WELLEE

CUSTOM ELECTRICAL INSULATION

Catalog - insulation components of oil-immersed transformers

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Well Electric - WELLELE
No. 196 Yingchun Road, Suzhou, Jiangsu, China
Tel +86 512 6708 1529 - sale@wellele.com - www.wellele.com

变压器绝缘成型件

Insulation Components of
Oil-immerg Transformer

QUALITY
LEADS
THE WAY
让品质做主

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WELL ELECTRIC CO.,LTD

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Catalogue

诚信　稳健

卓越　共赢

主要理化性能
Main Property Standard Value

绝缘成型件是以 100%绝缘木浆为原材料，利用适当的模具、采用专业的制造方法或专用机械加工成型的，用来保证油浸式电力设备的绝缘强度和机械强度的各种绝缘件。

Insulating components are made of 100% Electrical-grade pulp through special designed moulds and processing methods or professional machines, which can ensure application in oil-immersed power transformers for good mechanical strength and insulation property.

绝缘成型件的电气性能和机械性能主要取决于材料本身的性能，此外还与制造方法有关，不同的制造方法生产出来的成型件，性能会有差异。根据生产方式的不同，绝缘成型件可分为：异型件（手工成型件）、模压件、结构件。其中，异型件(手工成型件)是指形状复杂的绝缘成型件（如各类绕组出线绝缘件）；模压件是指借助模具不使用胶粘剂制成的各种绝缘件（如槽板、角环）；结构件是指采用变压器纸板和胶粘剂，经机加工成型用于变压器结构绝缘的绝缘件。

Both of electrical and mechanical properties of insulating components depend on raw materials quality and manufacturing methods. Different manufacturing methods will result in different performance on final products.According to the diversities of producing methods and techniques, insulation components can be classified into three main categories: (1) special-shape parts molded by hands, (2) Molded components by pressing and framing on machinery, (3) mechanical kits/components. Special-shape parts are more complicated on shape-designs, such as Lead exits; Components pressed & moulded by machinery, like clamps, angle rings, are made by molds without adding any adhesive and additive; Mechanical kits/components are made through processing of laminated boards into different parts.

成型件的质量符合如下规范:
The quality of insulation components should be conformed with the following standards:

1、外观要求 Requirements on appearance

产品基本尺寸应符合图样要求。

异型件和模压件内外表面应平整,应无可见分层、裂纹、凸凹、污染斑点、无气泡、孔洞、产品加工断面应平整、无毛刺、不允许有碳化现象。

结构件的表面应平整，无明显凹凸、气泡、污染斑点等缺陷，粘胶应均匀，不得有开裂、起泡、脱胶、分层等现象。任何机 加工部位应平整，不允许有超 0.2㎜ 的凹凸及楞凸或刀齿印，

不允许有碳化现象,允许有因密度和加工产生的色差。

成型件的颜色应为原材料本色,但允许有每处面积小于 30㎜^{2}因修补而形成的局部色泽差别。修补深度不允许超达厚度的 30%。厚度小于 2㎜ 的绝缘件,不允许有修补痕。

The dimension should be in conformity with design drawings;

The inside and outside surfaces of moulded parts should be flat and free of delamination, cracks, ruptures, convex-concave,polluted spots, bubbles and holes. and its transverse section should be smooth and free of burrs and carbonization.

The surface of Mechanical kits/components must be smooth and free of defects like convex-concave, bubbles, polluted spots, etc; and the glue or adhesive must be even and free of bursting, bubble, degumming and delaminations. All processed sections must be smooth, no convex-concave and cracks more than 0.2mm, no carbonization, no color difference due to density and processing.

Color of components should be natural as raw material, but part of shades deviation caused by repairing under 30square millemeter per area are allowed. Burled depth is not exceeding 30% of the thickness. No burling marks on components with thickness less than 2 mm.

2、机械加工性能要求 Requirements on machining property

成型件应能承受剪切、钻孔、铣切等机械加工，加工后不得有裂纹、脱落缺口和碳化变色。

The components should be endurable to mechanical process, such as shearing, drilling and milling . They should be free of cracks, ruptures and carbonizing discolor caused by processing.

3、粘接剂要求 Requirements on binding/adhesive agent

成型件生产过程中需要使用粘接剂里，所用粘接剂应具有较强的粘接力、耐热性、抗老化性与变压器油具有良好的相容性，不得污染变压器油。

During the production process, the binding/adhesive agent required must perform very well in adhesiveness, thermal resistance, aging resistance and compatibility with transformer oil meanwhile be free of pollution to transformer oil.

4、成型件的理化性能应符合下表的规定：

Physics and chemistry property of components should conform to the standard as follows:

序号 No	项目名称 Property			单位 Unit	指标值 Value			试验方法 Means of Test
					异型件 Hand-molded parts	模压件 Press-Molded parts	结构件 Structure parts	
1	紧度 Apparent density			g/cm^3	0.70-1.00	1.00-1.25	1.10-1.35	GB/T451.2 GB/T451.3
2	水分 Moisture content			%	＜6.0		≤4.0	GB/T462
3	灰分 Ash content			%	＜1.0		≤0.6	GB/T463
4	水抽出物电导率 Conductivity of aqueous extract			ms/m	＜8.0			GB/T7976
5	水抽出物 PH 值 PH of aqueous extract			-	5.5-9.0			GB/T1545.2
6	收缩率 Shrinkage	厚度方向 Thickness		%	＜5.0		≤4.0	GB/T451.2 GB/T452.1
		其他方向 Otherwise		%	＜1.0		≤1.0	
7	电气强度 Electrical strength	1-2mm	空气中 In air	kv/mm	＞8.0			GB/T1408 IEC763-2
			油中 In oil		＞10	＞30		
		2mm 以上	空气中 In air		＞8.0			
			油中 In oil		＞20			
8	吸油率 Oil absorption			%	≥9			IEC763-2
9	弯曲强度 Flexural strength	垂直层向 Vertical Sheet	纵向 MD	N/mm^2			≥100	IEC763-2
			横向 CMD				≥85	

通 用 成 型 件

General Insulating Components

一、 角环

Angle Ring and Caps

角环是用于线圈及线圈饼端部的、与电场等位线相吻合的绝缘件，以增大爬电距离和加强线圈纵绝缘强度。

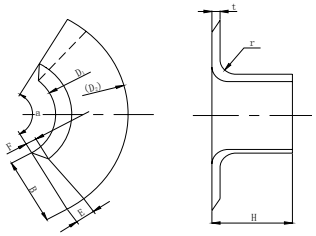
Angle Rings & Caps are Suitable for insulating top and bottom coils. If it is placed in parallel with the electrical field line, it can widen the creepage distance and strengthen insulation property on machine direction of coils

分瓣正角环
Sectors of Angle Ring

分瓣反角环
Sectors of Angle Cap

窄边角环
Angle Ring & Cap and Sectors of Edge-Insulating Angle Ring

二、分瓣正角环
Sectors of Angle Rings



适用于线圈上下端边缘部分的绝缘与等电位面平行放置，可以增大线圈的爬电距离。
Suitable for insulating top and bottom coils. If it is placed in parallel with the electrical field line, it can enlarge the creepage distance and strengthen insulation property on machine direction of coils.

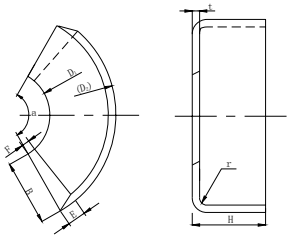
制作范围和公差 Dimensions and Tolerance(单位：㎜)

W	H	r		t			
＜200	＜200	≤40	＞40	1.0	1.5	2.0	3.0
±2	±2	±3	±5	0 +0.2	0 +0.4	0 +0.4	0 +0.6

模具分档情况 Dimensions of molds

模具中心直径	使用直径范围（常规))	使用直径范围（特殊）	分瓣数	H	W	T	R
400		375-425	4				20
450	401-500	425-475	5				10, 20
500		475-525	6				20
550	501-600	525-575	6				10, 20
600		575-625	7				20
700		675-725	7				10, 20
750	701-800	725-775	7				10, 15, 20, 50
800		775-825	7				10
850	801-900	825-875	8				10, 15, 20, 30, 40
900		875-925	8				5, 10, 20
950	901-1000	925-975	8				10, 15, 20, 30, 50
1000		975-1025	8				10
1050	1001-1100	1025-1075	9			1.0	10, 15, 20, 30, 40, 50
1150	1101-1200	1125-1175	9	≤200	≤	1.5	10, 15, 20, 25, 30, 40, 50
1200		1175-1225	9		200	2.0	10, 15
1300	1201-1400	1250-1350	10			3.0	10, 15, 20, 30, 40, 50
1400		1350-1450	10				5, 10
1500	1401-1600	1450-1550	11				10, 15, 20, 30, 40, 50
1600		1550-1650	12				15, 20
1700	1601-1800	1650-1750	12				10, 20, 30, 40
1800		1750-1850	13				5
1900	1801-2000	1850-1950	13				10, 20, 30
2000		1950-2050	14				25
2100	2001-2200	2050-2150	14				10, 20, 30
2200		2150-2250	14				10, 20
2300	2201-2400	2250-2350	15				20, 30, 40
2400		2350-2450	16				5, 10

三、分瓣反角环
Sectors of Angle Caps



适用于线圈上下端边缘部分的绝缘与等电位面平行放置，可以增大线圈的爬电距离。Suitable for insulating top and bottom coils. If it is placed in parallel with the electrical field line, it can enlarge the creepage distance and strengthen insulation property on machine direction of coils.

制作范围和公差 Dimensions and Tolerance(单位：㎜)

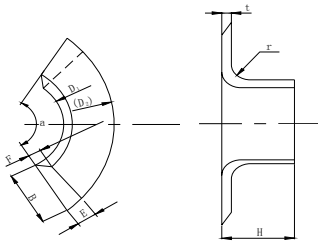
W	H	r		t			
＜200	＜200	≤40	＞40	1.0	1.5	2.0	3.0
±2	±2	±3	±5	0 +0.2	0 +0.4	0 +0.4	0 +0.6

模具分档情况 Dimension of molds

模具中心直径	使用直径范围（常规）	使用直径范围（特殊）	分瓣数	H	W	t	r
550	501-600	525-575	6	≤200	≤200	1.0 1.5 2.0 3.0	10
650	601-700	625-675	6				15
750	701-800	725-775	6				10
800		775-825	6				20
850	801-900	825-875	6				10, 15, 20
950	901-1000	925-975	6				10, 20, 30
1050	1001-1100	1025-1075	6				10, 20, 40
1100		1075-1125	7				30, 40
1150	1101-1200	1125-1175	7				10, 20, 30
1300	1201-1400	1250-1350	8				10, 20, 30, 40
1350		1300-1400	8				20, 30
1400		1350-1450	9				30
1500	1401-1600	1450-1550	10				10, 20, 40
1600		1550-1650	11				5, 20
1700	1601-1800	1650-1750	11				15, 20
1750		1700-1800	12				5
1900	1801-2000	1850-1950	12				10, 50
2000		1950-2050	13				20, 50
2100	2001-2200	2050-2150	13				10, 30
2150		2100-2200	13				10, 20
2200		2150-2250	13				10
2250		2200-2300	14				15
2300	2201-2400	2250-2350	14				20
2500	2401-2600	2450-2550	15				10
2700	2601-2800	2650-2750	16				10, 20
2800		2750-2850	18				15
2900	2801-3000	2850-2950	19				

四、 窄边正角环

Sectors of Edge-Insulating Angle Rings



适用于线圈的边缘保护，以增强电气强度小的R角可较好地与线圈导体的边缘配合。

Suitable for protecting edges of coils. The chamfer R matches very well with the edges of coil conductor.

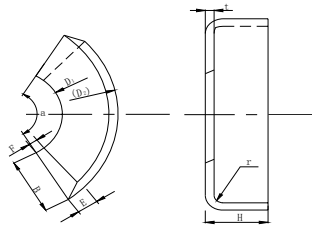
制作范围和公差 Dimension range and Tolerance

W	H	r	t		
±2	±2	±2	1.0	1.5	2.0
			+0.2	+0.4	+0.4

可供产品规格 Available dimension of products

ϕD	W≤	r	H
84	55	10	175
112	107	10	100
180	89	3	110
258	140	20	148
304	60	20	60
380	109	5	120
458	60	5	60
556	98	10	150
658	110	3	150
770	60	3	60
856	60	3	60
956	60	3	60
1054	60	3	60
1159	60	3	60
1270	60	3	60
1380	60	3	60
1488	60	3	60
1564	60	3	60
1678	60	3	60
1804	60	3	60
1900	60	3	60
2100	60	3	60
2176	60	3	60
2202	60	3	60
2332	60	3	60
2465	60	3	60

五、 窄边反角环
Edge-Insulating Angle Caps



适用于线圈的边缘保护，以增强电气强度小的R角可较好地与线圈导体的边缘配合。
Suitable for protecting edges of coil to increase its electric strength. The chamfer matched very well with the edges of the conductor.

