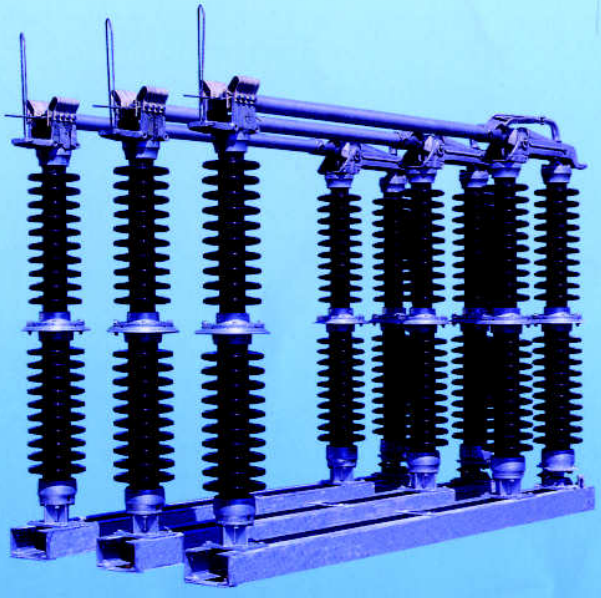
士林電機廠股份有限公司

空 斷 開 關 69KV～161KV

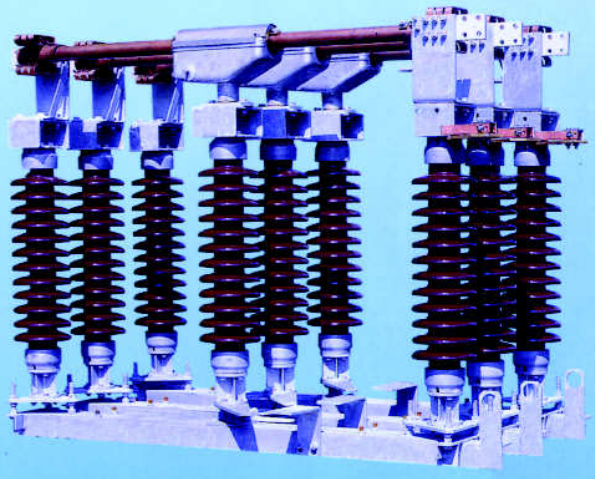
AIR BREAKER SWITCH

台電定型檢驗合格
屋外用遠方操作方式

ISO 9002



VST型



HDT型

Shihlin Electric

機　　種（TYPE）

型　式 Models	形式記號 Type	額定電壓 Rated Voltage KV	額定電流 Rated Current A	額定瞬時電流 Rated Momentary Current KA	額定短時間電流 Rated Short-time Current KA 3秒 3 sec	絕緣耐壓 Rated Withstand Voltage			重量 Weight （Kg）
						額定周波 60 Hz KV rms		衝擊波 1.2×50μS Impulse	
						乾試1分鐘 dry 1 min	濕試10秒 wet 10 sec		
VST	60N-VST-6	69	600	40	25	175	145	350	500
	60N-VST-12		1200	61	38				550
	60N-VST-20		2000	100	63				600
HDT	60N-HDT-4	69	400	20	12.5	175	145	350	500
	60N-HDT-6		600	40	25				500
	60N-HDT-8		800						550
	60N-HDT-12		1200	61	38				550
	60N-HDT-16		1600	61	38				600
	60N-HDT-20		2000	100	63				600
VST	160N-VST-6	161	600	40	25	385	315	750	2000
	160N-VST-12		1200	61	38				
	160N-VST-20		2000	100	63				

註：形式記號後加
G表示附接地開關
TSA表示手動操作
MSB表示電動操作。

NOTE: Representation of letters added after type number:
G＝with grounding switch
TSA＝Hand operation
MSB＝Electric operation

特　　長（STRONG POINTS）

1.回轉形接觸子（Reverse Loop Contact）

圖 1,2,3 所示為接觸部詳細圖。箭頭所示為電流方向。接觸子成回轉形，當故障電流通過時，電磁力向接觸面作用，使接觸壓力增大，能防止接觸部之熔著。一般接觸子若要耐大電流則接觸壓力須增大，操作力亦增大，且接觸面之磨損亦增大。回轉形接觸子平時僅須一般接觸壓力之一半，故操作力及接觸面磨損亦可相對減半。

Figures 1,2, and 3 are the detailed drawings of contact section. The arrow indicates the direction of current. The contact forms into a reverse loop. Therefore,

when the faulty current passes through, magnetic force will act on the contact surface so that contact pressure will increase and prevent the contact section from melting. In order for ordinary contact to withstand big current, contact pressure should be increased, operating force is also increased, so abrasion on contact surface also increases, Ordinarily, reverse loop contact requires only one half of ordinary contact pressure. Hence, operating force and contact surface abrasion is also reduced to half.

2.管狀閘刀（Pipe Blade）

69KV 將銅管之兩端壓扁，鍍銀作為可動接點。故閘刀無接續部份，電氣上信賴度高。

161KV以導電率良好之高強度鋁合金管製造，因其材質較輕，用以降低操作力矩，其前端以不銹鋼螺絲組固定高導電率硬質紅銅鍍銀之可更換式可動接觸子，導電性能良好。而管狀在機械特性上為最佳之形狀，對於大電流之空斷開關而言，須考慮集膚效應而本方式為最適品。

69KV blade is press both end of copper pipe flat. Use silver plating as removable contact. Therefore, there is no splice section on the blade, electrical dependability is high. 161KV blade is made of good conductivity high strength aluminum alloy, so its material is lighter. It is used in reducing operation moment. A set of stainless steel screw fixed its front end to a changeable and removable contact made of high conductivity hard silver plated copper plate, good conductivity. And pipe shape is the optimum shape for the characteristic of the machine. Form the point of air breaker switch（A.B.S.）which uses big current where skin effect should be taken into account, this method is the optimum.

3.閘刀回轉機構（Blade Rotating Mechanism）

回轉機構用不銹鋼及鑄鐵等製造，故在積雪、風雨、塵埃等惡劣條件下，仍能完全確實地操作，而構造簡化，幾乎不須保養與維護。

The rotating mechanism is made of stainless steel and cast iron. Therefore, under vile condition such as snow pack, storm, and dust, it can still operate. Also, its configuration is simplified, almost require no maintenance.

