

TECHNICAL SPECIFICATION

Outdoor type

Vacuum Circuit Breaker

3Phase 50/60Hz 36kV 25kA 1250A

VITZROTECH Co., Ltd.

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1. GENERAL

The purpose of this technical specification is to intend to cover the design, manufacture, assembly, test and inspection at VITZROTECH's site of 36kV outdoor vacuum circuit breaker with all materials and accessories.

2. STANDARDS

2-1 Standard which is not specified in this specification is compliance with the standard as follow.

(1) IEC62271-100 : 2012

High voltage switch-gear and control-gear

Part 100 : Alternating current circuit breakers

(2) IEC62271-1 : 2011

High voltage switch-gear and control-gear

Part 1 : Common specifications

(3) IEC62271-200 : 2011

High voltage switch-gear and control-gear

Part 200 : AC metal-enclosed switchgear and control-gear for rated voltages above 1kV and up to and including 52kV

2-2 Dimensional tolerance which is not marked on the drawing is applied in accordance with the related IEC standard. The dimensional tolerance for assembly product is $\pm 2\%$.

3. SERVICE CONDITIONS

VITZROTECH vacuum circuit breakers have been designed for outdoor installation in the following surrounding conditions:

Descriptions	Values
Surrounding Temperatures	Min. -5°C ~ Max. 60°C
Relative air humidity	Max. 95%
Installation altitude	Max. 1000m above sea level

This means that one has to:

- ▷ Avoid installation in dust areas.
- ▷ Avoid installation in areas with high relative air humidity.
- ▷ Avoid installation in areas subject to lightning strikers.
- ▷ Avoid installation in surroundings where the circuit breaker can come into contact with aggressive gases or fluids.

4. TECHNICAL SPECIFICATION

Technical specification		VVBX-36125M
4- 1 Rated voltage	kV	36
4- 2 Rated current	A	1250
4- 3 Rated breaking current	kA	25
4- 4 Rated short-time withstand current	kA rms	25
Duration	sec	3
4- 5 Rated making current	kAp	65
4- 6 Rated breaking capacity	MVA	1550
4- 7 Insulation level		
Power frequency withstand voltage	kV/1min	70
Lightning impulse withstand voltage	kV(BIL)	170
Control and operating circuit withstand voltage	kV/1min	2
4- 8 Transient recovery voltage	kV/ μ s	67.9 / 57
4- 9 Rated frequency	Hz	50
4-10 Rated breaking time	cycle	3
4-11 Applied standard		IEC62271-100
4-12 Class		S2
Mechanical endurance		M2
Probability of re-strike		C2
Electrical endurance		E2
4-13 Standard operating duty		O-0.3s-CO-3min-CO
4-14 Auxiliary switch classification		Class 1
Rated current	A. DC	10
Short-time withstand current	A/ms	100 / 30
4-15 Rated supply voltage/current		
Rated motor operating voltage	V. AC	230
Rated closing control voltage	V. DC	110
Rated opening control voltage	V. DC	110
Rated motor operating current	A. AC	Less than 10A
Rated closing control current	A. DC	Less than 5A
Rated opening control current	A. DC	Less than 5A
4-16 Rated cable-charging breaking current	A	50
4-17 Rated making time	ms	Less than 60ms
4-18 Rated opening time	ms	Less than 40ms
4-19 Vacuum interrupter type		M203R
Stroke	mm	18 $\pm$ 1
Manufacturer		VITZROTECH Co., Ltd.
4-20 Max. time difference during operation	cycle	Close : 1/4, Open : 1/6
4-21 Operating mechanism		Motor drive spring mechanism

5. TECHNICAL REQUIREMENT

5-1 General Structure

5-1-1 General

Vacuum circuit breaker described in this specification is designed with a high quality materials to give an excellent electrical and mechanical performance under a normal operating conditions. The operating of the circuit breaker is smooth and the operating shock is low which is easy to handle for maintenance.

5-1-2 Structural strength

The strength of the structure can endure overlapping of the electron repulsion due to the impulse load and ground fault during the closing and opening mechanism.

5-1-3 Waterproof Structure

The enclosure and internal components of the circuit breaker described in this specification are equipped with a waterproof structure and cause no damage or problem when exposed to moisture or rain.

5-1-4 Moisture-proof Structure

The enclosure and internal components of the circuit breaker described in this specification are designed with a moisture-proof structure to prevent internal condensation caused by the temperature changing.

5-2 Internal Structure

5-2-1 Main Circuit

Main circuit is equipped with a high reliability, and long life of the vacuum interrupter which requires a few maintenance. The structure of the main circuit has high reliability where the current switching mechanism occurs inside the vacuum interrupter which avoids the arc discharge. Also, the breaking conductive part has a sufficient current capacity and the contact is equipped with high-degree vacuum to operate the device safely.

