

10KV 有载分接开关

10KV On-load Tap Changer [OLTC]

安装使用说明书

Installation and Operating Instructions

V1.3

辽宁金立电力电器有限公司

(原丹东金立电力电器有限公司)

LiaoNing Jinli Electric Power Electrical Appliance Co., Ltd.

欢迎您使用本公司的有载分接开关。

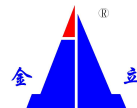
在使用您所购置的有载分接开关之前，请务必仔细阅读我公司的使用说明书。并妥善保管，以备使用中查阅。

谢谢！

You are welcome to use the on-load tap-changer produced by our company.

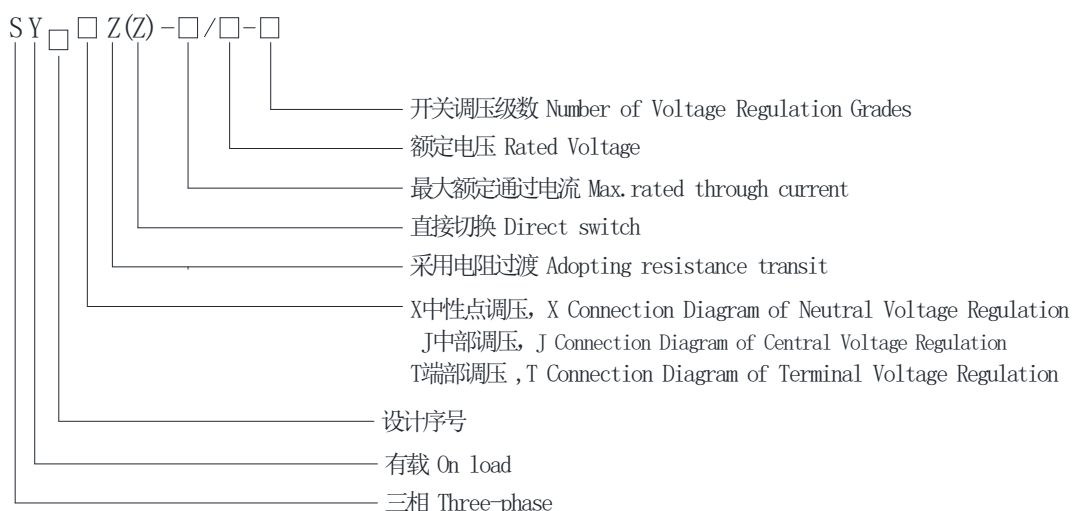
Before using the on-load tap-changer which you have bought, please be sure to read these instructions given by our company carefully and please look after the service manual carefully for you to refer to in the course of using the product.

Thanks!



一：总则

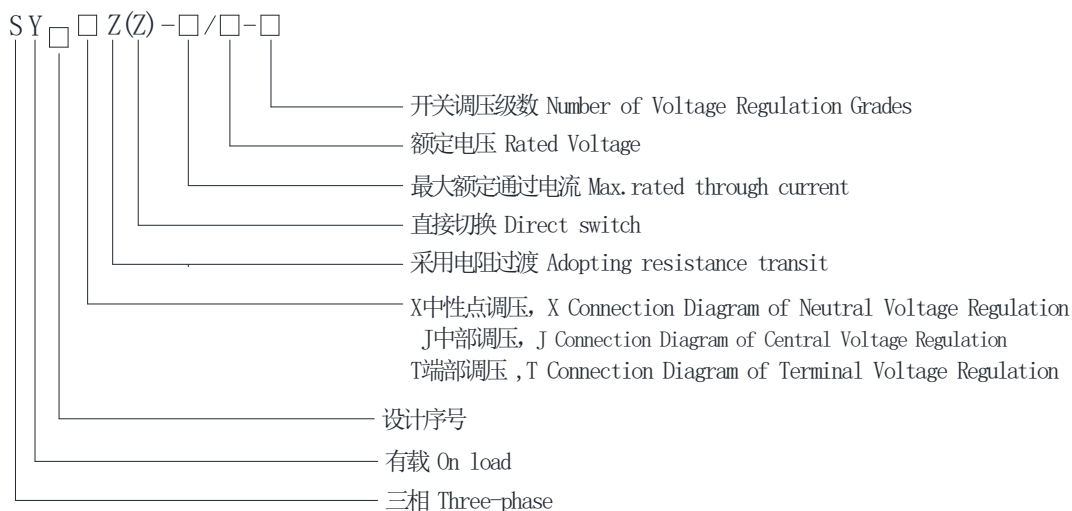
- 1.1 本说明书适用于额定电压为 10KV，额定通过电流 400A、300A、200A、100A 以下系列的有载分接开关。
- 1.2 额定电压 10KV 及以下系列有载分接开关，适用于交流 50HZ、一次侧线电压额定为 10KV，额定通过电流为 400A 及以下，配装油浸式变压器，是有载调压变压器的一个组成部分。本开关应选用本厂的相应配套的有载调压控制器，作为开关操作控制机构。本开关的基本作用是将开关的分接头连接至变压器高压线圈的一端分接头，在变压器带负荷的状态下，有载分接开关根据控制器发出的信号，自动地切换分接位置，以改变高低压线圈之间的匝数比，从而达到稳定或调节负荷中心的电压，提高电压质量，提高系统功率因数，减少无功消耗的有效措施之一。有载调压控制器，可用手动操作，也可以根据二次侧电压（额定值 400V）偏差信号，自动操作指令开关完成切换任务，详见《有载分接开关控制器说明书》。
- 1.3 本开关的基本技术数据如下：
 开关额定工作电流为 400A、300A、200A、100A 及以下；
 开关额定工作电压为 10KV；
 开关最大分级电压为(相电压)600V；
 分级调压幅值为 2.5%~5% ；
- 1.4 本有载分接开关适用于下列工作条件：
 周围空气的最低温度为-25℃，最高温度为+40℃，
 变压器油的最低温度为-25℃，最高温度为+100℃，且不能受潮，
 开关安装场合与垂直面的倾斜度不超过 5 度。
- 1.5 本有载分接开关不适用于下列工作条件：
 充满导电尘埃的介质环境；
 腐蚀性气体或蒸汽的浓度足以破坏金属及绝缘介质的环境中；
 有爆炸危险的场合。
- 1.6 有载分接开关型号说明：



