Vacuum Circuit Breakers &Vacuum Contactors

UL recognized

HD HYUNDAI ELECTRIC

Essential for Today, Potential for Tomorrow

HD Hyundai Electric solely pursues the growth of our customers' business. From power generation to power distribution, we focus on developing and commercializing products and solutions aimed at increasing the efficiency of energy equipment as well as at proactively monitoring and controlling assets in an integrated manner to improve our customers' productivity and management efficiency. We are well aware that our efforts add to the driving force behind our customers' growth and contribute to the creation and maintenance of a more dynamic world. We focus on achieving innovation and strive to evolve continuously to shape a better tomorrow based on today's technological advancement

Vacuum Circuit Breakers

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VCB

4.76-15kV
Vacuum Circuit Breaker

UL® Recognized

Ensuring excellent breaking capability and high quality with various advantages

- Retaining the high dielectric strength with the interrupter of the high vacuum degree of 10^{-7} mbar.
- Providing reliable mechanical performance and long-life expectancy with rigid structure of motor-spring energy stored mechanism.
- Having excellent breaking capability with the special contact material designed by the advanced vacuum technology.
- Having rapid breaking time of 3 cycle.
- Certified by UL® Recognized and other related standards by HD HYUNDAI in ISO9001/14001 and OHSAS18001 certified facilities.

Rigid structure to prove high reliability and long-life expectancy

- 36inch (914mm) wide switchgear available with small size & light weight.
- Mechanical endurance of 10,000 operations

Rated Voltage	Rated Short-circuit breaking Current	Rated Current
4.76kV	25kA	630-2,000A
4.76kV	31.5/40kA	630-3,000A
4.76kV	50kA	630-4,000A
8.25kV	25kA	630-2,000A
8.25kV	31.5/40kA	630-3,000A
15kV	25kA	630-2,000A
15kV	31.5/40kA	1,200-3,000A

MS TYPE VCB BODY

MS TYPE CRADLE

Overview and Characteristics

- With rigid structure and minimized moving parts, HVF breaker operation mechanism features reduced maintenance requirements providing high reliability and long-life expectancy.
- The breakers are more compactly designed in size with high performance vacuum interrupters, which are made with the special contact material and advanced vacuum technology.
- These series are certified by UL® Recognized and other domestic standards.

Operating mechanism

HVF circuit breakers have motor-spring energy stored mechanisms of a rigid structure.
It consists of the charging mechanism, the closing spring, the trip spring, the motor, solenoids, auxiliary switches, spring charged and on/off indicators as shown in Fig.1.

Depending on the intended protection functions, the operating mechanism can be supplemented by 2nd shunt release, under voltage release, lockout relay, cut-out switch, limit switch, electrical local closing and so on.

The released closing spring is automatically recharged sequences "open-close-open" which is required when unsuccessful auto-reclosing operation is attempted.

<Fig.1. Front view of draw-out VCB body>

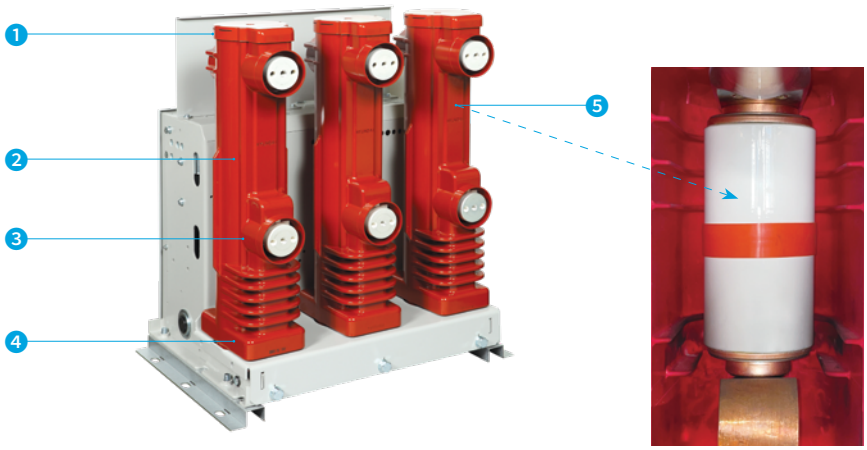
1 Manual charging hole
2 Charge/Discharged indicator
3 Close/Open indicator
4 Cycle counter
5 Rack button
6 Close button
7 Open button
8 Name plate
9 Truck

Pole part

The pole parts are placed on the rear side of the operating mechanism.
The internal parts of the pole are well enclosed by the tubular type insulation frame as shown in Fig.2.
This prevents dust on the internal insulation material which is highly resistant to tracking.

The vacuum interrupters are mounted rigidly in the insulation frame, so they can withstand forces arising from switching operation and contact pressure.

In the closed state, the necessary contact pressure is established by the contact pressure spring and the atmospheric pressure.
The contact pressure spring automatically compensates the arc erosion which is very small.



<Fig.2. Rear view of fixed VCB>

1 Frame cap
2 Upper pole support (contact)
3 Lower pole support (contact)
4 Insulation frame
5 Vacuum Interrupter (inside)

<Fig.3. Rear view of draw-out VCB body>

1 Tulip contact
2 Secondary
3 Lower female arm
4 Truck

Ratings and Specifications

Model [1]	HVF 144□	HVF 145□	HVF 146□	HVF 147□
Standard	UL Recognized			
Rated voltage (kV)	4.76			
Frequency (Hz)	60			
Rated current (A)	1 630 2 1,200 4 2,000	1 630 2 1,200 4 2,000 7 3,000	1 630 2 1,200 4 2,000 7 3,000	1 630 2 1,200 4 2,000 7 3,000 8 4,000
Rated short-circuit breaking current (kA)	25	31.5	40	50
Rated short-circuit making current (kA)	65	82	104	130
Short-time withstand current for 3sec (kA)	25	31.5	40	50
Power-frequency withstand voltage (kV, 1min)	19			
Impulse withstand voltage (kV, 1.2x50μs)	60			
Operating duty	O – 0.3sec – CO – 15sec[3] – CO			
Closing time (ms, at DC125V)	45 – 70			45 – 55
Opening time (ms, at DC125V)	28 - 38			31.5 – 38.5
Breaking time (cycles)	3			
Closing operating: System	Motor spring stored energy			
Closing operating: Supply voltage (V)	DC48, 125, 250 / AC110, 120, 240			
Closing operating: Current (A)	Refer to Table 3 (see page 12)			
Closing & tripping control: Tripping system	Shunt trip			
Closing & tripping control: Supply voltage (V)	DC48, 125, 250 / AC110, 120, 240			
Closing & tripping control: Current (A)	Refer to Table 3 (see page 12)			
Operating life (times): Mechanical peration[2]	10,000[2]			
Operating life (times): Electrical operation	Refer to Table 2 (see page 11)		Refer to Table 2 (see page 11)	
Auxiliary contacts	4NO+4NC (Max. 10NO+10NC)			
Weight (kg/lbs) (Main-body)	1 170/375 2 170/375 4 210/463	1 180/397 2 180/397 4 220/485 7 280/662	1 180/397 2 180/397 4 220/485 7 280/662	1 200/375 2 200/375 4 220/463 7 280/662 8 280/662

※ 1) Type number in the square "□" shall be listed as shown in the line for the rated current.
2) The value is with maintenance, 2,000 times without maintenance.
3) HVF 147□ is 3min.

Model [1]		HVF 244□	HVF 245□	HVF 246□
Standard		UL Recognized		
Rated voltage (kV)		8.25		
Frequency (Hz)		60		
Rated current (A)		1 630 2 1,200 4 2,000	1 630 2 1,200 4 2,000 7 3,000	1 630 2 1,200 4 2,000 7 3,000
Rated short-circuit breaking current (kA)		25	31.5	40
Rated short-circuit making current (kA)		65	82	104
Short-time withstand current for 3sec (kA)		25	31.5	40
Power-frequency withstand voltage (kV, 1min)		36	36	36
Impulse withstand voltage (kV, 1.2x50μs)		95	95	95
Operating duty		O – 0.3sec – CO – 15sec - CO		
Closing time (ms, at DC125V)		45 - 70		
Opening time (ms, at DC125V)		28 - 38		
Breaking time (cycles)		3		
Closing operating	System	Motor spring stored energy		
	Supply voltage (V)	DC48, 125, 250 / AC110, 120, 240		
	Current (A)	Refer to Table 3 (see page 12)		
Closing & tripping control	Tripping system	Shunt trip		
	Supply voltage (V)	DC48, 125, 250 / AC110, 120, 240		
	Current (A)	Refer to Table 3 (see page 12)		
Operating life (times)	Mechanical peration[2]	10,000[2]		
	Electrical operation	Refer to Table 2 (see page 11)		
Auxiliary contacts		4NO+4NC (Max. 10NO+10NC)		
Weight (kg/lbs) (Main-body)		1 170/375 2 170/375 4 210/463	1 180/397 2 180/397 4 220/485 7 300/662	1 180/397 2 180/397 4 220/485 7 300/662

※ 1) Type number in the square "□" shall be listed as shown in the line for the rated current.
2) The value is with maintenance, 2,000 times without maintenance.

Ratings and Specifications

Model [1]		HVF 344□	HVF 345□	HVF 346□
Standard		UL Recognized		
Rated voltage (kV)		15		
Frequency (Hz)		60		
Rated current (A)		1 630 2 1,200 4 2,000	1 630 2 1,200 4 2,000 7 3,000	1 630 2 1,200 4 2,000 7 3,000
Rated short-circuit breaking current (kA)		25	31.5	40
Rated short-circuit making current (kA)		65	82	104
Short-time withstand current for 3sec (kA)		25	31.5	40
Power-frequency withstand voltage (kV, 1min)		36	36	36
Impulse withstand voltage (kV, 1.2x50μs)		95	95	95
Operating duty		O – 0.3sec – CO – 15sec - CO		
Closing time (ms, at DC125V)		45 - 70		
Opening time (ms, at DC125V)		28 - 38		
Breaking time (cycles)		3		
Closing operating	System	Motor spring stored energy		
	Supply voltage (V)	DC48, 125, 250 / AC110, 120, 240		
	Current (A)	Refer to Table 3 (see page 12)		
Closing & tripping control	Tripping system	Shunt trip		
	Supply voltage (V)	DC48, 125, 250 / AC110, 120, 240		
	Current (A)	Refer to Table 3 (see page 12)		
Operating life (times)	Mechanical peration[2]	10,000[2]		
	Electrical operation	Refer to Table 2 (see page 11)		
Auxiliary contacts		4NO+4NC (Max. 10NO+10NC)		
Weight (kg/lbs) (Main-body)		1 170/375 2 170/375 4 210/463	1 180/397 2 180/397 4 220/485 7 300/662	1 180/397 2 180/397 4 220/485 7 300/662

※ 1) Type number in the square "□" shall be listed as shown in the line for the rated current.
2) The value is with maintenance, 2,000 times without maintenance.

Type of Mounting

As the standard version, the fixed type and three kinds of draw-out type circuit breaker can be provided on request.
The draw-out type breakers consist of truck, mechanical interlock, control terminal, and various accessories.

