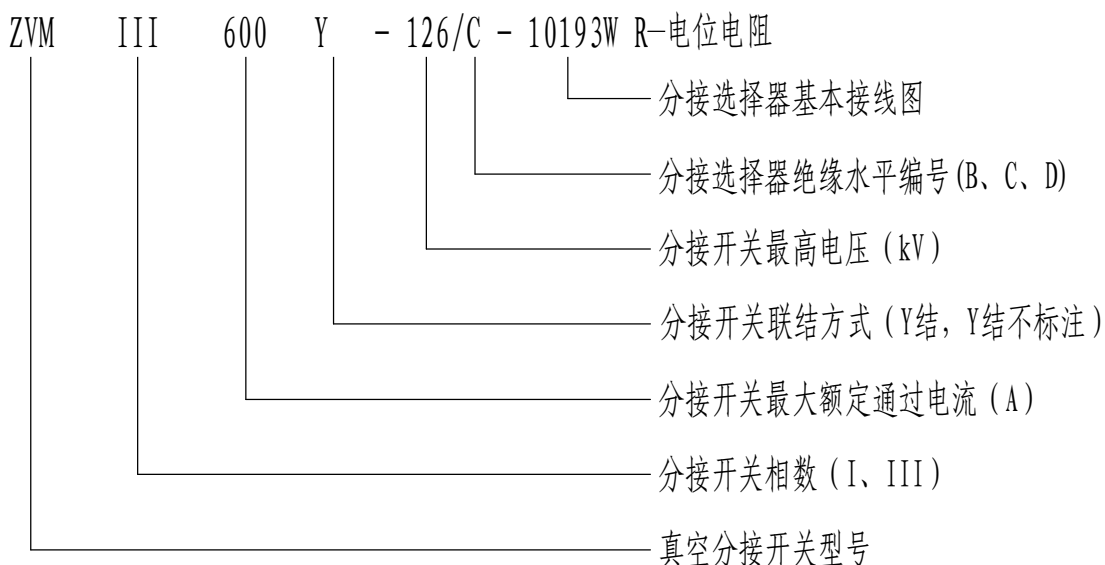


# ZVM 组合式真空有载分接开关

## 一、ZVM 型号说明

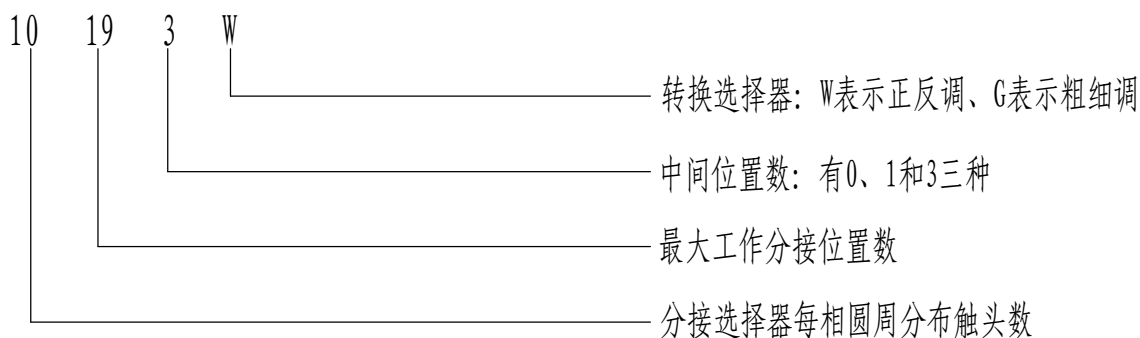
### 1.1 型号表示方法

ZVM 有载分接开关根据其相数、最大额定电流、最高电压、分接选择器绝缘等级和联结方式的不同组合，有多种型号规格。型号中各项参数含义说明如下：



### 1.2 型号中分接选择器基本接线图表示方法

根据变压器的调压范围和绕组的连接方式不同，分接选择器有多种不同的规格。分接选择器的规格由分接选择器分布触头数、操作位置数、中间位置数和转换选择器组成。在基本接线图中。各项参数含义说明如下：



# ZVM有载分接开关技术数据

## 二、ZVM技术参数

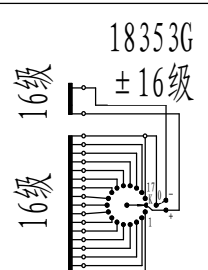
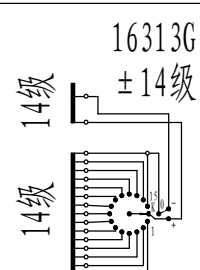
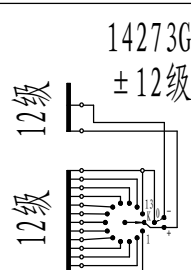
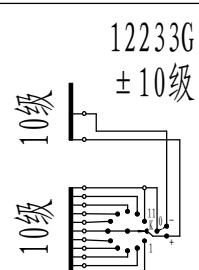
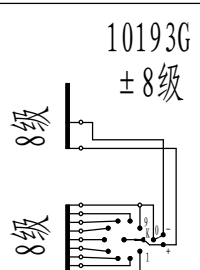
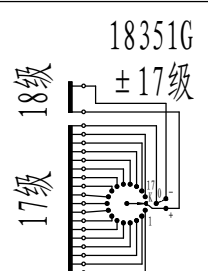
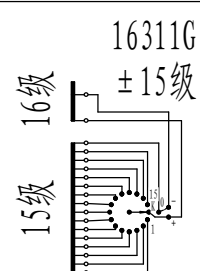
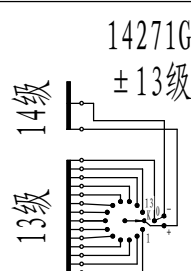
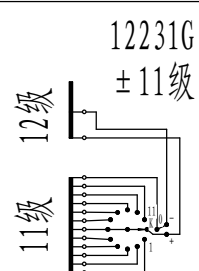
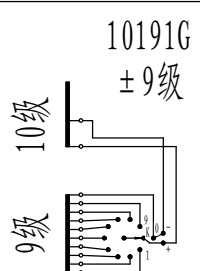
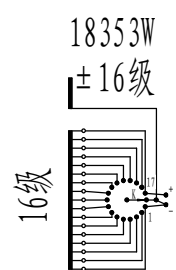
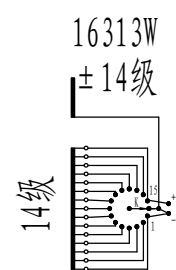
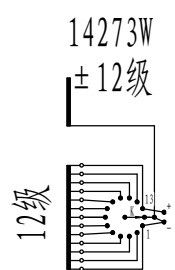
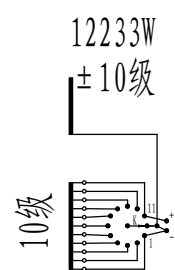
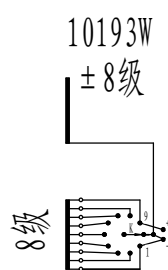
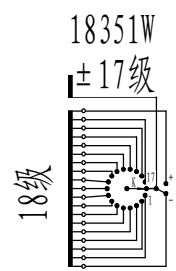
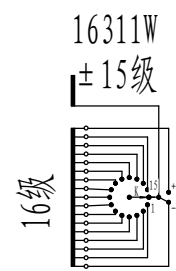
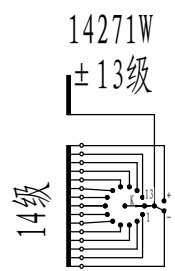
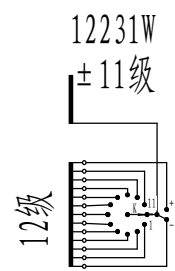
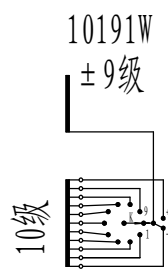
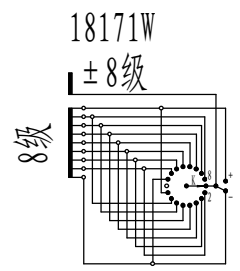
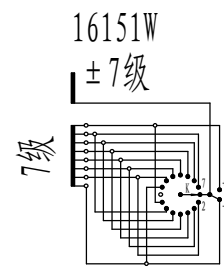
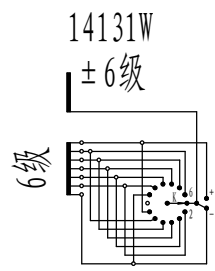
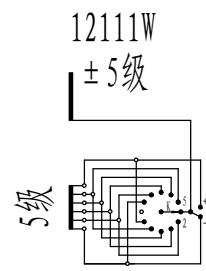
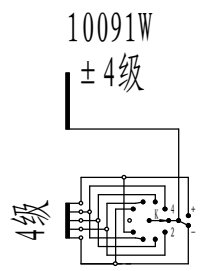
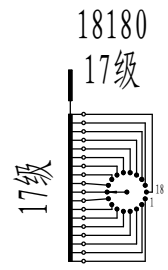
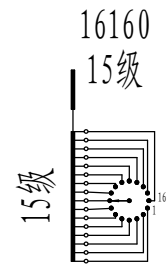
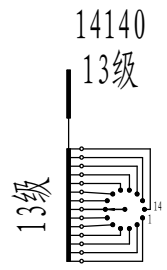
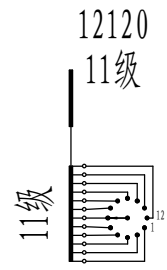
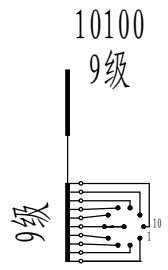
项	分类特征	III300	III500	III600	I301	I501	I601	I800	I1200	I1500	
1	最大额定通过电流 (A)	300	500	600	300	500	600	800	1200	1500	
2	额定频率 (Hz)	50或60									
3	相数和联结方式	三相Y联结中性点			单相任意联结方式						
4	最大额定级电压 (V)	3300									
5	额定级容量 (kVA)	1000	1400	1500	1000	1400	1500	2640	3100	3500	
6	承受短路能力 (kA)	热稳定(3秒有效值)	6	8	8	6	8	8	16	24	24
		动稳定(峰值)	15	20	20	15	20	20	40	60	60
7	工作位置数	线性调7、10、12、14、16、18、22、34 正反调和粗细调: $\pm 3 \sim \pm 17$									
8	分接开关绝缘水平 (kV)	额定电压	35	66	110	150	220				
		最高工作电压	40.5	72.5	126	170	252				
		工频试验电压(50Hz, 1min)	85	140	230	325	460				
		冲击试验电压(1.2/50 $\mu$ s)	200	350	550	750	1050				
9	分接选择器	按绝缘水平分为4种尺寸: 编号为A、B、C、D									
10	机械寿命	不低于150万次									
11	电气寿命	不低于35万次									
12	切换开关油室	工作压力	0.03MPa								
		密封性能	0.1MPa 24h 不渗漏								
		超压保护	爆破盖(0.4~0.5)MPa								
		保护继电器	QJ4-25整定油速1.0m/s $\pm 10\%$								
13	排油量(L)	约190~270									
14	充油量(L)	约125~190									
15	重量(kg)	约240~350									
16	配用电动机构	ZD/MA7D									

注: 1. 级容量等于级电压与负载电流的乘积, 额定级容量是连续允许的最大级容量。

2. 三相分接开关触头并联而成的单相分接开关选用时应考虑变压器线圈分流, ZVMI800两路分流, ZVMI1200、I1500三路分流。

3. 工作位置数为34的单相线性调分接开关只有: I500A、I800A、I1500A。

## 二、ZVM基本接线图

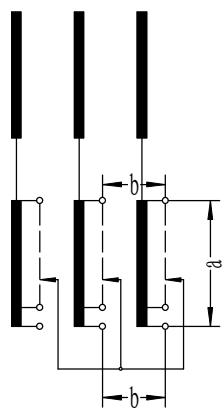


#### 四、ZVM内部绝缘水平

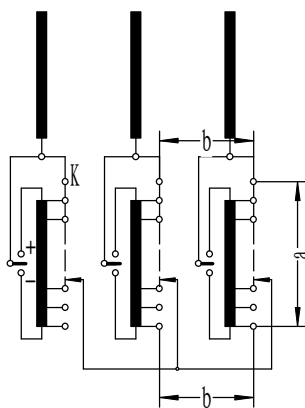
绝缘 距离 符号	分接选择器A型		分接选择器B型		分接选择器C型		分接选择器D型	
	kV	kV	kV	kV	kV	kV	kV	kV
	1.2/50 $\mu$ s	50Hz1min	1.2/50 $\mu$ s	50Hz1min	1.2/50 $\mu$ s	50Hz1min	1.2/50 $\mu$ s	50Hz1min
a	135	50	265	50	350	82	490	105
b	135	50	265	50	350	82	490	146
c <sub>1</sub>	200	95	485	143	545	178	590	208
c <sub>2</sub>	200	95	495	150	550	182	590	225
d	135	50	265	50	350	82	490	105