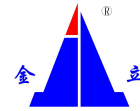
例如：SYJZZ 100/10-9 表示三相有载中部调压采用电阻式过渡电阻直接切换的有载开关，开关额定电流为100A，额定电压10KV，开关有9档分接。

1. General Provisions

- 1.1 These instructions are suitable for the tap-changer of series of the rated voltage of 10KV, the rated passing current of 400A,300A, 200A, 100A and under 100A.
- 1.2 The tap-changer of the rated voltage of 10KV and under 10KV is suitable for fitting out the oil-immersed transformer of AC50HZ with primary side line voltage rated 10KV, rated passing current 400A and under 400A, it is one of the components of the on-load voltage-regulating transformer. This switch needs to select the relative mating load voltage-regulating controller as the operation control device of the switch. The major function of this switch is to carry out the load tap-changing through the way to connect the tap-changing point of the switch to the tap-changing point of the high-tension coil of the transformer, under the load-up condition of transformer, on-load tap-changing the signal given by the switch according to the controller, automatically transfer the tap-changing positions to change the turn ration between the high-tension and low-tension coils, so as to stabilize or regulate the voltage of the load center, improve the voltage quality and the system power factor, and effectively reduce the reactive consumption. The on-load voltage-regulating controller can be operated by hand, and can also automatically complete the switching task according to the deviation signal of the secondary side voltage (rated value 400V), automatic operation instructions.
- 1.3 The basic technical parameter of this switch is as follows:
 The rated working current: 400A,300A, 200A, 100A and under;
 The rated working voltage: 10KV;
 The maximum grading Voltage: 300V;
 The voltage-regulation grades: neutral point is 9 grades (The most 13 grades), central part is 9 grades, end-part is 9 grades;
 The amplitude of grading voltage-regulation is 2.5%~5%.
- 1.4 This on-load tap-changer is suitable for the following working conditions:
 The minimum ambient temperature is -25℃, the maximum ambient temperature is +40℃,
 The minimum temperature of the transformer oil is -25℃, the maximum temperature of the transformer oil is +100℃, at the same time can not be affect with damp.
 The slop of the installation place of the switch and the vertical face shall not be over 5 degrees.
- 1.5 This on-load tap-changer is not suitable for the following working conditions:
 in the environment where there is full of the medium of conductive dust;
 in the environment where the density of the corrosive gas or steam is full enough to destroy the metal and the insulating medium;
 in the place where there is a danger of explosion.

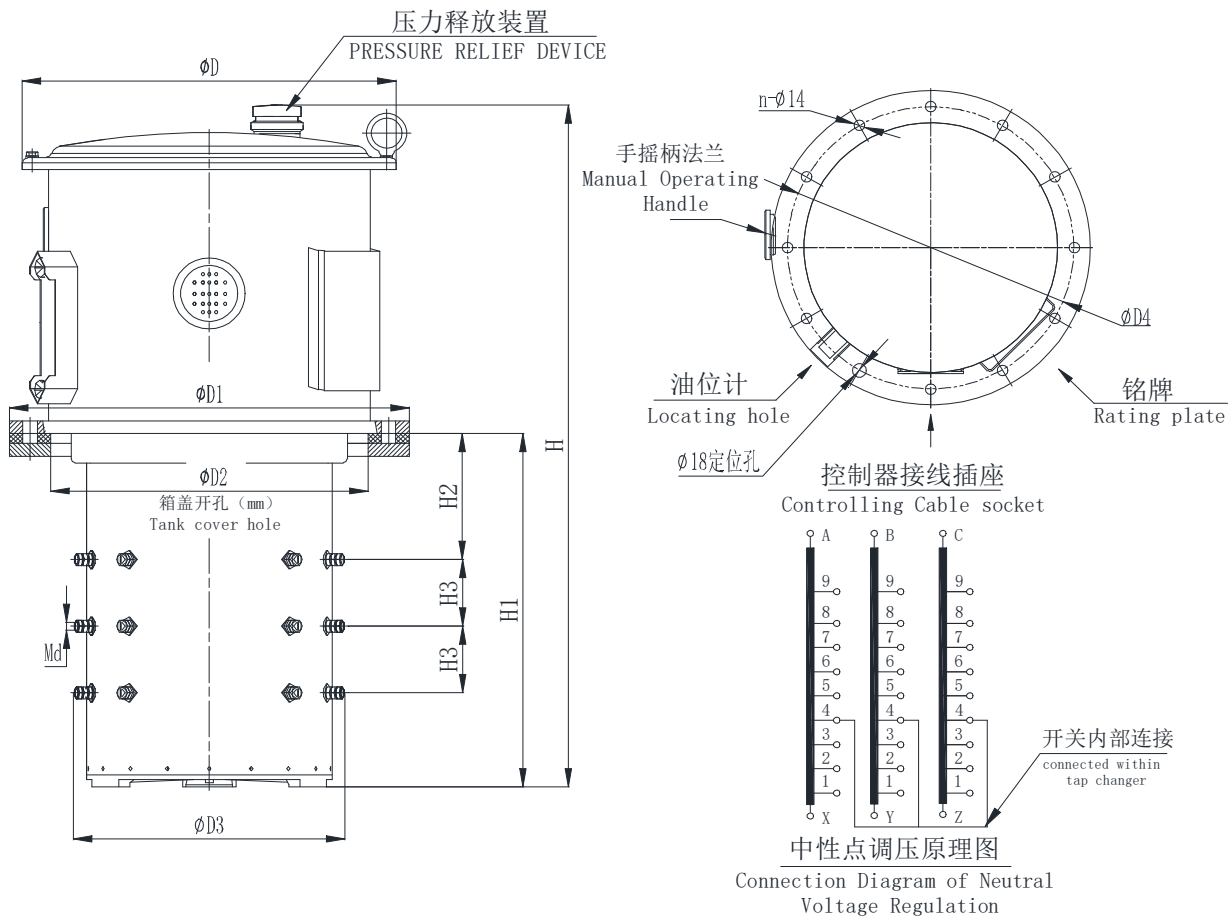


例如：SYJZZ 100/10-9 表示三相有载中部调压采用电阻式过渡电阻直接切换的有载开关，开关额定电流为100A，额定电压10KV，开关有9档分接。



SYXZZ 有载开关外形尺寸图:

