



**KYN28-12/24**

**Drawer-type metal clad switchgear**



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## General Description

KYN28-12/24铠装型移开中置式金属封闭型开关设备（以下简称KYN28型中置柜）是3.6~12/24kV三相交流50/60Hz单母线及单母线分段系统的成套配电装置。主要用于发电厂用电、输变电系统变电所的受配电、工矿企业事业配电等场合，实行控制、保护和监督。

KYN28智能中置柜选用VD4、VDM6、VDMS6、VS1 (VDMS) 等型号的真空断路器作为主开关，结构紧凑、性能优越、可靠性高。

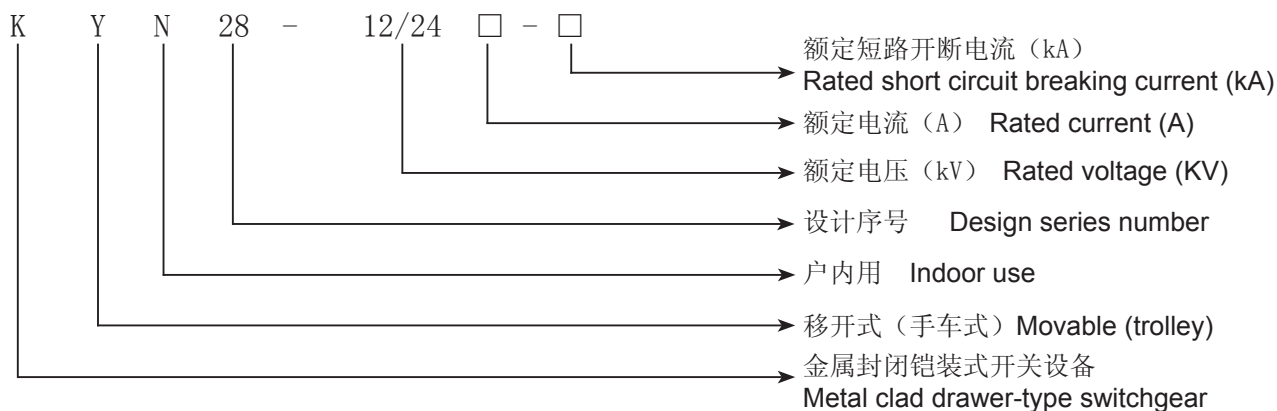
中置柜完全满足IEC298、IEC694、GB3906、GB11022、GB1984、GB311及DL404等标准，具有可靠的“五防”功能，结构强度高，元件布置合理，方案齐全，可扩展性强，是一种理想的新型配电装置。

KYN28-12/24 Drawer-type movable metal clad switchgear (KYN28 switchgear for short as below) is 3.6KV—12KV three- phase alternating current 50HZ, single bus bar and single bus bar segment system switchgear. It is used for power plant, electric receipt and distribution of power transmission or power transformation systems, and distribution of mining and industrial enterprises to control, keep and supervise.

KYN28 metal clad switchgear adopts VD4, VDM6, VDMS6, and VS1, etc vacuum circuit breaker as main switch, with compact structure, predominant feasibility and high reliability.

KYN28 switchgear can completely fulfill IEC298、IEC694、GB3906、GB11022、GB1984、GB311 and DL404 etc standards, with reliable “five-prevention” function, high intensity configuration, reasonable component collocation, full scheme and great extension character, therefore, it is a perfect brand new switchgear.

### 产品型号的组成及含义 Buildup and meanings of product type:



### 使用环境 Service Conditions:

- 环境温度: 45℃~-35℃, 最大温差≤25℃ Ambient temperature :-35℃--+40℃, the max. temperature difference ≤25℃;
- 海拔高度: ≤2500米 Altitude≤2500M;
- 湿度 humidity
  - 日相对湿度平均值不超过95% Average value of daily relative humidity ≤95%
  - 月相对湿度平均值不超过90% Average value of monthly relative humidity ≤90%;
- 抗震能力: 地震烈度不超过8度 Anti-earthquake capacity :earthquake intensity ≤ 8 degree;
- 周围空气应不受腐蚀性或可燃性气体、水蒸汽等明显污染。  
Air around should not be obviously polluted by corrosive, or flammable gas and vapor.

超过本产品技术条件规定的环境条件使用时，由用户和制造厂协商。

When customer's requirement exceeds our environment condition ruled by technical condition, it needs the user and manufacture negotiate from each other.

KYN28-12/24型中置柜的技术参数及要求

Technical parameter and requirement of metal clad switchgear

项目 Item		单位	参数 Technical parameter			
额定电压 Rated voltage		kV	12		24	
额定频率 Rated frequency		Hz	50/60			
额定电流 Rated current		A	630，1250，1600，2000，2500，3150, 4000			
额定 绝缘 水平 Rated Insulated Level	工频耐受电压 Power frequency withstand voltage	kV	相间、相对地 interphase	一次隔离断口 one disconnect breaker	相间、相对地 interphase	一次隔离断口 one disconnect breaker
	雷电冲击耐受电压 Lighting impulse withstand voltage		42	48	60	79
			75	85	125	145
	辅助控制回路工频耐受电压 Power frequency withstand voltage of auxiliary control loop	V	2000			
额定短路开断电流（有效值） Rated short circuit breaking current (virtual value)		kA	16，20，25，31.5，40, 50			
额定关合电流 Rated making current (peak value)		kA	16，20，25，31.5，40, 50			
额定动稳定电流（峰值）* Rated dynamic stability current (peak value)		kA	16，20，25，31.5，40, 50			
额定动4s热稳定电流（有效值） Rated 4 seconds heat –stable current (virtual value)		kA	16，20，25，31.5，40, 50			
辅助控制回路额定电压 Rated voltage of auxiliary control loop		v	DC48 DC/AC 110 220			
防护等级 Protection degree			外壳IP4X cabinet IP4X 隔离间，断路器室门打开时IP2X compartment, circuit breaker door open IP2X			
外形尺寸 Dimension		mm	800（550、650、1000） × 1610(1500、1250、1660、1800) × 2300			

## Technical parameter of circuit breaker

VD4-12型真空断路器（ABB产）

VD4-12 type vacuum circuit breaker (Produced by ABB)



### VD4型真空断路器的主要技术参数 Technical parameter of VD4 circuit breaker

序号 NO.	参数名称      Name of parameter		单位 Unit	数据      Data
1	额定电压    Rated voltage		kV	12
2	额定绝缘水平 Rated Insulated level	1 min工频耐压 1min Power frequency withstand voltage	kV	42
		雷电冲击耐压（峰值） Lighting impulse withstand voltage (Peak value)	kV	75
3	额定频率    Rated frequency		Hz	50
4	额定电流    Rated current		A	630, 1250, 1600, 2000, 2500, 3150, 4000*
5	额定短路开断电流（有效值） Rated short circuit breaking current (virtual value)		A	16, 20, 31.5, 40, 50
6	直流分量    DC component			不小于额定短路开断电流的35% no less than 35% of short circuit breaking current
7	额定动稳定电流（峰值）    Rated dynamic stability current (peak value)		kA	40, 50, 63, 80, 100, 125
8	3秒热稳定电流（有效值） 3seconds heat –stable current (virtual value)		kA	16, 20, 25, 31.5, 40, 50
9	额定操作顺序    Rated operation sequence			分-3min-合分-3min-合分    0-3min-C0-3min-C0
10	自动重合闸操作顺序    Automatically reclose operation sequence			分-0.3s-合分-0.3s-合分    0-0.3s-C0-3min-C0
11	合闸时间      Closing time		ms	55～67
12	分闸时间      Opening time		ms	33～45
13	燃弧时间      Arcing time		ms	≤15
14	开断时间      Breaking time		ms	48～60

\* 在额定电压下的参数 The parameter is obtained at rated voltage.

