ZENITH SWITCHGEAR (M) SDN BHD

ZSG12

12-17.5kV Air insulated VCB switchgear

(Fully type-tested)

ZSG12 Air insulated VCB switchgear

ZSG12 Metal Enclosed AIS VCB Switchgear

1. It is an integration of many years' knowledge and experience of leading switchgear technology.
2. It is a safe and ideal distribution power switchgear for the world.
3. It is a modular product integrating the mechanical and electrical designs, offering all the possible configuration models.
4. Other than IEC, ZSG12 are also Complying With DET NORSKE VERITAS and extended its service from onshore to offshore projects.
5. ZENITH SWITCHGEAR is capable of offering quality power distributing solutions and providing worldwide service support at any time.

Index of ZSG12 AIS Technical Brochure

1. Key Complying Standards of ZSG12 AIS

- IEC 62271-200: AC Metal-enclosed Switchgear and Control Gear for rated voltage above 1kV and up to and including of 52kV
- IEC 60694-2002: Common Specification for HV Switchgear & Control Gear
- IEC 62271-100: HV AC Circuit Breakers
- IEC 62271-102: HV AC Disconnectors and Earthing Switches
- IEC 62271-103: Switches for rated voltage above 1kV up to and including 52kV
- IEC 62271-105: AC Switch-fuse combination
- IEC 62271-106: AC Contactors & Contactor based Motor Starters

2. Normal Service Conditions

- Installation site： Indoor
- Installation Environment: No fire, no explosion, no serious pollution, no chemical corrosion, no severe vibration environment.
- Ambient temperature: -15℃～+50℃
- Altitude：≤1000m
- Relative humidity: Daily average relative humidity ≤ 95%. Monthly average relative humidity≤90%
- Earthquake intensity: ≤ 8 G Richter Scale

Note: When used in ambient above 40℃, a derating factor is required in accordance with IEC standards.

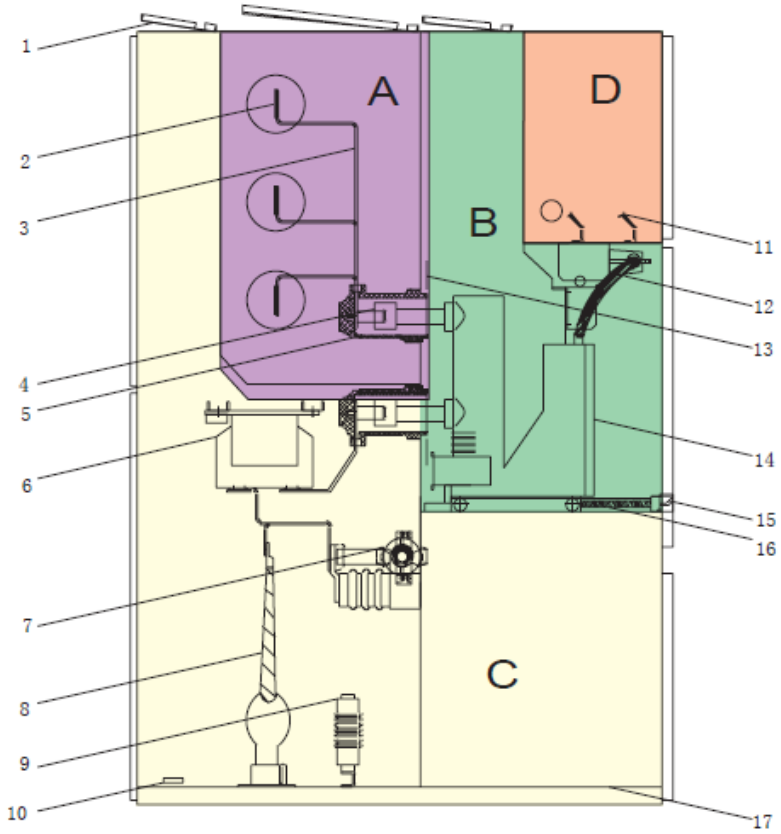
3.1. Design Features: Modular Compartments

- 1. Metering: Control and protection devices are located at the top, away from HV Magnetic interference.
- 2. VCB compartment: All movable trucks such as VCB, Voltage transformer are installed here. The plug-in point is isolated by a pair of metallic shutters that open when plug-in and close when the truck is withdrawn.
- 3. Bus compartment: The main and auxiliary bus are made of rectangular round edge copper busbars. The joints are tinned for anti-oxidation.
- 4. Cable compartment: Located at the bottom with CTs, Lightning arrestors, earthing switch and other primary components. Termination point is >500mm from the floor. The secondary wirings are connected directly to the metering panel through channel at the bottom sides.

3.2. Design features: Key function parts

1. Metering compartment
2. VCB compartment
3. Main bus compartment
4. Cable compartment and pressure relief
5. Internal arc pressure relief compartment
6. Pressure arc barriers
7. Earthing switch
8. Shutter assembly

3.3. Key Parts of ZSG12



Isolated Compartments

A. Bus Compartment

B. Circuit Breaker Compartment

C. Cable Compartment

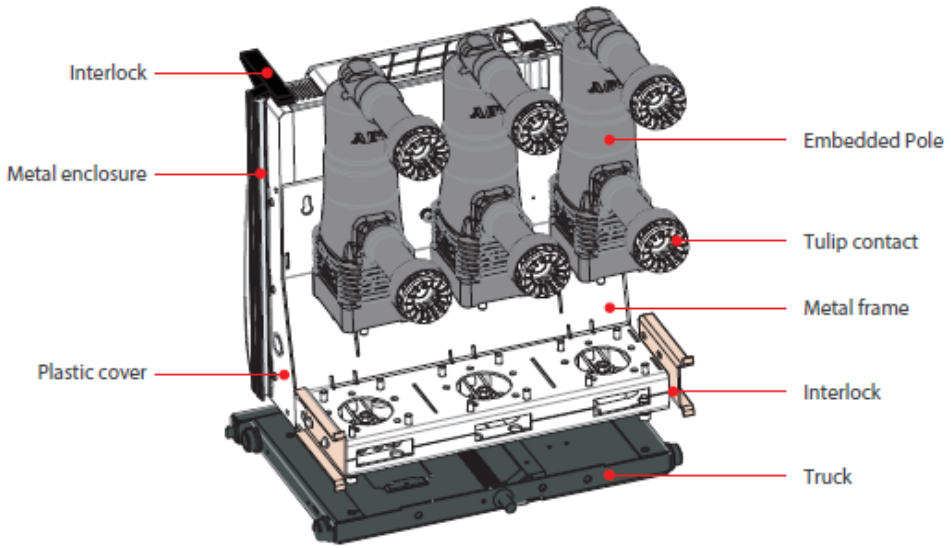
D. Low-voltage Compartment

1. Pressure-relief Flap
2. Main Busbar
3. Branch Busbar
4. Disconnecting Contacts
5. Primary Contacts Box
6. CT
7. Earthling Switch
8. Cable Terminals
9. ZnO Arrester
10. Main Grounding Bus
11. Terminal Blocks
12. Secondary Coupler
13. Shutter
14. Vacuum Circuit Breaker
15. Operation Mechanism of Earthling Switch
16. Lead-screw Mechanism
17. Chassis

3.4. AEG design features: Embedded Pole VCB

VL12 Cassette VCB (Embedded Pole Design)

3.5. Basic product coding of AEG VL type VCBs



Product coding

VL – □ □ / □ – □ □ □

- Product
- Related voltage(V): 12、24、40.5
- Pole type: A-Assembly Pole E-Embedded Pole
- F-Fixed W-withdrawable
- N/A-Mid-Set(withdrawable) B-VCB on truck
- Related short circuit breaking current(kA) : 25、31.5、40、50
- Related current(A): 630、1250、1600、2000、2500、3150、4000、5000

3.6. AEG ZC12 Vacuum contactor unit

Applications：

1. MV Motor Starters
2. Station transformers

Features：

1. Same size of Cassette VCB
2. Equipped with MV Vacuum Contactor and MV Fuse

4.1. ZSG12 Cubicle Technical parameters

ITEM NO.	Description	Unit	Parameters			
1	ZSG12 CUBICLE MODEL NO.		ZSG12-R25	ZSG12-S32	ZSG12-T32	ZSG-U/V-32
2	Maximum rated voltage	kV	12/17.5			
3	Rated power-frequency withstand voltage (1min rms.)	kV	28/38/42			
4	Rated lightening impulse withstand voltage(Peak)	kV	75/95			
5	Rated frequency	Hz	50			
6	Rated short time withstand current	kA	62.5	80/100/125	80/100/125	80/100/125
7	Duration of short circuit	s	3			
8	Rated peak withstand current	kA	62.5	80/100/125	80/100/125	80/100/125
9	Partition	Class	PM			
10	Cubicle Protection	IP	4X			
11	Internal Arc Fault	kA/s	25kA 1S	31.5/40kA 1S	31.5/40kA 1S	31.5/40kA 1S
12	Main bus current	A	1250/2000/3150/4000*			
13	Branch bus current	A	630	1250	2000	2500/3150
14	Width of cubicle	W(mm)	650/800	800	800	1000
15	Depth of cubicle	D(mm)	*1550	*1550	*1550	*1550
16	Height of cubicle	H(mm)	2200	2200	2200	2200

*Note: Dimensions of depths may change due to project requirement.