Outline Dimension Diagram of SYXZZ Load Tap changer:



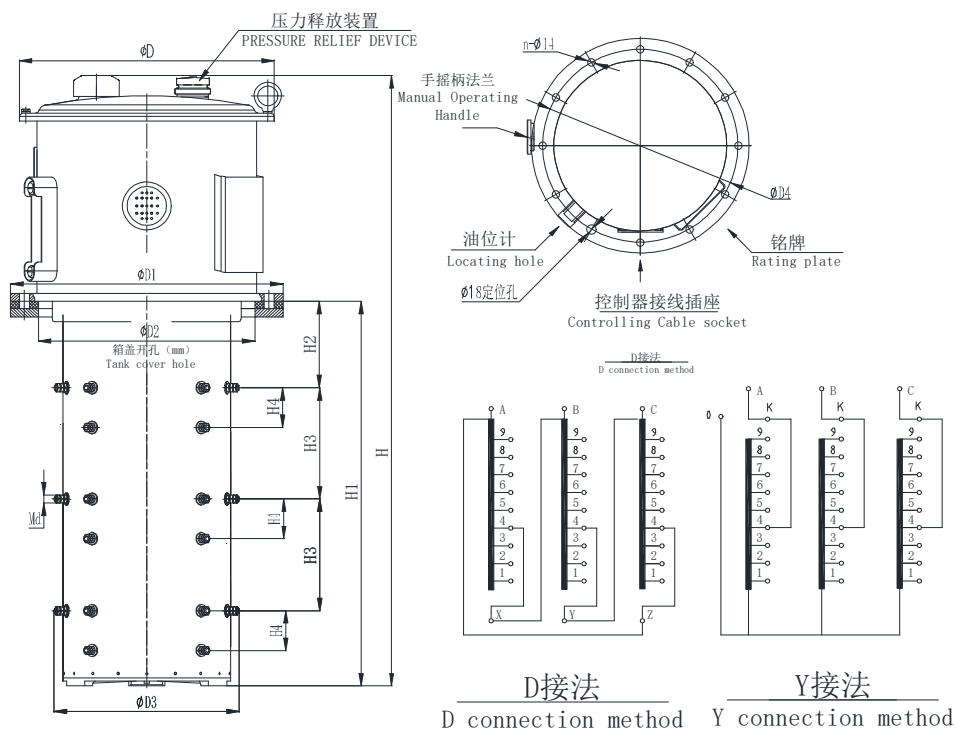
序号 Serial number	开关型号 Model No.	额定 电流 (A) Rated current	额定 电压 (v) Rated voltage	安装尺寸 (mm) Install dimension (mm)										
				ΦD	ΦD1	ΦD2	ΦD3	ΦD4	H	H1	H2	H3	Md	n
1	SYXZZ 50/10-3~5	50	10	280	285	220	215	258	660	320	120	60	M8	★
2	SYXZZ 100/10-5~9	100	10	365	390	310	305	350	660	356	131	66	M8	11
3	SYXZZ 100/10-10~11	100	10	365	430	360	355	390	680	378	126	70	M8	11
4	SYXZZ 100/10-12~13	100	10	435	490	415	400	450	890	480	150	100	M8	11
5	SYXZZ 200/10-5~9	200	10	365	430	360	355	390	680	378	126	70	M10	11
6	SYXZZ 200/10-10~11	200	10	365	430	360	355	390	680	378	126	70	M10	11
7	SYXZZ 200/10-12~13	200	10	435	490	415	400	450	890	480	150	100	M10	11
8	SYXZZ 300/10-5~9	300	10	435	540	460	435	500	860	468	156	85	M14	11
9	SYXZZ 300/10-10~13	300	10	596	610	520	505	570	1050	700	160	100	M14	23
10	SYXZZ 400/10-5~9	400	10	435	540	460	435	500	860	468	156	100	M16	11
11	SYXZZ 400/10-10~13	400	10	596	610	520	505	570	1050	700	160	100	M16	23

注: 1.★SYXZZ 50/10-3~5 有载分接开关安装孔为 10—Φ12

产品改进时以上设计及参数的变化恕不另行通知,具体尺寸以订货时我司提供开关外形图为准.

SYJZZ 有载开关外形尺寸图:

Outline Dimension Diagram of SYJZZ Load Tap changer:

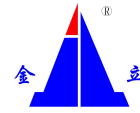


序号 Serial number	开关型号 Model No.	额定 电流 (A) Rated current	额定 电压 (v) Rated voltage	安装尺寸 (mm) Install dimension (mm)										
				ΦD	ΦD1	ΦD2	ΦD3	ΦD4	H	H1	H2	H3	Md	n
1	SYJZZ 100/10-5~7	100	10	365	390	310	305	350	725	424	131	100	M8	11
2	SYJZZ 100/10-8~9T	100	10	365	390	310	305	350	880	578	126	155	M8	11
3	SYJZZ 100/10-11	100	10	435	490	410	400	450	890	480	150	100	M8	11
4	SYJZZ 200/10-5~7	200	10	365	430	360	355	390	740	440	130	100	M10	11
5	SYJZZ 200/10-8~9T	200	10	365	430	360	355	390	880	578	126	155	M10	11
6	SYJZZ 200/10-10~13T	200	10	435	490	420	415	450	1110	720	156	190	M10	11
7	SYJZZ 300/10-5~7	300	10	435	540	460	435	500	920	540	156	120	M14	11
8	SYJZZ 300/10-8~9T	300	10	435	540	460	435	500	1110	720	156	190	M14	11
9	SYJZZ 400/10-5~7	400	10	435	540	460	435	500	920	540	156	120	M16	11
10	SYJZZ 400/10-8~9T	400	10	435	540	460	435	500	1110	720	156	190	M16	11