制作范围和公差 Dimension range and Tolerance

W	H	r	t		
±2	±2	±2	1.0	1.5	2.0
			+0.2	+0.4	+0.4

可供产品规格 Available dimensions of products

∮D	W≤	r	H
465	120	10	210
584	150	5	60
700	60	3	60
784	60	3	60
880	60	3	60
968	100	4	60
1088	60	5	60
1198	120	3	60
1296	60	3	60
1392	60	3	60
1494	60	3	60
1576	60	3	60
1700	60	3	60
1780	60	3	60
1842	60	3	60
1978	60	3	60
2096	60	3	60
2210	60	3	60
2300	60	3	60
2328	60	3	60
2340	60	3	60
2475	60	2.5	60
2486	60	3	60
2514	60	3	60
2600	60	3	60
2615	60	3	60
2699	60	2.5	60

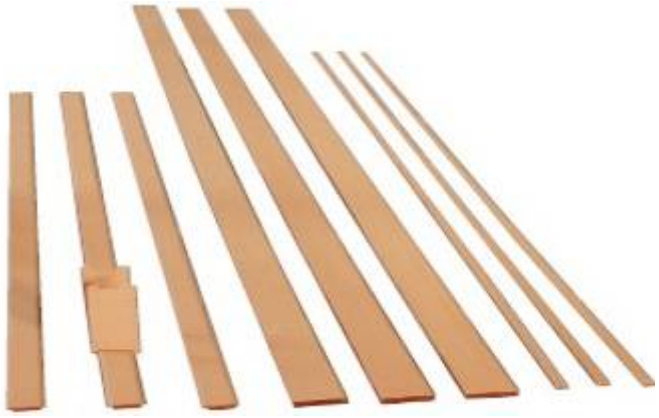
六、 撑条和油隙垫块
Strips & Milling Spacers

撑条用在线圈之间以及缠绕层之间，提供了适当精确的油道。撑条根据断面形状分类主要有矩型撑条、T 型撑条、鸽尾撑条、异形撑条，鸽尾撑条的机械强度高于“T”型撑条且不易开裂，有取代“T”撑条的趋势。

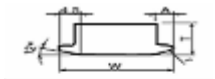
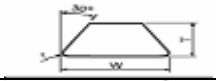
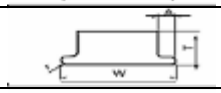
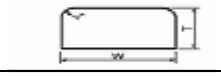
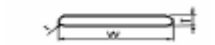
Main strips: Rectangular strips, T-strips,trapezoidal strips and other shapedstrips. Trapezoidal strips have stronger mechanical strength and split-resistanceproperty, it tends to take the place of T-strip.

公司生产的各种油隙撑条和支撑撑条具有以下特点：
高的机械强度High mechanical strength
高的电气强度High electric strength
精确的产品尺寸Precise product dimension

项 目 名 称		单 位	标准
密 度		g/cm^3	1.20-1.35
水 分		%	≤4.0
最大收缩率	任意方向	%	≤1.0
	厚度方向		≤4.0
压缩率		%	≤4.0



各类撑条的制作范围如下表 Dimension range of strips

形状 Type	厚T Thickness	幅宽W Width	r mm
A 	≥4	/	0.7
B 	≥4	≥13	0.7，1.5
C 	≥4	≥12	0.7
D 	≥4	≥6	1.0,1.5
E 	≥4	≥6	1.0,1.5
F 	1.3~3	≥80	0.7,1.5

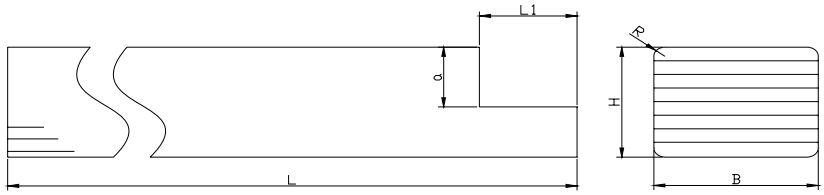
注：若超过一般制作范围，可以相互协商解决。

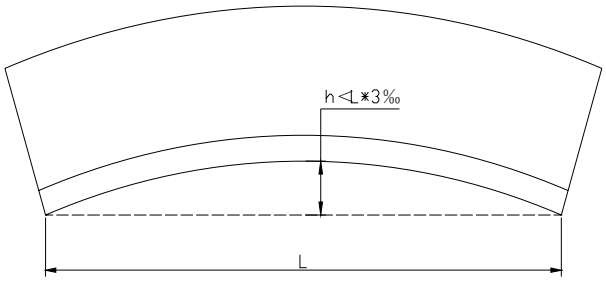
Remarks: Customer specified dimensions are available upon negotiation and confirmation between both parties.

七、矩形撑条和T型撑条

Rectangular Strips & T-strips

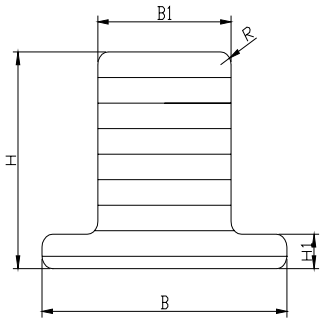
矩形撑条制作范围和公差（㎜）Dimension and Tolerance of Rectangular strips

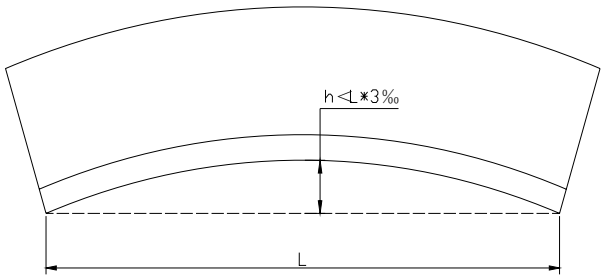




项目	厚度 H	宽度 B	长度 L	长度 L1	R角	开口深度 a	侧面弯曲度 h
指标值	±0.5	±0.5	±2.0	+5.0 0	0.5～2.0	+1.0 0	＜L 3‰

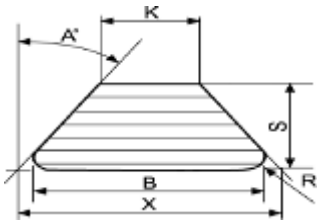
T 型撑条制作范围与公差 Dimension range and Tolerance of T-strip





项目	厚度H	厚度H1	宽度B1	宽度B2	R角	长度L	侧面弯曲度
指标值	±0.5	±0.3	±0.5	±0.5	0.5～2.0	+4.0 -1.0	＜L 3‰

八、 鸽尾撑条
Trapezoidal Strips



鸽尾撑条制作范围与公差
Dimension range and Tolerance of Trapezoidal Strips

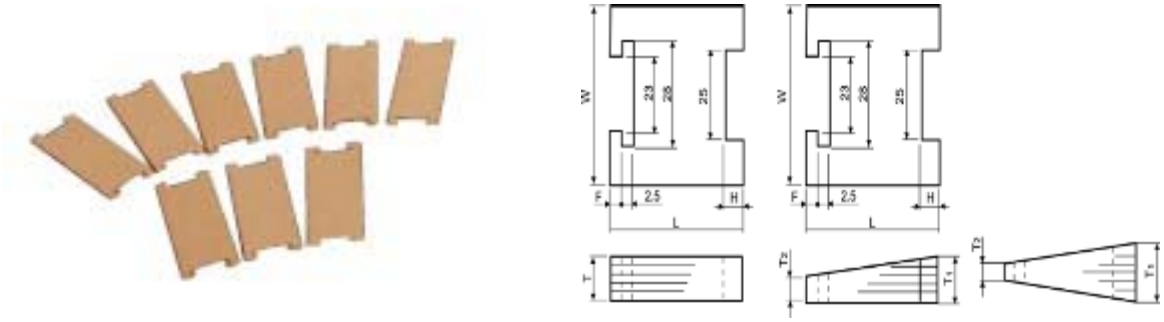
标准 Standard

尺寸 Dimension		公差 Tolerances	
厚度 Thickness	S	4≤S≤6	6＜S≤13
	偏差 Tolerance	±0.15	±0.2
宽度 Width	B	13≤B≤70	B＞70
	偏差 Tolerance	-0.7/-1.2	协商 on request
长度 Length	L	一般标准 common standard	特殊标准 special standard
	偏差 Tolerance	±100	±2
角度 Angle	A°	30°	
	偏差 Tolerance	±2°	
圆角 Round	R≈1.0		

可根据客户要求生产特殊规格

Special dimensions can be produced according to customer's request.

铣削加工油隙垫块 Milling Spacers



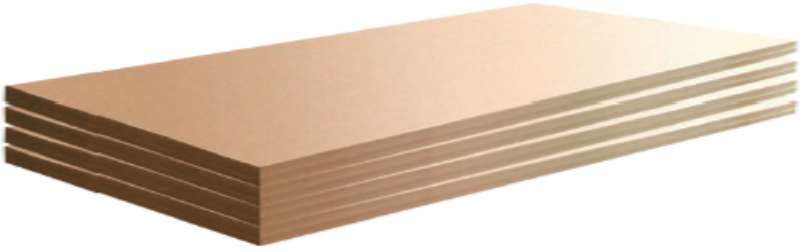
制作范围和公差 Dimension range and tolerance

长度 length	L	≤220	±1
宽度 width	W	≤80	±1
厚度 thickness	T1	≤30	±1.5
	T2	≥2	±1.5

九、 层压纸板
Laminated Board

层压纸板是用 100%未漂硫酸盐针叶木浆（电子级）为原材料的高品质绝缘纸板加上改性酚醛浸渍纸、酪素胶、聚脂胶压制面而成，与层压木相比，具有密度高、机械强度好、电气强度高、压缩系数小以及绝缘性能好等方面具有明显的优势，适用于对机械性能要求较高的电机电器设备中作绝缘结构零部件，并可在变压器油中使用。板面最大尺寸为 3200×3200mm，我司可以提供 3200×3200mm 以下，厚度 150mm 以下规格的层压纸板。

LAMINATED BOARD are produced by laminating and hot pressing of multi-layers of high-quality transformer boards(H4) together with improved phenolic resin, casein glue and Polyester adhesive. Comparing with Laminated wood, laminated boards have the advantages of higher density, better mechanical strength, higher electrical strength and lower compressibility and better insulation property strength, they are suitable to apply in generators and electrical equipment as insulation parts which requirement for high mechanical strength , they can also be used in transformer oil .The maximum dimension we can produce is 3200x3200X150mm(Thickness).



层压纸板的制作范围和公差
Dimension range and Tolerance

厚度 mm		长度 mm	公差	宽度 mm	公差
基本尺寸	误差	尺寸标准		尺寸标准	
T≤10	±0.5	2000 3000	±8	1000 2000	±8
10＜T≤20	±1.0				
20＜T≤30	±1.5				
30＜T≤50	+1.75 -1.50				
T＞50	±2.0				

主要性能指标(㎜) Main Property Standard Value

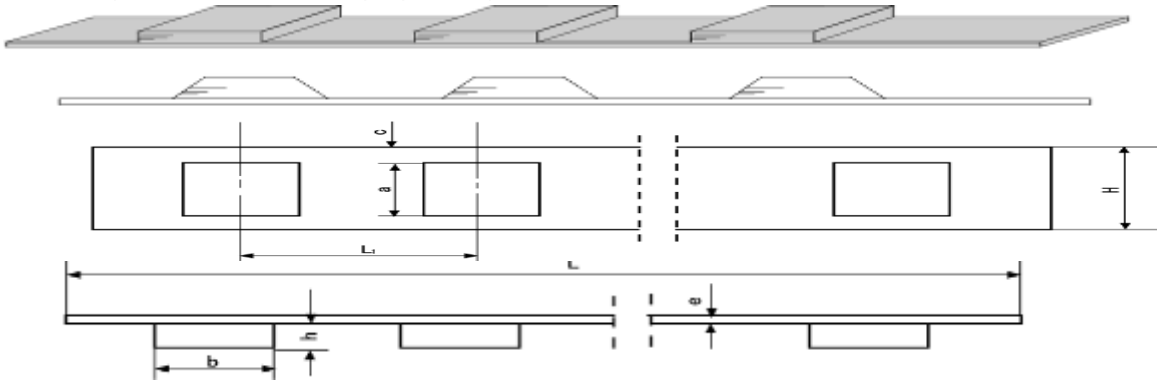
指标名称 Property		单位 Unit	指标值 Standard Value
密度 Apparent density		g/cm^3	1.20-1.35
水分 Moisture Content		%	≤4.0
收 缩 率 Shrinkage	纵向 MD	%	≤0.4
	横向 CMD		≤0.6
	厚向 thickness		≤4.0
压缩率 compressibilty		%	≤3.0
弯曲强度 Flexural strength	层垂直纵向	Mpa	≥100
	层垂直横向		≥85
水抽出物电导率 Conductivity of aqueous extract		mS/m	≤10.0
油中电气强度 Electrical strength in Oil		kV/mm	≥8.0
吸油率 Oil Absorption		%	≥5.0
灰分 Ash Content		%	≤0.6
X 光检测金属颗粒、杂质和气隙 Detection of Metal particles, foreign particles and air clearance through X-Ray scanner		-	不允许有金属颗粒、杂质和气隙

十、辐向油隙绝缘和纵向油隙撑条组合

Radial Oil Gap Insulation & Clack Bands

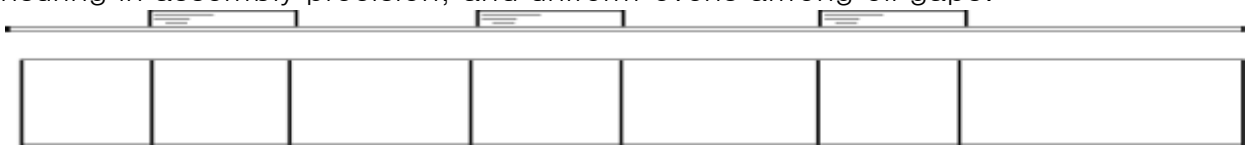
辐向油隙绝缘俗称垫块链，是大型变压器线圈的一种油隙绝缘，垫块链生产是用电缆纸为基带，粘结层压纸板垫块而成。

Radial oil gap insulation is also called as clack band. It function as oil gap insulation of coils in medium and large-scale transformers. The clack band is formed by sticking laminated spacers on cable paper tapes.



纵向油隙撑条组合是将矩形撑条排列粘接在电缆线上，主要目的更便于操作，而且更保证装配精度，保证各油隙的均匀，确是值得推荐的产品。

Longitudinal oil gap insulation (duct spacing) are formed by sticking rectangular strips on cable paper tapes. This item is strongly recommended because of easy operation, ensuring in assembly precision, and uniform evens among oil gaps.



