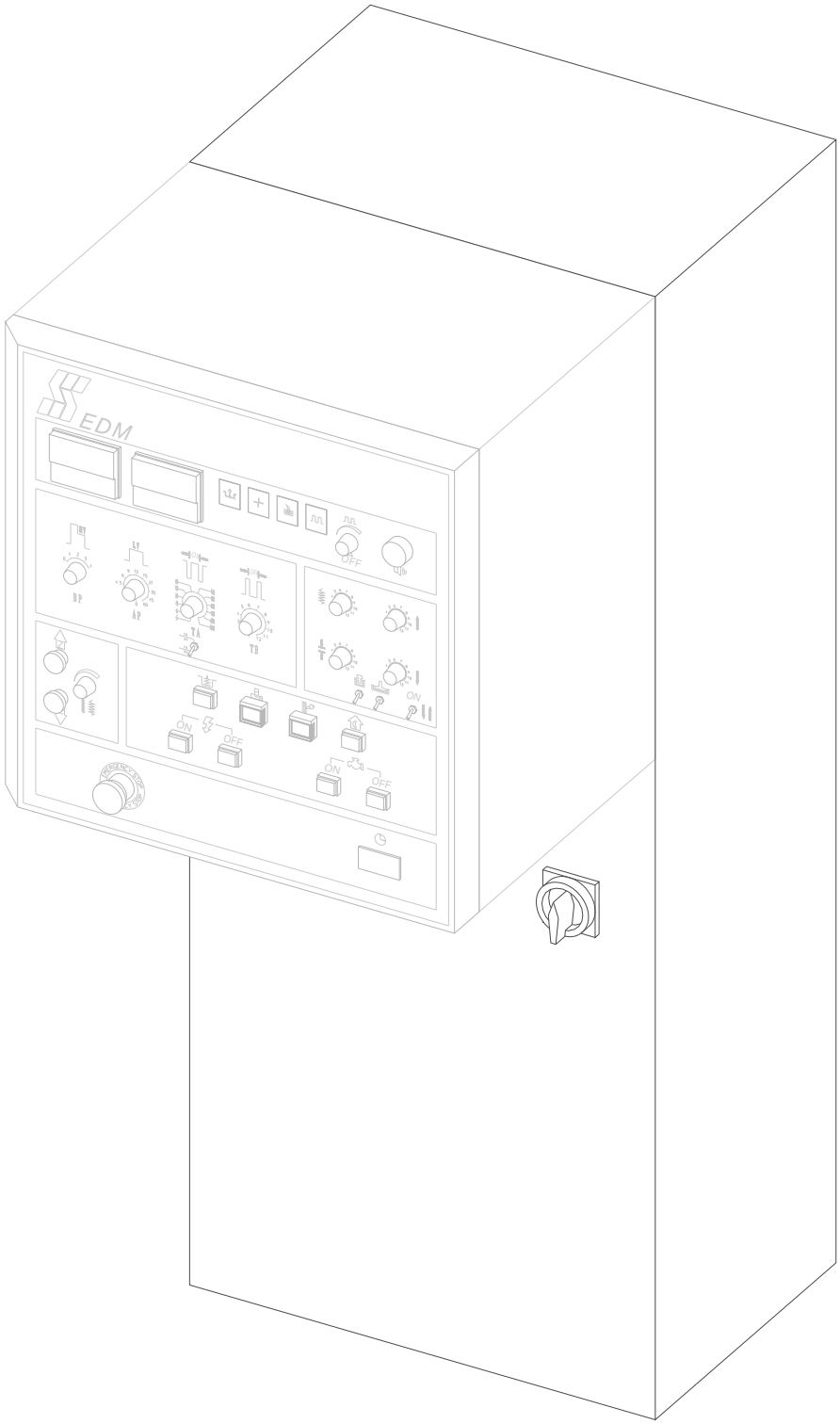

FIG. 1

CHAPTER 2 : EDM PRINCIPLES AND TECHNOLOGY

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Electrical discharge processing involves the flowing of a dielectric fluid between the work piece and the electrodes, wherein direct current is normally utilized to maintain pole voltage to produce an electrical potential.

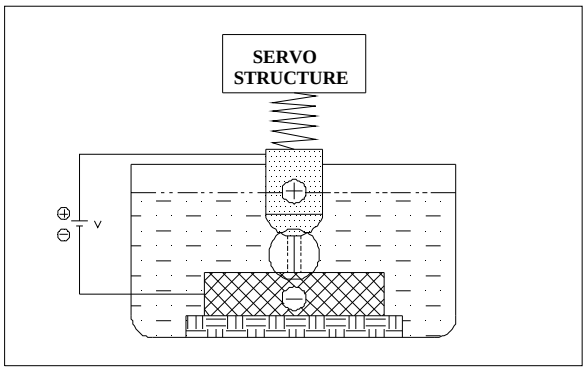
The feeder device such as servo structure has precision interval pole gap distances (within approximately 0.02mm-0.1mm) to produce a high magnitude electric field that overcomes the insulating properties of the dielectric fluid to generate an electrically conductive ionized channel of free flowing electrons as the produced electric current.

This type of current does not require.

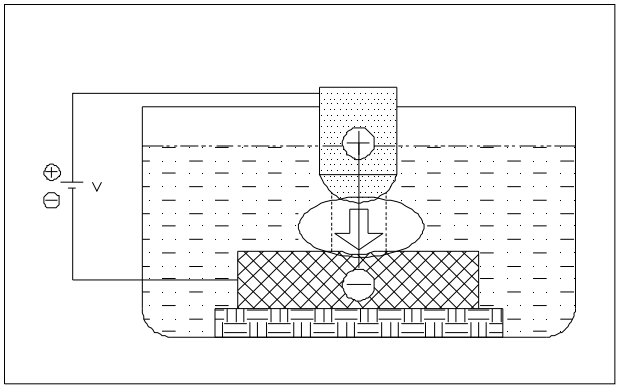
Conductors to transmit the produced flow of current and we call it an isolated electric discharge reaction. In this phenomenon, electrical energy is instantaneously transformed into an ultra-high heat level of approximately 10,000℃.

Due to the transformation of the energy, the high-temperature heat produced melts to the surface of the work piece.

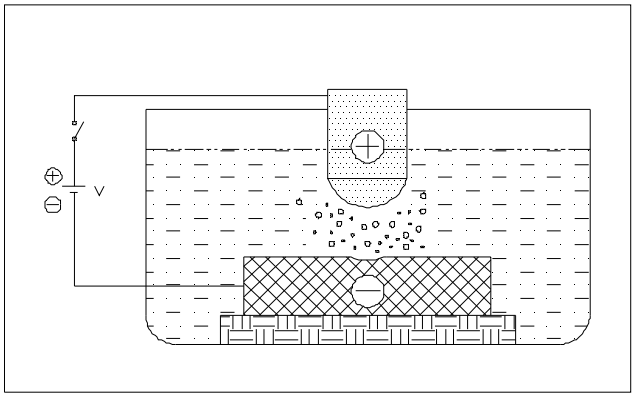
By utilizing this reaction, we can fabricate electrodes of different shapes to erode a range of different exterior contours in the mold of the work piece.



1. When voltage is applied to the electrode and the work piece, an electrical field form as the voltage builds up, and this will be getting stronger when the distance between electrode and work piece get closer.



2. When the pole distance between the electrodes and the work piece reaches the appropriate value, the insulation breakdown produces high-impact ionization due to the intensification of the electric field. The electrical energy is instantly transformed into heat energy to erode the work piece, resulting in the forming of a cavity and producing of carbon residues and so on.
Meanwhile, the dielectric fluid disintegrates into an airborne gas that rapidly expands outward.



3. The transportation energy at the center point between the electrodes is cut off lost through dielectric resolution, which is manifested as a sparking electrical discharge of the dielectric fluid. At this time, high-temperature gases are absorbed inward. The molten material of the work piece continues to flow and be removed as the dielectric fluid disintegrates.

After knowing the principles and physical characteristics of EDM, we would like to describe the relative factors of EDM influence efficiency.
Careful control of those variables gap, polarity, amperage , duration , and this is essential to be sure of tooling at maximum efficiency.
For example; Polarity selection; matching of amperage and duration electrode wear may vary from 0.1% to 99.8%.