5-2-2 Insulation Structure

The insulation structure is constructed with a material that can minimize the insulation deterioration due to moisture. The structure is also suitable for long-term use as it has sufficient electrical and mechanical strength.

5-3 Bushing and Insulator

5-3-1 Bushing

The bushing has the insulation strength which is able to coordinate the internal insulation of the vacuum circuit breaker. Breaking mechanism due to high current is secured either

electrically or mechanically and the rated current of the bushing is same with the rated current of the circuit breaker.

5-3-1

The insulator of the vacuum circuit breaker can endure the stress caused by the distortion or expansion of the conductive parts due to the overload or temperature change.

5-4 Operating and Control Device

5-4-1 General

The circuit breaker has a suitable structure as mentioned below regardless the operating mechanism.

- (1) 3-pole circuit breaker operating mechanism has a structure that operates the closing and opening mechanism simultaneously.
- (2) The closing and opening of the circuit breaker can be performed by the remote control device. The circuit breaker also can be operated by the control switch which is installed within the operating control site.
- (3) The circuit breaker is equipped with lever for a manual closing (at no load condition) and opening (with load or no load condition) operation.
- (4) The circuit breaker has two (2) types of trip free device as below:
 - ① Trip Free
A device to open the circuit breaker when closing command is applied.
 - ② Anti Pumping
A device to prevent from the closing mechanism even the closing command is continuously applied.
- (5) Coil solenoid for CLOSE/OPEN operation can endure the form deformation and insulation aging even when used for a long-term.
- (6) The internal auxiliary contacts (NO & NC) are equipped with 8ea for each contact.

5-4-2 Electrical Control Circuit

- (1) Opening and closing operation of the electrical control circuit is reliable, and it is configured to fit trip free, anti pumping and reclosing operation of the breaker.
- (2) Opening and closing of the control circuit operate with no error within the voltage range shown in [Table 1].

[Table 1]. The Range of the Control and Operating Voltage

Device	Min	Rating	Max	Remark
Motor Operating Voltage	AC195.5V	AC230V	AC253V	85% ~ 110% of rated value
Making Control Voltage	DC93.5V	DC110V	DC121V	85% ~ 110% of rated value
Closing Control Voltage	DC77V	DC110V	DC121V	70% ~ 110% of rated value

(3) The terminal block is reserved with at least 6 terminals in order to avoid insufficient terminal for wiring with the secondary winding of the current transformer and the control circuit.

(4) High durability, heat resistance and ozone-proof of the SIS cable is used for the internal wiring.

5-4-3 Operating Control

Outdoor control operation is coated with moisture-proof steel plate with the thickness of 3mm and the Hinged door is installed at the front.

5-4-4 OPEN/CLOSE Indicator & Operating Counter

(1) OPEN/CLOSE indicator is installed at the front part of the circuit breaker to indicate the switching mechanism.

(2) Indicator displays "CLOSE" for the close state and display "OPEN" for the open state.

(3) Operating counter is installed at the front part of the circuit breaker to display an accumulation of operating number.

5-5 Connector & Ground Terminal

Connector used to connect the conductor to the circuit breaker has a sufficient contact area.

5-6 Frame

Frame is coated with an anticorrosive structural rolled steel Class 2 (SS400) or equivalent as specified in KS D 3503.

5-7 Coating

Before coating the exposed metal part of the circuit breaker (excluding charging part), oxide film (oil, dust and other impurities) is removed. Then, the breaker is coated for at least 2 times with a high quality of anticorrosive coating and let it dried. And the breaker is coated again with paint and for the exposed part is coated with Munsell NO 5Y 7/1 (light yellow tinged gray) paint.

5-8 Making and Breaking Performance

5-8-1 Standard Operating Duty at Running State

The structure has a smooth operation without any puncture of the insulation, flashover between conductor and mechanical shock.

5-8-2 Standard Operating Duty after Completing

Component part of the circuit breaker after breaking has no significant difference before and after operating. The charging structure can endure the continuous opening and closing of the rated current for the voltage which is not higher than the rated voltage.

5-8-3 Voltage Range of the Operating Control

No error is occurred during the opening and closing mechanism within the specified voltage range as shown in [Table 1]. Making, closing and operating of the control device can be conducted at no load without any mis-operation.

5-8-4 Breaking Time

In case of breaking current of a basic short-circuit breaking current (10%~100%) under the rated voltage, opening time and arching time must not exceed the rated breaking time.