### VD4型真空断路器操作机构的主要技术参数

### Technical parameter of operation mechanism of VD4 circuit breaker

额定电压（V） Rated voltage		储能电动机功率 power of storage electromotor (VA/W)	储能时间 Energy storage time (秒second)	合闸脱扣器功率 Power of closing trip coil (VA/W)	分闸脱扣器功率 Power of opening trip coil (VA/W)	闭锁电磁铁功率 Power of atresic electrical magnet (VA/W)
交流 AC	110	150	15	250	250	10
	220	150	15	250	250	10
直流 DC	24	130	15	250	250	10
	48	130	15	250	250	10
	60	130	15	250	250	10
	110	140	15	250	250	10
	220	140	15	250	250	10

## Technical parameter of circuit breaker

BP系列永磁机构真空断路器（乌克兰RZVA公司产）

BP Series permanent magnetic vacuum circuit breaker (Produced by Ukraine RZVA company)



BP系列永磁机构真空断路器技术参数

Technical parameter of BP Series permanent magnetic vacuum circuit breaker

项目 Item	单位 Unit	技术参数 Technical parameter
额定电压 Rated voltage	kV	12
额定电流 Rated current	A	630, 1250, 1600
1 min工频耐压 1min Power frequency withstand voltage	kV	相间及相对地 interphase 42
		断口间 Rupture 48
雷电冲击耐压（峰值） Lighting impulse withstand voltage (peak value)	kV	相间及相对地 interphase 75
		断口间 Rupture 85
额定短路开断电流 Rated short circuit breaking current	kA	20, 25, 31.5
额定短路关合电流（峰值）Rated short circuit making current (peak value)	kA	50, 63, 80
额定峰值耐受电流 Rated peak value withstand current	kA	50, 63, 80
4s短时耐受电流 Four seconds short time withstand current	kA	20, 25, 31.5
额定操作顺序（具有重合闸功能） Rated operation sequence (with the function of reclose)		0-0.3S-C0-180S-C0
额定短路电流开断次数 Times of rated short circuit current breaking	次 times	100
机械寿命 Mechanism life	次 times	100000
电寿命（额定电流）Life-Span of electricity (rated current)	次 times	50000
额定操作电压 Rated operation voltage	V	AC, DC110, 220
动静触头允许磨损厚度The abrasion thickness of dynamic and still contactor	mm	3
触头开距 The distance of contactors	mm	8+/-1.0
触头超程 Range of the contactor	mm	4+0.5/-0.3
平均合闸速度 Average closing speed	m/s	0.8~1.5
平均分闸速度 Average opening speed	m/s	1.3~1.8
合闸弹跳时间 Closing bouncing time	ms	≤1
三相分合不同期 Different periods of three phase making	ms	≤1
合闸时间 Closing time	ms	≤80
分闸时间 Opening time	ms	≤50
每相回路直流电阻 DC resistance of each phase loop	μΩ	≤40, 26, 22
温升试验 Test for temperature's rising		1.1 × 1r
适用环境 Suitable environment		
运行环境温度 Running environment temperature	℃	-25℃~+50℃
运行环境海拔标高 Altitude of running environment	m	≤2500
相对湿度 Relative humidity:	日平均值不大于95%，月平均值不大于90% Average value of daily relative humidity ≤95% Average value of monthly relative humidity ≤90%	



## Technical parameter of circuit breaker

VDM6-12型永磁机构真空断路器

VDM6-12 permanent magnetic vacuum circuit breaker



VDM6-12型永磁机构真空断路器技术参数

Technical parameter of VDM6-12 permanent magnetic circuit breaker

项目 Item	单位 Unit	技术参数 Technical parameter
额定电压 Rated voltage	kV	12
额定电流 Rated current	A	630, 1250, 1600, 2000
1 min工频耐压 1min Power frequency withstand voltage	相间及相对地 interphase 断口间 Rupture	kV 42 48
雷电冲击耐压（峰值） Lighting impulse withstand voltage (peak value)	相间及相对地 interphase 断口间 Rupture	kV 75 85
额定短路开断电流 Rated short circuit breaking current	kA	20, 25, 31.5
额定短路关合电流（峰值） Rated short circuit making current (peak value)	kA	50, 63, 80
额定峰值耐受电流 Rated peak value withstand current	kA	50, 63, 80
4s短时耐受电流 Four seconds short time withstand current	kA	20, 25, 31.5
额定操作顺序（具有重合闸功能） Rated operation sequence (with the function of reclose)		0-0.3S-C0-180S-C0
额定短路电流开断次数 Times of rated short circuit current breaking	次 times	100
机械寿命 Mechanism life	次 times	100000
电寿命（额定电流） Life-Span of electricity (rated current)	次 times	50000
额定操作电压 Rated operation voltage	V	AC, DC110, 220
触头开距 The distance of contactors	mm	9+/-1 /11+/-1
触头超程 Range of the contactor	mm	4+0.5/-0.3
平均合闸速度	m/s	0.8~1.5
平均分闸速度 Average closing speed	m/s	1.3~1.8
合闸弹跳时间 Average opening speed	ms	≤1
三相分合不同期 Different periods of three phase making	ms	≤1
合闸时间 Closing time	ms	≤80
分闸时间 Opening time	ms	≤50
每相回路直流电阻 DC resistance of each phase loop	μΩ	≤40, 26, 22
适用环境 Suitable environment		
运行环境温度 Running environment temperature	℃	-25℃~+50℃
运行环境海拔标高 Altitude of running environment	m	≤2500
相对湿度 Relative humidity:	日平均值不大于95%，月平均值不大于90% Average value of daily relative humidity ≤95% Average value of monthly relative humidity ≤90%	

## Technical parameter of circuit breaker

VS1 (VDMS) -12/24型真空断路器

VS1(VDMS) -12/24vacuum circuit breaker



VS1 (VDMS) 真空断路器技术参数

Technical parameter of VS1 (VDMS)circuit breaker

项目 Item	单位 Unit	技术参数 Technical parameter	
额定电压 Rated voltage	kV	12/24	
1 min 工频耐压 1min Power frequency withstand voltage	kV	相间、相对地 interphase 42/50	断口 Rupture 48/60
雷电冲击耐压（峰值） Lighting impulse withstand voltage (peak value)	kV	相间、相对地 interphase 75/125	断口 Rupture 85/145
额定频率 Rated frequency	Hz	50	
额定电流 Rated Current	A	630, 1250, 1600, 2000, 2500, 3150, 4000	
额定短路开断电流（有效值） Rated symmetrical short circuit breaking current (virtual value)	kA	20, 25, 31.5, 40	
机械寿命 mechanical life	次 times	30000	
额定热稳定电流（峰值） Rated heat-stable current (peak value)	kA	50, 63, 80, 100	
4秒热稳定电流(有效值) 4 seconds heat stability current (virtual value)	kA	20, 25, 31.5, 40	
二次回路工频耐受电压 secondary loop power frequency withstand voltage	V	2000	

