Fuji Electric

Innovating Energy Technology

Vacuum Circuit Breakers

3.6 to 36kV Classes

06C1-E-0004a

Fuji Vacuum Circuit Breaker
····for Safe Operation, Easy Handling and Compactness

Vacuum circuit breakers are compact designed for safe operation, high reliability and easy maintenance, and are widely used for various types of high voltage circuits.
Fuji HS series vacuum circuit breakers (VCB) have been developed through the use of our many years of successful experience and advanced technology. They are compact and light-mass (weight), and are available in a number of current ratings.

Features

Compact, light-mass design

Vacuum circuit breakers have a small switching stroke as compared with other types of circuit breakers, so their breaking unit is small in size. To take full advantage of this feature, the operating mechanism has been designed to reduce the size and mass of the circuit breakers.

Spring closing system

The vacuum circuit breakers use a motor-spring stored-energy mechanism (rapid auto-reclosing type) to provide stabilized electrical and mechanical characteristics and to reduce the closing operating current.

Safe operation and simplified maintenance

• The operating mechanism is mounted on the front of the frame and the live parts are mounted on the rear. Thus, the operating mechanism is completely isolated from the live parts (dead front type).
• The draw-out type (Y) con be fitted with a misoperation-protection-interlock complying with the IEC and JEM standards (available by designation).

Stable breaking performance

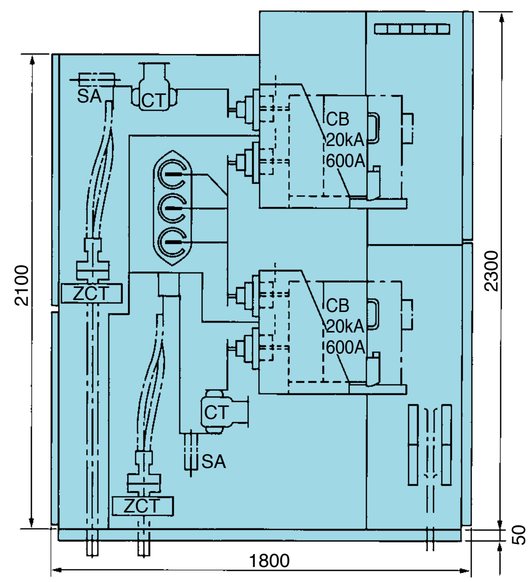
The excellent insulation recovery characteristics of the vacuum interrupter allow it to react quickly from small current to short-circuit currents, and also to exhibit a stable interrupting performance in double earth fault and out-of-phase currents.

Scope of VCB basic type

Rated voltage [kV]		3.6/7.2				
Rated breaking current [kA]		20	25	31.5	40	50
Rated current [A]	600	■	■			
	1200	■	■	■	■	■
	2000	■	■	■	■	■
	3000			■	■	■
	4000				■	

Rated voltage [kV]		12						
Rated breaking current [kA]		12.5	16	20	25	31.5	40	50
Rated current [A]	600	■	■	■	■			
	1200	■	■	■	■	■	■	■
	2000	■	■	■	■	■	■	■
	3000					■	■	■
	4000						■	

Rated voltage [kV]		24				36
Rated breaking current [kA]		12.5	16	25	40	25
Rated current [A]	600	■	■	■		■
	1200	■	■	■	■	■
	2000			■	■	■
	3000				■	

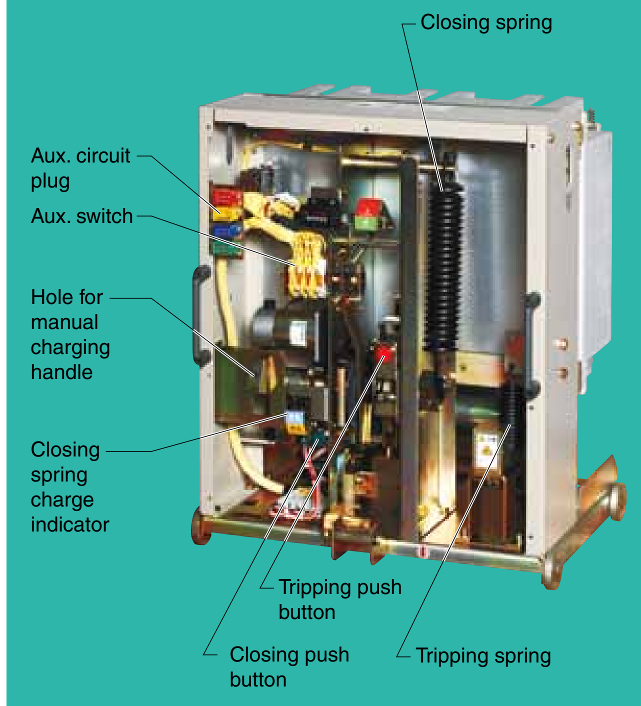


[Unit: mm]

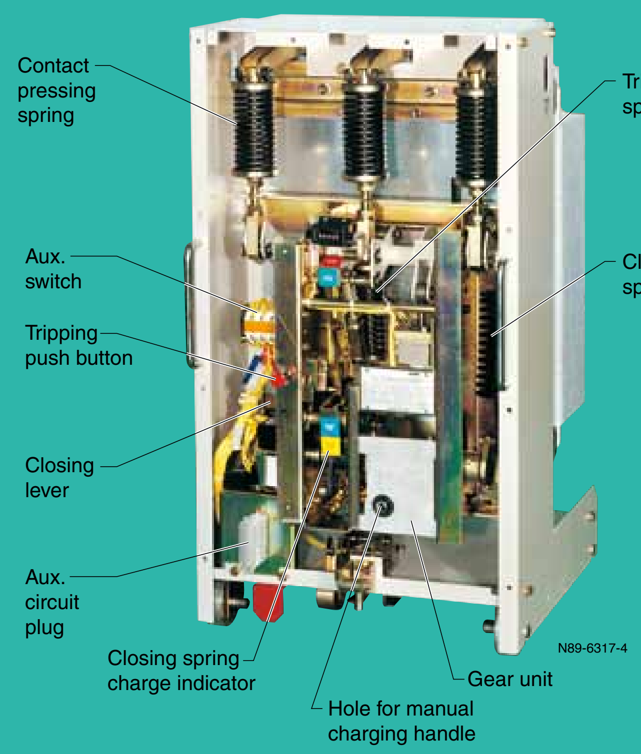
External view

Internal view

Internal view



Internal view



Ratings and Specifications

Standard ratings and specifications of HS series VCB

Type			HS2006□ -□Mf-E		HS2506□ -□Mf-E		HS3106□ -□Mf-E		HS4006□ -□Mf-E		HS4006□ -40Mf-N		HS5006□ -□Mf-NA		HS5006□ -30Mf-N		HS1210□ -□Mf-E	HS1610□ -□Mf-E	HS2010□ -□Mf-E	HS2510□ -□Mf-E	HS3110□ -□Mf-E	HS3110□ -30Mf-N
Ratings	Voltage	[kV]	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	12					
	Normal current JEC IEC	[A] [A]	600, 1200, 2000 630, 1250, 2000				1200, 2000, 3000 1250, 2000, 3000				4000 4000		1200, 2000 1250, 2000		3000 3000		600, 1200, 2000 630, 1250, 2000				1200, 2000 1250, 2000	3000 3000
	Short-circuit breaking current	[kA]	20		25		31.5		40				50				12.5	16	20	25	31.5	
	Short-circuit breaking capacity (reference value)	[MVA]	125	250	160	310	200	390	250	500	250	500	310	620	310	620	260	330	415	520	650	
	Short-circuit making current (peak value)	[kA]	50		63		80		100				125				31.5	40	50	63	80	
	Short-time withstand current JEC, 2s IEC, 1s*1	[kA] [kA]	20 20		25 25		31.5 31.5		40 40				50 50				12.5 12.5	16 16	20 20	25 25	31.5 31.5	
	Breaking time	[cycle]	3						5								3					
Rated withstand voltage	1 min power frequency JEC IEC	[kA] [kA]	22 20														28 28					
	Impulse (1.2 x 50μs)	[kV]	60														75					
No-load closing time		[s]	0.04				0.04 (3000A: 0.05)				0.1						0.04					0.1
Rated operating sequence JEC IEC			O-1min-CO-3min-CO, CO-15s-CO or O-0.35s-CO-1min-CO O-3min-CO-3min-CO, CO-15s-CO or O-0.3s-CO-3min-CO																			
Opening time JEC IEC		[s] [s]	0.03 0.03				0.03 0.03		0.03 0.04		0.07 0.07						0.03 0.03					0.04 0.04
Operating system	Closing system		Motor-spring stored-energy (rapid auto-reclosing) (M)																			
	Operating voltage and current for closing	AC, DC	100V 1.7A 2A (2000A)		100V 2A 200V 1A		100V 2.5A 200V 1.7A				100V 6A 200V 3A						100V 1.7A (600A, 1200A), 2.5A (2000A) 200V 1A (600A, 1200A), 1.7A (2000A)				100V 2.5A 200V 1.7A	100V 6A 200V 3A
	Control voltage and current for closing	AC, DC	100V 4A 200V 2A				100V 5A 200V 2.5A				100V 4A 200V 2A						100V 4A (600A, 1200A), 5A (2000A) 200V 2A (600A, 1200A), 2.5A (2000A)				100V 5A 200V 2.5A	100V 4A 200V 2A
	Tripping system*2		Shunt trip (f)																			
	Operating voltage and current for tripping	DC	100V 4A 200V 2A				100V 4A 200V 2A		100V: JEC 4A, IEC 3A 200V: JEC 2A, IEC 1.5A		100V 4A 200V 2A						100V 4A 200V 2A					
No. of auxiliary switches (for external circuit)			4NO+4NC, switching capacity 100/200V AC: 20/10A, 100/200V DC: 5/3A																			
Service life	Mechanical	[time]	10000																			
	Rated normal current switching	[time]	10000																			
Installation			P, Y (all) X, U (600, 1200A)				P, Y (all) X (1200, 2000A)				P, X		P, Y				P, Y (all) X (600, 1200A)				P, X, Y	P, Y
Mass (for draw-out type main unit only)		[kg]	62(X, U, Y, 600A) 66(Y, 1200A) 117 (Y, 2000A)		66(X, U, Y, 600A) 70(Y, 1200A) 117 (Y, 2000A)		122 (X, Y, 1200A) 130 (X, Y, 2000A) 220 (Y, 3000A)				400		240		320		71 (Y, 600A) 71 (Y, 1200A) 130 (X, Y, 2000A)			75 (Y, 600A) 75 (Y, 1200A) 130 (X, Y, 2000A)	122 (X, Y, 1200A) 130 (X, Y, 2000A)	320
Connection daiagrams (page 11)			A				B				C						A				B	C
Dimensions (pages 12 to 16) (typical example *3)			600, 1200A: A 2000A : B				1200, 2000A: C 3000A : D				E		F		G		600, 1200A: H 2000A : I				I	J