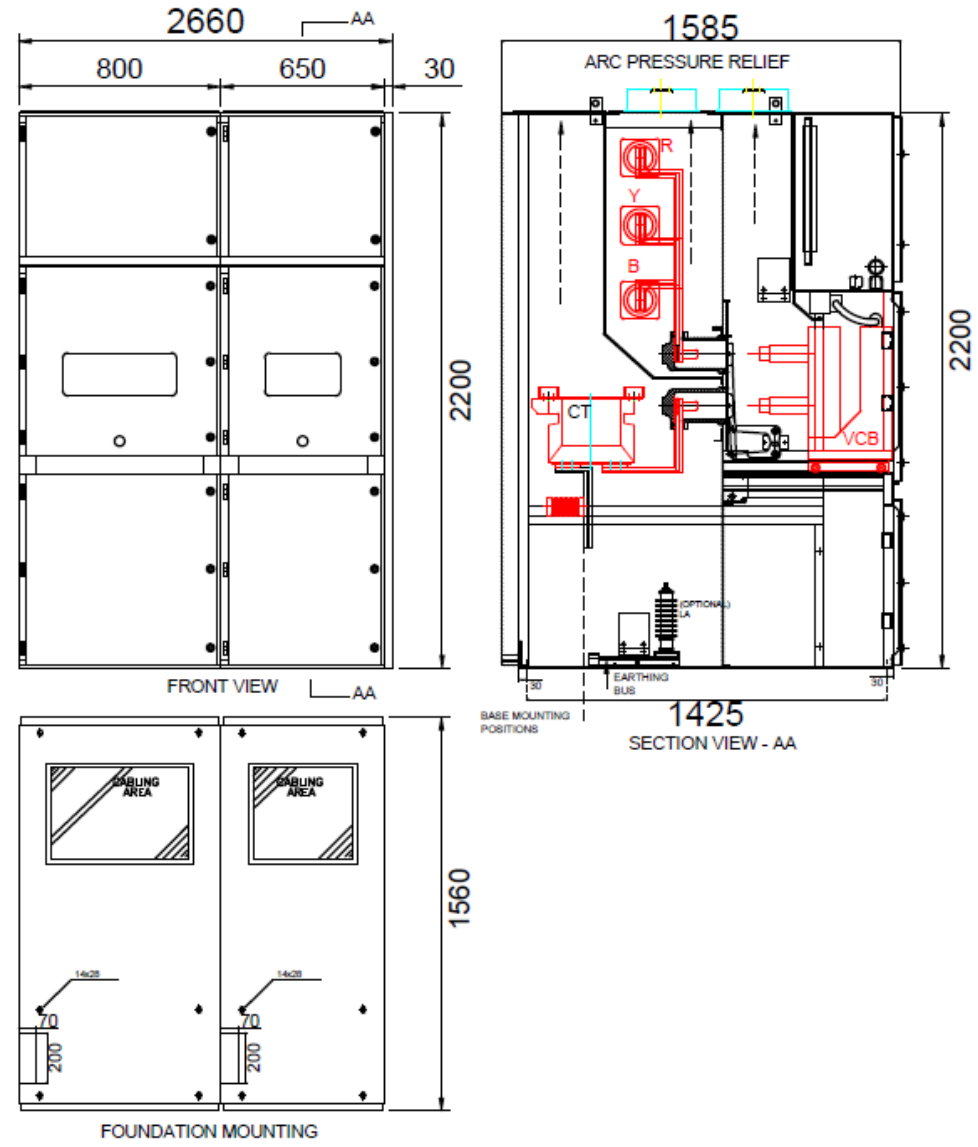
4.2. AEG VL12 VCB Technical parameters

Item No.	Description	Unit	Parameters			
1	VL12 MODEL NUMBER	VL	VL12-E-630-25	VL12-E-1250-31.5/40	VL12-E-2000-31.5/40	VL12-E-2500/3150-31.5/40
1	Maximum rated voltage	kV	12/17.5			
2	Rated power-frequency withstand voltage (1min rms.)	kV	28/38/42			
3	Rated lightening impulse withstand voltage(Peak)	kV	75/95			
4	Rated frequency	Hz	50			
5	Rated current	A	630	1250	2000	2500/3150
6	Phase Centers (P CC)	mm	150	210	210	275
7	Upper / Lower Pole Centers (U/L CC)	mm	205*/275	275	310	310
8	Rated short-circuit making current	kA	25	31.5/40	31.5/40	31.5/40
9	Rated short-circuit breaking current	kA	25	31.5/40	31.5/40	31.5/40
10	Rated short time withstand current	kA	62.5	80/100	80/100	80/100
11	Duration of short circuit	s	3			
12	Rated peak withstand current	kA	62.5	80/100	80/100	80/100
13	Operating sequence	Duty	O-0.3s-CO-180s-CO			
14	Rated closing/opening/tripping time	ms	20~50 / 15~35 / <60			
15	Closing spring energy storage		Motor spring charge			
16	Control Supply voltage	V	30/48/60/110/220VDC			

4.3. AEG ZC12 Vacuum Contactor Technical Parameters

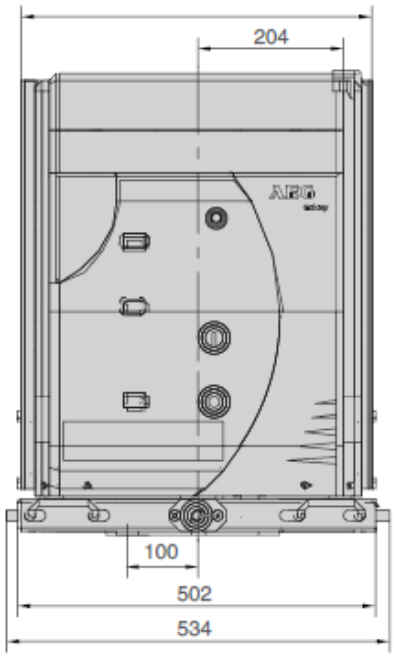
Item	Description	Unit	Rating
1	Rated Voltage	kV	3.6/7.2/12
2	Rated Contactor Current	A	200/400/630A
3	Rated Contactor Breaker Current	kA	4/6.3/10
3	Rated Frequency	Hz	50/60
4	Rated Power Withstand Frequency	kVp for 1 Min	20/28/38/42
5	Impulse Withstand Voltage	kVp	60/75
6	Rated Fuse Current	A	25-200
7	Rated Fuse Breaking Current	kA	40, 50
8	Mechanical Life	Cycles	300,000
9	Maximum Start/stop	Times/h	300

