

## TECHNICAL DATA

# KYH1-24 Model Removable AC Metal-clad Switchgear

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KYH1-24



## GENERAL AND APPLICATION

KYH1-24 model Metalclad Centered Metal-enclosed Switchgear (hereinafter referred to as switchgear) is a new product independently designed and developed by HEAG group after absorbing international advanced technology. The product has the outstanding advantages as follows:

1.1 The enclosure is completely formed by Al-Zn coated steel plate after multiple bending processed by CNC machine, then is assembled with the bolts, which has strong mechanical strength and effectively ensure the neatness and good appearance. The door is painted by the plastic powder and has strong anti-impact and corrosion proof ability. The protection grade of enclosure is IP4X.

1.2 The main circuit breaker can be VHY1-24 model which is independently designed and developed by HEAG group.

1.3 For the circuit breaker, the air insulation distance shall be over 180mm and the insulation distance from phase to ground shall be 200mm; the creepage distance along the insulation piece shall be over 480mm, however, the composite insulation will be instead of it if unappeasable. The product has the unique advantages of long life, high reliability, less maintenance and small volume, furthermore, it has perfect and reliable anti-misoperation function.

The switchgear applies to three phase power system of rated voltage 3.6 ~ 24kV AC 50Hz (or 60Hz) for receiving and distributing power energy, and also for circuit control, monitor and protection. It can be used in single-busbar system and single-busbar section system.

It accords with the standards as follows:

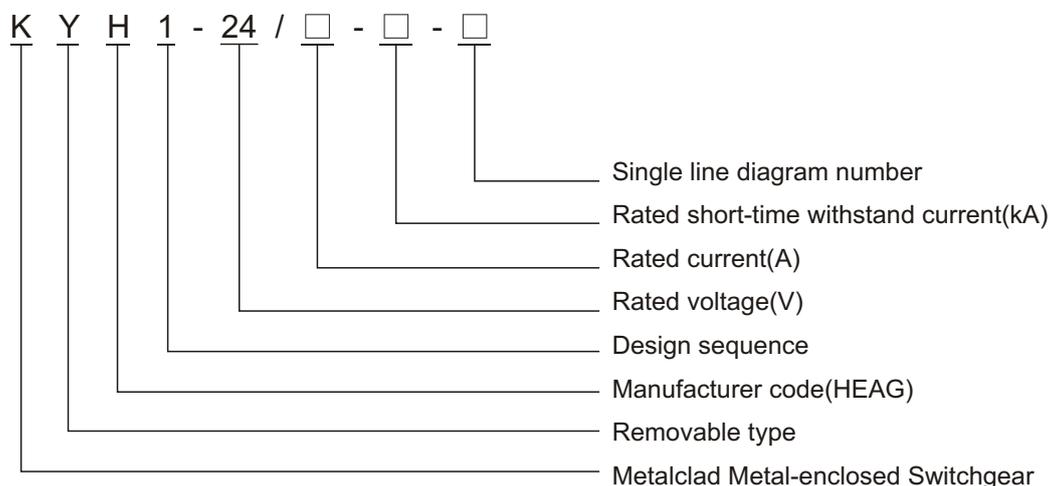
- IEC 62271-200 <Alternative-current Metal-enclosed Switchgear and Control Equipments of rated voltage 1 ~ 52kV>;
- IEC 62271-1 <High-voltage switchgear and controlgear - Part 1: Common specifications>;
- GB 3906 <Alternative-current Metal-enclosed Switchgear and Control Equipments of rated voltage 3.6 ~ 40.5kV>;
- DL/T 404 <Alternative-current Metal-enclosed Switchgear and Control Equipments of rated voltage 3.6 ~ 40.5kV>.

## NORMAL SERVICE CONDITIONS

- ◆ Environmental ambient temperature: +40°C ~ -15°C;
- ◆ Relative humidity: daily average less than 95%, monthly average less than 90%;
- ◆ Altitude above sea level: not exceed 1000m;
- ◆ Earthquake intensity: not exceed 8 grade;
- ◆ Site without flammable, explosive and corrosive material, and frequent vibration.

If the service conditions exceed the above mentioned range, the user shall consult the manufacturer.

## MODEL AND MEANING



## MAIN TECHNICAL PARAMETERS

### 4.1 Main technical parameters of switchgear

table 1

Item		Unit	Data
Rated voltage		kV	24
Rated insulation level	1 min P.F. withstand voltage	kV	Interphase, phase to ground 65; between gaps 79
	Lightning impulse withstand voltage	kV	Interphase, phase to ground 125; between gaps 145
Rated frequency		Hz	50, 60
Rated current		A	630, 1250, 1600, 2000, 2500
Rated short-time withstand current(4s)		kA	25, 31.5
Rated peak withstand current※		kA	63, 80
IAC grade			BFLR
Kind of operation continuity			LSC2B-PM
Protection grade			IP4X(enclosure), IP2X(compartment)
Outline dimension (W×D×H)		mm	800(1000)×1800×2300※※
Weight		kg	about 800

※: The short-circuit capacity of CT shall be separately considered;

※※: The back aerial outgoing scheme shall add an attached cabinet, and the user shall consult the manufacturer about its depth. The cubicle of width 800mm applies to the rated current up to 1250A.