- XA type: Fixed VCB with IEC control jack
- GA/MA type: Draw-out VCB body only for GS/MS cradle
- GS type: Draw–out VCB with GS cradle [Metallic partition & bushing with shutter]
- MS type: Draw–out VCB with MS cradle [Metallic partition & bushing with shutter, with door]

XA type

MA/GA type

GS type

MS type

Technical Data

Application

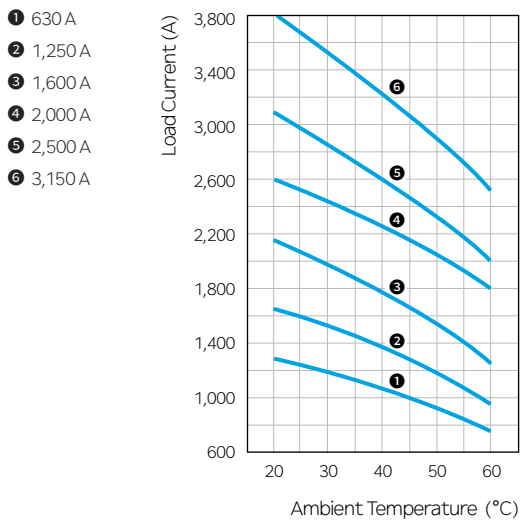
Applicable standards
HD HYUNDAI vacuum circuit breakers meet UL® recognized.

Rapid load transfer & operating duty
With its consistent short closing and operating times, HD HYUNDAI vacuum circuit breakers are especially beneficial in load transfer from one circuit to another without interruption of service. This high speed operation perform synchronizing of the systems to be paralleled at the instant of contact closure as well. According to the relevant standards and breaker types, tests were carried out for the following operating duties.

- O – 0.3sec – CO – 15sec – CO
  (O: Open, C: Close)

Current carrying capacity
HD HYUNDAI vacuum circuit breakers may keep at ambient temperatures between -30℃ and +40 ℃. The rated normal currents are determined according to UL® recognized at an ambient temperature of 40 ℃. When the breakers are operated at different temperatures, the correction on the operating current must be considered. Fig.9. shows appropriate operating currents at different ambient temperatures. However, the diagram applies only to open type switchgear so metal enclosed switchgear load currents shall be reduced accordingly.

<Fig.1> Vacuum Circuit Breaker Load Characteristic Curve



Switching of overload transmission lines and cables
The relatively small capacitive currents of overload transmission lines and cables under no load condition can be safely interrupted without restrike and overvoltage development

Switching of capacitors
HD HYUNDAI vacuum circuit breakers are the solution for capacitive application by switching the circuit without restrike and over voltage. VCB above 4.76kV 25kA can switch ON/OFF up to 50A capacitive load, and higher than 50A circuit, shall be informed in advance.

Switching unloaded transformer
By the special contact materials, the chopping current of the vacuum circuit breakers is only 4A to 5A, so overvoltage is limited when transformers disconnected at no load condition.

Switching of motors
Long electrical lifetime at rated current lets HD HYUNDAI vacuum circuit breakers be the excellent solution for high voltage motors. Surge absorber is recommended on these motors, which have less insulation level or less than 600A starting current. Even though low surge occurrence is the feature of HD HYUNDAI vacuum circuit breakers, the motor and the circuit itself can be protected efficiently by the surge absorber.

Interruption of transient recovery voltage
HD HYUNDAI vacuum circuit breakers can break the accident current properly at down steam of transformers, generators and current limit chokes, whose rising rates of transient recovery voltage are higher than UL® recognized even up to 10kV/us.

Arc Quenching System

A metal-vapor arc discharge in the vacuum is initiated by the current to be interrupted as the contacts open. The current flows through this metal-vapor plasma until the next zero transition.

The arc extinguishes in the vicinity of the current zero, and the conductive metal-vapor condenses within a few microseconds on the metal surfaces. As a result, the dielectric strength in the contact gap is rapidly rebuilt.

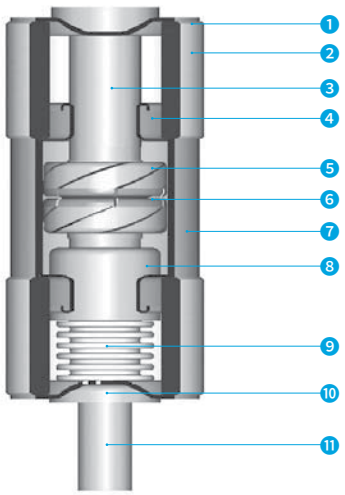
The rapid build-up of the dielectric strength even if contact separation takes place shortly before a current zero transition. The maximum arcing time for the last pole to clear is therefore only up to 15ms.

If the metal vapor arc discharge can be maintained within a certain level, the current is supposed be chopped prior to current zero.

This chopping current must be controlled in order to prevent build-up of unduly high over voltages when inductive circuits are switched. The sintered CrCu contact limits the chopping current up to 4A to 5A.

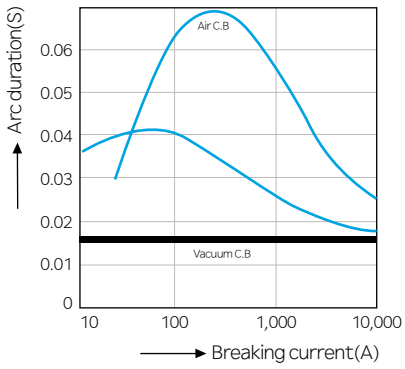
The geometry and size of the contact are designed differently according to breaking current and interrupter type.

Section view of VI



1. End Flange
2. Ceramic Insulator
3. Fixed Stem
4. Middle Flange
5. Contact Base
6. Contact Trip
7. Act Chamber
8. Bellows Shield
9. Bellows
10. Bearing Cap
11. Movable Stem

Arcing time-breaking current curve



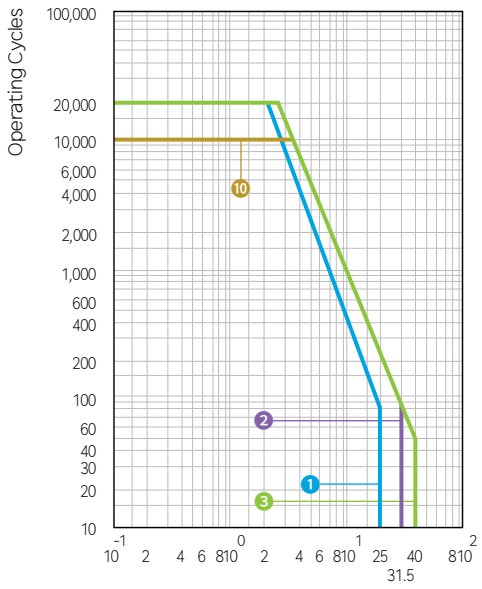
<Table 1> Arc quenching medium

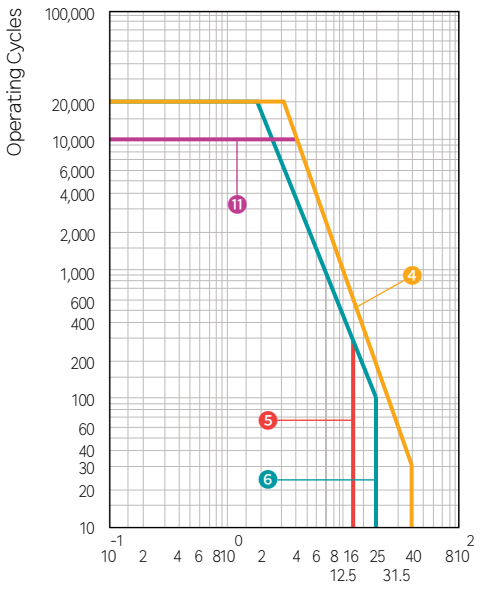
Breaker type	Arc voltage(V)
Vacuum circuit breaker	20-200
SF_6 gas circuit breaker	500-1,000
Oil circuit breaker	1,500-3,000
Magnetic blaster circuit breaker	1,500-3,000

Technical Data

Service Life

HD HYUNDAI vacuum circuit breaker needs minimum maintenance due to the simple operating mechanism and robust construction.
Vacuum circuit breaker shall be maintained periodically to ensure the perfect performance during mechanical and/or electrical lifetime. Please refer to the instruction manual for the detailed information.





<Table 2> Electrical endurance curve number depending on VCB type

Model		HVF				
Rated voltage	kV	4.76			8.25/15	
Rated breaking Current	kA	25	31.5/40	50	25	31.5/40
Curve number	630A	1	3	11	1	4
	1,200A	1	3	11	1	4
	2,000A	1	3	11	1	4
	3,000A	-	3	11	-	4
	4,000A	-	-	11	-	-

Power Consumption & Rated Current

Charging Motor

HD HYUNDAI VCB adopts short-time duty charging motor and the specification is stipulated on Table3.
Since the motor operating time is short, the maximum value and inrush current are disregarded.

Applicable standards

Closing solenoid and tripping solenoid operate latching Mechanism for VCB springs, so the VCB can be controlled remotely.
The specification is mentioned on Table 3.
The solenoids unlatch the closing spring and opening spring to close and open the VCB, respectively

Auxiliary Contacts (Secondary)

The following versions are available:

- C: IEC single control jack mounted on the breaker upper body with 0.8m cable, 4NO+4NC for fixed VCB (Manual jack)
- D: IEC double control jack mounted on the breaker upper body with 0.8m cable, 10NO+10NC for fixed VCB (Manual jack)
- I: Single control jack mounted on the breaker rear body, 4NO+4NC (Auto jack)

Rating of auxiliary contacts

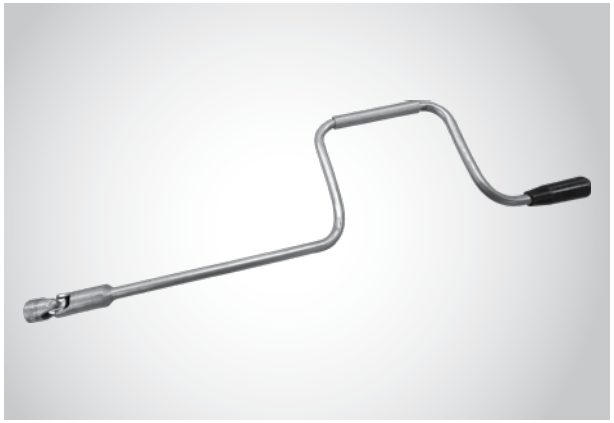
- Operating voltage: Max. 250V AC, DC
- Continuous thermal current: 10A
- Breaking current: DC48V – 10A, DC125A – 4A, DC250A – 2A

<Table 3> Power consumption & control voltage

Control voltage	Control current (A)			Voltage range
	Motor	Closing solenoid	Tripping solenoid	
DC48V	22.0	3.0	7.0	Motor/Close: 38-56V Open : 28-56V
DC125V	8.0	1.5	3.0	Motor/Close: 100-140V Open : 70-140V
DC250V	4.0	1.0	1.5	Motor/Close: 200-280V Open : 140-280V
AC120V	9.0	1.8	3.0	Motor/Close: 104-127V Open : 104-127V
AC240V	5.0	1.0	1.8	Motor/Close: 208-254V Open : 208-254V

Attachments

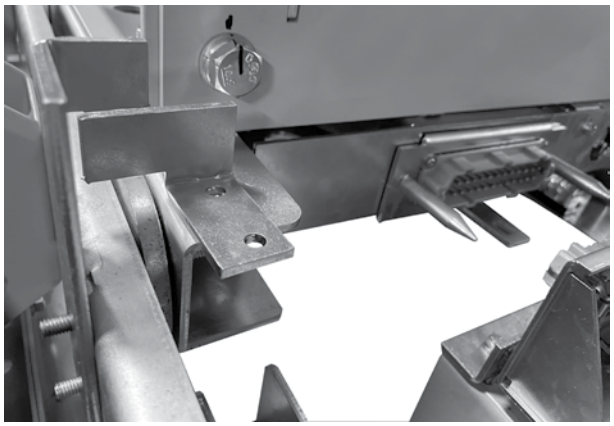
Draw in/out handle



Manual charging handle

Coding plate

Coding plate can be provided to prevent removable elements with lesser current and insulation ratings from being inserted into compartments with greater current and insulation ratings.

