

Medium Voltage Distribution

Vacuum Circuit Breakers 12-24 kV

***HVX** withdrawable version*

Catalogue

2019



General Presentation

Vacuum interrupter

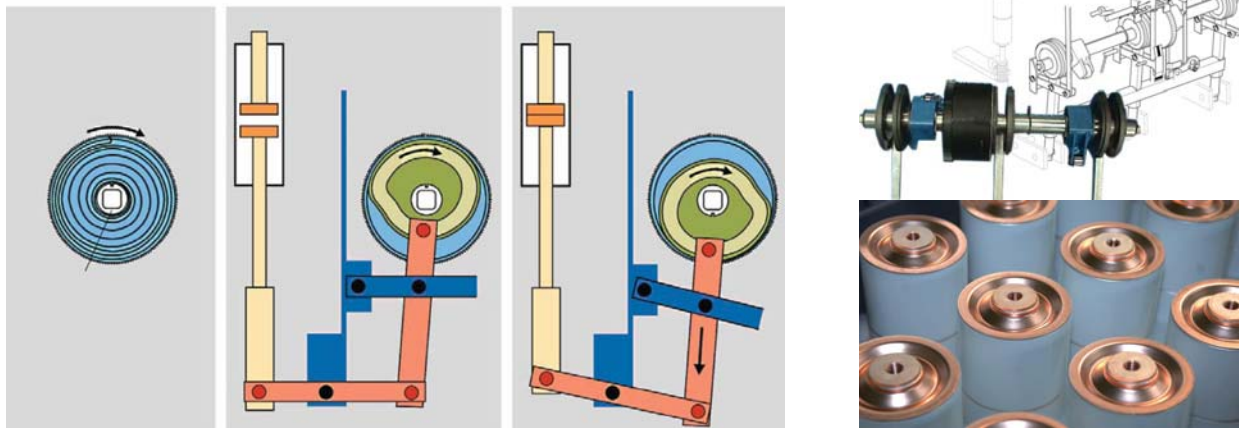
By the newest computer modeling tools, incorporating the comprehensive proven testing, Schneider Electric VG series achieves the true optimal design. With the most With our patent design and full knowledge of vacuum interrupter technology, Schneider Electric vacuum interrupter is distinctively outstanding in medium voltage field with its high reliability, small size and long service life. The special geometry of the contacts and the choice of material used ensures limited duration of the arc and thus helps to reduce thermal and dielectric stress.

Wholly embedded-pole

The embedded pole is another contribution of Schneider Electric to medium-voltage products, with its over 100 years experience in design and manufacture, originated from 40 years operation experience of outdoor high-voltage products application technology, which has been practical test proved. Employing the elastic material of good hermetic property, completely mounding the vacuum interrupter, main circuit and insulated shaft in an epoxy pole to realize total isolation of the main circuit from the external, which obtains the pole the highest adaptability with the environment, thus the breaker can function normally under bad environment.

Operating mechanism

HVX adopts a spring mechanism incorporating a single-shaft system, a sprial spring supplies the energy required in a standard on and off operation cycle. Cam output of three independent phases provides the optimal match of vacuum interrupter. The one step output of transmission mechanism and the particular axletree design has optimal transmission efficiency to ensure energv saving and stable, reliable mechanism.