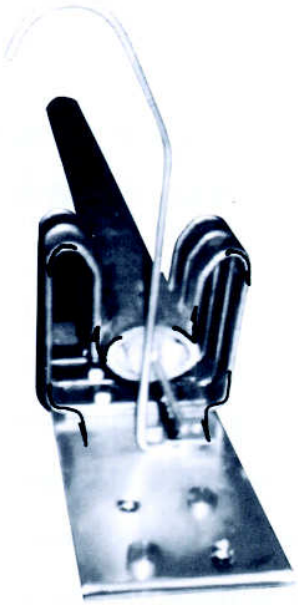


圖1，接觸部詳圖　69KV VST型

Figure 1 Contact Section, 69KV VST Type

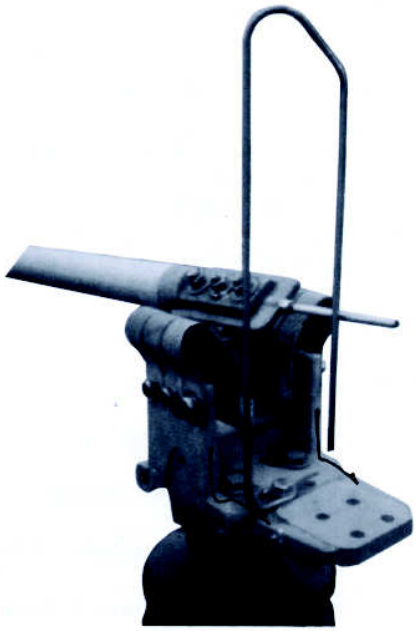


圖2，接觸部詳圖　161KV VST型

Figure 2 Contact Section, 161KV Vst Type

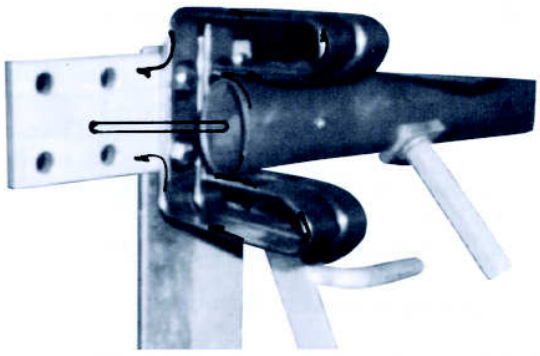


圖3，接觸部詳圖　69KV HDT型

Figure 3 Contact Section, 69KV HDT Type

構　　造（CONFIGURATION）

1.固定接觸部（Contact Section）

回轉形接觸子69KV係用高導電率，高抗張力之熱處理銅合金（Cu-Ni-Si）製成。161KV採用導電率良好的硬質銅板鍍銀製成，回轉形內部以壓縮彈簧支撐產生接觸壓力，並加上鐵氟龍絕緣片，使彈簧與電流路徑分離。接觸面鍍銀，性能優越，操作數萬次亦無異狀發生。尤以暴露於屋外時，更見其優良之特性。

69KV Reverse loop contact is made of high conductivity, high tension, and heat treated copper alloy（Cu-Ni-Si）.161KV is made of good conductivity and hard silver plated copper plate. The inside of reverse loop is supported with a compression spring to generate contact pressure and a teflon insulator to separate the spring from the circuit path. The performance of silver plated contact surface is excellent. It can be operated several thousand times without extraordinary occurrence. Its excellent feature is more evidential when it is exposed outdoor.

2.回轉機構部（Rotation Mechanism Section）

圖 4,5,6 所示為回轉機構部詳圖。操作迴轉軸固定於回轉碍子上，利用操作連桿與閘刀曲柄交連，當迴轉軸回轉時，先帶動曲柄回轉一個角度，並帶動閘刀本身回轉，軸臂繼續回轉，則曲柄被拉起，連帶閘刀亦被拉起。閉路時按逆向順序動作。

操作連桿內裝有彈簧，當閉路時，操作連桿與閘刀形成 185° 左右，故彈簧保持力量向閘刀方向作用，使回轉位置能確實保持，且具有吸收開閉動作中所產生之衝擊力。

Figures 4,5,6, are the detailed drawings of rotation mechanism section. Fix the operation rotation shaft on the rotation insulator. Use the operation connecting rod to crosslink with blade crank. When the rotation shaft is rotating, it will first drive the crank to rotate an angle, then drive the blade itself to rotate. The shaft arm will continue to rotate, and the crank will be raised together with the blade. During closed circuit, operate at counter direction.

There is a spring inside the operation connecting rod. During closed circuit, the operating connecting rod will form a approach to 185 degree with the blade Therefore, the spring will maintain its force at the direction of the blade, so that rotation position can be accurately maintained, and can also absorb the impact force generated while switching.

3.支持碍子（Insulators）

69KV 空斷開關係使用符合 NEMA TR. NO.216 station post type 絕緣碍子，161KV 使用符合 NEMA TR. NO.291 station post type 絕緣碍子，絕緣性能高，機械強度好，安全係數高。

Station post type insulators conforming to NEMA TR NO. 216 are used in 69KV A.B.S., and station post type insulators conforming to NEMA TR. NO. 291 are used in 161KV A.B.S., High insulation performance, good mechanical strength, and high safety coefficient.

編號 No.	名稱 Description	數量 Quantity	編號 No.	名稱 Description	數量 Quantity	編號 No.	名稱 Description	數量 Quantity
1	軸承 Bearing	2	6	叉型連桿 Forked connecting rod	1	11	閘刀 Blade	1
2	迴轉軸 Rotating shaft	1	7	可動導電座 Removable conductor seat	1	12	軸承 Bearing	1
3	閘刀支架 Blade support	1	8	操作連桿 Operation connecting rod	1	13	軸承桿 Bearing rod	1
4	平衡彈簧 Balancing spring	1	9	鉸鏈 Hinge	2	14	閘刀接點 Blade contact	1
5	彈簧座 Spring holder	1	10	接點彈簧 Contact spring	1			