注: 1.SYJZZ 100~200/10-8~9 T H4=55 H=578 SYJZZ 100~200/10-10~13 T H4=70

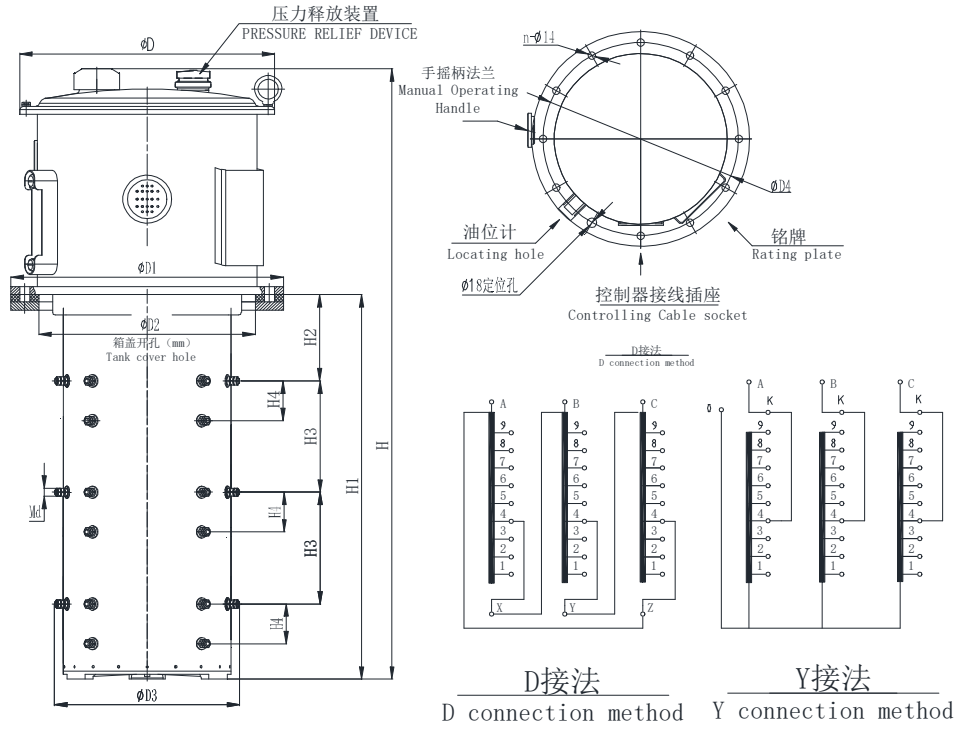
2. SYJZZ 300~400/10-8~9T H4=70 H=720

产品改进时以上设计及参数的变化恕不另行通知,具体尺寸以订货时我司提供开关外形图为准。



SYTZZ 有载分接开关外形尺寸图:

Outline Dimension Diagram of SYTZZ Load Tap changer:

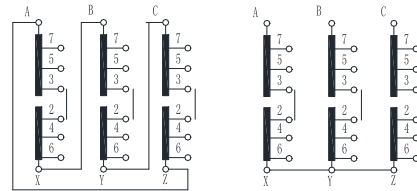
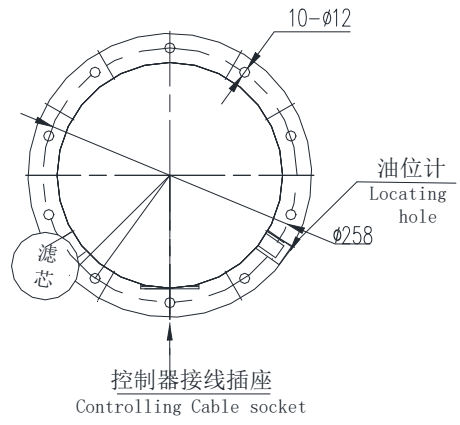
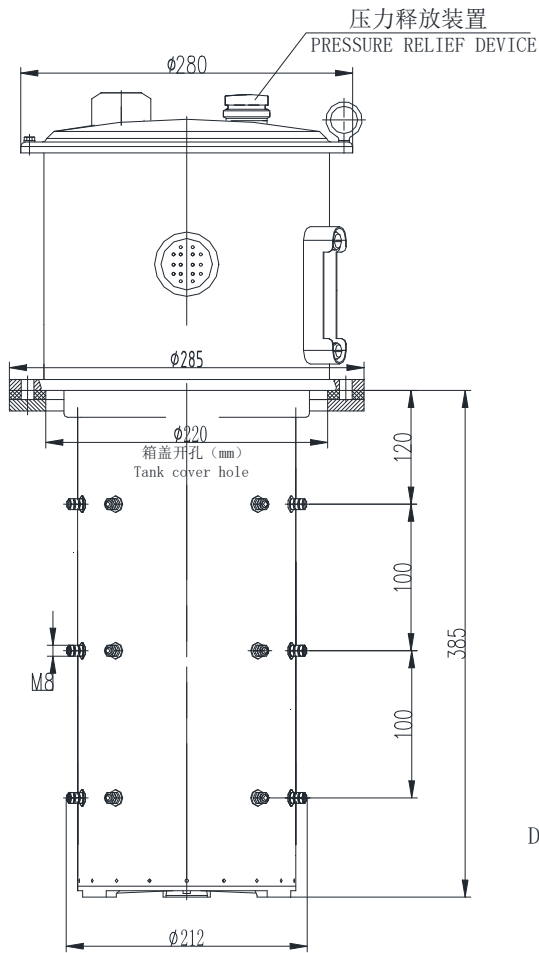


序号 Serial number	开关型号 Model No.	额定 电流 (A) Rated current	额定 电压 (v) Rated voltage	安装尺寸 (mm) Install dimension (mm)											
				ΦD	$\Phi D1$	$\Phi D2$	$\Phi D3$	$\Phi D4$	H	H1	H2	H3	H4	Md	n
1	SYTZZ 100/10-5~9	100	10	365	390	310	305	350	880	580	131	150	65	M8	11
2	SYTZZ100/10-10~11	100	10	365	430	360	355	390	880	580	126	155	65	M8	11
3	SYTZZ100/10-12~13	100	10	435	490	420	415	450	1010	625	140	155	65	M8	11
4	SYTZZ 200/10-5~9	200	10	365	430	360	355	390	880	580	126	155	65	M10	11
5	SYTZZ200/10-10~11	200	10	365	430	360	355	390	880	580	126	155	65	M10	11
6	SYTZZ200/10-12~13	200	10	435	490	415	400	450	1040	625	140	170	75	M10	11
7	SYTZZ 300/10-5~9	300	10	435	540	460	435	500	1110	720	156	190	70	M14	11
8	SYTZZ 300/10-10~13	300	10	596	610	520	505	570	1750	1050	192	270	100	M14	24
9	SYTZZ 400/10-5~9	400	10	435	540	460	435	500	1110	720	156	190	70	M16	11
10	SYTZZ 400/10-10~13	400	10	596	610	520	505	570	1750	1050	192	270	100	M16	24
11	SYTZZ 300/10-7~9YZ	300	10	435	540	460	435	500	1435	720	156	190	70	M14	11
12	SYTZZ 400/10-7~9YZ	400	10	435	540	460	435	500	1435	720	156	190	70	M16	11

注：YZ 代表开关带油枕

产品改进时以上设计及参数的变化恕不另行通知,具体尺寸以订货时我司提供开关外形图为准.

