



40.5-1100kV 系列化 GIL 40.5-1100kV GIL Series

气体绝缘金属封闭输电线路简称GIL，是一种新型、大容量、环境友好的电力传输设备，可有效解决传统输电线路输送容量小、占地大、损耗大、跨江河时影响通航和环境等局限。

GIL技术来源GIS母线，并集成了工业管道的优点，具有结构简单、安装灵活、单位造价低等优势。

GIL主要模块包括直线单元、转角单元、隔离单元、可拆卸单元和补偿单元等；关键零部件包括盆式绝缘子、三柱式支撑绝缘子、外壳、电联接、直线导体、转角导体、密度继电器、波纹管、支撑等元件。

1. 标准直线单元长度达到18米，转角单元采用统一化设计和柔性制造，转角结构灵活，适应宽泛转角要求（ $90^{\circ} \sim 179.9^{\circ}$ ）。
2. 盆式绝缘子采用螺栓联接的内置式结构，减少法兰连接面，降低漏气率。
3. 支柱绝缘子采用三柱式结构，有效保证外壳与导体同心，电场分布更均匀，结构性更好。
4. 壳体间采用螺栓联接，焊缝与壳体受力方向有一定角度，降低结构应力，强度更高。
5. 在每个绝缘子处设置微粒陷阱，在绝缘子附件形成一个电场极低的封闭空间，能够使GIL内部的异物得到吸附，有效提升了GIL绝缘可靠性。

Gas-insulated Metal-enclosed transmission Line is shorten as GIL, is a new type, large capacity and environment-friendly power transmission equipment, which can effectively solve the limitations of traditional transmission lines such as small transmission capacity, large land occupation, large loss and impact on navigation and environment when crossing rivers.

GIL technology comes from GIS busbar and integrates the advantages of industrial pipeline. It has the advantages of concise structure, flexible installation and low unit cost.

The main modules of GIL include linear unit, corner unit, isolation unit, detachable unit and compensation unit; Key components include basin insulator, three column support insulator, shell, electrical connection, linear conductor, corner conductor, density relay, bellows, support and other components.

1. The length of the standard straight-line unit reaches 18m, and the corner unit adopts unified design and flexible manufacturing. The corner structure is flexible and can meet the wide angle requirements ($90^{\circ} \sim 179.9^{\circ}$).
2. The basin insulator adopts the built-in structure connected by bolts to reduce the flange connection surface and reduce the air leakage rate.
3. The post insulator adopts three column structure, which effectively ensures that the shell and conductor are concentric, the electric field distribution is more uniform and the structure is better.
4. The shells are connected by bolts. The welding seam has a certain angle with the stress direction of the shell, which reduces the structural stress and improves the strength.
5. A particle trap is set at each insulator. An enclosed space with extremely low electric field is formed in the insulator attachment, which can absorb foreign matters in GIL and effectively improve the insulation reliability of GIL.



武汉特高压交流试验基地1100kV GIL 线路

一期绝缘介质为 SF_6 ，二期绝缘介质（ N_2+SF_6 ），三期为环保气体（ $\text{C}_4\text{F}_7\text{N}+\text{CO}_2$ ）。

1100kV GIL Line of Wuhan UHV AC Test Base

Phase I insulation medium is SF_6 , phase II insulation medium is N_2+SF_6 , and phase III is environmental protection gas ($\text{C}_4\text{F}_7\text{N}+\text{CO}_2$).