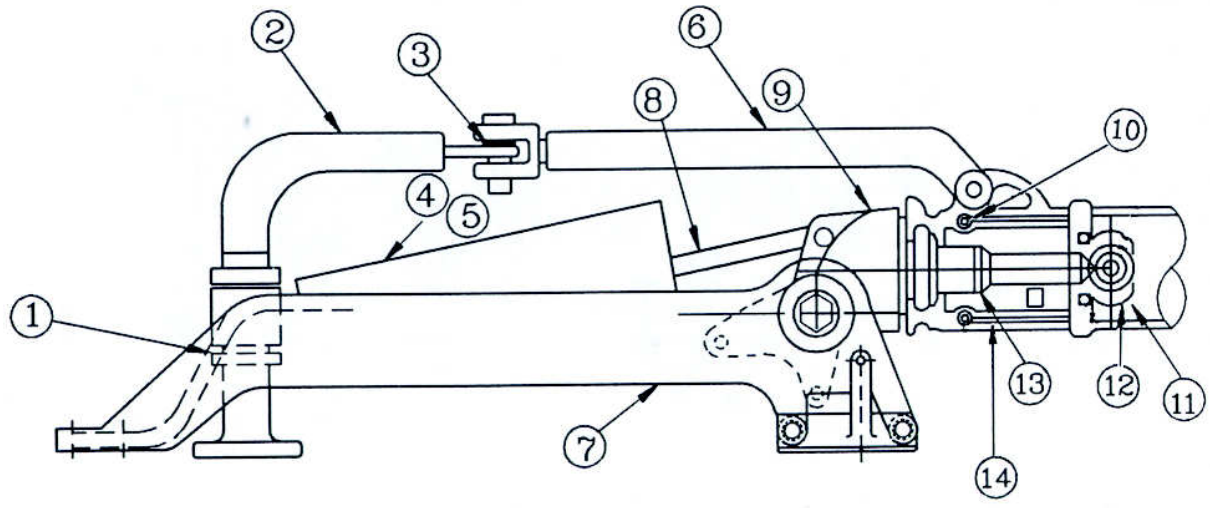


圖4 161KV VST型 回轉機構部詳圖

Figure 4 161KV VST Type Rotation Mechanism Section

編號 No.	名稱 Description	數量 Quantity	編號 No.	名稱 Description	數量 Quantity	編號 No.	名稱 Description	數量 Quantity
1	迴轉軸 Rotation shaft	1	11	套筒 Sleeve	1	21	無油軸承 Oil-include bearing	2
2	無油軸承 Oil-include bearing	1	12	連桿 Connecting rod	1	22	連桿 Connecting rod	1
3	導電板固定座 Conductor plate fixed seat	1	13	梢 Pin	1	23	連桿 Connecting rod	1
4	導電板 Conductor plate	1	14	墊圈 Washer	3	24	彈簧 Spring	1
5	固定台 Fixing stand	1	15	開口梢 Split pin	6	25	固定接點 Contact assembly	3
6	曲柄 Crank	1	16	六角螺絲 Bolt	5	26	梢 Pin	1
7	軸組 Shaft set	1	17	軸臂 Shaft arm	1	27	平墊圈 Washer	9
8	止片 Stop Plate	1	18	彈簧梢 Spring pin	2	28	六角螺絲 Bolt	6
9	軸組 Shaft set	1	19	梢 Pin	1	29	六角螺絲 Bolt	6
10	連桿 Connecting rod	1	20	套筒 Sleeve	2	30	六角螺絲 Bolt	2

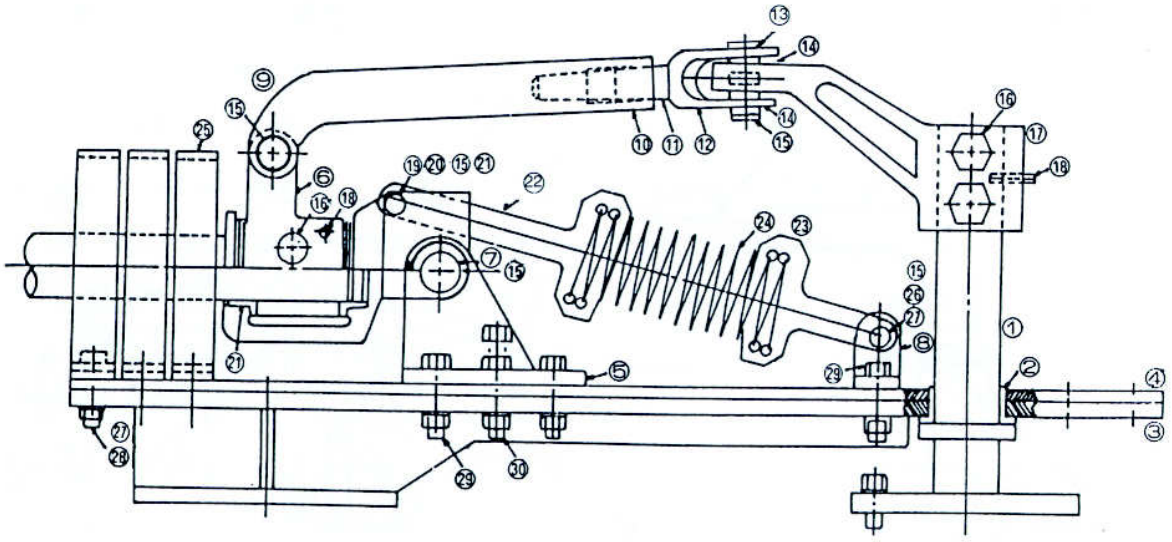
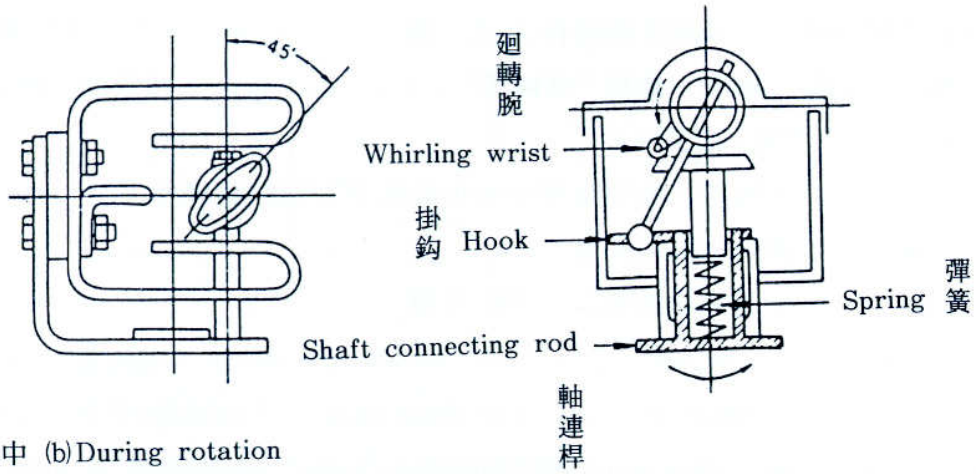