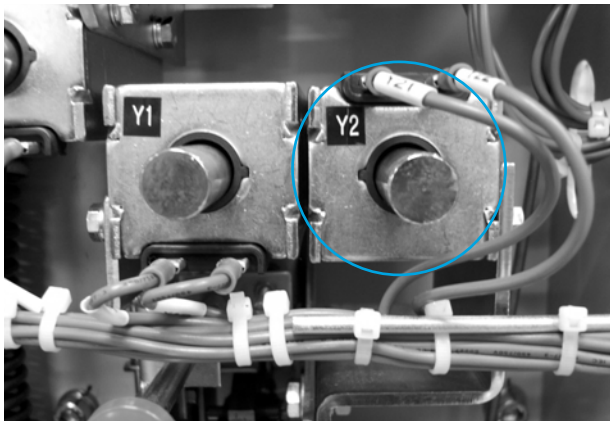


Additional Options

2nd shunt release (Y2)

- Order code: R☐

2nd shunt release is used to open the circuit breaker by intelligence relay, deliberate electrical or mechanical action. 2nd shunt release can be connected to control power (AC or DC); but 2nd shunt release may also be connected to voltage transformers.



Varistor module (V1, V2, V3)

- Order code: V☐

Varistor module protects charging motor and solenoids from the surge of DC control system. Potential damage caused by DC surge can be limited by applying varistor module to motor and solenoids.

※"☐" : Control Voltage

Additional Options

Close & Open Button Cover

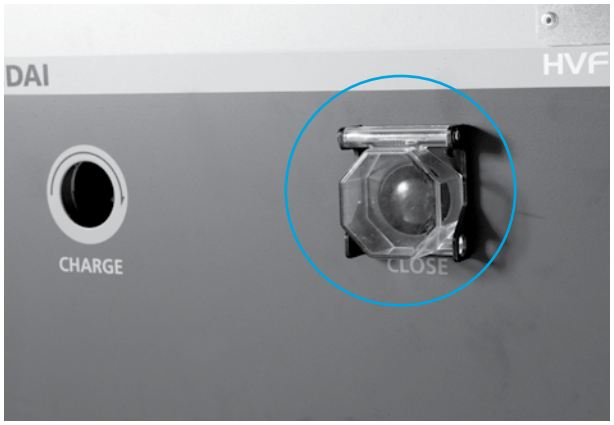
- Order code: BC (for close button only)
- Order code: BO (for open button only)

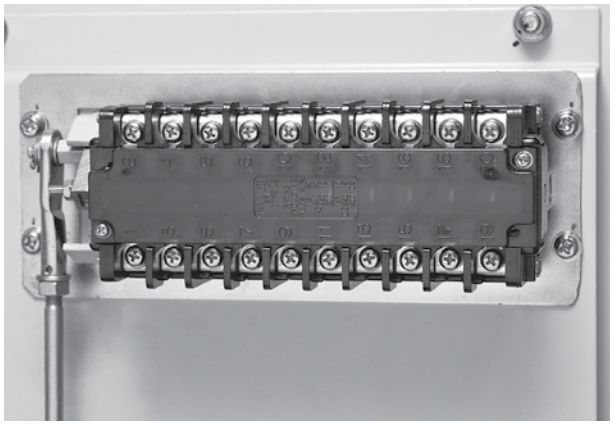
Close button cover & open button cover protests an accident caused by manipulation of operators

MOC(M3) : Mechanism Operated Cell switches

- Order code: M3, M6, MA, MP

In the TEST and CONNECTED positions of the circuit Breaker as the circuit breaker closes, MOC switch contact position is changed. MOC switch contacts operate in the same manner as the auxiliary switch contacts in the circuit breaker. Although the MOC switch operator is provided on all circuit breakers, the compartment mounted MOC switches are only provided when specified with the order. Basic contacts are 3a+3b.





TOC(T3) : Truck Operated Cell switches

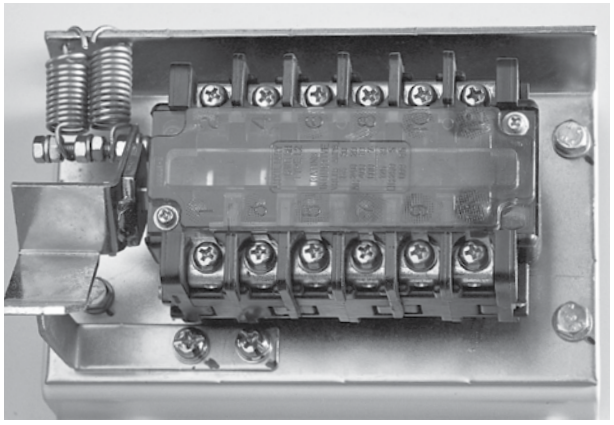
- Order code: T3, T6

TOC switch operator is mounted inside the right foot of the circuit breaker. It operates the TOC switch as the circuit breaker moves to the CONNECTED position in the switchgear compartment. Basic contacts are 3a+3b.

Position padlock with Kirk key

- Order code: KL

Position padlock key locks VCB in each position



Position padlock

- Order code: PD

Position padlock locks VCB in each position.

Fan

- Order code: FA

4 fans are provided for 4000A.

Spring charged signal (S41)

- Order code: S1

Spring charged signal is an electric function in order to check VCB charged.

Control jack no. 21 and 22 when there is no separate discussion will be withdrawn.

Trip coil supervision signal

- Order code: TC

Trip coil supervision signal is applied to a relay for monitoring a trip coil.

Control jack no. 23 when there is no separate discussion will be withdrawn.

Early "b" contact

- Order code: WC, W2

Early b signal is applied to provide 5 ms faster contact time.

Basic contact is 1EA.

Additional Options

Condenser trip device

Even though control power is lost, condenser trip device can trip the VCB of AC control system.

Item	Contents			
Order code	HVFS-T7	HVFS-T9	HVFS-T4	HVFS-T6
Rated input voltage	AC110V	AC220V	DC110V	DC220V
Charging voltage	DC145V	DC290V	DC110V	DC220V
Ordinary current	DC2A			
Time delay	within 0.5 sec			
Frequency	50/60 Hz		-	

Vacuum checker

- Order code: HAFS-VC9(22KV)

  Vacuum interrupter has longer lifetime than VCB, but vacuum degree can be checked for more reliable operation.

Item	Contents
Rated input voltage	AC220V
Rated output voltage	AC 11/22kV
Dimensions	W200 x L350 x H176mm

Designation Options

Control circuit lead cable [2.2m, 1.5SQ]

Control circuit connector [withdrawal jack]

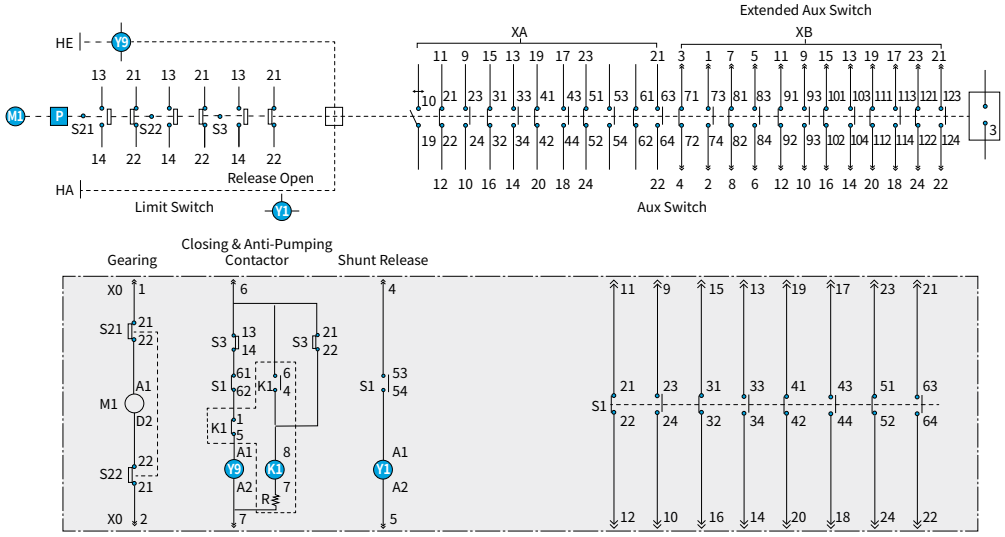
Remote rac king device

Lifter

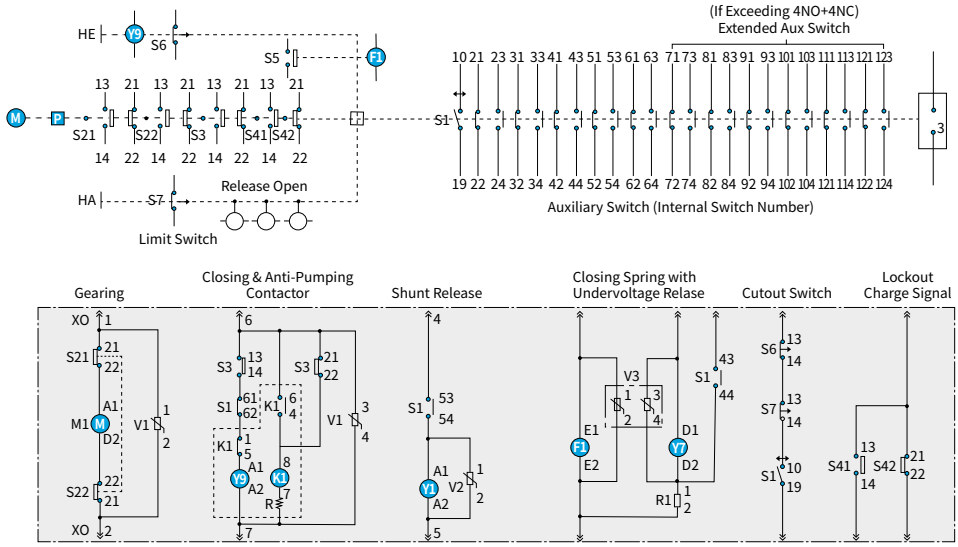
Circuit Diagram

HVF Circuit Diagram

Standard Circuit Diagram



Varist and Attached Release Detached Circuit



F1 : Lockout
HA : Manual Tripping
HE : Manual Closing
K1 : Anti-Pumping Relay
M1 : Motor
P : Stored Energy Mechanism
Y1 : Tripping Solenoid
Y7 : Under Voltage Release
Y9 : Closing Solenoid
R1 : Resistance
S1 : Aux Switch
S21, S22 : Limit Switch
(Charge spring and then interrupt motor circuit)
S3 : Limit Switch (K1 Control)
S41, S42 : Limit Switch
(Spring charging status signal)
S6, S7 : Cutout Switch
V1, V2, V3 : Varistor Module
X0 : Plug/Socket

※ For request for draw-out type option, No. 3 and 8 are drawn-out by default. For request for fixed type option, No. 21 and 22 are drawn out by default.
For request for two or more options, refer to Vacuum Circuit Breakers (Technical Data) on our website.
No 10 and 19 of S1 is a wiping contact ; connecting it in parallel with 'b' contact enables early 'b' contact configuration. (Option : WC)
M1 (Charging Motor) can be used both for AC and DC.

