油浸式电力变压器

安 装 使 用 说 明 书

Oil-immersed Power Transformer

Installation and Operation Manual

SCOTECH

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OBT、469、1200

变压器安装使用说明书

Transformer Installation and Operation Manual

1. 总则

General rules

1.1、本说明书适用于 6300KVA 及以下低损耗油浸式电力变压器。

The instruction manual hereof apply to the low-loss oil-immersersed power transformers with the capacity of 6300KVA and below .

1.2、变压器的使用条件按 OBT.500.1200 和 OBY.500.507 之规定，使用地区的气候条件及相应的最高油面温升规定如下：

The using conditions for transformer are according to the regulations of OBT.500.1200 and OBY.500.507, the climatic conditions and corresponding max.temperature rise of the oil level in using distric as follows:

表 1-1　Table 1-1

使用地区 Use District	最高环境温度℃ Max.Ambient Temperature	空气相对湿度 Relative Air Humidity	最高温升℃ Max. Temperature Rise
温带 Temperate Zone	40	+25℃时不超过 90% Not Exced 90% when +25℃	55

2. 运输

Transportation

2.1、容量 2500 千伏安以下变压器应装满油运输，一般套管、储油柜等不必拆卸。容量 2500 千伏安及以上变压器，运输时应将油箱内油面降至箱盖以下 100 毫米，同时还须拆卸储油柜和散热器等。各拆卸接口均须密封良好，以免运输过程中变压器受潮。所有拆卸件和应附带的零件、备件、配套件及产品出厂技术文件另行包装，与变压器一起发运。

The transformers that the capacity is below 2500 KVA , should be transported filling with oil, and

no need to remove the bushing and conservator. But for which the power is 2500kVA or above, in the transit, the oil level should be dropped to 100mm of tank cap, meanwhile, the conservator and radiator have to be removed. All of the removed parts ,accessories, kit parts and tech-documents, shall be packed separately and delived together with the transformer.

2..2、在运输及安装过程中吊变压器时，应同时使用箱壁上的四个吊攀。这四个吊攀可以承受变压器总重量。箱盖上的吊板仅供吊起器身之用。起吊时钢绳与垂线之夹角不得大于30°。若不符合此条件时，则用特殊中间横梁起吊变压器。

When lifing the transformer on transportation and installation, please use 4 lugs attached to the tank side at the meantime, which can support the total weight of the transformer.The lifing board on tank cover is only used to lift the transformer body. Please be noted that the angle between lifting rope and vertical line shall not be larger than 30°. Otherwise, please lift the transformer by special middle beam.

2.3、运输过程中，变压器的倾斜度不得大于 15°。移动速度不宜过急，防止对变压器产生震动、颠簸和冲击。

The inclining angle of the transformer during transportation is allowed not to exceed 15°. Do not move previous so that the transformers will not to be shocked, jolted and striked.

3. 验收与贮存
Examination & Acceptance and Storage

3.1、用户收到变压器后，应立即按铭牌查对所收到产品的型号、规格是否与订货合同相符，技术文件及产品附件是否齐全。

User should check from the nameplate to see the model and specifications are confrom to the order contract, as well as the tech-documents and accessories are completed.

3.2 对变压器进行外观检查：

Examine the appearance of the transformer:

1)变压器各部位有无渗油漏油现象。

Whether the oil is leaking or seeping

2)产品零件有无损坏

Whether the accessories are damaged.

3)易损零部件，如套管、油面表、吸湿器、信号温度计、气体继电器等有无损坏（容量为 800 千伏安及以上变压器应装有气体继电器，1000 千伏安及以上变压器应有户外式信号

温度计）。

Whether the damageable parts are free from damage,such as bushing,fuel level gauge, dehydrating breather, signal thermometer,gas rellay and etc. (For which the power is 800KVA and above should have a gas relay, for which the power is 1000 KVA and above shoud have the outdoor signal thermometer.)

3.3 若变压器不立即安装使用，需要存放时，其油面应经常保持在箱盖以上，并应定期检查存放情况。对于拆卸储油柜运输的变压器，到达安装地点后，不管是否立即投入运行，均须立即装上储油柜，并灌注合格的变压器油相当于当时气温的油面线上，以保证油箱内有足够的油量与油压，适应温度变化的需要。

If the transformer is not installed immediately and need to store, the oil level shall always keep above the tank cover, meanwhile should check periodically the storage conditions. For the transformer that is transported with conservator removing, we must to fit on conservator promptly when arrival whether or not it is put into operation, and pour into the qualified oil up to the oil level line to ensure there is enough oil and pressure in the tank, so as to to meet the needs of the temperature change.

4. 变压器的检查
Transformer Inspection

4.1、本系列变压器，在结构上考虑了防止运输过程紧固件松动和器身产生相对位移的措施。经正常运输后一般不作吊芯检查，只有当发现在运输过程中有损坏结构及有严重渗漏油情况才进行吊芯检查。

This series of transformers, we have taken measures to avoid the fasteners loosen and relative displacement of the body in transportation. So,it is generally no need to lift the core for checking, unless there are damanges or serious tank leaking during the transportation .

4.2、吊芯一般在室内进行。室内应清洁、干燥。若不得已放在室外检查时，必须采取措施，严防灰尘和骤雨等影响器身。

It is generally to lift core indoor, where should be clean and dry. What's more, when it have to be checked outdoor, we must strictly prevent the dust and sudden downpour.

4.3、吊芯检查必须在器身温度（即上铁轭处所测得的温度）不低于周围环境温度的条件下进行。如器身温度低于周围温度，则应延迟吊芯时间，采取妥善措施将器身温度提高到与周围气温相同，以免空气中的水分在器身凝结致使变压器受潮。

The core hanging must under a condition of the transformer temperature(measured on upper yoke)is not lower than the ambient temperature. Unless, we should delay the hanging time, and take appropriate measures to increase the transformer temperature, in order to avoid the transformer affected with damp that caused by the moisture in the air condensed in the body.

4.4、雨天或雾天只允许在室内进行吊芯检查，此时室温要求较室外高 10℃。

It is only allowed to lift the core indoor on rainy day or greasy day, by this time, the temperature indoor is requested 10℃ higher than outdoor.

4.5 器身在空气中的停留时间(接触外界空气时间自放油时开始算起，注油时间不计在内）不应超过下列规定:

The time stay in the air of the transformer shall not exceed the following stipulations:

在空气相对湿度不大于 65%的干燥天气中不应超过 16 小时；

Do not exceed 16 hours in case of the RH max. 65% in dry weather

在空气相对湿度不大于 75%的潮湿天气中不应超过 12 小时。

Do not exceed 12 hours in case of the RH max.75% in wet weather.

4.6 器身检查内容：

Transformer body inspections:

1) 检查时要消除已被发现的一切故障和损伤，应特别注意线圈的压紧情况和引线支撑、夹持情况，如有松动、偏斜及其他碰撞等缺陷，都应仔细修理。

To elimate all the faults and damages have been found in checking, and should pay special attention to coil compression and leads supporting&clamping situation. If there is any looseness, deflection and other defects such as collision, should be repaired carefully.