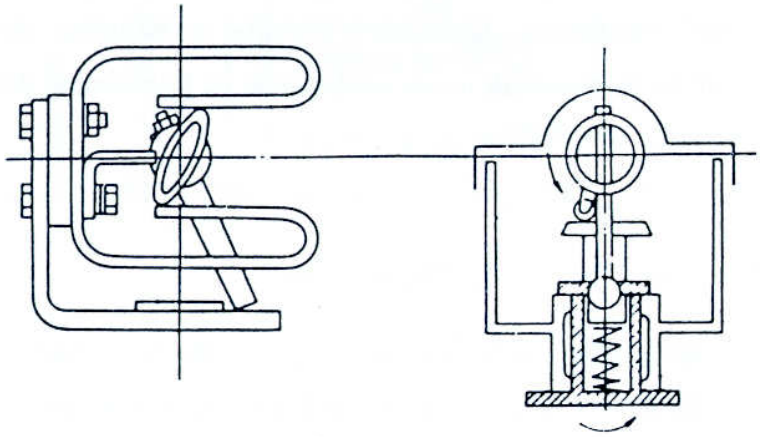
圖5，69KV VST型回轉機構部詳圖

Figure 5 69KV VST Type Rotation Mechanism Section

(a)回轉前 (a)Before rotation



(b)回轉中 (b)During rotation



(c)回轉完畢 (c)Rotation completed

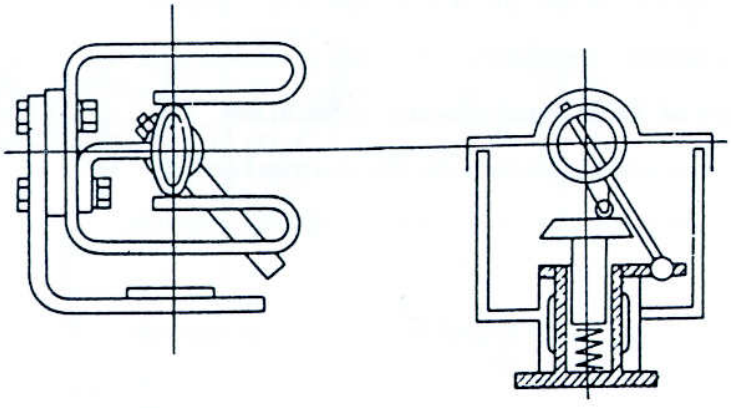


圖6，HDT型固定接觸部與回轉機構部之關係

（空斷開關開路之場合按逆向順序動作）

Figure 6 HDT Type Contact Section and Rotation Mechanism Section

（A.B.S. work at counter direction during open-circuit）

操作機構（OPERATION MECHANISM）

1.手動操作機構（Hand Operation Mechanism）

一般操作頻度較少時，均採用手動操作方式。圖 7 為手動操作方式之外形圖。利用縱操作管之回轉來帶動碍子轉動。此種“扭轉式”（Torsional type）較其他“錘擺式”（Bell Crank type）操作輕快，確實。

操作把手如圖所示垂下放置，使用時舉至水平向水平方向回轉操作。

若須下列附屬品，敬請指定以便供應。

(1)補助開關3a，3b　(2)電氣連鎖裝置　(3)指示燈

When ordinaty operation less often, use hand operation. Figure 7 is the outline drawing of hand operation method. Use the rotation of kongitudinal operation pipe to drive the insulator. This kind of “torsional type” operation is actually brisker than “bell crank type” operation. Operation handle is hanging down as shown in the drawing. Raise it to horizontal level and rotate at horizontal direction.

Please specify if to supply the following accessories.

(1)Auxiliary switch 3a, 3b.　(2)Electric interlock　(3)Indication lamp

2.電動操作裝置（Electric Operation Mechanism）

操作頻度較多或須要電動控制時，則採用電動操作方式。圖8所示為MSB形電動操作方式之內部構造，若要用手動操作時須將手動安全開關打開，使其不能電動控制，確保操作者之安全。

操作回路如圖9所示操作電源為3 ϕ .AC220V。

When operation is more often or when electric control is required, use electric operation. Figure 8 shows the inside configuration of MSB type electric operation.

When using hand operation, switch on the manual safety switch so that it cannot do electric controlling, to ensure operator's safety.

Operation loop is as shown in Figure 9. Operation power is 3 ϕ AC 220V.