5-8-5 Re-strike

Making and breaking mechanism for the current that is below than the rated breaking current and rated making current can be conducted without any problem. No re-strike and voltage fault occurred after breaking.

5-9 Switching Performance

5-9-1 Opening Time

Opening time [refer Table 1] at no load is a time that must not exceed a rated opening time.

5-9-2 Closing Time

Closing time [refer Table 1] at no load is a time that must not exceed a rated closing time and there is no problem occurs when the standard operating duty is carried out.

5-9-3 Interval of Opening Time

Interval of opening time for each pole at no load must not exceed 1/6 cycle.

5-9-4 Mechanical Durability Characteristic

Vacuum interrupter and main circuit contacts should be in good condition after 10,000 consecutive switching operations at no load state. This characteristic also applies no damage on the device even though the power frequency withstand voltage (80% of rated value) is applied.

5-10 Temperature Rise

The structure of the device is designed not to exceed a temperature rise limitation as shown in [Table 2].

[Table 2] Temperature Rise Tolerance Limit

Description		Temp Rise Limit (K)	Max. Allowable Temp (°C)
Contact Part	Copper Contact	35	75
	Silver Contact	65	105
Contact Part at tightening bolt	Copper Contact	50	90
	Silver Contact	75	115
Terminal to be connected to External Conductor	Copper Contact	50	90
	Silver Contact	65	105
Ambient Temperature Limit		40°C	

5-11 Short-time current strength

No damage occurs on the circuit breaker during the temperature rise test and when the rated current is applied. It is a structure for the breaking and making current.

5-12 Insulation Strength

5-12-1 The insulation strength between the main circuit and terminals prevents from flashover and ground fault.

[Table3] Withstand Voltage Reference

Description	Voltage Value	Remark
Power frequency withstand voltage [kV/1min]	70	
Lightning impulse withstand voltage [kV]	170	1.2 x 50µs

5-12-2 The insulation strength of the operating and control circuit is designed and can endure for a period of 1 minute when 2kV of the power frequency withstand voltage (RMS) is supplied to the circuit between earth.

5-13 Insulation Resistance

Insulation resistance for main circuit-ground and main circuit terminal shall be higher than 500MΩ and operating control circuit-ground shall be higher than 2MΩ.

6. TEST AND INSPECTION

No.	Item		Type test	Routine test	Remark
1	Structure and visual inspection		O	O	
2	Insulation Test	2-1. Lightning impulse withstand voltage test	O	-	
		2-2. Power frequency withstand voltage test	O	O	
		2-3. Insulation test of the auxiliary circuit	O	O	
3	Temp. rise Test	3-1. Main circuit	O	-	
		3-2. Auxiliary circuit	O	-	
4	Measurement of Resistance	4-1. Main circuit resistance	O	O	
		4-2. Coil resistance	O	-	
		4-3. Insulation resistance	O	O	
5	Short-time withstand current test		O	-	
6	Short circuit current making and breaking tests	6-1. Basic short circuit duties test (10%)	O	-	
		6-2. Basic short circuit duties test (30%)	O	-	
		6-3. Basic short circuit duties test (60%)	O	-	
		6-4. Basic short circuit duties test (100% symmetry)	O	-	
		6-5. Basic short circuit duties test (100% asymmetry)	O	-	
		6-6. Single phase short circuit test	O	-	Effectively grounded
		6-7. Out of phase making and breaking test	O	-	
		6-8. Cable charging test	O	-	C2
		6-9. Single capacitor bank current switching test	O	-	
		6-10. Short-line fault test	O		
		6-11. Electrical endurance test	O		E2 (list3)
7	Mechanical operating test	7-1. Manual operation test	O	O	
		7-2. Mechanical characteristics test	O	O	
		7-3. Mechanical endurance test(10,000 times)	O	-	M2
8	High-temperature test (60℃)		O	-	
9	IP-55 Test		O	-	

No.	Item		Type test	Routine test	Remark
10	Radio interference voltage test		O	-	
11	Auxiliary and control circuit environment test	9-1. Short-time withstand current test for	O	-	
		auxiliary switch			
		9-2. Short circuit capacity test	O	-	
		9-3. Electrical continuity test of the ground	O	-	
		metal parts			
		9-4. Dry heat test	O	-	
		9-5. Humidity test	O	-	
		9-6. Humidity cycle test	O	-	

7. INDICATION

The vacuum circuit breaker is provided with the stainless steel plate-made name plates placed at easily visible portion and fixed with the stainless steel screw or rivets including as follows in accordance with the IEC62271-100 (2012).