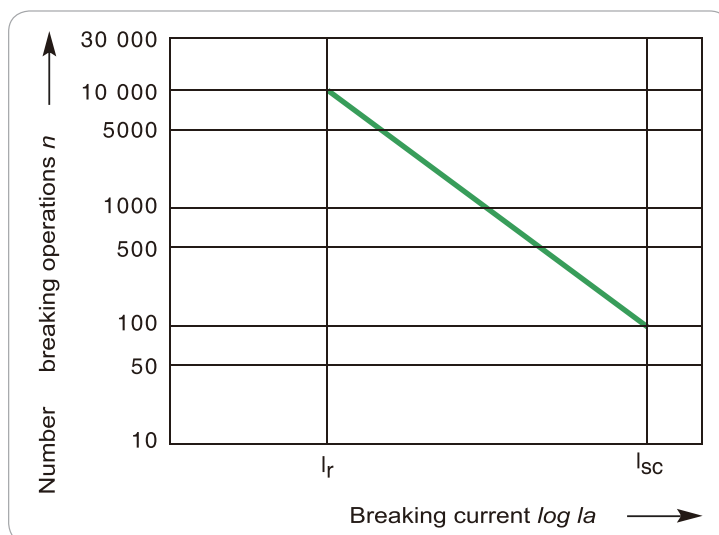
VG series vacuum interrupter

Function theory

Through the electric motor or manual crank, the energy required for a whole operating cycle is stored in sprial spring. The opening and closing of vacuum interrupter is control of the cam, upon closing, the spring automatically restore the energy for an integrated automatic on and off operating cycle. On and off preserving mechanism, with high-efficiency rubber and no grid contact among the transmission parts, can absorb the excessive energy of the dirve mechanism upon a quick on and off operation. The mechanism has electric and manual charging devices. The relevant interlock prevents the error manipulation after the energy storing.

Relationship between the permitted operation times & breaking current

The following graph explains the relationship between the permitted VG vacuum interrupter operating times and breaking current.



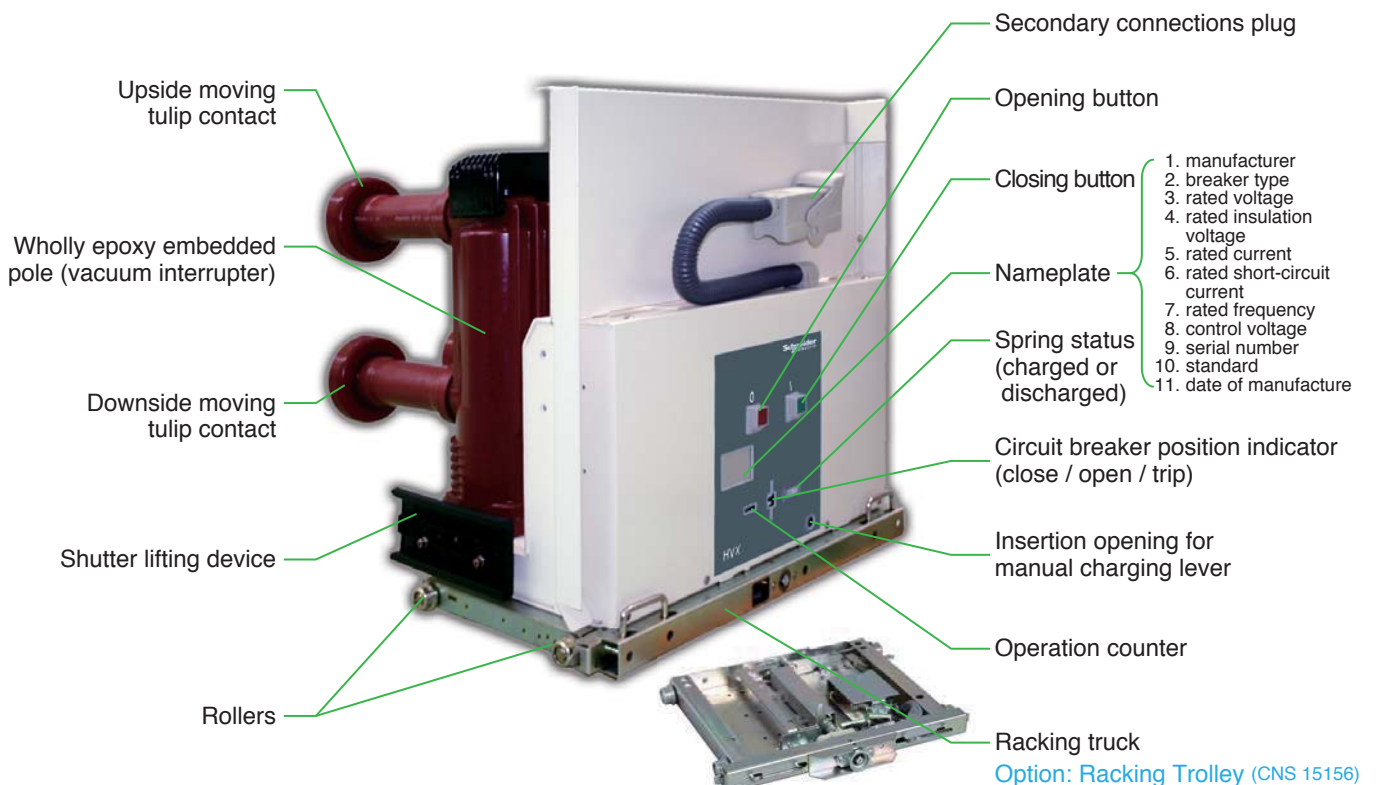
Ir=Rated current[A]
Isc=Rated short-circuit current[kA]