#### 调压线圈各部位的绝缘距离

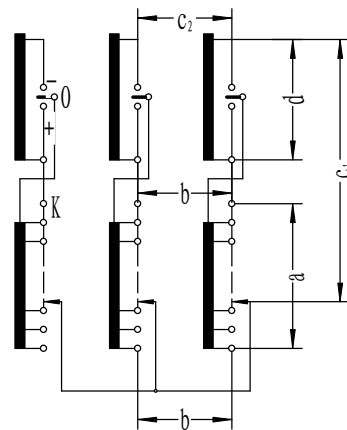
III 300、III 500、III 600



线性调

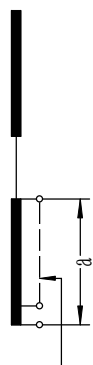


正反调

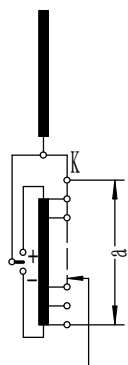


粗细调

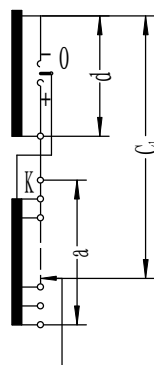
I 301、I 501、I 601、I 800、I 1200、I 1500



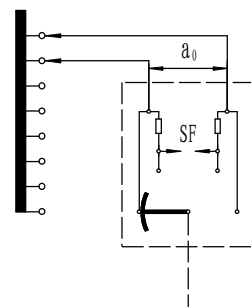
线性调



正反调

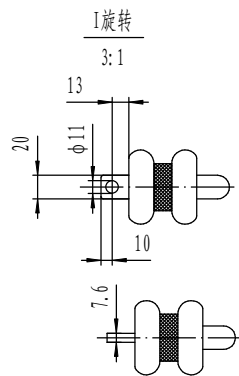
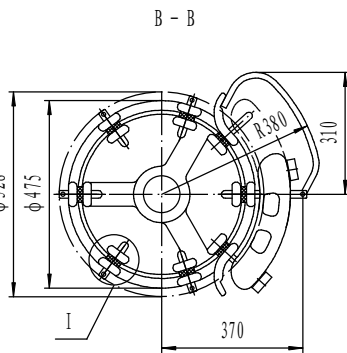
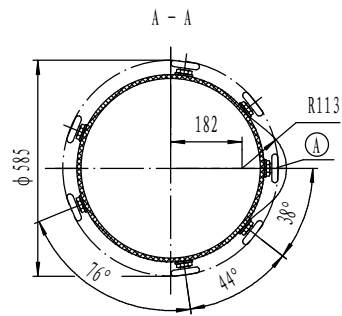
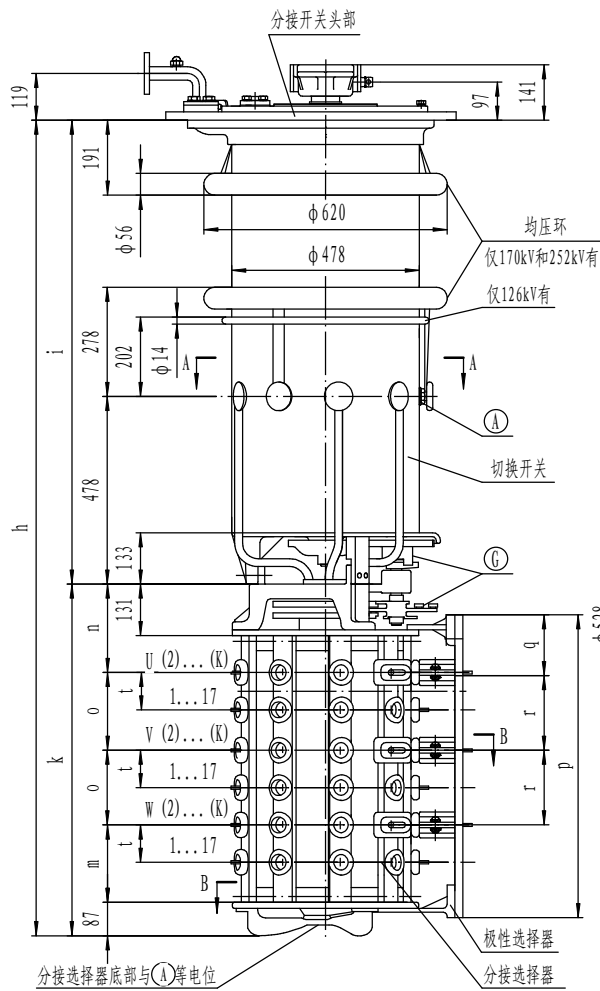


粗细调

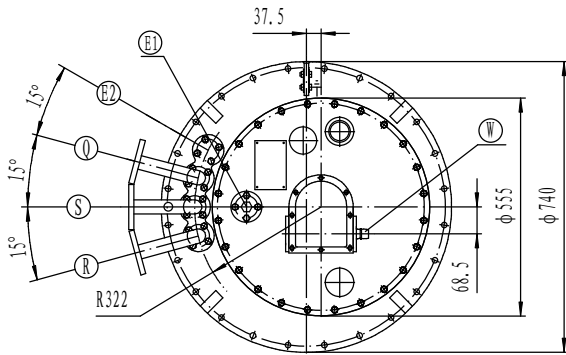
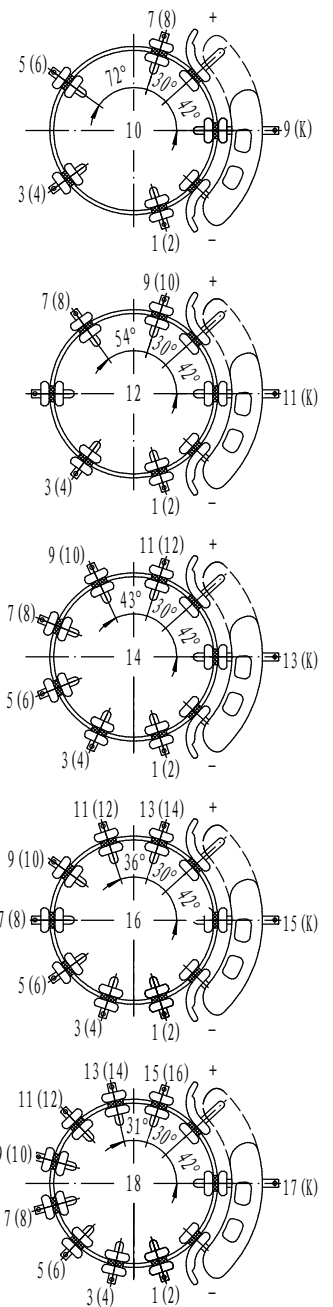


带火花间隙SF的级间绝缘水平 $a_0$ 为：  
50Hz 1min 20kV和1.2/50  $\mu$ s 90kV。

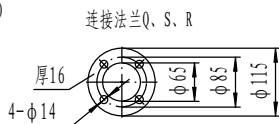




分接选择器触头排列(平面图)

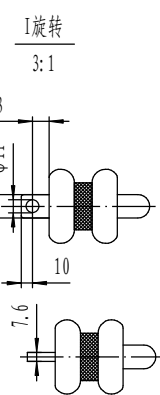
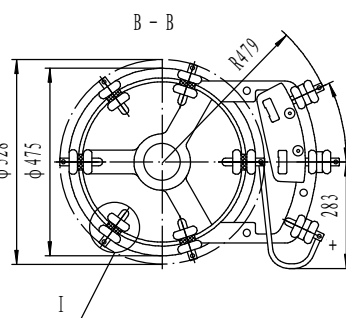
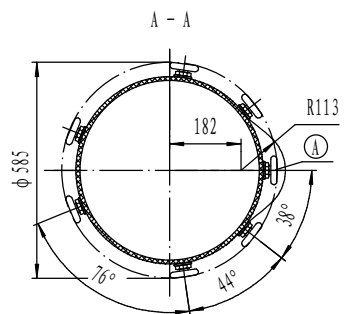
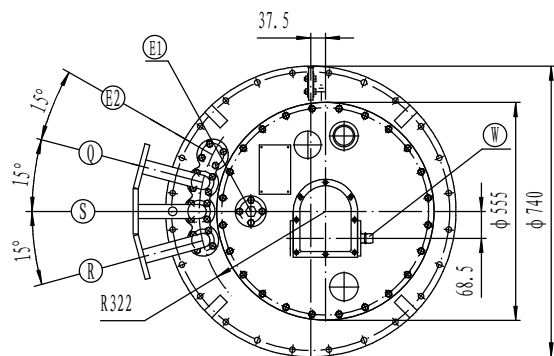
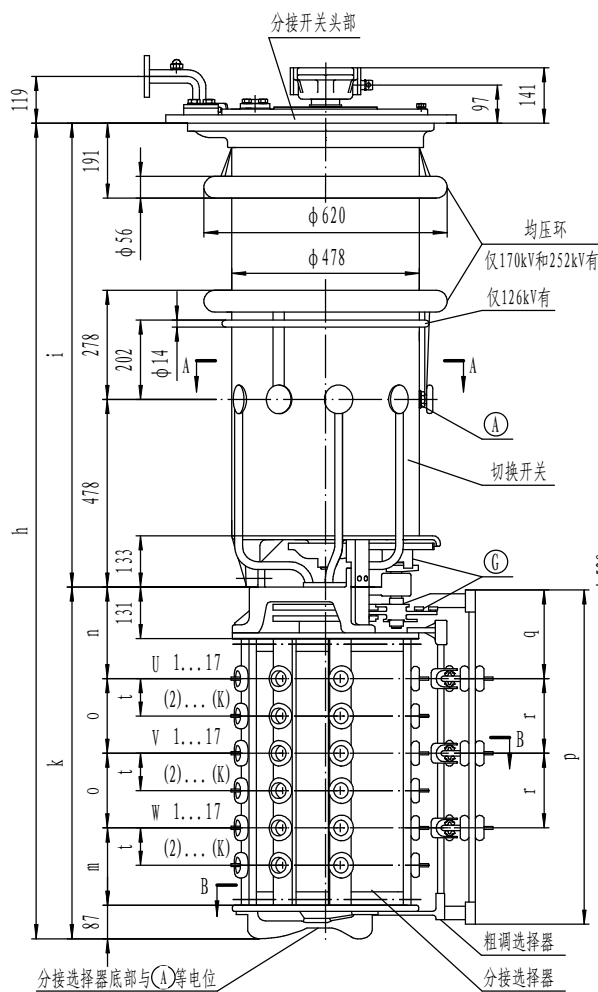


- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ1-分接开关头部溢油孔
- Ⓔ2-变压器油箱溢油孔
- Ⓒ-分接选择器传动装置(与Ⓐ等电位)
- Ⓓ-回油联结法兰(不带槽)
- Ⓔ-保护继电器联结法兰(不带槽)
- Ⓕ-吸油管联结法兰(不带槽)
- Ⓖ-传动轴

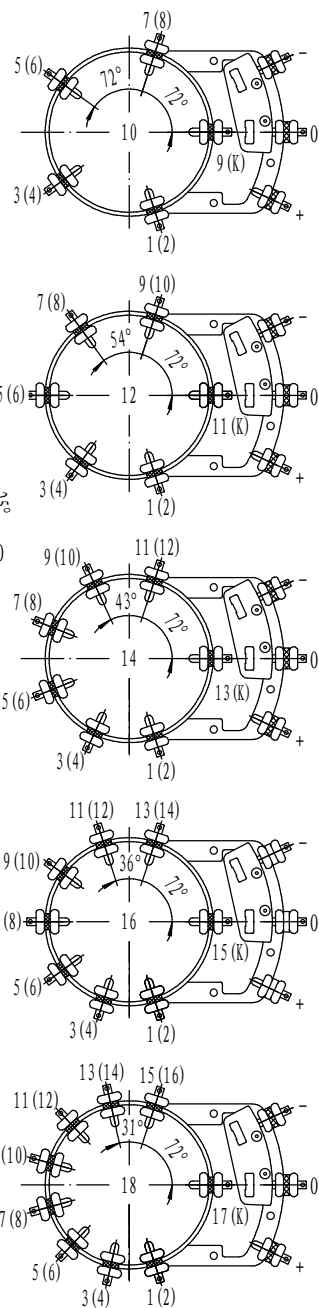


选择器编号	A				B				C				D			
最高工作电压(kV)	40.5	72.5	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252		
尺寸mm	h	1795	1795	1893	2023	2153	2253	2068	2198	2328	2428	2523	2653	2783	2883	
	i	996	996	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356	
	k	799			897					1072				1527		
	n	229			233					258				323		
	o	154			190					240				370		
	t	77			95					120				185		
	m	175			197					247				377		
	r	154			190					240				370		
	q	156			160					185				250		
	p	685			783					958				1413		
	油积dm <sup>3</sup>	130	130	150	170	190	190	130	150	170	190	130	150	170	190	
排油量dm <sup>3</sup>	199	199	224	244	264	264	199	224	244	264	207	232	252	272		
重量kg	290			295					305				330			

