



树脂绝缘干式铁心并联电抗器 安装使用说明书

Installation Operation and Maintenance Manual Dry-type Steel Core Shunt Reactor

BK2500SM

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本说明书适用于额定容量20000kvar及以下、电压等级35kV及以下环氧浇注薄绝缘干式铁心并联电抗器的安装和使用。

This manual is applicable to the installation and application of dry-type steel core shunt reactor with rated capacity equal to 20000kvar and below and voltage class equal to 35kV and below.

一、产品特点 Product Features

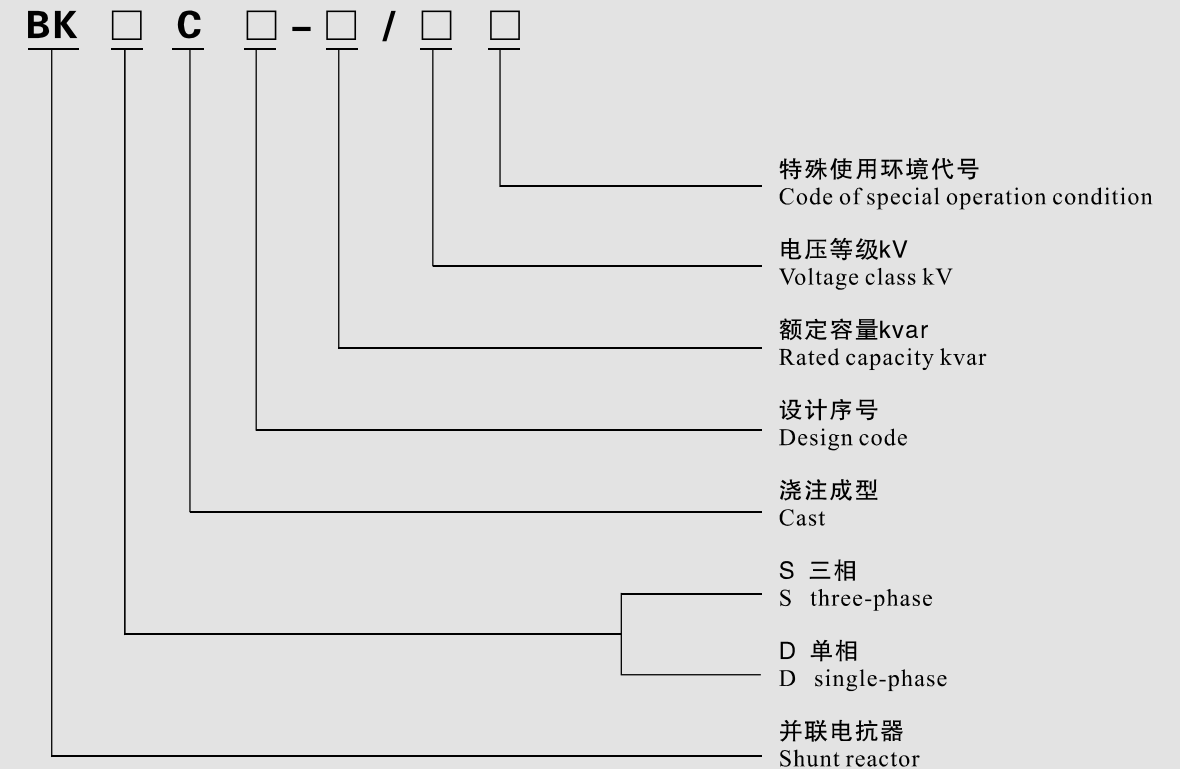
并联电抗器应用于电力系统，通常安装在高压长距离输电线的始端升压站、中间联络站以及高压直流输电的换流站中，并联连接于变电站的35kV及以下的低压回路。具有补偿电网无功功率、降低电网损耗、提高输电能力以及抑制电网谐振过电压、防止发电机自励磁、消除空载长线电容效应和高压电缆电容效应、抑制工频过电压等众多功能，可节约能源、提高电力系统的运行稳定性和可靠性。并联电抗器与并联电容器、大功率晶闸管和微机控制系统组成静止无功补偿装置，可对电力系统的无功功率进行适时动态调节。产品完全符合GB10229《电抗器》、IEC60076-6《电抗器》等标准的要求。