Performance Tables

Type		HVX		HVX	
		12-25-06/12-31-06	12-25-12/12-31/12	24-16-06/24-25-06	24-25-12
rated voltage* ¹		12kV		24kV	
rated current		630A	1250A	630A	1250A
rated shortcircuit breaking current I _{sc} * ²		25kA/31.5kA		16/25kA	25kA
power frequency withstand (50/60Hz 1min)		28kV		50kV	
lightning impulse withstand		75kV		125kV	
pole center spacing		150mm		210mm	
rated frequency		50/60Hz			
rated short-circuit making current I _p (50/60Hz)		2.5I _{sc} / 2.6I _{sc}			
rated short time withstand current (4s/3s)		25kA/31.5kA		16/25kA	
operating sequence		O-0.3s-CO-3 min-CO			
		O-180s-CO-3 min-CO			
		O-0.3s-CO-15s-CO			
mechanical endurance		class M2			
electrical endurance		class E2			
higher number of operation cycles upon maintenance plan		30,000 operations			
service temperature		-25 ~ +40°C			
operating time	opening	40-70ms			
	arcing	≤15ms			
	closing	30-60ms			
line charging breaking current		10A (class C2)			
cable charging breaking current		31.5A (class C2)			
standards		IEC62271-100 , CNS15156-100			

★1 17.5kV is also available, please contact us for more information.

★2 Three-phase breaking capacity = $U_r \times I_{sc} \times \sqrt{3}$ (MVA), Ex: 24kV x 25kA x $\sqrt{3}$ = 1039MVA.



Function Description

Composition

- The “racking in” function is provided by:
 - the racking truck (driven by screw) supporting the circuit-breaker (mobile part),
 - the cradle including the bushings (fixed part),
 - provision for padlocking in test and disconnect positions (option),
 - the LV plug.
- The allowable voltage range for all electrical operations of the circuit-breaker is within 85% ~ 110%Un.
- auxiliary contacts: 5NO+5NC (4NO+4NC+1CHG)
- antipumping relay
- operation counter

Operating Procedure

- The circuit-breaker moves through 2 stable positions (with indicators on the cradle):
 - service position: circuit-breaker racked in and locked in place; low voltage plug connected.
 - test and disconnect position: circuit-breaker racked out and locked in place; low voltage plug connected.

Safety Functions

A propulsive system combined with a screw-shaft makes racking in and racking out easier.

■ Interlocking

In accordance with IEC standards 62271-100 and 62271-200, the following interlocking is provided:

- racking in or out is impossible unless the circuit-breaker is in the open position.
- circuit-breaker CANNOT be withdrawn when the main contacts are in “closed” position.
- the main contacts of the circuit-breaker are forbidden to be closed when:
 - a. circuit-breaker is in the process of being withdrawn or led-in.
 - b. circuit-breaker is between the “test” and “service” positions.
 - c. circuit-breaker is between the “test” and “disconnected” positions.
- racking in or out is impossible during breaker’s charging procedure.

■ **Metal-clad enclosed cradle** with epoxy casting bushing ensures the safest construction.

■ **Earthing** is achieved throughout the whole racking in operation by means of the wheels of the racking truck.

■ **Protective shutters** on the cradle prevent access to the racking fingers when the device is extracted (protection index: IP2X).

■ For maintenance or test purposes, it is possible to:

- padlock the shutters in the closed or open position (option)

■ Earthing Switch (option)

It can be fixed on the cradle, allowing proper interlocking between the circuit-breaker and the earthing switch.

- auxiliary contacts for earthing switch, activated when earthing switch is in open or closed position.

