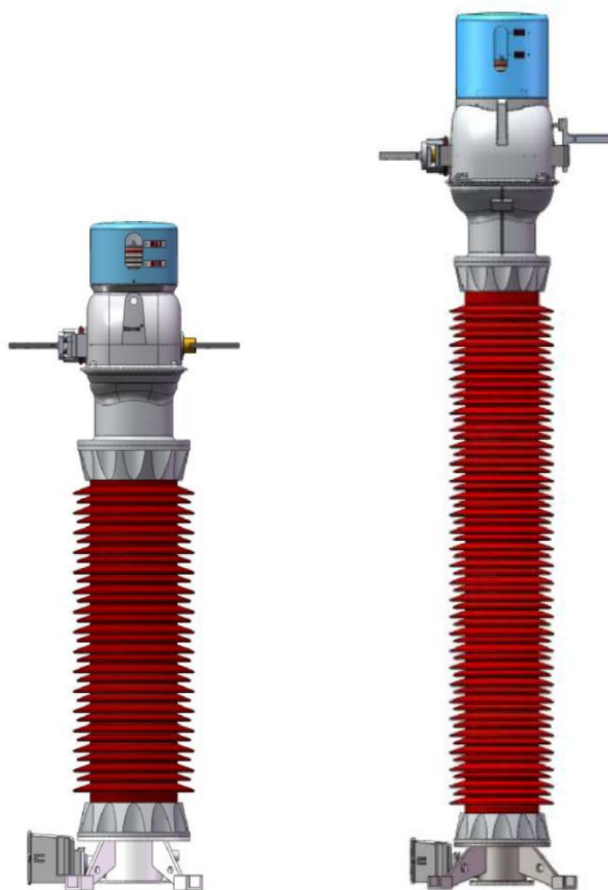


用户手册 User Manual

JLD 系列运输、安装、维护使用说明书

Operation Manual of transportation, installation and maintenance
of JLD series

M020002696



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适用范围/Scope of application

CN/本使用说明书适用于户外型、组合式互感器产品的运输、安装、维护及注意事项等要求。

EN/This user's manual is applicable to the transportation, installation, maintenance and precautions of outdoor type and combined type transformer products.

产品说明/Product description

CN/产品结构简介

ES/Introduction to product structure

CN/典型的组合式互感器结构见图 2.1

EN/A typical composite transformer configuration is shown in figure 2.1.