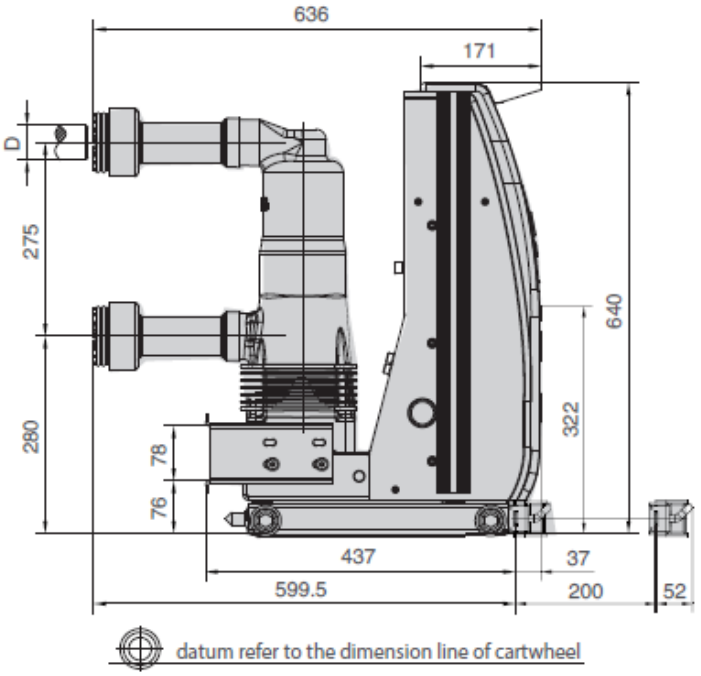
5.1. ZSG12 Typical dimensions

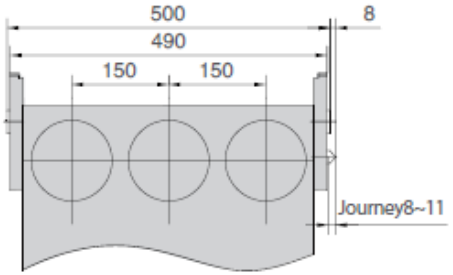


5.2. AEG VL12 VCB dimensions

12kv Withdrawable Embedded Pole - Pole center distance150mm



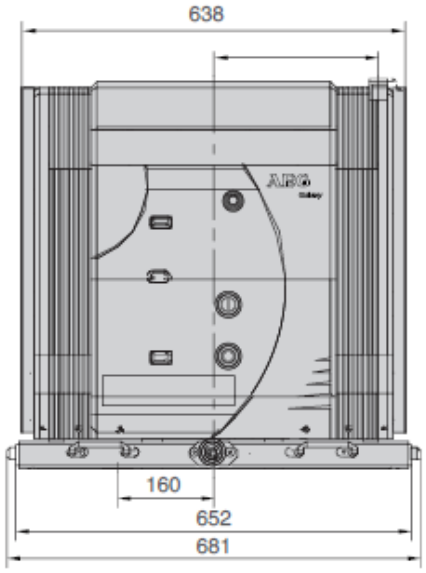


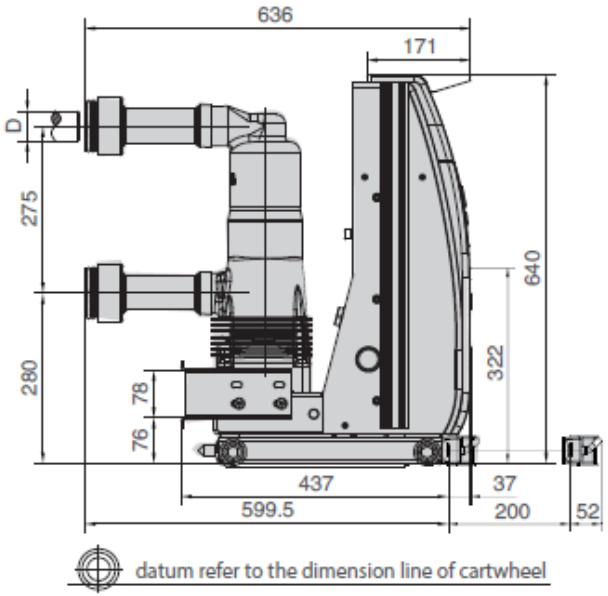


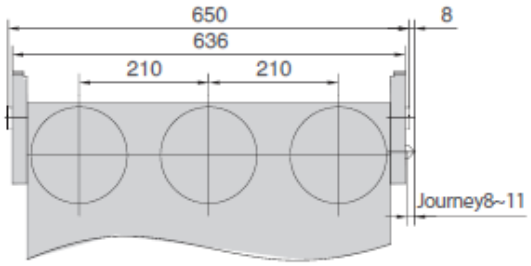
Type	D
630A/25~31.5kA	Ø35
1250A/25~31.5kA	Ø49

5.3. AEG VL12 VCB dimensions

12kv Withdrawable Embedded Pole - Pole center distance210mm



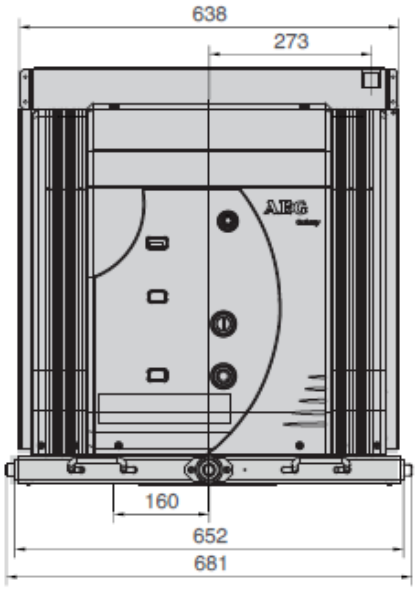


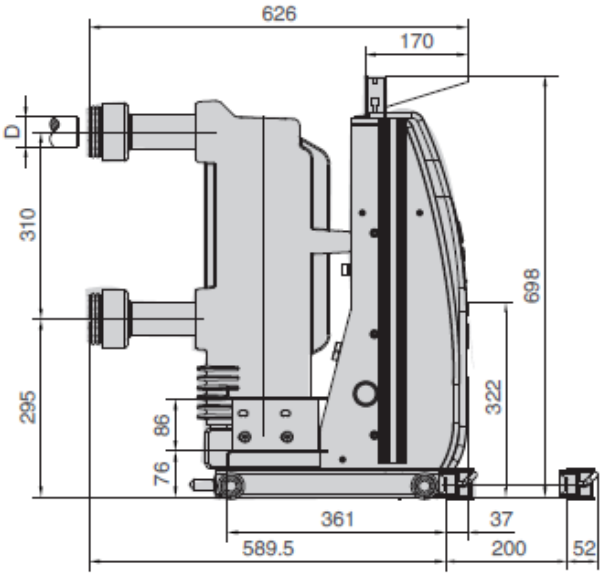


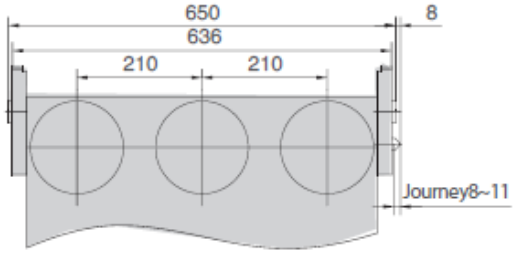
Type	D
630A/25~31.5kA	Ø35
1250A/25~31.5kA	Ø49
1250A/40kA	Ø49
1600A/31.5~40kA	Ø55

5.4. AEG VL12 VCB dimensions

12kv Withdrawable Embedded Pole - Pole center distance210mm





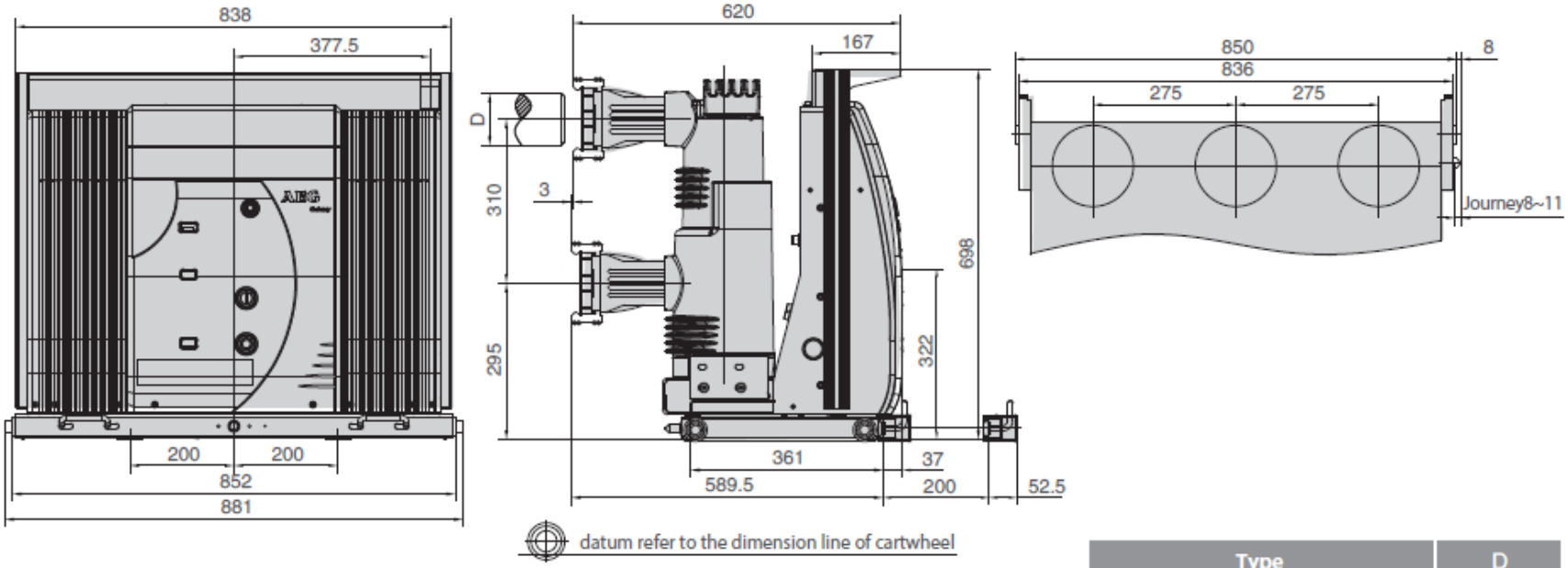


datum refer to the dimension line of cartwheel

Type	D
1250/50kA	Ø49
1600A/50kA	Ø55

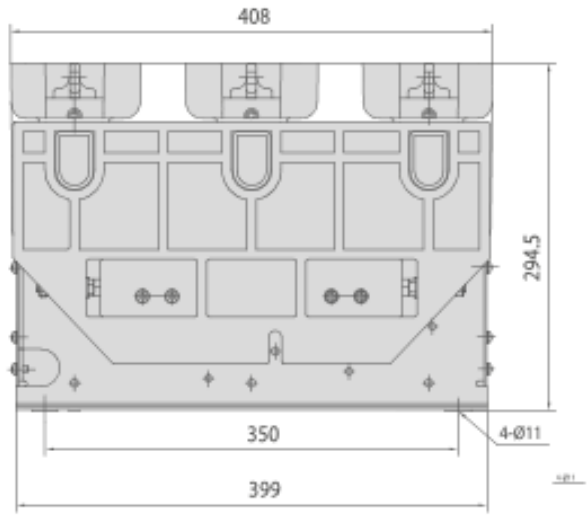
5.5. AEG VL12 VCB dimensions

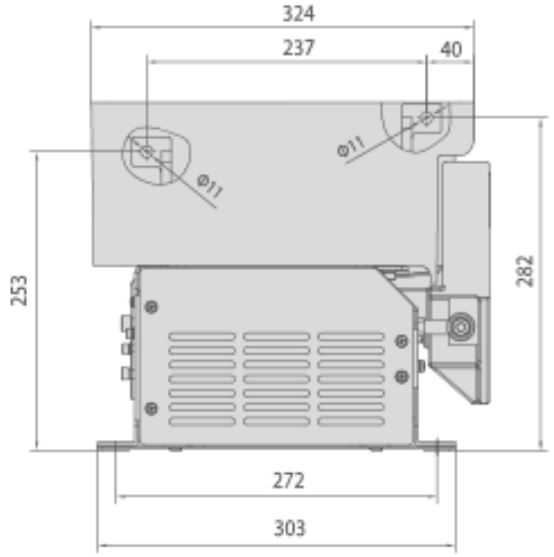
12kv Withdrawable Embedded Pole - Pole center distance275mm