CHAPTER 3 : ELECTRODE MATERIAL

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Any material which is a good electrical conductor can be used.
Materials with the highest melting point and the lowest electrical resistivity are the best.
Because electrode cost is critical factor in cost analysis, selection of electrode material, the quantity and the method of manufacture are all important and need careful consideration.

Electrode materials can usually be divided as follows:

1. Silver tungsten
2. Copper tungsten
3. Copper graphite
4. Chromium copper
5. Electrolytic copper
6. Graphite
7. Bronze
8. Aluminum alloy
9. Steel

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

Graphite features are low electrode wear and high removal rate, but breaks easily as low density.
So it is best employed when fine finish is not required.

Steel is most utilized in the tooling of split lines plastic and die casting mold.

3-1 ELECTRODE MATERIALS CHARACTERISTICS

ELECTRODE MATERIAL	MELTING PONT	RESISTIVITY $\Omega\ mm^2/m$	DENSITY g/mm^2
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	0.085~0.15	0.0015~0.0018
BRONZE	1060		0.0082
ALUMINUM ALLOY			
STEEL	1539	0.0971	0.0087

3-2 ELECTRODE MANUFACTURING

1. Traditional machining methods such as turning, milling, shaping, grinding, engraving, ...Etc.

2. Stamping

3. Extrusion or drawing

4. Galvanic plating

The above methods of production are all suitable.
Selection of one depends on electrode material.

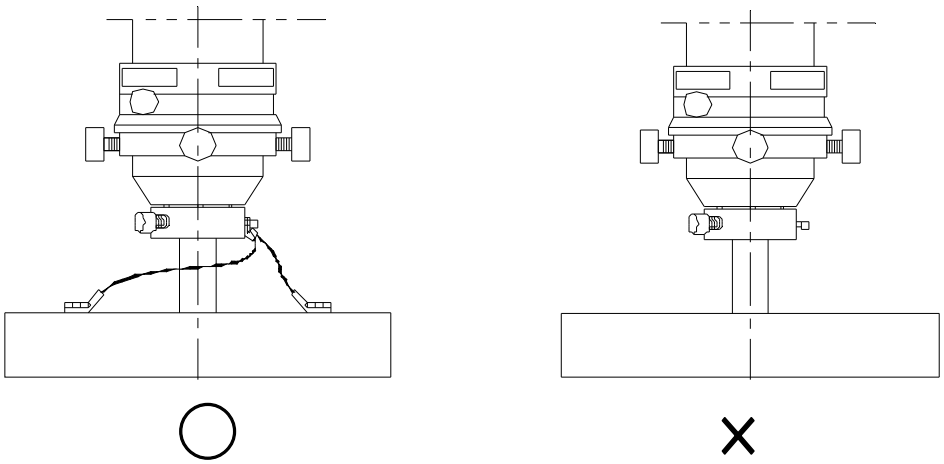
＊. Complex or convoluted electrode shape
may be produced in separated parts.

＊. Irregular electrode shape: it must be centered on easily measure axis.

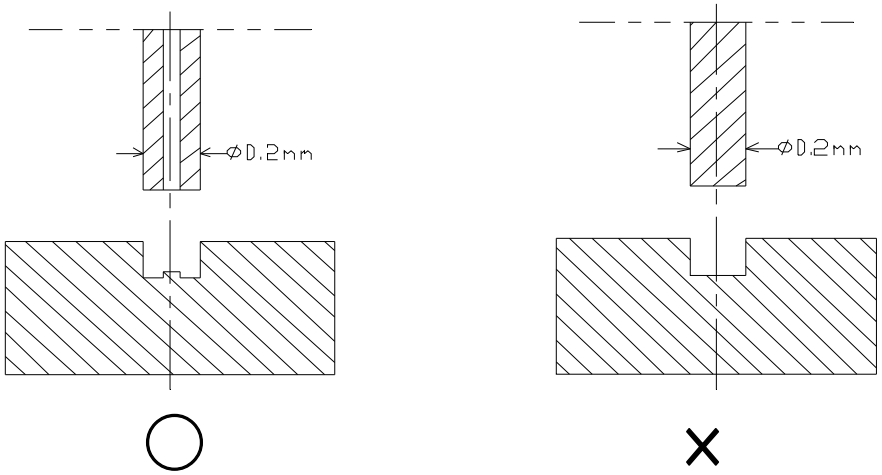
＊. Long , thin electrodes : Have to be installed with current supplied to the ends as well as the center
thereby ensuring even discharge over whole work place. (fig.3-1)

＊. Small diameter holes require tube electrode:
to ensure high efficiency in flushing And draining.(fig.3-2)

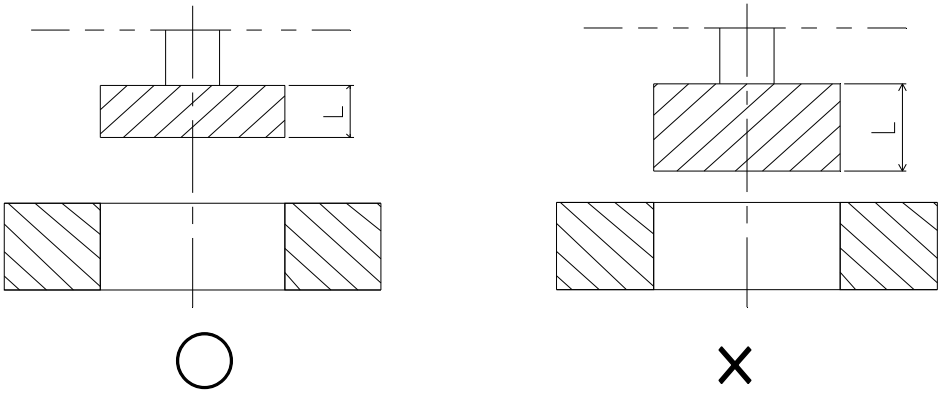
＊. For through the hole machining ensure work head electrode is thin. Thick Electrodes impede particle discharge. (fig.3-3)



（**FIG. 3-1**）



（**FIG. 3-2**）



（**FIG. 3-3**）

CHAPTER 4 : EDM APPLICATION

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EDM applications depends on a skilled operator that analyses all the EDM factors to produce high quality work. There are the discharge factors:

1. Electrode material
2. Work piece material
3. Electrode volume
4. Surface roughness
5. Spark gap
6. Electrode wear
7. Removal rate

(the above factors are explained in the enclosing 30A 45A 60A application note)

During sparking (discharge) the gap area must be continuous flushed to clean off particles and residue, and the dielectric fluid also have to keep clearing.

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.

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.

To set servo sensitivity bear in mind sensitivity depends on current : when the current is low , then little amplitude and high sensitivity.

4-1 DISCHARGE OPERATION PROCESS

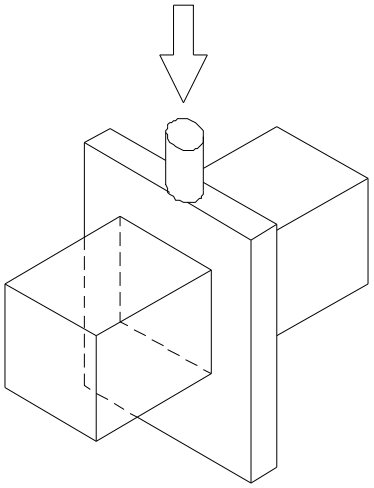
1. Turn on the main switch in “ON” position.
   ↓
2. Electrode zero vertical angle and at position “0” .
   ↓
3. Finding x. y axis reference point , set up their position.
   ↓
4. Moving z axis to reference point , and clear it‘s value to “0”.
   ↓
5. Setting sparking parameter.
   ↓
6. Setting synchronous flushing switch and overflow control switch & work head lift control.
   ↓
7. Dielectric pump and fire control lamp “ON” , adjust overflow gate.
   ↓
8. Discharge switch “ON”.
   ↓
9. Observe the index of voltage & amperage gauge, and the reaction of z axis to check whether they are stable when sparking.