Dimensions

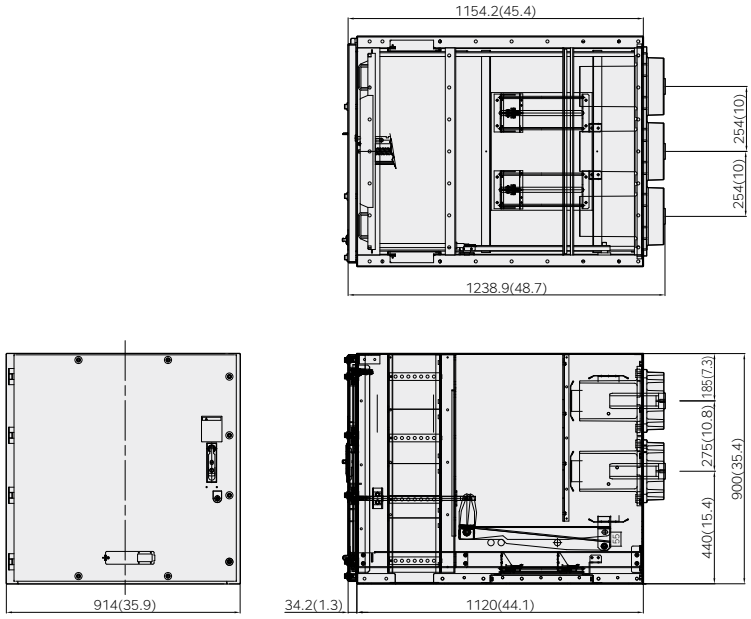
MS type Draw-out VCB with MS cradle

Unit : mm(inch)

HVF 1442
HVF 2442
HVF 3442
HVF 1452
HVF 2452
HVF 3452
HVF 1462
HVF 2462
HVF 3462

HVF 1472

- 4.76/8.25/15kV 25/31.5/40kA 1200A
- 4.76kV 50kA 1200A



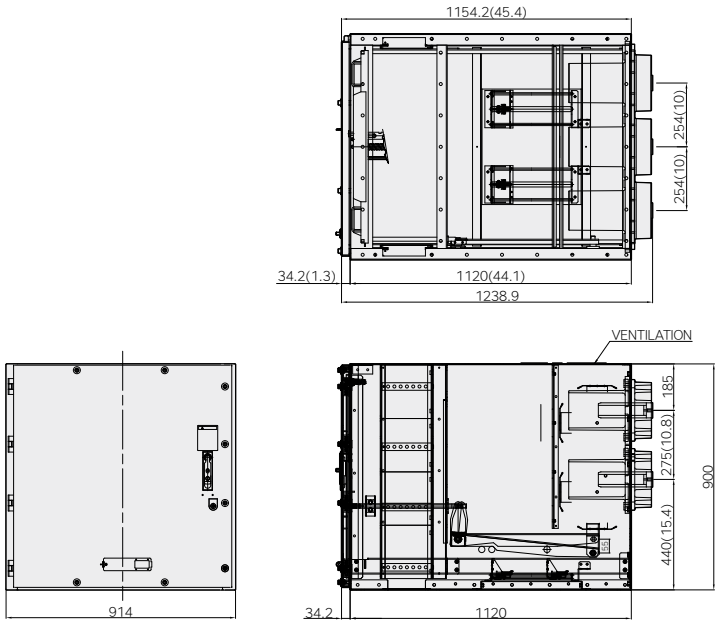
MS type Draw-out VCB with MS cradle

Unit : mm(inch)

HVF 1444
HVF 2444
HVF 3444
HVF 1454
HVF 2454
HVF 3454
HVF 1464
HVF 2464
HVF 3464

HVF1474

- 4.76/8.25/15kV 25/31.5/40kA 2000A
- 4.76kV 50kA 2000A



※ Dimensions may be revised without notice.

Dimensions

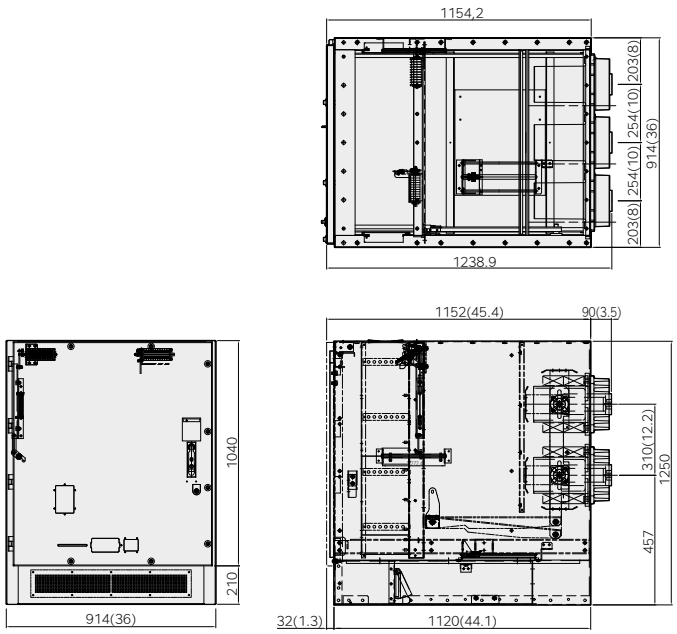
MS type Draw-out VCB with MS cradle

HVF 1457
HVF 2457
HVF 3457
HVF 1467
HVF 2467
HVF 3467

HVF1477
HVF 1478

- 4.76/8.25/15kV 31.5/40kA 3000A
- 4.76kV 50kA 3000/4000A

Unit : mm(inch)



※ Dimensions may be revised without notice.

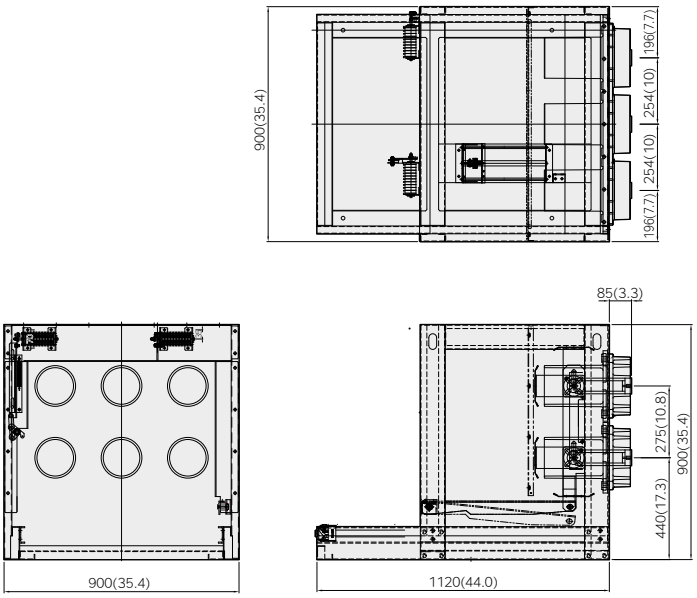
GS type Draw-out VCB with GS cradle

Unit : mm(inch)

HVF 1442
HVF 2442
HVF 3442
HVF 1452
HVF 2452
HVF 3452
HVF 1462
HVF 2462
HVF 3462

HVF 1472

- 4.76/8.25/15kV 25/31.5/40kA 1200A
- 4.76kV 50kA 1200A



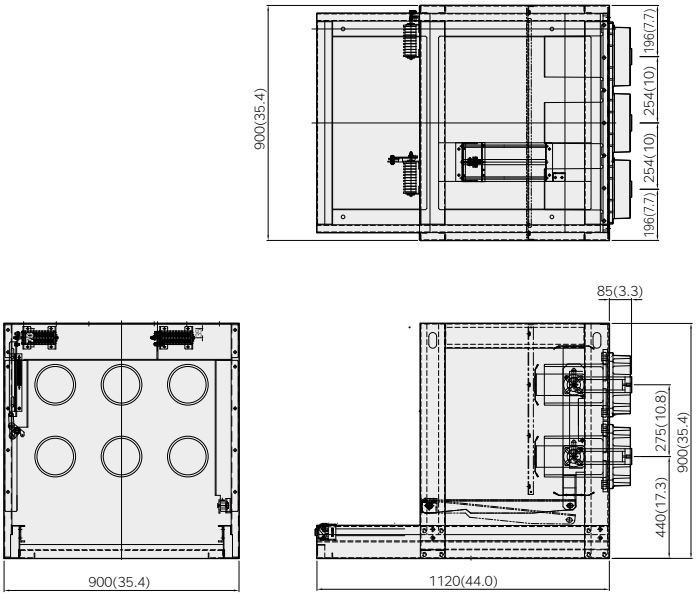
GS type Draw-out VCB with GS cradle

Unit : mm(inch)

HVF 1444
HVF 2444
HVF 3444
HVF 1454
HVF 2454
HVF 3454
HVF 1464
HVF 2464
HVF 3464

HVF 1474

- 4.76/8.25/15kV 25/31.5/40kA 2000A
- 4.76kV 50kA 2000A



※ Dimensions may be revised without notice.