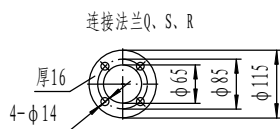
图2 ZVMIII 300/III 500/III 600正反调



分接选择器触头排列(平面图)

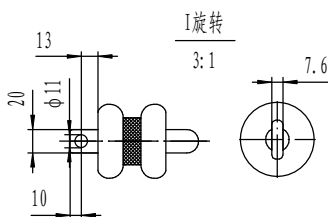
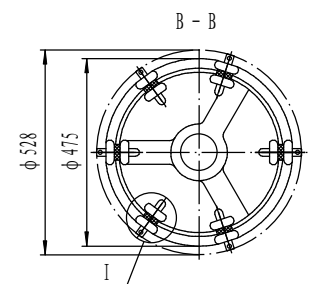
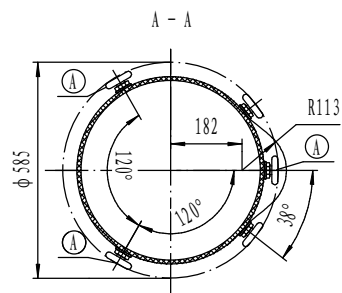
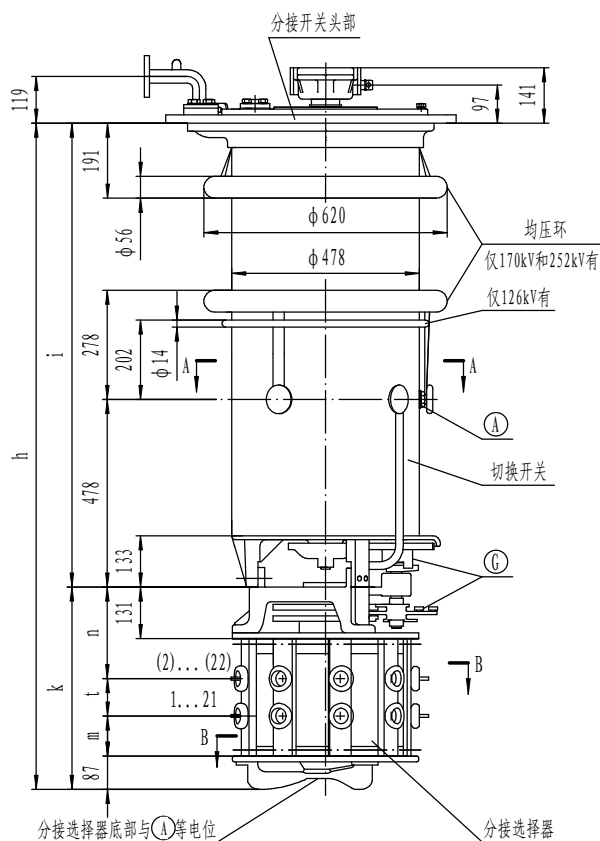


- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ-分接开关头部溢油孔
- Ⓕ-变压器油箱溢油孔
- Ⓖ-分接选择器传动装置(与Ⓐ等电位)
- Ⓛ-回油联结法兰
- Ⓜ-保护继电器联结法兰
- Ⓢ-吸油管联结法兰
- Ⓦ-传动轴

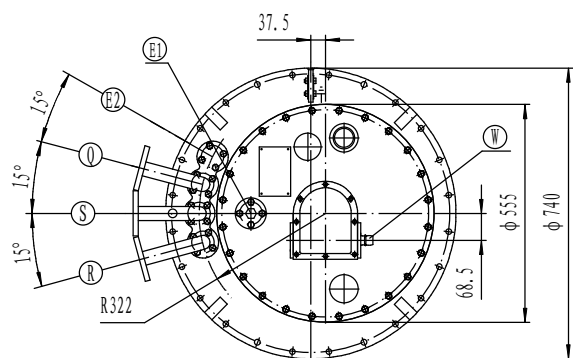
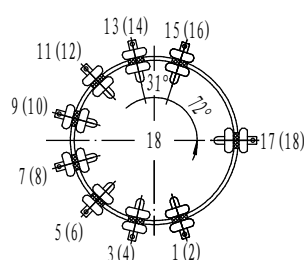
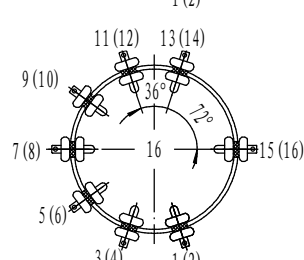
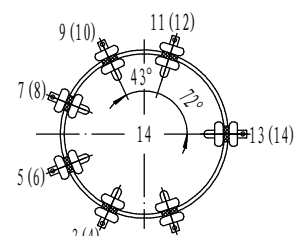
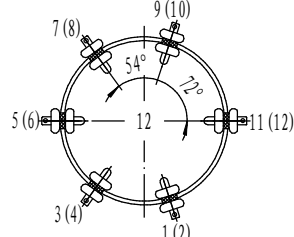
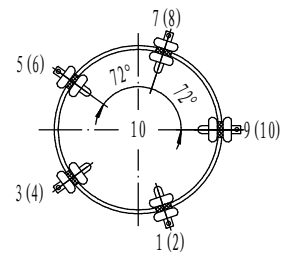


选择器编号	A				B				C				D			
最高工作电压(kV)	40.5	72.5	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252		
尺寸mm	h	1795	1795	1893	2023	2153	2253	2068	2198	2328	2428	2523	2653	2783	2883	
	i	996	996	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356	
	k	799			897						1072			1527		
	n	229			233						258			323		
	o	154			190						240			370		
	t	77			95						120			185		
	m	175			197						247			377		
	r	154			190						240			370		
	q	272.5			276.5						301.5			366.5		
	p	794			892						1067			1522		
	油积dm <sup>3</sup>	130	130	150	170	190	130	150	170	190	130	150	170	190		
排油量dm <sup>3</sup>	199	199	224	244	264	199	224	244	264	207	232	252	272			
重量kg	270			275			280			305						

图3 ZVMIII 300/III 500/III 600粗细调

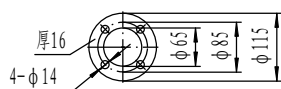


分接选择器触头排列(平面图)



- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ1-分接开关头部溢油孔
- Ⓔ2-变压器油箱溢油孔
- Ⓒ-分接选择器传动装置(与Ⓐ等电位)
- Ⓓ-回油联结法兰
- Ⓔ-保护继电器联结法兰
- Ⓕ-吸油管联结法兰
- Ⓖ-传动轴

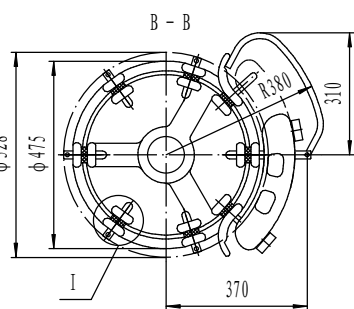
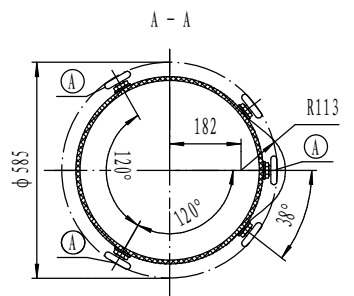
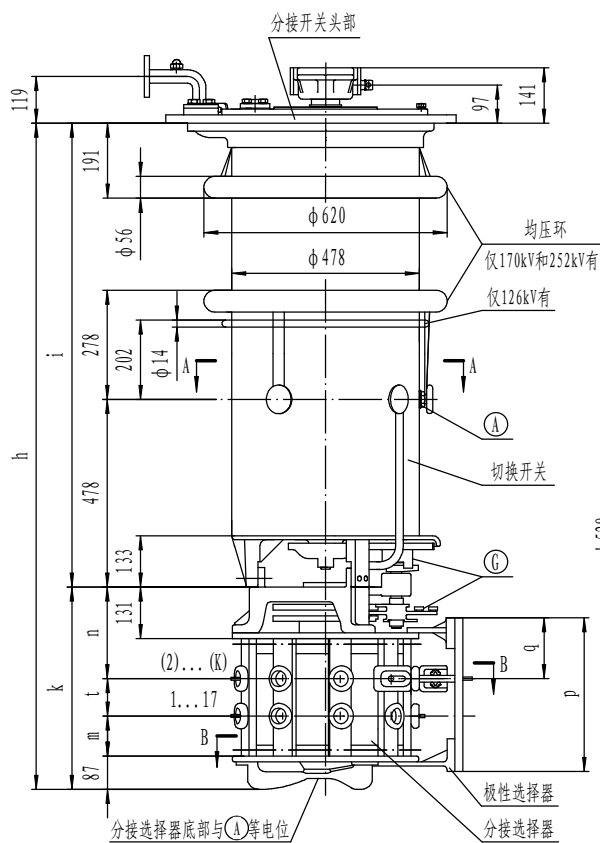
连接法兰Q、S、R



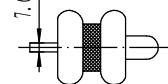
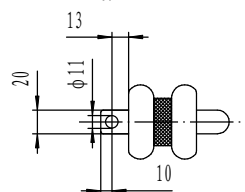
选择器编号	B				C				D				
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252	
尺寸mm	h	1513	1643	1773	1873	1588	1718	1848	1948	1783	1913	2043	2143
	i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
	k		517				592				787		
	n		233				258				323		
	t		95				120				185		
	m		102				127				192		
油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190	
排油量dm <sup>3</sup>	189	214	234	254	189	214	234	254	190	215	234	255	
重量kg		240				240				245			

图4 ZVMI301/I501/I601线性调

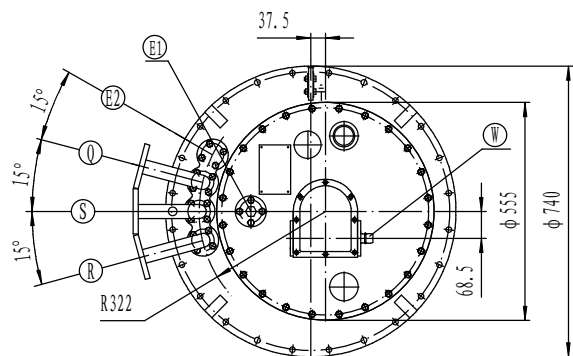
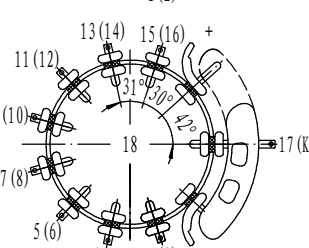
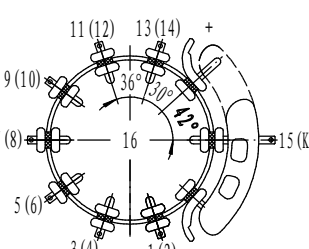
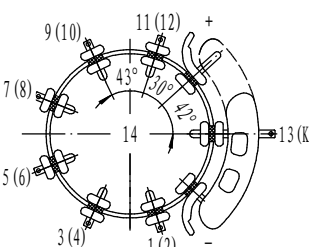
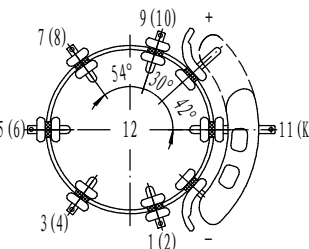
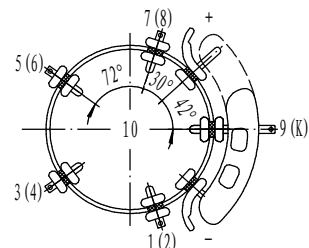




I 旋转

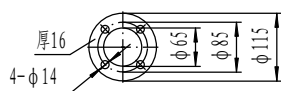


分接选择器触头排列(平面图)