Notes : *1 Contact Fuji for the information concerning to the 3s time rating of IEC.
*2 If capacitor tripping mechanism is required, connect a capacitor trip unit VCB-T1PB, T1A or VCB-T2PB, T2A (optional accessory) to an AC power supply.
*3 Contact Fuji for dimensions of the types not listed here.

Type			HS4010□ -□Mf-NA	HS4010□ -□Mf-N	HS5010□ -□Mf-NA	HS5010□ -30Mf-N	HS1220□ -□Mf-EA	HS1620□ -□Mf-E	HS2520□ -□Mf-E	HS4020□ -□Mf-N	HS2530□ -□Mf-N
Ratings	Voltage	[kV]	12				24				36
	Normal current JEC IEC	[A] [A]	1200, 2000 1250, 2000	3000, 4000 3000, 4000	1200, 2000 1250, 2000	3000 3000	600, 1200 630, 1250		600, 1200, 2000 630, 1250, 2000	1200, 2000, 3000 1250, 2000, 3000	600, 1200, 2000 630, 1250, 2000
	Short-circuit breaking current	[kA]	40		50		12.5	16	25	40	25
	Short-circuit breaking capacity (reference value)	[MVA]	830		1040		520	665	1000	1660	1600
	Short-circuit making current (peak value)	[kA]	100		125		31.5	40	63	100	63
	Short-time withstand current JEC, 2s IEC, 1s*1	[kA] [kA]	40 40		50 50		12.5 12.5	16 16	25 25	40 40	25 25
	Breaking time	[cycle]	5				3			5	3
Rated withstand voltage	1 min power frequency JEC IEC	[kV] [kV]	28 28				50 50				70 70
	Impulse (1.2 x 50μs)	[kV]	75				125				170
No-load closing time		[s]	0.1				0.04			0.1	0.1
Rated operating sequence	JEC IEC		O-1min-CO-3min-CO, CO-15s-CO or O-0.35s-CO-1min-CO O-3min-CO-3min-CO, CO-15s-CO or O-0.3s-CO-3min-CO								
Opening time	JEC IEC	[s] [s]	0.04 0.04 } (4000A: 0.07)		0.07		0.03 0.03			0.07 0.07	0.04 0.04
Operating system	Closing system		Motor-spring stored-energy (rapid auto-reclosing) (M)								
	Operating voltage and current for closing	AC, DC	100V 6A 200V 3A				100V 2A 200V 1A		100V 2.5A 200V 1.7A	100V 6A 200V 3A	
	Control voltage and current for closing	AC, DC	100V 4A 200V 2A				100V 4A 200V 2A		100V 5A 200V 2.5A	100V 4A 200V 2A	
	Tripping system*2		Shunt trip (f)								
	Operating voltage and current for tripping	DC	100V 4A 200V 2A								
No. of auxiliary switches (for external circuit)			4NO+4NC, switching capacity 100/200V AC: 20/10A, 100/200V DC: 5/3A								
Service life	Mechanical	[time]	10000								
	Rated normal current switching	[time]	10000								
Installation			P, Y	P, Y (3000A) X (4000A)	P, Y		P, X, Y			P, Y	P, M, X
Mass (for draw-out type main unit only)		[kg]	210	320 (3000A) 400 (4000A)	240	320	120 (P, X, 600A) 130 (P, X,1200A) 135 (Y)		190 (Y, 600, 1200A) 200 (Y, 2000A)	280 (1200, 2000A) 350 (3000A)	280 (M, X, 600, 1200A) 300 (M, X, 2000A)
Connection daiagrams (page 11)			C				A		B	C	
Dimensions (pages 12 to 16) (typical example *3)			F	3000A: J 4000A: E	F	G	K	K	L	1200, 2000A: M 3000A: N	O

Notes : *1 Contact Fuji for the information concerning to the 3s time rating of IEC.
*2 If capacitor tripping mechanism is required, connect a capacitor trip unit VCB-T1PB, T1A or VCB-T2PB, T2A (optional accessory) to an AC power supply.
*3 Contact Fuji for dimensions of the types not listed here.

Type designations

HS2010Y-06Mf-E

② ③④ ⑤⑥⑦

①

① Basic type

- 3.6/7.2kV, 20 to 40kA 3000A max. and 12kV, 12.5 to 31.5kV 2000A max. 24kV, 16, 25kA : HS ·············· –E
- 24kV, 12.5kA : HS ··········· –EA
- 3.6/7.2kV, 50kA 1200/2000A and 12kV, 40, 50kA 1200/2000A : HS ··········· –NA
- Except for the above ratings : HS ·············· –N

② Short-circuit breaking current

Rated [kA]	Symbol
12.5	12
16	16
20	20
25	25
31.5	31
40	40
50	50

③ Voltage

Rated [kV]	Symbol
3.6/7.2	06
12	10
24	20
36	30

④ Installation

Type	Symbol
Fixed type	P
Draw-out type for HS2530	M
Draw-out unit type for class CW	X, U
Draw-out unit type for class MW or PW	Y

⑤ Normal current

Rated [A]	Symbol
600, 630	06
1200, 1250	12
2000	20
3000	30
4000	40

⑥ Closing system*

System	Symbol
Motor-spring stored-energy (rapid auto-reclosing)	M

⑦ Tripping system*

System	Symbol
Shunt trip	f

Note : * For closing and tripping systems, specify the type and operating vlotage.

Construction

The Fuji VCB features a dead front structure; the operating mechanism and control circuit are mounted on the front of the circuit breaker, and the vacuum interrupter and main circuit terminals are on the rear to avoid accidental touching with the live parts. These parts are enclosed in a metal cover to prevent them from making contact with the live parts during operation.

Closing mechanism

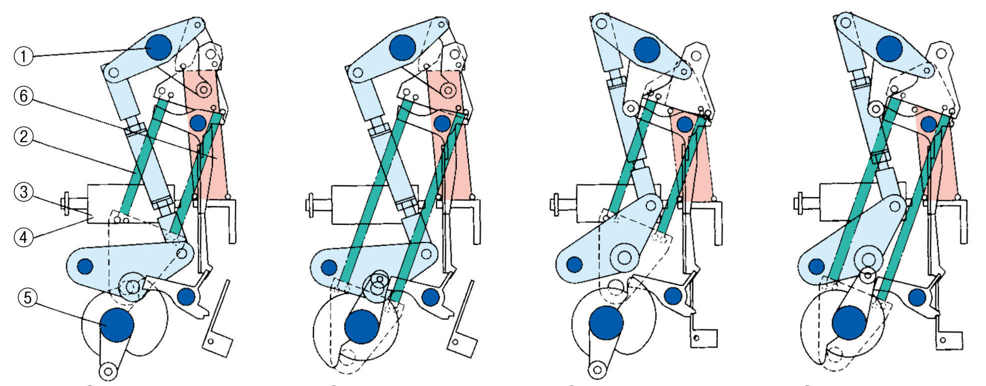
The closing mechanism is simple in design and provides high reliability. The circuit breakers use a motor-spring stored-energy closing mechanism of the rapid auto-reclosing type.

Motor-spring operation

The motor-spring operating mechanism of Fuji VCB is designed to carry out the closing sequence using the stored-energy in the closing spring supplied by the motor.
The operating mechanism incorporates springs capable of storing the energy required for an OFF-ON-OFF sequence when the breaker has been closed. The closing spring is recharged automatically after closing. This breaker model is suitable for rapid auto-reclosing duty. It can be used for reclosing since the charging time for the motor mechanism is 15s or less.