Optional Parts

- Position Contact (2 or 4 racked in/out), activated when circuit-breaker is in the “test” or “service” position.
- Condenser Tripping Device (CTD, 2000μF) providing DC power for the unit to trip when encountering power failure.
- Communication Output (RS485 RTU) monitoring operating conditions and positions of circuit-breaker and earthing switch, can also provide remote control of circuit-breaker
- Earthing Switch
- Interlock Protection Mechanism (when interlocked with another breaker):
 - locking the breaker in “test” or “disconnected” position and forbidding it to be closed.
- Under Voltage Release
- Key Locking Device (OFF position locking, forbidden to rack in/out the cradle)
- Interlock and Padlock device (pushbutton locking, forbidden to close or open the breaker)
- Arc Protection Relay: full time monitoring of arc flash of fault. The relay can detect arc flash via flash sensor, rapidly trip the circuit breaker when fault occurs. The relay can also be configured to trip only when BOTH over current and arc flash are detected, in order to give the circuit break best protection.
- The HVX racking trolley allows panel builders to design switchgear solutions with enhanced safety features. It has a robust interlocking system with the switchgear door, LV plug, circuit breaker, and ground switch. It can be equipped with an electric motor for remote racking from the control room. Conforming to CNS 15156 requirements.
- Surge Arrester.



Racking trolley

Release

Auxiliary switches F2, F11/F12

The coil of auxiliary release is actuated by auxiliary power supply. The coil is designed for short-term working, its main circuit is routed via an auxiliary switch contact controlled by the circuit breaker shaft, thus once released interrupting the current circuit.

Over current release F3

(Transformer-type over current release)Secondary release are used for automatic release of switching devices in case of short circuits and over current. Once the protector reacts, the release is actuated by the transformer current, thus causing the switching to be tripped. These releases are supplied for transformer secondary currents of 0.5A,1A and 5A.

Under voltage release F4

Under voltage releases are supplied by the auxiliary source permanently. Wherever the auxiliary current is interrupted or its voltage drops essentially, the switching devices is tripped at once.

Auxiliary switches

Auxiliary switch in switching position S11/S12

Auxiliary switches are always actuated directly by the switch shaft via an intermediate linkage, their position always corresponding to the position of the main contacts, indicating on and off position status of the breaker, in wiring,the interlock assist the release to prevent the error manipulation. The circuit breaker is equipped in general with an auxiliary switch with 8 contact elements.

Auxiliary switch in charging position S2

The auxiliary switch is mainly used for checking and indicating the charging status, it is connected by harging mechanism to assure that upon closing operating the driving mechanism can automatically store the energy. After charging finished, it breaks the electric charging circuit. The circuit breaker is equipped in general with an auxiliary switch with 8 contact elements.

Anti-pumping relay

Anti-pumping relay K01

If both an ON and OFF command are permanently present on the circuit breaker at the same time, the latter returns to its initial position after closing. it remains in this initial position until the ON command is issued again. This prevents continuous closing and opening(="pumping").

Counter

Operation counter

The counter is installed on the operation interface to record operation times of the breaker.

Charging motor

Motor M1

Electrically store the energy for the mechanism operation of the breaker,preparing the erengy for closing operation the next time.

Blocking coil

Blocking coil of closing Y1

Losing the secondary controlling power supply,the breaker can not perform normally closing operation(including manual closing operation).

Blocking coil of movement track Y0

Losing the secondary controlling power supply,the trolley can not perform normally manual operation.

Condenser tripping device & Arc protection relay

Condenser tripping device (CTD, 2000 μ F) providing DC power for the unit to trip when encountering power failure.

Arc protection relay can detect arc flash via flash sensor,and rapidly trip the circuit breaker when fault occurs.



Condenser tripping device (CTD)



