



Susol
Super Solution

Air Circuit Breakers





Susol

Super Solution

Premium Susol ACB meets your demands for high breaking capacity, fully line-up, and optimized panel size. Various accessories and connection methods realize user-friendly handling.

Susol ACB provides you with total solutions with an advanced trip relay for measurement, diagnosis, analysis, and communication as well as protective functions for absolute protective coordination and electric power monitoring system.

Contents

• Overview	4
• External configuration	14
• Internal configuration	16
• Ordering	18
• Ratings	22
• Trip relays	24
• Accessories	50
• Electrical diagram	76
• Dimensions	78



**UL Listed/ANSI Certified
Susol UA Circuit Breakers**

LSIS *SuperSolution* series



- **Modular design**
- **High (130kA)**
- **Breaking Capacity Full Line-up to 5000A**
- **Satisfy the needs for a compact sized panels**
- **N-Phase conducting capacity 100%**
- **Interchangeable Trip unit and Rating plug**

Safety

Monitor temperatures for safety (Optional)

- Careful selection of materials
- Arc space is zero
- Perform discriminations between upstream and downstream levels

User convenience

various connection type for main circuit terminals

- Easy installation of accessories
- Interchangeable Trip unit and Rating plug

Intelligent Trip relay

Various and advanced functions
protection, measurement, diagnosis, analysis, communication



*Susol Manual
Motor Starters*

**UL 1066
ANSI C37.13**



Susol Air Circuit Breakers



Susol Molded Circuit Breakers



*Susol Magnetic Contactors &
Overload Relays*



Full line-up & Compact

Up to 5000A, Susol ACB provides fully lined-up 3 frame.

For each frame, there is just one size, which is smaller and more compact.

It makes it possible for you to design the optimized volume panel.

800~1600AF

800~3200AF



H = 430mm

W = 334mm

W = 412mm

85kA

100kA

UAS-08/16D

08	800AF
16	1600AF

85kA at 508Vac

W=334(3p), 419(4p)mm

UAH-08~32E

08	800AF
16	1600AF
20	2000AF
25	2500AF
32	3200AF

100kA at 508Vac

W=412(3p), 527(4p)mm

3200~5000AF



130kA

- The high breaking capacity:
85/100/130kA (at 508Vac)
- 3 ampere frame sizes:
1600/3200/5000AF
- N phase current conducting capacity: 100%

UAH- 32~50G

32	3200AF
40	4000AF
50	5000AF

130kA at 508Vac
W=785(3p), 1015(4p)mm

Trip Relay (OCR)

Trip relays are classified according to function.

Trip relays are classified according to their usages and functions to maximize customers' satisfaction. Classified trip relays and easy installation.

- Protection: overload, short current, ground fault, earth leakage, under voltage, over voltage, under frequency, over frequency, reverse power, unbalance, etc
- Measurement: voltage, ampere, power, energy, frequency, power factor, Harmonics, etc.
- Event & fault recording: Max. 256 events & faults
- Communication: Modbus/RS-485, Profibus-DP



Susol ACB Trip Relay functioning world-best protection can be interlocked with mechanism. It makes the breaking capacity of ACB improved and ACB's life enhanced, and provides advanced functions - measurement, diagnosis, analysis, and communication.

Susol ACB Trip relay

N type



A type



P/S type



- L/S/I/G/Thermal
- Self Power
- RTC Timer mounted
- Fault information (LED)

- L/S/I/G/Thermal
- ZSI
- Remote Reset
- Modbus/RS-485
- Profibus-DP
- Self Power
- AC/DC 100~250V
- DC 24~60V
- RTC Timer mounted
- Fault Recording (10EA)

- L/S/ I/G/Thermal(Continuous)
- UV/OV/OF/UF/rP/Vun/Iun
- Measurement: V/A/W/Wh/F/PF
- Harmonics (63th), Waveform (S Type)
- ZSI
- Remote Reset
- Modbus/RS-485
- Profibus-DP
- AC/DC 100~250V
- DC 24~60V
- RTC Timer mounted
- Event Recording (256EA)
- Fault Recording (256EA)
- Fault Wave (S Type)