Operating mechanism

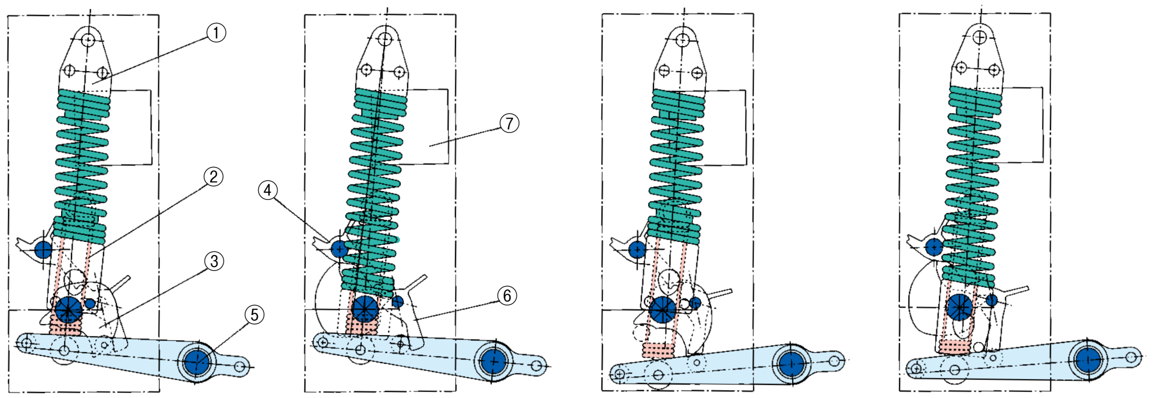
– N, – NA types



Open position (spring free) | Open position (spring charged) | Closed position (spring free) | Closed position (spring charged)

① Breaker shaft
② Closing spring
③ Tripping coil
④ Closing coil
⑤ Shaft
⑥ Tripping spring

– E, – K types



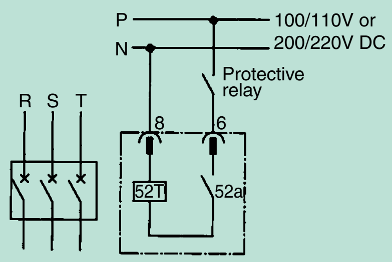
Open position (spring free) | Open position (spring charged) | Closed position (spring free) | Closed position (spring charged)

① Closing spring
② Tripping spring
③ Closing cam
④ Closing ratch
⑤ Breaker shaft
⑥ Tripping ratch
⑦ Operating motor

Tripping system

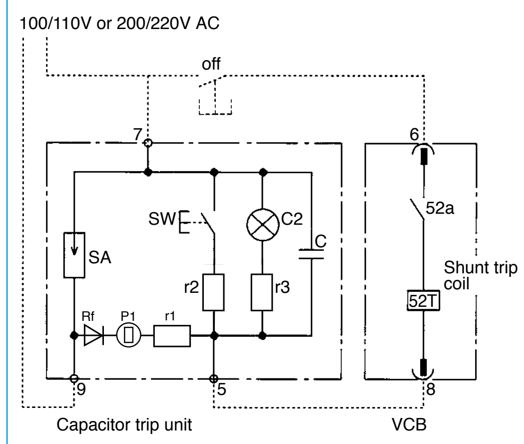
The VCB normally employs a shunt trip utilizing 100V DC or 200V DC.
If it is desired to use the capacitor tripping type, connect a capacitor trip unit, available as an optional accessory, to the shunt trip unit.

Shunt trip (f)

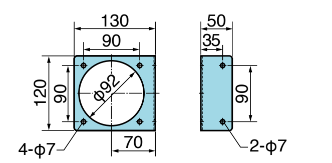


Capacitor trip unit (separate mount, option)

Connection

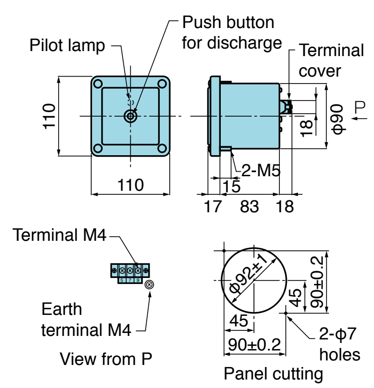


VCB-TK
(Mounting plate fittings for mounting in the cubicle.)

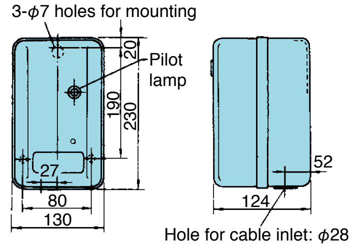


Outline drawings [Unit: mm]

VCB-T1PB, T2PB types



VCB-T1A, T2A types
3-φ7 holes for mounting

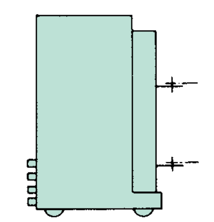
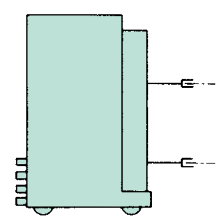
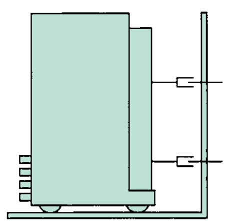
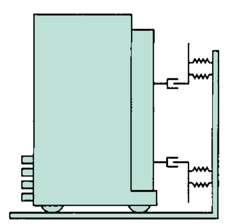
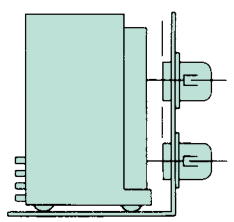


Hole for cable inlet: φ28
Rubber bush inside dia.: φ23

Specifications

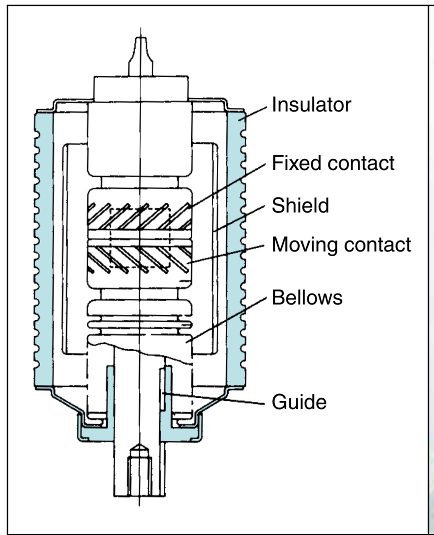
Name	Type	Rated input voltage AC [V]	Effective time for tripping	VCB shunt trip coil DC [V]
Capacitor trip unit	VCB-T1PB, T1A	100/110	Within 30s after AC power disappeared	100/110
	VCB-T2PB, T2A	200/220		200/220

Installation

Installation		Fixed type	M draw-out type	Draw-out unit type		
				X	U	Y
						
Type		HS···P	HS···M (for HS2530)	HS···X	HS···U	HS···Y
Terminal connection	Main circuit	Screw	Plug			
	Aux. circuit	Connector				
	Earth (ground)	Screw	Shoe			
Insulation shutter		–	–	–	–	With
Interlock		–	With draw-out interlock			

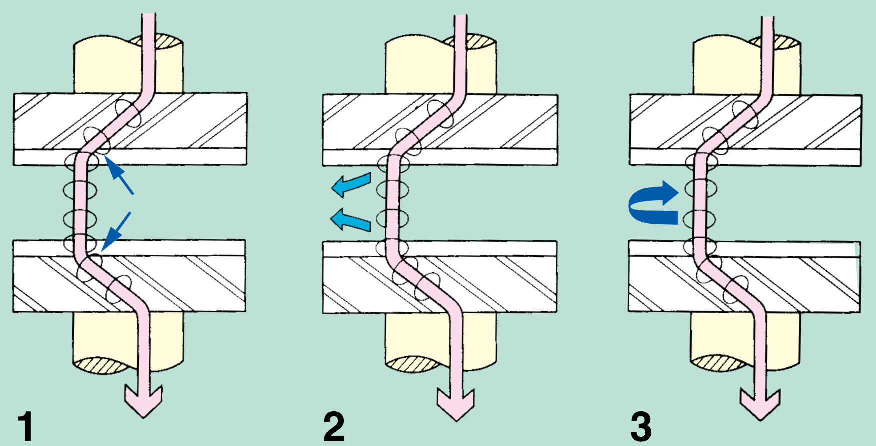
Vacuum Interrupter

In the vacuum interrupter, there is a pair of cup contacts, each having oblique slots.
This contact structure allows a current to flow along a winding path as shown by "1" in the illustration below.
When the contacts open, the arc deflects in the direction shown by "2" and rotates in the direction shown by "3".
The arc is driven round the contact surface without arc stagnation, and is extinguished in a short time. This prevents local overheating of the contact surface and uneven wear of the contacts, thereby providing a longer service life.
Since the contacts are made of a special material, chopping current flowing into the contacts is reduced to 3.5A.



AF96-32

Function of contact structure



1 The current path bends as shown by both arrows.

2 The arc receives the force in the arrow direction.

3 The arc is driven in the arrow direction, and it rotates without arc stagnation.

Service life

Judgement of vacuum condition

The vacuum condition in the vacuum interrupter is an important factor for operation of the VCB.
The interrupter of Fuji VCB is designed to maintain a high vacuum for a long period of time. It is factory tested to insure reliable performance.
When checking the vacuum condition, use the following procedure.
With VCB in the "open" condition, apply a commercial frequency voltage (ex.22kV effective value for VCB rated at 7.2kV) for 1min time across the poles of the same phase. When the vacuum interrupter withsatnds this voltage, the vacuum condition is normal.