Arc protection relay and arc flash sensor



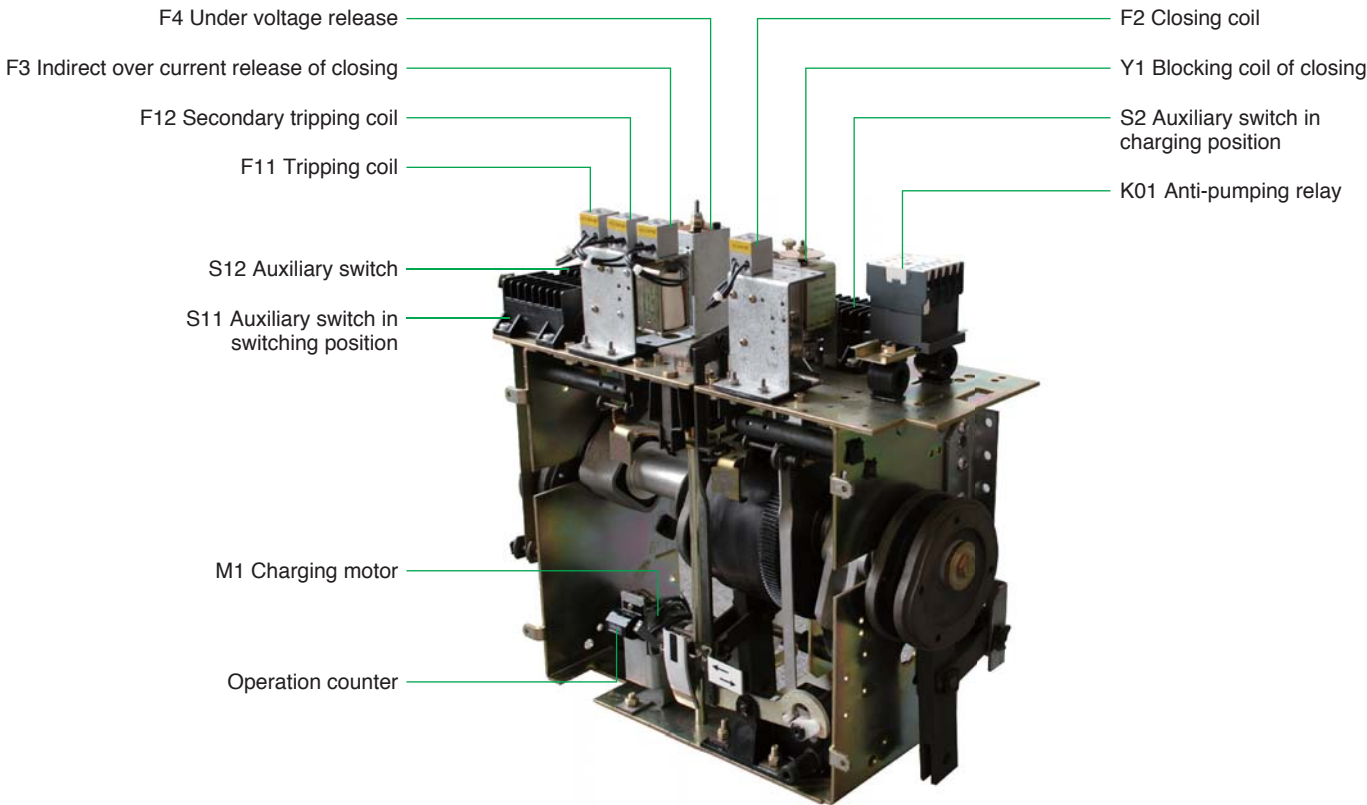
Secondary Devices

Specification of the release

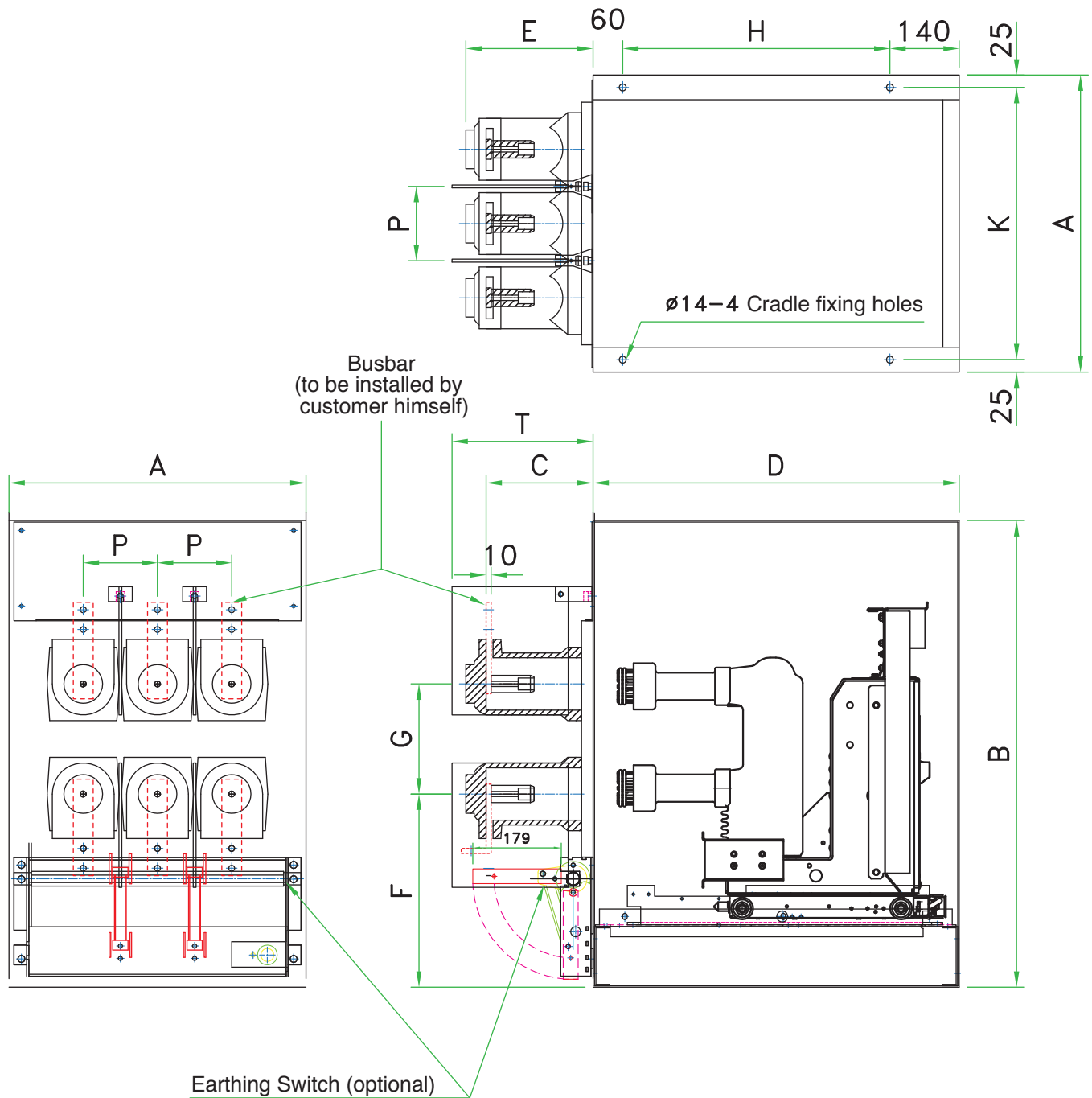
Designation	Release	Rated supply voltage Ua(V) 50/60Hz	Range Ua(V)	Power consumption		Operating time
				DC(W)	AC50/60Hz(VA)	
F2	closing coil	DC 24, 48, 110, 220 / AC 110, 220	85~110%	≤250		20ms
F11/F12	tripping coil	DC 24, 48, 110, 220 / AC 110, 220	65~120%	≤250		20ms
F4	undervoltage	DC 24, 48, 110, 220 / AC 110, 220	35~0%	approx.12		20ms
M1	motor charging	DC 24, 48, 110, 220 / AC 110, 220	85~110%	approx.100		≤12s
Designation	Release	Rated supply current Ia(A)	Range Ia(A)	Operating time		
F3	indirect over current release	0.5 , 1.0 , 5.0	90~110%	20ms		

Technical data of the release & auxiliary switch

Rated auxiliary voltage	DC(V)			AC(V)	
	≤48	125	220	120	230
Switching capacity (A)	10	3.8	2	10	
Time factor T=L/R (ms)	10			20	—
Rated short-time current	250A/3s				
Rated continuous current (A)	15			—	



Dimensions (Bushing Type)