制作范围和公差 Dimension range and Tolerance

L	±20	
L1	±1.5	
H	±1.0	
h	＜10	±0.5
	＞10 参照层压板厚度公差/Refer to the tolerance of laminated board	
a	h＜50	±0.5
	h＞50	±1.0
b	h＜50	±0.5
	h＞50	±1.0
c	±0.75	

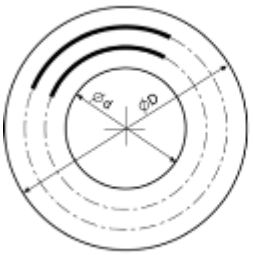
注：电缆纸厚度可根据客户的要求确定。

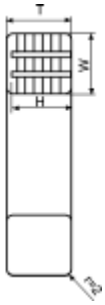
Note: Thickness of cable paper as per customer's request

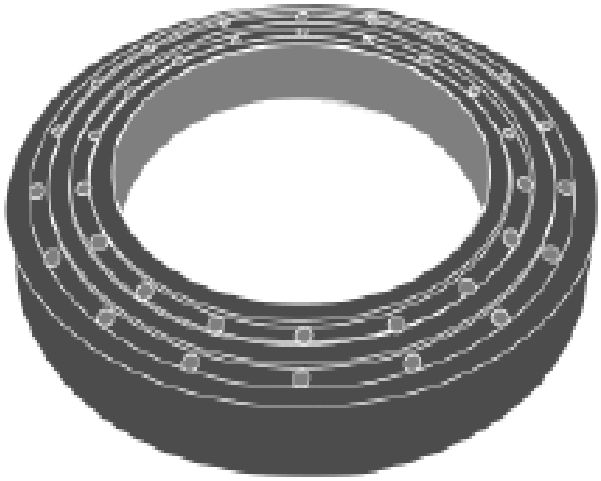
端部及引线绝缘
Snouts End Clamping and Supports Insulating Components

一、压环（压板或压圈）和静电基环
Clamping Rings and End Rings &
Stress Ring Blanks（Clamping Rings）

压环（压板或压圈） Clamping Rings and End Rings
用于压紧整个线圈以及承受短路作用力以提高整体的机械强度。
Used to clamp the whole winding coils and to bear the short circuit force, and to bear the short circuit force.







制作范围 Dimension range

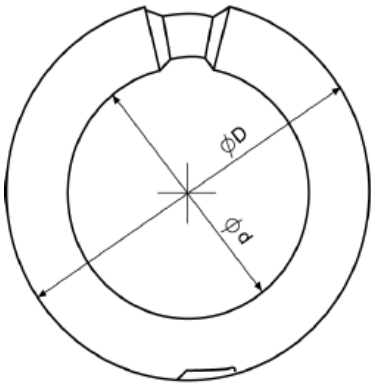
外径 Diameter	D	D＜3100
宽度 Width	W	W＞15
厚度 Thickness	T	T＜150

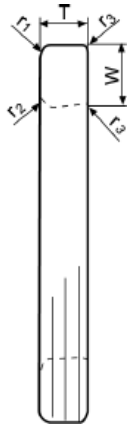
公差 Tolerance

外径 Outer Diameter	D	＜500	500-1000	1000-2000	＞2000	
		0/-2	0/-2.5	0/-3	0/-4	
内径 Inner Diameter	d	＜500	500-1000	1000-2000	＞2000	
		+2.0/0	+2.5/0	+3/0	+4/0	
厚度 Thickness	T	T＜10	10＜T＜20	20＜T＜30	30＜T＜50	T＞50
		±0.5	±1.0	±1.5	+1.75/-1.5	±2
倒圆角 Rounded finish	r	±1.5				
深度 Depth	H	+2/0				

静电基环 Stress Ring Blanks (Clamping Rings)

用作静电环绕金属带芯材，经过高精度的外形加工，并精心倒园角。
To be used as the core of stress rings to binding wire band. It has been accurately shaped and rounded.





制作范围 Dimension range

外径 Outer Diameter	D	D＜3100
宽度 Width	W	W＞15
厚度 Thickness	T	T＜150

公差 Tolerance

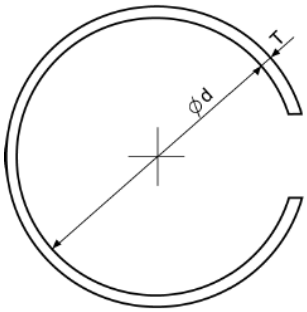
外径 Outer Diameter	D	＜500	500-1000	1000-2000	＞2000	
		0/-2	0/-2.5	0/-3	0/-4	
内径 Inner Diameter	d	＜500	500-1000	1000-2000	＞2000	
		+2.0/0	+2.5/0	+3/0	+4/0	
厚度 Thickness	T	T＜10	10＜T＜20	20＜T＜30	30＜T＜50	T＞50
		±0.5	±1.0	±1.5	+1.75/-1.5	±2
倒圆角 Rounded finish	r	±1.5				

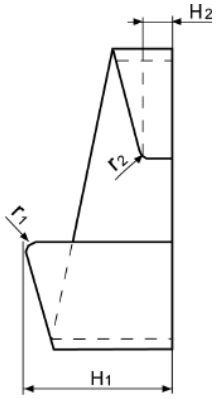
二、调节端圈和铁轭绝缘端圈
Narrow Clamping Rings and End Rings & Collars with Spacers

调节端圈 Narrow Clamping Rings and End Rings

主要用作端部线圈的护筒，主要用于绕组端部或段间，可以加工成梯形、开口的样式。
Mainly used as protection cylinder for coil ends. It can be made into bevel-shape, split-type.

制作范围 Dimensions	
内径 Inner Diameter d	d＜2000
厚度 Thickness T	T＜25
高度 Height H1	H1＜500
高度 Height H2	H2＞5
公差 Tolerances	
内径 Inner Diameter d	±5
厚度 Thickness T	±1.5
高度 Height H1	±2.0
高度 Height H2	±2.0
r1、r2	±2.5





铁轭绝缘端圈 Collars with Spacers

主要是压紧线圈的上下端部绝缘，也可以制成马蹄形。
Used for supporting end coils, also being able to be made into horse foot-shape.

制作范围 Dimensions

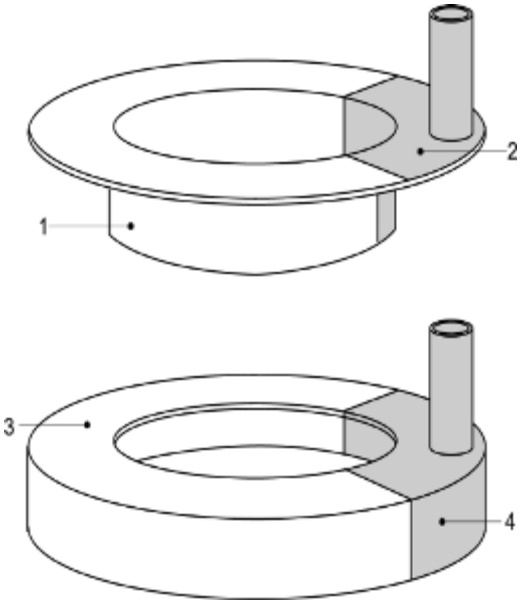
垫圈 Collars	外径 Outer Diameter D	D＜3100
	宽度 Width W	W＞15
	厚度 Thickness T1	T1＜150
垫块 Spacers	厚度 Thickness T2	T2＜150

公差 Tolerances

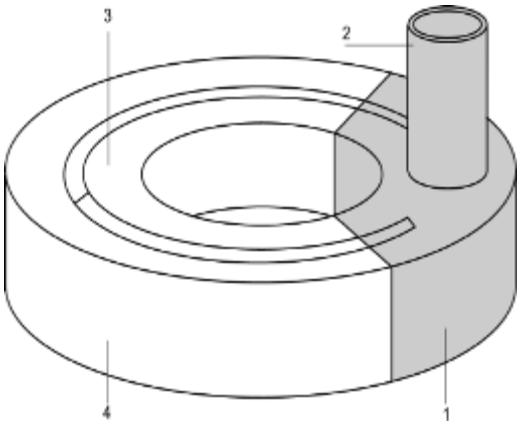
外径 Outer Diameter D	＜500	500-1000	1000-2000	＞2000	
	0/-2	0/-2.5	0/-3	0/-4	
内径 Inner Diameter d	＜500	500-1000	1000-2000	＞2000	
	+2.0/0	+2.5/0	+3/0	+4/0	
厚度 Thickness T1	T＜10	10＜T＜20	20＜T＜30	30＜T＜50	T＞50
	±0.5	±1.0	±1.5	+1.75/-1.5	±2

三、 引线角环片
Snout Angle Rings and Caps

适用于线圈顶部和底部的绝缘，其形状被设计成与电场等位面相似，从而大大减小了场强在固体绝缘件切向上的分量，这样就可以减小引线到绕组之间的绝缘间距。
Suitable for insulating at coil ends and top. It can be designed in the way similar as Electric equipotential surface which will reduce the share of electrical intensity forced on solid insulation parts, in this way, it will shorten the insulation distance between coil windings.
各类角环片与正角环和反角环的组合方法
Some combined methods for sectors and angle rings and caps:



1. 分瓣正角环 Sector of angle ring
2. 引线角环片 Snout sector
3. 分瓣反角环 Sectors of angle cap
4. 引线角环片 Snout sector



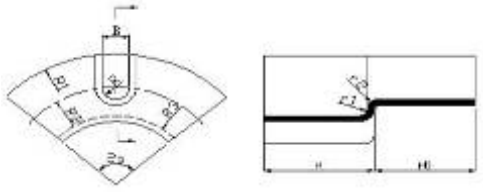
1. U形角环片 U-sector
2. 引线管 Lead tube
3. 正角环 Angle ring
4. 反角环 Angle cap

所有形式的角环片尺寸形状均可按用户要求制作
The products can be supplied according to customer's requirement.

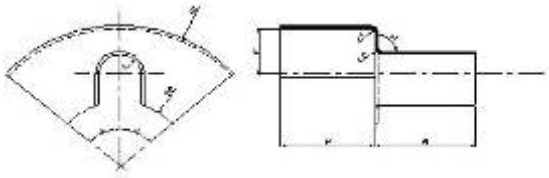
四、U 形槽保护正角环片

U-shape Snout Sectors

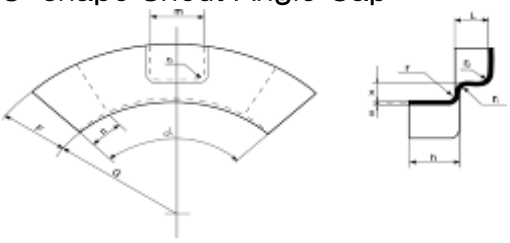
本类产品手工湿法成型。Molded by hands.



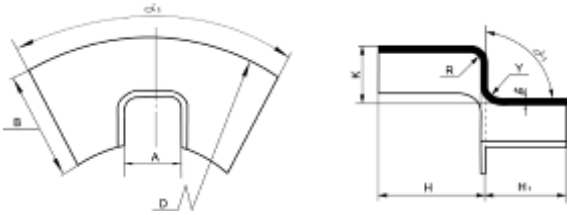
A、U形槽保护正角环片
U-shape Snout Angle Cap



B、U形槽保护反角环片
U-shape Snout Angle Ring



C、保护正角环片
Protections to Angle Rings



D、方槽保护反角环片 Channel Snout Protections to Angle Rings

制作范围 Dimension range

形状 Type

A、

R	R1	R2	R3	B	r1	r2	α	H	H1
36.5	720	567.5	507.5	73	23.5	13.5	29	250	360
42	740	557	514.5	84	32.5	13.5	29	250	550
32	720	538	505.5	64	22.5	13.5	28	250	510
18	720	594	491.5	36	13.5	12.5	49	250	370

B、

R1	R2	r	r1	r2	α	α1	K	H	H1	B
577	370	34	22.5	13.5	39	90	34.5	250	230	0
439.5	250	34	22.5	13.5	66	90	34	250	350	68

公差 Tolerance

C、

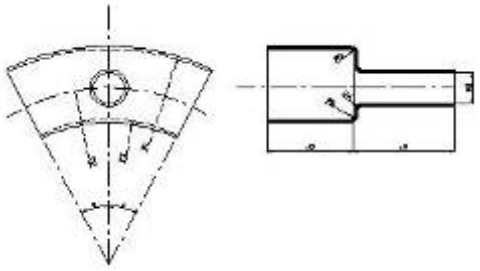
尺寸 Dimensins	m	n	F	G	a	r	r1	h	L	x	s	r2、r3
偏差 Tolerance	±3	+10 0	±3	0 -3	±2°	+4 0	+10 0	±3	±3	±3	+1.5 0	±5

D、

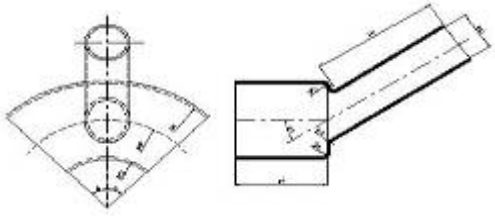
尺寸 Dimensions	H	H1	B	D	A	r	a1	a2	ζ	K
偏差 Tolerance	0/-3	0/-3	0/-3	0/-5	±4	+4/0	±2°	±5°	+1.5/0	±3

五、 直筒引线角环槽和斜筒引线角环槽
Snout and Inclined Snout Channel

本类产品手工湿法成型 Molded by hands.



直筒引线角环槽
Snout Channel



斜筒引线角环槽
Inclined Snout Channel

公差 Tolerances

直筒引线角环槽 Snout Channels

尺寸/Dimensions	H	H1	d	R1	R2	R3	R4	R5、R6	a1	ζ
偏差/Tolerance	0 -3	0 -3	+2 -1	0 -2.5	0 -0.5	0 -2.5	+10 0	+4 0	±1°	+1.5 0

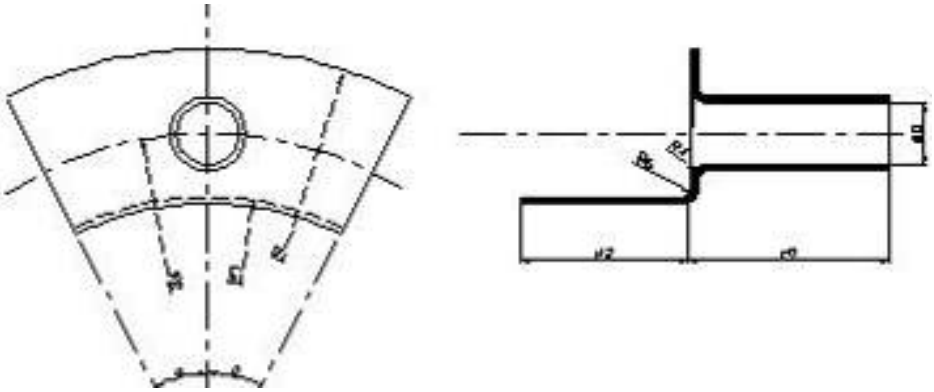
斜筒引线角环槽 Inclined Snout Channels

尺寸 Dimensions	H	H1	d	R1	R2、R3	R4	R5、R6	a1	a2	ζ
偏差 Tolerance	0 -3	0 -3	+2 -1	0 -2.5	0 -2.5	+10 0	+4 0	±1°	±5°	+1.5 0

六、 直筒和斜筒引线正角环片
Snout and Inclined Snout Sectors of Angle Ring

本产品为手工湿法成型。

Wet-form Molded by hands.