Trip relays series



N Type (Normal)

- Self-power + Current protection



A Type (Ammeter)

- Current Meter + Current protection + DO control + Communication



P Type (Power Meter)

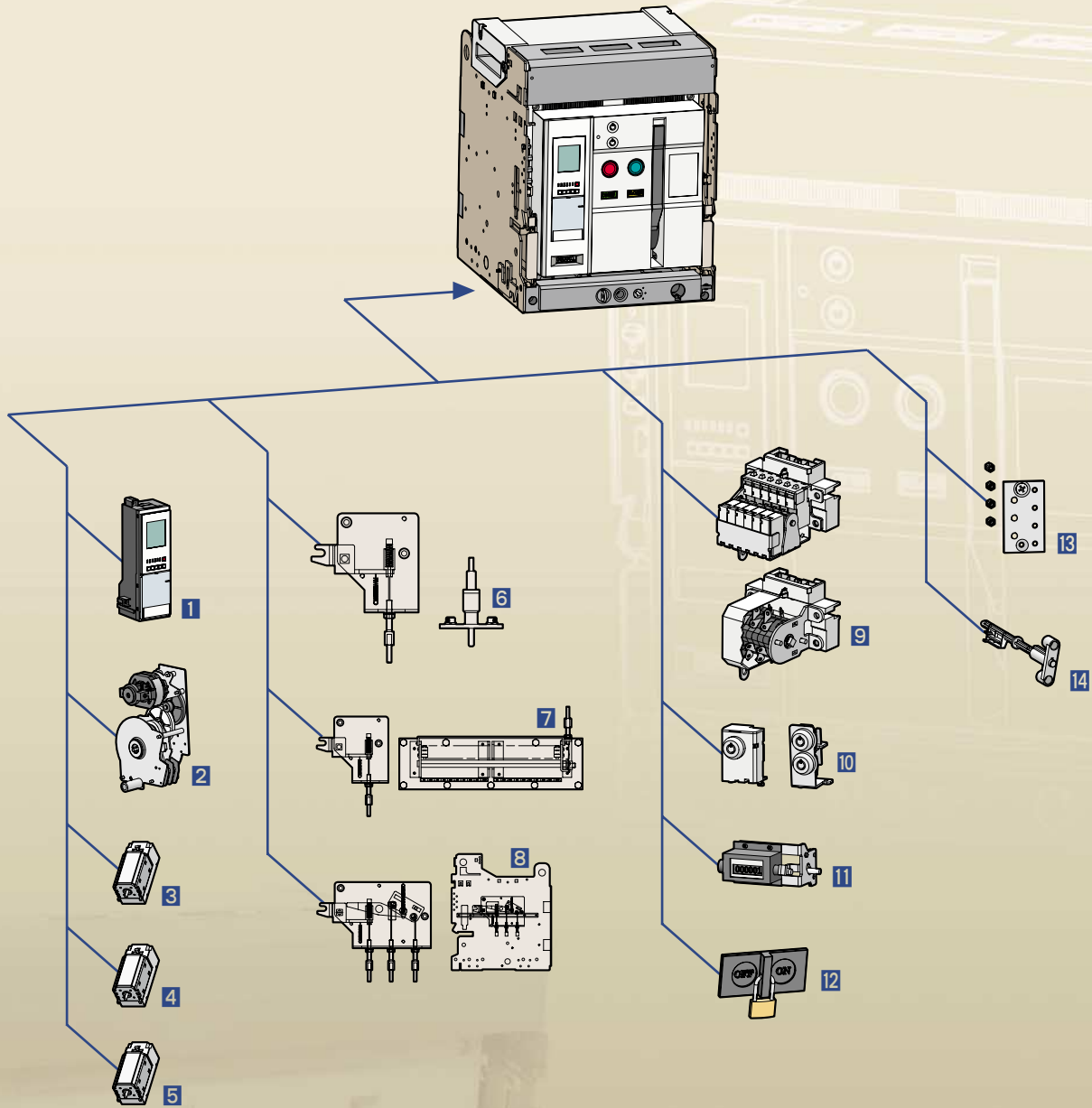
- A type + Power Meter + Voltage / Frequency / Unbalance protection