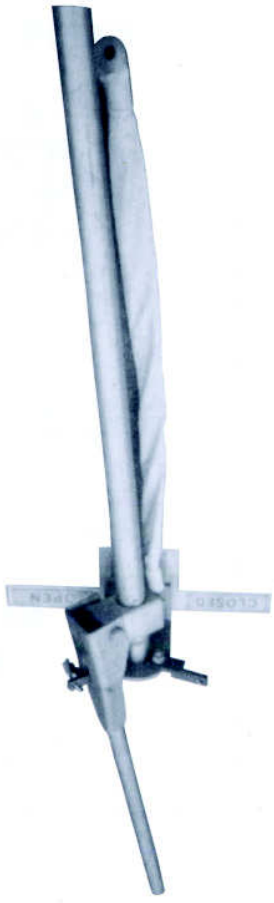


圖7，TSA形　手動操作裝置外型圖

Figure 7 TSA Type Hand Operation Mechanism Outline Drawing

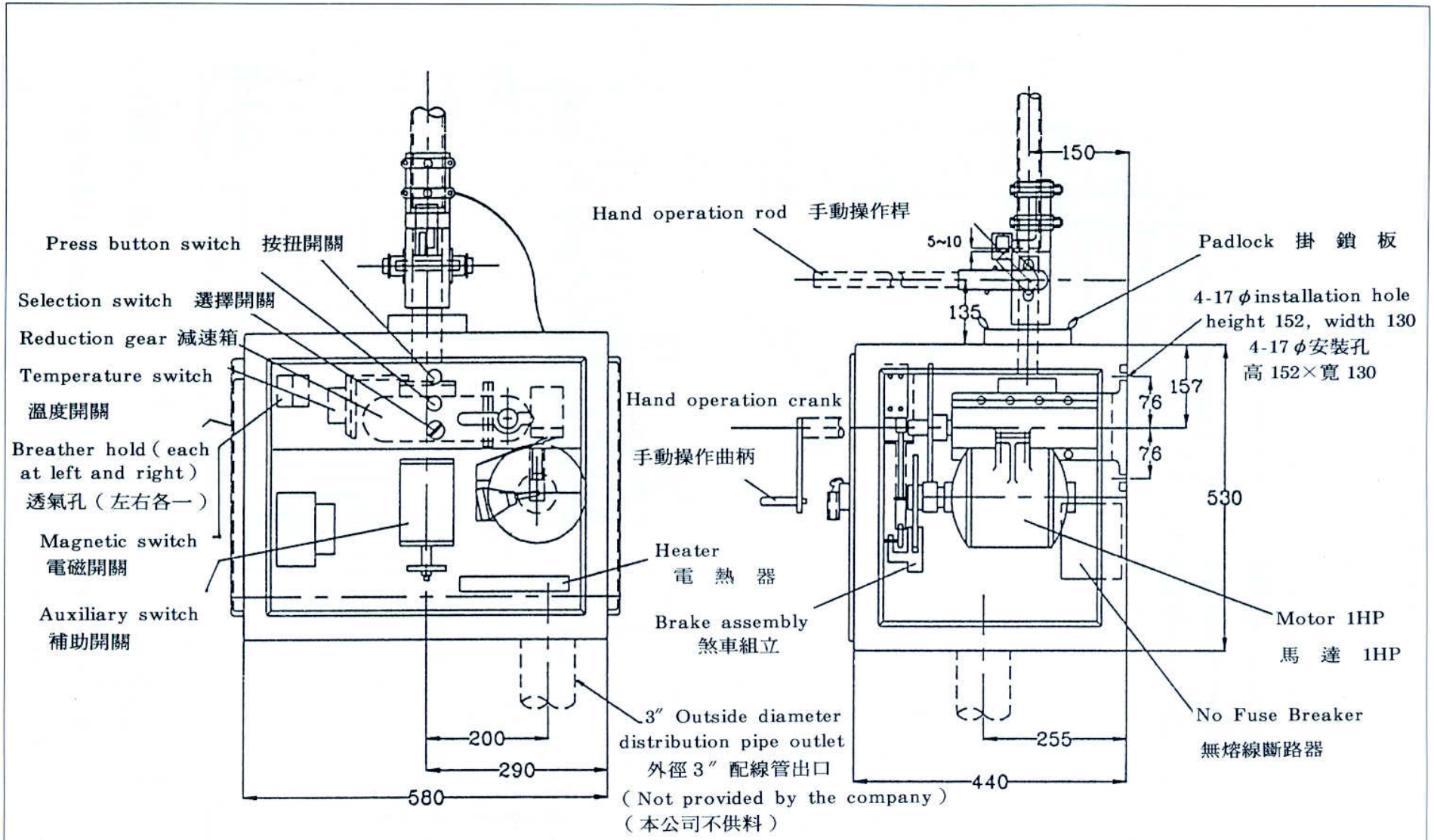


圖8，MSB電動操作箱內部零件配置圖

Figure 8 Components layout in the MSB Electric Operation Box

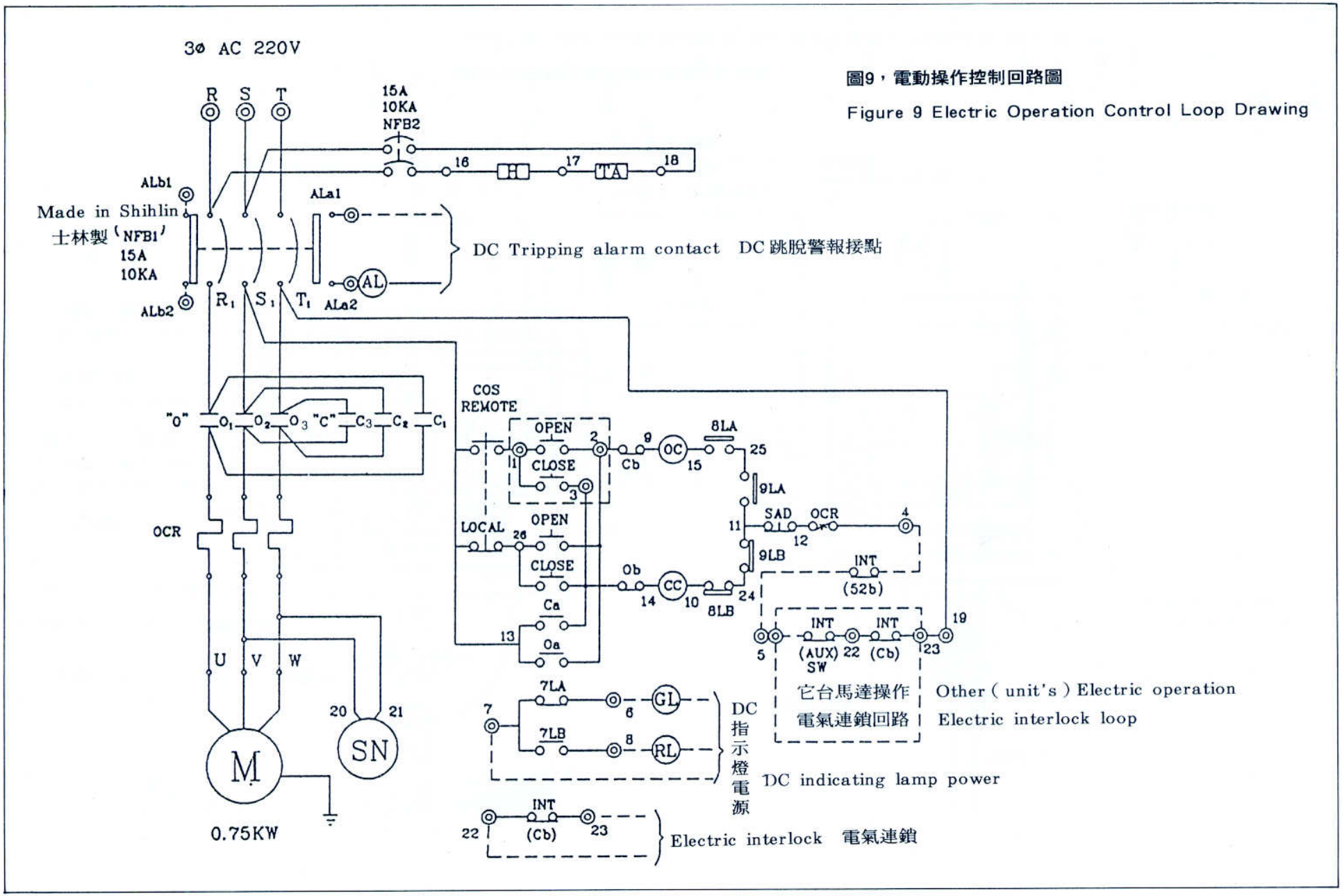
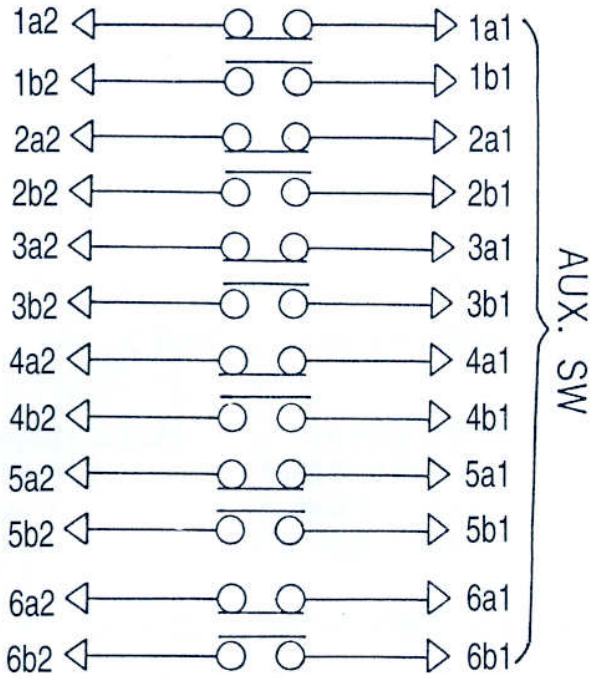


圖9，電動操作控制回路圖

Figure 9 Electric Operation Control Loop Drawing

符號 Symbol	名　　稱 Description
NFB1	3P無熔絲開關BH（15A） 3P NO Fuse Breaker BH（15A）
NFB2	2P無熔絲開關BH（15A） 2P NO Fuse Breaker BH（15A）
O	電磁開關（跳脫用） Magnetic switch（for opening）
C	電磁開關（閉合用） Magnetic switch（for closing）
SAD	手動安全開關 Manual safety switch
OCR	過電流熱動電驛 Thermal overload relay
M	3相感應馬達（220V，0.75KW） 3-Phase induction motor（220V, 0.75KW）
Aux.Sw	補助開關 Auxiliary switch
H	電熱器（100W） Heater（100W）
8LB,9LB	當空斷開關開路時，限制開關閉路 During A.B.S. open circuit, the limit switch is closed
8LA,9LA	當空斷開關閉路時，限制開關閉路 During A.B.S.closed circuit, the limit switch is closed.