Mechanical life

The VCB has a simple and excellent operating mechanism, so the mechanical stress developed at the time of operation remains the constant and hence the mechanical characteristic is kept stabilized for many years of use. For the mechanical life, refer to the table on pages 3 to 6.
Fuji VCB is equipped with an operating counter for check of the mechanical life.

Electrical life

The electrical life of the vacuum interrupter is determined by the switching of load as shown in the table on pages 3 to 6. It can be checked by observing the amount of wear of the contacts which is indicated by the wear indication mark (for "–N" and "–NA" types). The indication mark can be visually checked from the front of the VCB (except for "–E" and "–EA" types) without removing it from the switchgear.

Accessories

● : Provldod
– : Not provlded

Standard accessories are listed in table below. Optional accessories are available on request.

Fuji VCB type			Motor-spring stored-energy (rapid auto-reclosing)							Remarks
			HS2006, HS2506				All VCBs except for models on the left			
		Installation	Fixed type	Draw-out unit type			Fixed type	Draw-out unit type		
Name			P	X	U	Y	P	X	Y	
Standard accessories	Mounted on VCB	Operating counter	●	●	●	●	●	●	●	Mounted on VCB
		Closing spring charge indicator	●	●	●	●	●	●	●	
		Main circuit connecting bolt	●	–	–	–	●	–	–	
		Fixing parts	●	–	–	–	●	–	–	
	Mounted on cradle	Main circuit isolating fixed contact	–	●	●	●	–	●	●	In case of installation type X, U and Y, these mounted on cradle
		Insulating shutter	–	–	–	●	–	–	●	
		Draw-out-guide	–	–	–	–	–	●*	●*	
		Cradle	–	●	●	●	–	●	●	
	Accessories	Aux. circuit plug	●	●	●	●	●	●	●	
		Manual charging handle	●	●	●	●	●	●	●	1 per 5 VCB
		Draw-out handle	–	●	●	●	–	●	●	
Optional accessories	Mounted on VCB	Limit switch for closing spring charge indication	●	●	●	●	●	●	●	Mounted on VCB (ON "a" contact)
		Limit switch for indication of service and isolated positions	–	●	●	●	–	●	●	Mounted on cradle (2 max. SPDT "c"contact)
		Au. plug-in interlock	–	–	–	●	–	–	●	
	Separate mount, option	Capacitor trip unit	●	●	●	●	●	●	●	
		Mounting plate	●	●	●	●	●	●	●	In case of mounted in the cubicle for VCB-T1PB, T2PB
		Connector with external lead wire	●	●	●	●	●	●	●	Length 3m
		Testing jumper	–	●	●	●	–	●	●	
		Vacuum condition tester	●	●	●	●	●	●	●	
		Lifter	–	●	●	●	–	●	●	

Notes : * Except for "–E" and "–EA" type

Capacitor trip unit

Type	Mount type	Rated input voltage
VCB-T1PB	Flush mounting	100/110V AC
VCB-T1A	Surface mounting	
VCB-T2PB	Flush mounting	200/220V AC
VCB-T2A	Surface mounting	

Vacuum condition tester

Type	Available VCB type	Remark
VC-1A	3.6/7.2kV type VCB	
VC-2A	12 to 36kV type VCB	

Capacitor trip unit

VCB-T1PB, T2PB (Flush mounting)

VCB-T1A, T2A (Surface mounting)

AF94-108

Vacuum condition tester

VC-1A

SH27

Lifter (Manufacturer : FUJI INDUSTRY MFG.,LTD.)

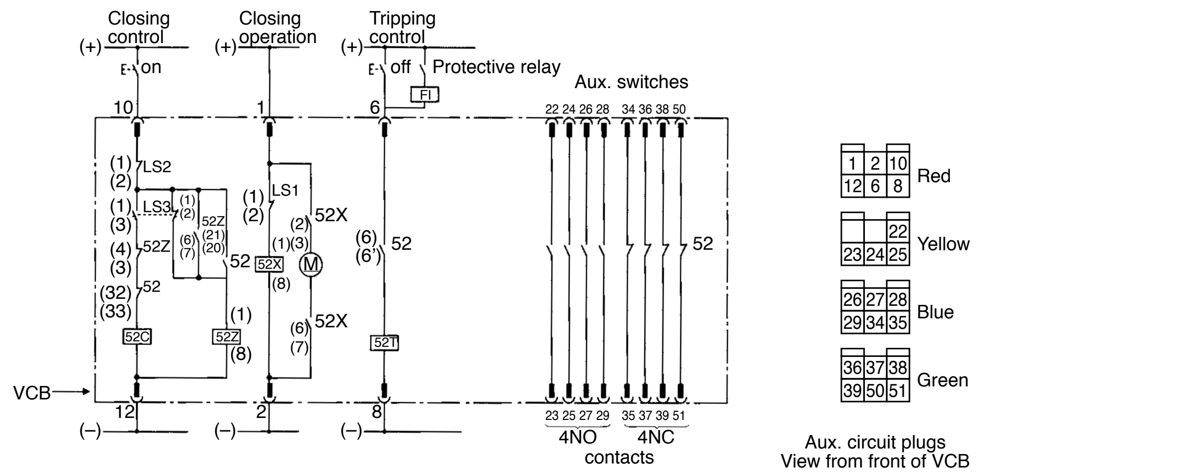
Type	Carrying VCB type	Remark
L-2HNB	HS2006-E HS2506-E HS2010-06, 12-E HS2510-06, 12-E	Other available equipment • MULTI. VCB • VMC (HN46A) • HD type truck
L-2HS40E	HS3106-12, 20-E HS4006-12, 20-E HS1210-20-E HS1610-20-E HS2010-20-E HS2510-20-E HS3110-12, 20-E	
L-4HS30E	HS3106-30-E HS4006-30-E	VCBs for L-2HS40E can also be mounted.
L-4HS43N	HS5006-12, 20-NA HS4010-12, 20-NA HS5010-12, 20-NA HS4020-12, 20-N	
L-4HS44N	HS4006-40-N HS5006-30-N HS3110-30-N HS4010-30, 40-N HS5010-30-N HS4020-30N	VCBs for L-4HS43N can also be mounted.
L-4HS12K	HS1220-06, 12-EA HS1620-06, 12-E	
L-4HS22E	HS2520-06, 12, 20-E	

Connection Diagrams

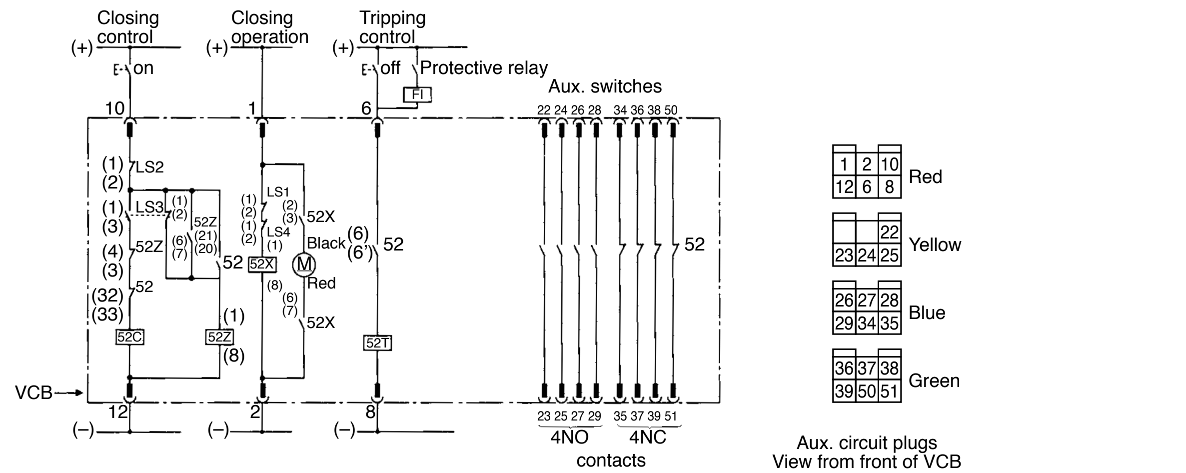
- —⊸ : EXTERNAL TERMINAL OF VCB
- 52 : VCB
- 52a : NO "a" contact of aux. switch
- 52b : NC "b" contact of aux. switch
- 52X : Magnetic contactor
- 52Z : Pumping preventive relay
- 52C : Closing coil
- 52T : Shunt tripping coil
- M : Operating motor

- LS_1: Limit switch (opens when the closing spring is in the charged condition)
- LS_2: Interlocking contact (only daw-out type)
- LS_3: Limit switch (NO "a" contact closes when the closing spring is in the charged condition)
- LS_4: Limit switch (opens when operation the closing push button)
- Protective relay: Over current relay etc.
- FI: Fault indicator