S Type (Supreme)

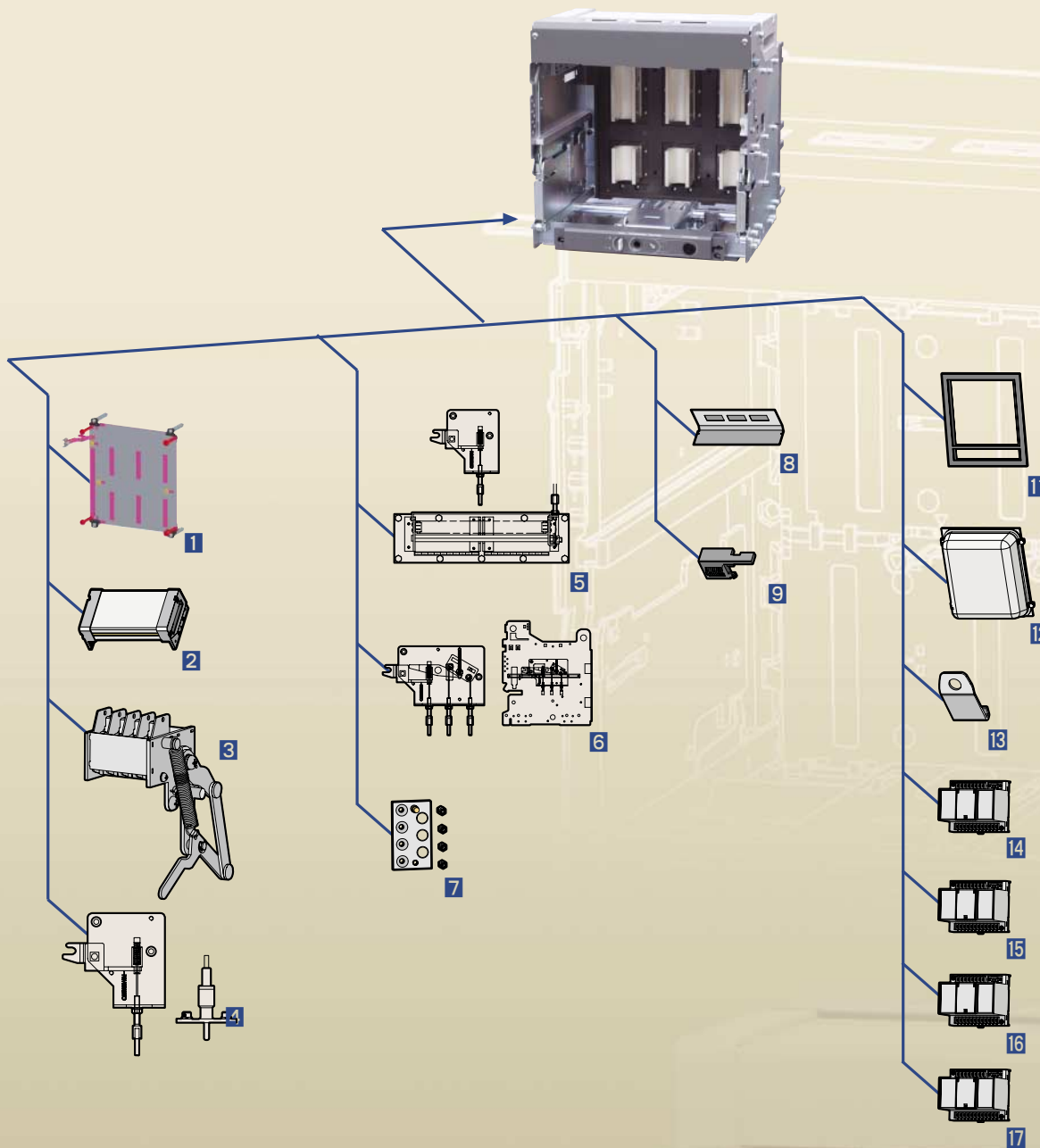
- P type + Harmonics analysis (63 th) + Fault wave recording