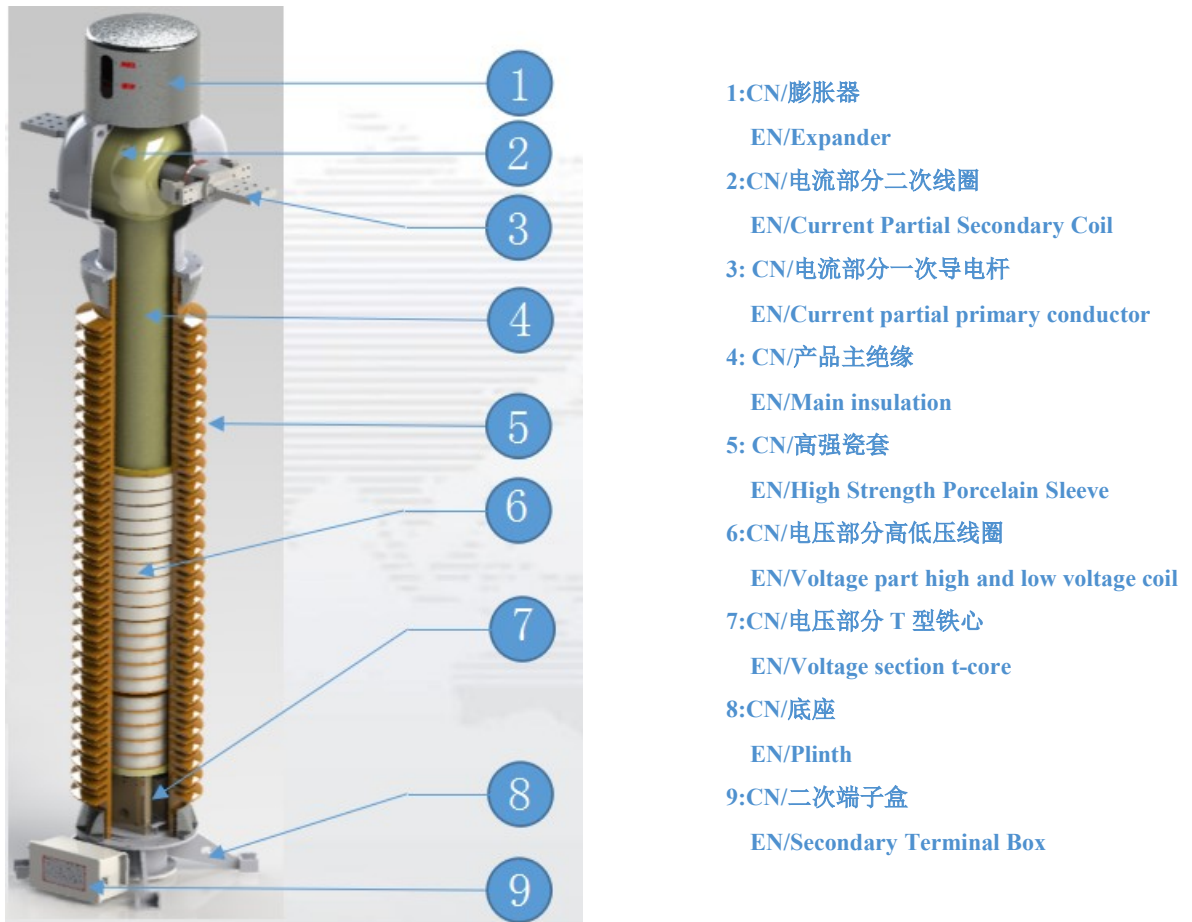


图 2.1 典型的组合式互感器结构图

Fig. 2.1 structure diagram of a typical combined transformer

CN/典型的组合式互感器参数见表 2.1

EN/Typical composite transformer parameters are shown in table 2.1

类型 Types		组合式互感器 Combined transformer					
电压等级 Voltage level	kV	36.5	72.5	123	145	170	252
额定工频耐受电压 Rated power frequency withstand voltage	kV	70	160	230	275	325	460
额定雷电耐受电压 Rated lightning withstand voltage	kV	200	325/350	550	650	750	1050
额定操作耐受电压 Rated operating withstand voltage	kV	-	-	-	-	-	-
额定一次电流 Rated primary current	A	0.5-4000A					
额定输出电压 Rated output voltage	V	100/√3、110/√3、115/√3, 等, 可选 100/√3, 110/√3, 115/√3, etc, Optional					
电压额定级次、负载 Voltage rating, load	VA	0.2 级, 50/50VA (极限负载) 0.2, 50/50VA (Ultimate load)					
额定电压因数 Rated v		1.9 倍(8h)/ 1.9 倍(30s)/1.5 倍(连续), 可选 1.9 times (8h)/ 1.9 times (30s)/1.5 times (continuous) , optional					
额定频率 Rated frequency	Hz	50/60					
爬电距离 Creepage distance	mm/kV	25-31 (其他要求可定制) 25-31 (Other requirements can be customized)					
产品运行环境 Product Operating Environment	°C	-25~+50					
绝缘等级 Insulation Grade		E					

表 2.1 典型的组合式互感器参数表

Table 2.1 parameter list of typical combined transformers

工作条件/Condiciones de trabajo

CN/环境条件

最高气温：50 °C

日平均气温不超过：40 °C

最低温度：-25 °C

月平均最大相对湿度：95 % (25°C)

以上温度为常规使用温度等级，当该说明书上的使用温度与技术规范不一致时，以签订的技术规范为准。

EN/Environmental conditions

Maximum temperature: 50 °C

The daily average temperature does not exceed: 40 °C

Minimum temperature: -25 °C

Monthly mean maximum relative humidity: 95 % (25°C)

The above temperature is the general use temperature grade. If the use temperature in the manual is not in accordance with the technical specification, the signed technical specification shall prevail.