## Technical parameter of circuit breaker

## VDMS6-24型真空断路器

## VDMS6 -24 vacuum circuit breaker



## VDMS6-24型永磁机构真空断路器技术参数

## Technical parameter of VDMS6-24 permanent magnetic vacuum circuit breaker

项目 Item	单位 Unit	技术参数 Technical parameter
额定电压 Rated voltage	kV	24
额定电流 Rated current	A	630~2000
1 min工频耐压 1min Power frequency withstand voltage	相间及相对地 interphase 断口间 Rupture	kV 50 60
雷电冲击耐压 (峰值) Lighting impulse withstand voltage (peak value)	相间及相对地 interphase 断口间 Rupture	kV 125 145
额定短路开断电流 Rated short circuit breaking current	kA	20, 31.5
额定短路关合电流 (峰值) Rated short circuit making current (peak value)	kA	50, 80
额定峰值耐受电流 Rated peak value withstand current	kA	50, 80
4s短时耐受电流 Four seconds short time withstand current	kA	20, 31.5
额定操作顺序 (具有重合闸功能) Rated operation sequence (with the function of reclose)		0-0.3S-C0-180S-C0
额定短路电流开断次数 Times of rated short circuit current breaking	次 times	100
机械寿命 Mechanism life	次 times	20000
电寿命 (额定电流) Life-Span of electricity (rated current)	次 times	10000
额定操作电压 Rated operation voltage	V	AC, DC110, 220
动静触头允许磨损厚度 The abrasion thickness of dynamic and still contactor	mm	3
触头开距 The distance of contactors	mm	12 +/- 1.0
触头超程 Range of the contactor	mm	4 +0.5 / -0.3
平均合闸速度 Average closing speed	m/s	0.8 +/- 0.2
平均分闸速度 Average opening speed	m/s	1.1 +/- 0.2
合闸弹跳时间 Closing bouncing time	ms	≤1
三相分合不同期 Different periods of three phase making	ms	≤1
合闸时间 Closing time	ms	≤80
分闸时间 Opening time	ms	≤50
每相回路直流电阻 DC resistance of each phase loop	μΩ	
温升试验 Test for temperature's rising		1.1 × 1r
适用环境 Suitable environment		
运行环境温度 Running environment temperature	℃	-25℃~+50℃
运行环境海拔标高 Altitude of running environment	m	≤2500
相对湿度 Relative humidity:	日平均值不大于95%，月平均值不大于90% Average value of daily relative humidity ≤95% Average value of monthly relative humidity ≤90%	



KYN28型中置柜的设计符合GB3906中对金属铠装移开式开关设备的要求。主要由柜体和中置式手车两大部分组成。柜体分为断路器室、母线室、电缆室和继电器仪表室等四个单独的隔室，外壳防护等级为IP3X，各隔室间和当断路器室门打开，断路器手车处于断开、试验位置时防护等级为IP2X。中置式手车由主开关（或其它功能元件）和底盘车两部分构成。

KYN28 metal-clad drawable switchgear is designed to meet GB3906 requirements on metal-clad drawables switchgears. It consists of two main parts, i.e. cabinet and drawables trolley. The cabinet is divided into four individual compartments: circuit breaker compartment, bus bar compartment, cable compartment and relay and meter compartment. The protection class of the enclosure is IP3X. The protection class is IP2X when each compartment and the door of breaker circuit compartment are opened and the circuit breaker trolley is in disconnected/testing position. The draw-able trolley is made up of either main switch or other function elements and lorry/truck/ trolley.

### ◆柜体结构 Configuration of the cabinet

KYN28型中置柜柜体是选用优质冷轧钢板经数控钣金设备加工折弯成形，通过高强度螺栓、螺母（8.8级）和拉铆螺母连接而成，柜体各构件中除门、后盖板、顶板采用喷塑喷涂工艺外采取表面镀锌工艺，这样使柜体不仅具有很高的精度，而且与同类设备相比具有重量轻、机械强度高、外形美观的特点。同时由于采用了组装式结构使零部件通过性强，加工生产周期缩短，生产占地面积小，可以根据订货情况便捷地组织生产。

KYN28 switchgear cabinet adopts advanced cold armor plate which needs to be processed and bended by CNC ,through high intense bolt, nut (8.8 class) and rivet nut connecting ,and all the components of the cabinet adopt zinc coating craftwork on the surface except that the door ,back cover plate and ceiling plate adopt plastic spraying or dope spraying craftwork in order that the cabinet will not only have the characters of high precision but also have light weight ,high mechanism intensity and good appearance comparing with the same type of equipment .

Synchronously as we adopt assembly structure so that the components have easy approval, and it will shorten the production cycle, also the production acreage is quite small, and then we can conveniently arrange production according to order status.

### ◆手车 Trolley

手车由断路器（或其它功能元件）、底盘车两部分组成。根据用途不同手车分为断路器手车、PT手车、计量手车、隔离手车等，同规格手车可以互换。

手车在柜体内有断开/试验位置和工作位置两个位置。当手车需要移开柜体进行检查、维护时，利用专用转运车就可以方便地取出。整个手车体积小，检查、维护都很方便。

手车装设有接地装置与柜体联接。

底盘车中装有丝杠螺母推进机构可轻便操作使手车在断开/试验位置和工作位置之间移动。借助丝杠螺母的自锁性可使手车可靠地锁定在工作位置，防止因电动力的作用引起手车窜动而引发事故。超越离合器在手车移动退至断开/试验位置 and 进至工作位置到位时起作用，使操作轴与丝杠轴自动脱离而空转，可以防止误操作而损坏推进机构。联锁机构可保证手车及其它操作必须按规定的操作程序操作才能得以进行，完全满足“五防”要求。

The trolley has two parts; one is circuit breaker (or other functional component), the other one is bottom trolley .According to different functions, the trolleys can be circuit breaker trolley, PT trolley, metering trolley, disconnecting trolley, etc, and the trolley with the same specification can exchange from each other.

The trolley has breaking /testing position and working position inside the cabinet. (See the cover above) When the trolley needs to withdraw the cabinet to be examined, maintained, we can utilize special transferring carts so that the trolley can be easily taken out. The whole trolley has small cubage, and it is easy to be examined and maintained.

The earthing device of trolley has interlock with the cabinet.

There are silk bar nut pressing device inside the bottom trolley, and we can easily operate this device so that the trolley can move between breaking/testing position and working position. We recur to locking character of the silk bar nut to make the trolley lock on working position firmly in order to prevent accident due to the trolley flounces because of the function of electricity drive. Exceeding clutch and when the trolley moves back to breaking /testing position and go forwards to working position, it will operate, which makes the operating axes be divorced from the silk bar axes automatically and it will be racing ,so as to prevent fault operation and damaging the promoting mechanism . The interlock mechanism can make sure that trolley and other operation must follow the ruled operation procedure so as to work normally and it can satisfy “five-prevention” requirement.



断路器



底盘车

## ◆隔室 Compartment

KYN28型中置柜中主要电气元件都有独立的隔室，即断路器室、母线室、电缆室、继电器仪表室。各隔室间防护等级均达到IP2X。除继电器仪表室外，其它隔室均有独立的泄压通道。

The main electrical components of KYN switchgear have their own compartment, those are circuit breaker compartment, cable compartment, bus bar compartment, relay and meter compartment. The protection degree of each compartment has reached IP2X. Each compartment has their own voltage releasing channels except of the relay and meter compartment.

## ◆断路器室 Circuit breaker compartment

断路器室两侧装设了导轨，对手车在断开/试验位置和工作位置间平稳运行起正确导向作用。静触头盒装有活门机构，上下活门在手车从断开/试验位置运动到工作位置过程中自动打开，当手车反方向运动时自动关闭形成有效隔离。上下活门不联动，在检修时可锁定带电侧活门，从而保证检修人员不会触及带电体。在断路器室门关闭时，手车同样能被操作。门上开有紧急分闸操作孔，在故障情况下能手动分闸。通过门上的观察窗可能观察到手车所处位置及断路器的合、分指示，储能状态。



There are leading tracks at both sides of circuit breaker compartment, and the leading tracks have correct leading function when the trolley plays stably at the breaking/test position and working position. There is an active door inside the stock-still contactor box and the upper and nether active doors will automatically open when the trolley moves from breaking/testing position to working position, and when the trolley moves from opposite direction, the two active doors will automatically close so that it will disconnect effectively. (See the cover above) If the upper active door and the nether one will not work normally, people will examine and repair them, they can lock the electriferous active door so as to make sure that the repairing people will not touch electriferous objects. When the circuit breaker compartment closes, the trolley can also be operated. There is an emergency closing operation hole in the door, when there is any fault situation, people can close it manually. Through the observational window of the door people can see the trolley's position, the situation of circuit breaker's closing, opening, and energy storing.