SYJZZ 50 / 10-5LT



D接法 Y接法
D connection method Y connection method

已9档为例

三：有载开关电气、机械结构 The Electric Mechanical Structure of the On-load Switch

3.1 电气部分线连接图（以 9 级为例，其他档位开关详见控制器说明书）

Wire-connecting Drawing of Electric part (Taking Grade9 as an example, for the switch of other grades, please see the controller service manual)

开关 21 芯航插编号(开关端):

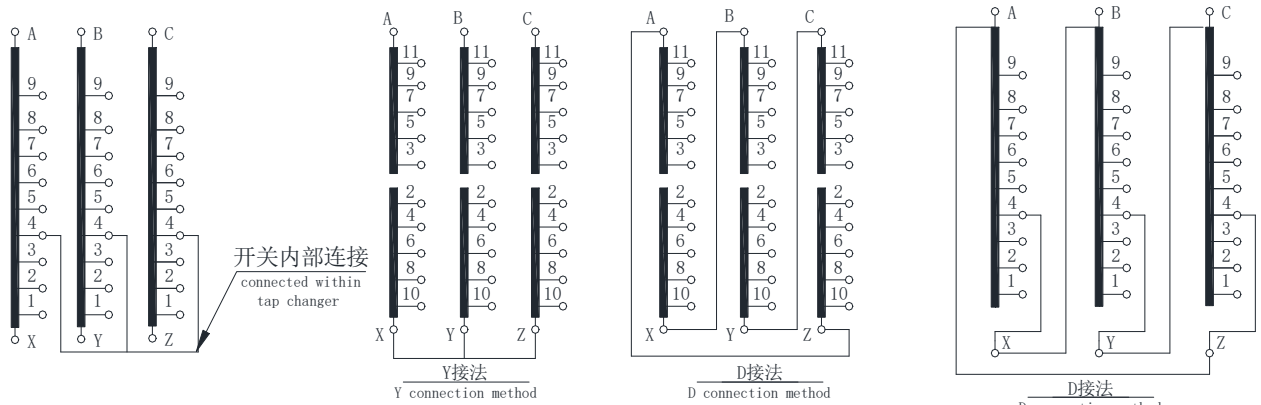
航插编号	1	2	3	4	5	6	7	8	9	10	17	18	19
功能	分接 1	分接 2	分接 3	分接 4	分接 5	分接 6	分接 7	分接 8	分接 9	档位公共端	电机公共端	电机降	电机升
电缆线编号	1	2	3	4	5	6	7	8	9	10	17	18	19

开关 19 芯航插编号：（开关内部）

内连线航插 Q24K19PJ	1	2	3	4	5	6	7	8	9	10	17	18	19
说明	档位 1	档位 2	档位 3	档位 4	档位 5	档位 6	档位 7	档位 8	档位 9	档位公共端	电机公共端	降档	升档

注：启动电容在 18、19 之间。对应 10KV 电压等级开关（120W）电机为 15 μF，对应 35KV 电压等级开关（180W）电机为 20 μF，SYJZZ50/10-5LT 对应为 3 μF。此电容已安装于本厂控制器内，若选用本厂控制器则无需额外加装此电容。

3.2 有载调压电路原理图 On-load Voltage-regulation Circuit Principle Drawing



中性点调压原理图

Connection Diagram of Neutral Voltage Regulation

中部调压原理图

Connection Diagram of Central Voltage Regulation

端部调压原理图

Connection Diagram of Terminal Voltage Regulation

3.3 本开关是一种复合式的电阻过渡的埋入式有载分接开关，开关有隔离于变压器的单独油室利用变压器油作绝缘和灭弧介质，因此结构简单，体积较紧凑，也便于用户检修和换油。开关的安装法兰上面，即露出变压器油箱平面的那一部分，是机械传动部分，由单相电机带动二级蜗轮蜗杆做减速传动，由上隔板下面的弓形板推动主弹簧拉伸储能，利用弹簧“过死点”后释放的能量推动拨槽件由拨槽件推动槽轮，作传动一定角度的运动，完成开关的操作任务。在动触头支架的主动触头和辅助触头之间，由过渡电阻作切换过程中的限流作用；开关的动静触头上均镶嵌铜钨合金，使开关的电气寿命足以能完成所规定的技术指标。

This switch is a kind of imbedded on-load tap-changer of composite resistance transition. The switch has its separate oil container which is isolated from the transformer, and uses the transformer oil as the medium of insulation and arc suppression; therefore, its construction is simple, the volume is compact, its is also convenient for the user to check and repair it and replace the oil. The upper part of the mounting flange of the switch, namely the part that appears above the plane surface of the oil tank of the transformer, it is the mechanical driving part, with the one-phase motor driving the second grade worm-and-gear doing gearing down, with the bow plate under the upper baffle plate driving the main spring to stretch for energy storage, using the energy released by the “over-die-point” of the spring to drive the slot-dialing part and the slot-dialing part to drive the slot-wheel to transfer the movement with a certain angle, so that it completes the operation task of the switch. Between the main movable contact on the supporting shelf of the movable contact and the auxiliary contact, the transition resistor completes the current-limiting function in the course of switching, there is copper-tungalloy inlaid respectively on the movable and stationary contacts, which makes the service life of the switch full enough to reach the required technical index.