使用环境 / Operational environment

序号 No.	名称 Item	单位 Unit	技术参数 Technical Data		
			SF ₆	SF ₆ +N ₂	C ₄ F ₇ N+CO ₂
1	周围空气温度 Ambient air temperature	最高气温 Maximum air temperature	+40	+40	+40
		最低气温 Minimum air temperature	-40	-40	-15
		最大日温差 Maximum daily temperature difference	K	25	25
2	阳光辐射强度 Solar radiation intensity	w/m ²	1000	1000	1000
3	风速 Wind speed	m/s	34	34	35
4	湿度 Humidity	日相对湿度平均值 Average daily relative humidity	≤95	≤95	≤95
		月相对湿度平均值 Average monthly relative humidity	≤90	≤90	≤90
5	地震烈度 (水平加速度) Seismic intensity (horizontal acceleration)	---	AG5	AG5	AG2
6	安装场所应无经常性剧烈振动及易燃、易爆物质和化学腐蚀的影响 The installation site shall be free from frequent violent vibration, inflammable and explosive substances and chemical corrosion.				

★ 应用优势

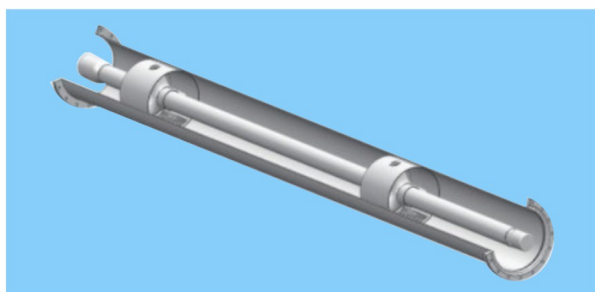
- 输送容量大、电能损耗低
- 安全可靠，故障率低，寿命长
- 结构紧凑，占用空间少，节约用地
- 环境友好，无电磁干扰
- 故障恢复时间短，运行维护方便
- 全寿命周期成本低
- 不受高落差和弯曲半径影响
- 不受大气污染和海拔等环境因素影响

★ Advantages

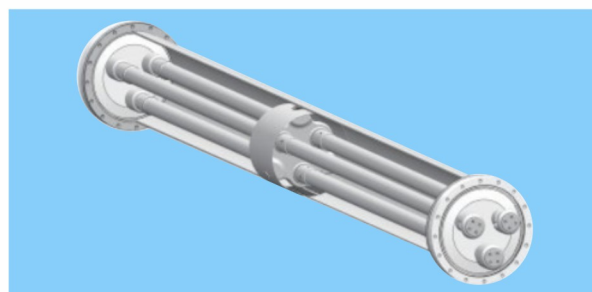
- Large transmission capacity and low power loss
- Safe and reliable, low failure rate and long service endurance
- Compact structure and land saving
- Environmental friendly, no electromagnetic interference
- Short fault recovery time and convenient operation and maintenance
- Low endurance cycle cost
- Not affected by high drop and bending radius
- Not affected by environmental factors such as air pollution and altitude

产品结构

Product structure

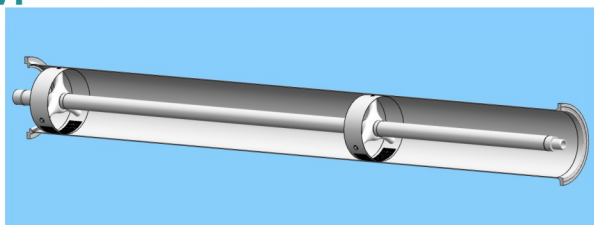


分箱结构
Individually encased structure

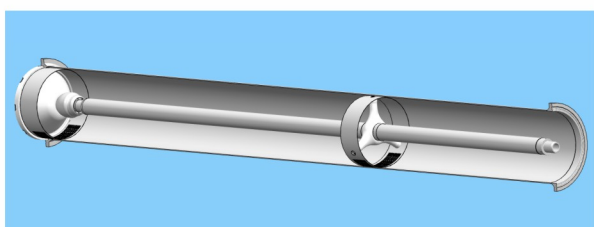
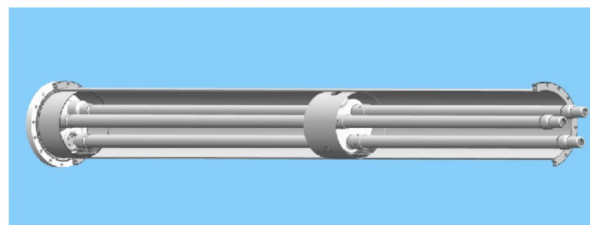