### 4.2 Main technical parameters of VHY1-24 model indoor vacuum circuit breaker

table 2

Item		Unit	Data
Rated voltage		kV	24
Rated insulation level	1 min P.F. withstand voltage	kV	Interphase and phase to ground 65
	Lightning impulse withstand voltage	kV	Interphase and phase to ground 125
Rated frequency		Hz	50
Rated current		A	630, 1250, 1600, 2000, 2500
Rated symmetrical short-circuit breaking current		kA	25, 31.5
Rated peak withstand current		kA	63, 80
Rated short-time withstand current(4s)		kA	25, 31.5
Rated operating sequence			O-0.3s-CO-180s-CO
Opening time		ms	≤50
Mechanical life		time	20000
Electrical life		grade	E2
Rated out of phase earth fault breaking current		kA	27.3
Rated instantaneous cable charging breaking current		A	31.5
Rated over-current tripping current		A	3.5/5
Rated voltage of secondary circuit		V	DC(AC)220, DC(AC)110
Rated voltage of motor for energy storage			DC(AC)220, DC(AC)110
Rated output power of motor for energy storage		W	50

**Remarks:** As the circuit breaker is used to control 3.6~24kV motor, if the starting current is less than 600A, a metal oxide lightning arrester must be added, and the user shall consult the manufacturer about the detail requirements. As the circuit breaker is used to break capacitor bank, rated current of the capacitor bank shall not exceed 80% of that of the circuit breaker.

## PRODUCT STRUCTURE

The product structure shown as Fig. 1.

The switchgear consists of a fixed body and withdrawable parts(handcart for short).The enclosure and all the metal baffle plates of each function unit are joined with the bolts. The electrical components inside the cubicle are shown as Fig.1. The protection grade of enclosure is IP4X and it will be IP2X as the cubicle door is opened.

### 5.1 Enclosure and baffle plate

The enclosure and baffle plates are made of Al-Zn coated steel plate after processed by CNC machine and multi-bending, then are assembled with the bolts to ensure its uniformity in size. The Al-Zn coated steel plate has strong antioxidant and corrosion-proof function, and is superior to similar ones on mechanical strength. The cubicle is divided into a handcart compartment, a busbar compartment, a cable compartment and an instrument compartment (low voltage compartment), and each independently connects ground. The cubicle door is coated by plastic powder, so that the surface is anti-impact and corrosion-proof, and ensure a beautiful appearance.

### 5.2 Handcart

The frame of the handcart is made of the steel plate processed by CNC machine and is assembled with the rivets. According to its usage, the handcart can be sorted into CB handcart, PT handcart, measurement handcart and so on. The height and depth of different kinds are same, so those of same specification are interchangeable. The handcart has the isolating/testing position and working position in the cubicle, each position is equipped with a positioning device to ensure that the handcart will not move at random when in specified position. Unlock the position lock before move the handcart, the circuit breaker must be in opening state before move the CB handcart.

#### Withdrawable circuit breaker handcart.

The frame is made of the steel plate, vacuum circuit breaker and the other auxiliary devices are on the handcart. The primary movable contact with spring finger system is installed on the outgoing terminals of circuit breaker through the arm rod, and all the control buttons and opening/closing position indicators are on the name plate of handcart for convenient operation. When the handcart enters into the cubicle and reaches the isolating/testing position, its enclosure reliably will connects the earthing system, and the instruments and control system also connect the cubicles through the secondary plugging pieces. However, when the handcart reaches the working position, primary circuit will be connected except CB.

### 5.3 Compartments in cubicles

#### 5.3.1. CB compartment

A special guide rail is installed in CB compartment(B) for the handcart to move between the isolating/testing position and the working position. The movable baffle plate made of the good metal sheet is installed on the back wall of handcart compartment. When the handcart moves from the isolating/testing position to the working position, the baffle plate in front of the fixed contact will automatically open. Contrarily, it will automatically close to seal the fixed contact box, thereby to ensure the operator's safety. If the handcart is operated when the cubicle door is closed, its position can be seen through the observing window. Meanwhile, ON(opening)/OFF(closing) buttons, ON(opening)/OFF(closing) mechanical position indicators and energy storing/releasing indicators can also be seen.