附　屬　品（ACCESSORIES）

（未指定時，不供應）（Not supplied if not specified）

1.接地裝置（Grounding Switch）

保養檢點時，萬一有錯誤發生以致產生短路電流時，接地裝置能確實保證保養員之安全。

The grounding switch is to ensure the safety of maintenance personnel when there is error which resulted short-circuit during maintenance.

2.主端子（Main Terminal）

一般均使用壓著端子或鎖緊形端子。

Ordinarily, all uses solderless terminal or locking terminal.

3.補助開關 3a,3b（Auxiliary Switch 3a,3b）

4.電氣連鎖裝置（Electric Interlock.）

5.指示燈（Indicating Lamp）

VST型空斷開關外形尺寸（VST A.B.S OUTLINE DIMENSION）

VST型（ VST TYPE ）：如圖 10 所示（ Shown as Fig.10 ）

形式記號 （ TYPE ）	A	B	C	D	E	X	Y	Z
60N-VST-6	1030	425	2244	215	979	1500	225 以 上	2000 以 上
60N-VST-12								
60N-VST-20	1060	455	2364	275				

註：形式記號後加
G表示附接地開關
TSA表示手動操作
MSB表示電動操作

NOTE：Representation of letters added after type number:
G＝With grounding switch
TSA＝Hand operation
MSB＝Electric operation

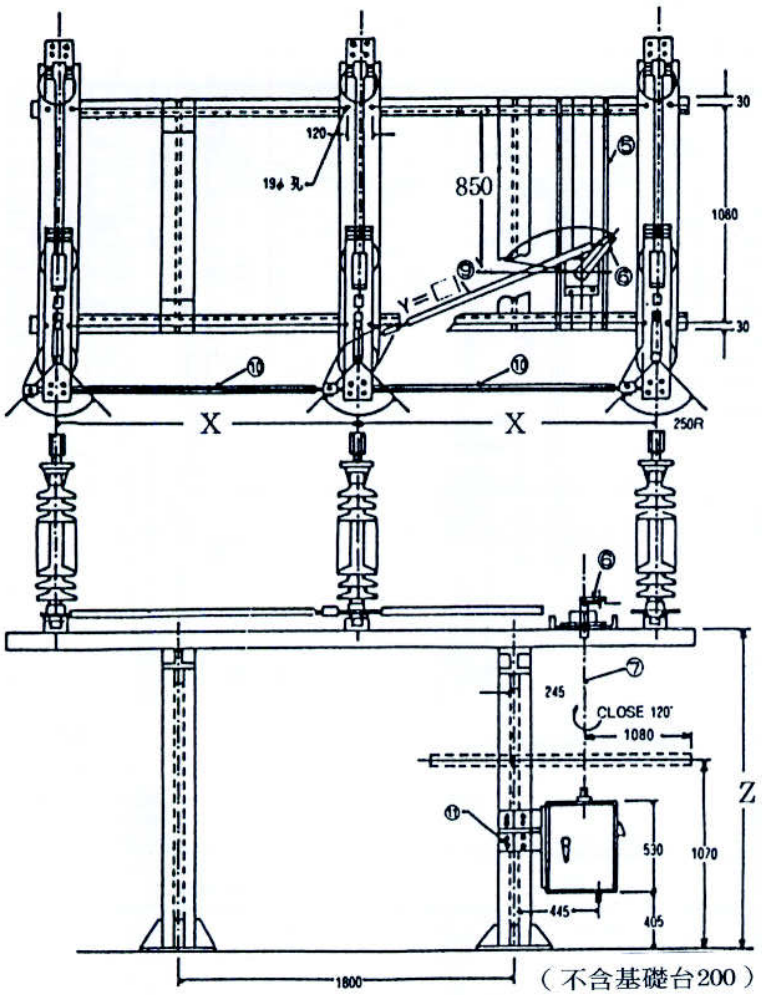
HDT型空斷開關外形尺寸（HDT A.B.S OUTLINE DIMENSION）

HDT型（ HDT TYPE ）：如圖 11 所示（ Shown as Fig.11 ）

形式記號TYPE	A	B	C	D	X	Y	Z
60N-HDT- 4	760	120	1321 （W/GB）	1676	1800	600 以 上	2000 以 上 （客戶指定）
60N-HDT- 6							
60N-HDT- 8		160	1221 (W/OGB)				
60N-HDT-12							
60N-HDT-16		215					
60N-HDT-20							

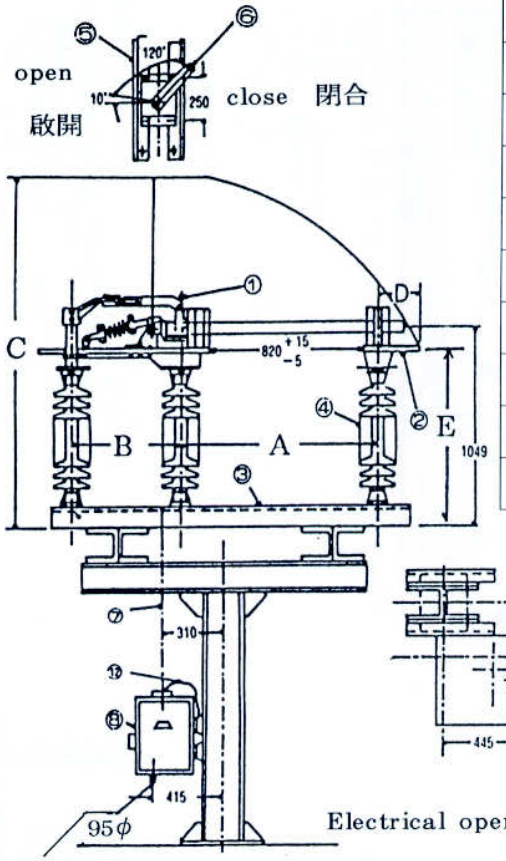
註：形式記號後加
G表示附接地開關
TSA表示手動操作
MSB表示電動操作

NOTE：Representation of letters added after type number:
G＝With grounding switch
TSA＝Hand operation
MSB＝Electric operation



（不含基礎台200）

（Excluding foundation platform 200）



Control power outlet 95 hole diameter 控制電源出口

編號 No.	名稱 Description	數量 Quantity
1	上部載流部分詳圖 Detailed drawing of upper live parts section	3
2	固定接觸子構造圖 Configuration drawing of Contact	3
3	底座詳圖 Detailed drawing of base	3
4	支持礙子詳圖 Detailed drawing of insulators	9
5	角鐵 Angle iron	2
6	傳動機構裝配圖 Installation drawing of transmission mechanism	1
7	垂直傳動軸詳圖 Detailed drawlig of vertical transmission rod	1
8	電動操作箱 Moter operation box	1
9	水平連桿 Horizontal Connecting rod	1
10	水平傳動桿 Horizontal transmission rod	2
11	槽鐵 Channel bar	2
12	接地軟銅帶 Grounding soft copper belt	1

註：本圖配合TDSI-15-4133台架

NOTE：1.This drawing coordinates with TDSI-15-4133 scaffolding.