Shunt reactor is applied to power system. It is usually installed in the first step-up station and interconnecting station of long-distance high-voltage power transmission and HVDC convertor station. It is connected in parallel to the low voltage circuit of 35kV or below. It has multi-functions, for instance, compensating reactive power of power grid, reducing loss of power grid, improving transmission capability, suppressing resonance overvoltage, preventing self-excitation of generator, eliminating capacity effects of no-load long distance and high-voltage cable, suppressing power frequency overvoltage and so on. It can save power energy and improve stability and reliability of power system. Static var compensation device is made up of shunt reactors, shunt capacitors, high-power thyristors and microcomputer-controlling system. It can adjust the reactive power of power system dynamically. The product complies with standards of Gb10229 Reactor, IEC60076-6 Reactor and etc.

该产品应用引进的树脂绝缘干式电力变压器的设计技术、工艺技术和引进的生产设备及检验设备进行产品设计、生产和检验。该产品具有绝缘强度高、局放小、机械强度高、节能、体积小、重量轻、防潮、阻燃、噪音低，可靠性高、漏磁少等优点，可广泛应用于输变电系统、电气铁道、冶金，石化等领域，特别是安装空间有限和具有特殊防火要求的城网变电站、地下变电站以及对电磁干扰有特别要求的微机控制站等场所，更能充分发挥其体积小、阻燃和漏磁小的优越性。

The product is designed based on the design technology and process technology of cast resin dry-type transformer and is produced and tested with imported production equipment and test equipment. The product has advantages of good insulating strength, little partial discharge, high mechanical strength, energy saving, small size, light weight, damp-proof, fire resistance, low noise, high reliability and less flux leakage, etc, and can be widely applied to power transmission and distribution system, electric railway, metallurgy, petrification, etc, especially to urban network substation and underground substation with limited installation space and special fire prevention requirements and microcomputer control station with special requirements for electromagnetic interference, where its advantages of small size, fire resistance and less flux leakage can be fully played.

二、产品型号说明 Product Type Specification



三、使用条件 Operation Condition

- 3.1 安装地点：户内。
Installation location: indoor;
- 3.2 冷却方式：空气自冷（AN）式或强迫风冷（AF）式。
Type of cooling : natural air cooling (AN) or forced-air cooling (AF);
- 3.3 保护等级：IP00、IP20、IP23等型式。
Protective level: IP00, IP20 and IP23, etc;
- 3.4 环境温度：-10℃~+40℃。
Ambient temperature: -10℃~+40℃;
- 3.5 海拔高度：不超过1000m。
Altitude: not more than 1000m;

3.6 绝缘等级: F级。

Insulation class: F;

3.7 本产品一般为户内式, 应安装在场地清洁、通风良好和具有合适的大气条件的户内场所。如果 并联电抗器安装在地下室或开关柜等空间受限制的地方时, 应有足够的通风, 一般每1kW损耗应有 $\geq 4\text{m}^3/\text{min}$ 的空气通风。

This product is generally indoor type and should be installed in clean indoor areas with good ventilation and suitable atmospheric conditions. If the shunt reactor is installed in underground room or switch cabinet where space is limited, adequate ventilation is necessary. Generally, 1kW loss requires no less than $4\text{ m}^3/\text{min}$ ventilation.

四、产品运输 Product Transportation

4.1 产品运输过程中, 如无包装或仅有简易包装, 应注意天气, 如遇下雨下雪, 应采取措施, 避免雨雪侵入其内。

Weather should be noticed during transportation of non-packed products or products with simple packages. Measures should be taken in the event of rain or snow in order to prevent rain or snow entering into products.

4.2 产品运输过程中, 其倾斜度不得大于 30° 。

Inclination of product can't be greater than 30° during transportation.