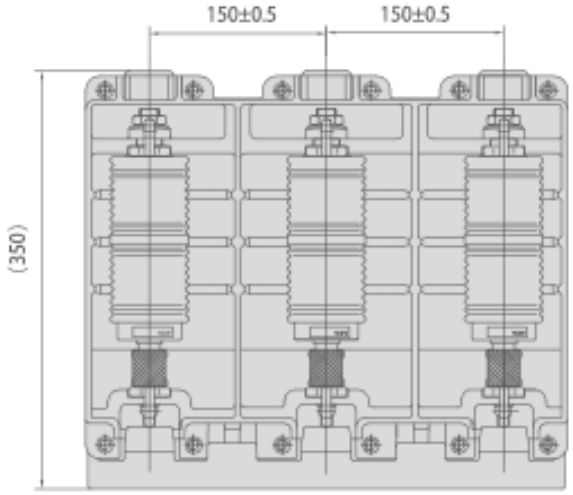


Type	D
1600~2000A/31.5~50kA	Ø79
2500~3150A/31.5~50kA	Ø109
4000A/40~50kA	Ø109

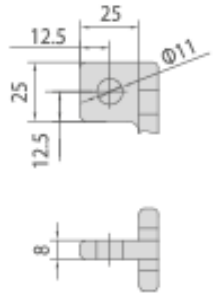
5.6. AEG ZC12 Fixed type vacuum contactor dimensions



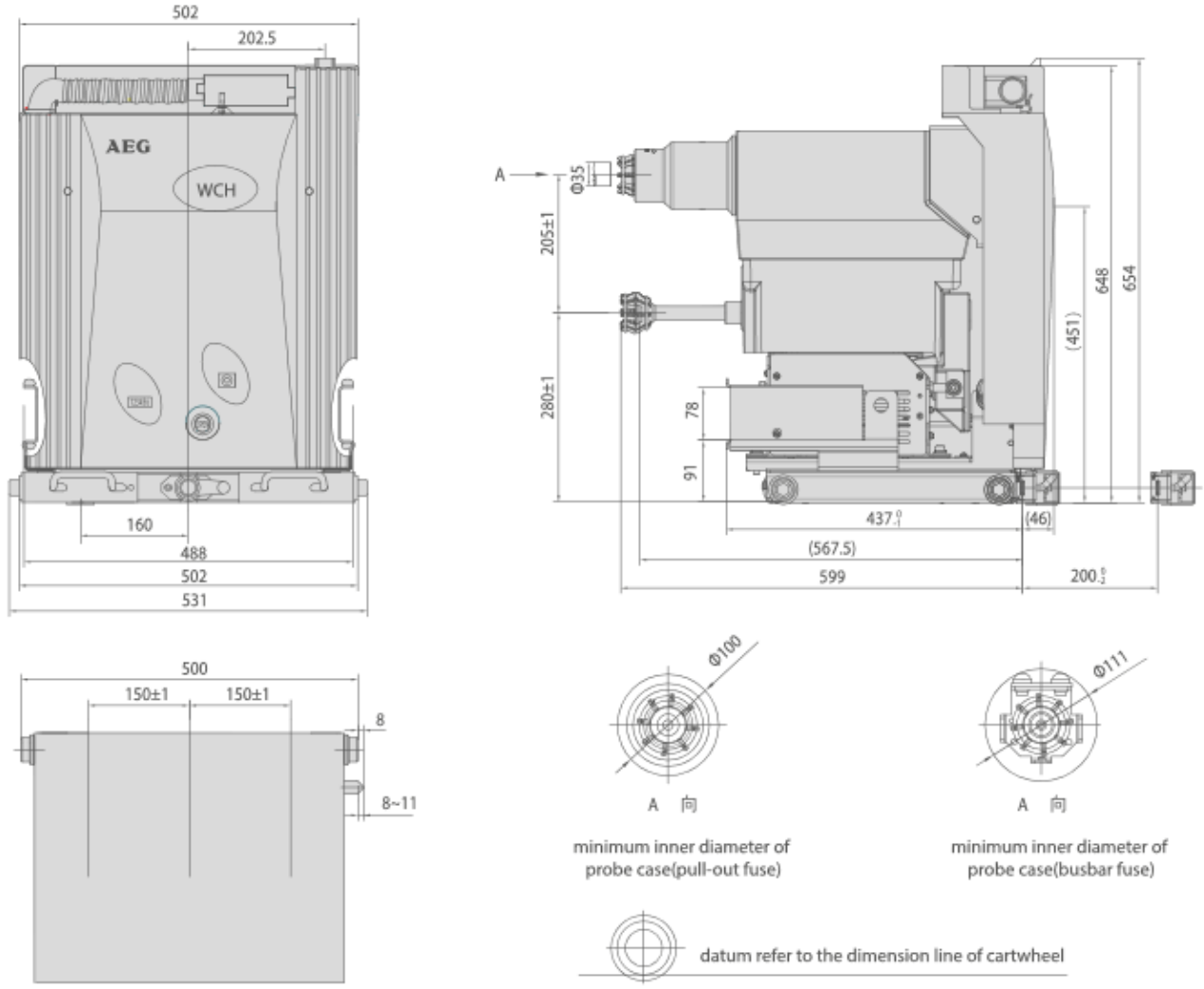




schematic diagram of amphenol connector



5.7. AEG ZC12 Draw-out type vacuum contactor dimensions



Remark: size of fixed contact Ø35mm, mesh size of moving contact & fixed contact ≥15mm。

6.1. Mechanical constructions - Mechanical Interlocks

1. When VCB is closed at service position, VCB door cannot open, VCB cannot rack out, ESW cannot close.
2. When VCB is opened at service position, VCB door cannot open, VCB can rack out, ESW cannot close.
3. When VCB is at service or test position, VCB can close or open. VCB cannot close at intermediate position.
4. VCB can only be racked in or out when VCB is in open condition; VCB cannot be racked in or out when VCB is in closed condition.
5. When VCB is at test position, then ESW can close and VCB door can only open.
6. ESW can only close or open when VCB is open and located at the test position.
7. Cable compartment back door can only be opened when ESW is closed.

6.2. CIRCUIT BREAKER COMPARTMENT

Circuit Breaker Compartment

Circuit breaker compartment is on the central front of the cabinet with special rail installed inside for carriage to work and slide on it. Carriage is able to move to either isolated/ test position or working position. There are disconnecting contacts box and metal protection shutter which is able to move up and down installed on the back of the circuit breaker compartment. The shutter can be opened freely when the truck is moving between test position and working position. The moving-contact can be easily plugged into the fixed contact socket to get it through to the moving contactor. When the carriage moves to the test position, the protection shutter goes down to cover the fixed contact to isolate it in case operator might get electric shock. Carriage can be operated even if the cabinet door is closed. Through the observation window on the front door, the position of carriage is visible, so as the open/close button of breaker, the on/off indicator and the indicator for the spring's energy.

6.3. CABLE COMPARTMENT

Cable Compartment

Cable compartment is in the lower back of the cabinet. CTs, earthling switches and lightening arresters can be installed in this compartment. Arrester handcarts and PT handcarts can be adopted in the cable compartment (in the former lower of the cabinet) if necessary. Constructors are able to go inside the cabinet to install cables from the back of the cabinet with the back boards removed, or from the front of the cabinet with handcarts and horizontal board removed. There are conductors for cable connection, which can join 1~3 cables in parallel.

Bottom of the cable compartment is detachable metal plate with rifts, equipped with cable fixation clamp and sealing ring with varying diameter. This ensures the convenience for construction and isolation from cable channel.

Besides, secured plate heaters are installed in both handcart compartment and cable compartment in case the condensation caused by the rise of environmental humidity.

6.4. MAIN BUS BAR COMPARTMENT

Busbar Compartment

Main bus compartment is in the upper back of the cabinet. Buses are able to go from one cabinet to another. Clapboards and bushings are adopted to fix and support the buses when they're going through the cabinets. Further more, these clapboards and bushing can prevent the equipment failure to affect neighbor cabinets. Branch buses are connected to main bus and fixed contactor box. All buses can be covered by insulating tape if it is necessary. Besides, insulating cover is also adopted to the bus lap joint.