公差 Tolerances

尺寸	R1	R2	R3	D	R4	R5	H	H1	α	δ
偏差	0 -2.5	0 -2.5	0 -2.5	+2 -1	+10 0	+4 0	0 -3	0 -3	±10	+1.5 0

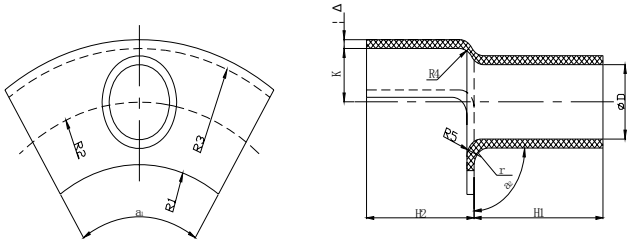
模具尺寸表 List of molds

R1	R2	R3	R4	R6	ϕD	H1	H2	α
740	585	490.5	14.5	9.5	78	300	250	32
650	520	436	13.5	19.5	58	300	250	54
740	600	515.5	10	9.5	68	250	280	35
750	614	520.5	13.5	19.5	64	520	250	39
1230	1060	970.5	13.5	9.5	108	300	250	17
1230	1060	983.5	13.5	9.5	108	300	250	17
970	803	758.5	13.5	19.8	88	250	250	27
820	681	582.5	9.5	0	64	460	250	40
780	631	535.5	14.5	9.5	78	300	250	30
635	506	431.5	21.5	17.5	38	420	250	35
655	524	453.5	13.5	9.5	38	400	250	38

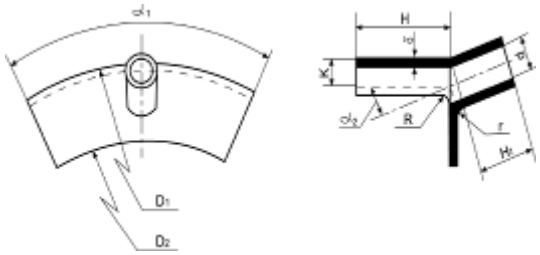
七、直筒和斜筒引线反角环片
Snout and Inclined Snout Sectors of Angle Caps

本类产品手工湿法成型 Wet molding process by hands.

直筒引线反角环片
Snout Sectors of Angle Caps



斜筒引线反角环片
Inclined Snout of Angle Caps



公差 Tolerances

尺寸 Dimensions	R	R1、R2、R3	R4	R5	r	ϕD	Φd1	Φd2	d	H	H1	H2	K	α	α1	α2
偏差 Tolerance	+4 0	0 −2.5	+10 0	+4 0	+10 0	+2 −1	0 −5	±5	+2 −1	0 −3	0 −3	+1 −3	±3	±2	±1	±5

八、 其它引线角环槽（片）
Other Snout Sectors

此类产品为手工湿法成型 Wet -rom molding by hands.

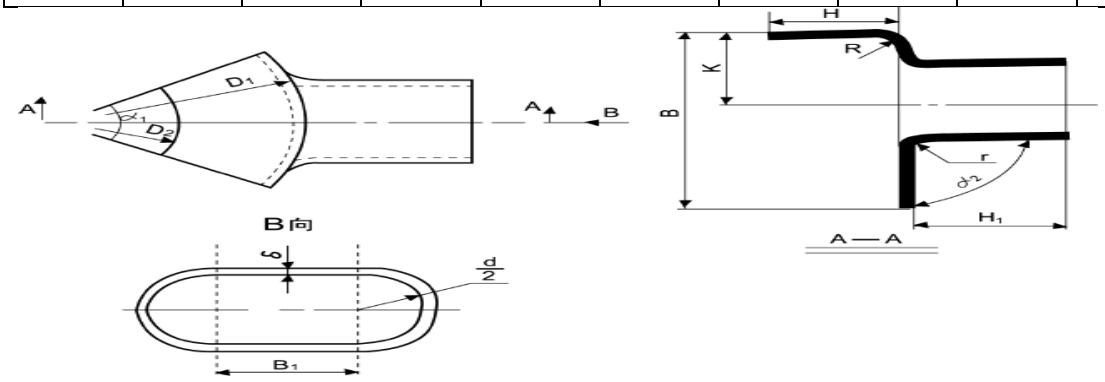
侧出式引线角环片 Cap sector with lateral snout

公差 Tolerances

尺寸 Dimensions	H	H1	B	D1	d	K	R	t	a1	a2	δ	D2
偏差 Tolerance	0 −3	0 −3	0 −3	0 −5	+2 −1	± 3	+4 0	+10 0	± 2°	± 2°	+1. 5 0	± 5

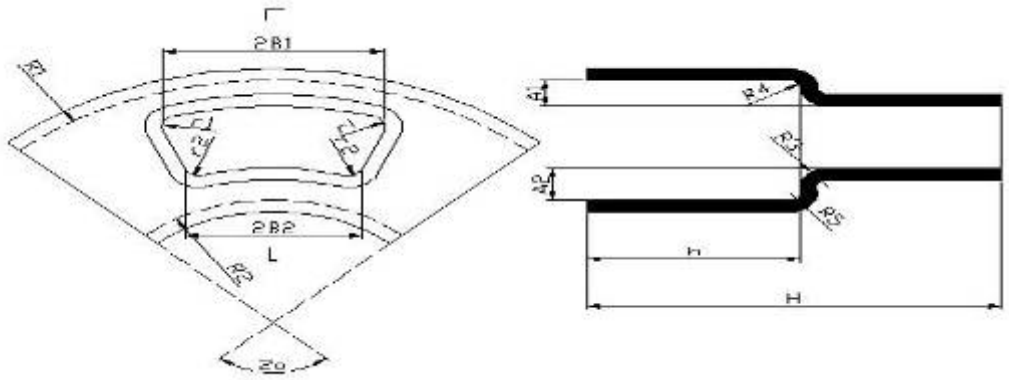
制作范围 Dimension range

H	D1	D2	D	r	R	B	B1	K	a	δ
120	ϕ1996	ϕ1692	ϕ60	R10	R30	200	55	47	30°	3
120	ϕ1992	ϕ1692	ϕ60	R10	R30	200	0	55	60°	3



扇面筒引线角环槽

Fan tube with fan channel



引线角环的规格品种繁多，产品样本上不胜枚举，各变压器生产厂家完全可以根据自己产品的需要来进行设计，我们将有能力提供你们所需要的各种形式的引线角环片（槽）。

Snout sectors are various in dimensions and shapes . we can't list them all in catalogue ,but we can design and produce as per customer specified requirements.

九、 整体角环
Angle Rings and Caps

适用于线圈上下端边缘部分的绝缘与等电位面平行放置，可以缩短线圈的绝缘距离。整体角环可分为整体正角环、整体反角环及斜头整体角环。

Suitable for insulating top and bottom coils. If it is placed in parallel with the potential, it shortens insulation distance of the coils.

本产品手工湿法成型。Wet molding process by hands.

公差 Tolerances

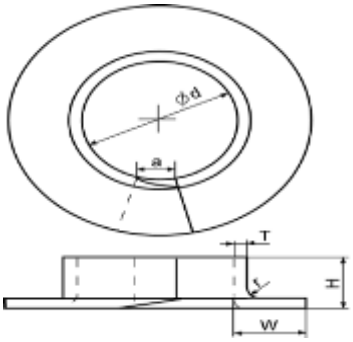
厚度t不大于6；搭接口宽a一般为a=20t+50 ±10

t≤6; overlapping width is about 20t+50, tolerance ±10

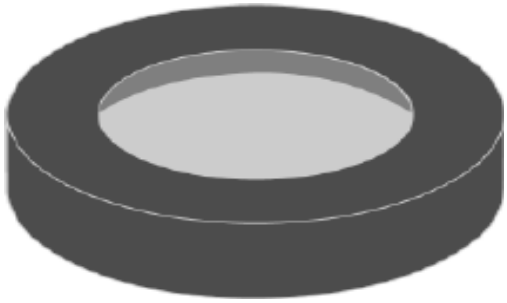
整体正角环的模具表及制作范围

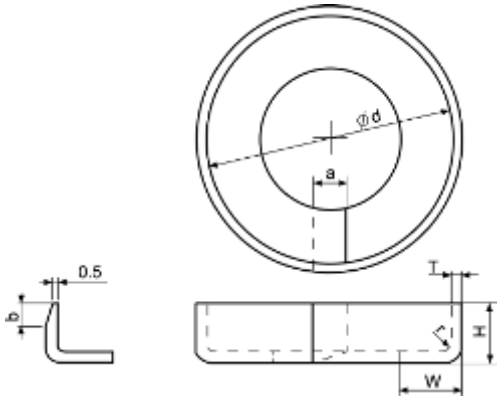
List of Angle Rings Molds & Dimensions

ϕd	ϕD	W	H	r	ϕd	ϕD	W	H	r	ϕd	ϕD	W	H	r
52	340	170	340	23.5	159	430	75	150	7.5	223	640	120	240	13.5
63	280	105	210	9	163	500	135	270	8.5	230	500	100	200	11.5
82	400	150	300	22.5	164	460	148	295	13	250	800	335	670	16
96	230	65	130	15	165	460	155	310	12.5	728	1150	135	270	23.5
98	270	125	250	18.5	168	410	130	260	8	742	1300	228	455	53.5
108	540	78	156	13.5	172	400	68	135	10	742	1300	228	455	53.5
114	400	150	300	16.5	173	450	138	275	8.5	742	1230	315	630	53
128	430	125	250	8.2	173	490	83	165	7.5	748	1150	135	270	23.5
128	430	125	250	8.5	178	370	110	220	8	891	1300	238	475	28
128	350	115	230	8.5	184	530	180	360	13	902	1500	160	320	68.5
133	440	160	320	8.5	184	400	75	150	10	1059	1400	170	340	13.5
138	390	125	250	8.5	188	590	153	305	13.5	1062	1600	125	250	28
138	320	123	245	8.5	200	420	63	125	R	1230	1780	130	260	14
143	400	160	320	8.5	217	640	120	240	13.5	1334	1700	170	340	13.5



整体反角环
Angle Caps

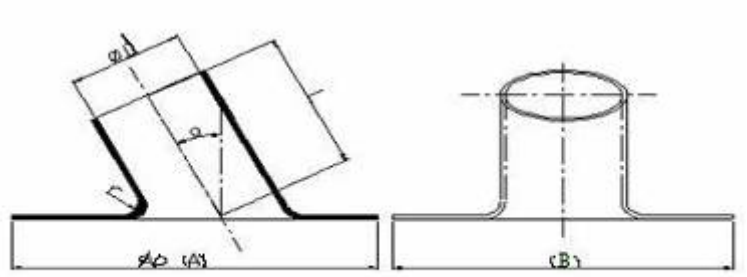




整体反角环模具表
List of Angle Caps Molds

ϕd	ϕD	W	H	r
1470	1820	175	250	9.5
1260	1845	292.5	250	9.5
1410	1850	220	250	9.5
1410	1872	231	250	9.5
1250	1890	320	250	9.5

斜头整体角环 Inclined Angle rings and caps



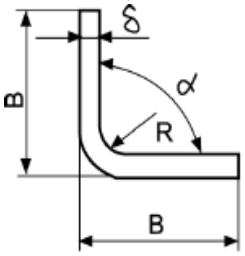
底部平面部分可制作成圆的，也可制作成边长为A与B的矩形。
Bottom flange can be to circle or rectangular shaped
模具表
Molds List

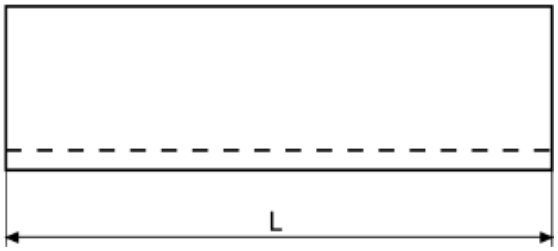
ϕd	ϕD	H	r	a
852	1200	700	73.5	67.3
814	1450	940	47.5	57

十、 L型引线支架
L-Insulating Supports

“L”型夹件绝缘俗称纸角铁，是油浸式变压器的理想夹件绝缘，它具有绝缘性能好、机械强度高、安装方便等特点，特别在 110KV 以上的大型变压器中，它更显示出直度好，不易变形等优点，是其它任何材料都难以替代的产品，同时也极具有经济性。

L-shape clamping insulation part, usually called as angle rail, is an ideal clamping insulation part for oil immersed transformers, which has the benefits of good insulation performance, high mechanical strength and easy assembly. Especially when the rail is used in large-scale transformers more than 110KV, its advantages of straightness and shape stability are more obvious, for which we can hardly find substitutes, in addition, it is more economical.





性能提标 Property

性能 Property		单位 Unit	指标 Standard Value
紧度 Density		g/cm3	1.2-1.3
水分 Moisture Content		%	＜7.0
灰分 Ash Content		%	＜1.0
水抽出物 PH 值			5.5-9.0
电导率 Condudivity of Aqueous Extract		Ms/m	＜8.0
击穿电压 Electrical breakdown strength	油中 In Oil	kv/mm	＞29
	空气中 In air	kv/mm	＞7.5

尺寸及公差 Dimension range and Tolerances

长度 Length	L	＜4000	±20
厚度 Thickness	δ	＜12	±15
宽度 Width	B	＜190	±2.0
角 Angle	a	90°	±2.5°

其上的固定孔、压板部位打孔或铣槽，用户可根据需要自行配作。

本产品应用双层塑料薄膜封装，应注意防潮，其它技术标准参照本公司标准执行。用户有超长规格或超出正常厚度规格的产品可以面洽。

层压纸角板抗弯强度试验图表。

As for the mounting hole, the hole or groove for the clamping plate, they should be prepared by the customer according to his own needs.