Accessories



ACB

- | | |
|---|--|
| 1 Trip Relay (OCR) | 9 Auxiliary Switch (AX) |
| 2 Motor (M) | 10 Key Lock (K1),
Double Key Lock (K3) |
| 3 Closing Coil (CC) | 11 Counter (C) |
| 4 Shunt Coil (SHT) | 12 On/Off Button Lock (B) |
| 5 Under Voltage Trip Device (UVT) | 13 Miss Insertion Preventing Device (MIP) |
| 6 Door Interlock (DI) | 14 Manual Reset Button (MRB) |
| 7 MOC (Mechanically
Operated Cell Switch) | |
| 8 Mechanical Interlock (MI) | |



Cradle

- 1** Safety Shutter (ST)
- 2** Zero Arc Space (ZAS)
- 3** Cell Switch (CEL)
- 4** Door Interlock (DI)
- 5** MOC (Mechanical Operated Cell switch)
- 6** Mechanical Interlock (MI)
- 7** Miss Insertion Prevent Device (MIP)
- 8** Safety Control Cover (SC)
- 9** Racking Interlock (RI)

Other

- 10** Door Frame (DF)
- 11** Dust Cover (DC)
- 12** Lifting Hook (LH)
- 13** UVT Time Delay Controller (JDC)
- 14** Profibus-DP Communication module
- 15** Remote I/O
- 16** Temperature Alarm

Connection and Installation



Diversified terminal connection methods of the ACB main circuit for users.

Multiple connections

Various installation methods

Standard connection



Horizontal type



Vertical type



Front type

Mixed connection



Horizontal / Vertical type



Vertical / Horizontal type



Horizontal / Front type



Vertical / Front type



Front / Horizontal type



Front / Vertical type

- Front connection type is available to be connected regardless of the depth of main circuit terminal, and it is suited for the panel required for limited installation space.
- The vertical and horizontal type terminal are module types which can easily compose the vertical and horizontal terminals by rotating 90°

• Please refer to the rating lists (Page 22~25) because the installation method is various according to the rated current.

External configuration

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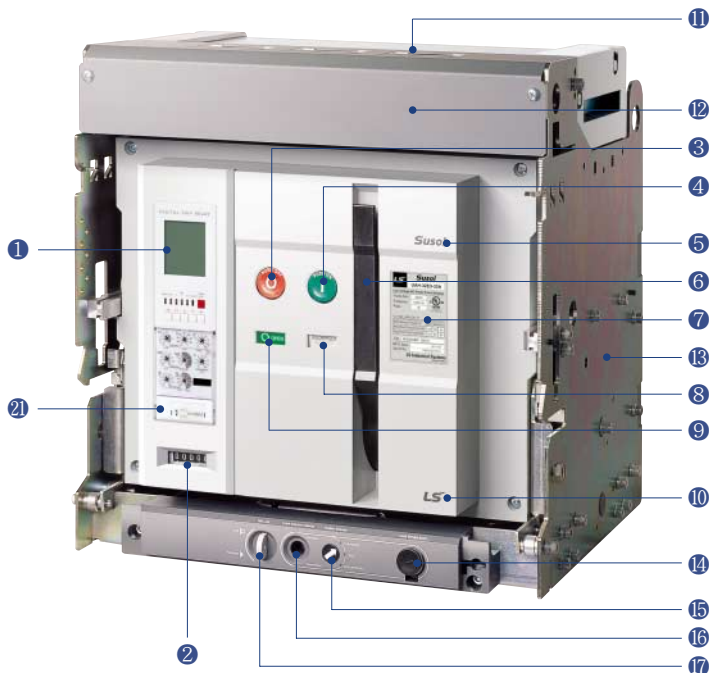
Fixed type ACB