3.4 开关的主要性能指标:

触头的接触压力整定在 $1 \pm 10\%$ 公斤范围内;

触头的接触电阻不大于 $500 \mu \Omega$;

开关各部位能承担下列规定的工频耐压试验, 历时一分钟, 不发生绝缘体击穿, 闪络或局部发热等绝缘强度明显下降的现象

The index of the main Properties of the switch:

The contacting pressure of the contact is set in the scope of $1 \pm 10\%$ kg;

The contacting resistance of the contact is not over $500 \mu \Omega$;

All the parts of the switch can undertake the following stipulated power frequency withstand voltage test for one minute without breakdown of insulated body, over flash, or partial heat and other phenomena of the insulating strength obviously falling.

注: 开关应浸在在绝缘强度 35KV 变压器油中 1min

需试部位 Part needed testing	耐受电压 Withstand Voltage KV
三相对地 Three-phase to earth	35
相间 Y 接 Inter phase Y Connecting	10
相间 Δ 接 Inter phase Δ Connecting	35
级间 Between grades	18

Note: The switch should be immersed in the oil of the transformer with the insulation strength 35KV for 1 min.

开关导电部分对变压器油的温升不超过 20°C ;

开关的电气寿命为 5 万次;

开关的机械寿命为 50 万次。

The temperature rising of the transformer oil caused by the conducting part of the switch is not over 20°C ;

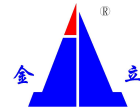
Operation life the electric appliance of the switch is 20000 times;

The mechanical service life of the switch is 200000 times;

四: 开关的安装

4.1 开关和变压器油箱平面的连接依靠焊在油箱上的螺栓与开关安装法兰连接固定, 螺栓的长度至少为 36 毫米, 开关的安装法兰和变压器油箱之间有安装垫圈(耐油橡胶)作为密封材料;

4.2 开关在安装前应进行干燥处理, 干燥时间为 2~3 小时, 温度为 $100 \pm 5^{\circ}\text{C}$, 最好在真空下进行, 干燥后的交流耐压标准, 开关载流体对地绝缘应满足工频耐压 35KV 一分钟的要求(试验时, 开关应浸在绝缘强度 35KV 变压器油中), 干燥后必须检查紧固件是否松动, 若发



现松动时，必须重新紧固及止退防松；

- 4.3 开关与变压器一次侧调压线圈的接线方法，即将开关分接头序号最高位接至高压线圈匝数最少的一个位置，而将序号最低位接至高压线圈匝数最多的一个分接位置，其他的，以此类推。开关分接头序号的排列是按顺时针方向排列的（从开关顶部向下观察）；
- 4.5 开关使用前体内应注入油质良好的变压器油，油位应达到油标红线刻划的油平面，要求油质的绝缘强度在 40KV 以上；
- 4.6 开关随变压器出厂及用户使用时，务必将航插防护罩安装好，防止进水，使开关电气部分受潮。

IV. Installation of Switch

- 4.1 The connection of the switch with the plane-face of the oil tank of the transformer depends on the bolt welded on the oil tank of the transformer to connect the mounting flange for fixation, the bolt is 36mm long at least. There is a mounting spacer ring (oil-resistant rubber) used as the seal material between the mounting flange of the switch and the oil tank of the transformer;
- 4.2 Before installed, the switch should be received the drying treatment, the drying time is 48 hours, temperature is $100 \pm 5^{\circ}\text{C}$, it is better be carried in vacuum, the AC withstand voltage standard after drawing, the insulation of the load fluid to earth should satisfy the requirement of power frequency with stand voltage 35KV for one minute (when testing, the switch should be immersed in the oil of the transformer with the insulation strength of 35KV);
- 4.3 The wiring method of the switch with the voltage-regulating coil of the primary side of the transformer, namely, connect the lowest position of the order number of the tap-changing point of switch to a position having the most turn number of the high-tension coil, in the meanwhile, connect the highest position of the order number to a tap-changing position having the least turn number of the high-tension coil, for others, and so forth. The order number of the tap-changing points of the switch is arranged according to the clockwise direction;
- 4.5 Before the switch is used, should inject the high-quality transformer oil into it, the oil level should reach the oil plane surface marked with the red line of the oil gauge, the insulating strength of the oil quality is required to reach over 40KV.
- 4.6 When the switch leaving the factory and being used, the user must install the protective shelter for the air socket well to prevent the electric part of the switch from wetting coming of water-entering.

五：开关的使用

本开关配装有载调压控制器，进行自动和手动操作；并断电时可以用手柄操作。

开关在投入运行前应作以下检查

- 5.1 开关投入运行前应进行 10 个循环操作，以检查开关的机械动作是否灵活，限位是否可靠，本开关上的限位螺钉（400A 以下及 9 档以下）是作为控制器电器连锁失灵后才会使用的机械限位，正常情况下不使用；
- 5.2 应测量变压器高压侧线圈（连接上本开关后）在各分接位置时的直流电阻与出厂数据相比较，以判断是否正常；
- 5.3 检查油质是否良好。

V. Use of Switch

This switch is equipped with the on-load voltage-regulating controller, which can operate automatically or by hand; and when power supply is cut off, can operate it with the handle.

Before starting to work, the switch should receive the following inspections:

- 5.1 Before it put into operation, the switch should perform 10 circles of operation in order to check to see if the mechanical movement of the switch is smooth, if the position-limit reliable or not, the position-limit screw on this switch (Under 400A and under Grade 9) is the mechanical limit position used when the inter lock of the electrical appliances of the controller having not worked, it is not used in normal condition;
- 5.2 Measure the DC resistance of the high-tension side line of the transformer (having connected to this switch) at each tap-changing position and compare it with the ex-factory data to judge is it is all right or not;
- 5.3 Inspect the oil quality to see if it is qualified or not.

六：开关运行及检修 Operation and Maintenance

在变压器运行前必须检查开关及附件的连接密封是否良好（吸湿器使用见其使用说明）各种连线是否接触良好

Before the transformer starting to operate, have to inspect the connecting seal of the switch and the auxiliary parts to see if it is good or not (for the usage of the moisture absorber, refer to its service manual) and if all the connecting wires are connected well or not.