6.5. LOW VOLTAGE COMPARTMENT

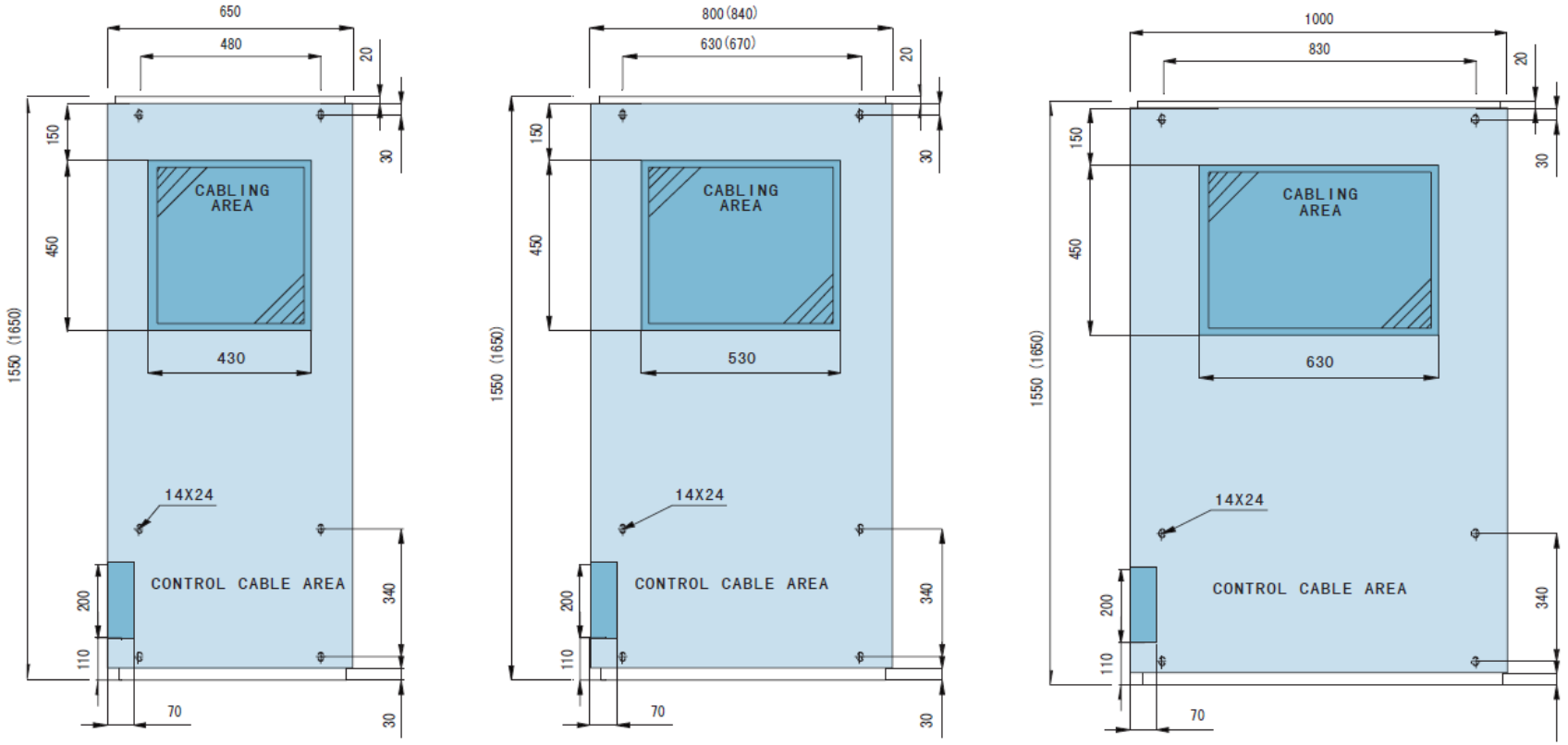
Low-voltage Compartment

Low-voltage compartment is in the upper front of the cabinet. Metering equipments, operation switches, buttons and signal lights, signal relays can be installed on the front door. There are tiny holes for buses to pass through on the side board of the low-voltage compartment to make it convenient for construction.

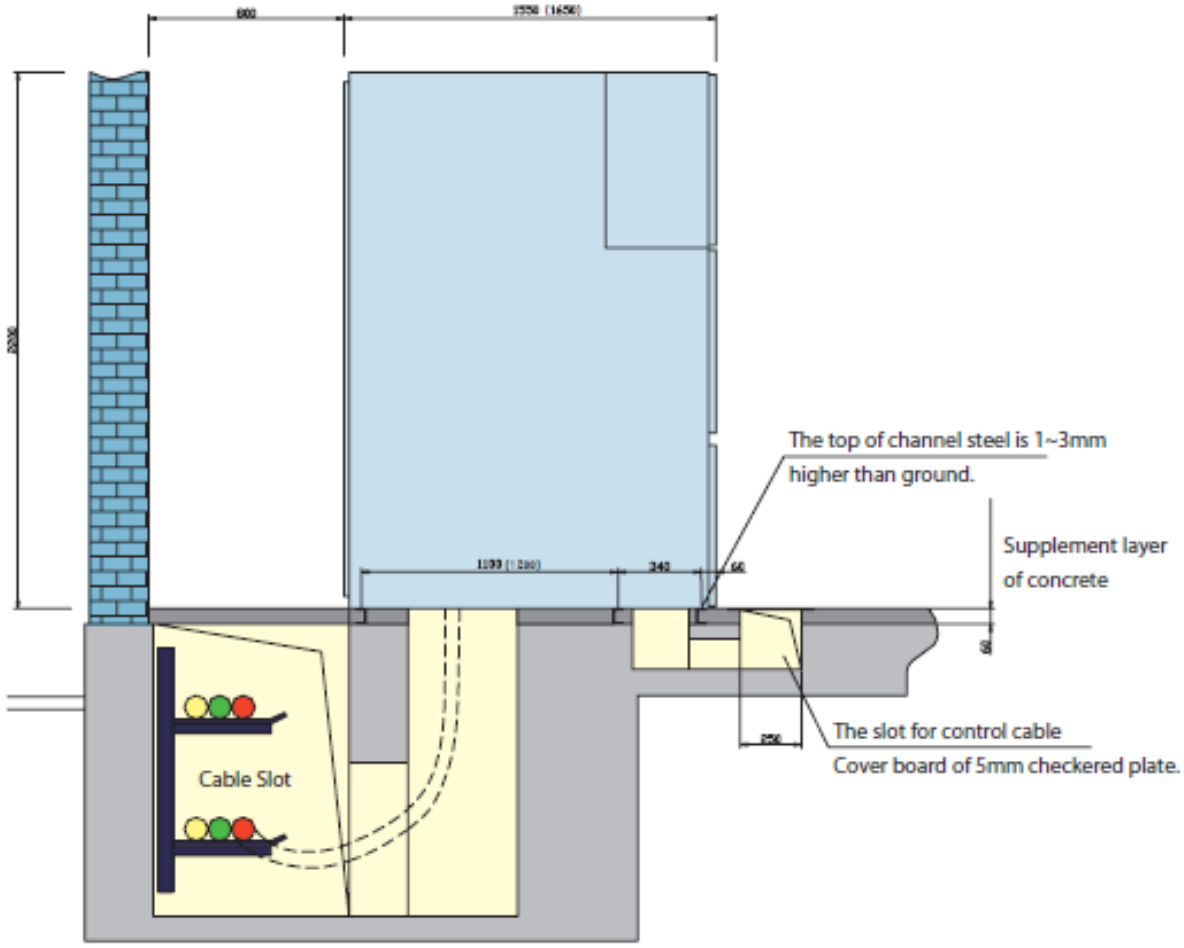
6.6. Draw-out or Fixed VTs

Draw-out or Fixed VTs Complied with IEC Standard are available as options.

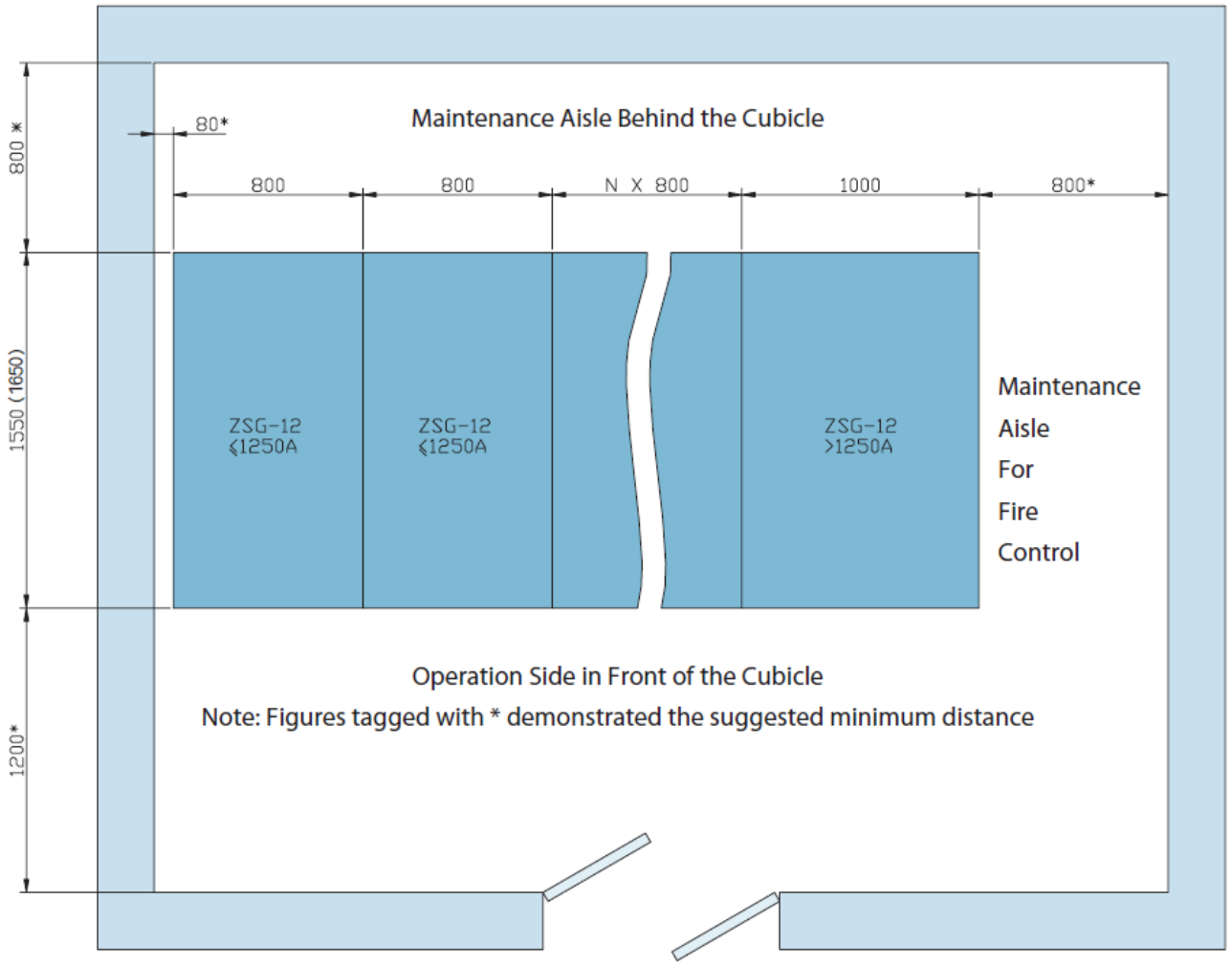
7.1. ZSG12 Installation – Typical base mounting dimensions