CN/海拔高度

互感器实际应用海拔详见产互感器上的铭牌

安装处海拔超过 1000m 时，其外绝缘的绝缘水平按 IEC 60071-1:2006 进行修正

未经我公司允许，不得将互感器挪用到其他高海拔地区（超过互感器铭牌上的海拔）

EN/Altitude

The actual application altitude of the transformer is shown in the nameplate on the production transformer

When the installation place exceeds 1000m above sea level, the insulation level of the external insulation shall be revised in accordance with IEC 60071-1:2006.

Without the permission of our company, the transformer shall not be diverted to other high-altitude areas (exceeding the elevation of the transformer nameplate)

运输/Transportation

CN/产品运输须将产品固定在包装箱内卧倒运输；运输时，建议使用互感器的原有包装箱，并按原有形式重新装箱包装箱如图 4.1 所示。

EN/The product shall be transported in a horizontal position fixed in the packing box, the original packing box of the transformer shall be used and the packing box shall be repacked in the original form as shown in Fig. 4.1.



图 4.1 互感器包装示意图（不同产品型号存在细节差异）

Figure 4.1 schematic of packing for transformers (details vary from model to model)

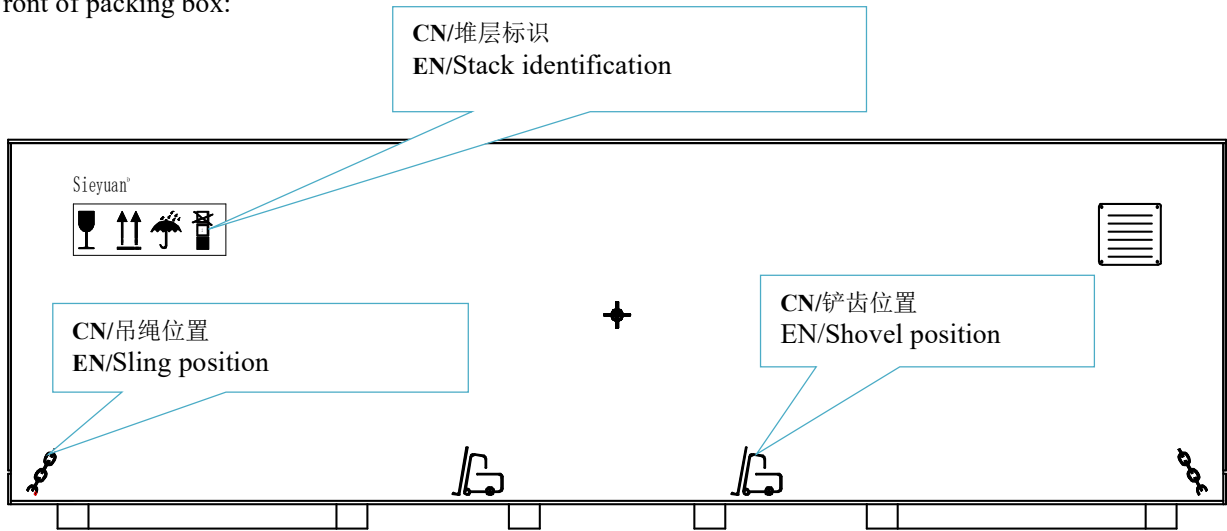
CN/运输和铲运时，按照包装箱上的标识运输、铲运流转。包装箱吊装时，使用的吊绳承受重量应大于包装箱（含互感器）重量 2 倍以上；包装箱铲运时，铲齿长度应大于包装箱侧面宽度尺寸（见图 4.2）。

EN/When transported and shovelled, the goods shall be transported and transported according to the marks on the

packing boxes. When lifting the packing box, the weight of the lifting rope should be more than 2 times of the weight of the packing box (including the transformer) , and the length of the shovels should be larger than the width of the side of the packing box (see figure 4.2) .