## ◆母线室 Bus bar compartment

主母线为分段母线，通过支母线和静触头盒固定，不需要其它绝缘子支撑。大电流母线采用双根母排。主母线、联络母线、支母线均为矩形截面铜排。相邻柜间用母线套管隔开，能有效防止事故蔓延，同时对主母线起到辅助支撑作用。用户需要时母线可采用热缩管或硫化涂覆绝缘。

The main bus bar is phase bus bar, and it can be fixed through branch bus bar and stock-still contactor box, and do not need other insulators to support. Big current bus bar adopts double bus bars. Main bus bar, liaison bus bar and branch bus bar are rectangle section cooper lines. Adjacent cabinet adopts bus bar bushing to disconnect from each other so as to prevent accident extending effectively, at the same time it can support the main bus bar. The bus bar can adopt pyrocondensation bushing or sulfuration coating for insulation when the user needs.



### ◆ 电缆室 Configuration of the cabinet

由于开关柜采用中置式，因而电缆室空间大，并保证了足够的电缆安装高度。每相可并1~3根电缆，最多可并按6根单芯电缆。将手车和可抽出式水平隔板移开后，安装检修人员就可以方便地从正面进柜内，对其中安装的CT、PT、接地开关、避雷器等元件进行检修安装。柜底配置开缝的可拆卸式封板，方便电缆的施工。

The metal-clad switchgear adopts middle-mounted type design, so the space for the cable compartment is large enough for the height of cable installation. Every phase can be connected 1~3 cables or 6 single-core cables at most. The repair man can enter the cabinet after removing the trolley and drawable level partition board and maintain the installed CT, PT, earth switch and arrester etc. The removable slotting sealing plate of the cabinet base is designed for convenience of cable connection.



### ◆ 防误操作联锁机构 Interlocking Device for Safe Operation

KYN中置柜内装有可靠的联锁装置，完全满足“五防”要求。

- 继电器仪表室内门上装有明显提示标志的操作按钮或KK转换开关以防误合、误分断路器；
- 断路器手车只有在断开/试验位置或工作位置时，断路器才能进行合分操作，而且在断路器合闸后，手车的推进机构无法操作，防止了带负荷推接断路器手车；
- 只有当断路器退至断开/试验位置同时转运车可靠地插入柜体并锁室后，手车才能从柜体内拉出至转运车上进行检修，也只有转运车插入柜体并锁定后手车才能推入柜内，防止了误操作跌坏断路器和对人员造成伤害；
- 仅当接地开关处在分闸时，断路器手车才能从断开/试验位置运动至工作位置，仅当断路器手车处于断开试验位置时，接地开关才能合闸操作，这样实现了防止带电误合接地开关和接地开关处于闭合状态时关合断路器；
- 接地开关处于分闸状态时，电缆室门无法打开，防止了误入带电间隔；
- 断路器手车处于试验或工作位置而没有控制电压时，仅能手动分闸而不能合闸；
- 断路器手车处于工作位置时，二次插头被锁定不能拔除；
- 可根据用户订货需求，装设电气联锁以提高可靠性。

KYN is equipped with reliable interlocking device inside to prevent any error operations. The functions of the whole interlocking device are listed as follows:

- there are obvious operating buttons or KK alternation switch installed in the door of relay and meter chamber, preventing switching on/off of circuit breaker by mistake.
- Circuit breaker cannot be switched on/off until it is in the position of disconnected/testing or working position. Once the circuit breaker is switched on, the trolley cannot move, preventing the circuit breaker trolley from moving forward with charge.
- The trolley can be drawn out and put on the transfer cart for repair or pushed in only when circuit breaker is in the position of disconnected /testing and the transfer cart is reliably inserted into cabinet and locked, which prevents operator from injuring and circuit breaker from falling down to the ground.
- The circuit breaker trolley cannot be moved from disconnected /testing position to the working position until the earth switch is switched off. The earth switch can be switched on only when the circuit breaker trolley is in the position of disconnected / testing position, which prevents earth switch and circuit breaker from simultaneous switch-on or switch-off.
- When earth switch is switched off, the door of cable chamber cannot be opened, which prevents operator from entering the chamber with electricity.
- Circuit breaker cannot be switched on but switched off manually when circuit breaker trolley is in the testing position or working position without any control voltage.
- The secondary plug is locked so that it cannot be pulled out when circuit breaker trolley is in the working position.
- The electric interlocking device can be installed as per user's requirement to upgrade the operation reliability.



### ◆泄压装置 Pressure Release Device

在断路器室、母线室和电缆室上方均设有泄压盖板。泄压盖板的一端用金属螺栓紧固，另一端由塑料螺栓固定，当柜内发生故障时，内部的高压气体能很容易地将泄压盖板冲开，释放压力，以确保操作人员的安全。

Pressure release cover plates are separately installed on the upward side of circuit breaker compartment, bus bar compartment and cable compartment. One end of the pressure release cover plate is fastened by metal screw and the other end by plastic screw. When there appears any fault in the cabinet, the pressure release cover plates will be automatically opened and release the internal high pressure gas, ensuring the security of operator and switchgear.



### ◆带电显示装置 Electrification Display Indicator

KYN中置柜可装设监督一次回路带电状态的带电显示装置。该装置不但可以提示高压回路带电状况，而且可以与电磁锁配合实现强制闭锁手柄、门，从而提高产品的防误性能。

KYN middle-mounted switchgear can be equipped with electrification display indicator to supervise the electrification status of primary circuit. This device can not only upgrade the charged status of HV loop but also match with electromagnetic lock to realize locking handle and door by force, thus improving its error-preventing function.



### ◆继电器仪表室 Relay and Meter Compartment

继电器仪表室内可安装继电保护控制元件、仪表以及特殊要求的二次设备。二次线路敷设在线槽内并有金属盖板，可使二次线与高压部分隔离。顶部可装设二次小母线。

The relay and meter compartment can install relay protection and control elements, meters and special secondary equipment. The secondary wires are laid in the wire grooves and enclosed with metal covers so that the secondary wires are separated from HV section. The top can install the secondary small bus bars.



### ◆防凝露的措施 Measures to Prevent Moisture

为了防止在高湿度或温度变化较大的气候环境中产生凝露而带来危险，可在断路器室和电缆室内附设加热器。

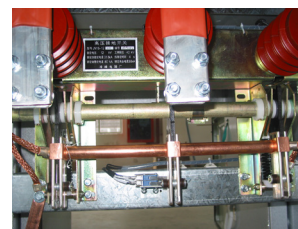
In order to prevent the danger from resulting from moisture formed under the high humidity or great temperature difference, a heater is suggested to be installed in circuit breaker chamber and cable chamber.



### ◆接地装置 Earth Device

在电缆室内单独设有5×40mm 的接地铜排，此排能贯穿整个排列并与柜体接触良好，供直接接地的元件使用，这样使整个柜子都处于良好的接地状态之中，确保操作人员的安全。

Inside cable compartment, there is a row of 5x40mm<sup>2</sup> earth copper bar penetrating each adjacent cabinet and contacting with cabinet body well and used as the component of direct earthing. In this case, the whole cabinet is in a good earthing state to safeguard the operating personnel.