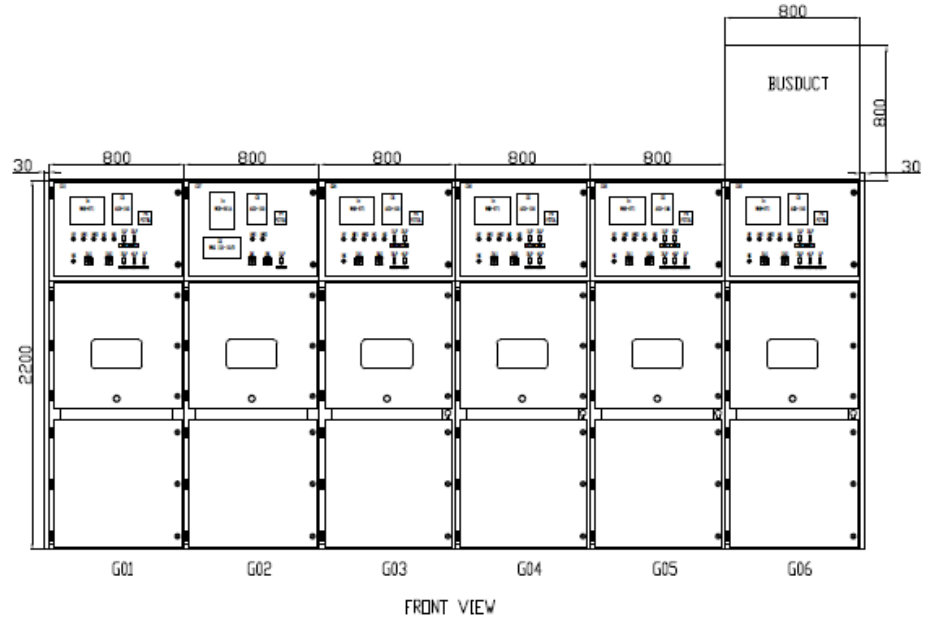
7.2. ZSG12 Typical guide of installation



7.3. ZSG12 Typical substation layout

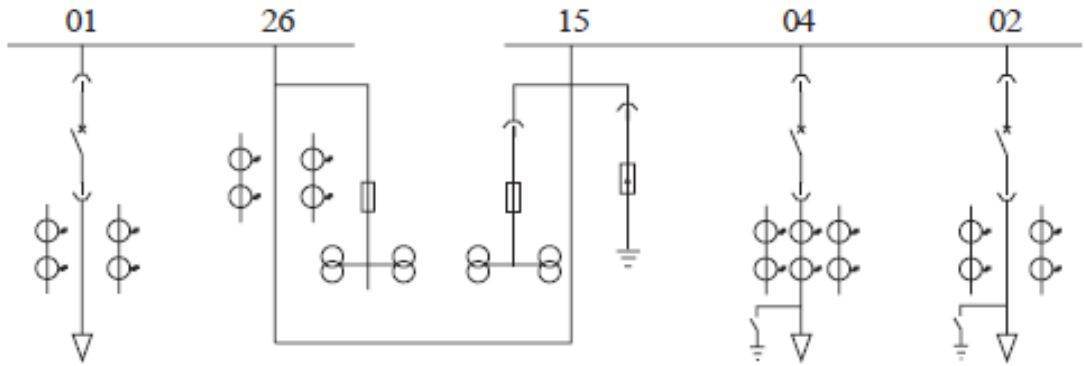


7.4. ZSG12 Typical general arrangement and foundation layout

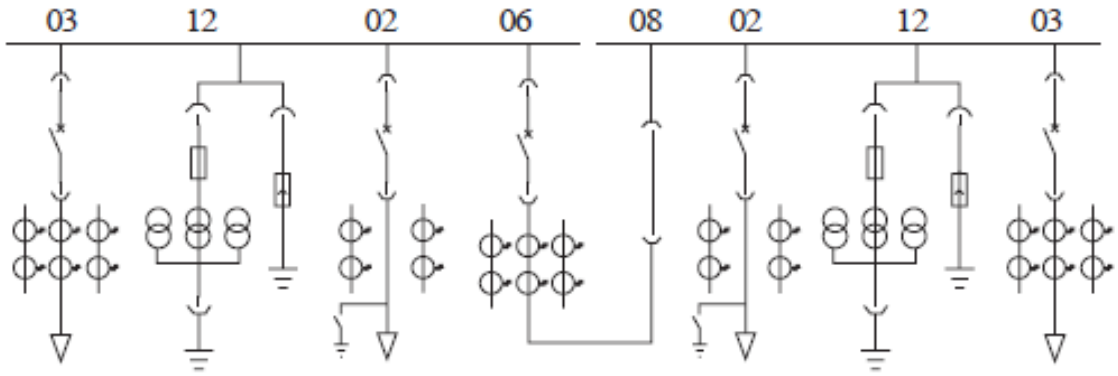


8.1. Typical application schemes

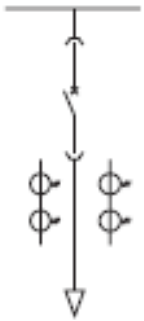
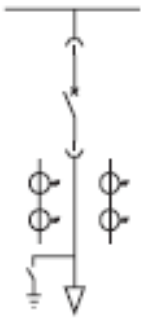
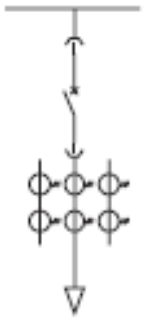
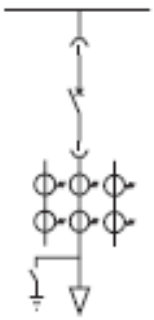
Application Schemes Illustration NO.1



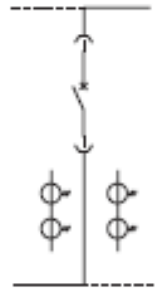
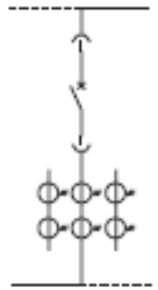
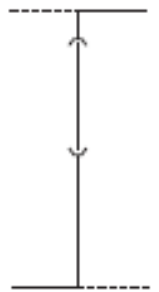
Application Schemes Illustration NO.2



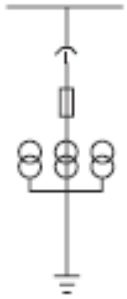
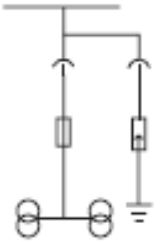
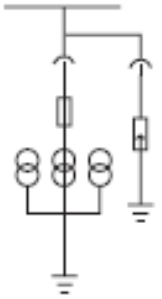
8.2. Primary schemes

Scheme NO.		01	02	03	04
Schematic Diagram of Primary Connection					
Rated Current (A)		630~1250	630~1250	630~1250	630~1250
Major Equipments	Vacuum Circuit Breaker	1	1	1	1
	Current Transformer LZZBJ9 -12	2	2	3	3
	Potential Tr ansformer JDZ10				
	Potential Transformer JDZX10				
	High Voltage Fuse XRNP1 -10				
	Earth ling Switch JN15		1		1
	Lightning Arrester HY5WS				
Application / Remark		For incoming and outgoing cables			

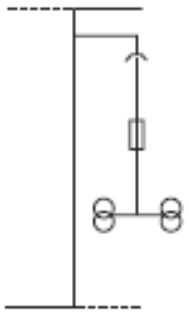
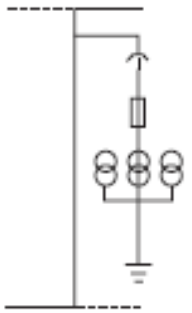
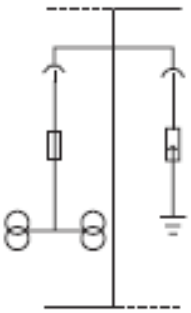
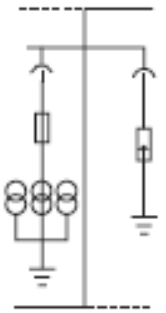
8.3. Primary schemes

Scheme NO.		05	06	07	08
Schematic Diagram of Prim ary Connection					
Rated Current (A)		630~1250	630~1250	630~1250	630~1250
Major Equipments	Vacuum Circuit Breaker	1	1		
	Current Transformer LZZBJ9-12	2	3		
	Potential Transformer JDZ10				
	Potential Transformer JDZX10				
	High Voltage Fuse XRNP1-10				
	Earth ling Switch JN15		1		1
	Lightning Arrester HY5WS				
Application / Remark		For Connection		For incoming and outgoing cables	For Isolating Connections