#### 5.3.2 Busbar compartment

The busbar is led from one cubicle into another cubicle under the supporting of the insulation bushings, and connects the fixed contact box through the branch busbar. The main busbar and inter busbar are round copper bars with rectangular section. All the busbar are coated by the insulation sleeves. Full-insulation busbar system consumedly decreases the occurrence probability of the internal faults. Furthermore, the busbar compartment is isolated from each other. When internal faults occur in one cubicle, the dissociate gas will not enter into the next cubicle to avoid expanding the faults.

#### 5.3.3 Cable compartment

The current transformer and the earth switch can be mounted on the back wall of the cable compartment, and the potential transformer and the lightning arrester can be mounted inside the compartment. After the handcart and the level baffle plate are removed, the worker can enter into cubicle from the bottom to install the cables. There are specified cable conductors for connecting 1 ~ 6 pieces single-core cables in parallel in the cable compartment. A movable metal plate is mounted on the bottom to provide convenience for site operation.

#### 5.3.4 Instrument compartment

The instrument compartment includes the protection relay, meters, power indicator and some specified secondary devices. The control circuits are laid in the neck grave with sufficient space and metal cover plate. The left one is pre-reserved for outgoing and incoming of the secondary busbar. There're also some leading holes for the secondary busbar on the side plate of the instrument compartment.

#### 5.4 Interlocking device for preventive mal-operation

The cubicle has reliable interlocking device for protecting the operators and equipments. Details are as following:

5.4.1 When the handcart moves from the working position to the isolating/testing position, the movable baffle plate will seal the fixed contact box to avoid entering into the electrified compartments. During overhaul, please lock the baffle plate by the hang-lock.

5.4.2 When the circuit breaker is in the closing position, the handcart can't be pulled out from the working position or moved from the isolating/testing position to the working position; The circuit breaker can be operated only when the handcart is completely locked in the testing or working position.

5.4.3 Earth switch can be operated only when the handcart is in the isolating /testing position or outside the cubicle. When the earth switch is in the closing position, the handcart can't be pushed from the isolating/testing position to the working position.

5.4.4 When the handcart is in the working position, the secondary plug shall be locked and can't be pulled out.

#### 5.5 Pressure-releasing device

The pressure-releasing devices are respectively mounted on the top of handcart compartment, busbar compartment and cable compartment. When internal fault arc occurs to the circuit breaker or the busbar, the air pressure will increase accompanying the appearance of arc, then the metal pressure-releasing plate will be automatically opened to release the gas and pressure to ensure the safety of operators and cubicle.

#### 5.6 Position interlocking between secondary plug and the handcart

The connection between the secondary circuit of the cubicle and the handcart's secondary circuit is realized through the secondary plugging pieces. The movable contact lead of the secondary plug, covered with a nylon bellows, can be connected with the handcart, and the secondary fixed contact socket is mounted on the right-top of the circuit breaker compartment. The secondary plug can be connected or released only when the handcart in the testing/isolating position, however, when the handcart in the working position, the secondary plug will be locked and not be released.

#### 5.7 Power indicator

The power indicator mounted in the cubicle consists of a HV sensor and a display. The sensor is mounted at the side of busbar or feeder, and the display is mounted on the door of the instrument compartment. When check if A, B, C phase are electrified, press the button, that it acts means the busbar or feeder is electrified, otherwise, they aren't electrified.

## FOUNDATION REFERENCE

6.1 All the construction of the cubicle's installation foundation should accords with related provisions of "Technical Specifications for Power Construction and Acceptance".

6.2 The installation foundation consists of the structure parts, such as the angle steel or the square steel and the channel steel. The level of its frame shall be calibrated before it is embedded, the required level error and flatness shall accord with clause 2.0.1 of GB 50171 standard, in other words, the non-straightness per meter shall be less than 1 mm and the total length shall be less than 5mm, the levelness per meter shall be less than 1mm and the total length shall be less than 5mm, the total length of the position error and non-parallelism shall be less than 5mm. Furthermore, The top height of foundation frame shall be less 3~5mm than the ground level of the distribution room.

6.3 Foundation structure as per Fig.2.

6.4 Upstair layers with cables as per Fig.4.

## INSTALLATION OF CUBICLES

7.1 According to the arrangement sequence specified in the drawings, transport the cubicles to the specified installation site and disassemble the lifting lugs.

7.2 Draw out the circuit breaker handcart from the cubicle and place it separated from the cubicle.

7.3 Disassemble the fixing bolts of the level baffle plate (under the guide rail of the handcart), and draw out the level baffle plate.

7.4 Disassemble the vertical baffle plate, the bottom plate and the left control cable slot cover, those are in front of the busbar compartment.

7.5 Accurately adjust the position and verticality of the cubicle one by one on the foundation (The edge of the front shall not depart from the vertical line over 2mm.). If the cubicles are over 10 sets, it is best to adjust the cubicle from the middle.