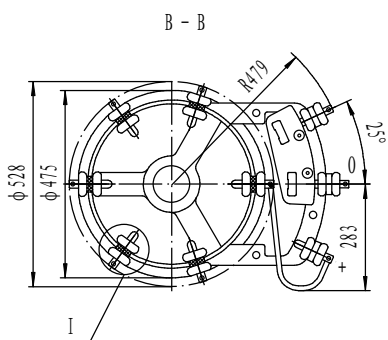
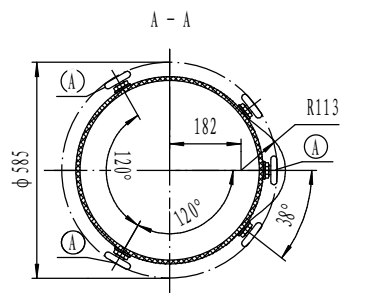
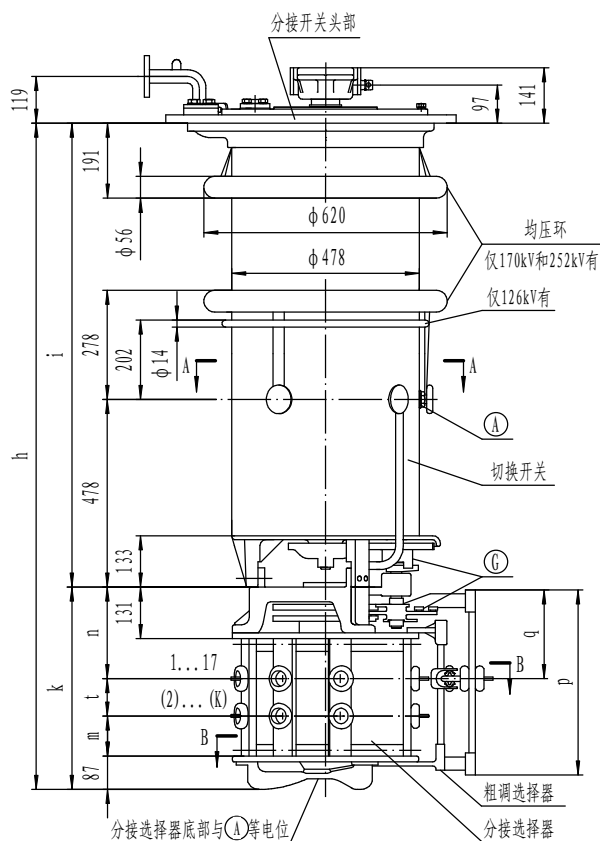
- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ-分接开关头部溢油孔
- Ⓕ-变压器油箱溢油孔
- Ⓖ-分接选择器传动装置(与Ⓐ等电位)
- Ⓚ-回油联结法兰
- Ⓛ-保护继电器联结法兰
- Ⓜ-吸油管联结法兰
- Ⓝ-传动轴

连接法兰Q、S、R

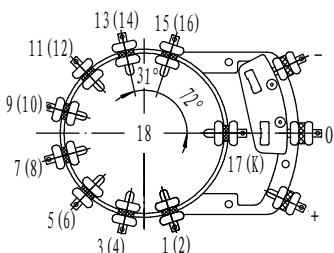
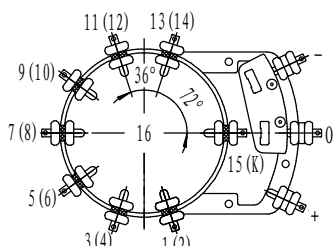
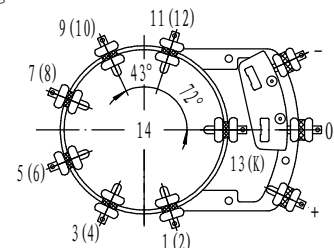
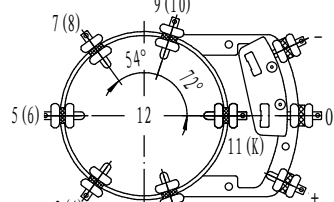
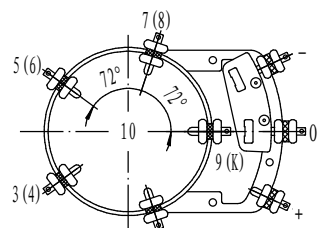


选择器编号	B				C				D				
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252	
尺寸mm	h	1513	1643	1773	1873	1588	1718	1848	1948	1783	1913	2043	2143
	i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
	k		517				592				787		
	n		233				258				323		
	t		95				120				185		
	m		102				127				192		
	q		160				185				250		
	p		403				478				673		
	油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190
	排油量dm <sup>3</sup>	191	216	236	256	192	217	237	257	193	218	238	258
	重量kg		250				255				260		

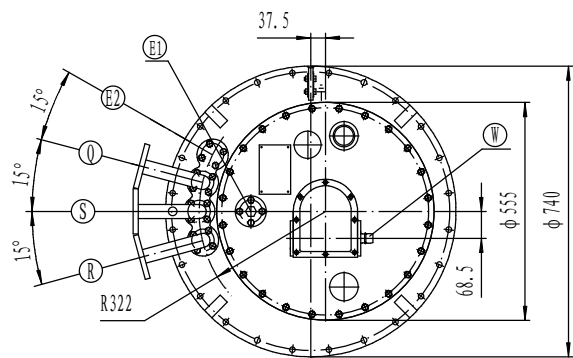
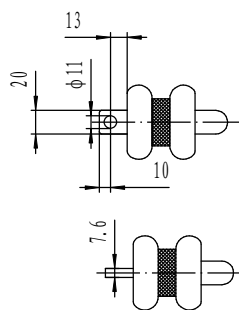
图5 ZVMI301/I501/I601正反调



分接选择器触头排列(平面图)

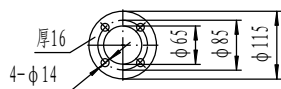


I 旋转  
3:1



- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ1-分接开关头部溢油孔
- Ⓔ2-变压器油箱溢油孔
- Ⓒ-分接选择器传动装置(与Ⓐ等电位)
- Ⓕ-回油联结法兰
- Ⓖ-保护继电器联结法兰
- Ⓖ-吸油管联结法兰
- Ⓖ-传动轴

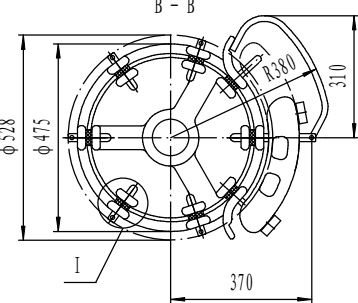
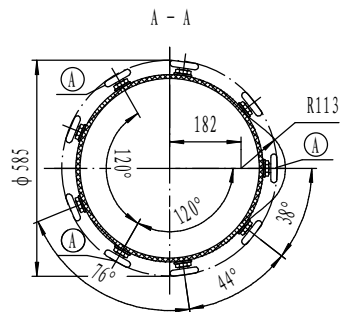
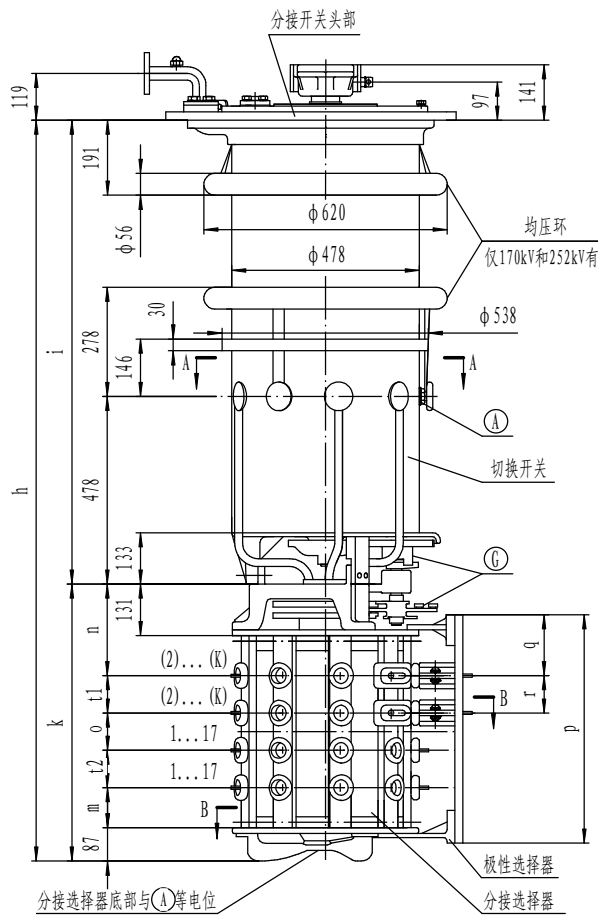
连接法兰Q、S、R



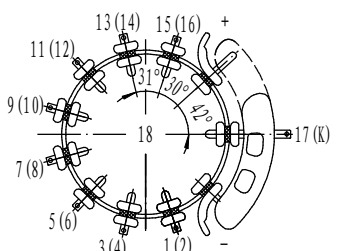
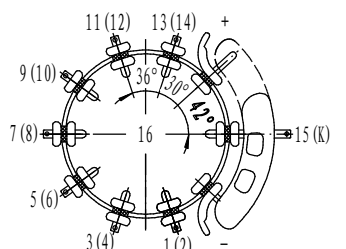
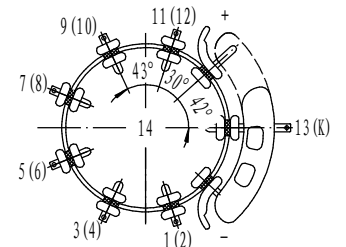
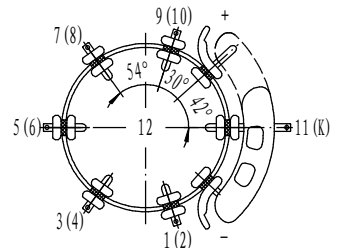
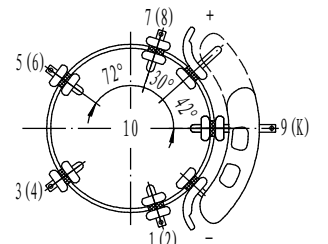
选择器编号	B				C				D				
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252	
尺寸mm	h	1513	1643	1773	1873	1588	1718	1848	1948	1783	1913	2043	2143
	i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
	k		517				592				787		
	n		233				258				323		
	t		95				120				185		
	m		102				127				192		
	q		276.5				301.5				366.5		
	p		512				587				782		
	油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190
	排油量dm <sup>3</sup>	193	218	238	258	193	218	238	258	195	220	240	260
	重量kg	260				260				265			

图6 ZVMI301/I501/I601粗细调

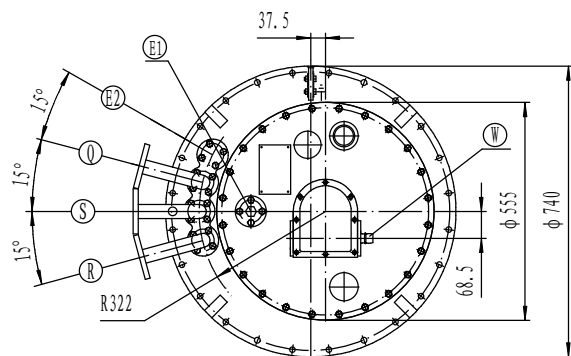
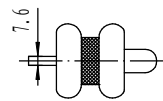
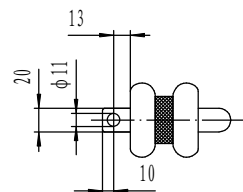




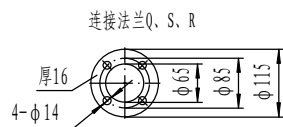
分接选择器触头排列(平面图)



I 旋转  
3:1

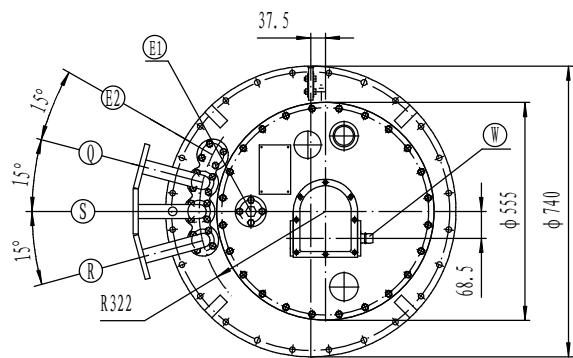
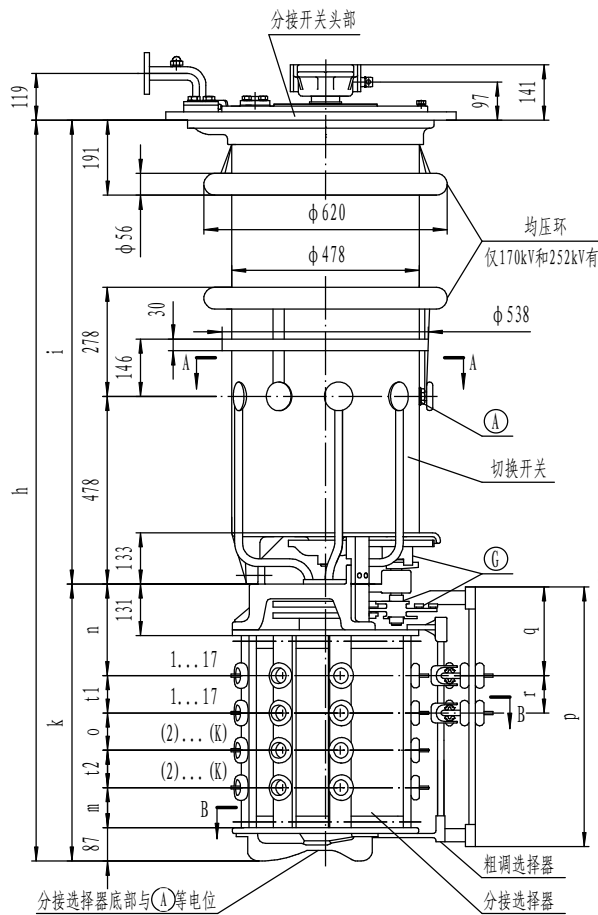