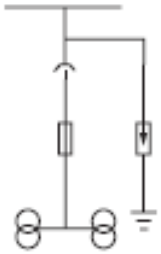
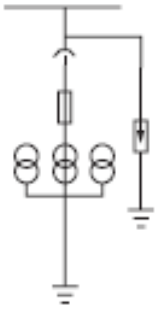
8.4. Primary schemes

Scheme NO.		09	10	11	12
Schematic Diagram of Primary Connection					
Rated Current (A)					
Major Equipments	Vacuum Circuit Breaker				
	Current Transformer LZZBJ9-12				
	Potential Transformer JDZ10	2		2	
	Potential Transformer JDZX10		3		3
	High Voltage Fuse XRNP1 -10	3	3	3	3
	Earth ling Switch JN15				
	Lightning Arrester HY5WS			3	3
Application / Remark		PT			

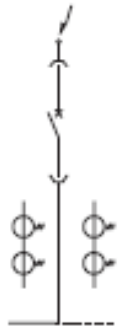
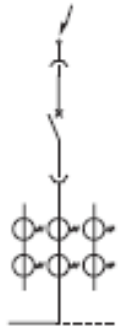
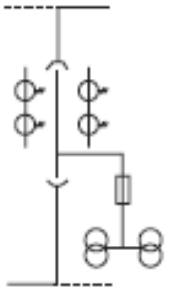
8.5. Primary schemes

Scheme NO.		13	14	15	16
Schematic Diagram of Primary Connection					
Rated Current (A)					
Major Equipments	Vacuum Circuit Breaker				
	Current Transformer LZZBJ9-12				
	Poten tial Transformer JDZ10	2		2	
	Potential Transformer JDZX10		3		3
	High Voltage Fuse XRNP1 -10	3	3	3	3
	Earth ling Switch JN15				
	Lightning Arrester HY5WS			3	3
Application / Remark		PT Connection			

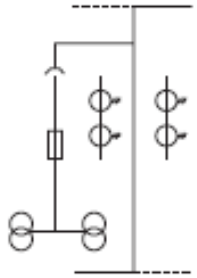
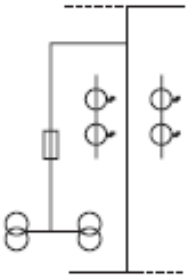
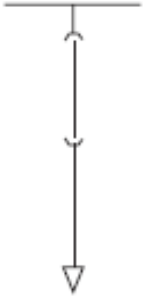
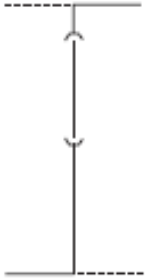
8.6. Primary schemes

Scheme NO.		17	18	19	20
Schematic Diagram of Primary Connection					
Rated Current (A)				630~1250	630~1250
Major Equipments	Vacuum Circuit Breaker				
	Current Transformer LZZBJ9-12				
	Potential Transformer JDZ10	2			
	Potential Transformer JDZX10		3		
	High Voltage Fuse XRNP1 -10	3	3		
	Earth ling Switch JN15				1
	Lightning Arrester HY5WS	3	3		
Application / Remark		PT		For incoming and outgoing cables	

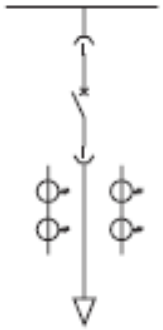
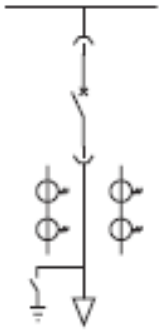
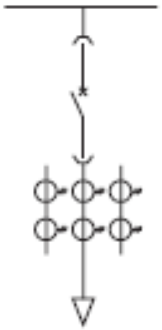
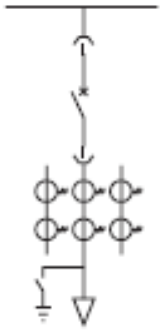
8.7. Primary schemes

Scheme NO.		21	22	23	24
Schematic Diagram of Primary Connection					
Rated Current (A)		630~1250	630~1250	630~1250	630~1250
Major Equipments	Vacuum Circuit Breaker	1	1		
	Current Transformer LZZBJ9-12	2	3		2
	Potential Transformer JDZ10				2
	Potential Transformer JDZX10				
	High Voltage Fuse XRNP1 -10				3
	Earth ling Switch JN15				
	Lightning A rrester HY5WS				
Application / Remark		For Incoming Overhead Line		For Bus Connection	For Metering Connection

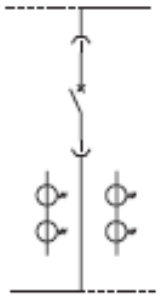
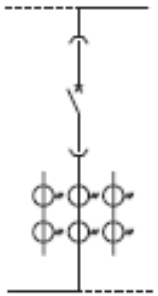
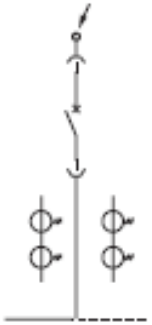
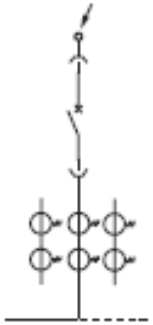
8.8. Primary schemes

Scheme NO.		25	26	27	28
Schematic Diagram of Primary Connection					
Rated Current (A)		630~1250	630~1250	630~4000	630~4000
Major Equipments	Vacuum Circuit Breaker				
	Current Transformer LZZBJ9-12	2	2		
	Potential Transformer JDZ10				
	Potential Transformer JDZX10	2	2		
	High Voltage Fuse XRNP1 -10				
	Earth ling Switch JN15				
	Lightning Arre ster HY5WS				
Application / Remark		For Metering Connection		For incoming and outgoing cables	Connection Isolation

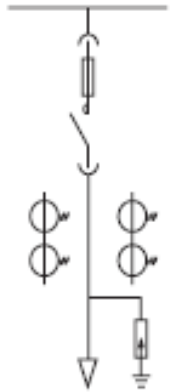
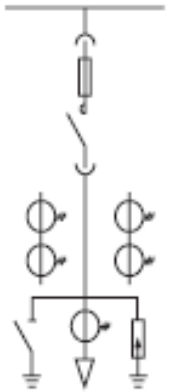
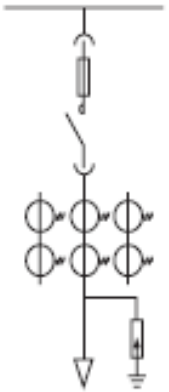
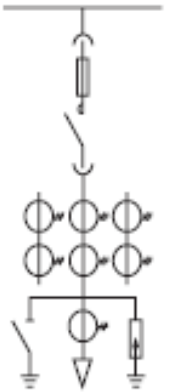
8.9. Primary schemes

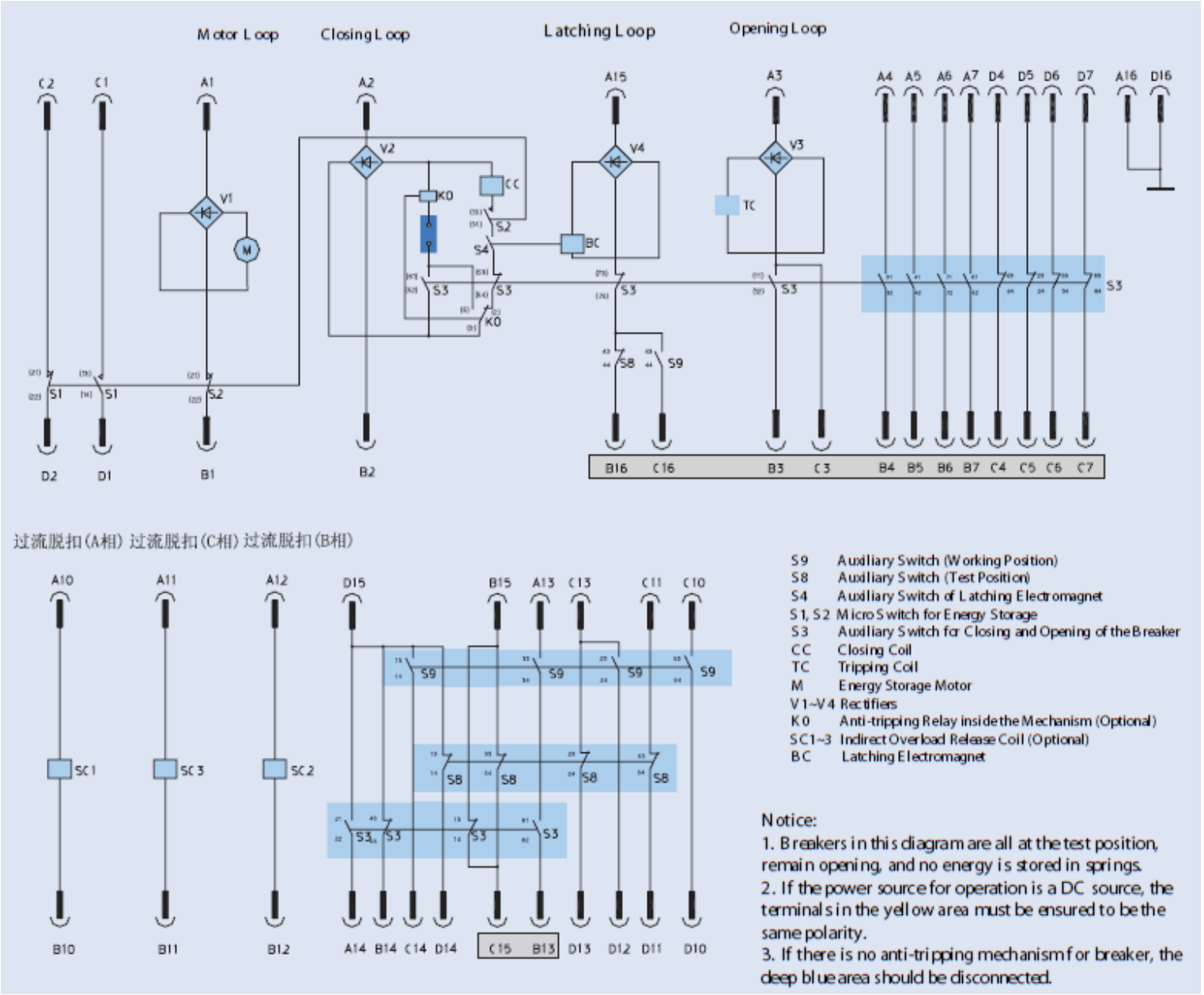
Scheme NO.		29	30	31	32
Schematic Diagram of Primary Connection					
Rated Current (A)		1600~4000	1600~4000	1600~4000	1600~4000
Major Equipments	Vacuum Circuit Breaker	1	1	1	1
	Current Transformer LZZBJ9-12	2	2	3	3
	Potential Transformer JDZ10				
	Potential Transformer JDZX10				
	High Voltage Fuse XRNP1 -10				
	Earth ling Switch JN15		1		1
	Lightning Arrester HY5WS				
Application / Remark		For incoming and outgoing cables			