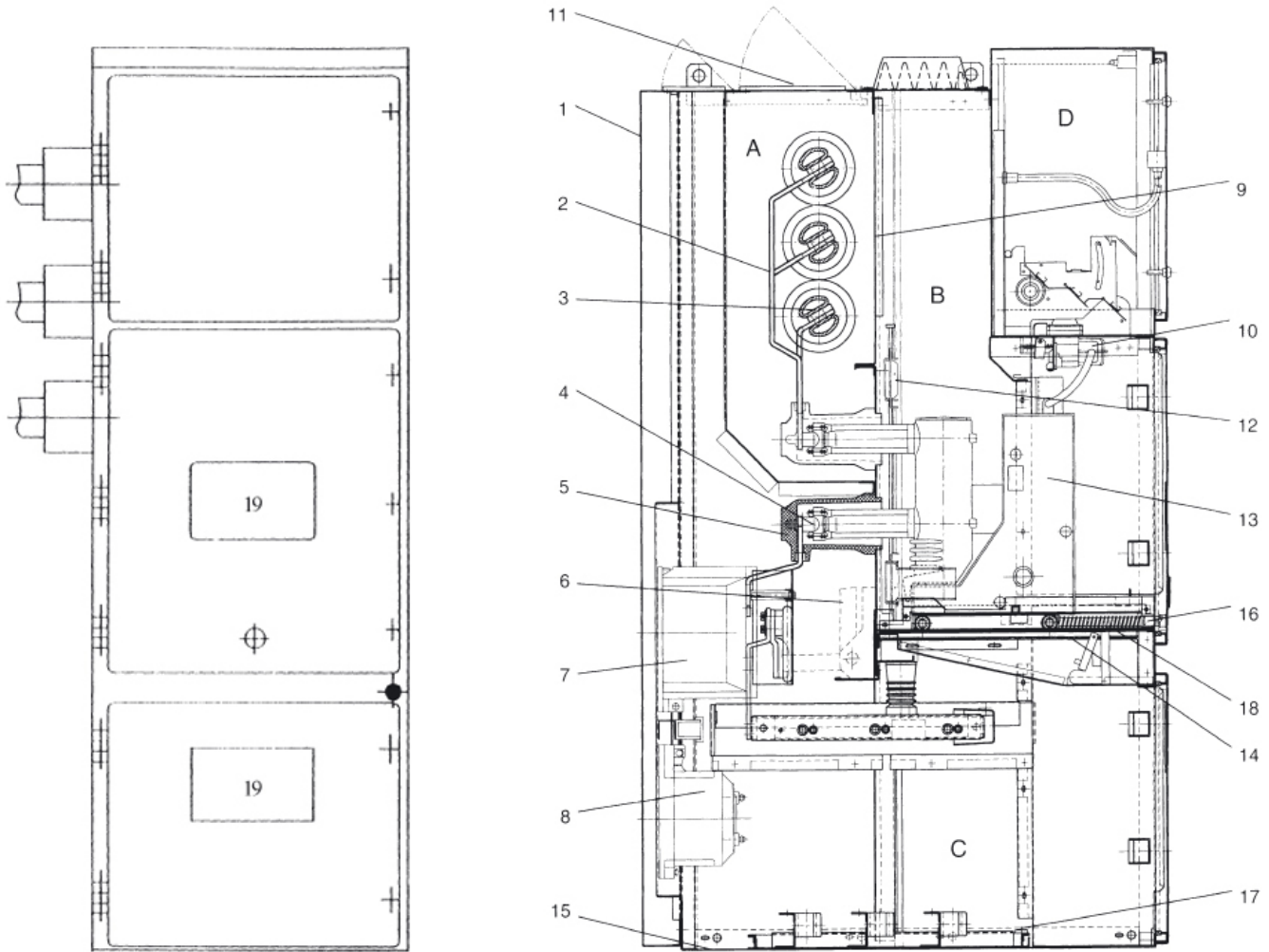


KYN28型中置柜可以从正面进行安装、调试和维护检修，因此背靠背组成双列排列，减小了占地面积。同时考虑到用户习惯，也有双面维护的布置方案。

KYN28型中置柜具有电缆进出线、架空进出线、联络、计量、隔离及其它功能方案，经排列组合后能灵活组成各种主接线方案。

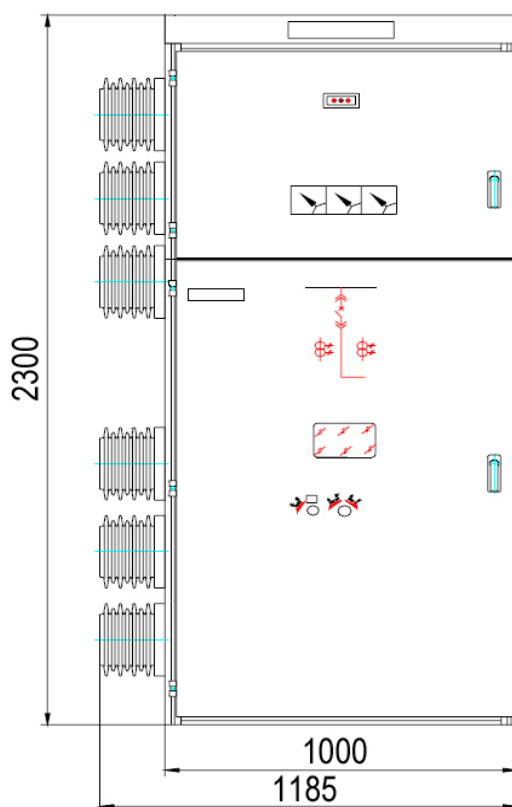
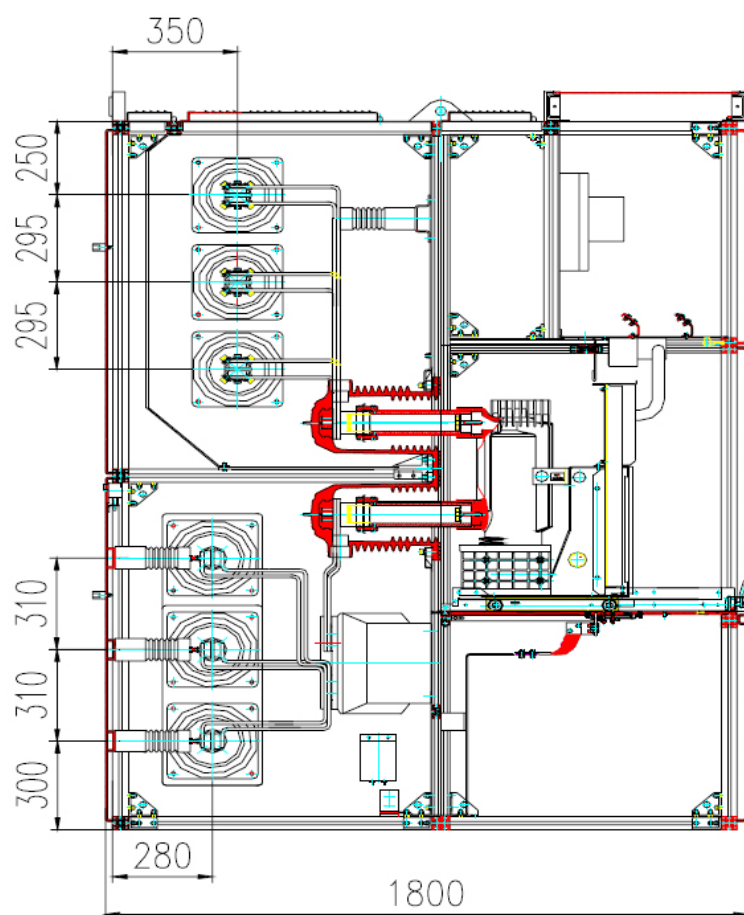
We can mount ,test and maintain KYN28switchgear from the front of the switchgear, therefore ,it can form back-to-back double array, and also decrease the occupation acreage .At the same time considering customers' habit, we also have schemes of both sides of maintenance.