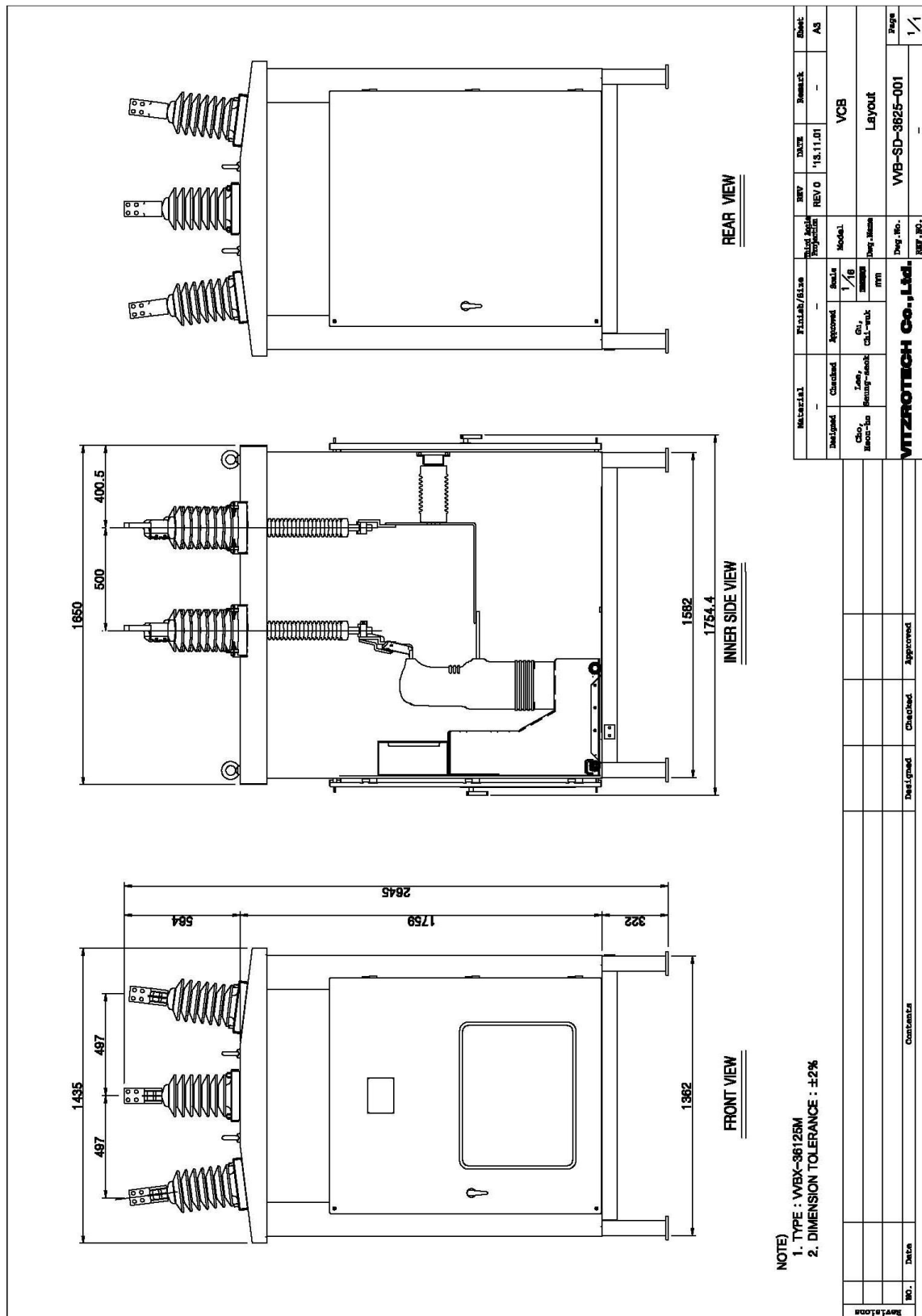
7- 1 Designation	
7- 2 Manufacturer	
7- 3 Serial No.	
7- 4 Mfg. Date	
7- 5 Rated voltage[kV]	Ur
7- 6 Rated current[A]	Ir
7- 7 Rated short time withstand current[kA]	Ik
7- 8 Rated duration of short circuit[sec]	tk
7- 9 Lightning impulse withstand voltage[BIL]	Up
7-10 Power frequency withstand voltage[kV]	Ud
7-11 Rated breaking time[cycle]	
7-12 Rated frequency[Hz]	fr
7-13 Rated voltage for control device[V.DC]	Ua
7-14 Rated operating sequence	
7-15 Classification	
7-16 Applied Standard	

8. ACCESSARIES

Manual charging handle : 1 PCS

9. DRAWINGS

9-1 Layout



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