Dimensions

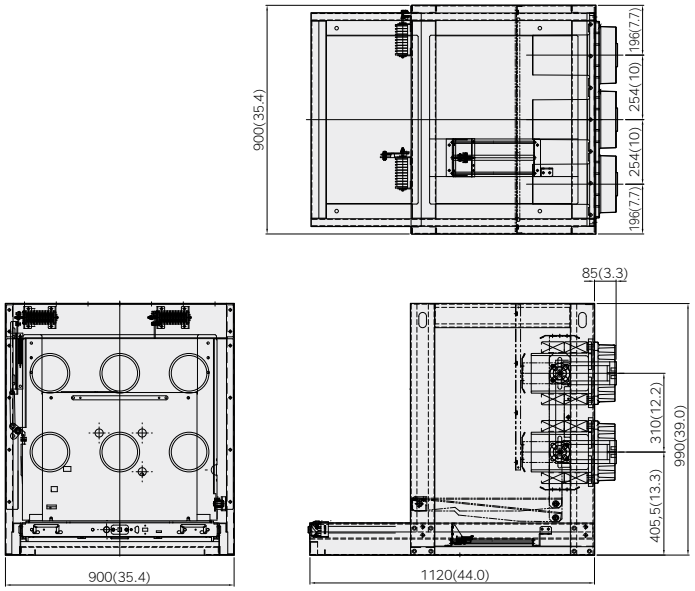
GS type Draw-out VCB with GS cradle

HVF 1457
HVF 2457
HVF 3457
HVF 1467
HVF 2467
HVF 3467

HVF 1477
HVF 1478

- 4.76/8.25/15kV 31.5/40kA 3000A/4000A
- 4.76kV 50kA 3000A

Unit : mm(inch)



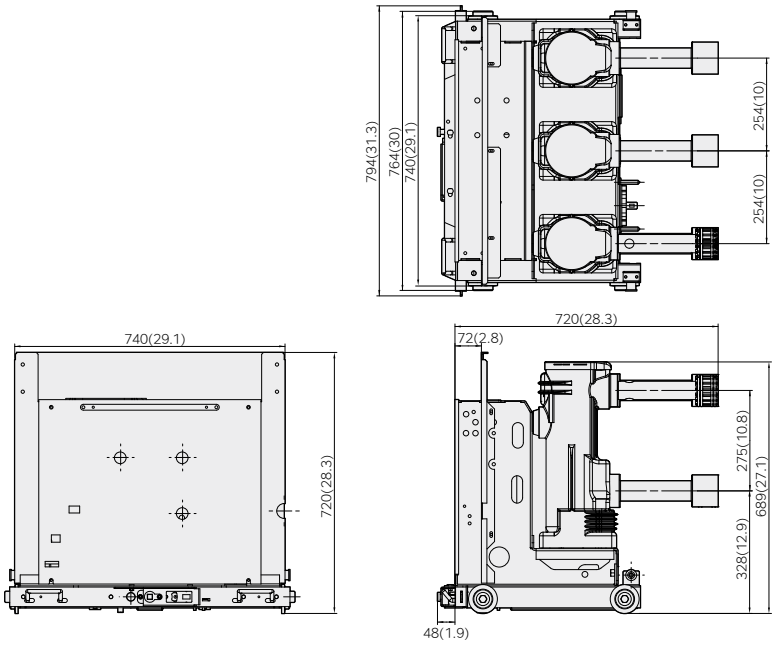
※ Dimensions may be revised without notice.

MA/GA type Draw-out VCB body only for MS/GS cradle

Unit : mm(inch)

HVF 1442
HVF 2442
HVF 3442
HVF 1452
HVF 2452
HVF 3452
HVF 1462
HVF 2462
HVF 3462

・4.76/8.25/15kV 25/31.5/40kA 1200A

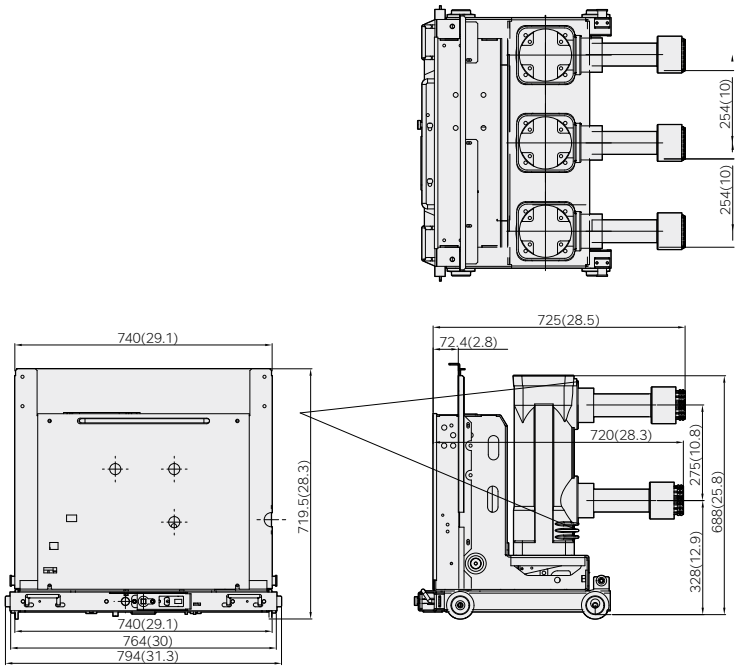


MA/GA type Draw-out VCB body only for MS/GS cradle

Unit : mm(inch)

HVF 1472

・4.76kV 50kA 1200A



※Dimensions may be revised without notice.

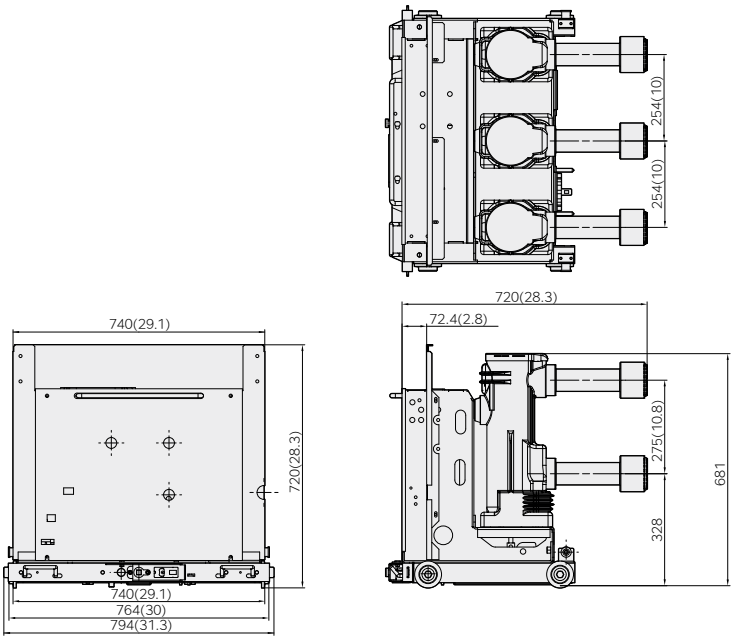
Dimensions

MA/GA type Draw-out VCB body only for MS/GS cradle

HVF 1444
HVF 2444
HVF 3444
HVF 1454
HVF 2454
HVF 3454
HVF 1464
HVF 2464
HVF 3464

Unit : mm(inch)

• 4.76/8.25/15kV 25/31.5/40kA 2000A

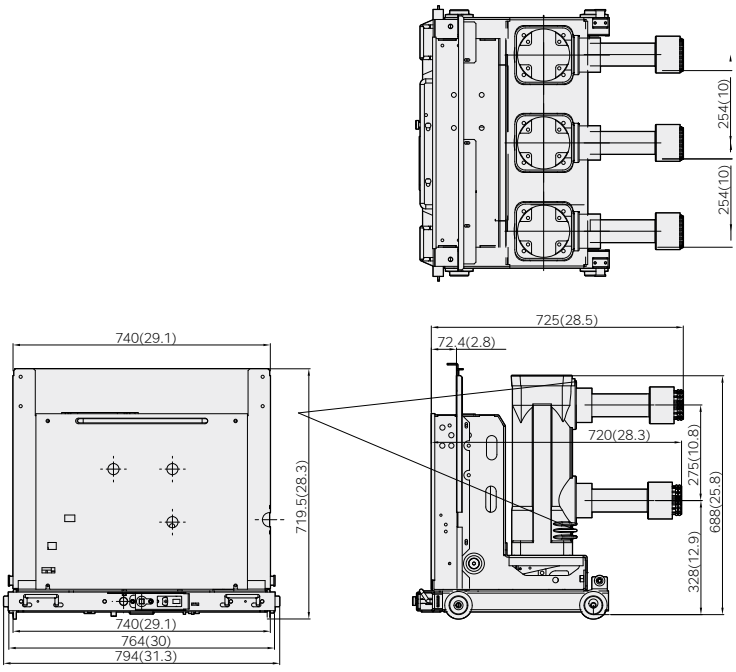


MA/GA type Draw-out VCB body only for MS/GS cradle

HVF 1474

Unit : mm(inch)

• 4.76kV 50kA 2000A



※ Dimensions may be revised without notice.

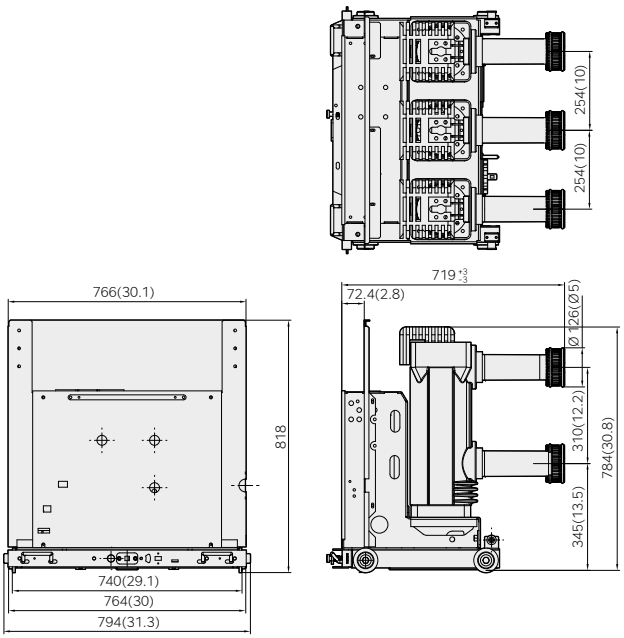
MA/GA type Draw-out VCB body only for MS/GS cradle

HVF 1457
HVF 2457
HVF 3457
HVF 1467
HVF 2467
HVF 3467

HVF 1477
HVF 1478

- 4.76/8.25/15kV 31.5/40kA 3000A
- 4.76kV 50kA 3000/4000A

Unit : mm(inch)



※ Dimensions may be revised without notice.

Dimensions

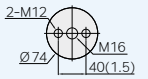
XA type Fixed VCB with IEC control jack

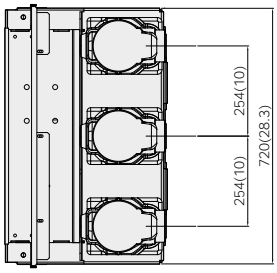
Unit : mm(inch)

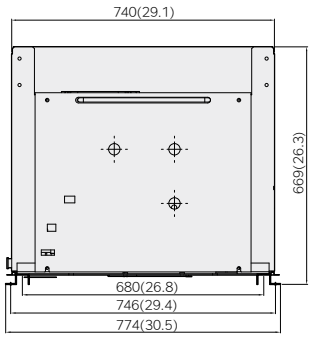
HVF 1442
HVF 2442
HVF 3442
HVF 1452
HVF 2452
HVF 3452
HVF 1462
HVF 2462
HVF 3462

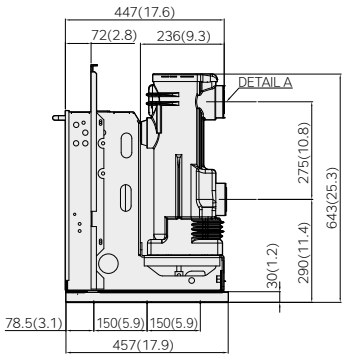
HVF1444
HVF 2444
HVF 3444
HVF 1454
HVF 2454
HVF 3454
HVF 1464
HVF 2464
HVF 3464

- 4.76/8.25/15kV 25/31.5/40kA 1200A
- 4.76/8.25/15kV 25/31.5/40kA 2000A

Rated Current	1250A/2000A
DETAIL A	





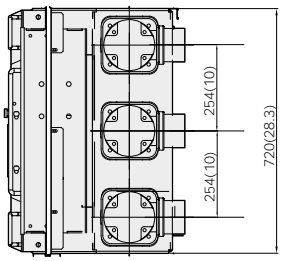


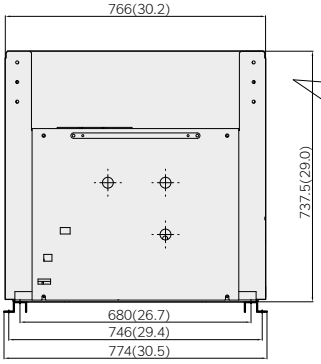
XA type Fixed VCB with IEC control jack

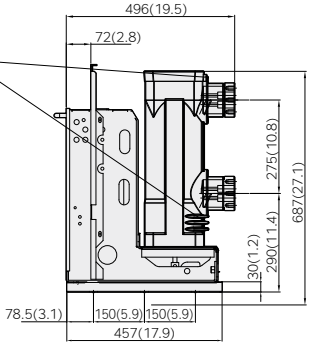
Unit : mm(inch)

HVF 1472
HVF 1474

- 4.76kV 50kA 1200/2000A







※ Dimensions may be revised without notice.