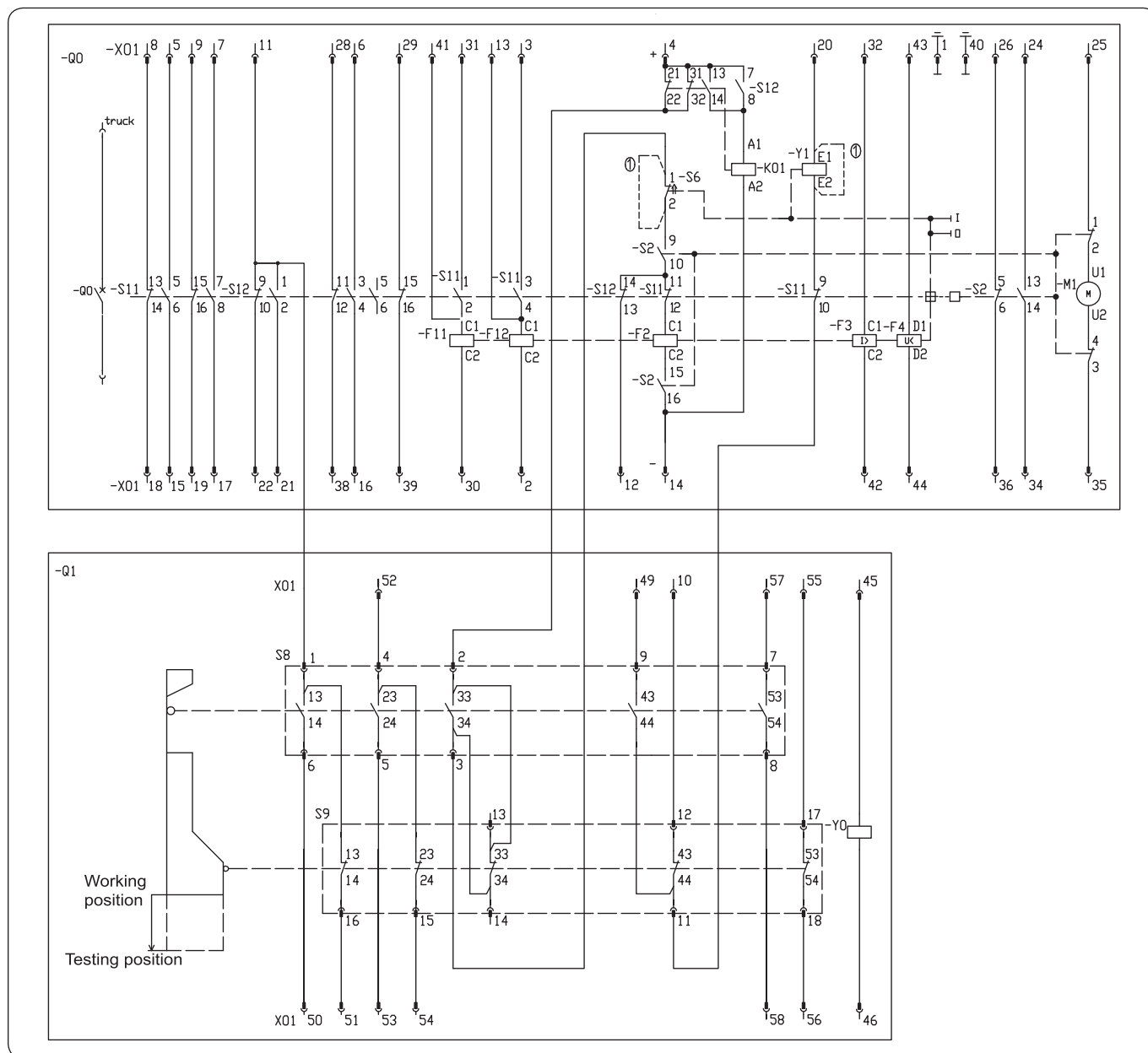


Cradle Type	Voltage (kV)	Current (A)	A	B	C	D	E	F	G	H	K	P	T
H12M	12	630 / 1250	600	943	210	740	250	390	205	540	550	150	351
H12ME													
H24M	24	630 / 1250	750	1128	268	900	321	457	310	700	700	210	351
H24ME													

unit: mm

Wiring Diagrams

HVX 12kV/17.5kV/24kV vacuum circuit-breaker withdrawable type with anti-pumping relay K01



The schematic is the largest circuit breaker configuration, according to the ordering requirements, some of the components shown are not included. Storage and distribution circuit breakers in the open state is not used in the working position.
Circuit Breaker closing lockout solenoid Y1, press the dotted line an access.

Q0 Secondary components of breaker

F11	Tripping coil
F12	Secondary tripping coil (option)
F2	Closing coil
F3	Indirect over current release of closing (option)
F4	Under voltage release (option)
Y1	Blocking coil of closing (option)
M1	Charging motor
S11/S12	Auxiliary switch in switching position (fault indicator along with control switch control)
S2	Auxiliary switch in charging position
S6	Micro switch lock solenoid closing (option)
K01	Anti-pumping relay

Q1 Secondary components of trolley

S8	Used test position indicator switches
S9	Used working position indicator switches
Y0	Used locking solenoid (option)

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