2) 检查器身各部位紧固螺栓，如发现松动，应予拧紧。

Checking the bolts on each part of the body, and should be tightened if there is any looseness.

3) 测量线圈对地绝缘电阻及检查铁芯接地情况。

Measuring the earthed insulation resistance of the coil and checking the grounding of iron core .

4) 检查分接开关接线及触头接触情况，并测量各个分接位置线圈的直流电阻。

Checking the tap-changer connection and measuring the dc resistance of coils in each tapping position.

5. 总装配
General Assembly

5.1 将运输时拆卸的散热器、储油柜、信号温度计、气体继电器以及水银温度计（用户自备）等进行安装，其方法可参考各有关附件的安装使用说明。

Well install the rediator, conservator, signal thermometer, gas relay and mercurial thermometer (prepared by user) which removed in transperation. Please as per the Operation Instructions Manual for all of the attachments.

5.2、在各附件及所有应该注油的地方，注入合格的变压器油。对于装有散热器、气体继电器以及上端带放气塞套管的变压器，在注满油后，为彻底排除顶部空气，应先开启散热器下部活门，再打开其上部活门，然后依次开启这些组件上的放气塞，将上部寄存的空气放出。放气时动作应迅速，只须将放气塞轻轻旋开，冒油后即可旋下封紧。待变压器停放 24 小时后，检查其是否有渗漏油现象，并再次放出气体继电器中的气体，补注变压器油。在补加变压器油时，应注意油的型号、产地，不同型号的变压器油一般不能混合使用，若要混合使用，须经试验合格后方可。

Fill the qualified oil to all of the attachments that should be oiled . For the transformers which equipped with rediator, gas relay and the bushing, we should open the rediator bottom valve first when filled with oil and then open the upper valve, afterwards, turn on the air relief plugs quickly and lightly to release the air. After 24 hours, check if there is any oil leaking, and then release the gas in gas relay again. When fill the transformer oil, please pay attention to the model and origin of the oil, gernerally, the different model can not be mixed except it is passed the tests.

5.3 注油完毕应做密封试验。

To do the sealing test after oiled.

利用储油柜上的注油塞，通入 0.25kg/平方厘米干净干燥的压缩空气做静压试验，保持 3 小时应无渗油现象。

Using oil plug on conservator, replenished with 0.25kg/cm2 dry and clean compressed air to do the static pressure test, keep 3 hours without tank leaking.

密封试验注意事项：

Attentions for sealing test:

1)使套管内充满变压器油

Fill transformer oil in bushings.

2)气体继电器应放气

Release the gas in gas relay

3)对有载调压变压器，应观察开关中的油面在加压过程中有无升高，如有升高现象，即为开关渗漏油，应通知制造厂处理。

For the transformer with OLTC, shall watch if the oil level in switch is rised or not in the process of forcing, If it is rised, then the switch may be oil leakage, and should inform the factory.

5.4、装有气体继电器的变压器，安装到地基后，应将油箱具有气体继电器的一端垫高 10-15 毫米，使变压器略有倾斜，以增加气体继电器的动作灵敏度。

For the transformer equipped with gas relay, one end of the tank with gas relay should be padded 10-15mm higher after installation, to make the transformer tilted slightly, so as to increase the action sensitivity of the gas relay.

6. 投入运行前的准备工作
Preparation before Running

6.1 变压器总装后在投入运行前应经过如下实验：

After the final assembly, it should be tested as following before running:

1) 变压器注油完毕，停放 12 小时后，从油样活门取油样做油的击穿电压试验。

After 12 hours when filled with transformer oil, take the sample from the valve for breakdown voltage testing.

2) 测量绝缘电阻

Measuring the insulation resistance.

3)测量线圈所有分接位置的直流电阻。所有直流电阻的数值与制造厂试验数值的差数不应超过±2%。

Measuring the coil dc resistance for all of the tapping position. The difference for the dc resistance value and factory value shall not exceed ±2%.

4) 校核各分接位置的电压比及电压矢量关系

Checking the voltage ratio and voltage vector for all of the tapping position.

5)外施工频高压试验。试验电压按变压器交接试验标准选取，历时 1 分钟。

Testing for applied power-frequency high voltage. The testing voltage is selected from the hand-over test standard, take 1minute.

6) 用不大于 110%额定电压进行空载试验，历时半分钟。注意此试验中变压器的音响及仪表变化。

Using max.110% rated voltage to do the no-load testing, take 30seconds. Pay attention to the changing for noise and instrument.

7) 测量变压器之空载电流与空载损耗。测得结果应与出厂试验结果无显著差别（参见产品说明书上相应之试验数值）。

Measuring the no-load current and no-load loss. The results shoud have no significant different with the factory testing results (as per the testing values on instructions).

上述实验均应在变压器注油至少 10 小时以后进行，进行试验时应保持上述试验项目之先后程序。

All the tests above shall be performed at least 10hours after filling with the transformer oil. And keep the testing sequence.

6.2、变压器通过前条各项试验后，应进行如下检查：

After finishing all of the above tests, it shall be inspected as follows:

1) 整定与试验保护装置：如气体继电器、过电流继电器、差动继电器之动作。

Setting and experimental protection device, such as the actions of gas relay, over-current relay, and differential relay.

2) 检查油短路的传动机构与连锁装置之动作。

Checking the actions of transmission mechanism and interlocking device of oil short circuit.

3) 检查储油柜油面，储油柜与油箱之联管活门一定要开通

Checking the oil level in conservator, the connecting valve between conservator and oil tank must be opened

4) 检查散热器之上下两个活门是否开通。

Checking the two valves (top&bottom) on rediator are both opened.

5) 检查温度计之读数是否正确。

Checking the thermometer reading is correct.

6) 检查变压器各处是否有其他不相干的东西存在。

Checking everywhere and ensure there are no irrelevant things on transformer.

7) 检查油箱接地是否良好

Checking the oil tank is well earthed.

6.3、装有气体继电器的变压器，在试投入运行时，先将气体继电器的信号触头接至变压器的电源跳闸回路，过电流保护时限整定为瞬时动作，然后将变压器接入额定电压，持续 30 分钟，倾听变压器音响。如有可能则变压器接入的电压应由零逐渐上升，以便早期发现故障。

For the transformers equipped with Buchholz relay, should turn the signal contact to the transformer power tripping circuit first, and set the over current protection delay as an instantaneous action, then join up the rated voltage, lasts 30minutes, and listen the noise.

6.4、试验完毕后，切断电源，重新调整过电流整定值，并将气体继电器的信号触头接至报警回路，跳闸触头接至跳闸回路，再使变压器的额定电压下空载合闸 3-5 次，以检查在激磁电流冲击作用下的继电器保护装置之动作。

Power cut after finish the testing, resetting the over current value, connect the signal contact to alarm circuit, and connect the tripping contact to trip circuit, and then no-load switching-in 3-5

times under the rated voltage for checking the gas relay protection device under the action of the excitation current shock.