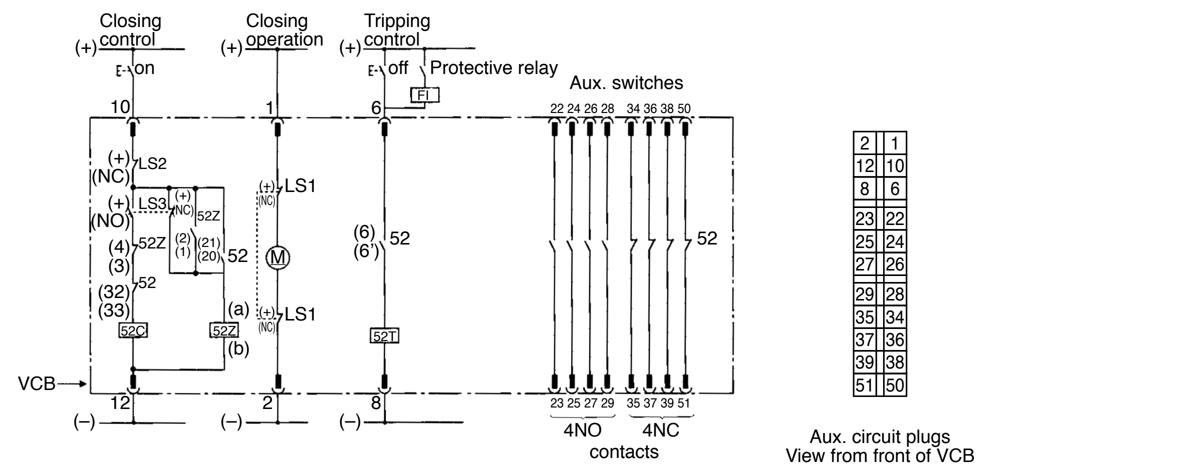
A HS2006, HS2506, HS1210-06, 12, HS1610-06, 12, HS2010-06, 12, HS2510-06, 12, HS1220, HS1620



B HS3106-E, HS4006-E, HS3110-E, HS1210-20, HS1610-20, HS2010-20, HS2510-20, HS2520-E



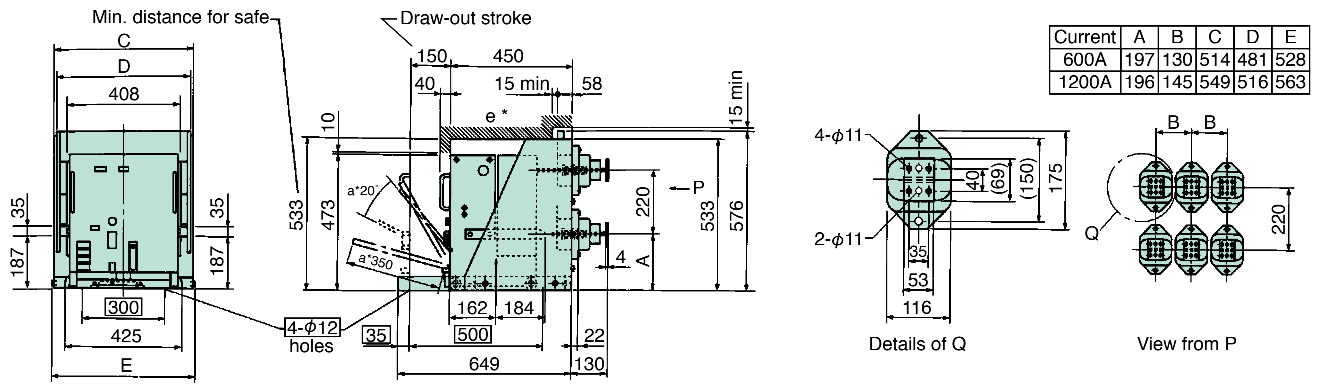
C HS4006-N, HS5006, HS3110-N, HS4010, HS5010, HS4020, HS2530



Outline Drawings [Unit: mm]

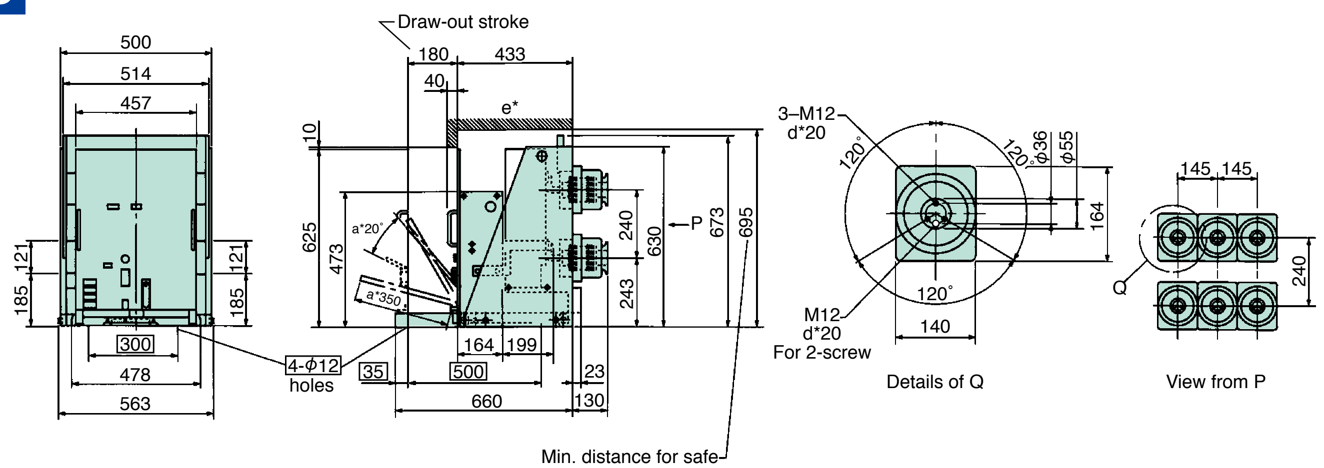
Dimensions within the lines ( ) are used for mounting

A HS2006Y··········E(600, 1200A), HS2506Y··········E(600, 1200A)

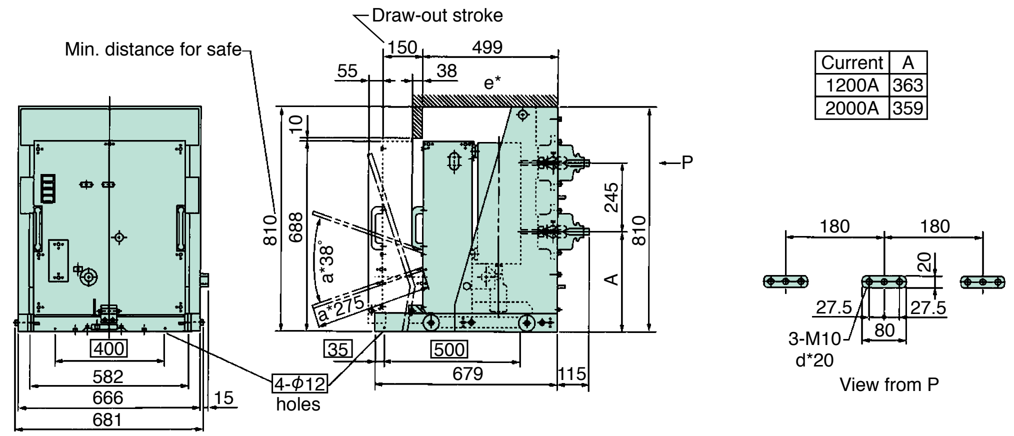


Current	A	B	C	D	E
600A	197	130	514	481	528
1200A	196	145	549	516	563

B HS2006Y··········E(2000A), HS2506Y··········E(2000A)



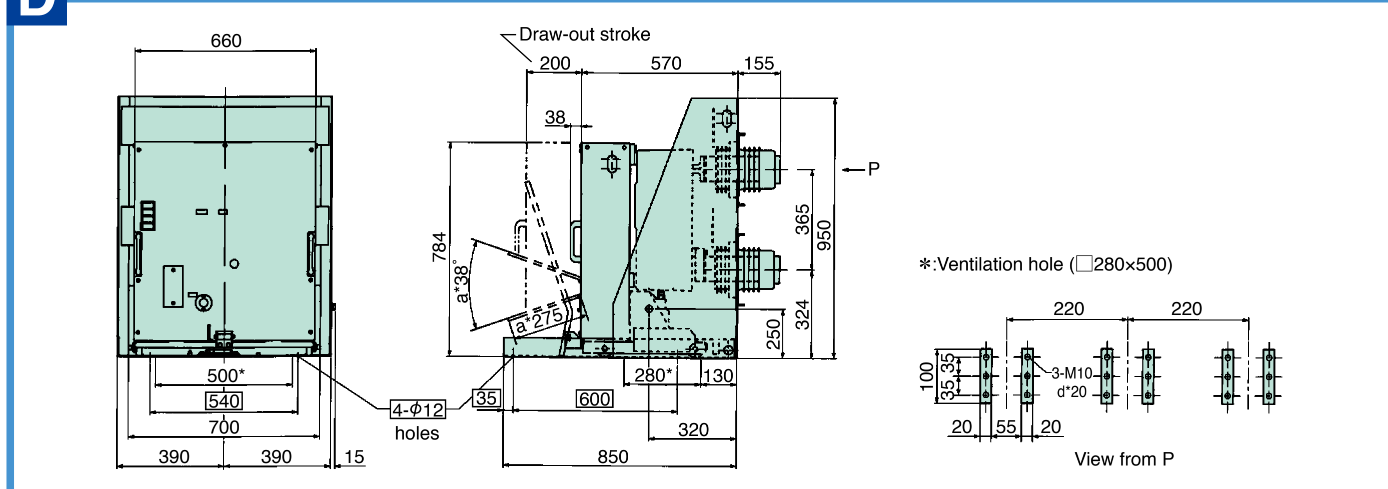
C HS3106Y(1200, 2000A), HS4006Y(1200, 2000A)