＊＊＊

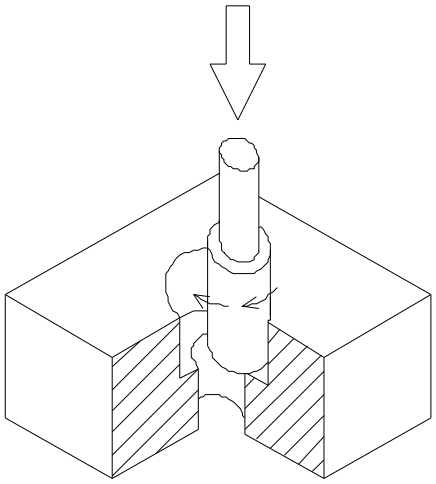
(Remark : do not touch the work head & electrode when sparking.)

4-2 THE SAMPLE OF SPARKING

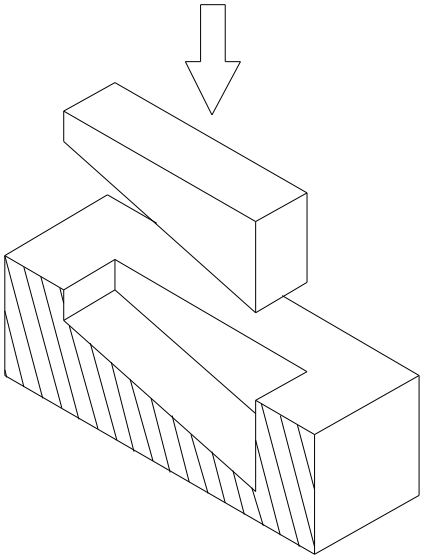
1. Sparking for cutting (fig. 4-1)
2. Sparking for grinding (fig. 4-2)
3. Sparking for carving (fig. 4-3 and fig. 4-4)



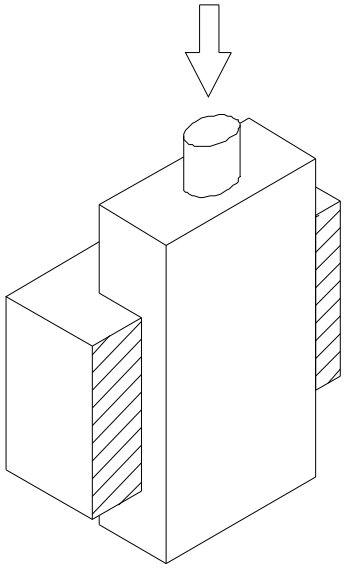
（**FIG. 4-1**）



（**FIG. 4-2**）



（**FIG. 4-3**）



（**FIG. 4-4**）

CHAPTER 5 :SYSTEM OPERATIONAL INSTRUCTION

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A. DESCRIPTION OF CONTROL PANEL

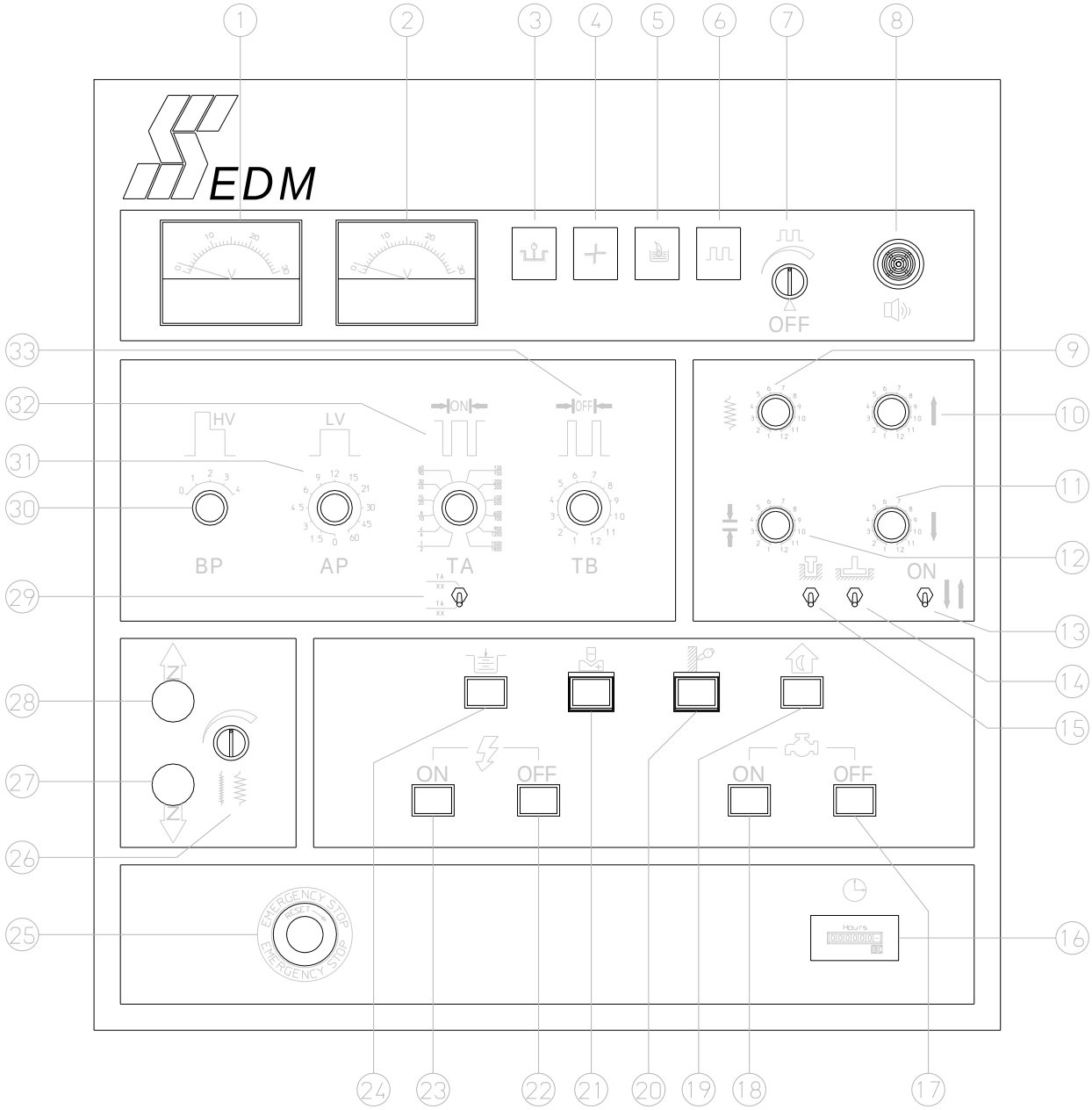

FIG. 5-1

5-1 DESCRIPTION OF CONTROL PANEL

SKM EDM <see Fig 5-1> manual control panel drawing

All of description of function keys are as below:

1. Voltmeter : shows the discharge voltage.
2. Ammeter : shows the discharge amperage.
3. Depth Reached indicator lamp.
4. Edge finding indicator lamp.
5. Temperature/fire control indicator lamp.
6. Arc indicator lamp.
7. Arc adjust knob.
8. Buzzer : warning sound.
9. Servo sensitivity.
10. (↑)Up pumping time.
11. (↓)Down pumping time.
12. Sparking gap voltage.
13. Up / down pumping timer switch.
14. Large area function (FB).
15. Deep hole function (FA)
16. Discharge timer.

.

17. Dielectric fluid pump “off” switch/lamp.

18. Dielectric fluid pump “on” switch/lamp.

19. Sleep switch/lamp.

20. Workpiece alignment.

21. Electrode polarity.

22. Discharge “off” switch/lamp.

23. Discharge “on” switch/lamp.

24. Overflow control switch/lamp.

25. Emergency stop.

26. Z-axis down switch.

27. Z-axis speed control knob.

28. Z-axis up switch.

29. TA numerical switch.

30. High voltage VS. Amperage switch (BP).

31. Low voltage VS. Amperage switch (AP).

32. Sparking on time (TA).

33. Sparking off time (TB).

5-2 THE FUNCTIONS OF CONTROL PANEL & REMOTE CONTROL

1. Voltmeter :

Shows the discharge voltage between electrode and work piece and the stability of sparking.

2. Ammeter :

Shows the discharge amperage , and operator can observe whether there is any difference between sparking and setting amperage.