6.5、若变压器接入电压的试验结果良好，便可接纳负荷，投入运行。

If the test result of input voltage is good, it's ok to put on load for running.

6.6、变压器总装配后，在投入运行前，其他必要的检查试验项目，按水电部颁发的《变压器运行规程》进行。

Before put into operation after final assembly, if there is any other testing items please as per the *Transformer operation regulation* issued by water and electricity dept.

7. 运行和维护
Operation and Maintenance

7.1、额定运行方式

Rated operation mode

1) 变压器在规定的冷却条件下，可按铭牌规范运行。

Transformers can be operated as per the nameplate in the specified cooling conditions .

2)油浸式电力变压器运行中的允许温度可按上层油温来检查，上层油温允许值应遵守制造厂的规定，最高油温不得超过 90℃。

The allowed temperature in running of oil-immersed power transformer can be checked by the top oil and its value should abide by the provisions of the factory, the highest oil temperature shall not exceed 90℃.

3)变压器在额定容量下，电压最大值不超过相应分接电压的 5%时可连续运行。

The transformer can be in continuously running under the rated capacity and maximun voltage does not exceed 5% of the corresponding tapping voltage.

7.2、允许的过负荷

Allowed overload

1) 变压器可以在正常过负荷和事故过负荷的情况下运行。正常过负荷可以经常使用，其允许值根据变压器的负荷曲线、冷却介质的温度以及过负荷前变压器所带的负荷等来确定。事故过负荷只允许在事故情况下使用，例如运行中的若干台变压器有一台损坏，又无备用变压器，则其余变压器允许按事故过负荷进行。变压器事故过负荷的允许值应按表 1-2 规定：

The transformer can be operated in the conditions of nomal overload and accident overload. Nomal overload can be often used, its value is decided by the transformer load curve, the temperature of the cooling medium and the load before overload.

Accident overload is only allowed to use in accident cases, for example, in case of one set is damaged in the several sets of transformer in running, but there is no standby one, then the rest of transformers are allowed to process as a accident overload. The allowed value as per table 1-2

表 1-2　　Table 1-2

事故过负荷对额定负荷之比 The ratio of accident overload to rated load	1.3	1.45	1.6	1.75	2.0
过负荷允许的持续时间（分） Allowed overload lasts time (minutes)	120	80	45	20	10

2) 允许的短路电流和不平衡电流：

Allowed short-circuit current and unbalance current:

a.变压器的短路电流不得超过电流的 25 倍，短路电流通过的时间 t 不应超过表 1-3 所列数值：

The short-circuit current of the transformer shall not exceed 25times of the current, the time of the short-circuit current passes through *t* shall not exceed the value listed by the following table 1-3

表 1-3 Table 1-3

K	20 以上 above 20	20-15	15 以下 below 15
T(秒) T (seconds)	2	3	4

注：表中 K 为稳定短路电流对额定电流的倍数。

P.S.: *K* in above table is shown the times between steady short-circuit current to rated current.

b、线圈按 YynO 联结的变压器，中线点电流不得超过低压额定电流的 25%。

For the transformers that the connection is YynO，the midline point current shall not exceed the 25% of LV rated current.

7.3 变压器的经常性维护：

The regular maintenance of transformer:

1) 变压器在运行中，应经常检查各温度指示和油面指示装置以及其他保护装置（如气体继电器等），以保证其动作可靠；经常查看各法兰及密封处是否漏油。

During the operation, please often check the temperature indicating device and oil level indicating device and other protective devices,such as gas relay,ect., to ensure the reliable actions. And also often check if there is any oil leaking in each flange and the seal.

2) 运行中变压器的油，最好每六个月作一次（至少每年一次）取样试验，如发现油中水分不断增加或含量较大并有杂质及沉淀时，则应作耐压试验并进行过滤。如油的绝缘性能降低过甚，则需检查变压器内部有无故障发生，如果正常负载下变压器油温骤然增高，必须检查其原因，如不能排除故障，则应停止运行，再将器身吊出作彻底检查，以便及时发现问题进行修理。

It is better to do an oil sampling test every six months(at least once a year). If the moisture is rising continually and contains impurities and sediments in oil, then should do a voltage withstand test for filtration. Besides, if the insulation performance of oil is reduced too much, shall check for any faults interior the transformer. In case of the oil temperature increased abruptly under the nomal load and cannot elimilate the fault, must stop running, and then hanging out the body for checking, so as to find out problems for repairing in time.

3) 如果变压器发生不正常响声，油面忽高忽低，甚至安全气道玻璃爆破，储油柜冒油或严重漏油致使油面降落低于油表油面线的限度等现象，则应立即停止运行，进行彻底检查。

Stop running for checking in case of any abnormal noises and oil level instability, even the glass of safty airway is blasting and conservator oil leaking seriously causing the oil level lower than the limit on oil meter.

4) 若变压器经常过负载或短路次数过多，则应每年吊芯检查一次。

If a transformer always amounts of load or short-circuit, then should hanging out the core for

chacking once a year.

5) 凡装有气体继电器的变压器，当气体继电器发生信号动作时，应立即检查判断发生信号动作之原因，如果经检查确实不是由于空气侵入或油面降低等外部原因所引起，应迅速鉴别继电器内积聚气体的性质，如为可燃性气体，变压器应立即停止运行，待排除故障并试验合格后方能投入运行。

For the transformers equipped with gas relay, when the gas relay send signals, if it is not caused by the external reasons such as the air intrusion or oil level reducing,ect., should quickly identify the gas nature, if it is flammable, then must stop running the thransformer at once until troubleshooting and passing inspection.

6) 变压器的其他维护要求，按水电部制定的《变压器运行规程》进行。

Other maintenance requirements please as per the *Transformer operation regulation* issued by Water and Electricity Dept.

8. 有载调压电力变压器使用须知
Power Transformer with OLTC Use Rules

8.1、结构特征

Structural feature

1) 10KV 级和 35KV 级有载调压变压器，分别从初级线圈中引出 9 个分接头和 8 个分接头，接至有载分接开关的相应位置接点，当电网电压在一定范围内波动时，可在带负荷情况下，借有载分接开关切换，改变初级线圈匝数，达到调节次级电压的目的。

For 10KV and 35KV power transformer with OLTC , there are 9 tap points and 8 tap points coming out respectively from the primary coil for connecting to the OLTC in corresponding position, when the grid voltage is fluctuated within a certain range, can switch the OLTC in loading cases, to change the primary coil turns for the purpose of regulating the secondly voltage.

2) 有载分接开关（见有载分接开关说明书）放置在与储油柜相反方向变压器油箱长轴方向，开关为电阻式，触头系选择开关和切换开关合一的复合式结构，快速切换动作由单相电容电机通过涡轮蜗杆减速后作用于弹簧储能过死点释放机构而完成。有载分接开关可通过自动控制器电动操作和自动控制。

The OLTC(as per *on-load tap changer specifications*) is placed on the oil tank along the long axis and in the opposite direction of conservator, the switch is the resistance-type, the contact terminal is combined the selector switch and deliverter switch. The OLTC can be automatic control and operated by the automatic controller.