- (A) 分接开关电流引出端(中性点)
- (E1) 分接开关头部溢油孔
- (E2) 变压器油箱溢油孔
- (C) 分接选择器传动装置(与(A)等电位)
- (Q) 回油联结法兰
- (R) 保护继电器联结法兰
- (S) 吸油管联结法兰
- (W) 传动轴

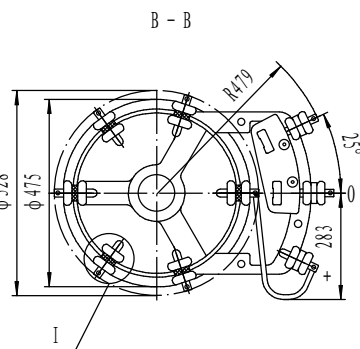
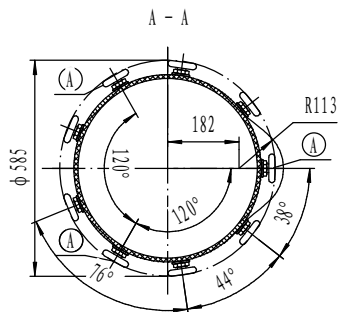
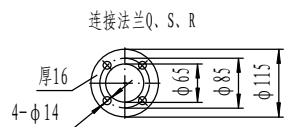


选择器编号	B				C				D			
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252
h	1698	1828	1958	2058	1773	1903	2033	2133	1968	2098	2228	2328
i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
k		702				777				972		
n		233				258				323		
o		95				120				185		
t1		105				105				105		
t2		80				80				80		
m		102				127				192		
r		105				105				105		
q		160				185				250		
p		588				663				858		
油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190
排油量dm <sup>3</sup>	195	220	240	260	195	220	240	260	199	224	244	264
重量kg		265				270				275		

图8 ZVM1800正反调

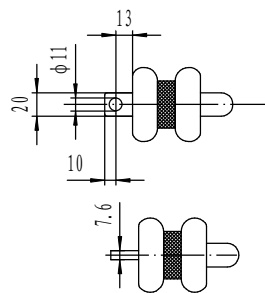


- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ1-分接开关头部溢油孔
- Ⓔ2-变压器油箱溢油孔
- Ⓒ-分接选择器传动装置(与Ⓐ等电位)
- Ⓓ-回油联结法兰
- Ⓔ-保护继电器联结法兰
- Ⓕ-吸油管联结法兰
- Ⓖ-传动轴

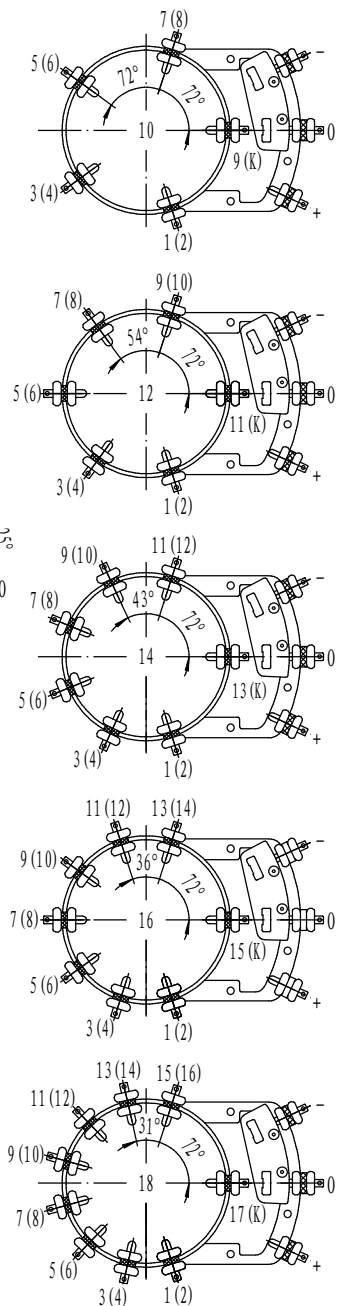


I 旋转

3:1

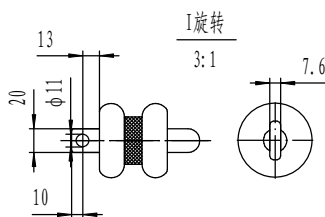
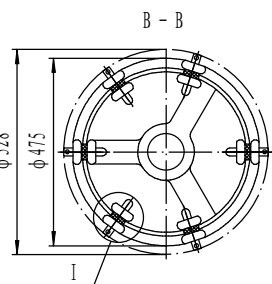
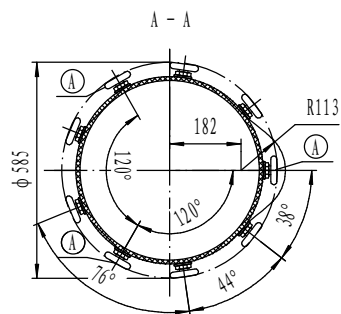
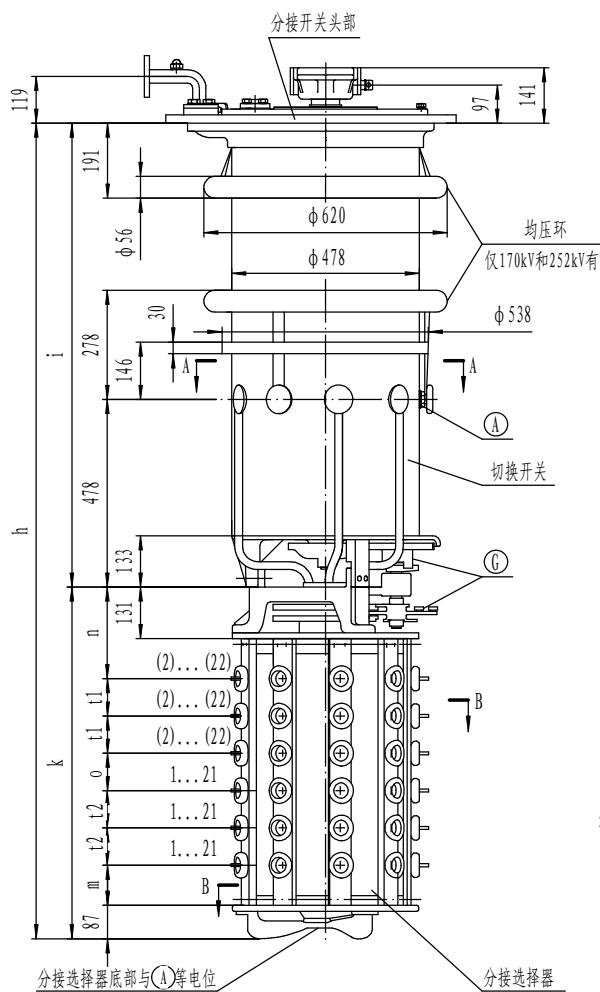


分接选择器触头排列(平面图)

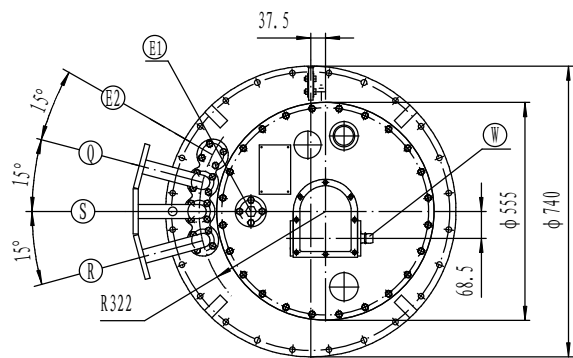
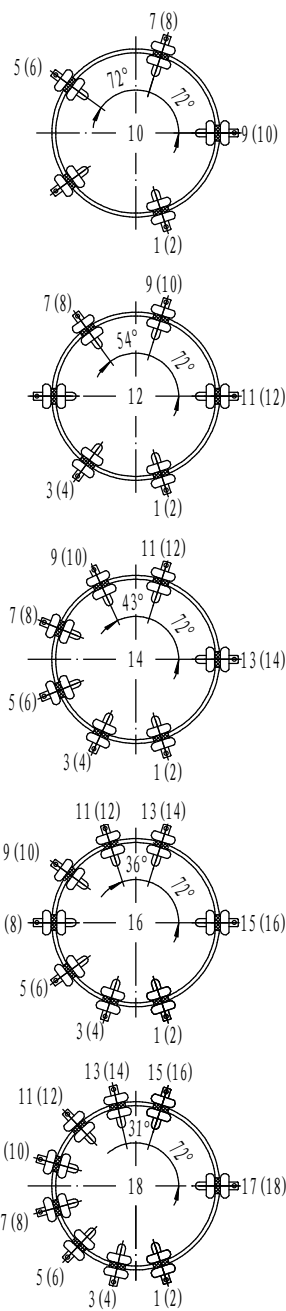


选择器编号	B				C				D			
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252
尺寸mm												
h	1698	1828	1958	2058	1773	1903	2033	2133	1968	2098	2228	2328
i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
k			702				777				972	
n		233				258				323		
o		95				120				185		
t1		105				105				105		
t2		80				80				80		
m		102				127				192		
r		105				105				105		
q		276.5				301.5				366.5		
p		697				772				967		
油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190
排油量dm <sup>3</sup>	195	220	240	260	196	221	241	261	199	224	244	264
重量kg	265				270				275			

图9 ZVM1800粗细调

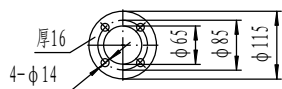


分接选择器触头排列(平面图)



- (A) 分接开关电流引出端(中性点)
- (E1) 分接开关头部溢油孔
- (E2) 变压器油箱溢油孔
- (G) 分接选择器传动装置(与(A)等电位)
- (Q) 回油联结法兰
- (R) 保护继电器联结法兰
- (S) 吸油管联结法兰
- (W) 传动轴

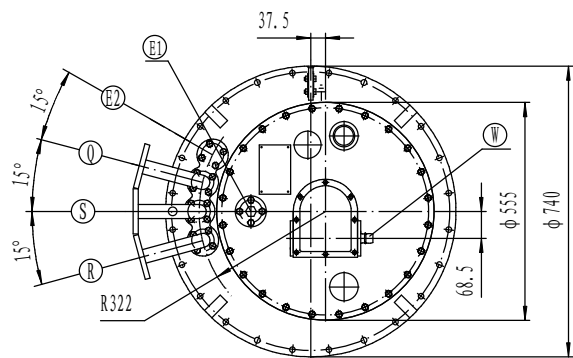
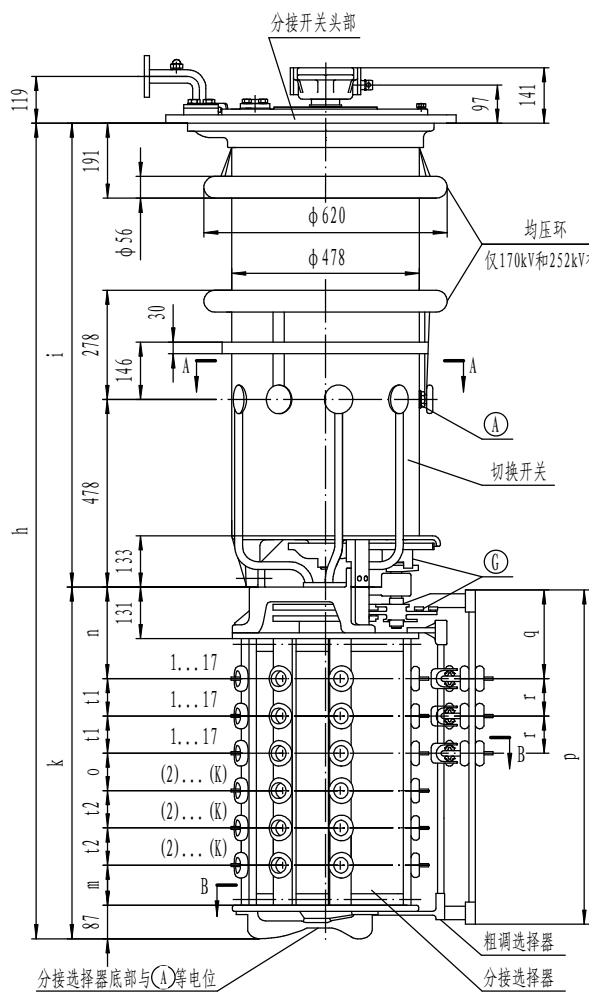
连接法兰Q、S、R