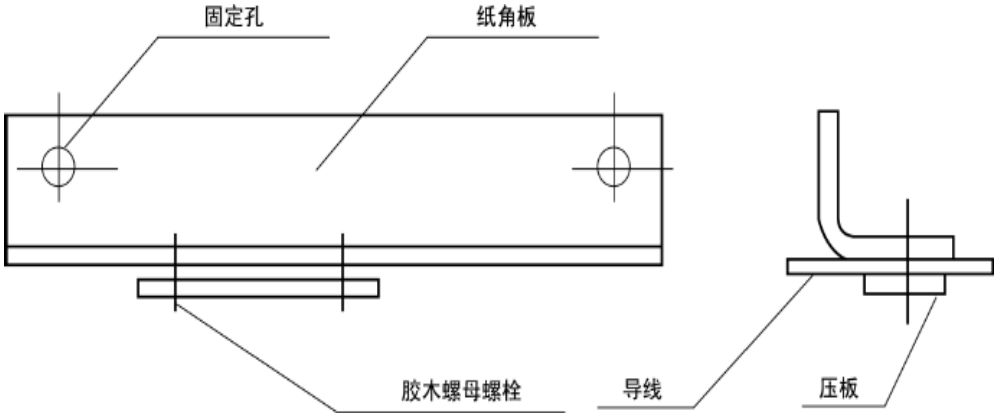
The product should be packed with double layers of plastic film to protect it from dampness, as for other technical standards, please refer to company standards.

If the customer requests specification which are excessively long or thick, it can be solved through discussion.

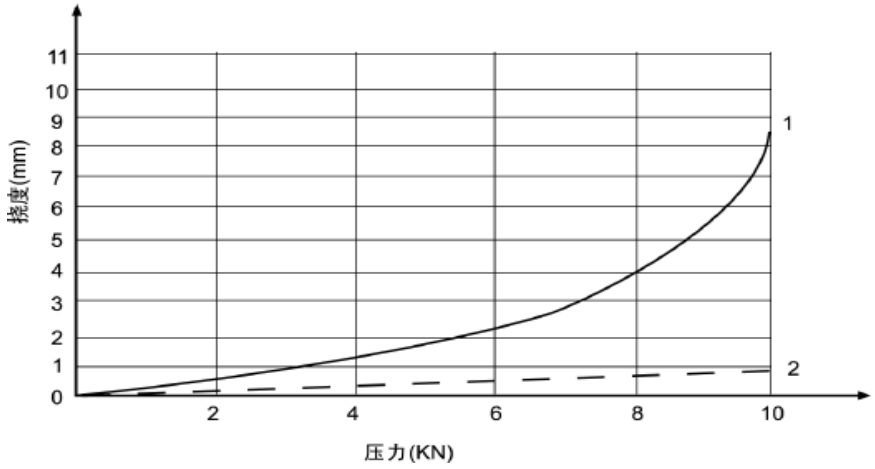
Test chart of bend strength .

本产品安装示意如下:

The installation sketch map of product as follow:



下图中：1、挠度曲线 deflection curve　2、残余变形曲线 residual deformation curve



出 线 绝 缘

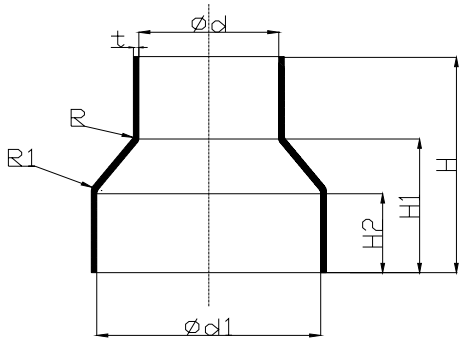
Flange insulation

一、绝缘筒 Tubes

泛指各类带有筒子的绝缘构件，主要作出线部分的绝缘构件。
General tube (or pipe) shape parts , mainly as lead exit .

1、绝缘筒

本产品为手工湿法成型 Wet molding process by hands



尺寸公差 Tolerance

尺寸	d		d1		H	H1	H2	t	R	R1
	⩽200	＞200	⩽200	＞200						
偏差	+3 0	+4 0	+3 0	+4 0	+4 0	+4 0	+4 0	+1.5 0	+10 0	+4 0

模具情况 Dimensions of molds

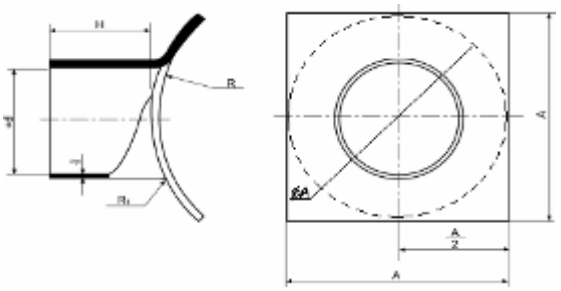
圆筒 Tubes	ϕd	H	δ	ϕd	H	δ	ϕd	H	δ
	224	650	3	170	650	3	118	400	3
	264	700	3	88	400	3	158	400	3
台阶筒 A ReducingTubes A	d	d1	H	H1	H2	δ	R	R1	
	78	120	295	130	80	4	10	14	
	174	280	425	287	195	4	30	44	
	202	308	425	295	203	4	30	44	
	240	346	425	306	214	4	30	44	
	212	346	440	336	220	4	30	44	
	174	308	440	325	209	4	30	44	
	180	450	660	530	365	4	30	54	
台阶筒 B ReducingTubes B	ϕD	ϕd	Φd1	h	h1	h2	R1	R2	
	428.6	106	78	640	370	115	13.5	19.5	
	428.6	126	98	640	370	115	13.5	19.5	
	428.5	136	108	640	370	115	13.5	19.5	
	430.7	180	148	645	370	120	15.5	19.5	
	433.6	108	80	600	330	115	13.5	19.5	
	435.5	118	90	610	330	125	13.5	19.5	
	432	154	126	620	340	115	13.5	19.5	

二、出线绝缘筒(上圆下方等)
Flange Tubes

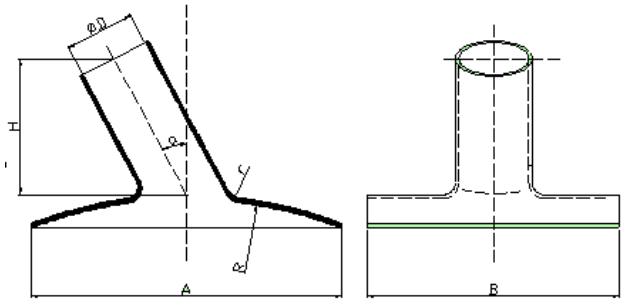
本产品为手工湿法成型 Wet-form molding by hands

出线绝缘筒（上圆下方等）

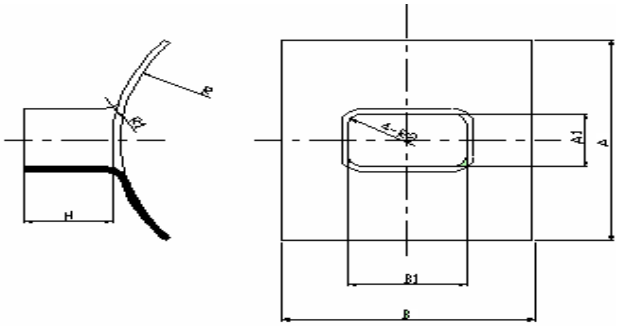
上圆下方(上圆下圆),图中虚线所示为剪成下圆时的形状
Flange Tubes (hat tubes)



斜头上圆下方
Tilted Flange Tubes



上方下方
Square flange tubes



尺寸公差 Dimension Tolerance

尺寸	d	δ	H	R	R1	A	A1
偏差	+3 0	+1.5 0	+10 0	± 2	+10 0	± 2	+3 0

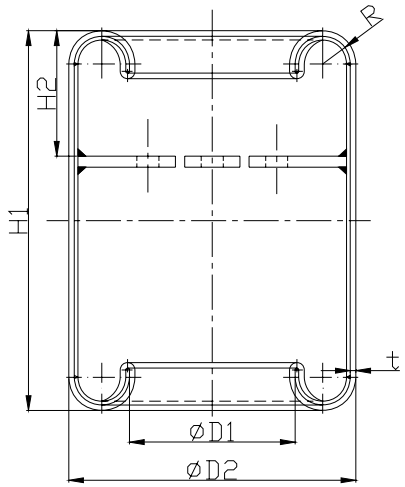
三、均压球和均压管
Equalizing Ball & Equalizing Tubes

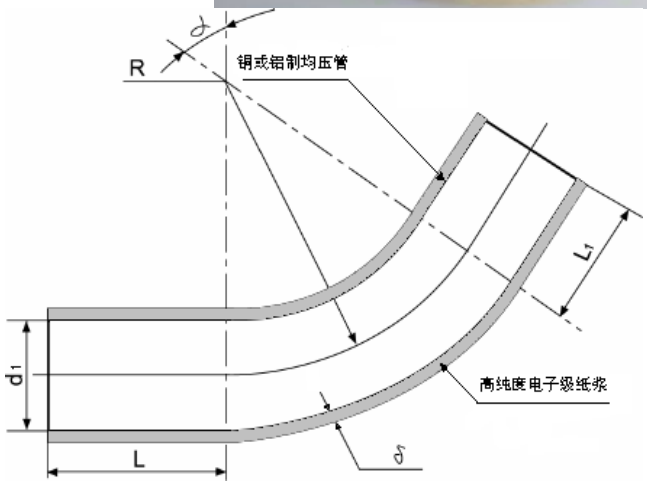
此类产品以铜板扳金制成的均压球或铝板压延制成的均压球为基础，外敷绝缘纸板制作而成。通常均压球（管）的形状及尺寸均由用户提供，也可由用户直接提供铜（铝）制成品进行敷纸。

These products are made by laminating wet pressboard sheets on the outside of copper plate or aluminum plate ball. Usually the inside Copper or aluminum ball should provided by customers.

本产品为手工湿法成型。

Wet-form molding by hands





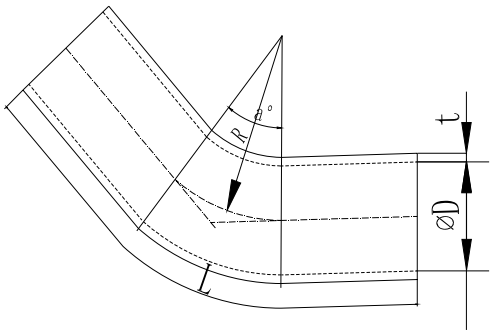
公差 Tolerances

尺寸 Dimensins	D	d	H	d1	L	L1	R	a	δ
偏差 Tolerance	+3 -2	+2 -3	±3	±1	±3	±3	±3	±1°	+2 0

四、弯管
Bend Tubes

用于各类均压管（球）外，以提高整体绝缘性能的绝缘构件。 Appliance for shielding various of equalizing ball and tube to increase insulation capacity.

本产品为手工湿法成型 Wet molding process by hands



模具制作范围 Dimensions range of molds

模具制作范围和尺寸公差

Dimensions range and Tolerances of molds

产品类型 type	d	d1	L	L1	L2	R	R1	R2	R3	A	r	δ	α
形状 A Type A	86		140	300		100						3	9.5°
	86		140	300		100						3	8°
	104		140	300		100						3	6.5°
	104		140	200		100						3	10°
	104		140	200		100						3	12°
	104		140	300		100						3	8°
	104		140	300		100						3	9.5°
	126		100	250		100						3	12.7°
	126		100	250		100						3	9°
	144		140	300		100						3	6.5°
	144		120	160		100						3	10°
	144		120	160		100						3	12°
	144		140	250		100						3	8°
	144		140	250		100						3	9.5°
形状 D Type D				300	100		26	33	85	90			
				550	100		26.5	33	86	90			
				450	200		27.5	33	88	190			
形状 E Type E	188	314	300	220		152	54				40	4	110°
	160	286	226	213		152	68				40	4	110°
形状 F Type F	188	314	150	260	85	152	54				40	4	70°
	160	286	150	250	90.5	152	68				40	4	70°

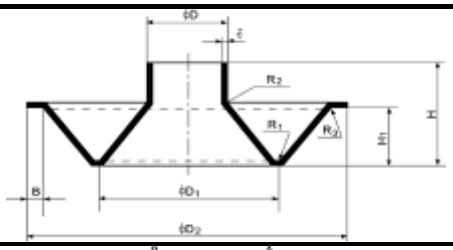
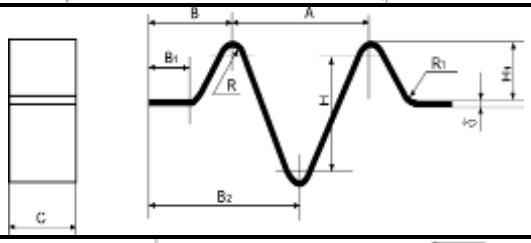
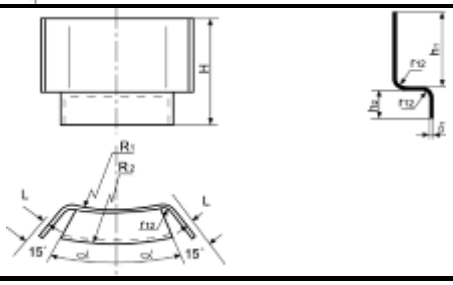
尺寸	d	D	d1	L	L1	L2	R	R1	R2	R3	A	B	C	r	δ	α	β
偏差	+3	+3	+3	+5	+5	+5	+4	+5			+5	+5	+5	+5	+1.5	±3	±3

弯管类产品均采用湿法手工成型，为了装配的方便，大部分以半片成型或整体成型然后锯割成两个半片的方法制成。

Wet molding process by hands. To be shaped in open scarfed overlapped or buff-jointed.