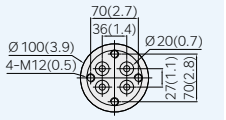
XA type Fixed VCB with IEC control jack

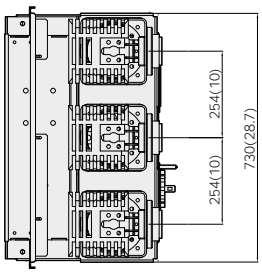
HVF 1457
HVF 2457
HVF 3457
HVF 1467
HVF 2467
HVF 3467

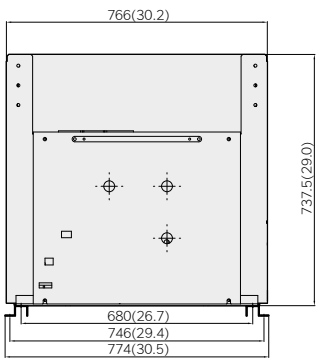
HVF 1477
HVF 1478

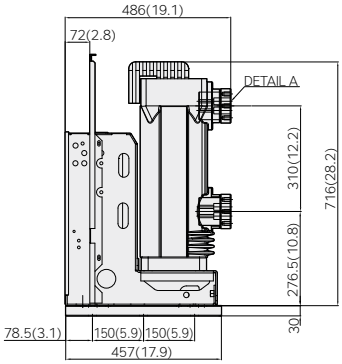
Unit : mm(inch)

- 4.76/8.25/15kV 31.5/40kA 3000A
- 4.76kV 50kA 3000/4000A

Rated Current	3000A
DETAIL A	







※ Dimensions may be revised without notice.

Order Code

HVF	34	5	2	H	GS
Model	Rated voltage	Rated breaking current	Rated current	Pole distance of VCB body	Mounting and structure

	Model
HVF	HVF

	Rated voltage
14	4.76kV
24	8.25kV
34	15 kV

	Rated breaking current
4	25kA
5	31.5kA
6	40kA
7	50kA

	Rated current
1	630A
2	1200A
4	2000A
7	3000A
8	4000A

	Pole distance of VCB body
H	254mm

	Mounting and structure	
XA	Fixed VCB with IEC control jack	Fixed type
GA	Draw-out VCB body only for GS cradle	Draw-out type
MA	Draw-out VCB body only for MS cradle	Draw-out type
GS	GS cradle [metallic partition & bushing with shutter]	Draw-out type
MS	MS cradle [metallic partition & bushing with shutter, with door]	Draw-out type

5	5	5	I	OO
Motor control voltage	Closing control voltage	Tripping control voltage	Auxiliary contact (Secondary) and structure	Attachments

	Motor control voltage
2	DC48V
5	DC125V
7	AC110V
H	AC120V
K	AC240V
L	DC250V

	Closing control voltage
2	DC48V
5	DC125V
7	AC110V
H	AC120V
K	AC240V
L	DC250V

	Tripping control voltage
2	DC48V
5	DC125V
7	AC110V
H	AC120V
K	AC240V
L	DC250V

	Auxiliary contact (Secondary) and structure
C	4NO+4NC, IEC control jack for fixed VCB
D	10NO+10NC, IEC control jack for fixed VCB
I	4NO+4NC (24 point), Auto secondary for draw-out VCB

	Attachments
R□	Second shunt release [□ : Number of voltage]
AJ	Auto jack
BC	Close button cover
BO	Open button cover
DD	Diode for Close and Open
DI	Door interlock
FA	Fan for 4000A
KL	Position padlock with kirk key
M0	MOC operated cell sensor
M3	MOC operated cell switch [3NO+3NC]
M6	MOC operated cell switch [6NO+6NC]
MA	MOC operated cell switch [10NO+10NC]
MP	MOC operated cell switch [12NO+12NC]
PD	Position padlock
P2	Position switch [Test 1a+1b, Conn. 1a+1b]
PI	Position indicator
S1	Spring charged signal "a" [S41]
S2	Spring charged signal "b" [S41]
T0	TRUCK operated cell sensor
T3	TRUCK operated cell switch [3NO+3NC]
T6	TRUCK operated cell switch [6NO+6NC]
WC	Early "b" contact 1
W2	Early "b" contact 2

Vacuum Contactors

Overview and Characteristics	34
Ratings and Specifications	36
Technical Data	37
Attachments	40
Control Circuits	41
Dimensions	42
Order Code	44

VCS

Vacuum Contactors

UL® Recognized

Superior switching performance

- Switching a vacuum makes for rapid breaking. Rapid build-up of the dielectric strength ensures safety breaking.

Optimum Design

- Optimized structure and mechanism complement frequent switching.

High Reliability

- Rigid insulation frame and operating mechanism offer high reliability, especially for safety and quality assurance.

Customer Convenience

- Light weight and compact size enable easy installation with high efficiency in space. Optimum design makes maintenance convenient.

Free voltage of control power

- Common operating voltage of AC/DC 100 ~ 125 V, AC/DC 220 ~ 240 V. Controller used in two voltage ranges is compatible as they are identical parts.

UL and cUL certification

- Acquired UL and cUL certification according to UL347, proving reliability for use in the US and Canada.

Overview and Characteristics

Operation Overview

Continuous-Type

Having longer mechanical life time than a latched type, more suitable for frequent switching.
When the transformer for controlling power fails to supply power due to accidents, continuously energized type protects the loads by tripping automatically.

Latch-Type

Latched type keeps the closing condition without the supply of power, so it is suitable for the system which has unstable power or the load which requires automatic closing with power.

Operation Time and Current

Item		Closing Current (A)	Holding Current (A)	Trip Current (A)	Closing Time (ms)	Trip Time (ms)
		3.6/7.2kV	3.6/7.2kV	3.6/7.2kV		
Continuous-Type	AC/DC 100 ~ 125 V	3.0	0.5	-	Less than 110	Less than 40
	AC/DC 220 ~ 240 V					
Latch-Type	AC/DC 100 ~ 125 V	3.0	-	4.0	Less than 110	Less than 25
	AC/DC 220 ~ 240 V					

※ For latch-type, closing current flows only for 170 ms.

Operating Voltage

Item	Contents
Closing Voltage	85 ~ 110 % of Rated Voltage
Trip Voltage	70 ~ 110 % of Rated Voltage
Drop Out Voltage	AC/DC 25 V

Rating of Auxiliary Contacts

Item	Contents	
Voltage	AC 110 V	AC 220 V
Operating Current	5 A	2 A

Anti Pumping Function

Anti pumping circuit which triggers closing and trip occur once only when the closing command and tripping command occur at the same time is embedded inside the controller.

Noise Removed

- By adopting the solenoid magnetizing method as standard using PWM control, noise is removed.

Reducing Current Consumption

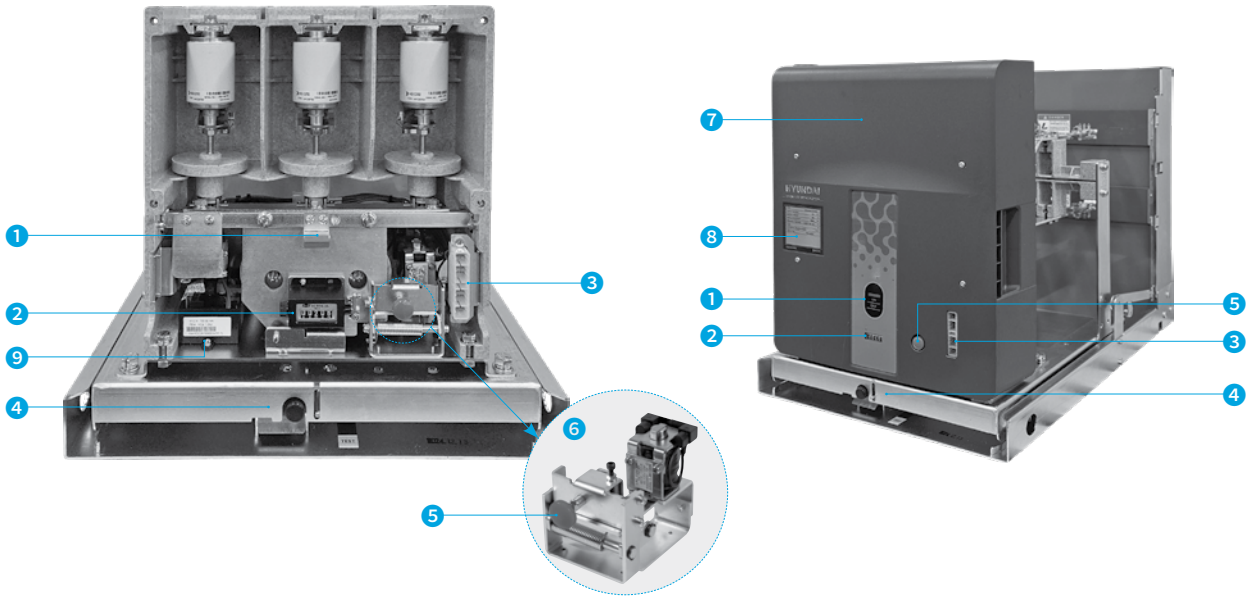
- By removing current in the PWM method, power consumption is reduced by 40 % in comparison with other products

Certification

- Products were developed in compliance with IEC, NEMA standards.
- Acquired UL and cUL certification according to UL347, proving reliability for use in the US and Canada.

