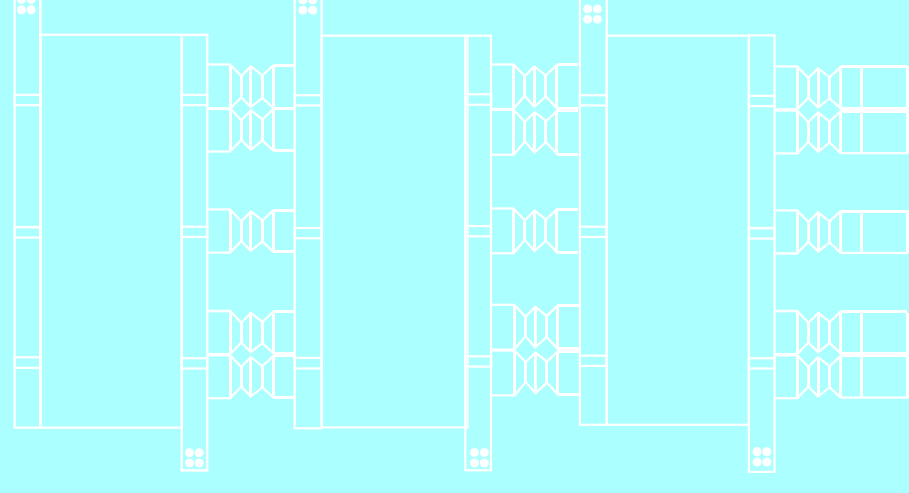


# 树脂绝缘干式空心滤波电抗器 安装使用说明书

## Installation Operation and Maintenance Manual Dry-type Air Core Filter Reactor

LK2200SM



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3.5 地震强度：水平0.3g，垂直0.15g。  
Earthquake intensity: horizontal 0.3g; vertical 0.15g

3.6 绝缘等级：F级。  
Insulation class: Class F

3.7 安装地点应清洁，无有害腐蚀性气体及蒸气，无导电性或爆炸性尘埃。

The installation location shall be clean without any harmful corrosive gas or vapor, conductive or explosive dust.

3.8 当电抗器用于户内时，应安装在场地清洁、通风良好和具有合适的大气条件的场所。电抗器安装在地下室或其它空间受限制的地方时，应有足够的通风，一般每1kw损耗应有2~4米<sup>3</sup>/分钟的空气通风。

When the reactor is used indoors, it shall be installed in clean and well-ventilated location with suitable atmosphere. When the reactor is installed in basement or other location with limited space, it shall be adequately ventilated. There shall have 2 ~ 4 m<sup>3</sup>/min ventilation for 1kw loss.

#### 四、产品运输 Product Transportation

4.1 电抗器本体、支柱绝缘子和支持底座等应分箱包装，电抗器连接座与包装底座应可靠固定位。对于两线圈调感空心滤波电抗器，运输时应将两线圈距离调至最近。

The reactors, post insulators and support bases shall be packaged in separate boxes. The reactor connection bases and package base shall be reliably and firmly fixed and positioned. For double-coils inductance modulation air core filter reactor, please shorten the distance between the two coils as possible.

4.2 电抗器在运输过程中，如无包装或仅有简易包装，应注意天气，如遇下雨下雪，应采取保护措施，避免雨雪侵入其内。

During the transportation of reactor, if there is no package or just there is simple package, the weather shall be considered. Measures shall be taken in rain or snow condition to prevent the rain or snow entering.

4.3 电抗器及包装箱应按规定方向放置，产品运输过程中，其倾斜度不得大于30°。

The reactor and package box shall be placed with specified direction. During transportation, its inclination shall be no more than 30°.

4.4 起吊电抗器时，如有包装箱，应在包装箱的四下角垫木处挂钢丝绳起吊。如没有包装箱或电抗器从包装箱中吊出时，应同时使用电抗器出线臂上的所有吊孔（板）垂直起吊，起吊钢丝绳之间的夹角不得大于60°。

When hoisting the reactor, if there is package box, steel wire ropes shall be hanged at the bed timbers at four bottom of package box. If there is no package box or the reactor has been hoisted from the package box, it shall be vertically hoisted with all lifting eyes (plates) on outgoing line arm of reactor. The included angle between steel wire ropes shall be no more than 60°.

#### 五、检查验收 Check and Acceptance

用户收到电抗器后，应立即进行检查。

Please check the reactor immediately after received it.

5.1 检查电抗器的铭牌数据与订货合同是否相符，如型号、系统电压、额定工频电流、额定电感值等。

Check whether the data on the nameplate are consistent with those on the purchase order, such as product model, system voltage, rated power frequency current, rated inductance value and 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 whether the parts and components in package box are in consistence with the packing list.