8.2、使用须知

Notice

1) 由于有载分接开关不保证同步切换，故变压器不能并联运行。

The OLTC do not guarantee the synchronous switching, so the transformer cannot be in parallel operation.

2) 变压器允许按 OBT 500 1200 低损耗中小型变压器技术条件的规定过载，但在过载

情况下，为了保证开关的正常使用寿命，应避免频繁操作，尽量减少开关动作次数。

The transformer is allowed to over load according to the OBT 500 1200 of low-loss medium sized transformer technology conditions. In order to ensure the nomal using life of the switch, should avoid the frequent operation.

3) 变压器过载超过 100%或发生短路事故时，一次侧继电保护装置应保证开关不得动作，并切断电源。

When the transformer over-load exceed 100% or short circuited, the primary side of relay protection device should guarantee the switch not to on-off, and cut off power supply.

4)为了避免恢复供电时变压器发生短时过磁激，导致二次电压突高而损坏受电电器，当有载分接开关处于负分接位置而发生失压时，应采取措施，使开关即时复位至额定分接档。

In order to avoid the short-time over magnetic excitation when power restoration,thus leading to the damanges of the electrical appliances while secondly voltage of a sudden increase. When the OLTC in the negative tapping position and loss of pressure, should take measures to make the switch instant reset to the rated tapping.

5) 调压范围±4x2.5%(10KV 级）和±3x2.5%（35KV 级）的产品，能保证在负分接时输出额定容量。

For the products that the voltage regulating ranges are in±4x2.5%(10KV grade) and ±3x2.5%（35KVgrade), should grantee to output the rated capacity when .nagative tapping,

6) 变压器出厂时，有载开关均处于额定分接位置。

OLTC should in rated tap position when the transformer leave factory.

7) 变压器在运行前，应操动控制器（有电动和自动两种），对有载开关作 1-9 分接循环试验，以检查控制器与开关的配合及机械动作是否灵活、正常。

Before running the transformer, should operate the controller(electric & autometic), and do the 1-9 tapping cycling test for OCTL for checking the controller and switch matching and mechanical action is flexible and normal.

8.3、维护及其他注意事项

Maintenance&other considerations

1) 变压器运行中应经常查看油面温度及储油柜与分接开关中的油面，及时添注同油号之合格变压器油。

Should always checking the oil level temperature and oil level in conservator & tap-changer in running, and filling the same type and qualified transformer oil timely.

2) 为防止雷击与过电压对变压器造成的损伤，建议在变压器的高低两侧均装避雷器。

In order to prevent lightning and over voltage to damage the transformer, it is suggested to install a lightning arresters on both up and down side of the tranformer.

3) 有下列情况之一时，必须更换分接开关中的油：

The oil in tap-changer must be replaced in case one of the following situations:

a.开关经 3000 次切换；

After 3000 times switchover.

b.油的击穿电压低于 25 千伏；

The oil breakdown voltage is lower than 25KV.

c.油的闪点低于 125℃。

The oil flash point is lower than 125℃.

4) 有载调压控制器每半年应检查调试一次（包括检查控制器电缆的绝缘），及时排除故障。

The on-load voltage regulating controller should be checked once every six

months(including the insulation of the controller cable) for troubleshooting timely.

5) 有载分接开关每切换 2 万次应进行一次维修。维修内容及方法详见有载分接开关说明书。

The OLTC should be maintained once for each 20000 times switchover, the content and method as per the *on-load tap changer specifications.*

6) 更换控制器电缆应按有载调压控制器说明书所示连接法，以免链接错误引起开关误动作或其他运行事故。

The controller cable replacement should according to the connection method shown in *on-load voltage regulating controller specifications,* so as not to cause the misoperation by error link or other running accidents.

7) 其他维护注意事项与无载调压变压器相同。

Other maintenance attentions are the same as the transformer with off-circuit tap-changer.

9.农用变压器使用注意事项
Agricultural Transformer Use Rules

9.1、使用电动机时应根据变压器的额定容量来配备，注意变压器的 1 千伏安并不等于电动机的 1 千瓦。根据粗略方法估计，1 千伏安变压器可配备 0.7 千瓦电动机。使用电动机时应测量其输入电流，看与变压器铭牌上的额定电流是否符合，超过者不能使用。

The electromotor should be equipped by the reted capacity of transformer, please be noted that the 1KVA transformer is not equal to 1KW electromotor. By rough estimate that 1KVA transformer can be equipped with 0.7KW electromotor. Measuring the input current is conform with the rated current on nameplate when use the motor, and it cannot use if exceed.

9.2、变压器的接地螺栓只能作接地用，不得作为其他用。接地必须可靠，以保证运行安全。

The earthing bolt is only for earthing use and must be reliable for safety operation.

9.3、注意经常运行，保持变压器清洁，维护工作须在停电时进行，特别注意保护瓷套管、油表灯易碰碎零部件，勿使损坏。

Running the transformer frequently, and keep it clean. The Maintenance must be in a power failure, and pay special attention to the fragile parts such as porcelain bushing, oil indicator lamp and ect not to be damaged.

9.4、变压器运行时，应经常测油面温度（用温度计插入变压器箱盖上之温度计座内测得），保证其不超过 95℃，超过者应降低负荷运行使其下降到允许值。允许油面温升为 55℃（温升是指温度计上指示的温度减去周围空气温度之值）。

In the operationof transformer, should measuring the oil level temperature frequently(measured with a thermometer inserted into the socket on tank cover), and ensure not to exceed 95℃,

otherwise should make it down to the allowable value by lower the load operation. The allowed temperature rise of oil level is 55℃ (the temperature rise means the value that the temperature on the thermometer minus the ambient air temperature)

9.5、当输电线路高压跌落保险丝烧掉时，不应当马上合闸，待查明原因后再进行合闸。

When the fuse is burned up due to the HV dropping of transmission line, should find out the reason first.

9.6、变压器送电前必须检查分接开关位置是否正确。

Must check the tap-changer position is correct before power transmission of transformer.

OBT、469、1201

无激磁调压分接开关使用说明书

Non-excitation Tap-Changer Operation Manual

1、用途

Usage

变压器箱盖上备有无激磁分接开关一只，作为变换变压器高压侧分接头之用。

There is a non-excitation tap changer on transformer tank cover, for the use of conversion for high voltage side of the tap.

2、结构与使用

Structure & Operation

2.1、三档分接开关指示盘数字位置Ⅱ表示额定电压，Ⅰ表示额定电压+5%之分接头，Ⅲ表示额定电压-5%之分接头。五档分接开关指示盘数字位置Ⅲ表示额定电压，Ⅰ，Ⅱ，Ⅳ，Ⅴ分别表示额定电压+5%，+2.5%，-2.5%，-5%之分接头。

The number positionⅡon three gears tap-changer dial is shown the rated voltage,Ⅰshows the tapping point +5% of the rated voltage, Ⅲshows the the tapping point -5% of rated voltage.