4.3 对于有小车的产品, 为防产品在运输过程中的位置移动, 一般应卸掉小车轮。

For products with trolley, the trolley should be normally removed in order to avoid movement of products during transportation.

4.4 起吊并联电抗器时, 如有包装箱, 应在包装箱的四下角垫木处挂钢丝绳起吊。如没有包装箱或并联电抗器从包装箱中吊出时, 应同时使用器身上的所有吊板起吊, 且起吊钢丝绳之间的夹角不得大于 60° 。

While hoisting the shunt reactor with packing box, wire ropes shall be hooked on the wood block of four bottom corners of packing box. If the shunt reactor has no packing box or shunt reactor has been hoisted from packing box, all lifting plates on reactor shall be used, moreover, the included angle between hoisting wire ropes can't be greater than 60° .

五、检查验收 Check and Acceptance

用户收到并联电抗器后, 应立即进行检查。

Please check the reactor as soon as receive it.

5.1 检查产品的铭牌数据与订货合同是否相符, 如产品型号、额定容量、额定电压、额定电流等。

Check whether the data on the nameplate are consistent with those on the purchase order, such as model, rated capacity, rated voltage and rated current, etc.

5.2 检查出厂文件是否齐全。

Check whether the delivery documents are complete.

5.3 检查包装箱内零部件是否与装箱单相符。

Check if parts and components in packing box conform to packing list.

5.4 检查产品运输过程中有无损伤, 产品的零部件是否损伤和移位, 接线是否松动, 断裂, 绝缘是否有破损, 是否有脏物或异物等。同时, 如有运输所使用的垫木等物, 必须把它们挪开。

Check if products are damaged, parts and components of product are damaged or displaced, wiring is loose or ruptured and insulation is damaged or if there are dirty matters or foreign matters in insulation. Meanwhile, wood blocks for transportation must be removed.

5.5 产品开箱检查完毕, 如不立即投入运行, 则必须重新包装好, 并把它放在户内安全的地方, 以防损防盗。

After checking, the products must be re-packed and put in indoor safe place if they are not put into operation in a moment in order to prevent damage and theft.

六、运行前试验 Test before Operation

6.1 绕组直流电阻的测试。

Test DC resistance of the windings.

6.2 检查电抗器的铁心是否真正地接地, 检查穿心螺杆的绝缘是否良好。

Check if the steel-core of reactor is completely grounded and check if insulation of through screw is good.

6.3 绝缘电阻测试。一般情况下, 绕组绝缘电阻可满足如下值:

Measurement of insulation resistance; in normal conditions, insulation resistance of winding can meet following value:

相—地 $\geq 100\text{M}\Omega$

Phase-ground $\geq 100\text{M}\Omega$

如果是在比较潮湿的环境条件下, 电抗器的绝缘电阻值会有所下降。一般地, 若每1000V额定电压, 其绝缘电阻值不小于 $2\text{M}\Omega$ (一分钟 25°C 时的读数), 就能满足运行要求。但是, 如果电抗器遭受异常潮湿发生凝露现象, 则无论其绝缘电阻如何, 在其进行耐压试验或投入运行前, 必须进行干燥处理。

Under humid conditions, insulation resistance of reactor will drop slightly. Generally, operation requirements can be met if insulation resistance is not less than $2\text{M}\Omega$ (reading in one minute under 25°C) per 1000V rated voltage. However, if dew appears due to abnormal moisture, drying treatment is required prior to withstand voltage test or putting into operation no matter how the insulation resistance of reactor is.

6.4 外施工频耐压试验。试验电压为出厂试验电压的85%, 历时5分钟。

Applied power frequency withstand voltage test; test voltage is 85% of ex-factory voltage and time is five minutes.

6.5 电抗值测量。

Measurement of reactance

七、安装与运行 Installation and Operation

7.1 将并联电抗器安装于预置有地脚螺栓的平面基础上，地脚螺栓数量不得少于底座安装孔数，螺母紧固后应采取防松措施。

The shunt reactor shall be installed on the flat foundation where foot screws are pre-laid. Number of foot screws can't be less than that of installation holes of base and looseness prevention shall be taken after nuts are fixed.