KYN28switchgear has many functional schemes ,such as cable incoming and outgoing ,trolley wire incoming and outgoing ,liaison ,metering ,disconnecting and many other schemes ,after permutation and combination it can flexibly form various main connecting schemes.



隔室

A - 母线室	busbar compartment	4 - 触头装置	contactor	12 - 活门	valve
B - 断路器室	circuit breaker compartment	5 - 触头盒	contactor box	13 - 断路器手车	circuit breaker trolley
C - 电缆室	cable compartment	6 - 接地开关	earth switch	14 - 接地开关操作机构	E/S operation mechanism
D - 低压室	low voltage compartment	7 - 电流互感器	current transformer	15 - 底板	bottom base
1 - 外壳	enclosure	8 - 电压互感器	voltage transformer	16 - 手车操作丝杆	trolley guide screw
2 - 分支母线	branch busbar	9 - 可拆卸隔板	removable divider	17 - 主接地母线	earthing busbar
3 - 主母线	main busbar	10 - 控制线插头	control wire plug	18 - 可拆卸水平隔板	removable level divider
		11 - 压力释放板	pressure release board	19 - 观察窗	view window





## Installation and Commissioning

KYN中置柜的安装基础的施工应符合《电力建设施工及验收技术规范》中的有关规定。

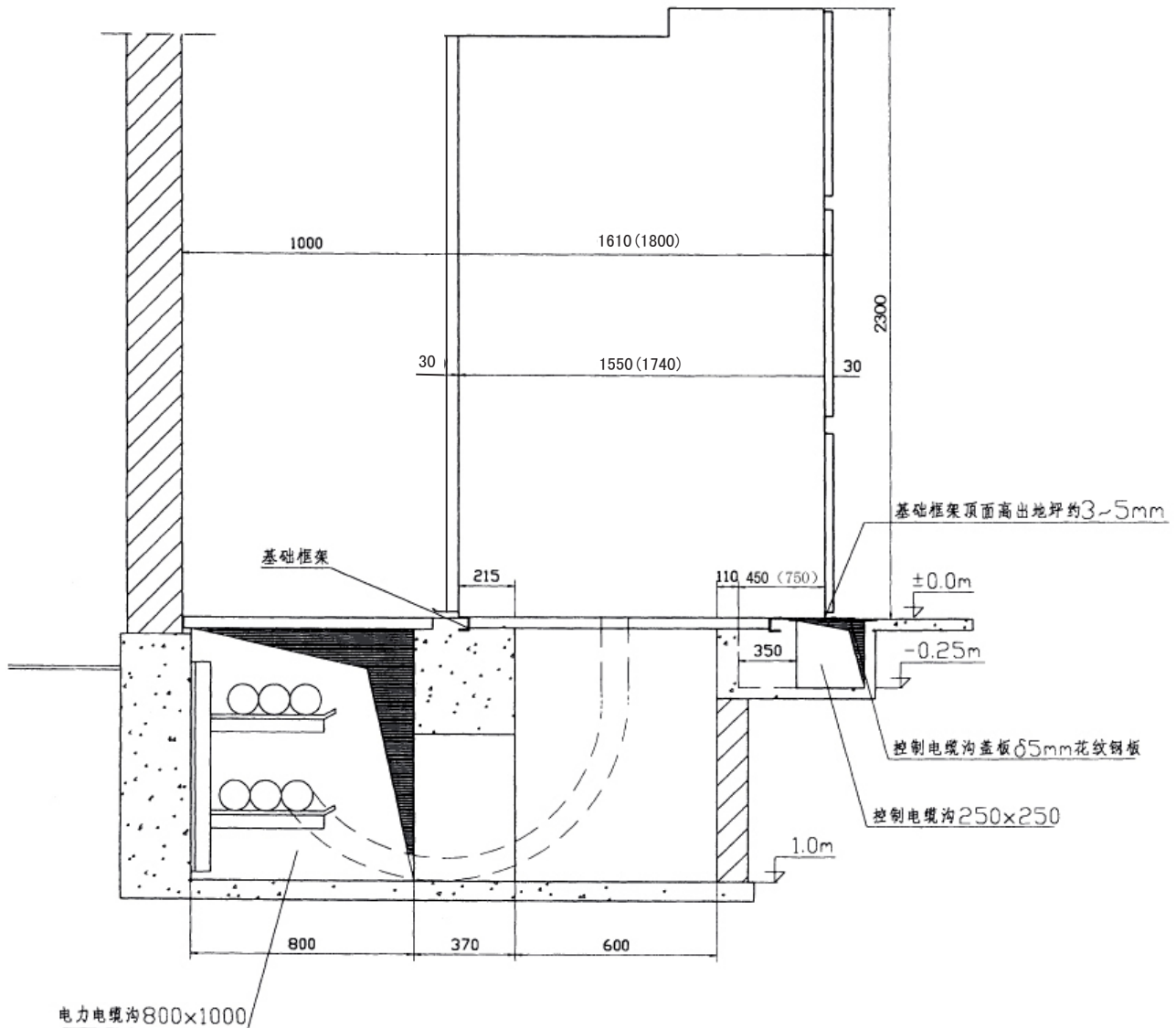
KYN中置柜的安装基础一般要分为两次浇灌混凝土。第一次为中置柜安装构件即角钢、方钢或槽钢构件的安装基础，第二次浇灌混凝土是地面的补充层。一般厚度为60mm。在浇灌混凝土补充层时混凝土高度应低于构件平面1~3mm。

- 要保证基础构件的安装质量，框架安装的水平度要求为1平方米内公差1mm。
- KYN中置柜的安装基础尺寸与安装尺寸(见下图，括号内尺寸为24kV柜体尺寸)

The construction of installing base for KYN switchgear should confirm to the related provisions of Electric Power Construction and Acceptance Technical Specifications.

Installation foundation is molded with concrete twice in general conditions. For the first time, install foundation components namely angle iron, square steel or channel steel to form installation base for KYN switchgear. For the second time, cast concrete of 60mm thick as the supplementary layer of the ground. The concrete height should be 1~3mm lower than the surface of the foundation components.

- To ensure the installation quality of base structure, the horizontal tolerance should be no more than 1mm in one square meter.
- Installation dimension of installation foundation and KYN switchgear.



## Installation and Commissioning

- 柜体单列时，柜前走廊以2.5米为宜，双列布置时，柜间操作走廊以3米为宜。
- 按工程需要与图纸将开关柜运至预定位置，10台以上的开关柜排应从中间部位开始。
- 开关柜在运输过程中应使用特定的运输工具，如吊车或叉车，严禁使用滚筒、撬杠，且严禁将手车推入柜体一起搬运，手车只有在柜体安装好以后再推入相应柜内。
- 松开母线室顶部泄压盖板的螺栓，卸下盖板。
- 松开断路器室下面的可抽出式水平隔板的紧固螺栓，并将其卸下。
- 拆去电缆封板
- 拆去二次线线槽的盖板
- 卸下吊装板及紧固件
- 在以上基础上，一个接一个安装开关柜，安装不平度不得超过2mm
- 当开关柜已完全组合拼装好后可用地脚螺栓将其与基础构件相联或用电焊将其与基础构件焊牢。
- When the cabinets are installed individually, the corridor in front of each cabinet should be 2.5 meters. When the cabinets are arranged in double-row, the operation corridor between cabinets should be 3 meters.
- According to the project requirement and drawing, switchgears should be delivered to the determined position. In condition of lining up a row of longer switchgears ( more than 10 units), the work of combining cabinets should start from the middle part.
- The special tools such as cranes or forklift trucks should be used during the transportation of switchgears. It's prohibited to use cylinders or crowbars. It is not allowed to insert the trolleys into cabinets for transportation together. Trolleys can be pushed into the corresponding cabinet only after the installation of cabinets is completed.
- Loosen the fixed bolts of the pressure release cover plate on the top of bus bar chamber and detach the cover plate.
- Loosen the fixed screw holds of the drawable parallel divider under circuit breaker chamber and detach it.
- Detach cable sealing plate.
- Detach the cover plate of secondary wire groove.
- Detach lifting board and fasteners.
- On the basis of the above, switchgears are installed one by one. The horizontal difference for each switchgear should be less than 2mm.
- After the switchgear is completely assembled , it can be combined together with foundation structure using ground bolts or by welding..