The number position Ⅲ on five gears tap-changer dialis shown the rated voltage,Ⅰ，Ⅱ，Ⅳ，Ⅴ respectively shows the tapping point +5%，+2.5%，-2.5%，-5% of the rated voltage

2.2、操作分接开关时，必须先切断高压侧线路，确定变压器无电时方可进行。

When operates the tap-changer, must cut-off the high voltage side line first to ensure without any power in transformer.

2.3、变换分接开关位置时，须先取下风雨罩，将定位件从指示盘定位槽中扳出，再转动手柄至所需的分接头位置，并使手柄定位件能正常置入相应的定位槽内，盖好风雨罩，然后才能使变压器投入运行。

When transforms the positin of tap-changer, must remove the drip-proof cap first, pull out the locating pieces from the dial locating slot, and then turn the handle to the required tap position, and make sure the handle locating piece can be normal placed in the relevent locating slot, well cover the drip-proof cap, then the transformer can be in operation.

3、维护和检修
Maintenance & Repair

3.1、分接开关每年都应进行一次维护检修工作。检修时应注意下列问题：
Tap-changer should be maintained and repaired annually and pay attention to the followings:

1) 取下风雨罩，检查各部位有无锈蚀，并揩擦干净，涂抹适量的润滑脂。

Remove the drip-proof cap for checking the rusting in each part, and to wipe up, paint the right amount of grease.

2) 检查分接开关各锁紧位置是否松动，如有松动者应予拧紧。

Checking the position of each tap-changer lock, if there is any loose shall be tightened.

3) 检查各分接头的接触及其损坏情况。将开关手柄左右回复旋转 10-15 次，若不需要改变电压，则手柄转动后仍旧固定在原来的位置上，若更换了分接位置，则应用电桥或万用表测量通路后才可投入运行。

Checking the situation for each tap contact and damage. Rotate left and right the switch handle 10-15 times, it shall be fixed in the original position if the voltage is no change. But if the tapping position is changed, then should measure the access by bridge and multimeter for running.

3.2、检查分接开关时，停留在空气中的时间不得超过同绝缘级次变压器器身在空气中停留的允许时间。
Please note that the time to stay in the air for checking the tap position should not exceed the allowed time to stay in the air of transformer body which in the same insulation grade.

3.3、如发现分接开关与箱盖联接处或分接开关转轴处有渗油现象，应将分接开关的安装螺母或压紧螺母稍予旋紧即可。
If oil leaking is found in the joint of tap-changer and tank cover or in the shaft of the tap-changer, shall slightly screw the mounting nut or gland nut of the tap-changer.

OBT、469、1202

35 千伏以下变压器套管使用说明书
Below 35KV Transformer Bushing Operation Manual

1、用途
Usage

套管是变压器内部线圈引出线与外部线路间的联结部件。其电压等级和工作电流决定于与之相联的线圈之额定电压和电流值。套管由瓷套、导电杆、螺母、垫圈及其他相应的零件组成。结构上具有可靠地电气性能和足够的机械强度，所有密封面均采用耐油橡胶垫良好密封，以保证变压器的长期正常运行。

The bushing is a piece which connect the inner coil outgoing line and outer circuit of transformer. Its voltage grade and the working current is determined by the value of rated voltage and rated current of the coil which connected with the bushing. The bushing is consisted by ceramic bush,conductive rod, nut, washer and other relevant parts. It has the reliable electrical performance and enough mechanical strength in structure, all of the sealing surface are well sealed by oil resistance rubber washer, to ensure the long-term normal operation of transformer.

2、使用和维护
Operation & Maintenance

2.1、每次变压器投入运行前，均须检查高、低压套管是否完好及其密封、清洁情况。

Before each operation, must check the HV & LV bushing are in good condition as well as the sealing &cleaning condition.

2.2、套管应避免重物撞击及严重振动，如有破损裂纹，即应更换。

The bushing should avoid the heavy impact and severe vibration, and should be replaced if there is any breakage crack.

2.3、变压器运行中应经常保持瓷套表面清洁，防止因尘炭堆积而引起闪络放电事故（擦拭

瓷套应在高、低压侧均不带电的条件下进行）。

The bushing surface shall always keep clean in transformer operatoin, to prevent the flashover discharge cause by coal dust accumulation(bushing cleaning should under the uncharged condition in both HV and LV side)

2.4、密封处若有渗漏油现象，可拧紧相应位置的压紧螺母。若因耐油橡胶垫老化或变质引起渗漏油，则应更换耐油橡胶垫。

Is there is oil leaking in the seal, can tighten the gland nut in the relevant location. If the oil leaking is caused by the oil resistance rubber washer aging or metamorphism, and then shall replace the washer.

2.5、如因特殊需要或瓷件损坏而必须拆卸和重新安装套管时，则应注意下列问题：

As a request of special needing or the porcelain damaged and have to remove and reinstall the bushing, please pay attention to the followings:

1) 对于复合式套管，若其上部瓷套因故损坏，允许在变压器不吊芯的情况下更换，但在安装时应特别注意将导电杆的定位钉插入下部瓷套的定位槽内，以防瓷套转动。若发现下部瓷套损坏时，则须吊起变压器盖方可更换。

For a combined bushing, if the upper ceramic bush is damaged, it is permit to replace without lifting the core. But must pay special attention in installing to insert the conductive rod pin into the bottom bushing locating slot, to avoid the rotation. If the bottom ceramic bush is damaged, then should be replaced by lifting the transformer cover.

2) 检修和安装套管时，应使导电杆与线路联接牢靠，但旋拧螺母不宜用力过度，以免损坏导电杆和瓷套。

When inspecting and instalingl the bushings, should make the conductive rod and circuit well connected, but it cannot be overexertion when screw the nut, so as not to damage the conductive rod and the ceramic bush.

3) 检修和安装带放气塞套管后，应旋松套管上部放气塞，使其加油过程中内部空气完全排除为止。

After maintenance and installation the bushings with vent plug, should unscrew the upper vent plug, make sure to rule out the internal air completely when oil.

OBT、469、1203

储油柜安装使用说明书

Conservator Installation and Operation Manual

1、概述

Summary

储油柜是一种油保护装置。为了减少变压器油与空气的接触表面，防止油过快地受潮和氧化，并保证变压器器身在任何状态下均浸没在变压器油中，油浸式变压器一般均装有储油柜，储油柜的容积约为油箱容积的 10%。

The Conservator is a kind of oil protection device. In order to reduce the contact surface of transformer oil and air, prevent the oil quick dampening and oxidation, and also ensure the transformer body is submerged in the oil in any case. The oil-immersed transformers are usually equipped with conservator which volume is about 10% of the oil tank.