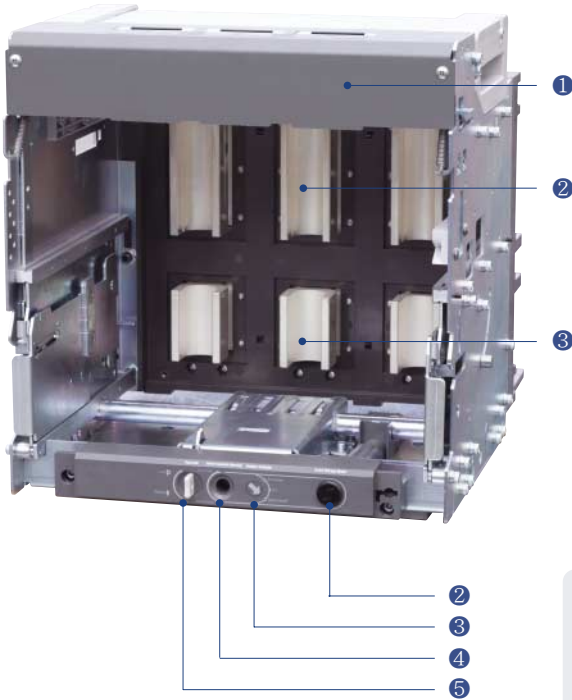
Terms

- ① Trip relay
- ② Counter
- ③ ON button
- ④ OFF button
- ⑤ Series name
- ⑥ Charge handle
- ⑦ Rated name plate
- ⑧ Charge/Discharge indicator
- ⑨ ON/OFF indicator
- ⑩ Corporation logo
- ⑪ Arc cover
- ⑫ Terminal cover
- ⑬ Cradle
- ⑭ Draw-out handle
- ⑮ Position indicator
- ⑯ Handle storage space
- ⑰ Pad lock button
- ⑱ Arc chute
- ⑲ Control cover
- ⑳ Fixed type bracket
- ㉑ Rating plug

Draw-out ACB (Cradle)



Cradle (Internal)



Cradle (Rear)



Terms

- ① Terminal cover of control circuit
- ② Draw-out handle
- ③ Position indicator
- ④ Handle storage space
- ⑤ Pad lock button
- ⑥ Connecting conductor (Line side)
- ⑦ Connecting conductor (Load side)

Main nameplate

[Acronym explanation]

Low Voltage AC Power Circuit Breaker

Frame Size :

Poles :

Frequency : 50/60 Hz

UL 1066 / ANSI C37.13

Rated Maximum Voltage (V)	254	508	635
Rated Short Circuit Current (kA)			
Rated Short Time Current (kA)			

Cat.

MFG. Date :

Serial No. :

LS Industrial Systems
MADE IN KOREA

[Secondary nameplate]

ACCESSORIES

Motor charge	<input type="checkbox"/>
Closing coil	<input type="checkbox"/>
Shunt tripping coil	<input type="checkbox"/>
Auxiliary switches	<input type="checkbox"/>
	<input type="checkbox"/>
OCR Control source	<input type="checkbox"/>
Alarm switch	<input type="checkbox"/>
Digital Trip Relay(OCR)	<input type="checkbox"/>
	<input type="checkbox"/>
Alarm(LSIG) Reset	<input type="checkbox"/>
Zone Selective Interlocking	<input type="checkbox"/>
Communication	<input type="checkbox"/>
Earth/Leakage	<input type="checkbox"/>
	<input type="checkbox"/>
Temperature sensor	<input type="checkbox"/>