3. Depth reached indicator lamp :

The buzzer will operate and the lamp lights when depth reach, it can be stopped by raising the z-axis.

4. Edge finding indicator lamp:

The buzzer operate and the lamp lights when the electrode contact work piece.

5. Fire control indicator lamp: (ONLY IF FIRE SENSOR IS FITTED)

When the work tank is on fire, the lamp will light and cause buzzer and the machine will stop discharging at the same time.

6. Arc indicator lamp:

The lamp will light and the machine will pluse a few second for flushing arc when arc happens, and the machine will stop sparking and the buzzer will operate if the arc situation is not resolved.

7. Arc adjust knob:

Turn on the switch to start monitoring arc. Turn to right direction to increase the sensitivity .

8. Buzzer :

It has 2 sounds, the loudest is for firing protection and the other will alarm when depth reach ,the electrode contacts work piece ,or arcing.

9. Servo sensitivity ( ):

Servo's adjustment must be synchronized with sparking on time(TA) and amperage (AP).
When the voltage meter is steady , synchronization has been achieved.

The work head vibration depends on the servo sensitivity.

The more servo sensitivity , the larger vibration will be achieved (range between **± 0.01mm ~ 0.025 mm**).
This approach is good for carbon evacuation.
However , the improper strong servo sensitivity will damage electrode during sparking.
On the contrary , the weak servo sensitivity will cause the ill-performance of carbon evacuation.
For general , strong servo sensitivity is applied on rough finish ; weak servo sensitivity is fit for fine finish.

10. (↑ **)** 、11. (↓):

↑↓ (Up/down pumping time) is used for eroding when it is difficult to evacuate carbon, ie; deep hole or blind hold finish.
The motion of pumping will increase the performance of carbon evacuation.
Under roughing, because the sparking energy is higher , it is easy to evacuate carbon. Therefore , the pumping frequency should be set as lower (higher ↓ value and lower ↑ value).
On the contrary, for fine finishing, we should set a higher pumping frequency to increase the pumping performance (lower ↓ value).
During pumping up, system will automatically shut down sparking power to avoid the abnormal side sparking.

12. Sparking gap voltage ( ):

GAP-V(sparking gap voltage) determines the sparking distance between electrode and work piece.
The lower value of GAP-V, the closer of sparking distance , hence the more sparking energy.
It will cause the side effect of poor carbon evacuation performance and increasing the gap temperature that can easily melt the electrode.
On the other hand, the higher value of GAP-V, the longer of sparking distance, hence the lower sparking energy.
This is good for carbon evacuation but increases the electrode wear rate.

13. Up / down pumping time switch (↑ ↓ **)**:

14. Large area function (- FB):

Large area sparking can cause suction of the work piece during pumping up motion.
When FB is **ON** , it will slow down pumping motion to eliminate the vacuum between electrode and work piece.

15. Deep hole function (- FA):

Deep hole sparking can cause poor evacuation, retarding the pumping down motion.

When FA is **ON** , it will force electrode down to the previous sparking on position then release to speed control to servo.
Therefore, it will increase the efficiency of deep hole sparking.

16. Discharge timer:

For cumulate calculation of sparking time.

17. Dielectric fluid pump “OFF” switch/lamp:

The lamp lights red color when the pump is “OFF”.

18. Dielectric fluid pump “ON” switch and lamp:

Switches on the dielectric pump.
The pump will stop when you press the “OFF” switch or depth is reached.

19. Sleep switch :

Z-axis will raise to maximum position when this switch is “ON” and depth is reached.

20. Work piece alignment :

When operator sets up the work piece, he can use the electrode or probe to align the horizontal and vertical ways of work piece.
When this switch is “OFF”, a short circuit between electrode and work piece will cause the z-axis to stop, thus protecting the work piece , at this moment the alarm buzzer and indicator lamp will activate.
When this switch is “ON”, a short circuit between electrode and work piece will NOT cause the z-axis to stop.
The operator can use this function to align the work piece by watching the indicating lamp.

21. Electrode polarity ():

In general, positive electrode voltage is used when sparking with AP that is applied for rough and fine finishing. When sparking with BP only, both of positive and negative electrode voltages are suitable. The only difference is, negative polarity electrode voltage will cause metallic polish on work piece. Some work piece materials need negative polarity electrode.
Please reference **application note** for detail information.

22. Discharge “OFF” switch/lamp:

Press this “ OFF ” switch stop the machine sparking.

23. Discharge “ON” switch/lamp:

When the machine is sparking the lamp is green.
The machine will stop sparking when pressing discharge “OFF” switch , z-axis “UP” switch or depth is reached.

24. Overflow control switch/lamp:

When the overflow lamp is “ON” the machine will start sparking before the dielectric fluid level is at the requested position.

25. Emergency stop switch:

Press the switch when there is any thing wrong in sparking and the machine will stop running.

26. Z-axis speed control knob:

For adjusting the speed of z-axis up-down movement.

27. Z-axis down switch:

It can not be used when the machine is in sparking.

28. Z-axis up switch:

When moving this switch while sparking , the machine will stop.

29. High voltage VS. Amperage switch:

Generally, BP can be applied in rough finishing.
In fine finishing, the sparking time and sparking depth cannot be too long because higher electrode wear will be caused.
In roughing, BP is the important auxiliary parameter.
Usually , we set BP as section 1 or 2.
It will cooperate with AP to accelerate sparking speed.
The performance will be increased by 5~10%; the electrode wearing will be increased by 1~1.5%.

30. Low voltage VS. Amperage switch:

AP can be applied on fine and rough finishing.
The cutting speed, electrode wear rate, gap between electrode and work piece and roughness can be determined by setting the different combination of AP and TA(sparking on time) values.
To see the detail information, see the reference on **application note**.

31. Sparking on time:

The combination of TA and AP values will determine the finish roughness.
The minimal value is rmax6~9μm/1μs, maximal value is rmax90~120μm/1800μs.
For non-wearing finish, TA should be set as 60μs or above.
If TA is directly operational to AP, the electrode wear rate will be less.
If TA is short and AP is large , the electrode wear rate will increase.
Since different metallic materials have different characteristics, it's necessary to use different TA setting according to the table defined in **application note**.

32. Sparking off time:

TB is the time between pulses off time when no impact ionization occurs and dielectric conditions are re-established.
Usually when the discharge is table and interval is short, efficiency is high and a protective coating will form on the electrode.
However, it causes poor carbon evacuation.
So, it's necessary to set the appropriate ↑ ↓ (electrode up/down pumping frequency) values and dielectric fluid flushing position.

CHAPTER 6 : DESCRIPTION OF EDM PARAMETER

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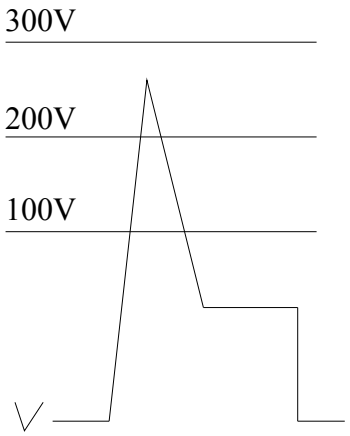
SKM EDM CNC provides the following edm parameters:

BP	AP	TA	TB			↑	↓		FA	FB
0	3	120	3	6	45	3	2	+	OFF	OFF

6-1 BP (HIGH VOLTAGE VS. AMPERAGE SWITCH)

BP is defined as the following values by default:



(BP) 260V SELECTION VS. AMPERAGE

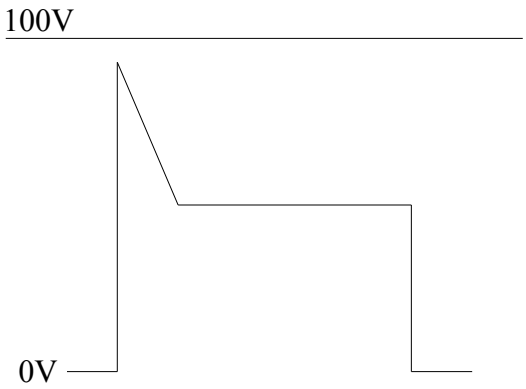
SELECTION AMPERAGE

0…….. 0A
1…….. ……1A
2…….. ……2A
3…….. ……3A
4…….. ……4A
5…….. ……5A

Generally, BP can be applied in rough finishing.
In fine finishing, the sparking time and sparking depth cannot be too long because higher electrode wear will be caused.
In roughing, BP is the important auxiliary parameter.
Usually , we set BP as section 1 or 2.
It will cooperate with AP to accelerate sparking speed.
The performance will be increased by 5~10%; the electrode wearing will be increased by 1~1.5%.