2、结构和用途

Usage & Structure

储油柜按其直径不同，可分为Φ180、Φ250、Φ310、Φ440、Φ610 五种规格。

The Conservator can be divided into five sizes from the different diameter: Φ180、Φ250、Φ310、Φ440、Φ610

储油柜的主体是用薄钢板卷焊成的圆形容器，它和内部变压器油及其他附件的全部重量依靠支架来承托。支架用钢板和角钢焊成，用螺栓水平固定在箱盖上。

The conservator body is a circular container which is welded by thin steel plate, the weights of transformer oil and other accessories are supported by a brace which is welded by steel plate and steel angle, and fixed to the tank cover with bolt flatly.

弯管用以联通储油柜和油箱。直径Φ440 及以上储油柜，弯管中装气体继电器（另见说明书），在气体继电器之靠近储油柜侧装有平板式活门，以便在必要时可将储油柜和油箱分开。

储油柜均为开启式，可拆下盖板，以便清洗内部。

Bend is worked to uniform the conservator and oil tank. For the conservators that the deameter is Φ440 or above, will equip a gas repay (as per the Gas Relay Instructions)in the bend, and also equip a flat valve on the gas relay close to the conservator side, so that the conservator and oil tank can be separated when necessary. All of the conservators are open-type, the cover plate can be removed for cleaning.

油表用以指示储油柜内油面的高度，变压器在停置状态下，油位的高度应在油表相应温度的刻度线上。

Oil meter is used to indicate the height of oil level in the conservator. When the transformer in holding state, the height of oil level should on the scale line of the relevant temperature in oil meter.

所有储油柜均装有吸湿器（另见说明书），用以减少当变压器“呼吸”时而进入储油柜内空气中的水分和灰尘杂物。

All of the conservators will be equipped with a Dehydrating Breather（as per the instructions), for reducing moistures and dusts in the air that entering into the conservator when transformer “breathing”.

直径Φ440 以上的储油柜带集污器，用以沉淀污物、水分，集污器下部焊有塞子。

For conservator that the deameter is above Φ440 will be equipped with a catch basin to precipitate the basin and moisture, and to weld a plug to the bottom of catch basin.

焊在储油柜下部的塞子，用以放油或需要时由此取样化验分析。

Plug on the bottom of conservator is used for oil dumping or sampling test when needs.

焊在储油柜上部的塞子，用以注油和放气。

Plug on the top of conservator is used for oiling and degassing.

在储油柜外壁上标有变压器油之牌号。

Outside the conservator wall will mark the type of the transformer oil.

OBT、469、1204

气体继电器安装使用说明书

Gas Relay Installation and Operation Manual

1、用途

Usage

气体继电器是带储油柜的油浸式变压器的一种保护装置，它被安装在变压器油箱与储油柜之间的连管路中。

The Gas Relay is a a kind of protection device for oil-immersed transformers equipped with conservator, it is installed in the pipe connector between transformer cover and conservator.

2、结构和工作原理

Structure & Working principle

气体继电器工作时应充满变压器油。如果变压器内部出现轻微故障，则因油分解而产生的气体集聚在容器上部，迫使油面下降，开口杯 E 随之下降。当 E 降到某一限定位置时，磁铁 D 使干簧触点 R 闭合，接通信号回路，发出信号。如果变压器内部限定位置时，磁铁 M 使干簧触点 R 闭合，接通跳闸回路，切断与变压器连接的所有电源，从而起到保护变压器的作用。

The gas relayIt shall full of transformer oil in operation. In case of the slight fault inside the transformer, it is due to the gas produced by the transformer oil decomposed gathers in upper gas chamber of the relay and forces the oil level to reduce, snap ring E reduces to a certain position together with it, and magnet D rhereon makes dry reed contact R suck to connect with the signal circuit to give alarm signal. If there is a limit position inside transformer, magnet M thereon makes dry reed contact R suck to connect with the tripping circuit to give alarm signal and cut off the transformer.

3、使用条件
Conditions of Use

3.1、允许工作温度：-30℃至 95℃。

Permissible operating tenperatures: -30℃to+95℃

3.2、安装方式：继电器的通径轴线应与变压器箱盖平行，允许接往储油柜的一端稍高，但其轴线与水平面之间的倾斜度不得超过 4%。

Assembling method: the relayis pipe axis should be parallel to the transformer case cover, and is allowed for the end leading to the consercator is higher, however the inclination between the axis and level surface may not exceed 4%.

3.3、额定电压：直流或交流 220 伏。

Rated Voltage: DC or AC 220V

3.4、管路通径：QJ_1-50 型继电器为 50 毫米；QJ_1-80 型继电器为 80 毫米.

Pipe diameter：Type QJ_1-50 is 50mm, Ttpe QJ_1-80 is 80mm.

4、性能参数
Performance Parameter

4.1、信号接点动作的气体容积：250-300 立方厘米。

Gas volume for signal contactt: 250-300m^3 。

4.2、跳闸接点动作的油流速度：

Oil flow velocity for trip contact action:

QJ_1-50 型继电器为 0.6-1.0 米/秒，出厂整定为 0.8 米/秒；

Type QJ_1-50 is 0.6-1.0 m/s, factory setting 0.8m/s.

QJ_1-80 型继电器为 0.7-1.5 米/秒，出厂整定为 1 米/秒；

Type QJ_1-80 is 0.7-1.5 m/s, factory setting 1m/s.

4.3、接点额定容量： 交流 220 伏 0.3 安。

Contact rated voltage: DC 220V 0.3A

4.4、绝缘强度如表 2-3：

Insulation strength as per table 2-3:

表 2-3　　Table 2-3

试验项目 Test item	单个接点端子间 Between each single contact terminals	出线端子对地 Outlet terminal to earth	信号与跳闸两组接点端子间 Between Signal and trip contact terminals
施加工频电压 Applied frequency voltage	2000 伏 1 分钟 2000V in one minute	2000 伏 1 分钟 2000V in one minute	2000 伏 1 分钟 2000V in one minute

4.5、密封性能：继电器内充满变压器油，在常温下加压 2.5 千克/平方厘米，持续 20 分钟无渗漏现象。

Sealing Property: The Gas Relay is full of transformer oil, and pressurize 2.5kg/m² at normal temperature , no oil leaking for 20 minutes.

4.6、抗震能力： 当震动频率（正弦波）为 4-20 赫兹，加速度为 4g 时继电器不误动作（g 为重力加速度）。

Shock resistance: When shock frequency(sine wave) is 4 to 20 Hz and acceleration is 4g, the gas relay is without fauly action (*g* means gravitational acceleration)

4.6、重量：约 10 公斤。

Weight: around 10kg.

5、安装与使用
Installation & operation

5.1、安装时先取出芯子，拆去绑扎带，检查多有紧固螺钉是否松动，开口杯及挡板的运动是否灵活，接点开闭是否可靠以及导线是否脱落。

The relay core must be taken out and the bandage is disassembled before installation. Check all of the fastenings if they become flexible, if the snap ring and guard board move flexibly, and if the contacts open and reliably.