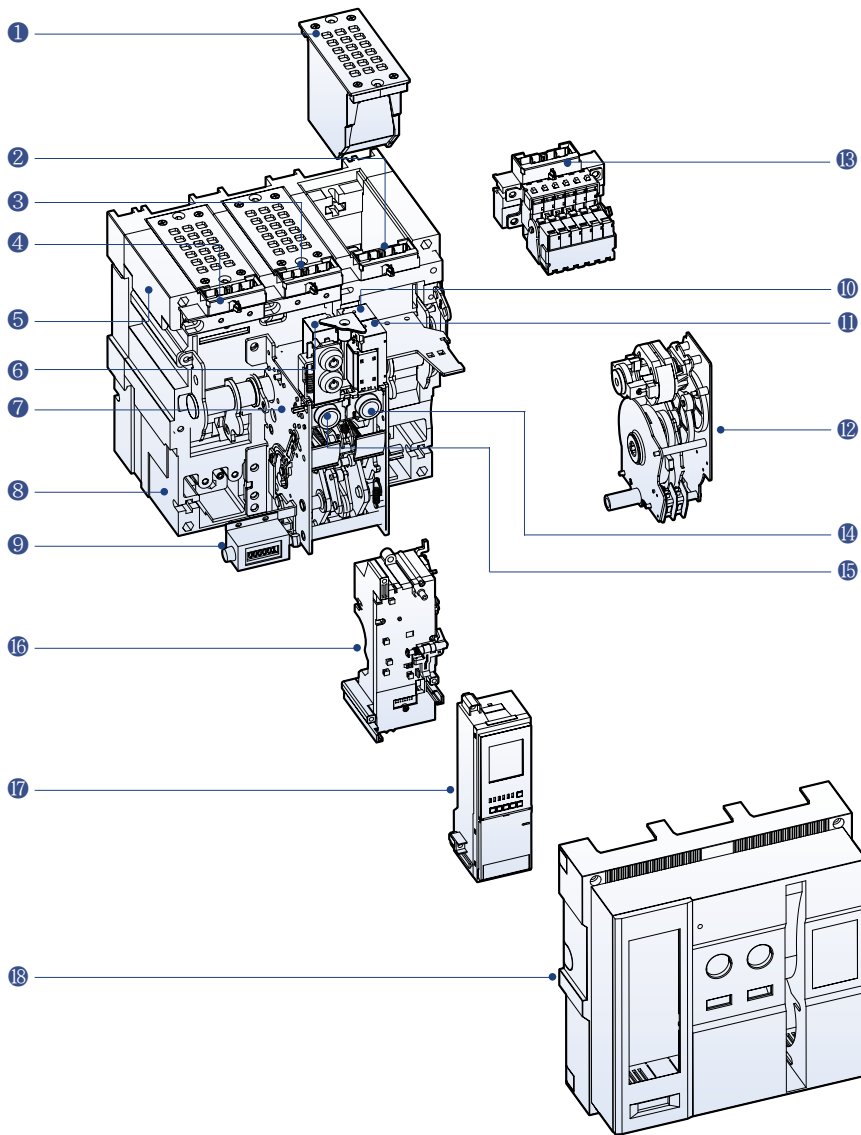
Available Adaptor
Not For Use As Service Equipment
Instruction manual 79563466001

Explanation of terminologies

- Motor charge Control power and terminal No.
- Closing coil
- Shunt tripping coil
- Auxiliary switches: Contact specification and terminal No.
- Under voltage trip: UVT terminal No.
- OCR control source: Trip relay control power
- Alarm switch: Alarm and terminal No.
- Digital trip relay: Switching diagram
- Z.S.I: Input/Output terminal No.
- Reset: LED/LCD reset
- Communication: Communication and terminal No.
- Voltage module: Phase voltage and symbol
- Earth/Leakage: Ground fault / Earth leakage input terminal No.