5.4 检查电抗器在运输过程中有无损伤，电抗器的零部件是否损伤和移位，接线是否松动、断裂，绝缘是否有损伤，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 whether the product is damaged, whether the product parts are damaged or moved, whether the wiring is loose or broken, whether the insulating layer is damaged, whether there are contaminants or impurities during transportation, and so on. Meanwhile, objects such as stow-wood used in the transportation must be moved away.

5.5 电抗器在开箱检查完毕后，如不立即投入运行，则必须重新包装好，放在户内安全的地方，以防损防盗。

Product should be packed again and placed at safe place after the unpacking check if it is not put into operation immediately in case of damage or theft.

#### 六、运行前试验 Test before Operation

6.1 检查所有零部件安装是否妥当、齐全，紧固件、连接件是否可靠紧固。

Check whether all the parts and components are installed properly and completely. Check whether the fastener and connection parts are reliably fixed

6.2 检查电抗器上是否有异物。

Check whether there is foreign material on reactor.

6.3 绕组直流电阻的测试。

Test DC resistance of the winding.

#### 6.4 绝缘电阻测试。一般情况下，绝缘电阻可满足如下值：

Test insulation resistance. Under normal conditions, the insulation resistance can meet following requirements:

相-相 $\geq 200M\Omega$ ， 相-地 $\geq 200M\Omega$ 。

Phase-phase:  $\geq 200M\Omega$ , Phase-ground  $\geq 200M\Omega$

如果是在比较潮湿的环境下，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2M $\Omega$ (一分钟25℃时的读数)，就能满足运行要求。

The insulation resistance value of reactor will slightly decrease under damp environment conditions.

Generally, if the insulation resistance value is no less than 2M $\Omega$  per 1000V rated voltage (readings for 1 minute at 25 $^{\circ}C$ ), it can meet the operation requirements.

#### 6.5 外施工频耐压试验。试验电压为出厂试验电压的85%，历时1分钟。

Applied power frequency withstand voltage test. The test voltage is 85% of ex-factory test voltage and it shall be applied for 1 minute.

#### 6.6 电感值测量。

Measurement of inductance value

### 七、安装与运行 Installation and Operation

7.1 电抗器安装时请先准备规格为1mm、2mm的薄钢板各若干块，数量应等于底座的数量。每块长50mm、宽20mm，用来调节产品底座与安装基础间的配合。

Please prepare several block steels of 1mm and 2mm thick, 50mm long and 20mm wide to adjust the adaptation between product bases and installation foundation. The quantity of the steels should be equal to that of product bases.

7.2 电抗器安装方式应符合电抗器的安装外形图的要求。在产品订货和设计时通常选用的安装布置方式见图1、2、3；通常选用的端子出线方向见图4；通常选用的相间端子夹角见图5。安装布置方式一经确定，则不允许再行变更。

The installation and arrangement of reactor shall meet the requirements of reactor mounting dimensions. The installation and arrangement normally selected during product order and design refer to figure 1, 2 and 3. The terminal outlet direction normally selected refers to figure 4. The phase-to-phase terminal angle normally selected refers to figure 5. The installation and arrangement must not be altered after confirmed.

7.3 按照安装外形图首先将支柱绝缘子与电抗器下出线臂上的连接座相连接，注意螺栓不要拧紧，以便给后装配留下活动裕度。

According to installation outline drawing, firstly connect the post insulators with connection bases on lower outgoing line arm of reactor. Notice that the bolts shall not be tightened to reserve moving margin.

7.4 将支持底座与安装于最下层的电抗器(水平布置时三相均为最下层)的支柱绝缘子相连接。

Connect the supporting bases with the post insulators of reactor installed at bottom (for horizontal arrangement, three phases are all the bottom.)

7.5 将装有支持底座的电抗器吊装于预置有支承钢板或连接螺栓的混凝土基础上定位并固定。

Lift the reactor with supporting bases on concrete foundation embedded with support steel plates or connection bolts and fix it.

7.6 安装三相电抗器时，应按出厂文件规定的出厂序号配组安装，垂直布置的电抗器应按由下向上的顺序逐台安装，出线端子方向和相间夹角按外形图。绝对禁止将位于中间的电抗器与位于上或下的电抗器的安装位置互换，否则，电抗器将不能正常运行。

When installing three-phase reactor, it shall be installed in group according to ex-factory serial number specified in ex-factory document. The reactor vertically arranged shall be installed one by one from down to up. The outgoing line terminal direction and phase-to-phase included angle shall refer to the outline drawing. It is absolutely prohibited to interchange the installation position of reactor at middle with the reactor at upper or lower position; otherwise the reactor will not normally operate.