### ◆母线的安装 Installation of Busbars

KYN28中置柜中的母线均采用分段矩形母线，在安装时必须按照下列步骤进行：

- 用清洁干燥的软布将母线擦拭干净，检查热缩管或硫化涂覆表面是否有缺陷，在连接部位涂上导电膏或中性凡士林。
- 一个接一个柜地安装母线，将母线和对应的分支母线连接在一起，栓接时应插入合适的垫块，用螺栓拧紧。
- 安装好母线室顶部的泄压盖板和正面的隔板。

The busbars inside KYN28 switchgear are all segment rectangular ones. The following steps should be carried out in installation of the busbars:

- Clean busbars with clean dry and soft cloth and check if there is any flaw on the surface of heat-shrinkable pipe and vulcanized coating , and then smear conducting cream or neutral Vaseline on the connections.
- Install bus bars into the cabinets one after one, connect the busbars with the corresponding branch bus bars. Insert suitable cushion block in bolting and tighten the connection with screws.
- Correctly install the pressure release cover plate over the top of busbar chamber and the divider in the front.

### ◆中置柜接地装置的安装 Installation of Earth Device

- 将各柜的接地母线连接在一起。
- 在柜内连接所有需要接地的引线。
- 将基础构件与接地排连接起来，超过10台以上的必须有两个以上的接地排。
- Connect the earth busbar of each cabinet together;
- Connect all leading wires which need earthing inside the cabinets.
- Connect fundamental structural parts and earth rows. If there are over 10 switchgears , over two earth rows should be required.

### ◆电缆的安装 Installation of Cables

- 按电缆施工规范制作电缆头并将其与柜内接线端连接。
- 用电缆夹将电缆固定在电缆封板上，并紧固电缆封板。
- Make cable heads as per cable construction requirements and connect them with the terminals inside the cabinets.
- Fix cables onto the cable sealing plate with cable clips and fasten cable sealing plate.

### ◆开关柜安装结束后的检查 Review Installation Status

当开关柜安装就位后，清除柜内的灰尘杂物，然后检查紧固螺栓有无松动，接线有无脱落，将断路器在柜内推进拉出并进行分合闸操作，观察有无异常。对表计进行校零，根据线路图检查二次接线是否正确。检查联锁是否有效。

After installation of switchgears is completed, clean away the dust and sundries inside the cabinets and then check whether the fastened screws are loose or not, and whether the wirings are deciduous, push circuit breakers into cabinets and draw them out from cabinets and make the switching-on/off operation to observe for any abnormality. Check meters and wirings against scheme to make sure the secondary wirings are correct and interlocking devices are effective .

## ◆ 操作程序 Operation Sequence

KYN28中置柜设计虽然有保证开关柜各部分操作程序正确的联锁，但操作人员对中置柜各部分的操作仍应严格按照操作规程和本技术文件的要求进行，不应随意操作，更不应在操作受阻时不加分析强行操作，否则容易造成设备损坏甚至引起事故。

Though KYN28 switchgear has the interlocking device that can assure the correct operation sequence of all parts of switchgear, operators should follow the regulation and the requirement in this document. Otherwise it's easy to lead to the equipment damage even accidents.

## ◆ 无接地开关的断路器柜的操作 The Operation for CB Cabinet without Earth Switch

- a. 将断路器装入柜内：断路器手车准备由柜外推入柜内前应认真检查断路器的状态是否完好，有无工具等杂物遗漏在手车上。确认无误后将手车装在转运车上并锁定，将转运车推至柜前使转运车前部的定位杆插入柜体中隔板的插孔并将转运车与柜体锁定，调整转运车升降至合适位置，然后解除手车与转运车的锁定。手车平稳推入后锁定。当确认手车与柜体锁定后，解除转运车与柜体的锁定，将转运车推开。
  - b. 手车在柜内的操作：手车在从转运车推入柜内后即处于断开位置，若要将手车投入运行，首先要使手车处于试验位置即应将二次插头插好。此时可对断路器进行操作试验。若要继续操作，首先必须将所有柜门关闭并确认断路器牌分闸状态（见d条），然后打开推进机构操作孔挡板，插主操作摇把，顺时针转动摇把直至超越离合器起作用使操作轴空转，此时主回路接通，断路器手车处于工作（热备用状态）可通过控制回路对其进行合分操作。若要将手车从工作位置退出，首先应确认断路器已处于分闸状态（见d条），打开推进机构操作孔挡板，插入操作摇把，逆时针转动摇把直至超越离合器起作用使操作轴空转，手车退至试验位置，此时主回路断开，活门关闭。（冷备用状态）
  - c. 从柜内取出手车：若准备从柜内取出手车，首先应确认手车已处于试验位置，然后拔二次插头并将其扣锁在手车上。将转运车推到柜前使其前部的定位杆插入柜体隔板插孔并将转运车与柜体锁定，调整转运车升降至合适位置，解除手车与柜体的锁定，解除转运车与柜体的锁定，把转运车向后拉出后停稳。如手车需用转运车运输较长距离时，在推动转运车过程中要格外小心，以免发生意外事故。
  - d. 断路器在柜内的合分状态确认：断路器的合分状态可由断路器手车面板合分闸指示牌及继电器仪表室门上的合分闸指示灯两方面判定。
  - e. 紧急手动分闸操作：在控制回路发生故障，断路器失去控制电源情况下可由人员到柜前对断路器进行手动紧急手动分闸。严禁在正常情况下用手动分闸操作杆操作断路器分闸。
- a. Install circuit breaker into the cabinet: check carefully whether the status of circuit breaker is good and check if there are any tools lost on lorry. After confirm, put the trolley onto transfer cart and lock it, and then move the transfer cart to the front of the cabinet, and then insert the locating rod into the socket of divider inside the cabinet and lock the transfer cart onto the cabinet. Adjust transfer cart to the suitable position, then unlock the trolley on the transfer cart. When the trolley is confirmed locked with cabinet, unlock the transfer cart locked with the cabinet then push away the transfer cart.
  - b. Operation of the trolley inside the cabinet: the trolley is on the off-position when it is pushed into cabinet. To put the trolley into running, the trolley must be in the testing position where the secondary plug is plugged in. Then the circuit breaker can be tested. If to proceed with running, firstly close all of the doors and confirm circuit breaker is switched off (SEE ITEM D), then open the valve of the propulsive mechanism, insert the handle for main operation, swing the handle clockwise until the operation shaft turns without load. At this moment, the main loop is connected on, circuit breaker trolley is on the working status( stand-b heat status) and the control loop can switch on or switch off the circuit breaker. If the trolley is wanted to be back from the working position, firstly confirm whether the circuit breaker is switched off ( SEE ITEM D), open the valve of propulsive mechanism, insert operation handle, rotate it counterclockwise until making operation axis rotate without load beyond clutch, at this moment, the trolley is in the testing position and the main loop is switched off, valve closes. ( stand-by cold status)
  - c. Take out lorry from cabinet: if to take out lorry from cabinet, first confirm the lorry has been on test position, then pull out the plug and lock it onto the lorry, push the transfer cart to the front of cabinet and insert front locating bar into the divider socket inside the cabinet and make transfer buggy locked with the cabinet, adjust transfer buggy to a suitable position, release the locking between lorry and cabinet and then that between transfer buggy and cabinet., then drag transfer buggy back and keep it stable. If lorry needs to transported by transfer buggy for a long distance, please be careful to avoid any accident.
  - d. Confirmation of on/off status of circuit breaker in cabinet: the on/off status of circuit breaker in cabinet can be judged by either the on-off indicator on lorry panel or the on/off indicating lamp on the door of relay and meter chamber
  - e. Manually switch off circuit breaker when in urgency: The circuit breaker loses control power supply when the control loop has malfunction. At this moment, working staff can urgent ly switch off the circuit breaker by hand in front of cabinet. It is prohibited to switch off circuit breaker using manual switching-off bar under normal conditions.