CN/包装箱正面:

EN/Front of packing box:



CN/包装箱侧面:

EN/ Side of packing box:

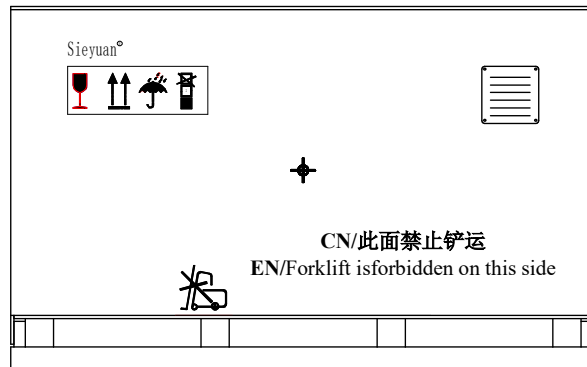


图 4.2 包装箱运输、铲运标识示意图
Figure 4.2 packaging transport, lhd logo schematic

CN/短时间存储:

EN/Short time storage

CN/ (1) 存储时的温度条件与运行环境相同, 应避免严重的污染并保护瓷套不受到损坏;

(2) 如互感器不立即安装, 建议在直立状态下存放, 直立存放时产品底脚须与地面连接固定, 防止产品倾倒;

注意: 本产品中心较高, 在直立存放时严禁推、拉、撞击产品。

EN/ (1) storage at the same temperature and operating conditions, should avoid serious pollution and protect the porcelain cover from damage;

(2) if the transformer is not installed immediately, it is recommended to be stored in the upright state, the bottom foot of the product should be connected with the ground and fixed when the product is stored vertically to prevent the product from dumping;

Note: The center of this product is relatively high. It is strictly forbidden to push, pull or hit the product when it is stored upright.

CN/长时间存储:

EN/Long-term storage

CN/如果互感器在投入运行前将被存放一段较长时间, 则应采取以下措施:

(1) 对存储超过 1 年的产品, 转运前应先确认包装箱完好无腐蚀现象, 腐蚀损坏的包装箱禁止用于产品流转。存储于安全、通风条件良好的环境;

(2) 任何情况下, 互感器卧倒放置的时间都不能超过两年;

(3) 卧倒放置超过两年的互感器需直立静放一段时间 (220 产品 $\geq 48h$; 145 及以下产品 $\geq 24h$), 再按出厂试验要求进行各项性能确认, 确认合格后方可进行安装使用;

(4) 卧倒存放时, 建议按原厂包装方式进行存储。如无法实现原厂包装方式, 产品头部必须垫实专用衬垫 (绝不允许导电排直接受力放在地上), 存放时二次接线盒须向上。

注意: 互感器存储再次转运前, 应检查包装箱外表有无腐蚀现象; 若因存储不当, 遭虫食或潮湿, 造成包装箱腐蚀, 转运前需加固。

EN/If the transformer is to be stored for a long time before it is put into operation, the following measures shall be taken: (1) for products stored for more than 1 year, the packaging box shall be confirmed to be in good condition before transshipment, corroded packing boxes shall not be used for the circulation of products. Storage in a safe, well-ventilated environment;

(2) in any case, the time of lying down of the transformer shall not exceed two years;

(3) the transformers which have been placed on the ground for more than two years shall be placed on the ground for a period of time (220 products $\geq 48h$; 145 and below products $\geq 24h$), and then the performance of the transformers shall be confirmed according to the requirements of the ex-factory test before they can be installed and used;

(4) when the transformers are placed on the ground, it is recommended to store in the original packaging. If the original packaging method can not be achieved, the product must pad the head of the Special Pad (do not allow direct force on the ground conductor row), storage of secondary junction box must be up.

Note: Transformer storage before re-shipment, should check the packaging box surface corrosion phenomenon; if due to improper storage, insect food or moisture, resulting in corrosion of the packaging box, need to be reinforced before re-shipment.

签收及拆箱检查/Sign and open box inspection

- CN/** (1) 互感器签收前，核实产品及配件数量是否与订货一致；
(2) 检查包装箱外观是否有损坏、油渍等异常；
(3) 互感器开箱吊装前，检查互感器外观有无磕碰、损坏或漏油等异常。

EN/(1) verify that the quantity of products and accessories is in accordance with the order before signing for the instrument transformers;

- (2) check whether the appearance of the packing box is damaged, grease stains, etc. ;
(3) before lifting the instrument transformers, check the appearance of the transformer for any bumps, damage or oil leakage, etc. .