7.7 电抗器安装完毕并经检验合格后，将电抗器支持底座与底座支承钢板焊接牢固。(注意：电抗器安装完毕后，必须检查并防止支持底座、支柱绝缘子和连接座连接得不够牢固及遗漏橡胶垫的情况，否则将产生不必要的噪声。)

After the installation of reactor is completed and it is verified as qualified, firmly weld the reactor supporting bases with base support steel plates. (Notices: Please check the connections among the support bases, post insulators and connecting bases installed well and check whether the rubber pads fixed well so as to prevent from producing noises.)

7.8 电抗器与电抗器之间、电抗器与周围金属物体之间需保持足够的磁间距，一般情况下，各种布置方式的电抗器的最小磁间距应不小于图1、2、3的规定。

Adequate magnetic spacing shall be remained between reactor and reactor, reactor and surrounding metal article. Under normal conditions, the minimum magnetic spacing of reactor with various arrangement shall be no less than the specification in figure 1, 2 and 3.

7.9 电抗器就位前应按电抗器总装配图中底座位置及尺寸图预制混凝土基础，在基础内预埋支承钢板和接地保护极，各支承钢板应可靠接地。基础应水平，其倾斜度应 $\leq 2/1000$ 。基础除应能承受电抗器的重力、运行振动和短路电动力的冲击外，对于户外安装的电抗器，还应能承受电抗器遭受正面35m/s的风袭时所产生的破坏力的作用。

It is necessary to prefabricate the concrete foundation according to base position and dimension drawing in reactor general assembly drawing before emplacement of reactor, embed support steel plates and grounding protection pole in the foundation. All support steel plates shall be reliably grounded. The foundation shall be horizontal, of which the gradient shall be less than or equal to 2/1000. The foundation shall be able to bear the gravity of reactor and impact by operation vibration and short-circuit electric dynamic force, furthermore, the reactor installed outdoors shall also be able to bear the destructive force resulted from 35m/s wind applied on outdoor of reactor.

7.10 在电抗器周围有影响的区域内(如图 1、2、3)及水泥基础内的金属件,不得有大的封闭金属环网,以免形成环流而增加电抗器的损耗,造成局部过热。

In the surrounding affective areas of reactor (see figure 1, 2 and 3) and metal piece in cement foundation, there shall have no large closed metal ring so as not to generate circulation flow and add the loss of reactor which may lead to partial overheating.

7.11 电抗器出线端子与外部母线或其它电器的连接最好采用电缆连接。如果必须采用硬母线连接时,母线应有缓冲的过渡性弯头,以保证电抗器本体在受到电动冲击力时有适当的振动自由度。

It is preferable to use cable to connect the outgoing line terminal of reactor with outside bus or other electric appliance. If it is necessary to connect with hard bus, the bus shall have buffering transition bend to ensure proper vibrational degree of freedom of reactor body when impacted by electric force.

7.12 连接端子排应平整光滑,清洁无污物,用螺栓紧固,建议在接触部分涂导电膏。

The connection terminals shall be flat, smooth and clean without dirt, and be fixed with bolts. It is recommended to apply conductive paste onto the contact part.

7.13 检查上述操作完全正确、电抗器整体无其它异常、所有异物均彻底清除后,电抗器可投入试运行。

Check the completely correctness of above operation. The reactor can be put into operation if the reactor has no other abnormality and all foreign materials have thoroughly been cleared.

7.14 试运行60分钟无异常后,电抗器可投入正式运行。

The reactor can be put into formal operation if there is no abnormality after test run for 60 minutes.

7.15 电抗器的长期运行电流为额定电流,因此,电抗器的长期工作电流应不大于额定电流。

The reactor shall continuously operate under rated current, therefore, for continuous operation, the current shall not exceed rated current.