6-2 AP (LOW VOLTAGE VS. AMPERAGE SWITCH)

AP is defined as the following values by default:



(AP) 90V AMPERAGE STEP VS. AMPERAGE

SELECTION	AMPERAGE	SELECTION	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
1 2	1 2A		

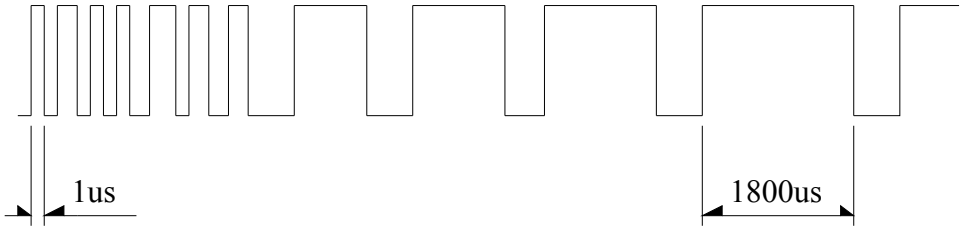
AP can be applied on fine and rough finish.
The cutting speed, electrode wear rate, gap between electrode and work piece and roughness can be determined by setting the different combination of AP and TA(sparking on time) values.
To see the detail information, see the reference on **application note**.

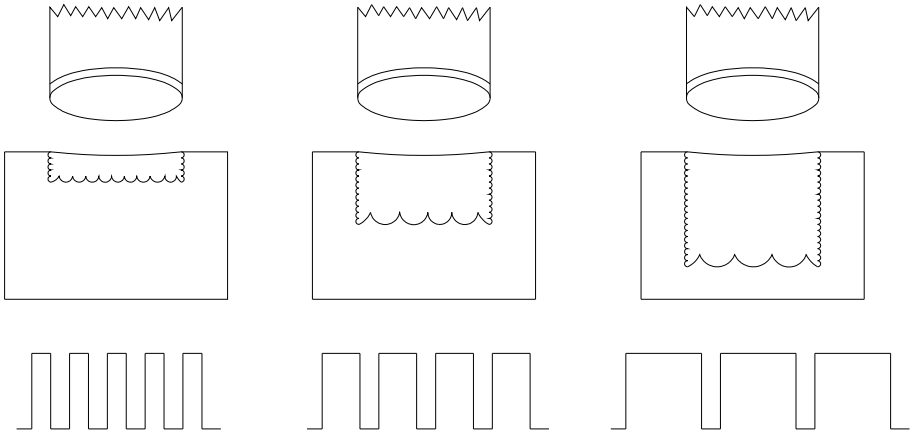
SURFACE / POWER RATIO TABLE

SURFACE AREA	POWER VALUE	REFERENCE
	Cu+ (Electrode) Cuw+ (Electrode)	Gr+ (Electrode) Gr- (Electrode)
0mm²~10mm²	3A~6A	3A~6A
10mm²~25mm²	6A~12A	6A~12A
25mm²~100mm²	12A~21A	12A~21A
100mm²~400mm²	12A~45A	21A~45A
400mm²~1600mm²	21A~60A	45A~60A
1600mm²~6400mm²	21A~60A	60A~120A
6400mm² Above	21A~60A	120A

6-3 TA (SPARKING ON TIME)

TA is defined as the following values by default:





SPARKING ON TIME

1=1us	30=30us	400=400us
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

TA is used to control the sparking on time duration.

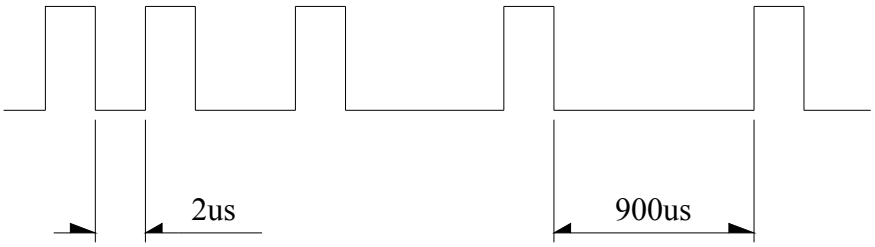
1. The combination of TA and AP values will determine the finish roughness.
The minimal value is rmax6~9μm/1μs, maximal value is rmax90~120μm/1800μs.

2. For non-wearing finish, TA should be set as 60μs or above.
If TA is directly proportional to AP, the electrode wear rate will be less.
If TA is short and AP is large , the electrode wear rate will increase.

3. Since different metallic materials have different characteristics, it's necessary to use different TA setting according to the table defined in **application note**.

6-4 TB (SPARKING OFF TIME)

TB is defined as the following values by default:



SPARKING OFF TIME

1= 2us	6=90us
2= 4us	7=200us
3= 8us	8=450us
4= 15us	9=900us
5= 45us	

1. TB is the time between pulses off sparking on time (TA), when no impact ionization occurs and dielectric conditions are re-established.
   Usually when the discharge settings are as the table and the interval is short, efficiency is high and a protective coating will form on the electrode.
   However, it causes poor carbon evacuation.
   So, it's necessary to set the appropriate ↑ ↓ (electrode up/down pumping frequency) values and dielectric fluid flushing position.

2. The shorter of TB , the higher of amperage.
   The longer of TB , the lower of amperage.
   No matter how different TB value, the sparking energy always be the same.

3. Since different metallic materials have different characteristics, it's necessary to use different TB setting to reach the best finish result.

4. TB setting valve as following

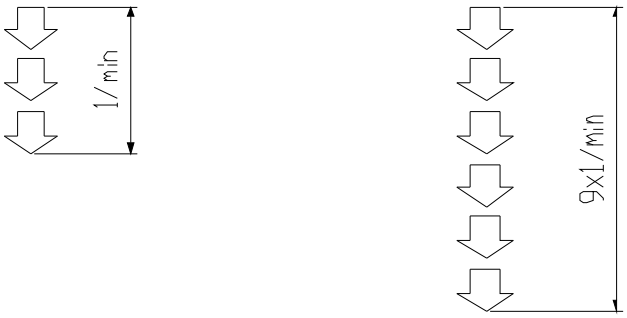
(1) Under stable sparking conditions, the sparking off time will be the same as the TB setting value. However, when an abnormal situation happens, for example, poor performance of carbon evacuation or arcing, the sparking off time will be automatically prolonged up to **5** times of TB setting value for trouble shooting.

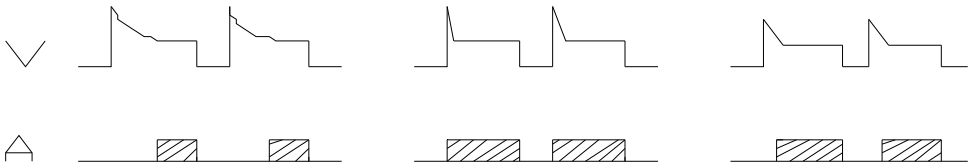
(2) User can increase the TB value manually to aid the carbon evacuation while sparking is unstable. Generally, this should be applied in deep hole, blind hole or gradient sparking.

(3) If the amperage of AP is larger than the maximal setting value defined in *surface/power ratio table*, user should enlarge the TB value to protect electrode from being fused since high AP will cause a high temperature at the electrode.