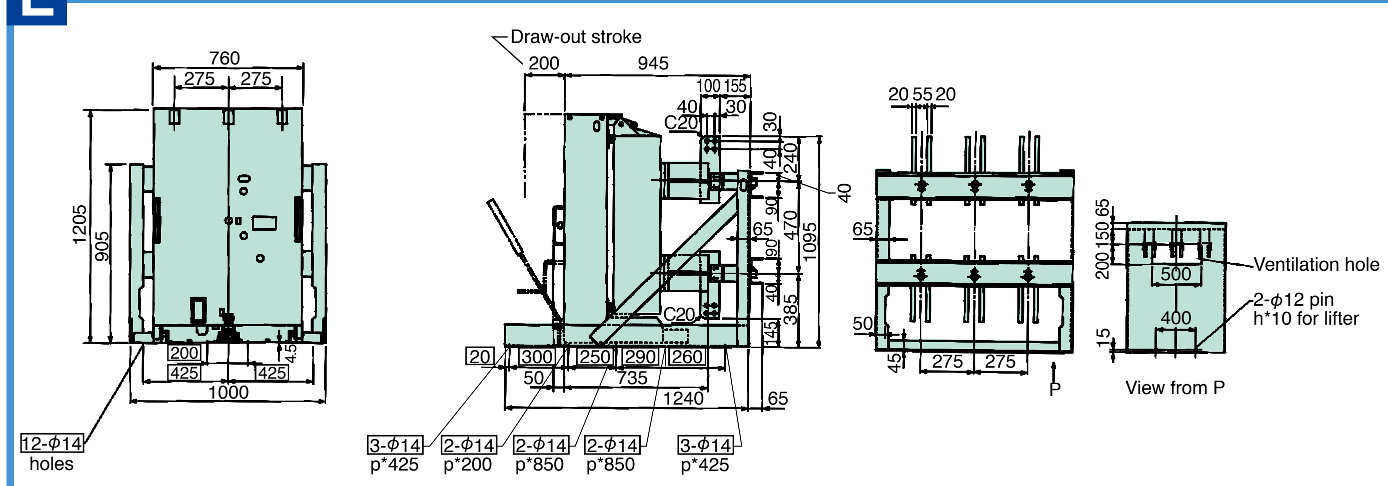
Current	A
1200A	363
2000A	359

Note* a: approx. d: depth e: elec. parts egual to earth potential h: height p: pitch

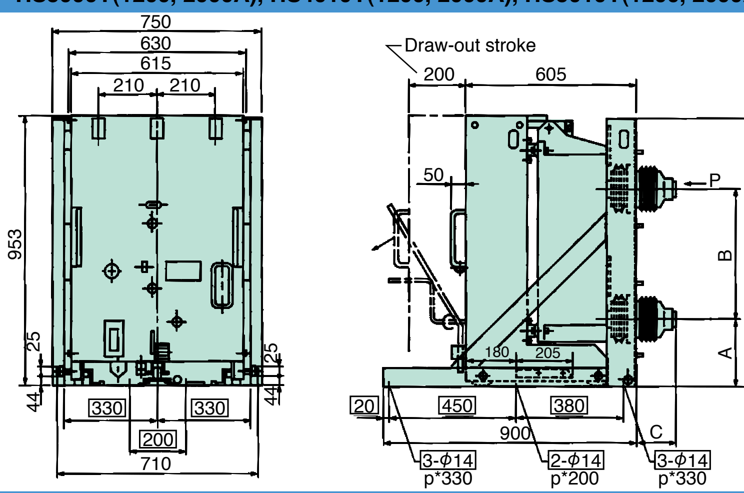
D HS3106Y(3000A), HS4006Y(3000A)



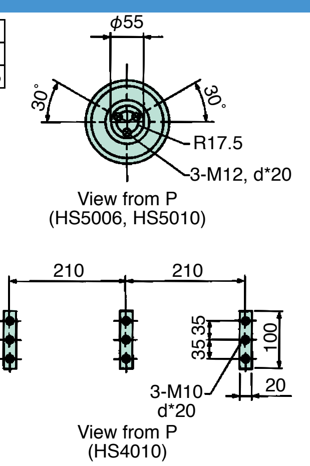
E HS4006X(4000A), HS4010X(4000A)



F HS5006Y(1200, 2000A), HS4010Y(1200, 2000A), HS5010Y(1200, 2000A)

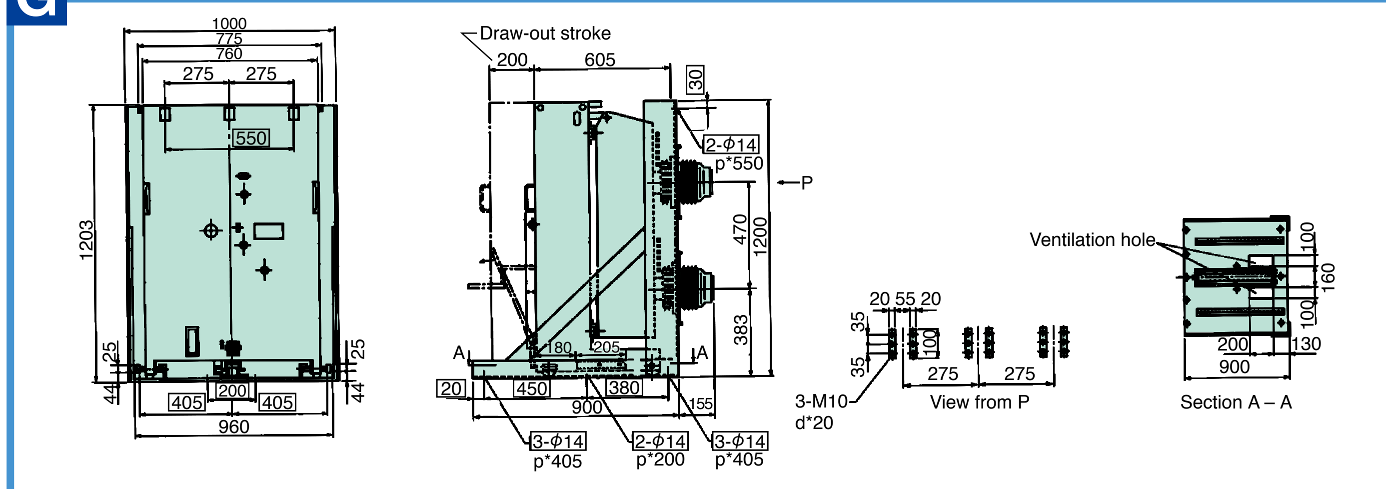


Type	A	B	C
HS5006, 5010	245	459	141
HS4010	291	413	155

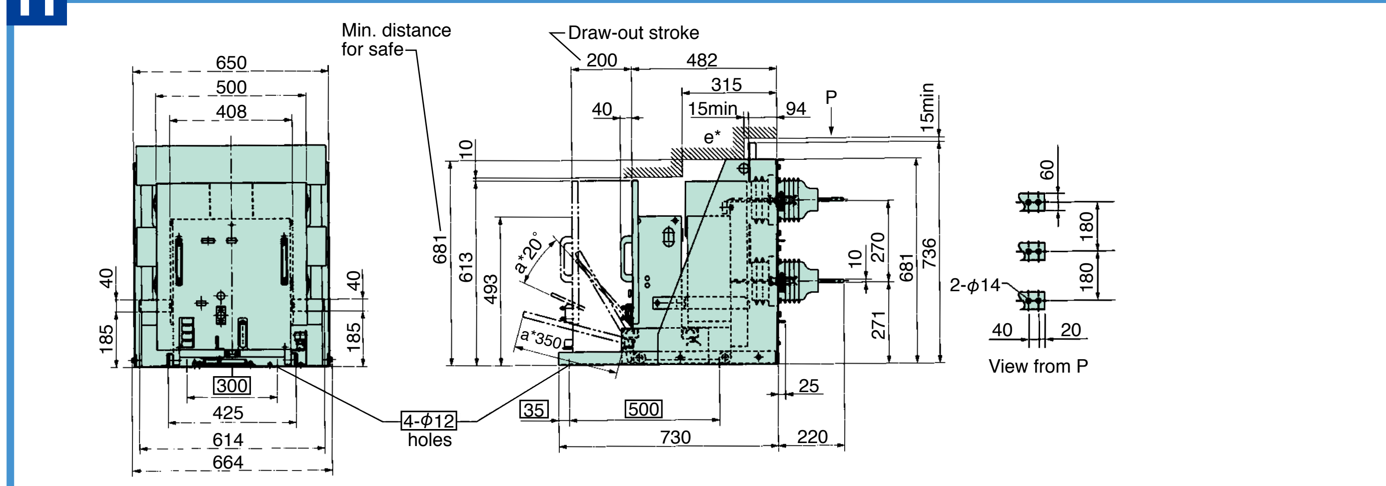


Note* a: approx. d: depth e: elec. parts egual to earth potential h: height p: pitch