7.6 Bolt and joint the cubicles together. For the cubicle without the busbar baffle plate, an additional baffle plate shall be installed above the busbar window; for the cubicle with the busbar baffle plate, the bushing plate shall be installed in advance.

7.7 After all the cubicles are joined together, fix them on the concrete ground with the foot screws, or weld them with the foundation frame.

## INSTALLATION OF BUSBAR

8.1 Install the busbar bushings.

8.2 Clean the busbar with a clean and dry soft cloth, and check if the insulation bushings are damaged, paint the conductive grease plaster or neutral vaseline to the joints.

8.3 Install the busbar one by one, and connect the main busbar with the corresponding branch busbar.

## INSTALLATION OF CABLES

9.1 Connect the cables in the specified positions according to the primary scheme and secondary scheme.

9.2 Block all the cable holes.

## EARTHING DEVICE

10.1 Connect all the main earthing busbar together by the connecting plate.

10.2 Connect all the earthing leads inside the cubicle.

10.3 Connect the earthing wires of earthing switch with the main earthing bus of the cubicle.

10.4 Connect the main earthing busbar of cubicle with earthing network.

## OPERATION REFERENCE

11.1 Lift the draw-out type circuit breaker onto the service handcart by the suitable crane, and lock it tightly.

11.2 Adjust the height of service handcart to make it reliably connect the cubicle (Insert the front pinch plate into the corresponding hole and lock it.).

11.3 The handcart reaches the testing position. When the circuit breaker is in opening state, pull the locking plate by hands to make the lock tongue retract into the bottom board machine, so as to push the handcart to reach the testing position of guide rail (Attention: Prohibit from pulling its tripping spanner, otherwise, the service handcart will leave the cubicle body and the circuit breaker will fall to ground and be damaged.), and both left and right lock tongues are inserted into the locking holes of the cubicle.

11.4 Insert the 58-pin aerial plug into the secondary circuit socket of the cubicle and lock it, close the door of the circuit

breaker, then the try operation begins.

11.5 The handcart reaches the working position. When the circuit breaker is in the opening state, insert the special handle into the forward mechanism of the bottom board machine and lightly press forward, then rotate the handle clockwise to make the circuit breaker reach the working position. Consequently, the opening/closing operation will be carried out after put down the handle.

11.6 The handcart quits the working position. When the circuit breaker is in the opening state, insert the special handle into the forward mechanism of the bottom board machine and lightly press forward, then rotate the handle counterclockwise to make the circuit breaker reach the testing position, open the door of CB compartment and pull out the secondary plug.

11.7 Lock the service handcart with the cubicle body tightly, pull the bottom locking plate of the cubicle by hands to make the lock tongue retract into the bottom board machine, then quit the circuit breaker out of the cubicle and carry it to the service handcart.