吊装/Levantamiento

CN/水平吊装

EN/Horizontal hoisting

CN/ (1) 吊具要求：选择吊绳的承受重量应大于互感器重量（见互感器铭牌）的 2 倍以上；水平起吊时，吊绳长度应为产品高度的 3 倍以上，且吊绳应无破损的软吊带。

(2) 起吊位置：一根吊带锁扣住互感器头部储油柜两侧吊攀，另一根吊带应捆绑在产品底脚上，根据产品重心调整吊绳位置，保持产品重心平衡，产品起吊平稳，防止磕碰，损坏产品。

(3) 放置要求：互感器水平放置时，注意在互感器底部垫上木块，以防导排磕碰。如图 7.1 所示

EN/(1) sling requirements: The selection of the hanging rope should bear more than 2 times the weight of the mutual inductor (see the mutual inductor nameplate) ; when lifting horizontally, the length of the hanging rope should be more than 3 times the height of the product, and the hanging rope should not be damaged soft sling.

(2) lifting position: One belt should lock on both sides of the oil tank at the head of the transformer, the other belt should be tied to the bottom of the product, adjust the position of the lifting rope according to the product's center of gravity to keep the balance of the product's center of gravity, and the lifting of the product should be stable to prevent bumping, damaged product.

(3) placement requirements: When the transformer is placed horizontally, pay attention to the bottom of the transformer pad on wooden blocks to prevent guide row knock. As shown in figure 7.1

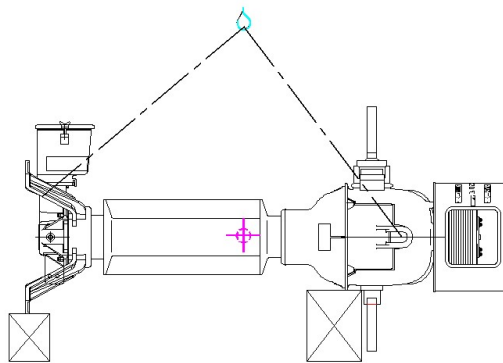


图 7.1 吊装示意图

Fig. 7.1 lifting diagram

CN/垂直吊装

EN/Vertical erection

CN/ (1) **吊具要求:** 选择吊绳的承受重量应大于互感器重量（见互感器铭牌）的 2 倍以上，单根吊绳长度不小于产品高度，且吊绳应无破损的软吊带；

(2) **起吊位置:** 用一根吊带锁扣住互感器头部储油柜两侧吊攀，产品起立时吊绳与地面必须成 90° 角，两股吊绳夹角不大于 30° 且吊绳不得碰到膨胀器外罩防损伤膨胀器外罩。如图 7.2 所示；

(3) **放置要求:** 互感器垂直放置时，应放置在平整硬质地面上，防产品倾倒。

EN/(1) sling requirements: The selection of the hanging rope should bear more than 2 times the weight of the transformer (see the transformer nameplate) , the length of a single hanging rope is not less than the product height, and the hanging rope should not be damaged soft sling;

(2) Lifting Position: Use a sling lock to fasten the two sides of the oil storage tank on the head of the transformer and the lifting rope must be at a 90 ° angle to the ground when the product is standing up, the angle between the two suspension ropes shall not be greater than 30 ° and the suspension ropes shall not touch the outer cover of the expander to prevent damage to the outer cover of the expander. As shown in figure 7.2;

(3) placement requirements: When the transformer is placed vertically, it should be placed on a flat hard surface to prevent the dumping of the product.