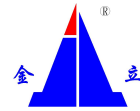
- 6.1 开关投入运行后，用户应定期检查变压器油质，要求油质耐压维持在 30KV 以上；要求开关切换 2000 次~2500 次操作后，更换新油，换油一般可结合检修，亦可在带电的情况下进行，打开开关顶盖，塞进一根塑料管或橡皮管，长度大于 500 毫米。利用虹吸原理，可把开关体内的变压器油全部吸出，然后注放新的变压器油，如不能停电换油时，则可在吸出污油的同时慢慢的注入新的变压器油，进行交换，使油平面始终不变，即可完成换油工作。

要求新的注入的变压器油耐压值在 40KV 以上。

After the switch is put into operation, the user should regularly inspect the oil quality of the transformer. The withstand voltage of the oil quality should be kept at over 30KV. According to the requirement. When the switch has switched for 2000~2500 times, the oil should be replaced with new oil, the oil-change generally can be combined with examination and repairing, it is also can be carried out under the live-line condition, if only the dirty oil is discharged out of the oil outlet pipe while the clean oil is injected into the oil inlet pipe (or the mouth for the handle to plug in), and keep oil level uncharged all the time. The withstand voltage value of the newly injected transformer oil shall be over 40KV. If installing an oil filter in the pipe connecting the oil outlet pipe with the oil inlet pipe, it can also carry out circulating oil-filtering.

- 6.2 开关换油两次以上或开关切换操作 5000 次后，应进行检修，其步骤如下：

- a) 将开关内变压器油排净；
- b) 拆去顶盖及顶盖上的附件（注意回装时，手动操作孔与传动机构的手摇机构同轴）；
- c) 拆去开关内航插连线；
- d) **（50A、100A、200A 中性点、端部调压级数为 9 级及以下，中部调压级数为 7 级及以下开关）**先将开关调至“1”分接，将开关安装法兰固定螺栓（3 颗 M8 内六角）旋松拆下，抓住开关电机逆时针旋转至动触头与静触片脱离，确认动静触头完全脱离后，缓慢向上拉起，即可将机芯全部拉出；
（400A 及调压级数 9 级以上，100A、200A 中部调压 9 级开关）将上隔板的安装螺钉旋出，拿掉电机撑板，拆下弹簧，然后将分接调至 0 档，即可将机芯全部拉出；
- e) 用油洗净开关各部分及油箱内壁，还应检查下列各部分情况：
开关各紧固零件（螺母、销子）是否松动，并予以紧固在允许范围内即可；
检查传动机构的情况，拉力弹簧有无损伤，拨盘及槽轮的圆弧面有无“打毛”现象，如有则应修光；
检查涡轮减速机构是否灵活，蜗轮磨损是否过分严重而影响转动；
检查拨槽件和槽轮之间的间隙是否等距，并应保持 0.2 毫米；
检查触头支架上电阻丝盘的电阻是否有过热而烧损的现象，测量其电阻值，与出厂数据比较，是否正常；
检查触头弹簧是否良好；



检查开关铜钨合金触头的烧损情况，烧毛处可用细纱布轻轻砂平，以减少动静触头之间的摩擦阻力，当动静触头烧损超过一定限度时应予更换，但应注意校正触头的水平位置，使其不大于 0.1 毫米；

检查绝缘筒壁上触头有无松动，放电痕迹，如筒壁破损，应予以更换；

f) 安装过程与拆卸过程相反，插入时应将开关芯子插入到底，并仔细核对档位；

g) 检查开关的转动是否灵活，动静触头间滑动是否可靠；

检查完毕后，将航插连线、电动机电源线接通，切换十个循环，注意开关有无慢动作现象，最后按前述开关的使用进行检查试验后方可投入运行。

When the oil of the switch having been replaced for over twice or the switch having completed 5000times of switching operation, it should be examined and repaired, the procedure is as follows:

a) ischarge all the transformer oil out of the switch;

b) Remove the top-cap and the accessories on the top-cap;

c) Remove the connecting wire of the air socket inside the switch;

d) (For the switches of 100A, 200A, with the voltage-regulating Grade 9and under) First, unscrew the two position-limit screws on the middle slot-wheel (inner hexagon screws at the two sides of Plsition“5”), align to Position “0” , namely, Position “0” of the slot-wheel aligns to the arrow mark, and then unscrew the four mounting screws of the upper baffle plate, so that the machine-core can be pulled out completely; (For the switches of 400A with the voltage-regulating Grade 9 and over) First, Unscrew the mounting screws of the upper baffle plate, then regulate the tap-changing to Position “0” , then pull out the machine-core completely;

e) Clean all the parts of the switch and the inner walls of its oil container, and should check the conditions of all the following parts to see:

—— if each of the fixing parts of the switch (screw nut, bolt) is loose or not; if so please fasten it in the allowed limit.

——if the driving organ is all right or not, if the pulling spring is damaged or not, if the circular-arc face of the dial plate and the slot-wheel burs or not, if so, please polish it;

——if the speed-reducing device of the turbine is smooth or not, if the worm wheel is wearing too seriously and hinder it from running;

——if the gap between the slot-dialing part and the slot-wheel is equidistant keeping 0.2mm;

——if the resistance of the resistance wire plate on the supporting shelf or the contact is burnt because of overheating or not, measure its resistance value and compare it with the ex-factory’s data to see if it is normal or not;

——if the spring of the contact is good or not;

——if the contact of copper-tungalloy has been burnt or not, if there is burnt burr, please polish it with the fine sand-cloth so as to reduce the frictional force between the movable and the stationary contacts;

——if the degree of sparkwear of the movable and stationary contacts has surpassed a certain limit, they should be replaced, also should take care to correct the horizontal position of the contacts to make it keep no more than 0.1mm;

——if the contact on the wall of the insulating cylinder is loose, has the discharging trace, or not, if the wall of the cylinder is broken, it must be replaced.

f) The mounting process is opposite to the dismounting process. When inserting, should insert the core of the switch to the bottom and take care to check up the grade-position;

g) Check the switch to see if its operation is smooth or not, if the sliding movement between the movable and the stationary contacts is reliable or not ;

When the inspection is completed, connect the air socket, switch on the power supply of the motor, let it switch for 10 revolutions, take care to see if the switch has the phenomenon of low-movement,

At last, only strictly carry out the inspection and testing according to the above mentioned use of the switch can the switch be put into operation.