6-5 (SERVO SENSITIVITY)

SERVO SENSITIVITY is defined as the following values by default:





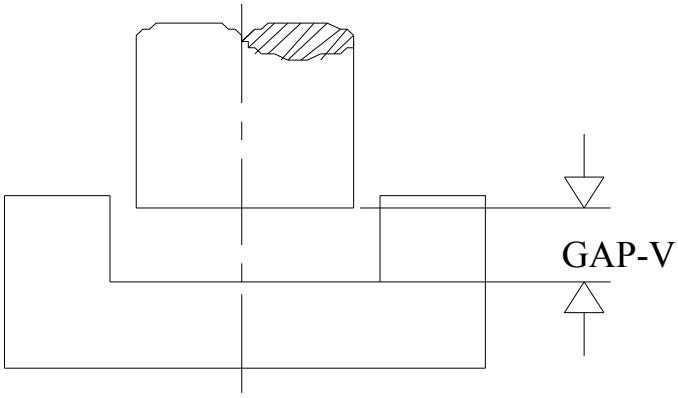
1. The servo's adjustment must be synchronized with sparking on time(TA) and amperage (AP). When the voltage meter is steady , synchronization has been achieved.

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.

3. The work head vibration depends on the servo sensitivity.
   The more servo sensitivity , the larger vibration will be achieved (range between **± 0.01mm ~ 0.025 mm**).
   This approach is good for carbon evacuation.
   However , improper strong servo sensitivity setting will damage electrode during sparking.
   On the contrary, a weak servo sensitivity setting will cause poor performance of carbon evacuation. Generally , a strong servo sensitivity setting is applied on roughing and a weak servo sensitivity setting is set for fine finishing.

6-6 ✳ GAP-V (SPARKING GAP VOLTAGE)

GAP-V (sparking gap voltage) is defined as the following values by default:



GAP-V(sparking gap voltage) determines the sparking distance between electrode and work piece.
The lower value of GAP-V, the closer the sparking distance , hence the more sparking energy.
It will cause the side effect of poor carbon evacuation performance and increased gap temperature that can easily melt the electrode.

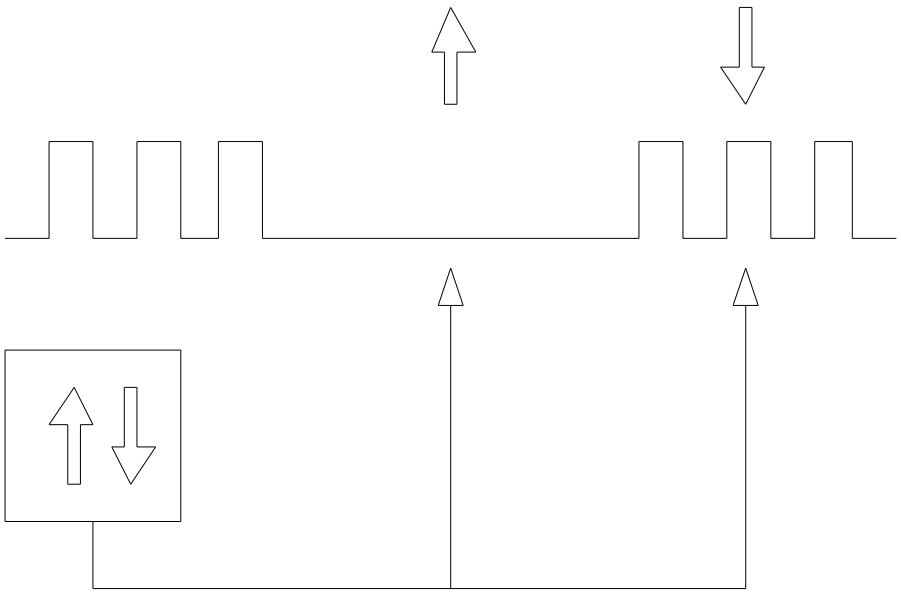
On the other hand, the higher value of GAP-V, the longer of sparking distance, hence the lower sparking energy.
It's good for carbon evacuation but increases the electrode wear rate.

1. When the GAP-V value is set as **60v** or above, it is good for fine finishing or when it is difficult to evacuate carbon, like deep hole, blind hole, large area or gradient finish.

2. When the GAP-V value is set as **45v** or below , the sparking energy is higher and achieves higher efficiency , it is good for roughing.
   It should be noticed that the lower value of GAP-V will cause a higher gap temperature that can easily melt the electrode, the user should be careful to set this parameter when sparking on a small area. Moreover, you can increase the TB value to increase cooling time to solve this problem.

6-7 ↑↓ (UP/DOWN PUMPING TIME)

↑↓ (up/down pumping time) is defined as the following values by default:



↑↓ (Up/down pumping time) is used when it is difficult to evacuate carbon, like deep hole or blind hole sparking.
The motion of pumping will increase the performance of carbon evacuation.

1. When roughing, because the sparking energy is higher , it is easy to evacuate carbon. Therefore, the pumping frequency should be set lower (higher ↓ value and lower ↑ value).

2. For fine finishing, we should set a higher pumping frequency to increase the pumping performance (lower ↓ value).

3. During pumping up, the system will automatically shut down sparking power to avoid abnormal side sparking.

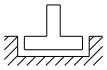
6-8 ELECTRODE POLARITY, DEEP HOLE AND LARGE AREA FUNCTION

ELECTRODE POLARITY:

Generally, positive electrode polarity is used when sparking with AP that is applied for rough and fine finishing. When sparking with BP only, both of positive and negative electrode polarities are suitable. The only different is, negative polarity electrode will cause metallic polish on work piece.
Some work piece materials need negative electrode polarity.
Please reference **application note** for detail information.

FA (DEEP HOLE FUNCTION):

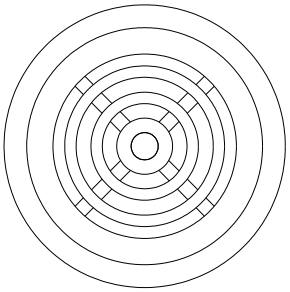
The deep hole function will improve the poor performance of carbon evacuation.
The FA function is used on deep hole sparking.
When FA is **ON**, it will force electrode down to the previous sparking on position then release to speed control to servo.
Therefore, it will increase the efficiency of deep hole finish.



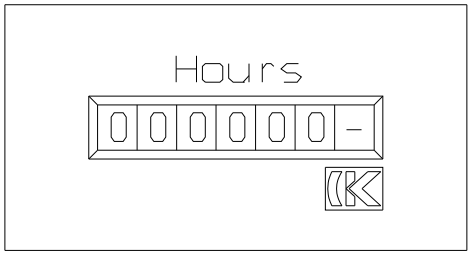
FB (LARGE AREA FUNCTION):

Large area sparking can cause suction of the work piece during pumping up motion.
When FB is **ON** , it will slow down pumping motion to eliminate the vacuum between electrode and work piece.