3-inch distribution pipe 95mm hole diameter （3″配線管用）

95φ

Electrical operation box 本體操作電動箱

Electrical operation power outlet 電動操作電源出口位置圖

圖10，VST型空斷開關安裝尺寸圖 單位：mm

Figure 10 VST Type A.B.S. Installation Dimension Drawing Unit:mm

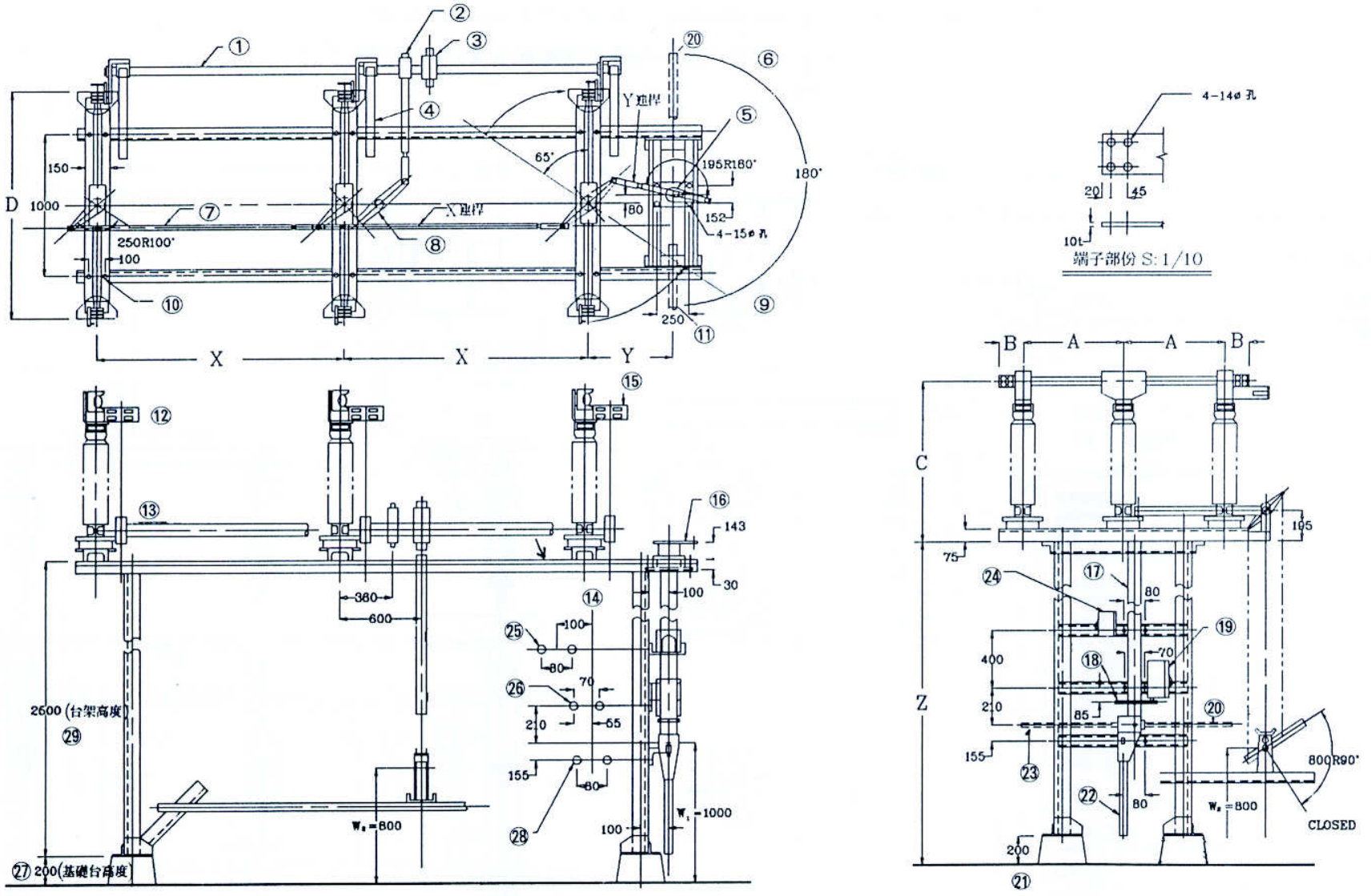


圖11，HDT型　空斷開關安裝尺寸圖　單位：mm

Figure 11 HDT Type A.B.S. Installation Dimension Drawing　　Unit：mm

HDT型空斷開關安裝尺寸圖對照表（DESCRIPTION OF HDT TYPE A.B.S. INSTALLATION DIMENSION DRAWING）

編號 No.	名稱 Description
1	連結管 Connecting pipe
2	接地連鎖用連桿 Connecing rod for grounding interlock
3	接地操作用連桿 Connecting rod for grounding operation
4	接地可動接觸子 Grounding removable contact
5	上部連桿 Upper connecting rod
6	OPEN（空斷開關） OPEN（A.B.S.）
7	X連桿 X connecting rod
8	接地機械連鎖 Grounding mechanical interlock
9	CLOSED（空斷開關） CLOSED（A.B.S.）
10	4-19φ孔 4-19φhole diameter
11	CLOSED（操作把手） CLOSED（operating handle）
12	CLOSED接地裝置 grounding switch
13	OPEN接地裝置 grounding switch
14	Z連桿中心線 Z connecting rod center line
15	接地夾板 Grounding clamping plate
16	上部連桿 Upper connecting rod
17	Z連桿 Z connecting rod
18	電氣連鎖制動片 Electric interlock locking plate
19	電氣連鎖 Electric interlock
20	OPEN操作把手 OPEN operating handle
21	200基礎台高度 200 Height of foundation platform
22	操作把手 Operating handle
23	CLOSED操作把手 CLOSED operating handle
24	輔助開關（3a,3b） Auxiliary switch（3a,3b）
25	2-15φ孔輔助開關安裝孔 2-15 hole diameter（auxiliary switch installation hole）
26	2-15φ孔電氣連鎖安裝孔 2-15 hole diameter Electric interlock installation hole
27	200（基礎台高度） 200（Height of foundation platform）
28	2-15φ孔（操作把手安裝孔） 2-15 hole diameter（operating handle installation hole）
29	2500（台架高度） 2500（height of scaffolding）