五、波纹栅（板）及绝缘紧箍
Faltenbalg (Waves) & Clamps

此类产品主要用于间接式出线 For indirect lead exit

波纹栅 Faltenbalg		
波纹板 Waves		
绝缘紧箍 Clamps		

波纹栅、波纹板和绝缘紧箍 Faltenbalg and Waves and Clamps

尺寸 Dimensions	D	D1	D2	H	H1	B	R	ζ	
偏差 Tolerance	+5/0	± 2	+6/0	+6/4	± 5	+3/0	± 5	+1.5/-1	
尺寸 Dimensions	H	h1	h2	R1	R2	a	ζ	R	
偏差 Tolerance	± 4	± 2	± 2	± 3	± 5	± 1°	+1.5/-1	± 3	
尺寸 Dimensions	A	B	B1	B2	H	H1	R	ζ	C
偏差 Tolerance	± 3	+5/0	+3/0	+6/-1	± 3	± 4	± 5	+1.5/-0.5	± 2

模具制作范围 Dimension range of molds

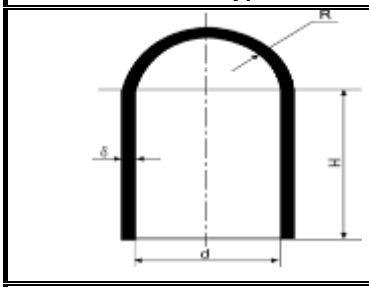
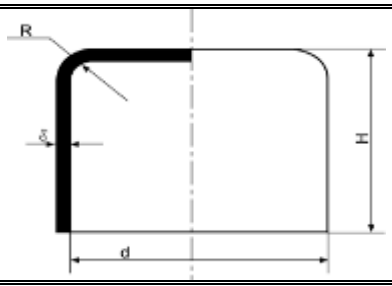
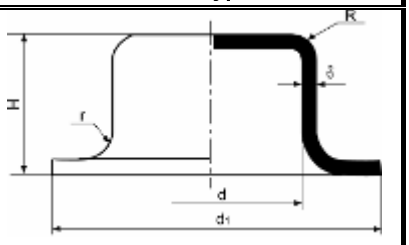
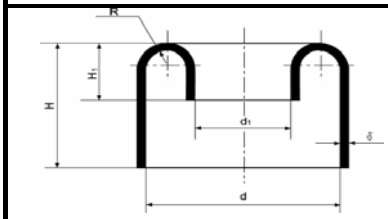
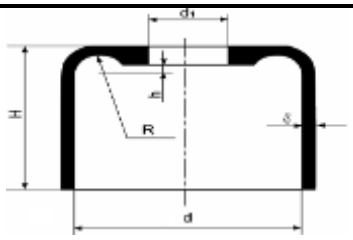
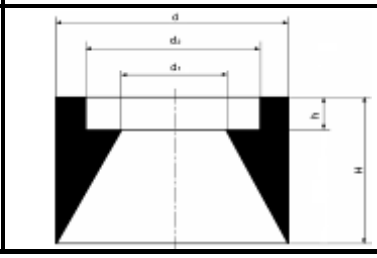
D	D1	D2	H	H1	R1	R2	R3	B	ζ
ϕ 268	ϕ 600	ϕ 1024	270	180	R30	R30	R30	60	10
ϕ 306	ϕ 600	ϕ 1024	270	180	R30	R30	R30	60	10
ϕ 306	ϕ 600	ϕ 1024	400	355	R10	R20	R15	132.5	8
H	h1	h2	L	R1	R2	a	ζ		
248	146	90	15	R94	R146	45°	12		
282	180	90	15	R91	R165	45°	12		
A	B	B1	B2	H	H1	R	ζ	C	
150	115	60	90	148	84	10	20	100	

保 护 绝 缘
Protections Insulation

一、绝缘罩 Bushing

用于导出系统的绝缘，手工湿法成型。

To be used for insulating leads. Wet-form molding by hands.

形状 A Type A	形状 B Type B	形状 C Type C
		
形状 D Type D	**形状 E Type E**	**形状 F Type F**
		

公差 Tolerances

尺寸 Dimensions	d	d1	d2	H		H1	h	δ		R	r
偏差 Tolerance	+3 0	+3 0	+2 0	＜50	±1	±5	±2	⩽3	+1.5 0	±2	+10
				50-200	±2						
				＞200	±5			＞3	+2 0		

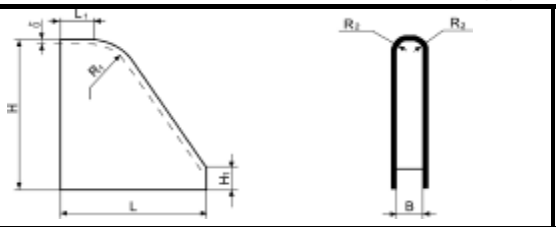
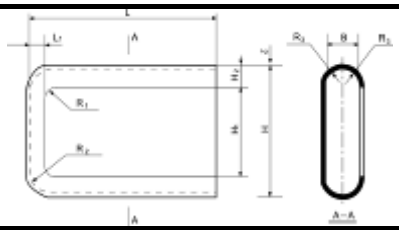
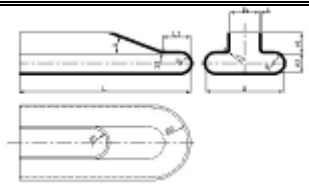
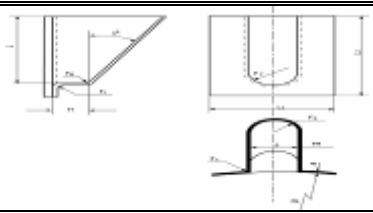
制作范围 Dimensions of molds

尺寸 Dimensions	d	d1	d2	H	H1	h	δ	R	r
形状 A Type A	56			120			3	28	
形状 B Type B	94			140			5	5	
	70			140			5	5	
	114			180			4	5	
形状 C Type C	52	95		30			4	9	5
形状 D Type D	90	60		170	40		4	6	
	52	28		200	40		4	3	
	115	65		100	40		4	10	
	74	44		100	40		4	5	
形状 E Type E	30	71		80		5	6	8	
形状 F Type F	58	36	50	50	10				

二、护套 Protectio

此类产品用于对金属凸出部位的绝缘保护。 To be used for protecting outshoot of metal parts.

此类产品为手工湿法成型 Wet molding process by hands

	
形状 A Type A	形状 B Type B
	
形状 C Type C	形状 D Type D

公差 Tolerances

尺寸 Dimensions	L,L1,B,B1,H,H1		δ		所有 R 及 r	α
偏差 Tolerance	＜50	±1	⩽3	+1.5 -0.5	±2.5	±2°
	50-250	±2				
	250-1000	±3	3-5	+2.0 -0.8		
	⩾1000	±5				

制作范围 Dimensions of molds

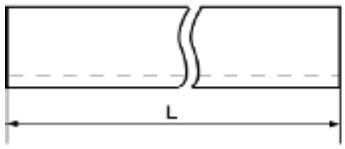
尺寸 Dimensions	L	L1	L2	B	B1	H	H1	H2	δ	R	R1	R2	R3	r1	r2	α
形状 A Type A	300	50		25		200			2		36	12				
形状 B Type B	300	25		26		222	26		2		25	25	12			
	490	35		50		413	35		5		25	50	20			
	500	50		80		313	50		3		25	65	35			
	180	30		25		160	30		3		25	25	12			
形状 C Type C	430	43		99	22		120	28		14	11	49.5		12	12	30
	540	38		99	22		120	28		14	11	49.5		12	12	25
形状 D Type D	特殊定制								3-5							

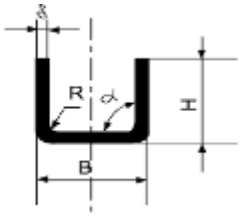
三、拉带绝缘和绝缘环
SmallChanneU-Shape Ring

拉带绝缘 Small Channels

本产品模压成型

Compression molding





公差 Tolerances

尺寸 Dimensions	B			H	L	R		a	δ
	＜20	20-50	＞50			＜5	⩾5		
偏差 Tolerance	±0.5	±2	±3	±1.5	±5	±0.5	±1	±1.5°	±0.5

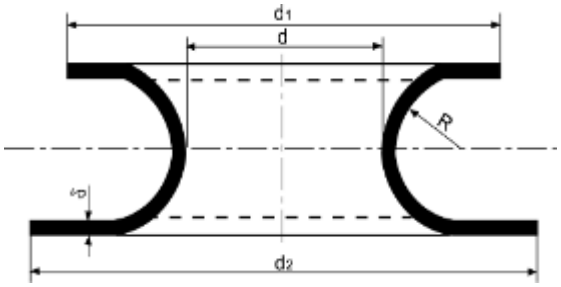
制作范围 Dimension range of molds

B	H	L	R	α	δ
38	20	600	2	90°	3
42	20	600	5	90°	4
65	30	600	2	90°	2
95	30	600	2	90°	2
206	35	550	0.5	135°	1.5
226	20	300	2	90	3.0
230	20	590	2	90°	3
245	35	450	0.5	135°	1.5

绝缘环 U-Shape Ring

本产品手工湿法成型

Wet molding process by hands



公差 Tolerances

尺寸 Dimensions	d	d1	d2	R	δ	坡口 scarf	分瓣角度 Degree of segment
偏差 Tolerance	+3 0	±2	±2	±1.5 0	+1.5 -0.5	+20 0	±5°

模具制作范围 Dimension range of molds

ϕd	Φd1	Φd2	R	δ
934	1139	1135	64.5	3

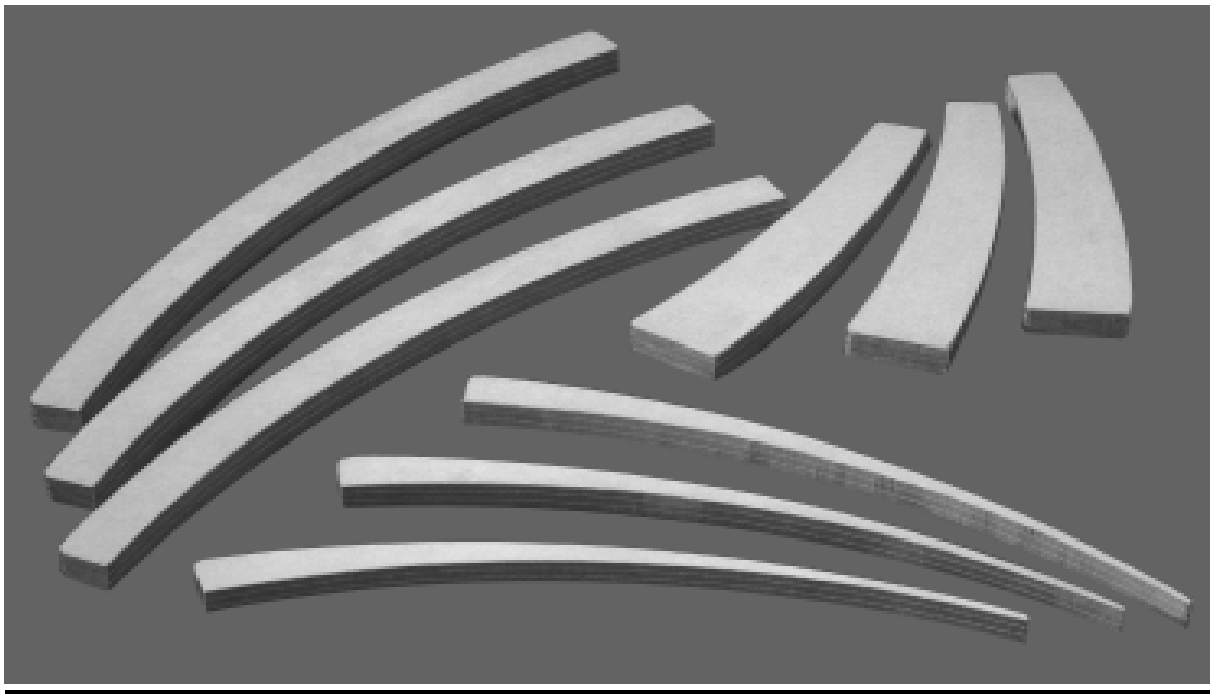
异型绝缘支撑件
Special shape Insulating Supports

绝缘紧固件、绝缘夹件及各种异型层压制品

Tightened insulation Parts, Clamp insulation Parts, various special shape Laminated Products

此类产品是借助各种模具热压成型的各种层压制品，如绝缘螺栓（杆）、绝缘螺母、各种夹箍、异型垫块、弧型垫块等。它是由变压器厂家根据需要自行设计。总之，应用绝缘纸板和树指胶纸，利用各种模具能产生各种各样层压制品，可以说应有尽有，在此不作一一详细介绍。

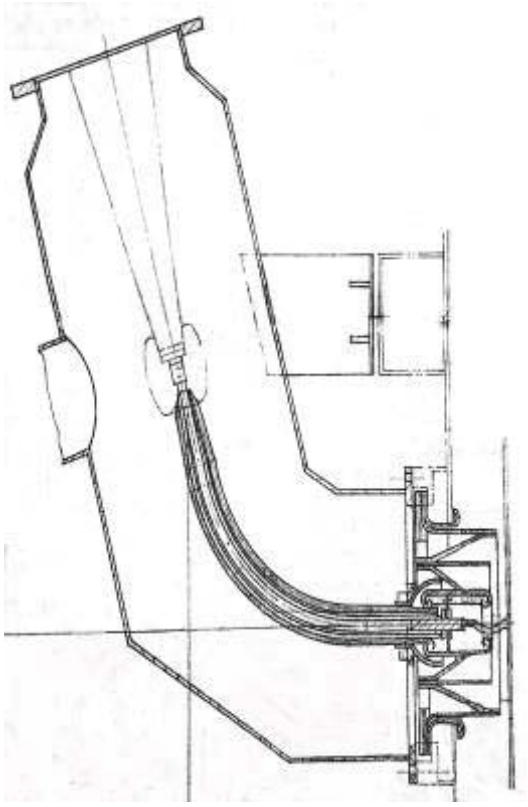
Products such as insulation bolts, screw rods, screw nuts, clamps, special shape spacers, arc spacers are made of laminated boards through different molds. They can be designed by transformer manufacturers. We can produce all kinds of laminated components. Here we will not make detailed introductions.