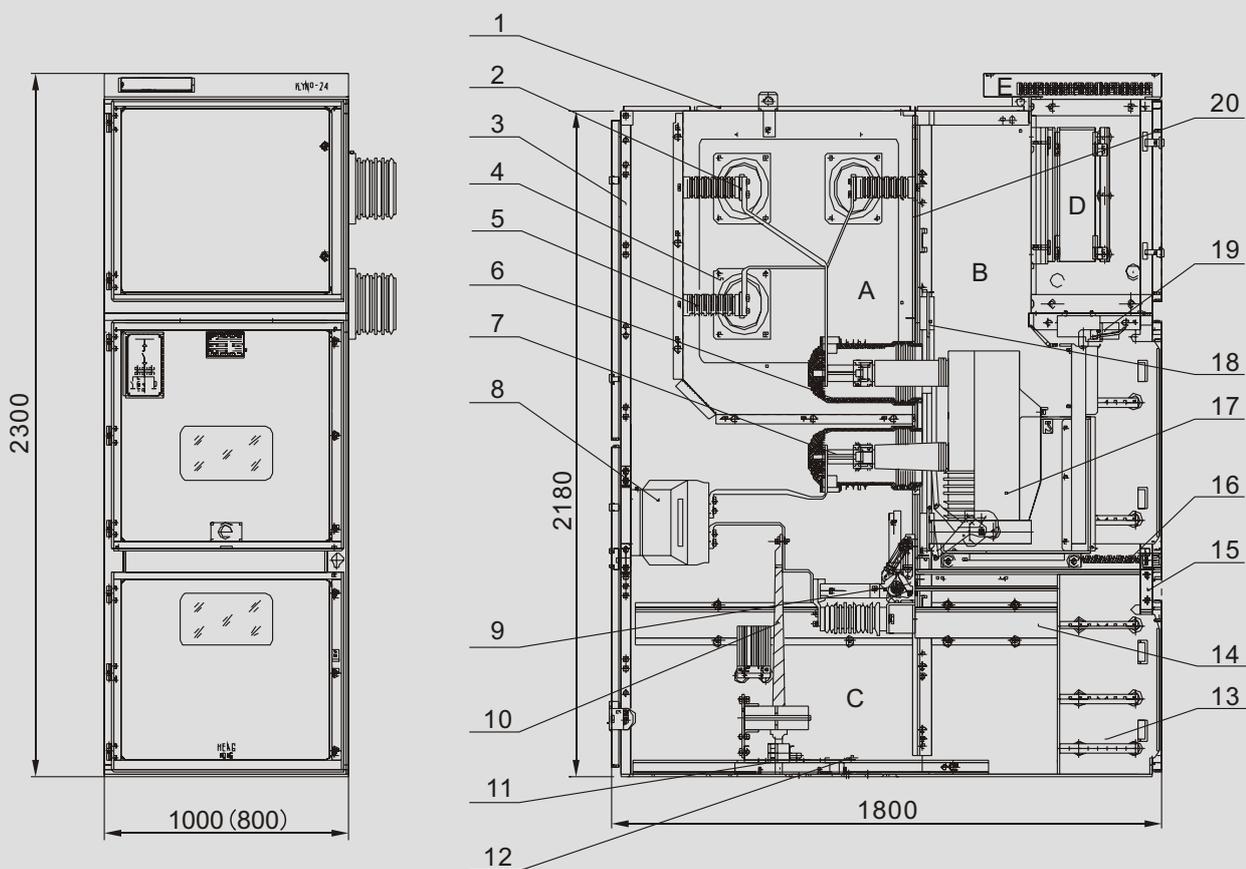


Fig.1 Section Drawing of Feeder Cubicle

A. Busbar compartment  
D. Instrument compartment

B. CB compartment  
E. Small busbar compartment

C. Cable compartment

- 1. Pressure releasing plate
- 4. Busbar bushing
- 7. Fixed contact arm
- 10. Cable
- 13. Control cable cover-plate
- 15. Removable level baffle plate
- 18. Safety shutter

- 2. Main busbar
- 5. Insulator
- 8. Current transformer
- 11. Bottom pate
- 14. Operating mechanism of earth switch
- 16. Guide screw mechanism
- 19. Secondary plug

- 3. Enclosure
- 6. Contact box
- 9. Earth switch
- 12. Earthing copper bar
- 17. CB handcart
- 20. Removable baffle plate