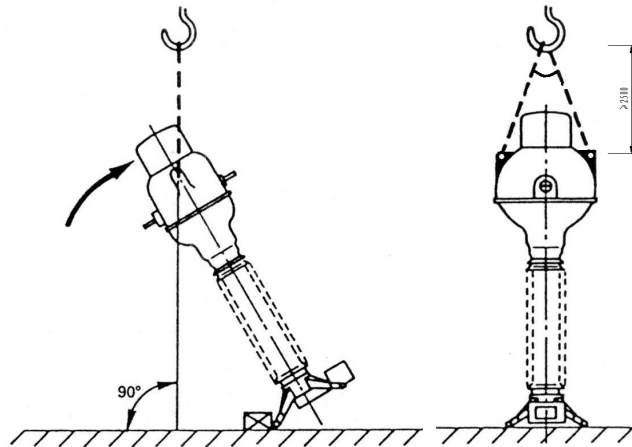


图 7.2 吊装示意图

Fig. 7.2 lifting diagram

安装/Installs

CN/互感器安装固定

EN/Installation and fixing of mutual inductor

采用合适长度的吊具，将互感器吊到平面支架，互感器就位后，用螺栓与安装支架固定牢靠，并用接地排将互感器底座与支架等电位连接。产品安装固定后，才可拆除吊具。

After the instrument transformer is in place, it is fixed firmly by bolts and mounting bracket, and the base of the instrument transformer is connected with the bracket by earthing row. After the product is installed and fixed, the hanger can be removed.

CN/一次接线端子

EN/Primary terminal

(1) 互感器投入运行前, 应根据铭牌上的标准、一次电流值把一次绕组设置为需要的连接方式;

(2) 一次为两匝结构的互感器在进行串联、并联连接方式转换时, 应先确认 P1、P2 两侧的导电排与相应的连接母线分离断开, 且必须将两侧的串联、并联用连接螺栓全部松开拧下后方可更改连接方式。连接前清理干净导电连接面, 并均匀涂抹导电膏;

(3) 在与一次接线端子连接前, 对各接触面表面进行清理, 保证良好的电气接触性能。接触面上涂抹一层导电膏。连接紧固件建议采用不锈钢材料。为保证长期有效的接触压力, 所有螺栓连接须加垫弹簧垫圈。

注: 铝制件和铜制件之间应避免直接接触。对于无法避免的场合, 接触点或面须采用耐腐蚀的镀层或用铜铝过渡接头复合板。

(1) before the transformer is put into operation, the primary winding shall be set as the required connection mode according to the standard on the nameplate and the primary current value;

(2) when the transformer with two turns of structure once is converted into series connection mode and parallel connection mode, before changing the connection mode, it is necessary to make sure that the conducting row on both sides of P 1 and P 2 is disconnected from the corresponding connecting bus, and the connecting bolts on both sides of p 1 and p 2 must be completely loosened before changing the connecting mode. Before the connection, clean the contact surface and smear the conductive paste evenly;

(3) before connecting with the primary terminal, clean the contact surface to ensure good electrical contact performance. A layer of conductive paste is applied to the contact surface. Stainless Steel Connection fasteners are recommended. To ensure long-term effective contact pressure, all bolted connections shall be provided with gasketed spring washers.

Note: direct contact between aluminum parts and copper parts should be avoided. For unavoidable situations, the contact points or surfaces shall be corrosion-resistant plated or clad with copper-aluminum transition joints.

紧固件紧固力矩参见表 8.1。

Fastener fastening torques are shown in table 8.1.

材料 Material	规格 Specifications	不锈钢 Stainless steel		8.8 级碳钢 8.8 Grade Carbon Steel	
		N·m		N·m	
		规定值 Prescribed value	偏差 Deviation	规定值 Prescribed value	偏差 Deviation
M10		35	±4	40	±4
M12		60	±5	65	±5
M14		70	±6	105	±6
M16		120	±8	160	±8
M20		180	±10	310	±10

M24	340	±12	580	±12
M30	700	±20	900	±20

表 8.1 一次接线紧固件力矩

Table 8.1 Torque of primary wiring fasteners

CN/二次端子连接

EN/Secondary Terminal Connection

- (1) 按照互感器铭牌或说明牌的示意图进行二次端子的连接。
- (2) 将每一个单独的二次绕组的接地一端和预备好的合适的地线可靠连接。
- (3) 二次绕组不允许开路，短接电流互感器中未使用二次绕组的接线端。如一个绕组具有多个变比，则必须短路最大变比对应的接线端子。

(1) connect the secondary terminals according to the schematic diagram of the nameplate or the specification plate of the transformer.

(2) reliably connect one end of the ground wire of each individual secondary winding to a suitable ground wire prepared.

(3) the secondary windings are not allowed to open, and the short-circuited terminals of the current transformer do not use the secondary windings. If a winding has more than one transformer ratio, the terminal corresponding to the maximum transformer ratio must be short-circuited.