6.3 用户对于运行和维修的情况，请作好记录，如有特殊情况，请随时与我厂联系，以互相交流运行和维修经验；

The user should keep record about the operation and repairing of the switch, if there is anything special, please contact our factory at anytime so that we can exchange the experience about the operation and maintenance of the switch.

6.4 使用注意事项

- 6.4.1. 本开关平均每天分接变换次数最多为30次。
- 6.4.2. 本开关运行2000次~2500次必须更换新变压器油；但如果频繁操作将会使变压器油加速变质，当变压器油击穿电压值低于30KV时，应停止自动电压控制器的使用，当变压器油击穿电压值低于25KV时，应停止分接变换操作，并要及时处理。更换或处理后的变压器油耐压值应 $\geq 40KV$ 。
- 6.4.3. 当系统中因倒闸操作或其他原因，可能造成电压大幅度波动时，应将有关变压器分接开关的自动控制器暂停使用，待操作完毕恢复正常后，再恢复自动控制。
- 6.4.4. 本开关更换变压器油两次或运行5000次后，必须对开关进行检修，操作方法详见使用说明书。
- 6.4.5. 本开关的安装投运与运行维修标准，应参照《有载开关运行维修导则 DL/T 574-2010》执行。

6.5 开关附件详见装箱单

For the accessories of the switch please refer.

七：开关的常见故障和排除方法 Common troubles of the switch and Eliminating Method

7.1 接通电源开关，控制器不工作，指示灯不亮：

检查控制器供电是否为 220V AC，电源保险丝是否熔断（控制器背板 S1 为电源保险）；

Turn on the power switch, the controller does not work, and the indicating lamp does not light:

Check the power supply of the controller to see if it is 220VAC, if the power fuse has blown or not;

7.2 电源指示灯亮，但档位无显示，控制器不工作：

a) 检查控制器与开关之间的电缆是否脱落；

b) 检查控制器是否有问题：方法是卸下电缆插头（21 芯航插），用导线一端搭在公用端“10”，另一端分别连接“1”—“9”，若显示相应档位，则控制器无故障；另外，用导线将“10”与“2”连接，按动“上升”或“下降”按钮，若听到继电器吸合声，说明控制器无故障，应进一步检查分接开关；

c) 检查开关内航插是否松动，航插两端相对应数码的连线是否导通；

The power indicating lamp lights, but the grade-position does not display, the controller does not work:

a) Check the cable between the controller and the switch to see if it has fallen off or not;

b) Check the controller to see if there is any problem with it or not. The method is as follows:

Remove the cable plug, let one end of the conductor connect with common end “10”, the other end respectively connect with “1” — “9”, if it shows the relative grade-position, that is to say the controller is all right. Then let a conductor connect “10” with “11”, push the “rising” or “falling” button, if hearing the sound of the relay pick-up it means that the controller is all right, should make a further inspection of the tap-changer;

c) Check the air socket in the switch to see if it is loose or not, if the connecting wire of the corresponding digits of both ends of the air socket is conducting or not;

7.3 档位显示正常，按“上升”或“下降”按钮开关不动作：

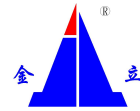
a) 卸下开关侧 21 针航空插头，用导线将“10”与“5”连通，万用表拨至 250VAC 档，两表笔分别插入“14”、“17”孔，按动“下降”按钮，万用表应显示 220V（若表笔插入“15”、“17”孔，则按动“上升”按钮）；

b) 用万用表 $R \times 1 \Omega$ 档测量 21 针航空插座的“10”与“5”之间是否接触不良，正常时应为“0 Ω ”；

c) 用万用表 $R \times 10 \Omega$ 档测量“14”与“17”、“15”与“17”之间，电阻均为 51 Ω 左右为正常，若偏差太大，甚至短路或开路，说明开关内电机损坏；

Grade-position displays normally, push “rising” or “falling” button, the switch does not work:

a) remove switch side 21-needle air plug, connect “10” with “5” using a conductor. Dial the universal meter pens respectively meter to the stage-position of 250VAC, put the two meter pens respectively into Hole “14” and Hole “17”, push the “falling” button, the universal meter should display “220V” (if the meter pens are respectively



- put into Hole “15” and Hole “17”, should push the “rising” button);
- b) use stage-position $R \times 1 \Omega$ of the universal meter to check the 21 needle air socket to see if the contacting between “10” and “5” is all right or not, when it is normal, the value shall be “0 Ω ”;
- c) use stage-position $R \times 10 \Omega$ of the universal meter to measure the resistance between “14” and “17”, “15” and “17”. If their resistance values are equal to about 51 Ω , it means “normal”; if the deviation is too great, even short circuit or open circuit, that is to say the electric machine in the switch is broken;

7.4 连续报警，若工作于自动状态时，开关连续升至最高档无信号电压：

检查信号电压是否正常或信号线是否脱落；

Continuously alarming, if working in the automatic condition, the switch continuously rises to the highest stage-position without signal voltage:

Check the signal voltage to see if it is normal or the signal wire has fallen off or not;

7.5 档位显示混乱或任何档位都显示“8”：

航插进水或电缆短路，需更换。

The stage-position displays in confusion or any stage-position displays “8” :

Water entered the air socket or the cable is short circuit, it should be replaced.

八：定货须知 Rules for Ordering Goods

用户定货时，需提供下列数据：

配装变压器的容量；

一次侧和二次侧额定电压；

分级调压幅值；

开关和控制器连接电缆线长度，一般供货长度为 30 米；

如用户需单独供应开关控制器，则需特殊说明。

When ordering goods, you need to provide the following data:

The capacity of the transformer to equip;

The rated voltage of primary side and secondary side;

The amplitude of step voltage regulation;

The length of the cable connecting the switch and the controller, the general length for supply is 15m;

If the user needs to order the controller of the switch separately, should give a special explanation.

如有订货及特殊要求请与我公司技术部联系！

If you want to order the goods and have special requirement, please contact the Technical Department of our company!

辽宁金立电力电器有限公司

LiaoNing Jinli Electric Power Electrical Appliance Co., Ltd.

地址 Add: 辽宁省丹东市振安区同兴镇: Tongxing Zhenan District Dandong City Liaoning Province

电话 Tel: 0415-6135555 (Telephone exchange) 6134555 传真 Fax: 0415-6131000