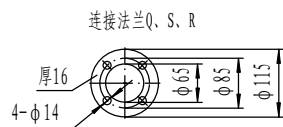
选择器编号	B				C				D				
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252	
尺寸mm	h	1883	2013	2143	2243	1958	2088	2218	2318	2153	2283	2413	2513
	i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
	k		887				962				1157		
	n		233				258				323		
	o		95				120				185		
	l1		105				105				105		
	l2		80				80				80		
	m		102				127				192		
	油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190
	排油量dm <sup>3</sup>	194	219	239	259	194	219	239	259	196	221	241	261
	重量kg	260				260				270			

图10 ZVMI1200/I1500线性调

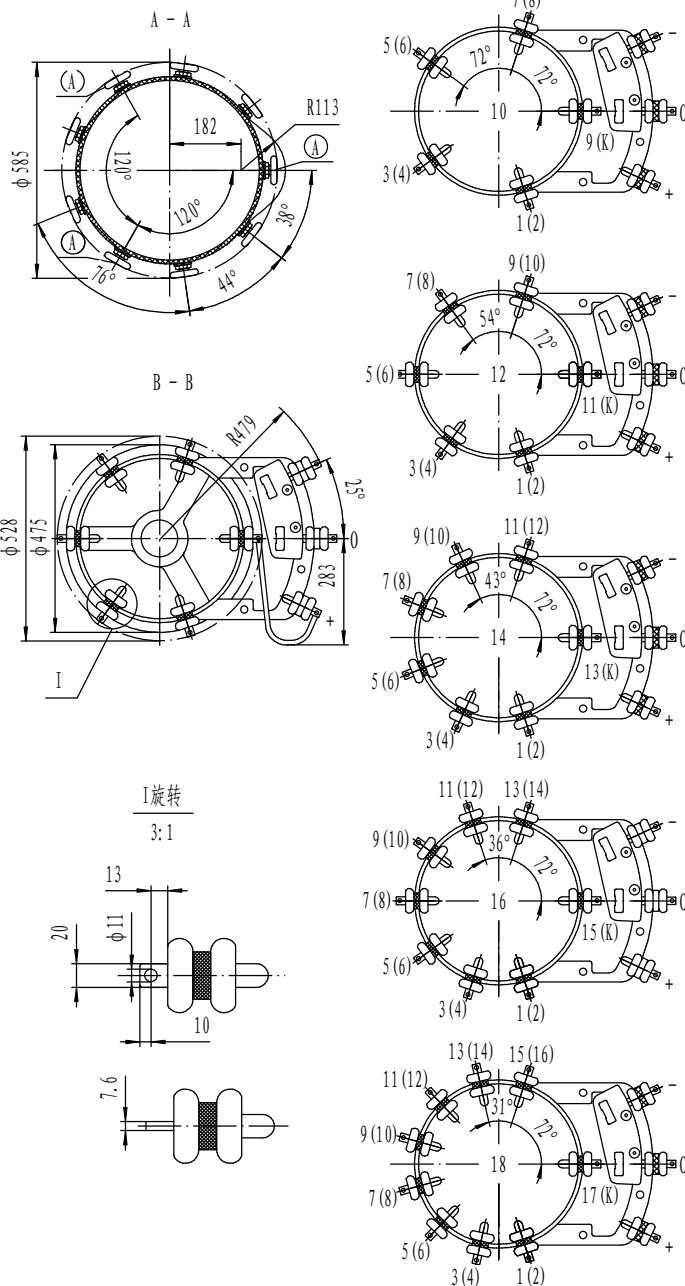




- Ⓐ-分接开关电流引出端(中性点)
- Ⓔ1-分接开关头部溢油孔
- Ⓔ2-变压器油箱溢油孔
- Ⓒ-分接选择器传动装置(与Ⓐ等电位)
- Ⓓ-回油联结法兰
- Ⓔ-保护继电器联结法兰
- Ⓕ-吸油管联结法兰
- Ⓖ-传动轴



分接选择器触头排列(平面图)



选择器编号	B				C				D				
	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252	
最高工作电压(kV)	72.5	126	170	252	72.5	126	170	252	72.5	126	170	252	
尺寸mm	h	1883	2013	2143	2243	1958	2088	2218	2318	2153	2283	2413	2513
	i	996	1126	1256	1356	996	1126	1256	1356	996	1126	1256	1356
	k		887				962				1157		
	n		233				258				323		
	o		95				120				185		
	t1		105				105				105		
	t2		80				80				80		
	m		102				127				192		
	r		105				105				105		
	q		276.5				301.5				366.5		
	p		882				957				1152		
油积dm <sup>3</sup>	130	150	170	190	130	150	170	190	130	150	170	190	
排油量dm <sup>3</sup>	200	225	245	265	200	225	245	265	204	229	249	269	
重量kg		285				285				295			

图12 ZVMI1200/I1500粗细调



## 六、ZVM安装尺寸图

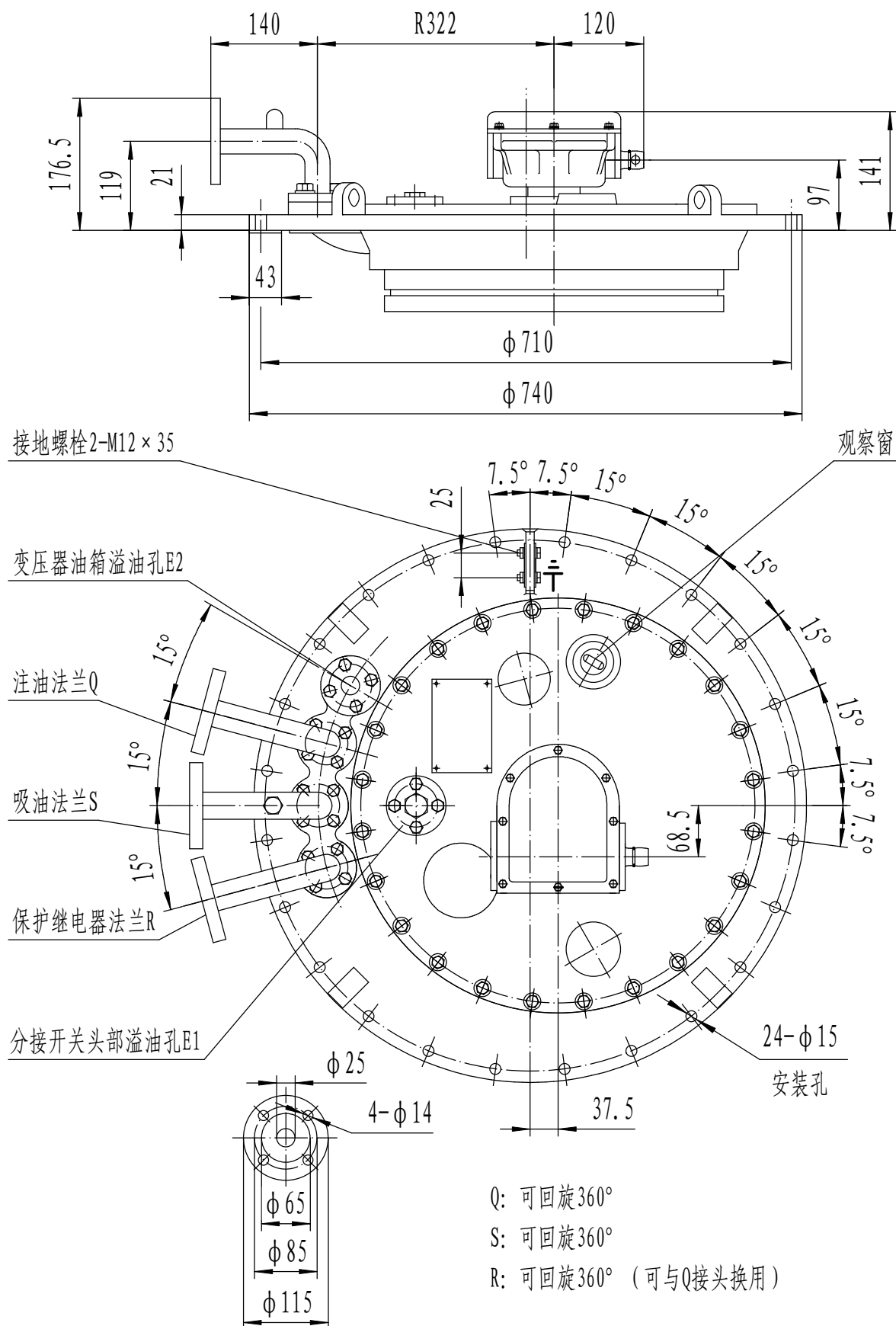


图13 ZVM头部安装尺寸图

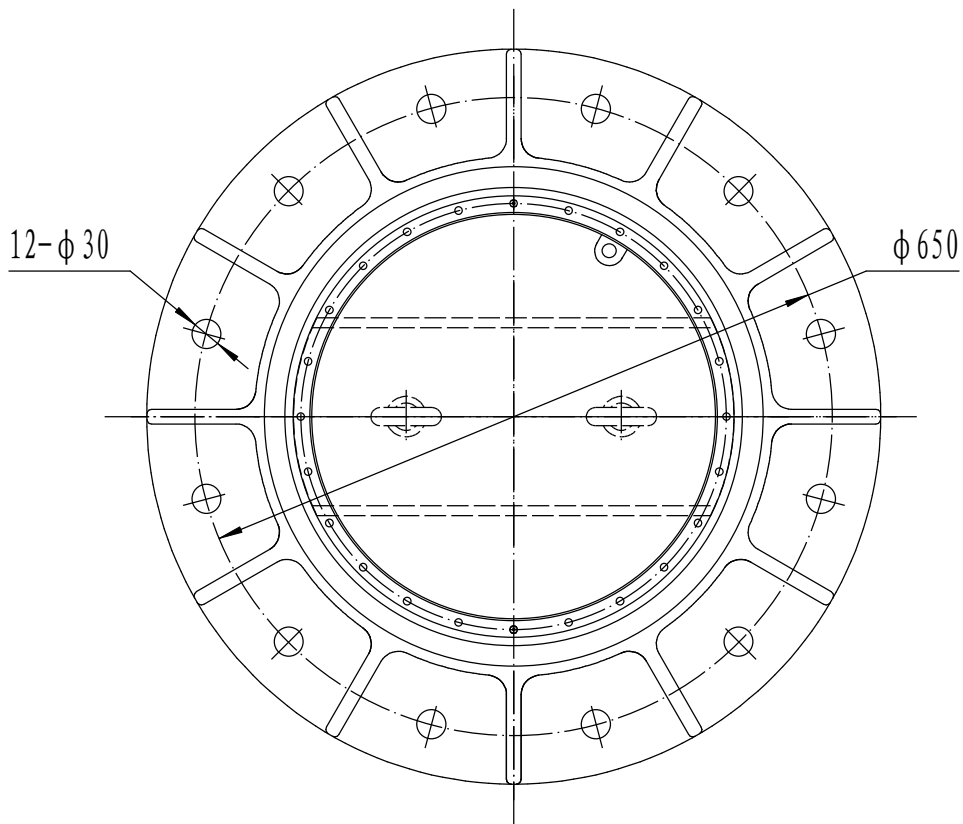
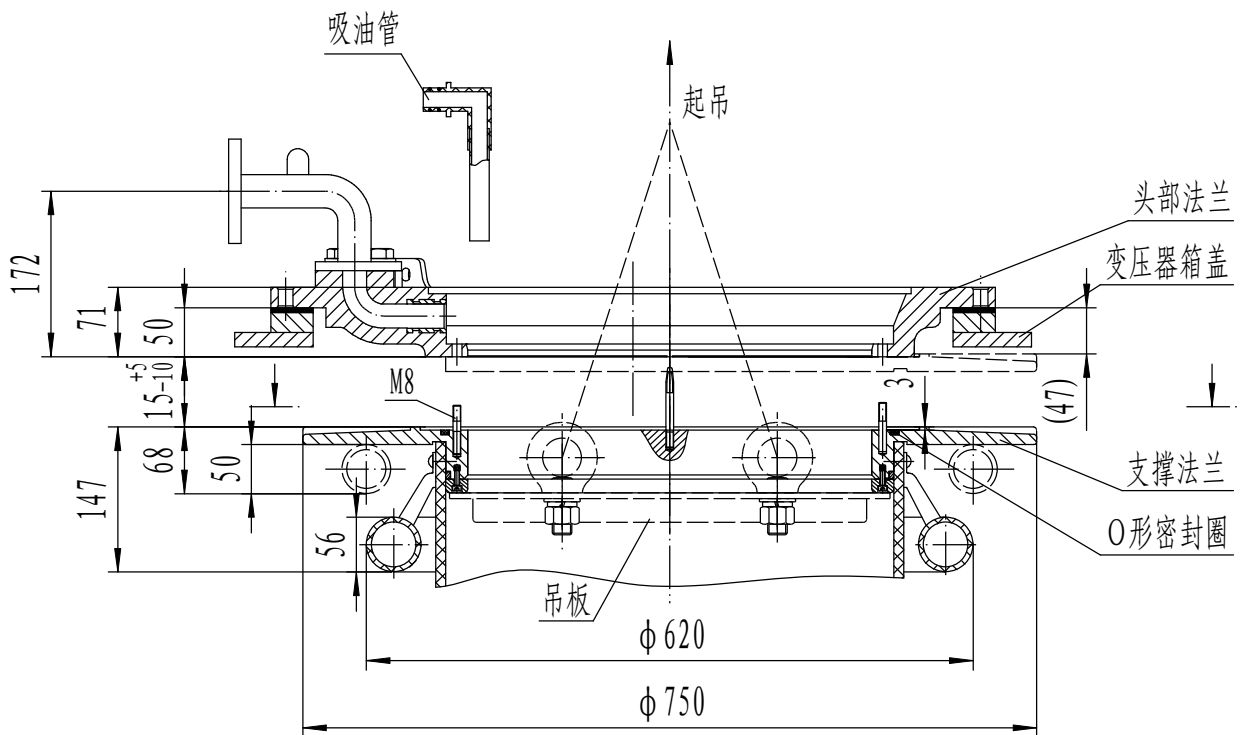