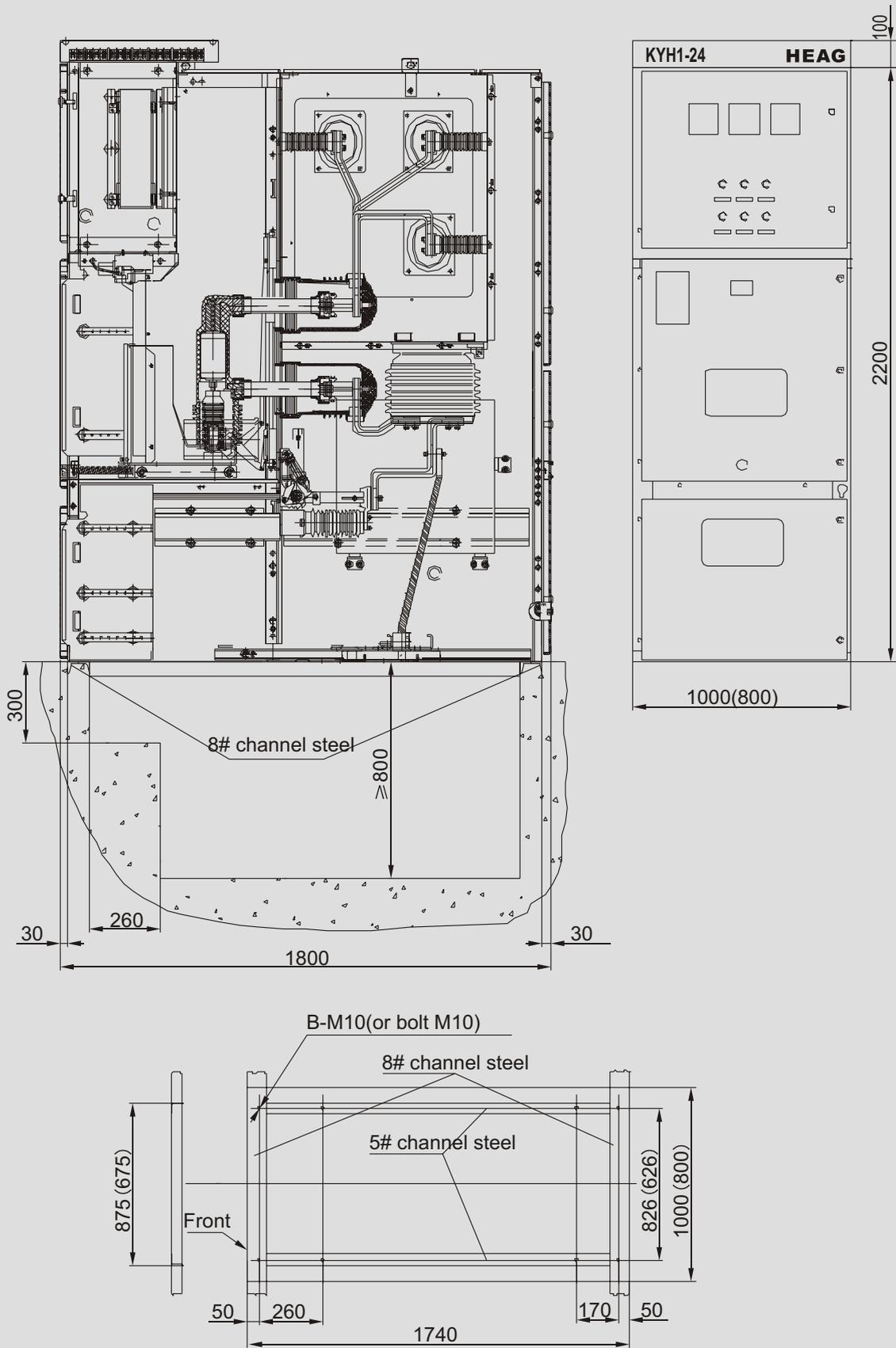


Fig. 2 Sketch of Installation Foundation  
Remarks: dimension in ( ) for the cubicle of 800mm width.

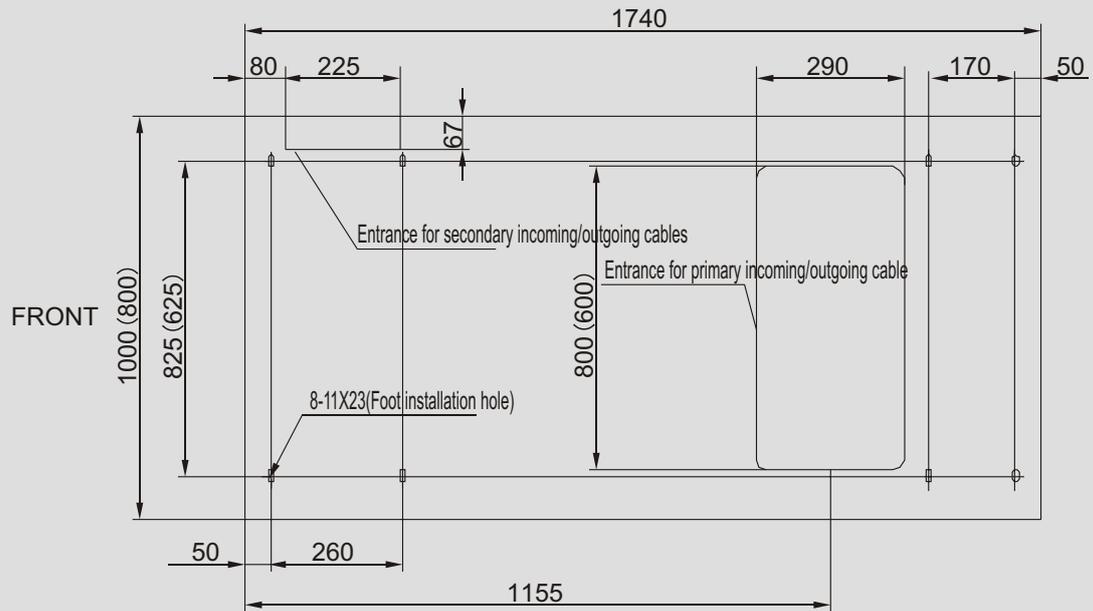


Fig.3 Opening Sketch of Bottom plate

Remarks: dimension in ( ) for the cubicle of 800mm width.