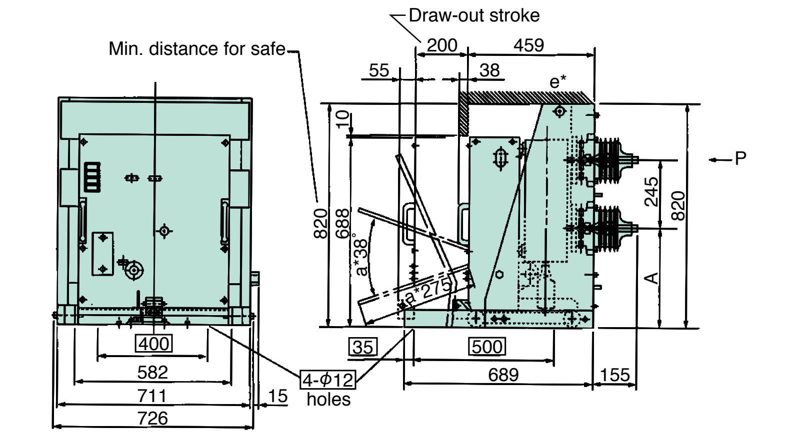
G HS5006Y(3000A), HS5010Y(3000A)



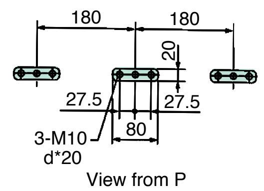
H HS1210Y(600, 1200A), HS1610Y(600, 1200A), HS2010Y(600, 1200A), HS2510Y(600, 1200A)



I HS1210Y(2000A), HS1610Y(2000A), HS2010Y(2000A), HS2510Y(2000A), HS3110Y(1200, 2000A)

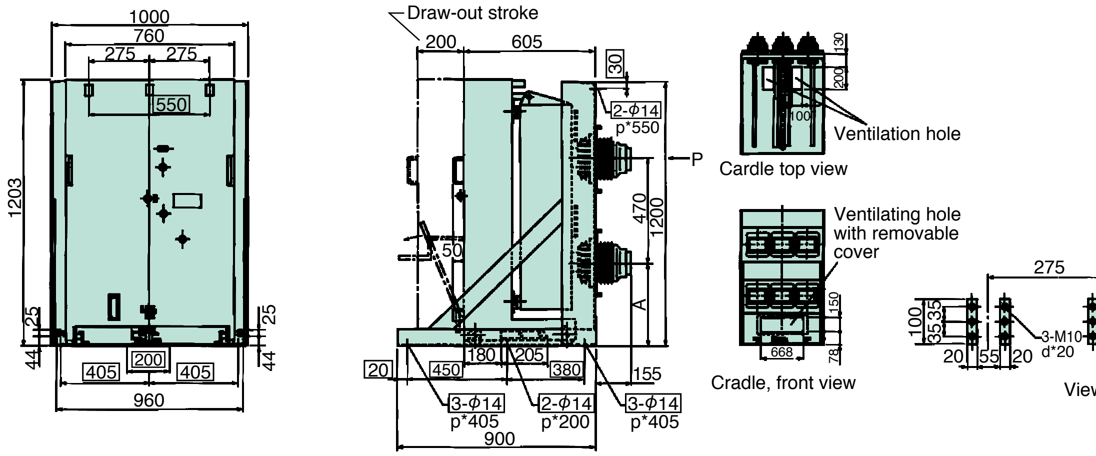


Current	A
1200A	363
2000A	359



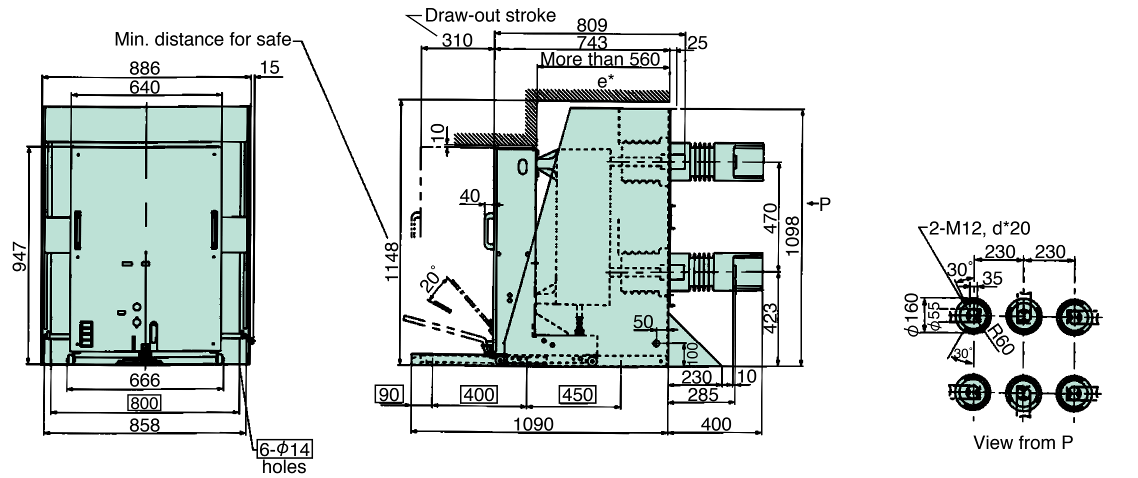
Note* a: approx. d: depth e: elec. parts egual to earth potential h: height p: pitch

J HS3110Y(3000A), HS4010Y(3000A)

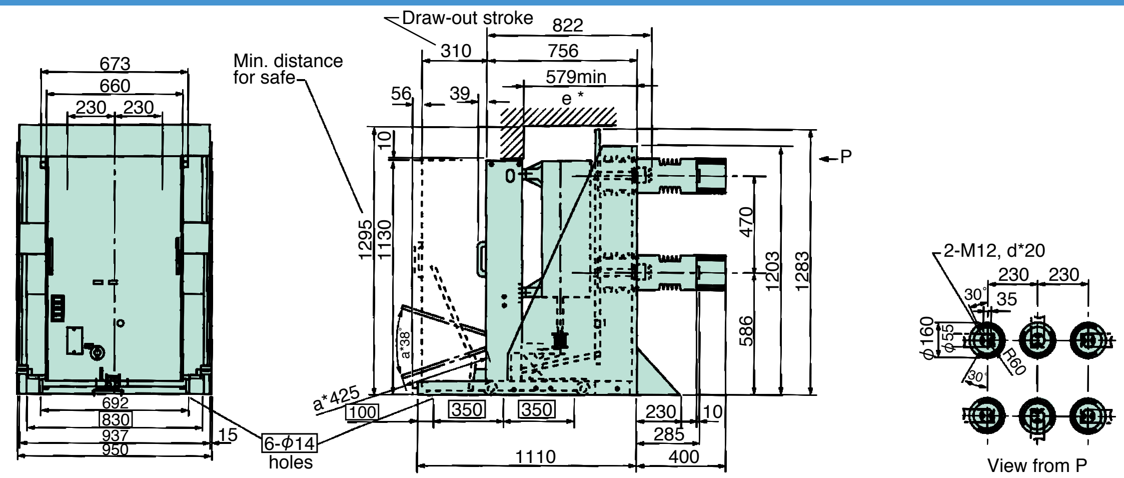


Type	A
HS3110	438
HS4010	383

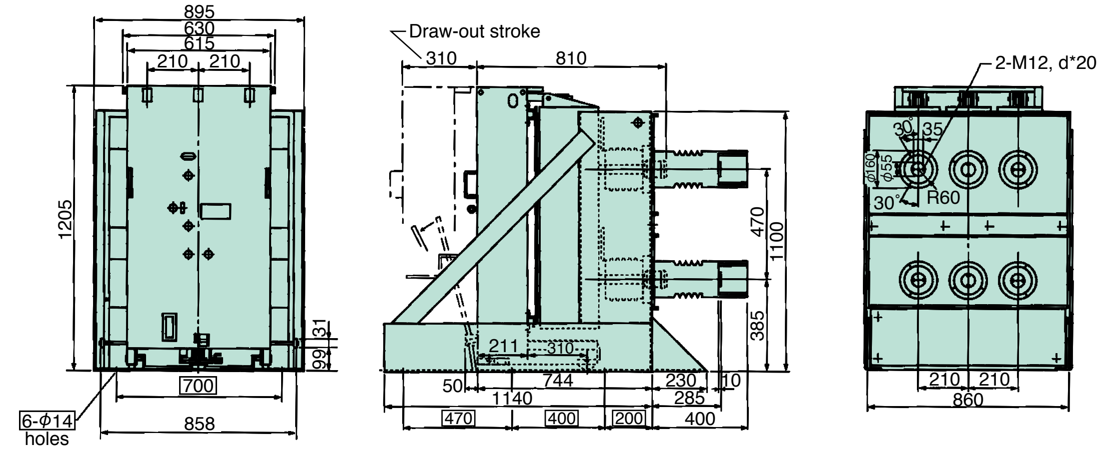
K HS1220Y(600, 1200A), HS1620Y(600, 1200A)