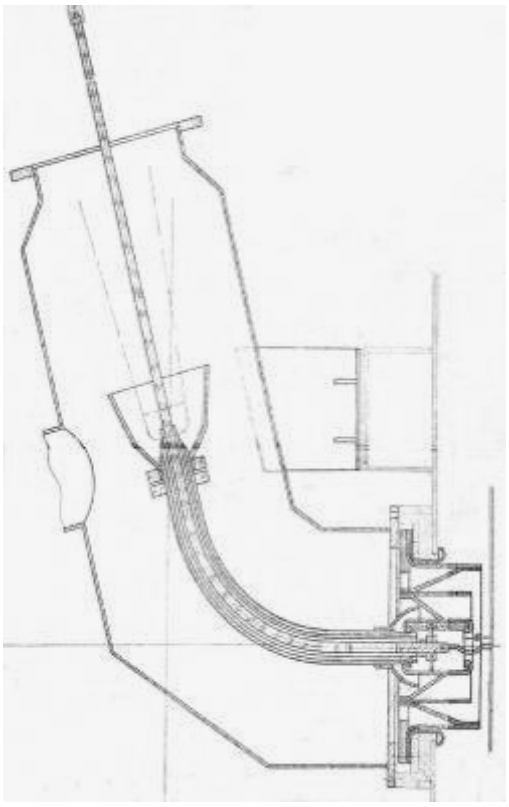


各类成套出线装置及绝缘部件
Set Assembly Lead Exit and Insulation Parts

一、220KV成套出线装置及绝缘部件

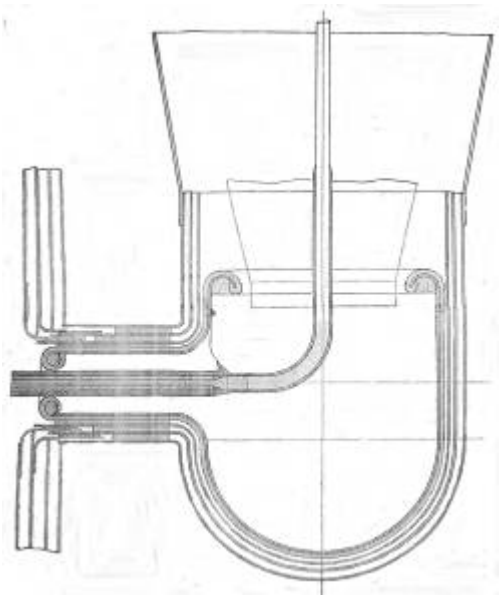
Set Assembly Lead Exit and Part 200KV Protections

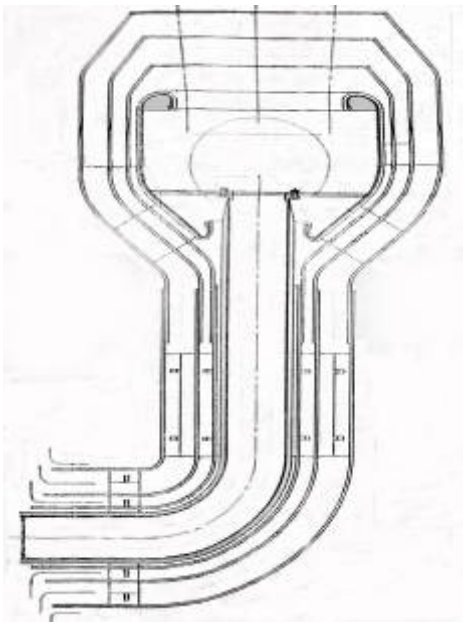


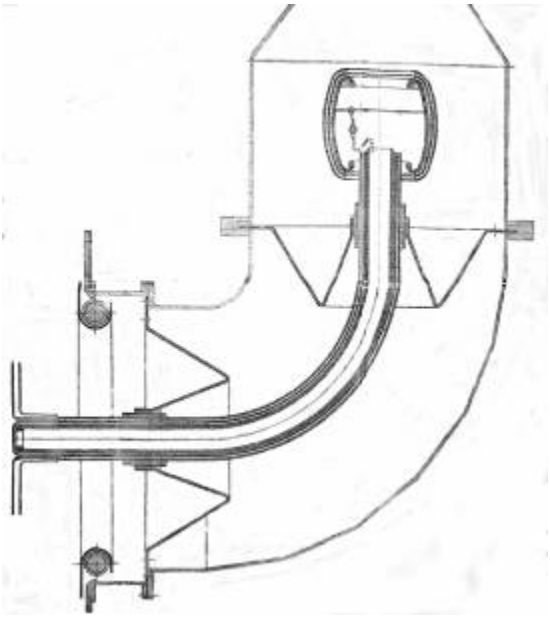


二、 500KV 成套出线装置及绝缘部件

Set Assembly Lead Exit and Part 500KV

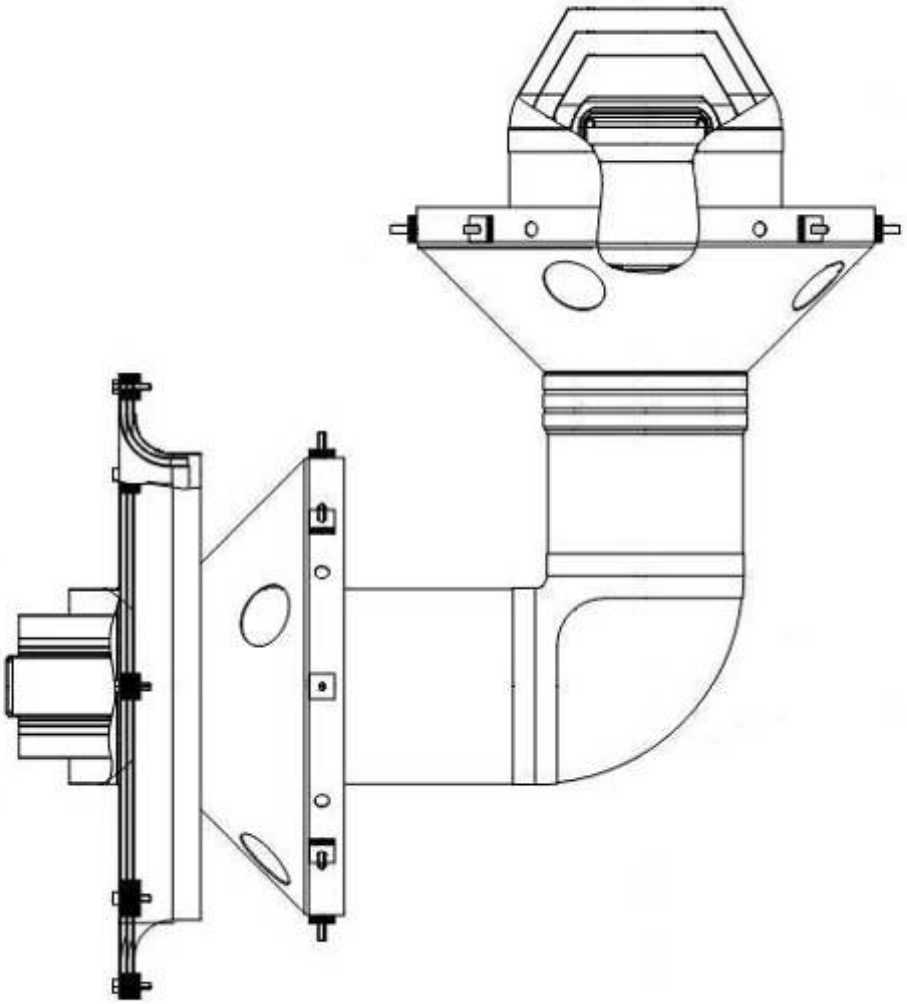






三、 1000KV成套出线装置及绝缘部件

Set Assembly Lead Exit and Part 1000KV



生产车间及部分生产设备图片

A parts of equipments pictures

绝缘纸板生产车间 Insulation board production workshop

左侧生产线为6.4m*3.2m，生产厚度为1.0-6.0mm,配备德国CASSEL X射线在线检测仪，年产能12000吨

The left side of the production line is 6.4m * 3.2m, production of a thickness of 1.0-6.0mm,with the German the CASSEL X-ray detector,the annual capacity is 12,000 tons

右侧生产线为4.4m*2.26m，生产厚度为0.8-10.0mm,配备德国CASSEL金属粒子在线检测仪，年产能5000吨

The right side of the production line is 4.4m * 2.26m,with a line detector of the German the CASSEL metal particles,the annual capacity is 5,000 tons

绝缘成型件生产车间

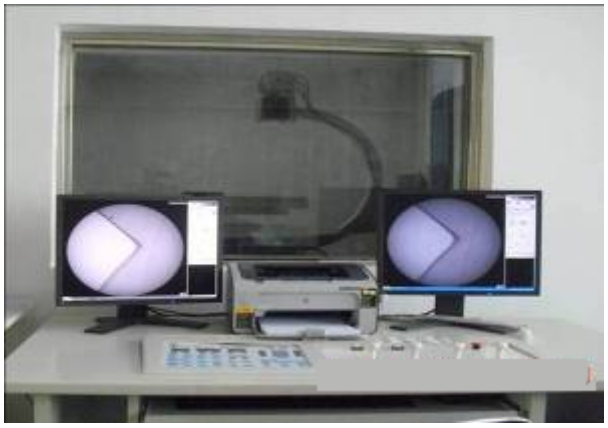
Molded insulation production workshop

4500T层压纸板热压机
幅面3.5m*3.5m 月产能40吨
Laminated board 4500T
Hot pressing machineProduction
Capacity: 40tonne/mth

台湾恩德3.5m*3.5m四轴联动加工中心
月加工能力25吨
Taiwan Ende 3.5m*3.5m four shaft
linkage processing center
Production Capacity: 25 tonne/mth

德国威力多根全自动撑条机，可一次刨面、倒角、去毛刺、成型，月产能30吨
Germany Weili automatic Strips machine Production Capacity: 30 tonne/mth

X射线检查机　可检测产品内部≥0.2mm异物
X-ray detector Able to detect 0.2 mm metal particles.



自动垫块机automatic spacer machine
月加工能力20吨
20 tons/month

卷圆机 rolling machine
卷辊直径140㎜ 长度2500㎜
Diameter:1400mm,length:2500mm

热粘机 hot adhesive machine
直径范围700-2800㎜
Diameter range 700-2800mm
最大长度2500㎜ 宽度140㎜
Max. longth 2500mm width140mm

坡口铣销机bevel cutting machine
最大长度3500㎜ 最大宽度1400㎜
Max. longth 3500mm
Max. width 1400mm

部分绝缘件图片

Pictures of insulation components

绝缘成型件Insulation Components

整体正角环Edge-insulation Angle Ring

湿法成型绝缘筒 Non-conventional wet forming components

弯管 Bend Tube

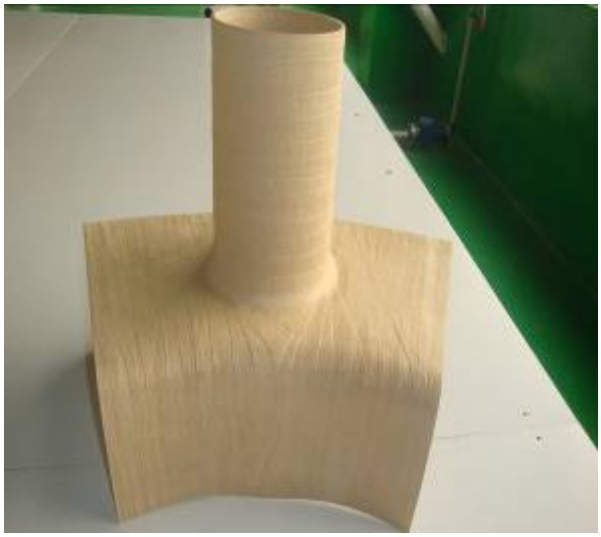
绝缘筒 Bend Tubes

出线绝缘筒 Flange Tubes

均压球 Equalizing ball

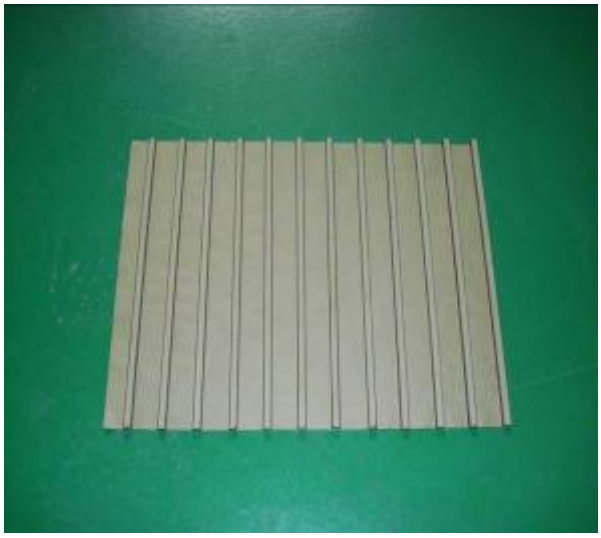
均压球 Equalizing ball

引线角环片
Snout Angle Rings and Caps



引线角环片
Snout Angle Rings and Caps

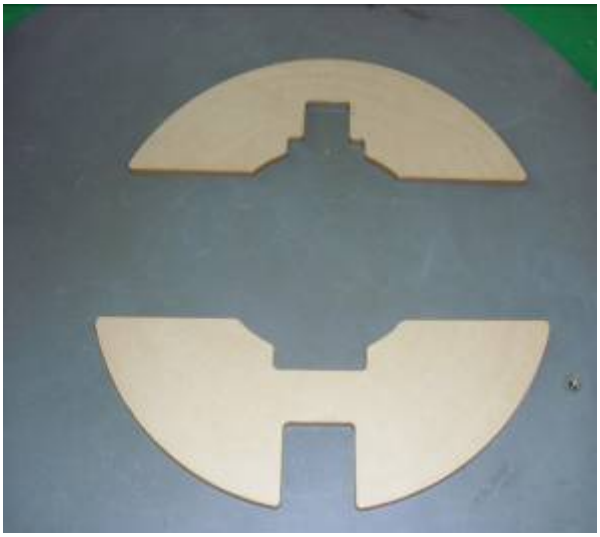
绝缘油道 Insulation duct spacing



窄边角环 Angle Ring and Caps

压板　Clamping Rings

压板　Clamping Rings



铁轭绝缘端圈 Collars with Spacers

铁轭绝缘端圈 Collars with Spacers

斜端圈　End Rings

燕尾撑条 Trapezoidal Strips

T 型撑条 T-shape Strips

垫块 Milling Spacers

导线夹 Wire clip

L 型夹件绝缘件 L-shape Clip

压钉碗 Equalizing bowl

压板和铁轭绝缘端圈 Clamping Rings

绝缘筒 Bend Tubes

层压木支撑板
Laminated Wood Supporting Plate

阶梯木
Laminated Wood Support

薄电绝缘纸系列产品
Thin electrical insulating series products

菱格上胶绝缘纸(DDP)　Lozenge shape insulation paper

菱格上胶绝缘纸是将特种改性环氧树脂呈菱格状涂覆在电工绝缘纸上的绝缘材料。

The product is one kind of insulation material which is painted by specially modified epoxy resin.