5.2、气体容积整定：开口杯的一侧装有重锤 F，改变重锤的位置，可在 250-300 立方厘米的范围内调节信号接点动作的气体容积。

Gas volume adjustment: one side of snap ring is installed a weights drop F, and the gas volume of signal contact can be adjusted by changing the position of weights drop for the range of 250-300

m^3 .

5.3、油速整定： 继电器出厂时，油速已按第四条第 2 款整定好了。若现场使用需另行整定，可先松动调节螺杆 Q,改变弹簧 K 的长度，即可调整跳闸接点动作的油流速度。

Oil speed adjustment:To loose the regulating rod Q and change the length of spring K, then the oil speed for the action of trip contact shall be adjusted.

5.4、螺杆 N 是用来调节磁铁 M 与干簧接点 P 之间的距离的（此距离一般为 0.5-1.0 毫米），螺杆紧固后，不要随意调动.

Regulating rod N is used for adjusting the distance between magnet M and dry reed contact P(usually 0.5-1.0mm).

5.5、经检查与调整后，将芯子放入继电器壳内（壳内及芯子必须先用变压器油洗净），然后将继电器安装在变压器油箱与储油柜之间的联接管路中。安装时，要特别注意使继电器上的箭头指向储油柜一侧！

After checking and adjusting, please put in the relay core to the shell (the shell and core must be cleaned by transformer oil), and then install the gas relay in the pipe connector between transformer cover and conservator. Please pay special attention that the arrow on the relay must be directed to the conservator.

5.6、安装完毕后，打开联接管上的油阀，使继电器充油，再打开气塞帽，拧松顶针让空气排出，直至排气口 T 连续冒出油为止。

After finish installing, open the oil valve on the connecting pipe to oil the gas reply, and then open the air plug cap, unscrew the trimble to eliminate air until the vent T bleeding continuously.

5.7、从 T 处打进空气，可以检查信号接点动作的可靠性。

Pump the air from T can check the reliability of the signal contact action.

5.8、将罩 A 拧下，按动探针，可以检查跳闸接点动作的可靠性。

Screw out the cap A, press the probe can check the reliability of the trip contact action.

5、注意事项
Notes

6.1、更换或增添磁铁及干簧接点附件的零件时，这些零件应该用非导磁材料制造。

When replace or add the magnet and dry reed contact, please note that all of these parts should be made by the non-magnetic material.

6.6、磁铁不能剧烈震动，也不能放在强磁场及温度超过 100℃或低于-40℃的环境中，以防

退磁。

The magnet may neight be vibrated acutely nor put in strong magnetic field or an environment at tenperature higher than 100℃ or lower than -40℃ to prevent from being demagnetized.

6.7、不要随便拆卸干簧接点，特别是根部引线不得任意弯折，以免损坏。

Do not disassemble the dry reed contact at will, especially donot bend the root of the lead to avoid from damaged.

OBT、469、1205

吸湿器安装使用说明书

Dehydrating Breather Installation and Operation Manual

1、用途
Usage

吸湿器用来过滤变压器油温变化而进入变压器储油柜中之空气，清除由空气带入的潮气和杂质，以保持变压器油的绝缘强度。它一般被安装在储油柜上。

Dehydrating Breather is used to filter the air that enters into conervator due to the oil temperature changing, and clean up the moisture and impurities.It is generally installed on the conservator.

2、结构和工作原理
Structure & Working principle

2.1、吸湿器的主体为一玻璃管，内盛用氯化钴浸渍过的硅胶（变色硅胶）作为吸湿剂。罩中装有变压器油作为杂物过滤剂。

The main body of Dehydrating Breather is a glass tube, contains silica gel(foxed silica gel) that is impregnated by cobalt chloride as a moisture absorbent. filled the transformer oil into the cap as a debris filter.

2.2、当变压器由于负荷或环境温度的变化导致变压器油的体积发生胀缩，迫使储油柜中的气体通过吸湿器来“呼吸”。这时，空气中的水分被硅胶吸收，还有少量的水分和灰尘被罩内的变压器油吸收，从而保证了进入储油柜的空气的干燥和清洁。

When the swell-shrink for transformer oil volume caused by the transformer load or the environmental temperature changing, and forced the gas in conservator “breathing” through the dehydrating breather. By now, the moisture in the air is absorbed by silica gel, and a small amount of moisture and dust are absorbed by transformer oil in the cap, and thereby to ensure that the air enters into the conservator is dry and clean.

2.3、变色硅胶在干燥状态下呈蓝色，吸收潮气后呈粉红色，此时即说明硅胶已失去吸湿效能，必须进行干燥或更换。

Foxed silica gel is blue color in dry state, and turns pink after absorbing the moisture. By now the silica gel is out of action and have to dry or replace.

3、使用和维护
Operation & Maintenance

3.1、使用前必须检查玻璃筒是否破裂，硅胶是否变粉红色，并将罩拧下，在罩内注入足量的变压器油，然后仍将罩拧上，罩与座间应保持透气的间隙。

Checking the the glass tube without broken and the silica gel does not turned to pink before operating. And then unscrewing the cap for filling with the transformer oil.

3.2.更换硅胶时，将吸湿器从变压器上卸下，从法兰盘的出口处即可倒出或装入硅胶。硅胶的粒度选用 2-7 毫米为宜。

Remove the dehydrating breather from transformer when replace the silica gel, that can be poured out or putted into from the flange exit. It is better the silica gel is 2-7mm.

3.3、受潮后的硅胶在 140℃温度下烘焙 8 小时（或在 300℃温度下烘焙约 2 小时）后，便可安全变为蓝色，否则，应酌量延长烘焙时间，直至完全转变成蓝色为止。注意烘焙温度不得过高，否则硅胶会结块而失掉吸湿能力。

The silica gel after the damp can be turn to blue color completely when baked 8 hours under the 140 ℃ temperature(or baked 2 hours under 300℃temperature). Please note that the baking temperature shall not be too high, or silica gel will agglomerate.

3.4、在使用过程中，应经常监视吸湿器中的硅胶是否变色，变压器油是否过脏或者因蒸发而使油面降低。如有上述情况者，可按第 1 条所述添注或更换变压器油，或按第 3 条所述将硅胶进行干燥更换。

During the operation, shall always keep watching if the silica gel color is changed, if the transformer oil is too dirty or if the oil level is reduced by evaporation.

4、硅胶浸渍氯化钴的方法
Silica Gel with Cobalt Chloride Impregnation Method

当没有变色硅胶时，可用原色硅胶浸渍氯化钴，其步骤如下：

You can use the original color silica gel when there is no foxed one for impregnating, and its steps are as follows:

4.1、取占硅胶重量 3%的氯化钴溶解于水，水量应保证使硅胶能充分吸收。

Take the cobalt chloride that is 3% of the weight of silica gel dissolved in the water, and should ensure that the water is engough for absorption of the silic gel.

4.2、将粒度为 2-7 毫米的硅胶浸没在氯化钴溶液中，并使它充分吸收直至硅胶变成粉红色为止。

Immersed the 2-7mm silica gel in the cobalt chloride liquor, absorbed completely until it turns to pink color.