共箱结构
Common enclosure structure

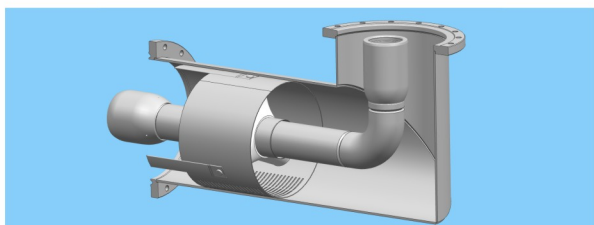
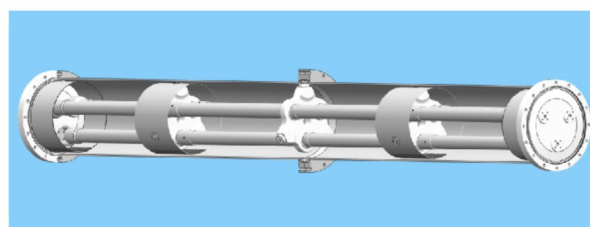
典型模块 Typical module



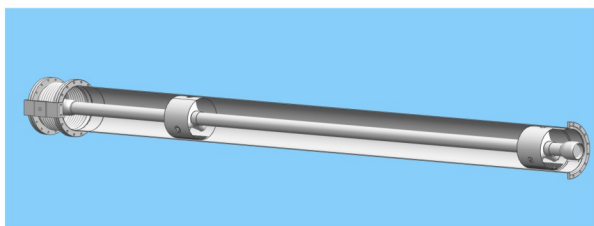
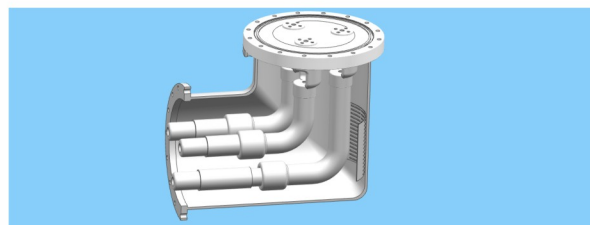
- 1** 直线单元：包含滑动和固定三支柱绝缘子，长度可达18米。
Straight line unit: including sliding and fixing three post insulators, up to 18m long.



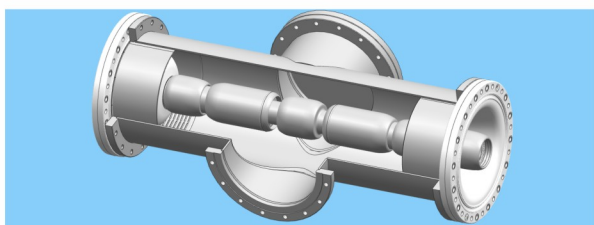
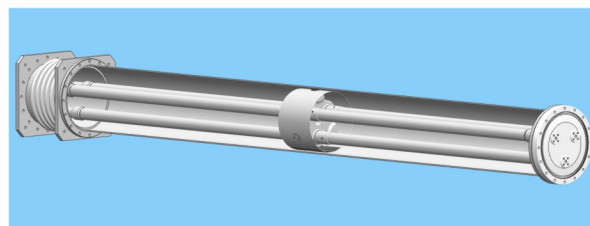
- 2** 气隔单元：包含滑动三支柱绝缘子和盆式绝缘子，实现气室分割。
Gas separation unit: Including sliding post insulator and basin insulator to make gas chamber division.