图14 ZVM钟罩式安装尺寸

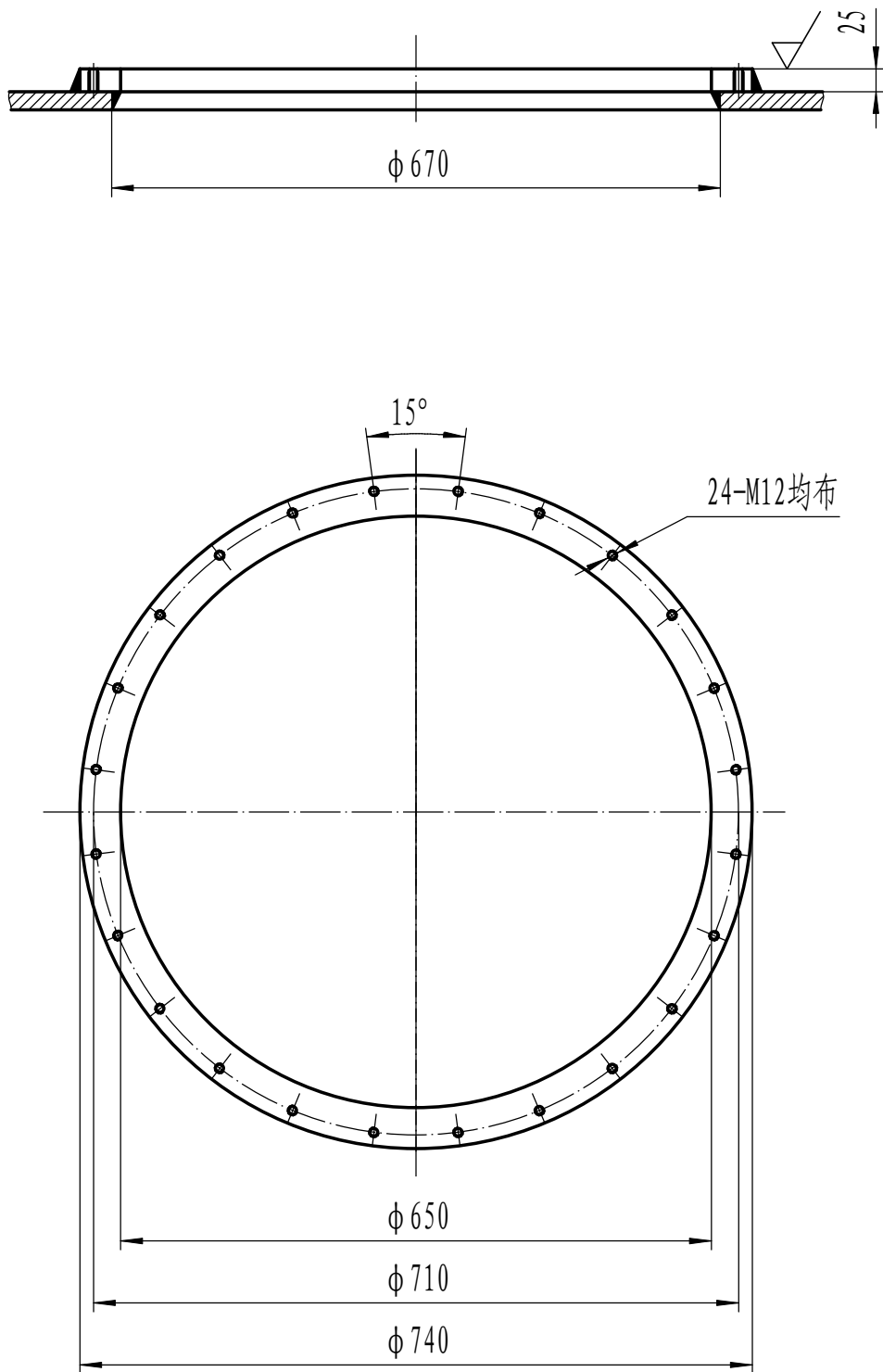
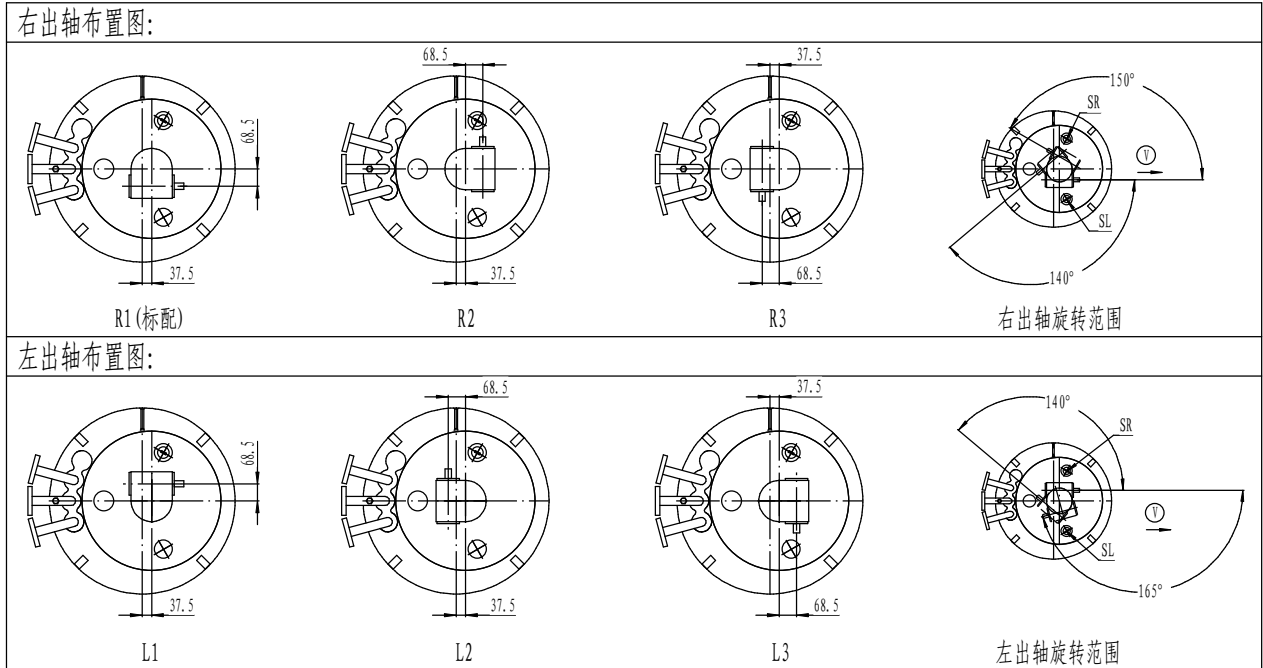


图15 ZVM变压器箱盖安装法兰尺寸图

# 七、ZVM头盖布置

## 1 不配压力释放阀头盖布置选配图

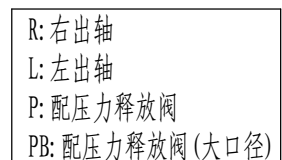
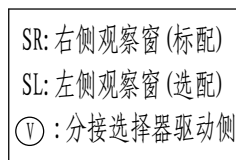
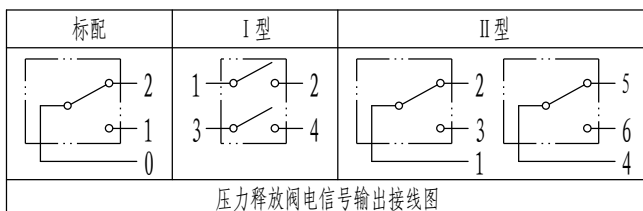
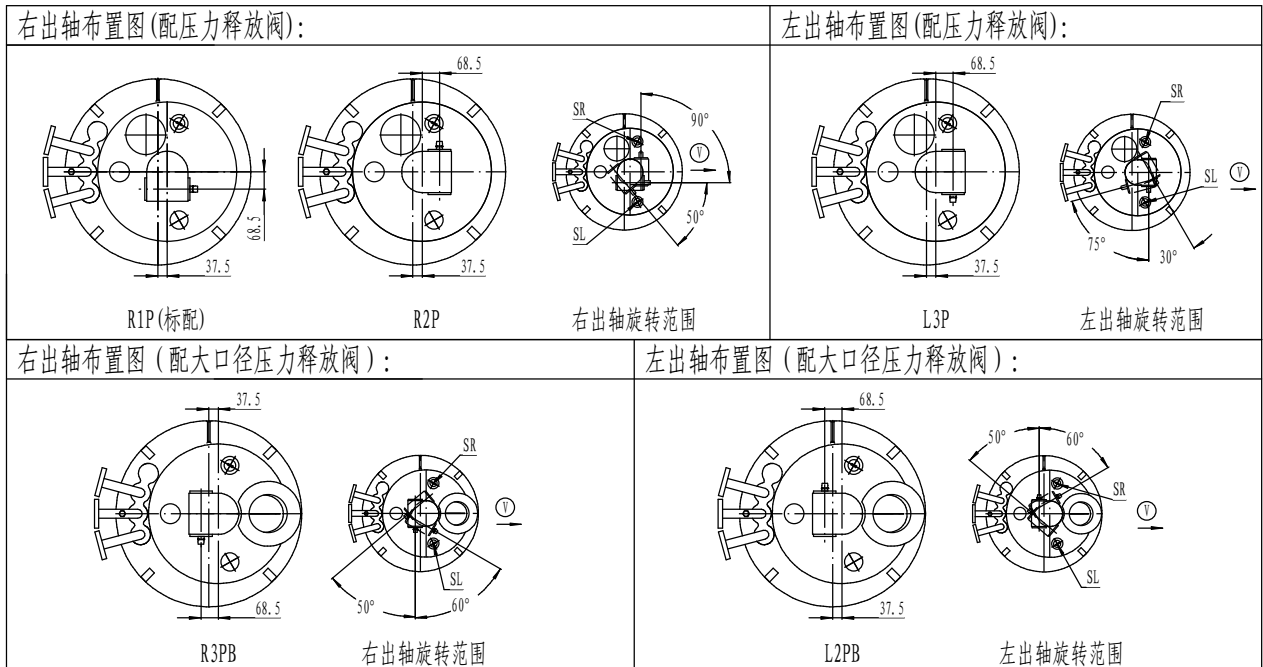
ZVM开关在定货时, 请选择头盖的生产方式, 若不选择按标配图R1生产。特殊角度情况请定货时提出要求。