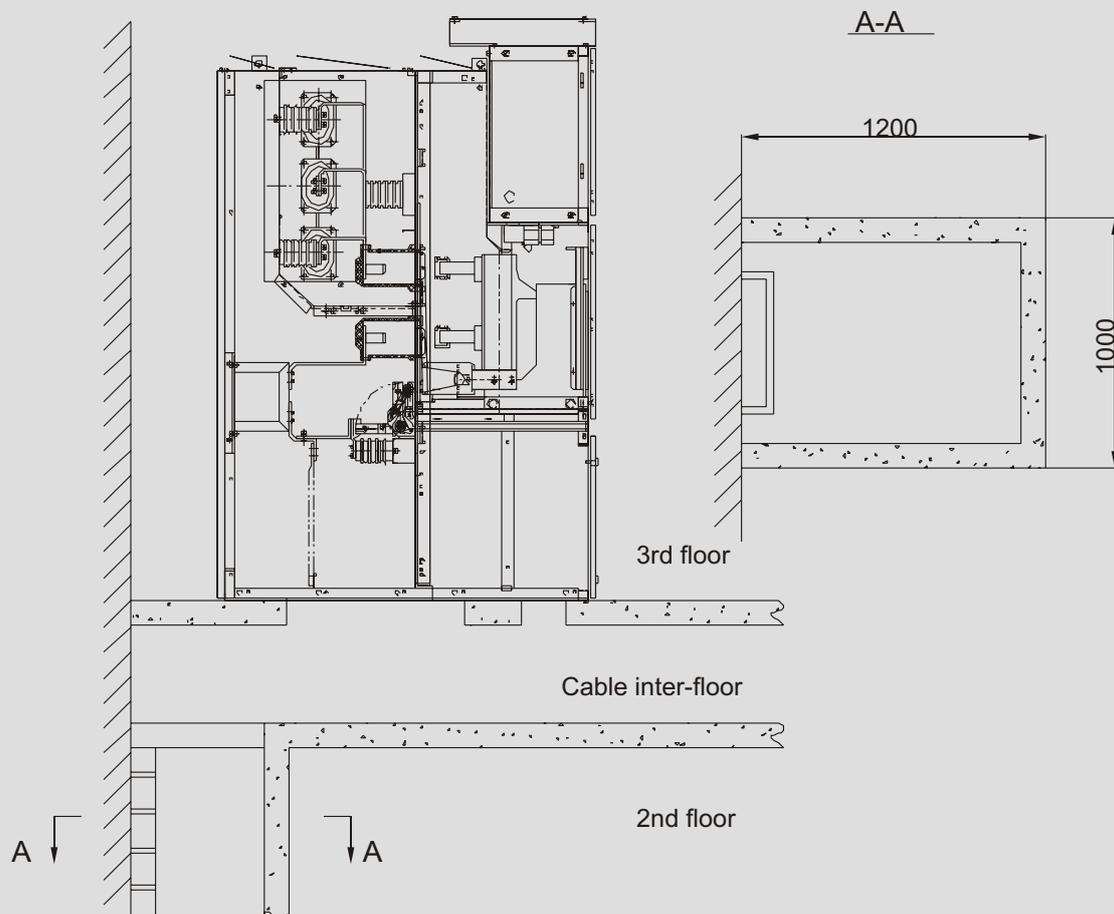


Fig.4 Sketch of Upstair Installation

## ORDERING INSTRUCTIONS

The user shall provide the following technical documents as placing an order:

12.1 Primary single line diagram and circuit usage, rated voltage, rated current, rated short-circuit breaking current, the distribution room plan and cubicle arrangement diagram.

12.2 Model, specification and quantity of the main components in the cubicle. For example, if the cubicles shall be connected by the busbar bridge, the user shall provide the details data, such as rated current-carrying capacity of the busbar bridge, the span of the busbar bridge, height from the ground, phase sequence of incoming/outgoing and so on.

12.3 Measurement, control and protection functions of the cubicle, other requirements of lock-up and automation devices.

12.4 The specifications of incoming/outgoing cables.

12.5 Special service conditions shall be pointed out as ordering;

12.6 Other special requirements.

## ATTACHED DOCUMENTS, ACCESSORIES AND SPARE PARTS

13.1 The attached documents includes:

- ◆ Qualification certificate and factory test report;
- ◆ Product Instruction;
- ◆ Secondary connection diagram;
- ◆ Packing list (including accessories, spare parts).

13.2 Accessories and spare parts:

- ◆ Forward handle for the CB handcart;
- ◆ Manual energy storage handle for the circuit breaker;
- ◆ Operating handle for the earth switch.

## SPECIAL ATTENTIONS

The switchgear will be of high condensation danger if it operates in the site where it is of high humidity, big difference in temperature between the day and the night, and big variation of the temperature. So the heater must operate all day if the switchgear in the steady or operating state. However, the heater need not operate when the switchgear operates under the load current up to 1250A.

## SINGLE LINE DIAGRAM (SLD)

Please find hereunder attached single line diagrams(SLD).

15.1 The models of the primary components listed in the sheet are for design selection, please consult the manufacturer if the user need other models.