8.10. Primary schemes

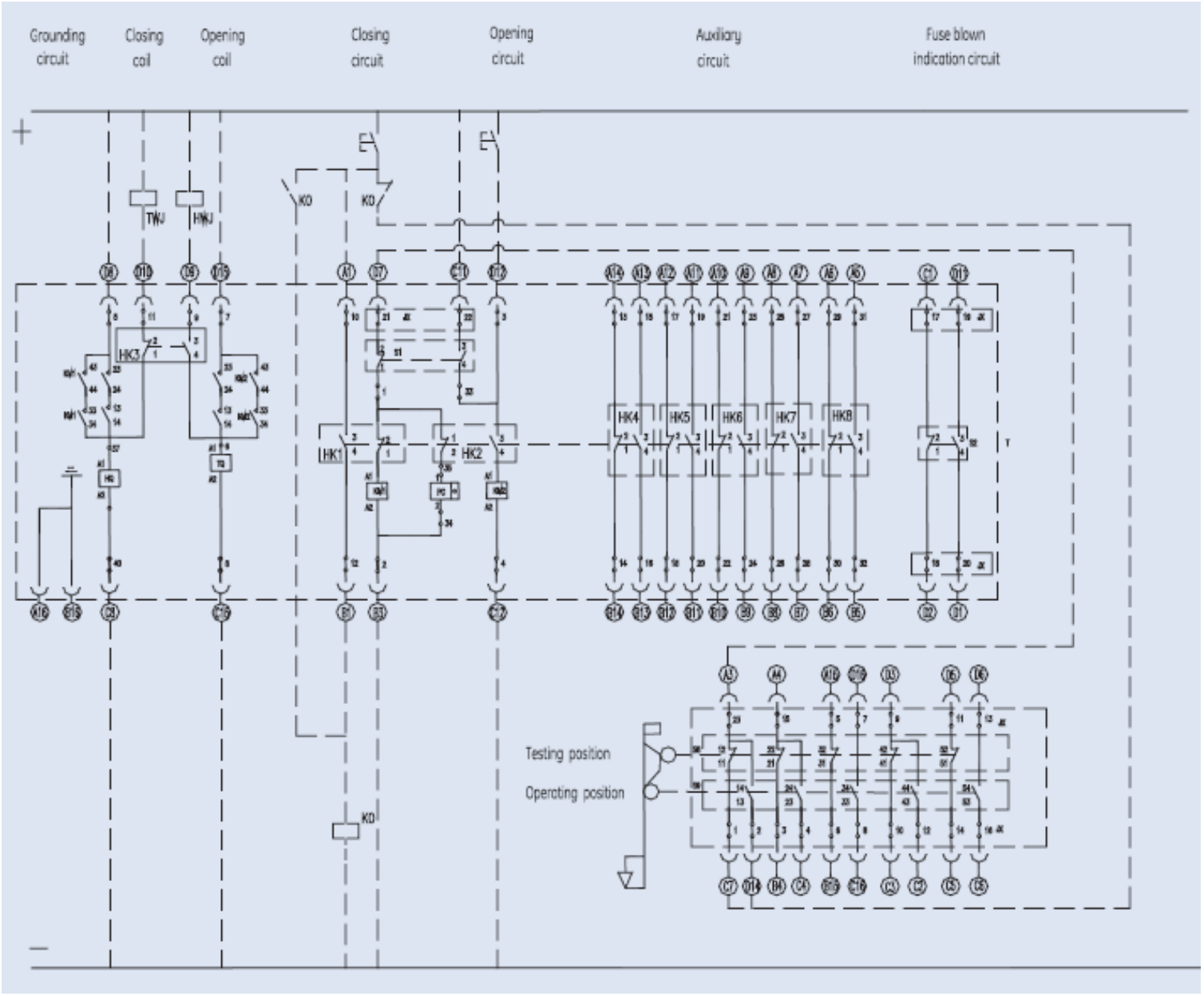
Scheme NO.		33	34	35	36
Schematic Diagram of Primary Connection					
Rated Current (A)		1600~4000	1600~4000	1600~4000	1600~4000
Major Equipments	Vacuum Circuit Breaker	1	1	1	1
	Current Transformer LZZBJ9-12	2	3	2	3
	Potential Transformer JDZ10				
	Potential Transformer JDZX10				
	High Voltage Fuse XRNP1-10				
	Earth ling Switch JN15				
	Lightning Arrester HY5WS				
Application / Remark		Connection		For incoming and outgoing Overhead Lines	

8.11. Primary schemes

Scheme NO.		37	38	39	40
Schematic Diagram of Primary Connection					
Rated Current (A)		315	315	315	315
Major Equipments	Vacuum Contactor	1	1	1	1
	Current Transformer LZZBJ9 -12	2	2	3	3
	High Voltage Fuse WFN/WKN/BFG	3	3	3	3
	Earth ling Switch JN15		1		1
	Lightning Arrester HY5WS	3	3	3	3
	Zero Sequence Current Transformer LJ		1		1
Application / Remark		For incoming and outgoing Cables			



9.1. VCB Control circuit



9.2. VC Control circuit

10. Type Test Certificate

DNV·GL

KEMA TYPE TEST CERTIFICATE OF COMPLETE TYPE TESTS

Object	A three-pole withdrawable air-insulated vacuum circuit-breaker in an air-insulated metal-enclosed switchgear assembly		**2067-16 PART 1**
Type	VL-17,5/1250-31,5	**Serial No.**	21507073, 21507074 21508044
Rated voltage	17,5 kV	Rated normal current	1250 A
Rated short-circuit current	31,5 kA	Rated frequency	50 Hz
Manufacturer	Shanghai AEG Enterprise Development Co., Ltd., Shanghai, China *)		
Client	Shanghai AEG Enterprise Development Co., Ltd., Shanghai, China		
Tested by	KEMA Nederland B.V., Arnhem, The Netherlands		
Date of tests	4, 7 to 9, 23, 31 March and 1 to 12 April 2016		

The object constructed in accordance with the description, drawings and photographs incorporated in this Certificate, has been subjected to the series of proving tests in accordance with the complete type test requirements of

IEC 62271-100 (2012)

This Certificate has been issued by DNV GL following exclusively the STL Guides.

The results are shown in the record of proving tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above standard and to justify the ratings assigned by the manufacturer as listed on page 8.

This Certificate applies only to the object tested. The responsibility for conformity of any object having the same type references as that tested rests with the Manufacturer.
*) as declared by the manufacturer

This Certificate consists of 667 pages in total.

KEMA Nederland B.V.

J.P. Fonteijne
Executive Vice President
KEMA Laboratories

KEMA Laboratories Arnhem, 30 June 2016

11. Ordering information required

1. Primary schemes or Zenith Switchgear ZSG12 Scheme Nos.;
2. Single line system diagram;
3. Rated voltage, rated current, rated short circuit breaking current;
4. Control voltage and nos. of auxiliary contacts.
5. Plan view of substation layout or switchgear layout diagram;
6. Specification and type of incoming and outgoing power and control cables;
7. Specification and requirement of control, measurement and protection schemes of each type of switchgear panel;
8. Requirement of interlocks and automatic features if any;
9. Model/part numbers, specification and quantity of key switchgear components.
10. If bus duct is required, please specified the rated current, length and height of crossing and other detail dimensions;
11. If switchgear is used in special operating environmental condition, please specify clearly;
12. Other special requirements if any.

12. How to contact us?

Zenith Switchgear (M) Sdn Bhd

Sales Office:
Unit AM13-PJ Industrial Park, Jalan Kemajuan, 462000 Petaling Jaya, Selangor Darul Ehsan, Malaysia.

Jimmy Wong, Managing Director, Mobile: +60173460728, Office/Fax: +60379317072, email: jimwkm@gmail.com, jimwkm@qq.com; Website: www.zenithswitchgear.com.my

Factory address:
No. 5, Jalan Rajawali, Bandar Puchong, 47100 Selangor Darul Ehsan, Malaysia.