图 8.1 二次端子示意图

Fig. 8.1 schematic Diagram of Secondary Terminal

CN/接地端子连接

EN/Ground Terminal Connection

CN/互感器的接地端子位于互感器底座下方，该接地点应与电站地网可靠连接。接地线应能承受系统短路电流。

EN/ terminalThe grounding terminal of the transformer is located under the base of the transformer, and the grounding point should be reliably connected with the grounding grid of the power station. The ground wire should be able to withstand the short-circuit current of the system.

投运及维护/Commissioning and maintenance

CN/投运前检查

- (1) 互感器安装固定后，至少静置 24h 后再投运；
- (2) 确认三相互感器油位高度一致；
- (3) 检查互感器无漏油异常；
- (4) 确认产品接地端可靠接地。

EN/Pre-launch inspection

- (1) after the transformer is installed and fixed, it shall be kept for at least 24 hours before being put into operation;

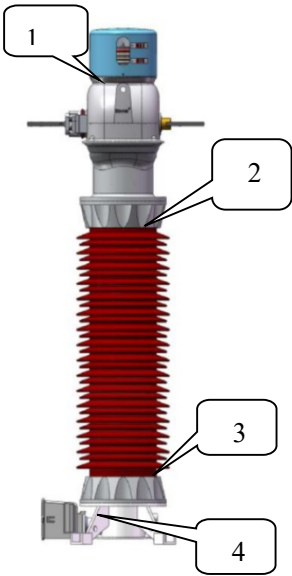
- (2) confirm that the oil level of the three-phase transformer is the same;
- (3) check that there is no abnormal oil leakage in the transformer;
- (4) confirm that the grounding end of the product is reliably grounded.

CN/日常巡查项目

EN/Routine Inspection Program

CN/设备投运后，应经常性进行日常检查，检查内容如表 10.1。

EN/After the equipment is put into operation, routine inspection should be carried out regularly. The contents of the inspection should be as shown in table 10.1.

序号 No.	检查项目 Check items		合格要求 Qualification requirements	巡查时间 Patrol time
1	运行状态 Running State	仪表指示 Instrument indication	仪表指示正常 Gauge reading's good	投运运行期间 During commissioning
2	油位指示器 Oil level indicator	1、检查三相互感器膨胀器油位指针高度是否一致； Check the three-phase mutual inductor expander oil level pointer height is consistent; 2、油位指示红色标识线位置。 The oil level indicates the location of the red marking line.	1、三相互感器的红色油位指示高度基本一致； The Red Oil level indication of the three mutual inductors is basically the same; 2、油位红色标识线在 MAX 与 MIN 之间，并且清晰可见。 The oil level red marking line between Max and Min is clearly visible.	投运运行期间 During commissioning
3	连接部位/油阀口 Connection/ Oil valve port		四个位置无油迹 Four spots, no oil	运行期间 Run Time
4	一次接线端子 Primary terminal	一次接线端子连接有无扭曲变形，连接处有无变色。 Whether the primary terminal connection is distorted or not, and whether the connection is	一次接线端子连接无扭曲变形，一连接处颜色没有变黑。 There is no distortion in the connection of primary	验收时 Acceptance Time 投运前 Before putting into operation

		discolored.	terminal, and the color of the connection is not black.	运行中 Running
5	瓷套 Porcelain Sleeve	瓷套伞裙有无破损、裂纹、严重油污、放电痕迹及其它异常情况。 Whether the porcelain umbrella skirt has the breakage, the crack, the serious oil pollution, the discharge mark and other abnormal situation.	瓷套伞裙无破损、裂纹, 无严重油污, 无放电痕迹及其它异常情况 Porcelain umbrella skirt without damage, crack, no serious oil pollution, no discharge marks and other abnormal conditions	运行期间 Run Time

表 10.1 检查项目
Table 10.1 check items

回收处置/Recycling disposal

CN/此产品主要组成材料成分包含：金属铜、铁、铝，变压器油及陶瓷；在正常工况条件下，互感器使用寿命为 30 年。互感器到期报废或不再使用后，金属铜、铁、铝，变压器油及陶瓷应集中交给具有资质的单位回收处理，以避免对环境的污染影响。

EN/The main components of this product include: Copper, iron, aluminum, transformer oil and ceramics; under normal working conditions, the service life of the transformer is 30 years. Copper, iron, aluminum, transformer oil and ceramics should be collected by qualified units for recycling to avoid the impact of environmental pollution.