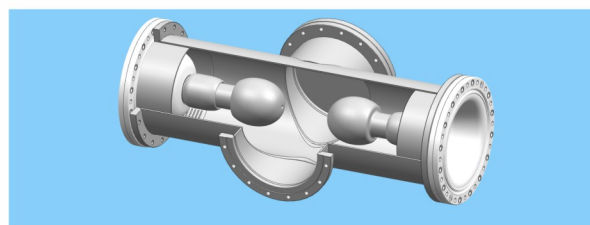
- 3** 转角单元：通过筒体顶弯或焊接技术实现90°~180°母线转弯，使设备布置极具灵活性。
Corner unit: the 90°~180° busbar turning is completed by the barrel top bending or welding technology, which makes the equipment layout extremely flexible.



- 4** 补偿单元：由伸缩节和母线筒体构成，主要用于吸收基础沉降、设备形变、安装误差及设备现场检修。
Compensator unit: it is composed of expansion joint and busbar barrel, mainly used to absorb foundation settlement, equipment deformation, installation error and equipment on-site maintenance.



- 5** 隔离单元：由可拆卸断口构成，用于较长GIL线路中，便于现场分段绝缘试验。
Isolation unit: it is composed of detachable structure, which is used in longer GIL lines to facilitate on-site sectional insulation test.



性能参数一 (SF₆型) / Parameter I (SF₆ Type)

序号 No.	项目 Item	单位 Unit	参数值 Data								
1	额定电压 Rated voltage	kV	1100	800	550	420	363	252	126	40.5	
2	额定电流 Rated current	A	6300	6300	5000	4000/ 5000	4000	4000	3150	3150	
3	额定工频耐受电压 (有效值) Rated power frequency withstand voltage (r.m.s)	kV	1150	960	740	650	510	460	230	95	
4	额定雷电冲击耐受电压 (峰值) Lightning impulse withstand voltage (peak)	kV	2400	2100	1675	1425	1175	1050	550	185	
5	额定短时耐受电流及持续时间 Rated short-time withstand current duration time	kA/s	63/2	63/2	63/3	63/3	63/3	50/3	40/4	40/4	
6	额定峰值耐受电流 Rated peak withstand current	kA	171	171	171	171	171	125	100	100	
7	气体压力 SF ₆ gas pressure	Mpa	0.45	0.40	0.45	0.50	0.40	0.45	0.40	0.10	
8	滑动触头机械试验 (循环次数) Mechanical test of sliding contact (number of cycles)	次 Times	15000	15000	15000	15000	15000	15000	15000	15000	
9	最大单元长度 Maximum unit length	米 Metre	18	18	18	18	18	18	18	18	
10	结构形式 Structural type	---	分箱 Individually encased	分箱 Individually encased	分箱 Individually encased	分箱 Individually encased	分箱 Individually encased	分箱 Individually encased	分箱 Individually encased 共箱 Common enclosure	共箱 Common enclosure	分箱 Individually encased

性能参数二 (环保型) / Parameter II (Environmental-friendly Type)

序号 No.	项目 Item	单位 Unit	参数值 Data		
1	额定电压 Rated voltage	kV	1100	550	252
2	额定电流 Rated current	A	6300	4000	3150
3	额定工频耐受电压 (有效值) Rated power frequency withstand voltage (r.m.s)	kV	1150	740	460
4	额定雷电冲击耐受电压 (峰值) Lightning impulse withstand voltage (peak)	kV	2400	1675	1050
5	额定短时耐受电流及持续时间 Rated short-time withstand current duration time	kA/s	63/2	63/3	50/3
6	额定峰值耐受电流 Rated peak withstand current	kA	171	171	125
7	绝缘介质 Insulating media	---	(C ₄ F ₇ N+CO ₂) / (SF ₆ +N ₂)	SF ₆ +N ₂	SF ₆ +N ₂
8	气体压力 SF ₆ gas pressure	Mpa	0.65	0.65	0.65
9	滑动触头机械试验 (循环次数) Mechanical test of sliding contact (number of cycles)	次 Times	15000	15000	15000
10	结构形式 (标准的单元长度) Structural type (standard unit length)	---	分箱 (18米) Individually encased (18m)	分箱 (18米) Individually encased (18m)	分箱 (18米) Individually encased (18m)

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