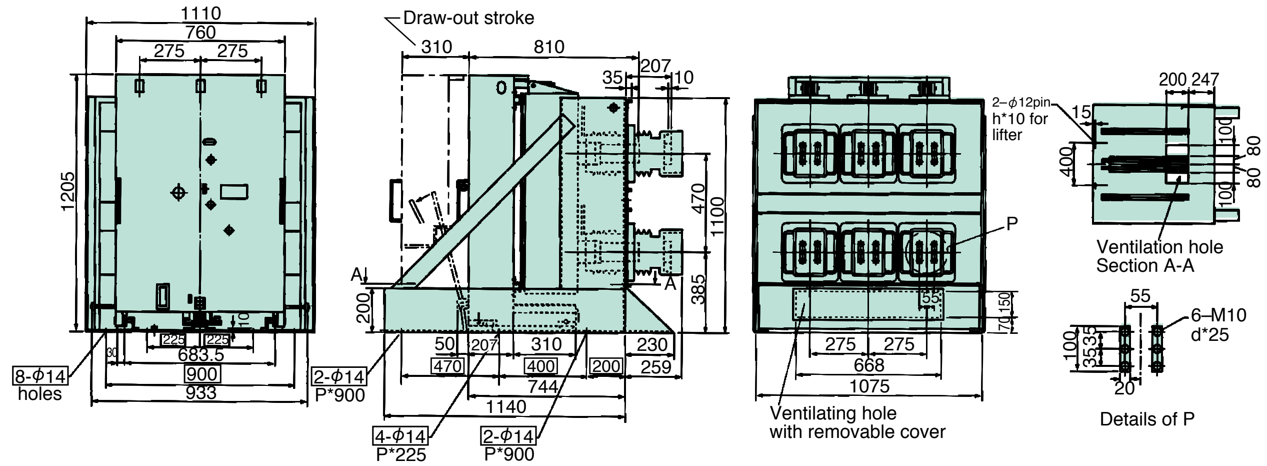
L HS2520Y··········E(600, 1200, 2000A)



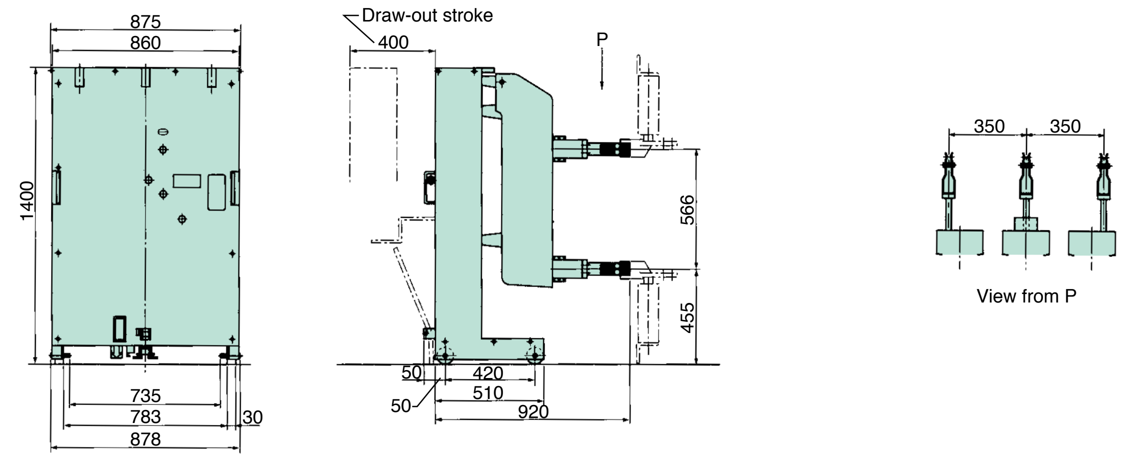
M HS4020Y(1200, 2000A)



N HS4020Y(3000A)



O HS2530M(600, 1200, 2000A)



Note* a: approx. d: depth e: elec. parts egual to earth potential h: height p: pitch

Note* a: approx. d: depth e: elec. parts egual to earth potential h: height p: pitch

Ordering Information

When your inquiring or ordering, please specify the following items.

Type designation and symbol

HS □ □ □ – □ □ f – E – □ □ □ □ □ □ □ □ □ □

① ② ③ ④ ⑤ ⑥ ⑦ ① ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰

① Basic type

- 3.6/7.2kV, 20 to 40kA : HS ······· –E
  3000A max. and
  12kV, 12.5 to 31.5kV
  2000A max.
  24kV, 16, 25kA
- 24kV, 12.5kA : HS ····· –EA
- 3.6/7.2kV, 50kA 1200/2000A : HS ····· –NA
  and
  12kV, 40, 50kA 1200/2000A
- Except for the above ratings : HS ······· –N

② Short-circuit breaking current

[kA]	12.5	16	20	25	31.5	40	50
Symbol	12	16	20	25	31	40	50

③ Voltage

[kV]	3.6/7.2	12	24	36
Symbol	06	10	20	30

④ Installation

- Fixed type : P
- Draw-out type for HS2530 : M
- Draw-out unit type for class CW : X, U
- Draw-out unit type for class MW or PW : Y

⑤ Normal current

[A]	600 630	1200 1250	2000	3000	4000
Symbol	06	12	20	30	40

⑥ Closing system

Motor-spring stored-energy (rapid auto-reclosing) : M

⑦ Tripping system

Shunt trip : f

⑧ Closing operation voltage

AC : Acceptable

⑨ Closing cotrol voltage

AC : Acceptable

⑩ Tripping control voltage

AC : Non-acceptable

DC [V]	100	110	200	220
Symbol	1	2	3	4

AC [V]	100	110	200	220	Special
Symbol	5	6	7	8	9

⑪ No. of aux. contacts

4NO, 4NC : 1
Special (6NO, 6NC) : 2
Ditto (9NO, 9NC) : 3

⑫ Aux. plug-in interlcok

Without : A1
Special (with) : A2

⑬ Applicable standards

JEC, Japanese : B1
IEC, English : B2
Special (JEC, English) : B3

⑭ Frequency

50/60Hz : C1
Special (50Hz) : C2
Ditto (60Hz) : C3

⑮ Environmental ambient condition

Basic : D1
Special (to tropical area) : D2

⑯ Limit switch for indication of service and isolating positions

Without provision : F1
Special (1 SPDT in each) : F2
Ditto (2 SPDT in each) : F4

⑰ Limit switch for closing spring charged indication

Without provision : G01
Special (with) : G15

Application Guide of Surge Absorber

The high surge voltage by the VCB that injures the insulation of the machines and apparatus is generated under certain specific conditions. The necesstiy of surge protection depends on the dielectric strength of the device used as a load.
The application guide given below is based on the results of switching surge tests. When the dielectric strength of the device is low, use of a surge absorber is recommended.

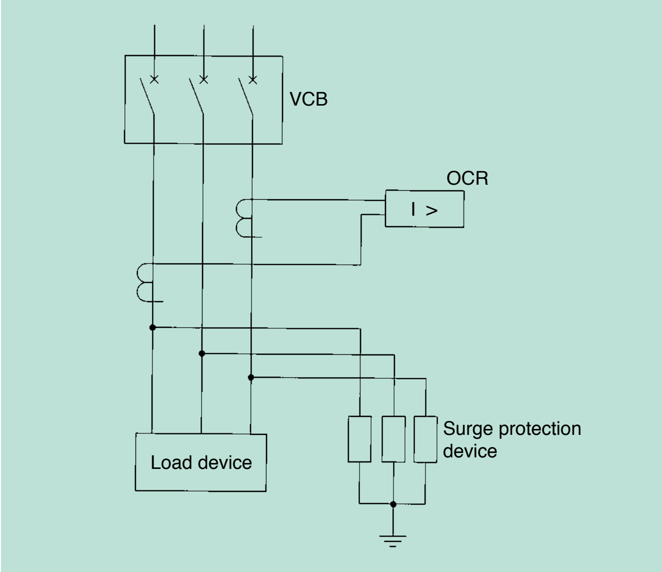
Surge absorber application guide

Load \ Voltage	3.3kV	6.6kV	11kV	22kV
Rotating machine	● C-R suppressor	● C-R suppressor	● C-R suppressor	● *4
Molded transformer *1	– *2, *3 (BIL≧45kV)	– *2, *3 (BIL≧60kV)	● *3 C-R suppressor or gapless arrester (BIL≧55kV)	● *3 Gapless arrester (BIL≧95kV)
Oil-immersed transformer *1	– *2, *3 (BIL≧45kV)	– *2, *3 (BIL≧60kV)	– *2, *3 (BIL≧90kV)	– *2, *3 (BIL≧150kV)
Dry-type transformer *1	● *3 C-R suppressor (BIL≧25kV)	● *3 C-R suppressor (BIL≧35kV)	● *3 C-R suppressor or gapless arrester (BIL≧55kV)	● *3 Gapless arrester (BIL≧95kV)

Notes: ●: Protection device is required.
–: Protection device is not required.
*1 When apply the gapless arrestor, the withstand voltages (impulse) of transformer must exceed the values listed above.
*2 When interrupting a magnetizing inrush current, it is recommended that a protection device be used.
A standard lightning arrester is sufficient.
*3 Semiconductor device must be provided with suitable protection devices when a semiconductor is installed on the load side of transformer, since a surge on the low voltage side will also cause a voltage appear on the load side, depending on the turns ratio.
*4 Contact Fuji for further information.

Connection of surge absorber

The surge absorber should be connected between the VCB and its load (device) as shown ; connect each phase betwwen the power line and the earth.



When using a C-R suppressor, it may be necessary to use a directional relay as a ground fault protection relay. Note that the C-R suppressor may be damaged due to higher harmonics.

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