4.3、将浸渍过的氯化钴溶液并呈粉红色的硅胶，放在 115℃温度下进行干燥处理，直至硅胶完全转变成蓝色为止。

Dry the pink silica gel under 115℃ temperature , until it completely turns to bule color.

OBT、469、1206

放油活门使用说明书
Draining Valve Installation and Operation Manual

1、概述
Summary

本系列活门作为介质流的一种开闭器，安装在油箱下部，专供放油之用。容量在 630KVA 及以下变压器装有通径为Φ25的活门，容量在800-6300KVA的变压器装有通径为Φ50活门。两者结构类同。

This series of valve is a kind of shutter uses as a medium, that is installed at the bottom of oil tank only for oil draining. For the transformers that the capacity is 630KVA and below are equipped with a valve in diameter Φ25, for the capacity is 800-6300KVA, the diameter of valve should be Φ50. The structure is similar for both of them.

2、结构与使用
Structure & Operation

放油活门的活门体通过螺栓螺母等与油箱管接头密封联接。使用时取下盖板和密封垫，旋松手轮即可放油。在平常不需放油的情况下，应旋紧手轮，并装好封垫和盖版，保持阀体内部不受污染。

Draining Valve is connected with tank pipe by bult,nut,ect. Please remove the cover plate and gasket in using, and unscrew the hand wheel for draining. But in usual, the cover plate and gasket should be well installed to keep the body cleaning.

OBT、469、1207

水银温度计座使用说明书

Pocket for Mercury thermometer Operation Manual

1、用途

Usage

水银温度计座安置在变压器箱盖上，靠近低压套管附近，供插入水银温度计测量运行中变压器的油面温升，以保证变压器的正常安全运行。此外，水银温度计座又兼作注油用。

Pocket for Mercury thermometer is placed on the transformer cover and closed to the LV bushing, that is for inserting a Mercury thermometer to measure the oil level temperature rising in operating, to guarantee the running safety and normally. Besides, the Pocket for Mercury thermometer is also for oiling using.

2、结构

Structure

水银温度计座伸入油箱 130 毫米，上端露出箱盖并配一罩及密封垫圈。为测量准确，管内须充满变压器油。

Pocket for Mercury thermometer will be inserted into the oil tank 130mm, only show the upper end and equipped with a cap and sealing washer. It should be filled with transformer oil for accurate measuring.

测量用的水银温度计由用户自备。其刻度范围可选择 20-100℃（指水银温度计插入温度计座后的可见部分）。

The Mercury thermometer is prepared by user. The scale range can be 20-100℃（It is refer to the visible part after the Mercury thermometer is inserted).

3、使用和维修
Operation & Maintenance

3.1、测量油面温升时，可将温度计座上面小罩拧下，插入温度计，测量完毕再取出温度计，重新装上小罩。

When measuring the oil level temperature rising, should unscrew the cap on the thermometer socket and then insert the thermometer.

当用以注油时，可将温度计座管旋出即可注油。

When used for oiling, should unscrew the thermometer socker tube.

3.2、观察油温时，必须切实注意与高电压之间保持一定的安全距离，不宜在高压侧进行检视，以免发生高压触电事故。

Please pay special attention to keep a safe distance from high voltage when observing the oil temperature.

3.3、从温度计上直观测得的温度是变压器之顶层油温度，顶层油温度减去环境温度即油温升，在一般情况下，油温升值不应超过技术条件所规定的最高限度。若超过时，应立即查明运行中有否不正常情况，是否超负载运行，并按情节轻重分别向值班负责人汇报，采取必要措施。

The temperature shown on the thermometer is the top oil temperature, the top oil temperature minus the environment temperature is the oil temperature rising, In an ordinary way, the oil temperature rising should not exceed the maximum level which stipulated in the technical conditions. Otherwise, should immediately find out if there is any abnormal siruation in operating.

3.4、若水银温度计断裂在温度计座管内时，可将温度计座管旋出，倒出破碎物，用油清洗内部，然后再将它装回原处，并注入清洁的变压器油。

If the mercury thermometer is fractured in the tube, then back-out the tube and poure out the broken. Then put it back, and poured into the clean transformer oil

3.5、拆卸或更换温度计座，须将变压器内部油面降低至箱盖以下方可进行。

When remove or replace the thermometer socker, the transformer internal oil level should be reduced to the tank cover.

3.6、更换温度计座后如发现渗油现象，则可能为密封垫偏斜滑脱或老化损坏，应予以更换

和修复。

If there is any oil leakage after the replacement of thermometer socker, then it may be caused by gasket deflection slippage or aging damage, and shall be replaced and repaired.

OBT、469、1208

油样活门、塞子及接地螺栓使用说明书

Oil Sampling Valve、Plug and Earthing Bolt Operation Manual

1、油样活门

Oil Sampling Valve

油样活门装于油箱下部低压侧，专供取油样用。使用时将罩取下，再将钢螺钉旋出 13 毫米，油即从放油嘴中流出。待取完油样，再旋紧钢螺钉，并装上罩，使之密封可靠。

The Oil Sampling Valve is equipped at the tank bottom in LV side,only for oil sampling. When using, the cap should be removed and then rotated out the steel screw for 13mm.

2、3/4 寸两用活门

3/4 inch dual-use valve

3/4 寸两用活门装于油箱下部低压侧，供容量 160KVA 及以下变压器放油和取油样用。使用时应将罩旋松取下。若需要取油样，只须把塞子旋出少许，油即从Φ3 之小孔中流出；若需要放油，可将塞子旋松，直至Φ18 孔全部露出，油即迅速畅通地流出。使用完毕依次装复好，并使之密封可靠。

The 3/4 inch dual-use valve is equipped at the tank bottom in LV side. It is used for oil draining and oil sampling for the transformer that the capacity is 160KVA and below. It is only need to unscrew the plug a bit when take oil sample, then the oil will flow out from the Φ3 hole. But when draining the oil, should unscrew the plug until to show the entire Φ18 hole, then the oil will flow out quickly and smoothly.

3、塞子
Plug

塞子结构，由塞子、塞座、密封垫圈三个零件组成。根据需要，塞子分别装于箱盖、箱底、散热器和储油柜上端或下端，供注油、放油或放气用。使用时将塞子旋出即可。

A plug is composed of the plug, holder and seal wash. It is equipped respetively to tank bottom, tank cover, rediator and the bottom and top of the conservator, for the using of oiling, draining or air-bleeding.

4、接地螺栓
Earthing Bolt

接地螺栓焊装于油箱低压侧下部，供变压器整体接地用。使用时在两垫圈中联结接地线，拧紧螺栓，以保证变压器安全运行。为了便于识别，在接地螺栓旁边还标有接地铭牌

The Earthing bolt is welded in the LV side of tank bottom, for the earthing use of the transformer. Should connect the ground line between two washers and screw down the bolt for safety running. There is a nameplate marked besides the earthing bolt for easy identify .

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Thank you for your support and cooperation! Please feel free to contact with our company if you have any enquiries in installation and operation!

SCOTECH

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