15.2 For the single line diagram not listed in the sheet, please consult the manufacturer.

SLD NO.	001	002	003	004	005
Main Circuit Scheme					
Usage	Incoming/Outgoing				
Outline Dim.(W×D×H)	800(1000)×1800×2300				
Rated current(A)	630~2500				
Main Components	VCB of VHY1-24	1	1	1	1
	CT of LZZBJ□-24	2	2	3	3
	Arrester of HY5W	3	3	3	3
	PT of JDZ□-24 or JDZX□-24				
	Fuse of XRNP-24/0.5				
	Earth switch of JN□-24		1		1
Remarks	The power display and the arrester shall be selected according the requirements.				
SLD NO.	006	007	008	009	010
Main Circuit Scheme					
Usage	Coupling				
Outline Dim.(W×D×H)	800(1000)×1800×2300				
Rated current(A)	630~2500				
Main Components	VCB of VHY1-24	1	1	1	1
	CT of LZZBJ□-24	2	2	3	3
	Arrester of HY5W				
	PT of JDZ□-24 or JDZX□-24				
	Fuse of XRNP-24/0.5				
	Earth switch of JN□-24				
Remarks	The power display and the arrester shall be selected according the requirements.				

SLD NO.		011	012	013	014	015
Main Circuit Scheme						
Usage		Aerial coupling				
Outline Dim.(W×D×H)		800(1000)×1800×2300				
Rated current(A)		630~2500				
Main Components	VCB of VHY1-24	1	1	1	1	
	CT of LZZBJ□-24	2	2	3	3	
	Arrester of HY5W					
	PT of JDZ□-24 or JDZX□-24					
	Fuse of XRNP-24/0.5					
	Earth switch of JN□-24					
Remarks		The power display and the arrester shall be selected according the requirements.				
SLD NO.		016	017	018	019	020
Main Circuit Scheme						
Usage		Back aerial incoming/outgoing				
Outline Dim.(W×D×H)		800(1000)×2300×2300				
Rated current(A)		630~2500				
Main Components	VCB of VHY1-24	1	1	1	1	
	CT of LZZBJ□-24	2	2	3	3	
	Arrester of HY5W	3	3	3	3	
	PT of JDZ□-24 or JDZX□-24					
	Fuse of XRNP-24/0.5					
	Earth switch of JN□-24		1		1	
Remarks		The power display and the arrester shall be selected according the requirements.				

SLD NO.	021	022	023	024	025
Main Circuit Scheme					
Usage	PT				
Outline Dim.(W×D×H)	1000×1800×2300				
Rated current(A)	630~2500				
Main Components	VCB of VHY1-24				
	CT of LZZBJ□-24				
	Arrester of HY5W	3	3	3	3
	PT of JDZ□-24 or JDZX□-24	2	3	2	3
	Fuse of XRNP-24/0.5	3	3	3	3
	Earth switch of JN□-24				
Remarks	The power display and the arrester shall be selected according the requirements.				
SLD NO.	026	027	028	029	030
Main Circuit Scheme					
Usage	PT coupling				
Outline Dim.(W×D×H)	1000×1800×2300				
Rated current(A)	630~2500				
Main Components	VCB of VHY1-24				
	CT of LZZBJ□-24				
	Arrester of HY5W			3	3
	PT of JDZ□-24 or JDZX□-24	2	3	2	3
	Fuse of XRNP-24/0.5	3	3	3	3
	Earth switch of JN□-24				
Remarks	The power display and the arrester shall be selected according the requirements.				

SLD NO.		031	032	033	034	035
Main Circuit Scheme						
Usage		Coupling	Isolation			
Outline Dim.(W×D×H)		800(1000)×1800×2300				
Rated current(A)		630~2500				
Main Components	VCB of VHY1-24					
	CT of LZBZJ□-24					
	Arrester of HY5W		3			
	PT of JDZ□-24 or JDZX□-24					
	Fuse of XRNP-24/0.5					
	Earth switch of JN□-24					
Remarks		The power display and the arrester shall be selected according the requirements.				
SLD NO.		036	037	038	039	040
Main Circuit Scheme						
Usage		Measurement				
Outline Dim.(W×D×H)		1000×1800×2300				
Rated current(A)		630~2500				
Main Components	VCB of VHY1-24					
	CT of LZBZJ□-24	2	2	3		
	Arrester of HY5W					
	PT of JDZ□-24 or JDZX□-24	2	2	3		
	Fuse of XRNP-24/0.5	3	3	3		
	Earth switch of JN□-24					
Remarks		The power display and the arrester shall be selected according the requirements.				

**HEAG**<sup>®</sup>

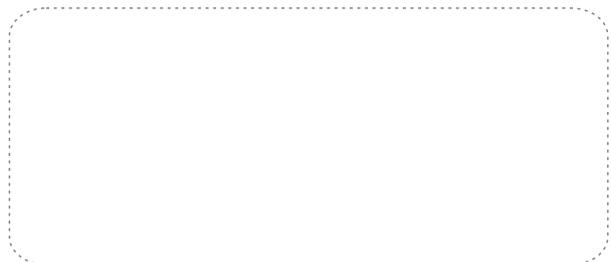
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