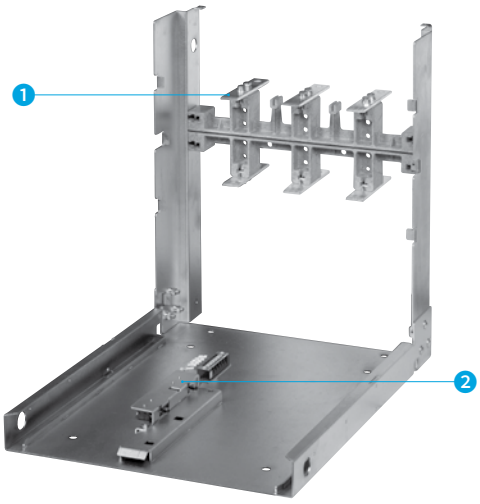
Operating mechanism

Internal and External Structure

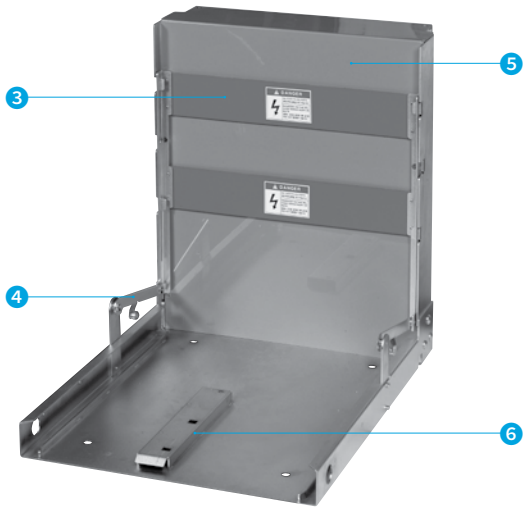


1. Switching Status Indicator
2. Switching Count Indicator
3. Control Plug
4. Pushing/Drawing Button
5. Emergency Trip Button (For Latch-Type)
6. Latch Device (For Latch-Type)
7. Front Cover
8. Nameplate
9. Controllers

Cradle Structure



E-Class Cradle



F-Class Cradle

1. Cradle Terminal
2. Position Detecting Switch
3. Shutter
4. Shutter Lifter
5. Rear Barrier
6. Interlock Supporter

Ratings and Specifications

Standards Acquisition

- UL347
- NEMA ICS 3
- IEC62271-106

Certification Acquisition

- UL
- cUL

Item \ Division		Fixed-Type				Draw-Out			
		X1				B1			
Type									
Continuous-Type		UVC 32C□	UVC 34C□	UVC 62C□	UVC 64C□	UVC 32C□	UVC 34C□	UVC 62C□	UVC 64C□
Latch-Type		UVC 32L□	UVC 34L□	UVC 62L□	UVC 64L□	UVC 32L□	UVC 34L□	UVC 62L□	UVC 64L□
Rated Breaking Voltage	kV	3.6		7.2		3.6		7.2	
Rated Operating Voltage	kV	3.3		6.6		3.3		6.6	
Rated Frequency	Hz	60				60			
Rated Current	A	200	400	200	400	200	400	200	400
Impact Withstand Voltage	kV	60				60			
Commercial Frequency Withstand Voltage	for 1 min, kV	20				20			
Control Circuit Withstand Voltage	for 1 min, kV	2							
Opening/Closing Capacity Category		AC 4							
Breaking Capacity (O–3 min–CO–3 min–CO)	kA	4							
Short-Time Current	kA								
1 sec		6.3							
30 sec		2.4							
Durability	10,000 operations								
Continuous-Type		100							
Latch-Type		30							
Control Voltage	V	AC/DC 100 ~ 125 V, AC/DC 220 ~ 240V							
Aux Contacts		3a2b							
Weight	kg	20				50			

Technical Data

Behavior Method Selection

Continuous Type, Latch Type

Continuous Type

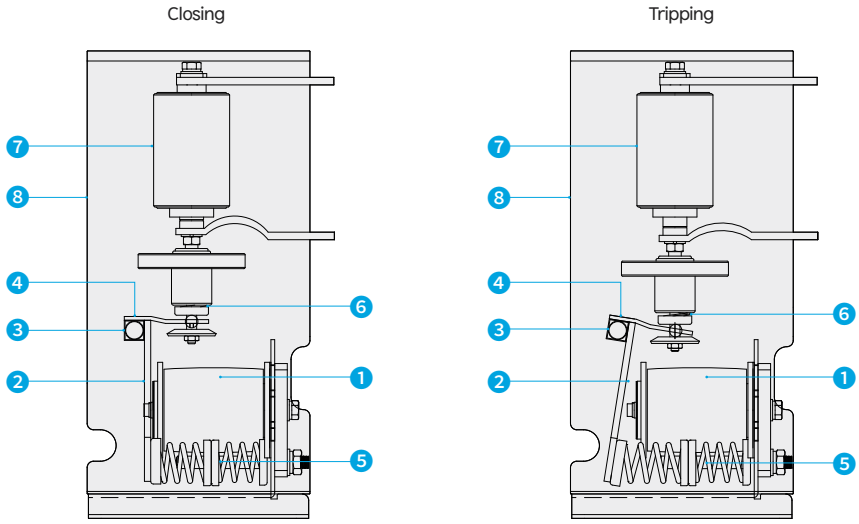
- Long mechanical switching life - suitable for frequent opening and closing.
- If you are using a transformer for control power, it is automatically tripped to protect the load when control power fails to supply.

Latch Type

- Shorter switching life compared with the continuous-type.
- It maintains closing status in case of no control power - suitable for systems without continuous control power supply,
- Or loads which needs automatic closing once power is restored.

Closing and Tripping

1. Closing Coil
2. Front Drive Plate
3. Shaft
4. Drive Plate
5. Trip Spring
6. Compression Spring
7. Vacuum Interrupters
8. Insulating Frame



Closing

- When closing coil (1) is magnetized, it pulls the front drive plate (2) and at the same time trip spring is compressed (5). Further, with the shaft (3) on the center, top drive plate (4) pushes driving unit of compression spring (6) and vacuum interrupters (7) making it closing status.
- In a continuous-type, once closing completes, controller automatically reduces the current supplied to closing coil.
- In a latch-type, at the time when closing is completes, the latch device installed on bottom of the product mechanically fixes the front drive plate to maintain closing. At this time, control power is automatically disconnected from the controller.

Tripping

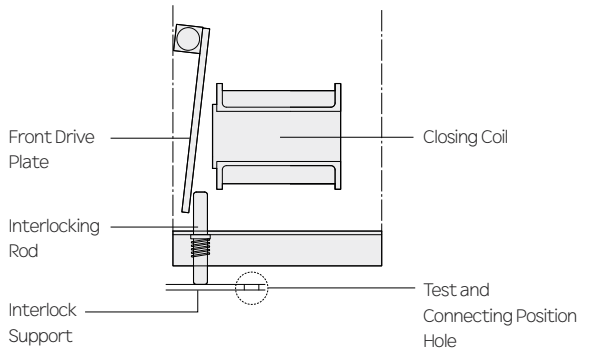
- For continuous-type, interrupting closing coil (1) control power releases magnetization of the coil, compressed trip spring (5) is recovered and tripped.
- For latch-type, providing power to trip coil releases latch that fixed front drive plate and at the same time, compressed trip spring is recovered and tripped.
- For latch-type, trip can be done by condenser trip device installed separately or by manual trip button even in the event of a power failure.
- With the main power applied, draw-out by interlocking device is unavailable for user's safety, make sure to trip before application.

Technical Data

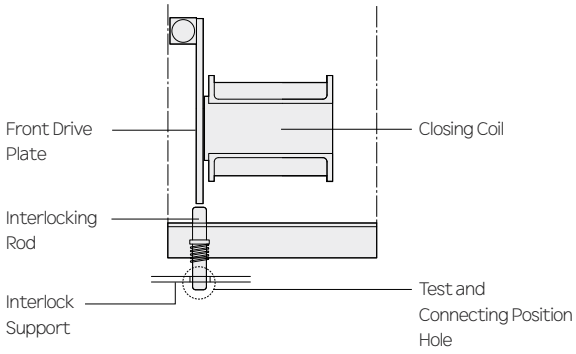
Interlocking Device

Interlock Condition	Interlock Information	Interlock Release	Remarks
With high-pressure vacuum contactor closing, pushing to connecting position is unavailable	The interlock bar built in the body mechanically interrupts pushing	Turn off high-pressure vacuum contactor	Standard Specifications
With high-pressure vacuum contactor closing, pushing from connecting position to testing position is unavailable	The interlock bar built in the body is fixed in the cradle interrupting pushing	Turn off high-pressure vacuum contactor	Standard Specifications
In incorrect segments of each intermediate position, closing is unavailable	If the interlock bar built in the body is not in the right position, it does not mechanically operates	Move high-pressure vacuum contactor to testing and contacting positions and close them.	Standard Specifications
	Electronically control in order not to supply control power if not in the right position		Optional (Electrical Interlock)
High-pressure vacuum contactor stops in the test position	The interlock bar built in the body is fixed in the test position	Press pushing/drawing button	Standard Specifications

If not at the Test or Contacting Position



Test and Connecting Positions



Cradle Selection

·High-pressure vacuum contactor is divided into a fixed and draw-out types based on installation method.
·Draw-out has main circuit connection terminal, pushing/drawing device to contact or separate body of the breaker to bus unit, and interlocking device that makes pushing/drawing unavailable at the time of closing. It is provided with a draw-out unit to suitably mount and conveniently use based on various switchgear type ; types of draw-out unit cradles are as follows based on configuration type of main circuit bus unit.

X-Type
Fixed-Type

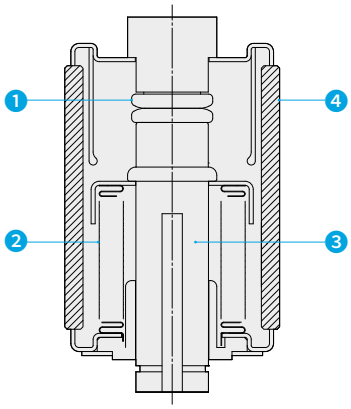
E-Type
Shutter Unattached
(For Cubicle-Type Switchgear)

F-Type
Shutter Attached
(For Compartment-Type Switchgear)

※ Cradle design and production can be customized depending on customer requirements even when they are not in the catalog.

Vacuum Interrupter

Vacuum interrupter of high-pressure vacuum contactor has the upper and lower stem ❸ and contacts ❶ of conducting unit as well as bellows ❷ and ceramic insulating material ❹ that form a support.
Special contact material enables approximately 1 million operations ; current chopping of 1 A or lower inhibits excessive recovery voltage. Inside of vacuum interrupters is a high degree of vacuum degree of less than 10-6 [mbar] and has a long life.



How to Push/Draw (E & F Cradle)

High-pressure vacuum contactor must be placed precisely on the cradle rail at this time. Make sure to use lift to lift contactor for the sake of safety. Sliding the contactor horizontally blocks interlock rod connected to the pushing/drawing button in the test position, making additional pushing unavailable.
In this position, connecting the control power allows testing the internal circuitry as required. In order to insert it into the connection position, push again the pushing/drawing button and slide it inside. When pulling is completed, main circuit connection terminal is fully inserted inside the cradle terminal and the interlock rod is inserted into the connection position hole and gets bound.

Attachments

Basic Attachments

Control Circuit Lead Cable

Standard length is 1.5 m and cable is 17AWG (Gray Color).

* Order code : UVCS0016

Optional Attachments

Vacuum Checker

Breaking in vacuum contactor is carried out in a vacuum interrupter fully sealed to a highly vacuum status. Vacuum interrupters are manufactured in a special process, thus can be used without inspection except for appearance check. However, in order to inspect vacuum interrupters for more stable operation, customer can use below mobile vacuum checker.