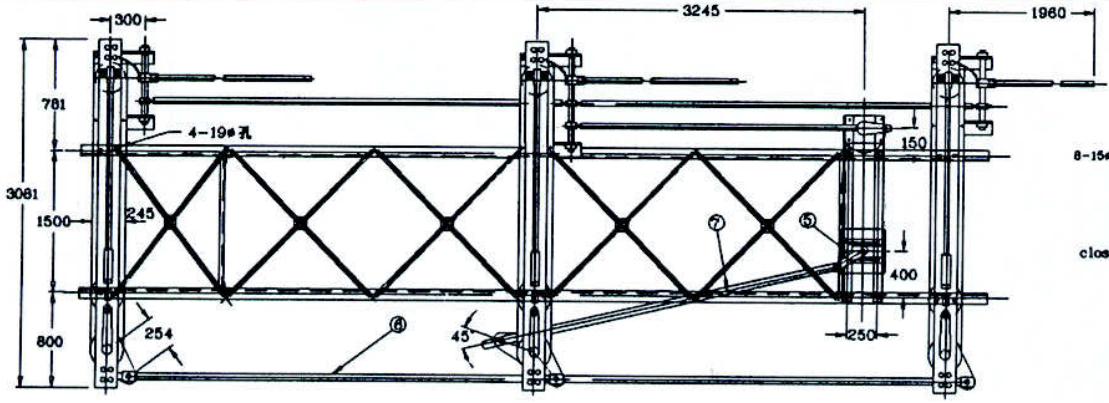
161KV 空斷開關外形尺寸（161KV A.B.S. OUTLINE DIMENSION）

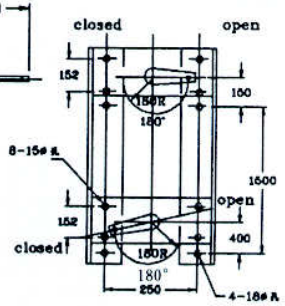
形式記號 TYPE	A	B	C	D
160N-VST-12	3000	4329	1844	2324
160N-VST-20				
160N-VST-12G	4200	4354	1854	2334
160N-VST-20G				

註：形式記號後加
G 表示附接地開關
TSA 表示手動操作
MSB 表示電動操作

NOTE：Representation of letters added after type number：
G＝With grounding switch
TSA＝Hand operation
MSB＝Electric operation

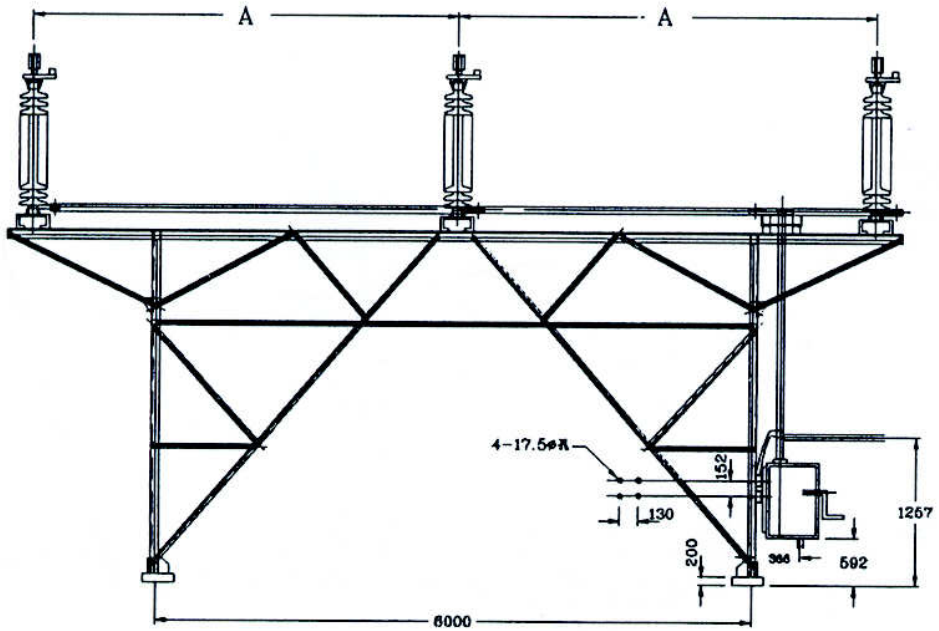
編號 No.	名稱 Description	數量 Quantity
1	上部載流部分詳圖 Detailed drawing of upper live parts section	3
2	固定接觸子構造圖 Configuration drawing of Contact	3
3	底座詳圖 Detailed drawing of base	3
4	支持礙子詳圖 Detailed drawing of insulators	9
5	傳動機構裝配圖 Installationdrawing of transmission mechanism	1
6	水平傳動桿 Horizontal transmission rod	2
7	水平連桿 Horizontal Connecting rod	2
8	垂直傳動桿 Vertical transmission rod	2
9	電動操作箱 Electric operation box	2
10	接地軟銅帶 Grounding soft copper belt	2

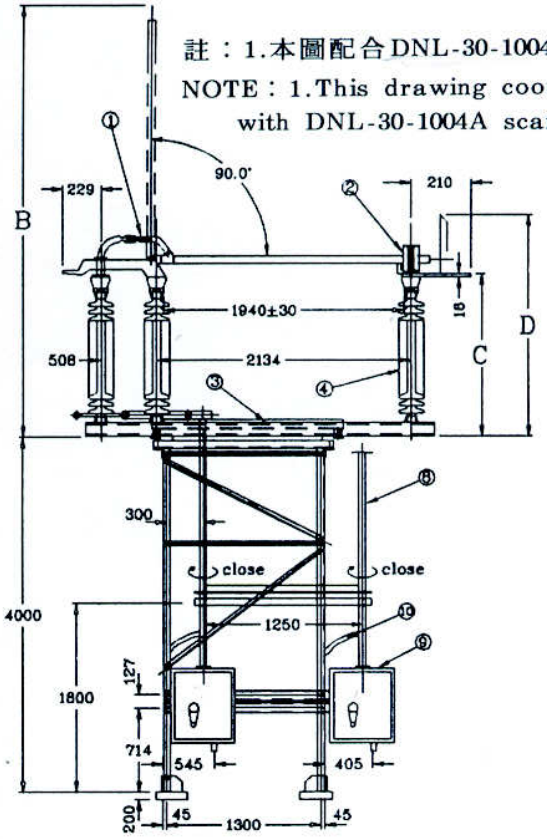




上部連桿安裝詳圖

Detailed installation drawing of upper connecting rod





註：1.本圖配合DNL-30-1004A台架

NOTE：1.This drawing coordinates with DNL-30-1004A scaffolding.

圖12，161KV 空斷開關安裝尺寸圖 單位：mm

Figure 12 161KV A.B.S. Installation Dimension Drawing Unit:mm