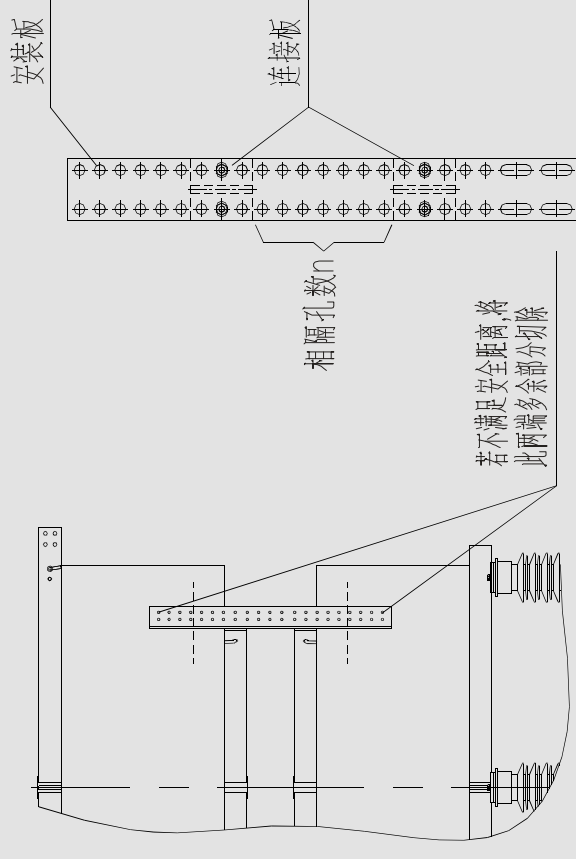
7.16 对于两线圈间距式滤波电抗器,电感值调整是通过上、下两线圈之间的距离实现的。两线圈距离越近,电感值越大。即相隔孔数 $n$ 越少,电感值越大。各相隔孔数对应电感值参见试验报告。调节上、下线圈间距时请使用配件调节器。

For double-coils filter reactor which distance is adjustable, you should adjust the distance between the two coils to change the inductance value. The closer the distance is, the larger the inductance value is. That is to say that the number of holes on the mounting plate between two coils is fewer. See the test report for the inductance value associated with the number of the holes. Please use the specialized regulator to adjust the distance.

电感调节完毕后请将安装板相对上下线圈居中固定,若安装板两端与上、下星形出线臂距离小于对应电压等级最小空气间隙,则请将两端多余部份切除,以保证安装板上、下星形出线臂的安全距离,避免放电现象。

Please fix the mounting plate medially after the inductance adjustment. In case the distance between the end of mounting plate and the outlet of the coil is less than the minimum air clearance, cut the redundant part of the plate to ensure the safe air clearance between the end of mounting plate and the outlet of the coil and avoid discharging.

cut the extra portion of aluminum busbars after the so as to avoid discharge between busbars and coils.



## 八、维护与保养 Maintenance

为了保证电抗器能正常运行,需对它进行定期检查和维护。

To ensure normal operation of reactor, it shall be regularly checked and maintained.

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。

Normally, check once every year or a bit more in dry and clean locations. At other locations, such as where the air with dust or chemical smoke pollution possibly enters, it shall be checked once every three to six months.

8.2 检查时,如发现过多的灰尘聚集,则必须清除,以保证空气流通和绝缘良好,特别要注意清洁电抗器的绝缘子、绕组顶部和底部。对通风道中的灰尘,可使用压缩空气吹净。

During check, excess dust conglomeration, if founded, must be removed to ensure the air circulation and good insulation. The insulators and the top and bottom of winding shall be especially cleaned. The dust in ventilating 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,绑扎拉带有无损伤,必要时应采取相应的措施进行处理。

Check the loose of fastener and connectors, rust or corrosion mark on conductive parts and components and other components. Observe whether there is creepage or carbonization on insulation surface and there is damage on binding belt, corresponding measures shall be taken if necessary.

8.4 电抗器表面漆每2-3年进行一次检查,发现不良时应及时处理或与厂家联系处理。

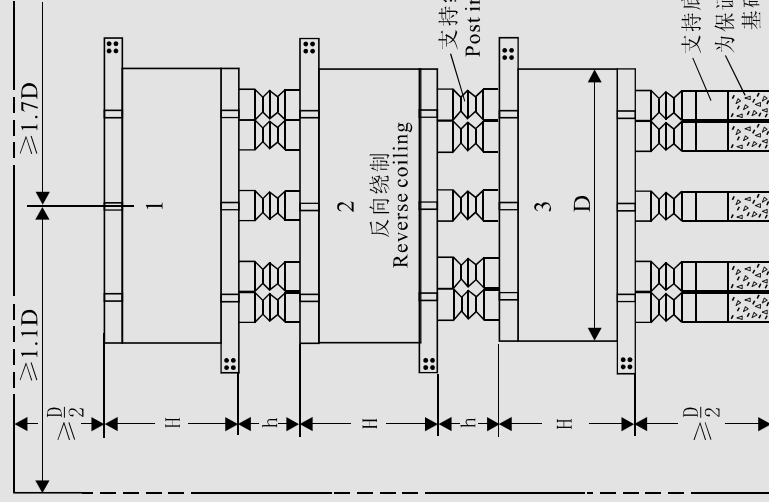
The surface paint of reactor shall be checked one time every 2 to 3 years. If poor condition is founded, it is necessary to timely treat or contact the factory for treatment.