7.2 将并联电抗器底座上的接地螺栓与接地母排可靠连接。

Grounding bolt on base of shunt reactor shall be reliably connected with grounding bus-bar.

7.3 将并联电抗器的出线端子与系统母线排相连接，连接线应有一定弹性余地。

The outlet terminals of shunt reactor shall be connected with bus-bars of system and the connection should have certain flexible margin.

7.4 对于有分接的产品，将分接头按规定要求调到需要的位置。

For products with tapping, the tap shall be adjusted to the position as per demand.

7.5 对于有风机的产品，应将电源电缆和控制电缆连接于端子排。

For products with fan, power cables and control cables shall be connected to terminal strip.

7.6 检查上述操作完全正确、并联电抗器整体无任何异常、所有异物均彻底清除后，并联电抗器可投入试运行。

The shunt reactor can be put into operation after checking and confirming that above operations are perfectly correct, there is no any abnormality for shunt reactor and all foreign matters are completely removed.

7.7 试运行60分钟无异常后，并联电抗器可投入正式运行。

The shunt reactor can be put into formal operation if there is no abnormality after 60-minute trial operation.

7.8 并联电抗器具有在1.1倍额定电压下长期运行的能力，但在通常情况下，并联电抗器的长期运行电压最好为额定电压。

The shunt reactor can be operated for a long time under 1.1 times of rated voltage; however, rated voltage is usually preferred for long-time operation of shunt reactor.

八、维护与保养 Maintenance

为了保证并联电抗器能正常运行，需对它进行定期检查和保养。

In order to ensure normal operation of shunt reactor, periodical maintenance is required.

8.1 一般地，在干燥清洁的场所，每年或更长一点时间进行一次检查；在其它场所，例如可能有灰尘或化学烟雾污染的空气进入时，每三至六个月应进行一次检查。

Generally, inspection shall be carried out in each year or even longer in dry and clean locations; inspection shall be carried out every 3~6 month in other locations with dust or chemical smoke pollutions.

8.2 检查时，如发现过多的灰尘聚集，则必须清除，以保证空气流通和防止绝缘击穿，特别要注意清洁并联电抗器的绝缘子、绝缘垫块、绕组装配的顶部和底部。对通风道中的灰尘，可使用压缩空气吹净。

During inspection, cleaning is required if excessive dust gathering is found in order to assure air circulation and avoid insulation breakdown, especially insulators, insulation blocks and top and bottom of windings of shunt reactor. Dust in air ducts can be blown off with compressed air.

8.3 检查紧固件、连接件是否松动，导电零部件以及其它零部件有无生锈、腐蚀的痕迹，还要观察绝缘表面有无爬电和碳化现象，必要时应采取相应的措施进行处理。

Check the looseness of fasteners and connectors, rust and corrosion of conductive parts and other parts; moreover, observe creepage and carbonization on insulation surface. Corresponding measures shall be taken if necessary.

九、安全注意事项 Safety Precautions

9.1 并联电抗器安装完毕投入运行之前，对于无外壳的并联电抗器，一般应在并联电抗器的周围1.5m以外安装隔离栅栏，以避免人或物进入发生意外事故。

For shunt reactor without enclosure, isolating barrier is usually mounted 1.5m around it after completing installation and prior to putting into operation in order to avoid occurrence of accidents.

9.2 并联电抗器投入运行以后，绝对禁止触摸电抗器主体，以免发生事故。

After putting shunt reactor into operation, touching the body of shunt reactor is strictly prohibited in order to avoid occurrence of accidents.

9.3 并联电抗器如安装于开关柜内，应按其电压等级留足对地安全距离，并应满足通风要求。

If the shunt reactor is installed in switch cabinet, safety distance to ground shall be sufficiently reserved according to its voltage class; moreover, ventilation requirements also shall be met.

9.4 除非另有规定，并联电抗器在系统最高电压下连续运行时间不得超过3小时。

Unless otherwise specified, the shunt reactor shall be working under the maximum system voltage less than three hours.