### ◆有接地开关的断路器柜的操作 Operation of Circuit Breaker with Earth Switch

将手车推入柜体和从柜内取出手车的程序与无接地开关的断路器柜的操作程序完全相同，仅当手车在柜内操作和操作接地开关过程中应注意：

- 手车在柜内操作：当准备将手车推入工作位置时，除了要遵守无接地开关的断路器柜操作b条中的各项要求外，还应确认接地开关处于分闸状态，否则下一步无法完成。
- 合、分接地开关操作：若要合接地开关，首先应确认手车已退至断开/试验位置，然后解除手车与接地开关操作轴的锁定，插入接地开关操作手柄，顺时针转动90度，接地开关合闸。

The procedure to push trolley into cabinet and take it out from cabinet is identical with that of the operation for the circuit breaker cabinet without earth switch. The attention should be paid for the below just during the period of the operation of the CB trolley and earth switch.

- operation of lorry inside cabinet: when trolley is ready to be pushed onto the working position, it is a must for the operator to confirm the earth switch is off status while abiding by the requirement of operation B for circuit breaker cabinet without earth switch, otherwise the next step can be finished by no means.
- Operation to switch on/off earth switch: to switch on the earth switch, firstly confirm the trolley has been back to the off/test position, then release the locking between trolley and the operating axis of earth switch, insert earth switch operating grip and rotate it clockwise by 90 degree, then the earth switch is turned off.

### ◆一般隔离开关的操作 Operation of Normal Isolator Cabinet

隔离手车不具备接通和断开负荷电流的能力，因此在进行隔离手车柜内操作时必须保证首先将与之相配合的断路器分闸后通过辅助触点转换解除与之配合的隔离手车上的电气联锁，只有这时才能操作隔离手车，具体操作程序与断路器手车相同。

Isolator trolley has not the capability to make and break load current, so for the operation inside cabinet with the isolator trolley, it is a must to guarantee to release the electric interlocking by exchanging auxiliary contacting points after switching off the circuit breaker matching the isolator trolley. Only at this time, can the operation of isolator trolley be done. The detailed procedure is the same as that for circuit breaker trolley.

### ◆使用联锁的注意事项： Attentions Using Interlocks

KYN28开关柜的联锁功能是以机械性强闭锁为主，辅以电气联锁和提示性联锁实现其功能的，能满足“五防”要求，但是操作人员不应因此而忽视操作规程。

- 本开关柜的联锁功能是在正常操作过程中同时实现的，不需要增加额外的操作步骤，如发现操作受阻，应首先检查是否有误操作的可能，而不应强行操作以至损坏设备，甚至导致误操作事故的发生。
- 有些联锁因特殊需要允许紧急解锁，紧急解锁的使用必须慎重，不宜经常使用，使用时也要采取必须的防护措施，一经处理完毕应立即恢复联锁状态。

The interlocking function of the KYN28 switch cabinet gives priority to strong closedown by mechanism. The electric interlocking and suggestive interlocking are auxiliary to realize the function, also can meet the “five preventions” requirement, but the operation staffs should not ignore the regulation because of the above.

- The interlocking function of the switch cabinet is realized during the period of normal operation, no need for extra operation steps, if the operation fault is found, first the possibility of wrong operation should be checked and confirmed, the operation by force should not be done which would cause the equipment damage even the accident.
- Some interlocking is allowable for urgent locking because of special needs, but be cautious to urgently lock and don't use it frequently. It is a must to adopt necessary protective measures, and recover interlocking status at once after the treating is finished.

### ◆KYN28中置柜的检修和维护除按有关规程的要求进行外，还应注意以下几点：

For the check, repair and maintenance of KYN28 switchgear, besides the requirement of relative regulation, the following should be paid attention to:

- 按所配元件的安装使用说明书的要求检查元件情况并进行必要的调整；
- 检查手车推进机构及联锁的情况，使其满足本技术条件的要求；
- 检查主回路触头情况，擦除动静头上陈旧油脂，察看触头有无损伤、弹簧力有无明显变化，有无因温度过高引起的异常氧化现象，如有这些情况应及时处理；
- 检查二次触头有无异常情况并进行必要的修正；
- 检查各部分紧固件，如有松动应及时紧固。
- Check components and make necessary adjustment according to the requirement of installation;
- Check trolley propulsive mechanism and interlocking status to make them in conformity with technical requirement;
- Check main loop contactor, wipe off the oil and grease on fixed and movable contactors, check wither oxidizing phenomena caused by over-high temperature, deal with the following if any of them happens;
- check the secondary contactor and repair it if it is not normal;
- Check fastening pieces and fasten loose parts in time.



## Transportation , Storage and Order

### ◆运输与储存 Transportation and Storage

开关柜在运输与储存过程中应注意以下几点:

1. 不许倾覆、倒置和遭受剧烈震动, 防止靠近水源;
2. 应防止淋雨以免受潮;
3. 不得随意拆卸零部件。

Be cautious for the below during transportation and storage:

1. Inversion is prohibited and avoid to be shocked drastically and be close to water source.
2. Prevent rain for fear to be affected with damp.
3. Don't detach spare parts at random.

### ◆随机文件包括: The attached documents include:

- |              |                                      |
|--------------|--------------------------------------|
| 1. 产品合格证;    | 1. Quality Certificate               |
| 2. 产品装箱单;    | 2. Packing List                      |
| 3. 产品出厂试验报告; | 3. Routine Test Report               |
| 4. 安装使用说明书;  | 4. Installation and Operation Manual |
| 5. 设备清单;     | 5. Equipment List                    |
| 6. 二次接线图。    | 6. Secondary Wiring Diagram          |

### ◆订货须知 Attentions in Placing an Order:

用户提供下列资料:

1. 主接线方案编号、单线系统图、排列图及平面布置图;
2. 二次原理图、端子排列图;
3. 开关柜内电器元件型号、规格、数量;
4. 电气设备汇总表;
5. 需要母线桥时需提供跨距和高度尺寸;
6. 开关柜使用在特殊环境时应在订货时提出;
7. 需要其它或超出附件供应时应提出种类和数量。

Buyers should offer the following information:

1. Project Number for main wiring, single-line diagram, and layout scheme;
2. Secondary schematic diagram, terminals pareto diagram
3. The model number , specifications and quantity of electrical components inside switchgear
4. Detailed list of electrical equipment
5. Length of span and height of the busbar bridge if there is any need of busbar bridge;
6. If the switchgear is used under special surroundings, please make notes in placing an order.
7. Type number and quantity of the other items if the offer is beyond attachment supply.



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