### 九、安全注意事项 Safety precautions

- 9.1 电抗器安装完毕投入运行之前，一般应在其周围安装非金属安全隔离栅栏，以避免人或物进入发生意外事故。  
Before the reactor is put into operation, non-metal separation fence is normally installed surrounding the reactor to avoid the entering of person or matters, which may lead to accident.
- 9.2 电抗器投入运行以后，禁止触摸电抗器主体，以防事故发生。  
After the operation of reactor, prohibit touching the reactor body to prevent from accident.
- 9.3 电抗器周围1.1倍直径范围内，不得有封闭的金属短路环，以免引起发热和增加电抗器的损耗。  
There shall have no closed metallic short-circuit ring within the range of 1.1 times diameter surrounding the reactor to avoid heating and additional reaction loss.
- 9.4 电抗器应安装良好，以防止产生附加噪声。  
The reactor shall be installed well to prevent generation of additional noise.

#### 图1 三相垂直叠放布置

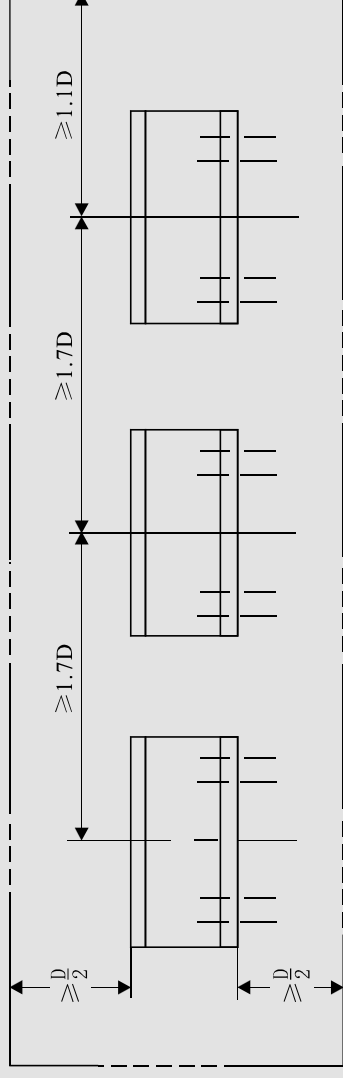
Figure 1 Vertical stacking arrangement



相对于不形成闭环的金属部件和其它电抗器的最小磁间距  
Minimum magnetic spacing in relation to metal components not forming closed loop with other reactors.

#### 图3 三相水平“-”形布置

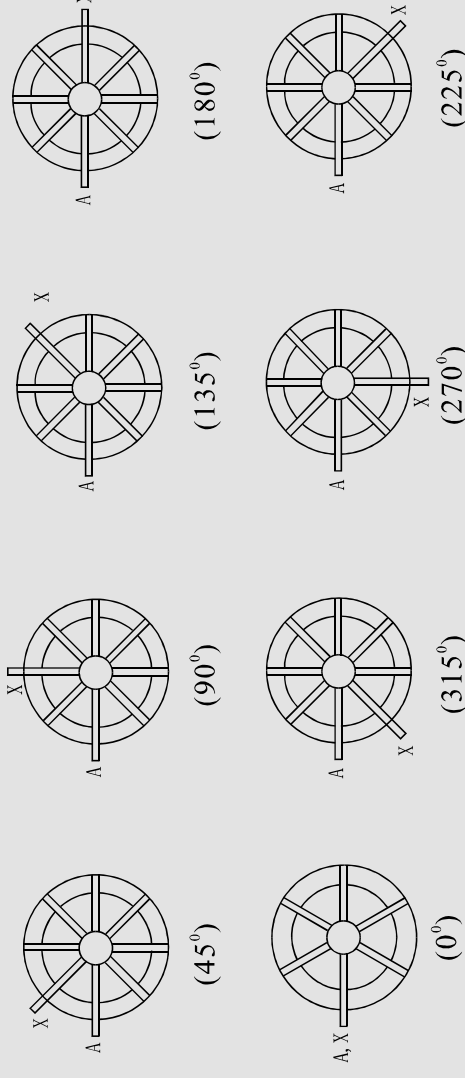
Figure 3 Horizontal “-” form arrangement



相对于不形成闭环的金属部件和其它电抗器的最小磁间距  
Minimum magnetic spacing in relation to metal components not forming closed loop with other reactors.

#### 图4 端子出线方向

Figure 4 Outgoing terminal direction



#### 图5 相间端子夹角

Figure 5 phase-phase terminal angle