6-9 BUZZER, DISCHARGE TIMER



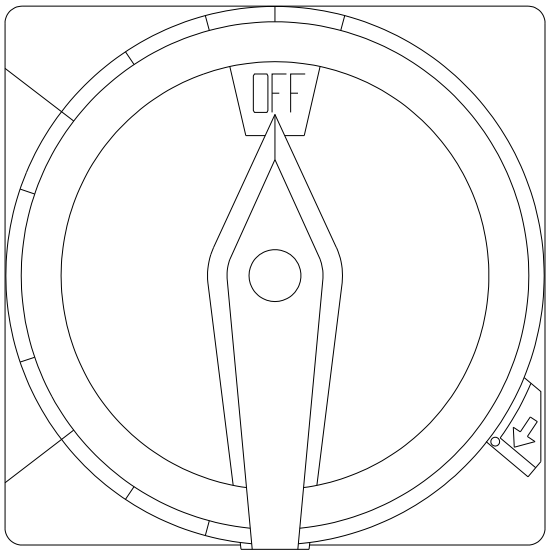
Warning buzzer



Discharge timer

6-10 EMERGENCY STOP, MAIN POWER SWITCH

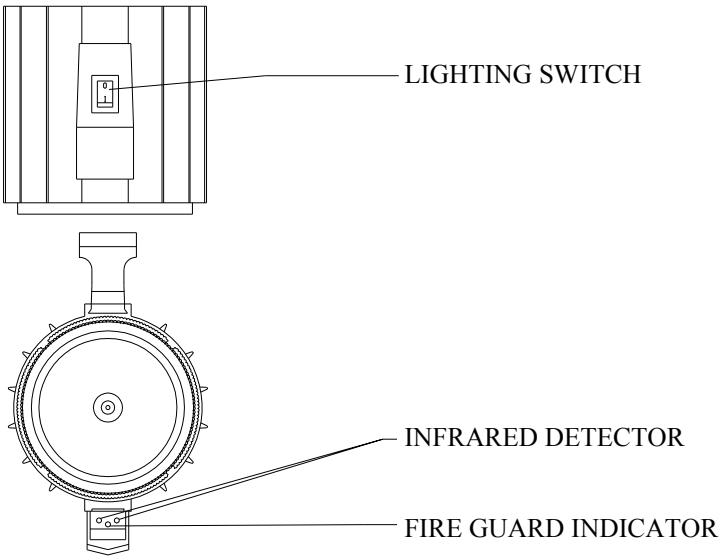
Emergency stop switch



Main power switch

6-11 LIGHTING SYSTEM AND FIRE GUARD INDICATOR *(IF FITTED)*

1. ILLUSTRATION:

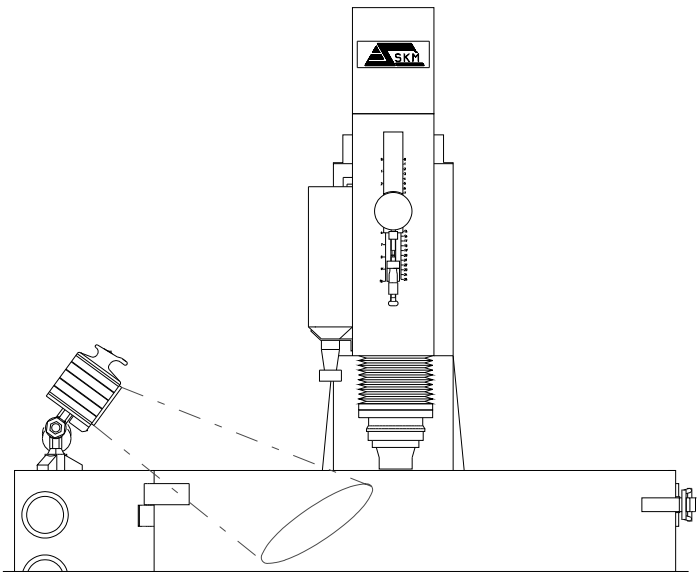


2. DESCRIPTION:

1> Activate lighting system:

a. Turn on lighting switch.

b. The fire guard function will become invalid and extinguish the fire guard indicator, therefore, the user has to turn off the lighting switch when he is not around the work place.



➔ Lighting range

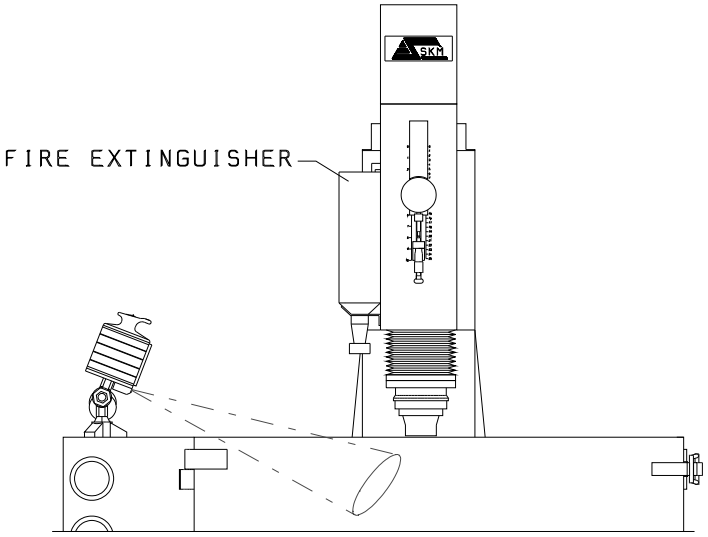
2> Activate fire guard:

a. Turn off lighting switch to extinguish working light.

b. The fire guard function will become valid and the indicator will on.

c. When the fire guard is activated, it starts to monitor during sparking. It will shut down the system power and give a beep warning when the fluid temperature is too high or a fire on working platform is detected.

d. The fire extinguisher should be checked once a year and can be used only one time. Notice the expiry date of fire extinguisher and check the pressure gauge everyday . If the pressure is too low, refill the extinguisher.



➔Infrared sensingrange

Note:

The fire guard detects the fire source by an infrared sensor.
To avoid error activation of the fire alarm, the machine should not be directly positioned under direct sunlight, bulb or other heat light source.
We strongly recommend installing the machine under a cold light source like fluorescent light.

CHAPTER 7 : THE SYSTEM OPERATION AND APPLICATION

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7-1 THE PROCEDURE FINE FINISH ADJUSTMENT OF SKM EDM

NO.	BP	AP	TA	TB	↑	↓		(V)
1	0	30	700	3	3	5	7	45
2	0	21	600	3	3	5	7	45
3	0	15	500	3	3	5	7	45
4	0	12	400	3	3	4	6	45
5	0	9	300	3	3	4	6	45
6	0	6	200	3	3	4	6	45
7	0	4.5	150	3	3	4	6	45
8	0	4.5	90	3	3	*3	6	45
9	0	4.5	45	3	3	*2	6	45
10	0	4.5	20	3	2	*2	6	50
11	1	4.5	10	2	2	*1	5	50
12	0	3	120	3	3	*3	5	45
13	0	3	60	3	3	*3	5	45
14	0	3	30	3	2	*2	5	50
15	0	3	10	2	2	*1	5	50
16	0	3	4	2	2	*1	5	50
17	0	1.5	15	2	2	*1	5	50
18	0	1.5	8	2	2	*1	5	50
19	0	1.5	4	2	2	*1	5	60
20	2	0	15	2	2	*1	5	*120
21	2	0	8	2	2	*1	5	*120
22	1	0	2	1	2	*1	5	*120

(1) Position 1-7 are for rough finish and bear the lowest wear rate.

(2) Position 8-11 are for fine finish of large area.

(3) Position 12-22 are fine finish of small area.

THE FORMULA OF FINISHING DISCHARGE DEPTH :

The finishing discharge depth = the total difference between the intended depth and the present settings of AP plus TA values.

For example :

The machining condition from **AP=15a, TA=400us change to AP=9a, TA=200us**
From **figure. A** , then the finishing discharge depth is :

AP					**TA**				
	0.06mm		**0.05mm**				**0.025mm**		**0.025mm**
15A	**→**	**12A**	**→**	**9A**	**400**	**→**	**300**	**→**	**200**

From above :

AP from **15A to 12A to 9A** , the necessary depth are **0.06 + 0.05 = 0.11mm**, **TA** from **400 to 300 to 200**, the necessary depth is **0.025 + 0.025 = 0.05mm**.
The total depth **AP + TA = 0.11mm+0.05mm=0.16mm**.

So when the machining condition from **AP→15A、TA→400us**, change to **AP→9A、TA→200us**, the minimum machining depth of z axis is about **0.16mm**.