## 2 配压力释放阀头盖布置选配图

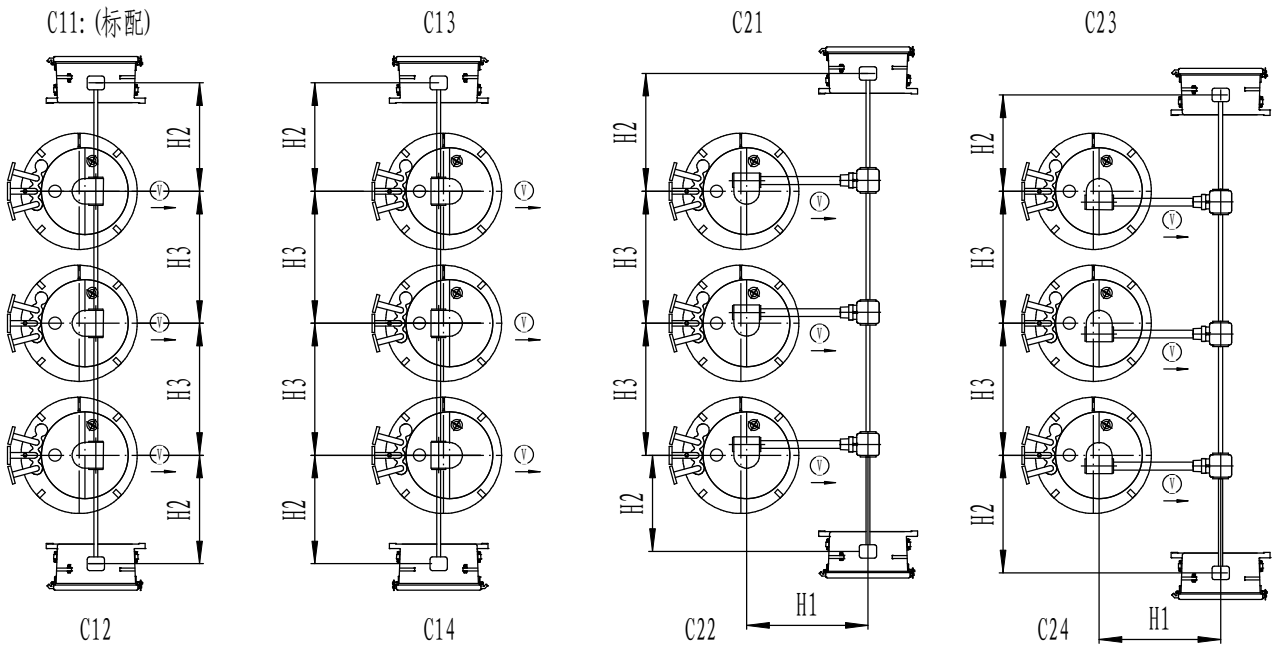
ZVM开关在定货时, 请选择头盖(配压力释放阀)的布置方式, 若不选择则按标配图R1P生产。特殊角度情况请定货时提出要求。

注: 当电流大于600A时, 只能选配大口径压力释放阀。

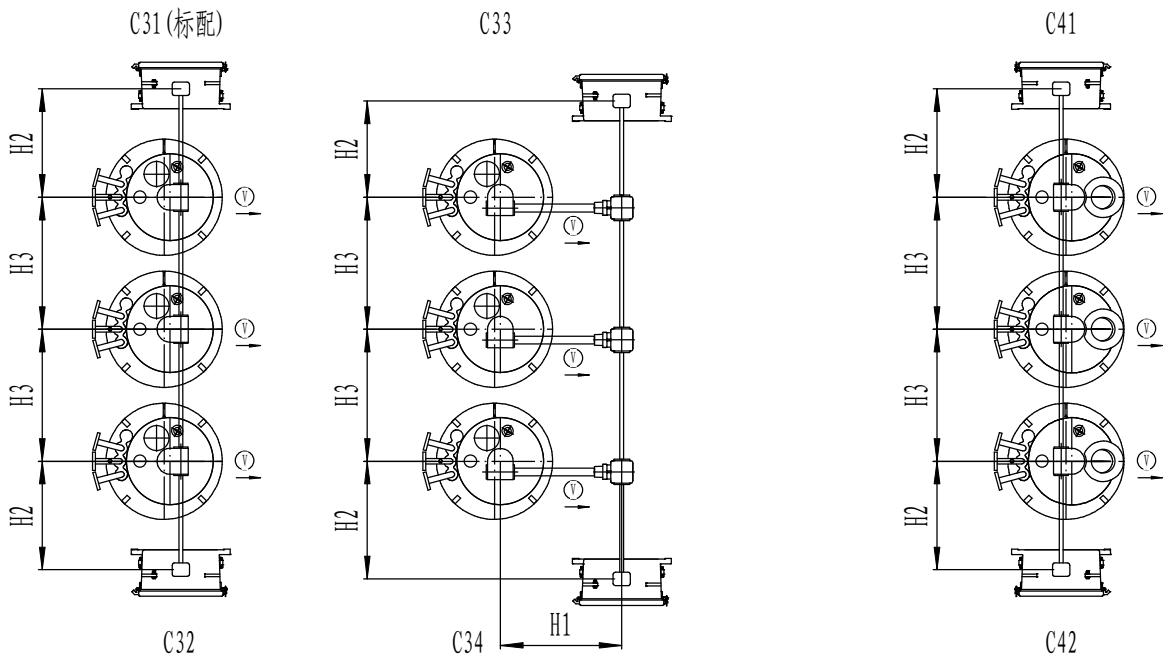


## 八、ZVM三台机械连动布置图

ZVM三台机械连动开关在定货时，请选择三台机械连动头盖布置的生产方式，若不选择按标配图C11生产。特殊布置方式请定货时提出要求。



ZVM三台机械连动开关在定货时，请选择三台机械连动头盖布置的生产方式(配置压力释放阀)，若不选择按标配图C31生产。特殊布置方式请定货时提出要求。

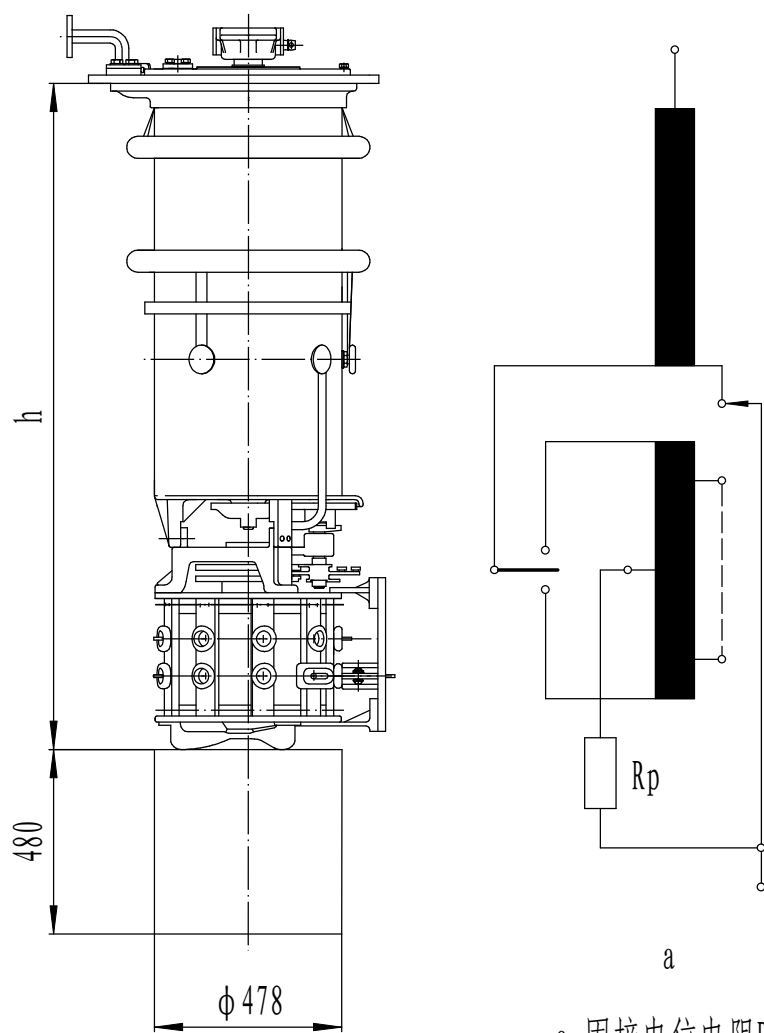


尺寸H	H1 ≥	H2 ≥	H3 ≥
最小尺寸 (mm) 机械最小尺寸	535	515	840

⊙V : 分接选择器驱动侧

## 九、ZVM电位电阻

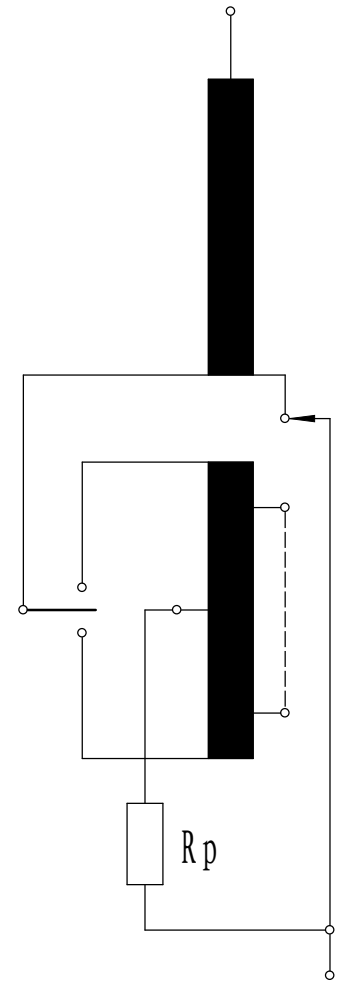
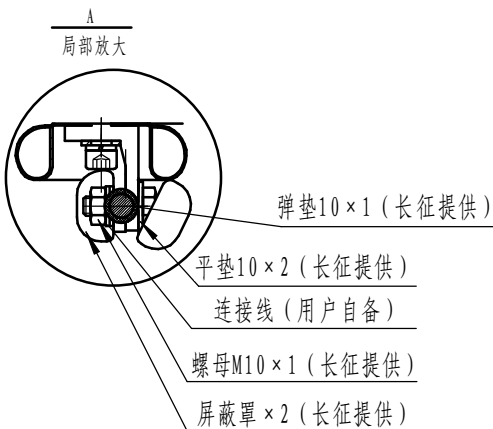
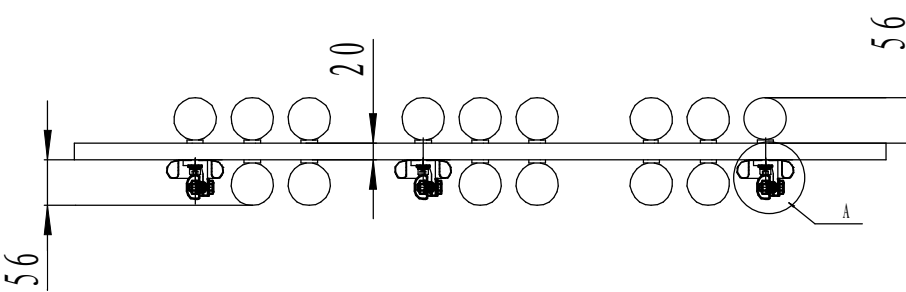
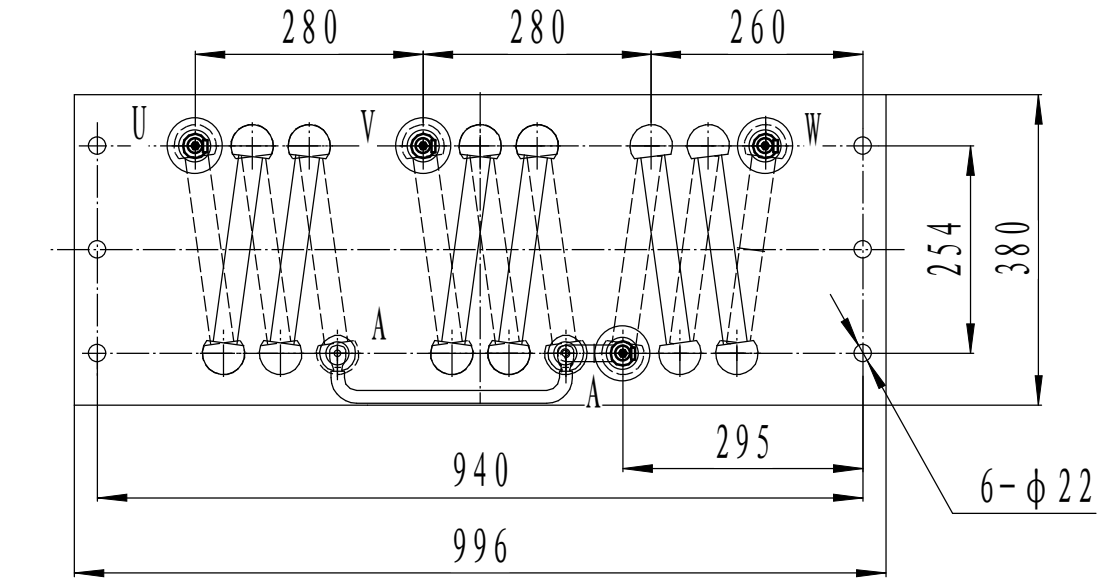
当分接开关转换选择器动作期间时，分接绕组处于“悬浮”状态。由于主绕组与分接绕组存在耦合电容 $C_w$ ，分接绕组与箱壳存在一耦合电容 $C_s$ 的缘故，转换选择器产生火花放电。为减少火花放电气体，采用固接电位电阻或由电位开关来联接电位电阻的方式。



a-固接电位电阻 $R_p$

# 板式电位电阻安装尺寸

安装说明：板式电位电阻连线由用户自备，导线一端连接到选择器中间档位（如10193W为5位置）触头上（M10螺栓），另一端分别连接电位电阻的U/V/W端子，自备导线将电位电阻A端子与切换开关A端子连接（M10螺栓）。



接线原理图

1. 电位电阻为带电体，应注意与变压器箱壁的距离。
2. 电位电阻与分接开关底部的距离应大于30mm.