产品广泛地用于油浸式电力变压器的层间绝缘及匝间绝缘，使用时涂覆层在线圈干燥过程中在一定温度时开始熔化，产生粘附作用，随着温度的升高又开始固化，使绕组的相邻各层可靠地粘合成一个固定单元。环氧树脂的粘合强度足以防止短路时绕组各层的位移，从而保证了绝缘结构长期的电气和力学性能。由于菱格上胶绝缘纸的树脂涂层呈点状，保证了油的浸入和绝缘材料中气体的排除，有效地避免电晕和局放，从而保证了绝缘结构的安全、可靠。

The products is widely used for layer insulation and turn-insulation of oil immersed transformer, when they are painted and coils are drying, along with the rising temperature, they are melt, and bringing adhering function, with the higher temperature, they become solidify, making winding coil adhere together into one unit. The adhere strength of epoxy resin could avoid to change coil position when electric power short out, so that make sure insulation material in good electric and strength performance. Duing to punctate distribution of resin on lozenge shape insulation paper, making sure oil immersed and gas in insulation material can be removed, avoiding electric short and partial discharge.

菱格上胶绝缘纸是用在油浸式（而不是干式）变压器里面，菱格胶要和邻层的绝缘层或金属层粘接在一起，但要留出空隙，让油通过，使变压器油将绝缘材料渗透，浸油材料将成倍增加绝缘性，同时将绝缘纸里产生的气泡通过菱格间的通道排出去，气泡中的空气是有害的。除了带走气泡，变压器油本身主要作用是通过流动将温度带走，通过循环降温。

Lozenge shape insulation paper is usd in oil immersed type transformer, lozenge shape glue must been adhered together with adjacent insulation layer or metal layer, but interspace, making oil get through, also making transformer oil to permeate insulation material, all the permeate insulation material will be more good performance, meantime, the gas in insulation paper will go out through Lozenge shape interspace. The gas is harmful. Except bring away gas, transformer oil mainly make transformer cool.

简单说明这种胶的特性：在不用 DDP 以前，是线圈泡在绝缘湿胶里在外层涂一层胶，使线圈（金属层和绝缘层缠绕而成）成为一个不易松开的整体，但里面还是松的，容易短路位移发热，而且烘干这些湿胶需要很长时间。而 DDP 本身在常温下是一种惰性的干爽的物质，没有粘接的危险，但当线圈在 105 度烘烤时，经过几个小时，DDP 胶里面潜伏的物质发挥作用，

进行了唯一次性的化学反应，融化并固化并粘接，这个反应不可逆，也就是再加温它也不会再一次的融化和固化，最终线圈成为一个牢不可破的整体除非锯开，所有的内部都粘连成块没有松动。不会出现因某处松动导致金属片震动噪声并产生热量烧毁变压器或使其老化。

Simply explain the features of this gluey: Before we did not use DDP, coil was put in insulation glue, making coil become one completely unit, but not caky inside, this method can be easier to the short out and emit heat, besides it will be needed more time to dry.However, DDP is one kind of material which is nonvalent and dry, there is no need to worry about glue together, but when coil is baked , several hous later, material in DDP glue will be effect and occur unique chemical reaction , melt, solidify and glue together, this reaction can not been back , that is to say , even more higher temperature, It will not melt and solidify again, finally coils become one tough unit except sawing off, all the inside material glue toghther without flexible, it will not occur transformer burn off and broken because of some parts flexible and metal shake with higher heat.

规格 Specification

规格 specification	
厚度 thickness	0.05mm，0.08mm,0.10mm，0.13mm,0.18mm,0.25mm,0.38mm,0.50mm
宽度 wideth	625mm，960mm，1000mm,1020mm，1120mm,1220mm,1320mm

菱格上胶纸产品标准 Stand for Lozenge shape insulation paper

厚度 thickness（mm）	0.003 0.08	0.005 0.13	0.007 0.18	0.010 0.25	0.015 0.38	0.020 0.50
厚度偏差（原纸）thickness deviation		±10%				
宽度偏差（mm）wideth deviation		±5mm				
紧度（g/cm3）tightness		0.9 to 1.1, 所有厚度 all thicknesses				
水分（%）moisture		4.0 to 8.0%, 所有厚度 all thicknesses				
水萃取液 PH PH of extract liquor		6.0 to 8.0, 所有厚度 all thicknesses				
灰份（%）ash		最大值 1%				
伸长率 elongation 纵向（%）lengthways 横向（%）crosswise		2 4				
未污染变压器油 unpollute transformer oil		未污染 unpollute				
抗张强度 tensile strength (N/mm^2) 纵向 lengthways 横向 crosswise	70 35	70 35	80 35	80 35	80 35	80 35
介质击穿 dielectric breakdown （伏，干试验）	750	1100	1400	2100	2900	3100
每面涂抹厚度（mm） paint thickness	0.006 - 0.012					
层间结合强度（Kpa） bond strength	450kpa					

*电解质数值根据 ASTM D-202，143 节 检测获得， 所有显示的数据只代表标准或典型的数值，不能认为是最大或最小的数值，除非有特别说明。

Date of electrolyte follow ASTM D-202, 143section, getting it from test. All the date only stand standard or special date, can not been regard as Max. or Min. date, except there are some special explanation.

应用提示 Application note

菱格上胶绝缘纸应贮存在不超过 35℃的干燥、洁净和通风的场所，不得靠近火源，暖气，避免阳光直射，贮存期为十二个月。 加热至 90℃±5℃，保持 3h 后升温 125℃±5℃，保持 6h 的条件下固化。

DDP should be stored in not more than 35℃dry, clean and ventilated place, or near the fire source, heating, avoid direct sunlight, storage period of twelve months. Heated to 90℃± 5℃, maintain 3h after temperature125± 5 ℃, keeping the 6h cure conditions.

薄电绝缘纸 Thin Electrical Insulating Paper

薄电绝缘纸采用 100%硫酸盐木浆精制加工而成，具有较好的电气性能和机械性能，广泛适应于电机、电器、仪表、开关中作绝缘材料，也可用于 6520 聚酯薄膜复合箔原纸。

thin electrical insulation paper is made of 100% kraft pulp. With good electrical and mechanical strengths , Which is widely adapted for insulating materials in electrical, electronics, instruments, switches. It also can be used for the 6520 polyester film composite foilbase paper.

规格

薄电绝缘纸厚度为 0.05mm-0.5mm，颜色主要为本色，纸板规格主要为卷筒，卷筒幅宽为 625mm-1350mm，根据用户特殊需要，可提供特殊尺寸、厚度。

Specification

Thickness 0.05mm-0.5mm;Color: Original pulp color;Width: 625mm-1350mm or customized;Thickness: customized

技术指标 Technical index

薄电绝缘纸执行 IEC641-3-2:1992 标准。

Thin Electrical Insulating Paper is comply with IEC641-3-2:1992 standard.

皱纹纸　Crepe paper

电工皱纹绝缘纸是由 100%纯进口纸浆生产的绝缘纸，经特殊起皱工艺加工而成，其特点是油溶性能非常好，广泛应用于油浸式变压器、互感器、电抗器等绕包部位绝缘、引线部位绝缘的包裹，从而提高了产品绝缘结构的电气性能和机械性能。

Crepe paper is made of insulating paper which is produced by 100% pure pulp imported and processed by special wrinkling process. With good oil-soluble performance it is widely used in oil-immersed transformers, transformers, power reactors around thepackage parts of the insulation, the insulation package by the lead parts. Crepe paper improved the electrical and mechanical properties of the insulation structure.

产品规格 Thickness：

规格 Thickness	
厚度	0.05mm、0.08mm、 0.10mm、0.13mm、0.20mm
宽度	25mm、30mm、40mm~960mm

贮存　Storage

产品应贮存于干燥而洁净的室内，不得靠近火源、热源或受日光直射。

Product should be stored in dry and clean interior. It should not be near the fire source, heat source or direct sunlight

皱纹纸性能指标　Items

序号 No	性能 Items		单位 Unit	要求 Requirment
1	厚度公差 Thickness tolerance		mm	±0.05
2	皱纹数 number of wrinkles		个/10mm	代号要求中数值 Code requirements
3	定量公差 Quantitative tolerances		%	代号要求数值的±10 Code requirements±10
4	断裂伸长率 Elongation at Break		%	代号要求数值的±15 Code requirements±10
5	吸油高度 Oil absorption height	纵向 MD	mm/10min	≥7
			mm/60min	≥30
		横向 CMD	mm/10min	≥20
			mm/60min	≥50
6	水分 Moisture		%	≤8
7	灰分 Ash Content		%	≤1
8	水抽出物电导率 Conductivity of A0queous Extract		mS/m	≤10
9	水抽出物 PH PH of A0queous Extract		-	6～8
10	电气强度（油中） Electric break down strength（in oil)		mV/m	≥20
11	对变压油的污染 Transformer oil pollution		-	tanδ<0.001

皱纹纸管　Crepe paper tube

皱纹纸管是由电工皱纹绝缘纸经特殊工艺加工而成，主要用于油浸式变压器内导线的绝缘包裹材料。

The product, made of electrical crinkled insulating paper through special process, is mainly used as insulating package materials of leads inside oil-immersed transformers.

贮存 Storage

产品应贮存于干燥而洁净的室内，不得挤压，靠近火源、热源或受日光直射。

Store in a dry and clean room, without being pressed, and keep away from fire or heat, or in the sun.

皱纹绝缘纸管常用规格表 Crepe paper tube technical index

序 号 No.	内　径 Inner Dimeter	外 径 Outer Dimeter	长　度 Length	备　注 Remarks
1	4mm	6mm	1000mm	*也可按照客户要求加工各种规格皱纹绝缘纸管 *Able to produce by customized size.
2	4mm	8mm	1000mm	
3	6mm	9mm	1000mm	
4	7mm	8mm	1000mm	
5	7mm	9mm	1000mm	
6	7mm	10mm	1000mm	
7	8mm	10mm	1000mm	
8	10mm	12mm	1000mm	
9	11mm	12mm	1000mm	
10	11mm	13mm	1000mm	
11	11mm	14mm	1000mm	
12	12mm	16mm	1000mm	
13	13mm	14mm	1000mm	
14	13mm	16mm	1000mm	
15	14mm	16mm	1000mm	
16	14mm	17mm	1000mm	
17	16mm	19mm	1000mm	
18	18mm	21mm	1000mm	
19	20mm	25mm	1000mm	
20	34mm	38mm	1000mm	
21	46mm	50mm	1000mm	
22	68mm	72mm	1000mm	

电工绝缘瓦楞纸板　Corrugated Board

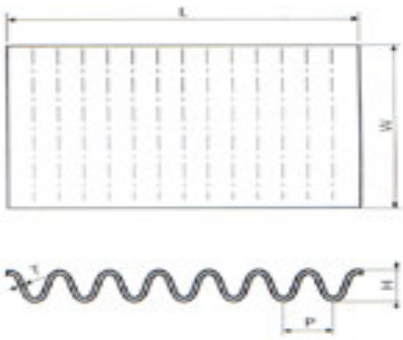
瓦楞纸板是小型变压器的一种常用油隙绝缘，它的优点是装配简单，改善了固体绝缘材料在油道中分配，与在径向均匀配置撑条相比，在瓦楞纸板的油道中，固体绝缘分布非常均匀，不存在与电场垂直的平面，因此，油道强度可提高 15%左右，而不丧失可靠性。

我公司采用热压成型工艺生产的瓦楞纸板，具有如下优点：较高的机械强度、优良的电气性能、形状稳定、尺寸准确。

The corrugated board is used for common oil-gap insulation in small transformers. The advantage of it is easy assembly and improved the allocation of solid insulating materials in the oil duct. Comparing with the strips in the radial stays in the oil passages in the corrugated board, solid insulation distribution is very uniform, there is no electric field perpendicular to the plane.therefore, the strength of the oil passages can be increased by about 15% without loss of reliability.To use thermoforming process to produce corrugated board has the following advantages: high mechanical strength, excellent electrical properties, dimensional stability, precise dimension.

瓦楞纸板的尺寸和公差 Corrugated board size and tolerance

尺寸 Size		公差 Tolerance
厚度 Thickness	1.0mm	±7.5%
	1.5mm	
	2.0mm	
宽度 Width	≤1450mm	±2
楞高 Corrugation Height	3.5-7mm	±0.5
长度 Length	3000mm	±50
楞距 Corrugation Spacing	20mm	±2



瓦楞纸板的主要性能指标 Corrugated board technical index

性能 Items	单位 Unit	指标 Index	
		平均值 Average value	最低值 Minimum
水份 Moisture	%	<7.0	/
灰份 Ask content	%	<0.8	/
水抽出物电导率 Conductivity of A0queous Extract	us/cm	<10.0	/
屈服强度 Yield strength	kg/cm2	>11.0	>9.0

菱格上胶绝缘纸 Lozenge shape insulation paper

皱纹纸 Crepe paper

皱纹纸管 Crepe paper tube

电工绝缘瓦楞纸板 Corrugated Board 油道 Oil passage