Item	Contents
Order No.	HAFS-VC9
Input Voltage	AC 200 / 220 V
Output Voltage	AC 11 kV / AC 22 kV
Weight	22 kg
Shape	Portable

Controllers

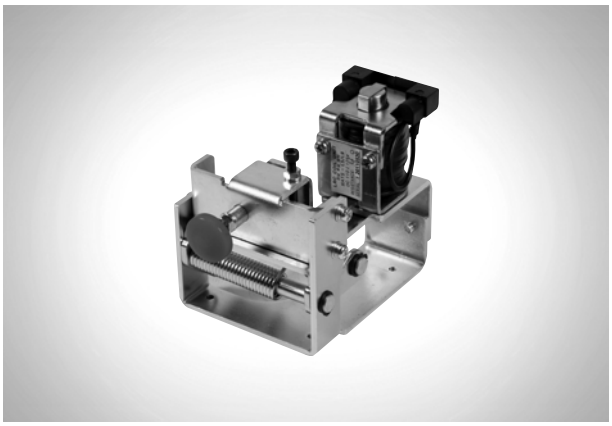
Electronic controller that provides closing coil current. It has latch and instantaneous type selection switches and for control power AC/DC.

* Order code : UVCS0018

Latch Device

It consists of a trip coil and a latch mechanism unit.
Trip coil can be purchased separately (UVCS0023, UVCS0024) and applies to instantaneous type only.

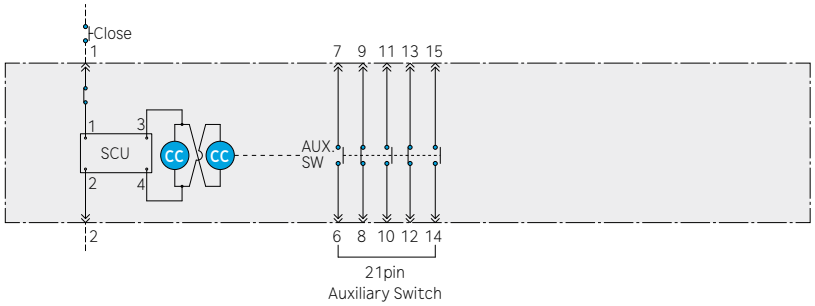
* Order code : UVCS0003 for AC/DC 100 ~ 125V
  UVCS0004 for AC/DC 220 ~ 240V



Control Circuits

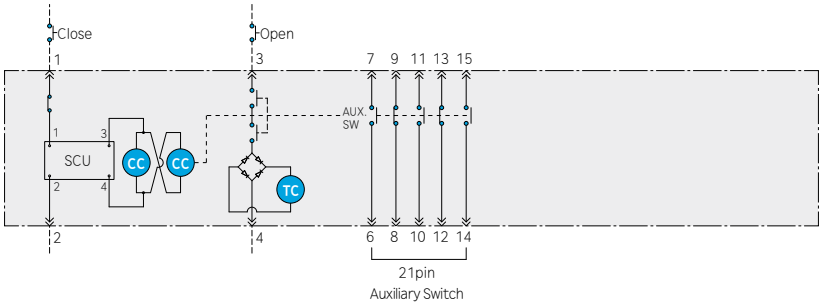
Circuit Diagram

Continuous Type (3.6/7.2 kV)



CC : Closing Coil
AUX, Switch : Aux Contact
TC : Trip Coil
SCU : Controller

Latched Type (3.6/7.2 kV)

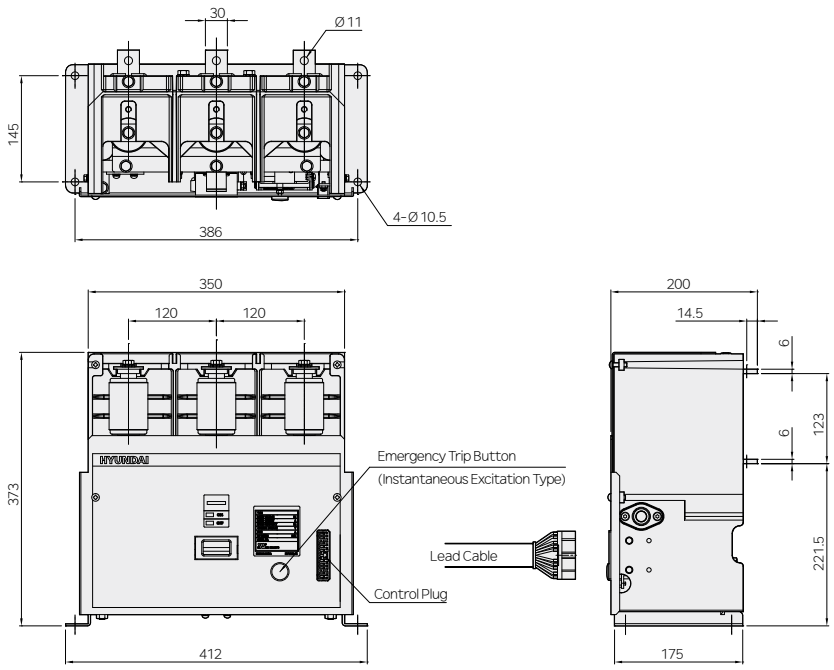


Dimensions

Vacuum Contactor (3.6/7.2 kV) Fixed Type

X1 and fuse not attached ; 21 pin front control plug

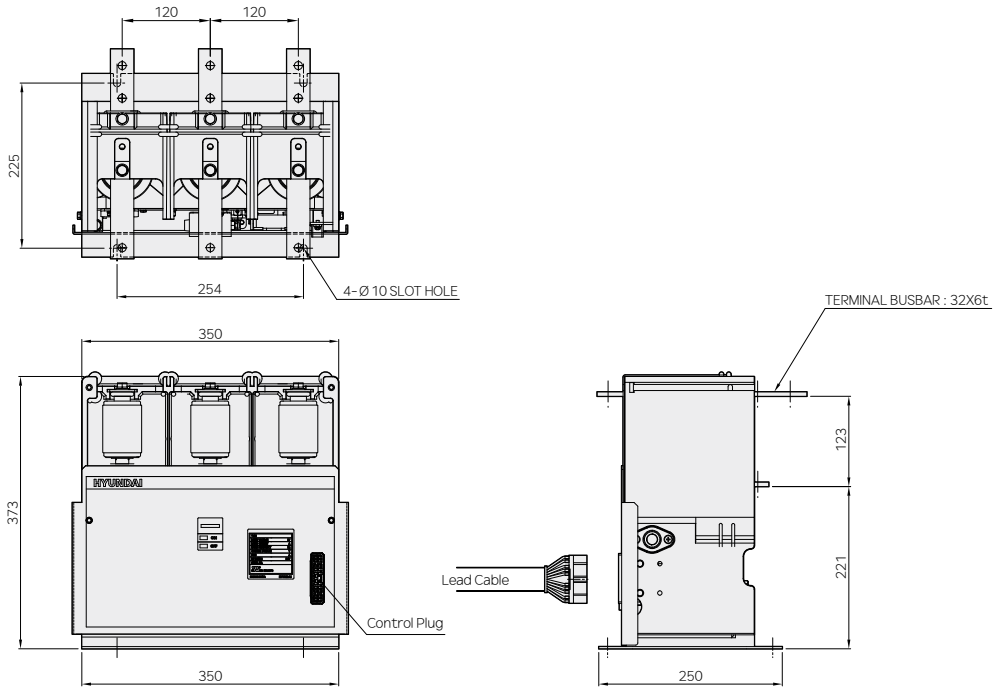
Unit : mm



Vacuum Contactor (3.6/7.2 kV) Fixed Type

X1 and fuse not attached ; 21 pin front control plug
(double terminal, without counter)

Unit : mm(inch)

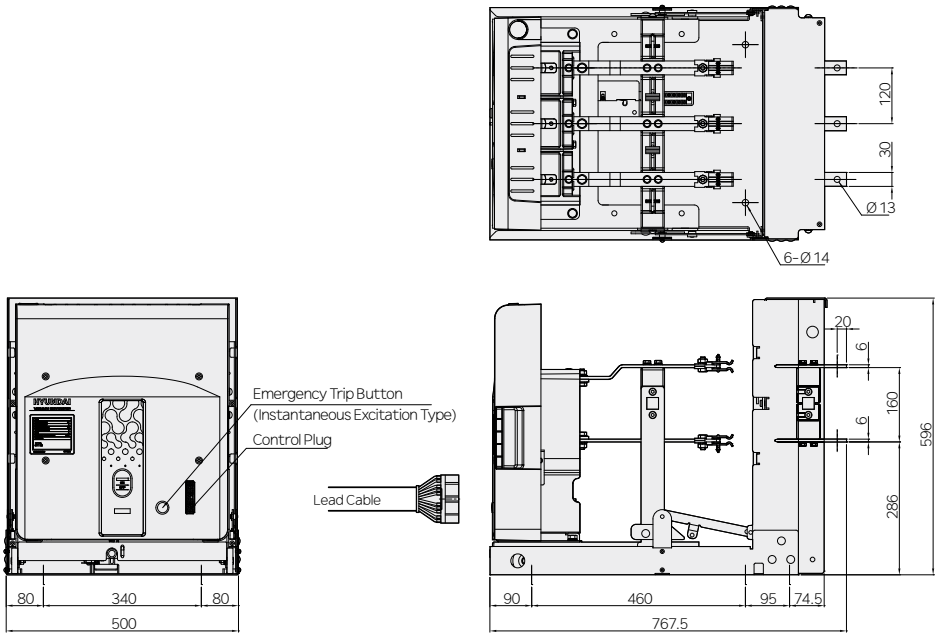


※ Dimension on this page are subject to change without notice.

E/F-Class Vacuum Contactor (3.6/7.2 kV) Draw-Out Type

B1 and fuse not attached ; 21 pin front draw-out control plug

Unit : mm



※Dimension on this page are subject to change without notice.

Order Code

UVC Type (For Body + Cradle Order)

UVC	6	4	C	B1	F1
Model	Rated Voltage	Rated Current	Operation Method	Connection Method / Fuse	Division / Cradle

Model	
UVC	Vacuum Contactor

Rated Voltage	
3	3.6 kV
6	7.2 kV

Rated Current	
2	200 A
4	400 A

Operation Method	
C	Continuous-Type
L	Latch-Type

Connection Method		Fuse
X1	Fixed-Type	Fuse Unattached 21 Pin Control Plug (Front Draw-Out)
B1	Draw-Out	Fuse Unattached 21 Pin Control Plug (Front Draw-Out)

Division		Cradle
00	Fixed-Type	-
07	Fixed-Type (Double terminal, without counter)	-
E0	E-Class (Shutter Unattached)	Not Used (Body Only)
E1		Used
F0	F-Class (Shutter Attached)	Not Used (Body Only)
F1		Used

0000	L
Fuse Specifications	Operating Voltage

Fuse Specifications	
0000	Fuse Holder Unattached

Operating Voltage	
L	AC/DC 100 ~ 125 V
H	AC/DC 220 ~ 240 V

Essential for Today
Potential for Tomorrow

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