CN/测介损的试验方法

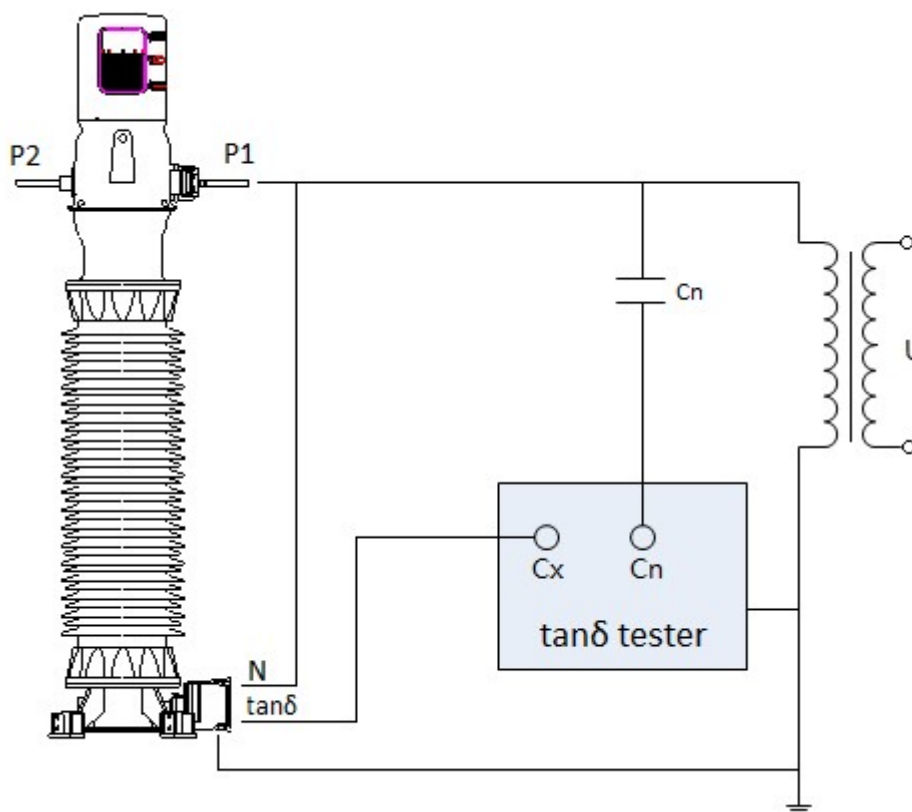
EN/Test Method for dielectric loss

CN/介损因数 $\tan\delta$ 测量说明: 当电压互感器从网上断开后, 二次端子盒内标记字母 N 的端子及 $\tan\delta$ 端子要从接地端子(⏏)断开。N 端与互感器顶部的高压 A 端进行短接, 接入电桥 Cn 端。电桥 Cx 接 $\tan\delta$ 端子, 详细见附图; 测量电压为 2kV, 测量时, 所有二次绕组及底座必须要接地。

EN/Dielectric loss factor Tan δ measurement description: When the voltage transformer is disconnected from the network, the terminal marked with the letter N in the secondary terminal box and the Tan δ terminal are disconnected from the grounding terminal (⏏). N-terminal and the top of the transformer high-voltage a short connection, access to the bridge end of the CN. Bridge Cx Tan δ terminals, as detailed in the attached figure; measuring voltage of 2kV, when measuring, all secondary windings and base must be grounded.

警告: 试验后, 产品在与线路连接前, 请确认已将二次端子盒内的端子 N 和 $\tan\delta$ 与接地端子连接。

Warning: After test, before connecting the product to the line, make sure that the terminals n and Tan δ in the secondary terminal box are connected to the grounding terminal.



附图 1 介损测试原理图

Fig. 1 schematic diagram of dielectric loss test