FIG. A

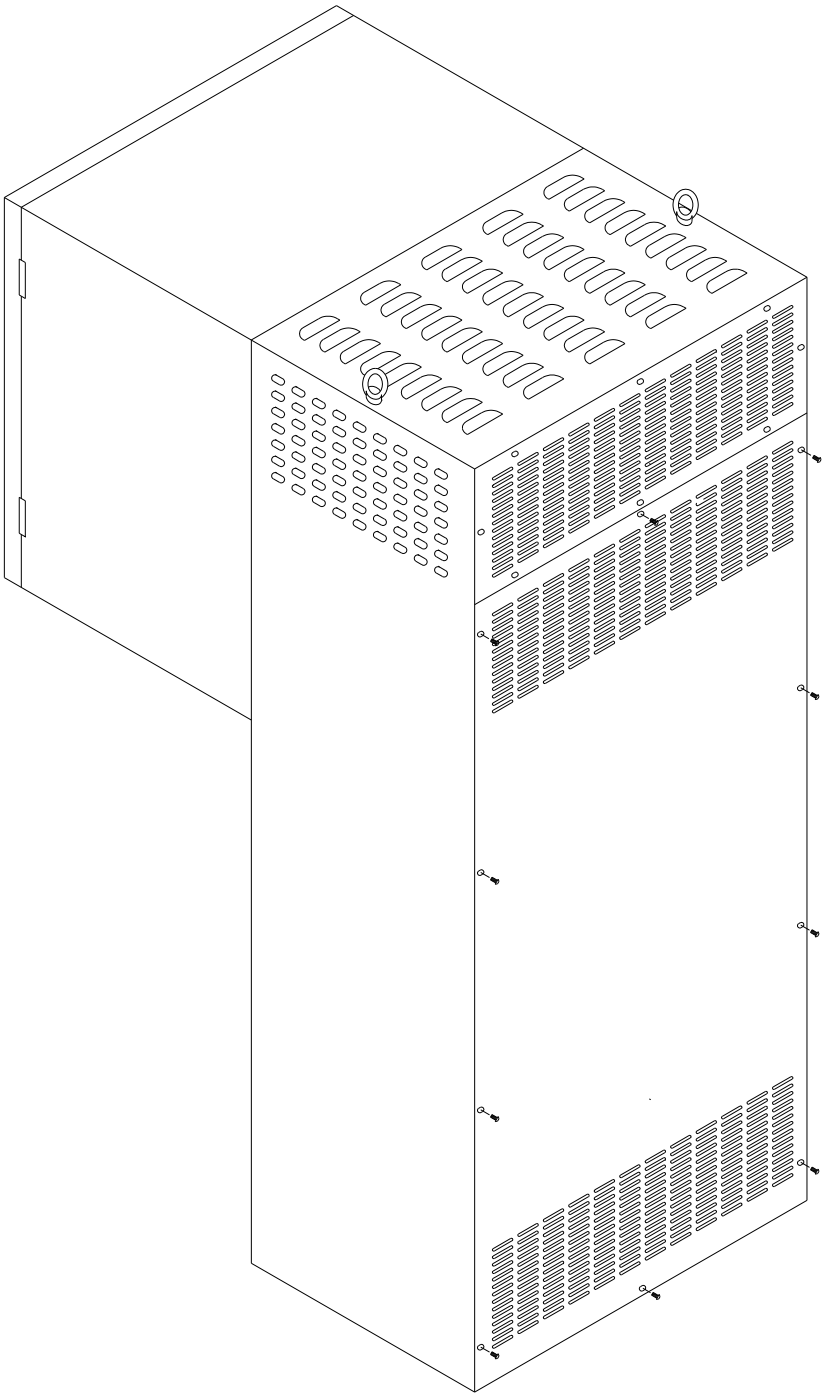
THE DIFFERENCING DEPTH BETWEEN AP STEP	THE DIFFERENCING DEPTH BETWEEN TA STEP	
60A	1800	60
↓ 0.2mm	↓ 0.04mm	↓ 0.015mm
45A	1500	45
↓ 0.15mm	↓ 0.04mm	↓ 0.01mm
30A	1200	30
↓ 0.1mm	↓ 0.04mm	↓ 0.01mm
21A	900	20
↓ 0.08mm	↓ 0.03mm	↓ 0.005mm
15A	700	15
↓ 0.06mm	↓ 0.03mm	↓ 0.005mm
12A	600	10
↓ 0.05mm	↓ 0.03mm	↓ 0.005mm
9A	500	8
↓ 0.03mm	↓ 0.03mm	↓ 0.005mm
6A	400	6
↓ 0.03mm	↓ 0.025mm	↓ 0.005mm
4.5A	300	4
↓ 0.02mm	↓ 0.025mm	↓ 0.005mm
3A	200	2
↓ 0.01mm	↓ 0.025mm	↓ 0.005mm
1.5A	150	1
↓ 0.01mm	↓ 0.02mm	
BP	120	
1 2	↓ 0.02nn	
↓ 0.005nn	90	
1	↓ 0.02nn	

CHAPTER 8 : BRIEF MAINTENANCE

♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠♠

NOTICE :

Turn off the main isolator switch before removing the cabinet screws.



POSSIBLE PROBLEMS

Situation 1: indicator lights do not work.

Maintenance action:

1. Check if the voltage complies with local requirements ?

For ex. 3 phase 415v ac is for UK.

2. Check (Fig.) if the no-fuse-breaker(NFB)of controller NO.1 position tripped?

If " yes", reset it.

3. Check (Fig.) if the 10A NFB of controller NO.2 position tripped?

If "yes", reset it.

4. Check (Fig.) if the 2.5A NFB of controller NO.5 position tripped?

If "yes", press the convex pot.

5. Check (Fig.) if the 3A NFB of controller NO.6 position tripped?

If "yes", press the convex pot.

Situation 2: pump does not work.

Action:

1. Check if the voltage complies with the local requirement?

For ex. 3 phase 415v ac is for UK.

2. Check(Fig.) if the pump magnetic & over load switch of controller NO.3 position tripped?

If "yes", press the reset switch.

Situation 3 : the light does not work.

Action:

1. Check (Fig.of page 44) if the 10A NFB of controller NO.4 position tripped?

If “yes”, press the convex point.

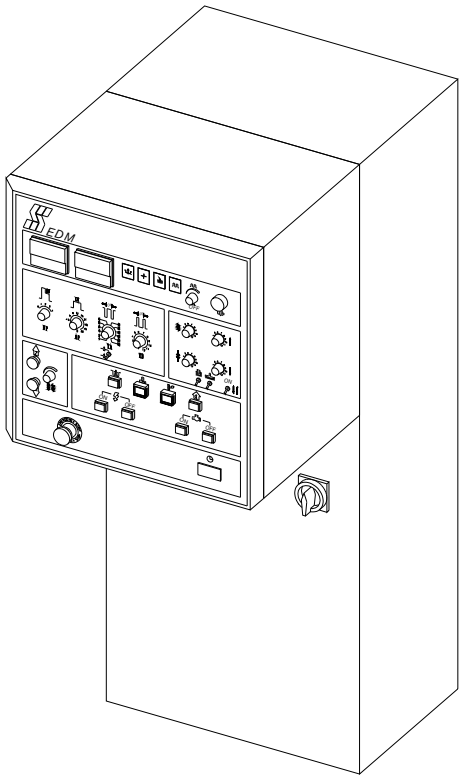
Situation 4: work head does not move up or down.

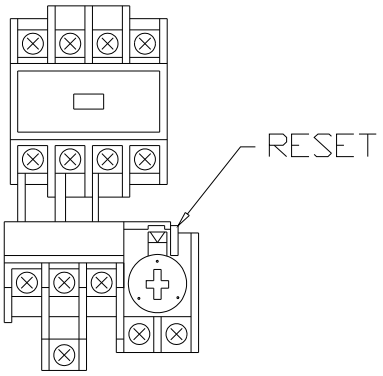
Action :

1. Push discharge switch on and off for 3 times continuously.

2. check if z-axis travel is out of work piece?

If “yes”, turn off the main switch and adjust z-axis to suitable travel.





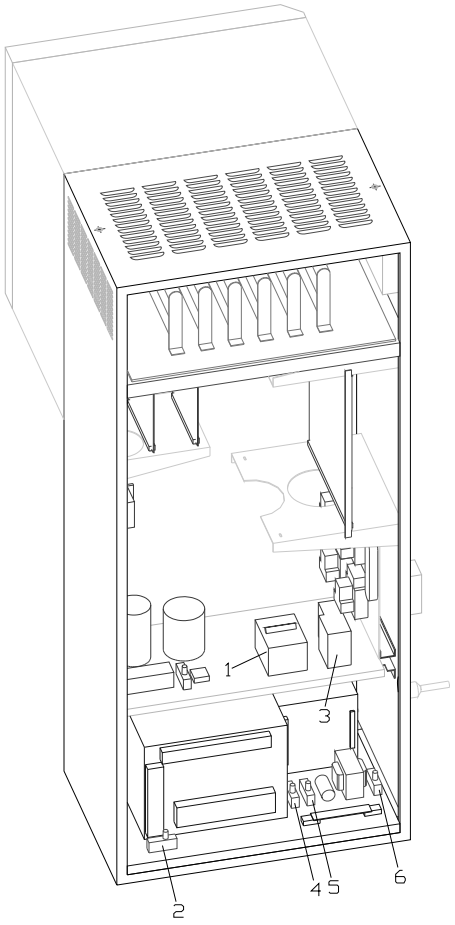


FIG.

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