Internal configuration

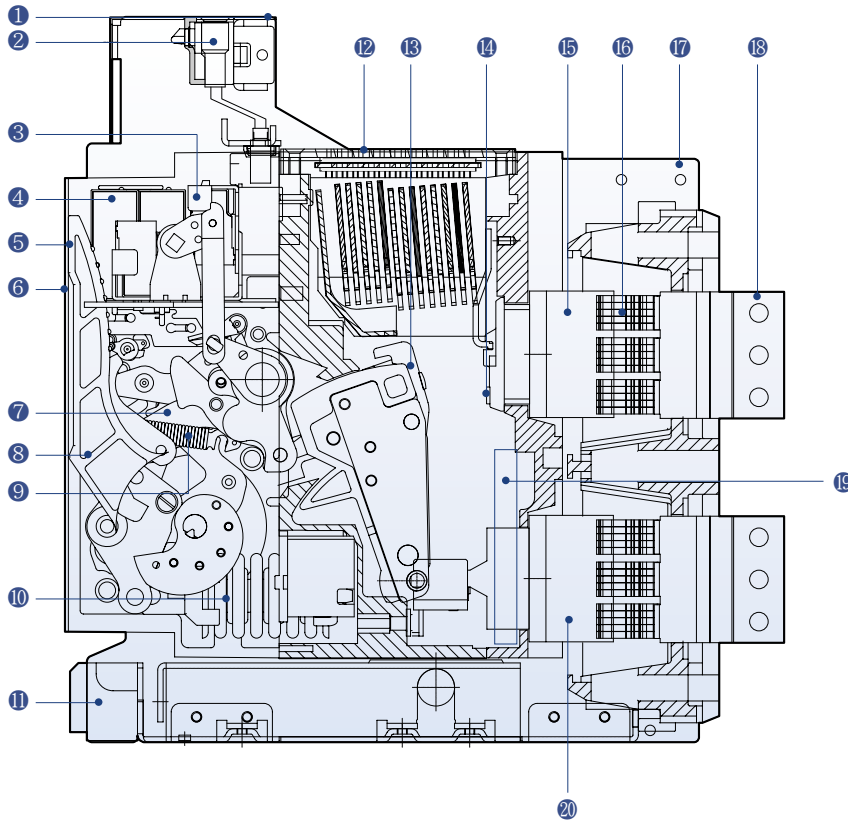
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Terms

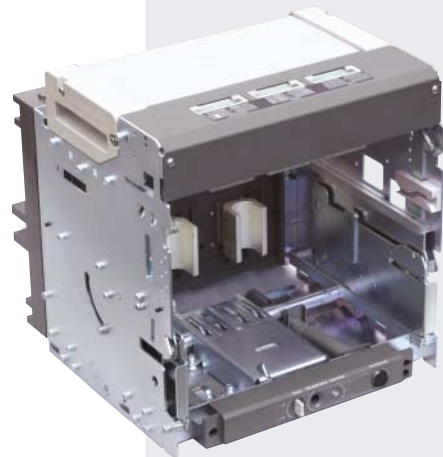
- ① Arc chute
- ② Aux. switch control terminal
- ③ Control power supply terminal
- ④ Trip relay control terminal
- ⑤ Carrying grip
- ⑥ Trip coil or UVT coil
- ⑦ Mechanism
- ⑧ Main body
- ⑨ Counter
- ⑩ Shunt coil
- ⑪ Closing coil
- ⑫ Motor Ass'y
- ⑬ Aux. switch
- ⑭ Closed button
- ⑮ Open button
- ⑯ MTD base
- ⑰ Trip relay
- ⑱ Front cover





Terms

- ① Control circuit terminal block
- ② Control terminal
- ③ Auxiliary switches
- ④ Closing, Shunt, UVT coil
- ⑤ Trip relay
- ⑥ Front cover
- ⑦ Mechanism
- ⑧ Charge handle
- ⑨ Trip spring
- ⑩ Closing spring
- ⑪ Draw-in/out device
- ⑫ Arc extinguishing part
- ⑬ Moving contact
- ⑭ Fixed contact
- ⑮ Conductor on line side
- ⑯ Cradle finger
- ⑰ Cradle
- ⑱ Connecting conductor
- ⑲ Power supply CT
- ⑳ Conductor on load side



Ordering

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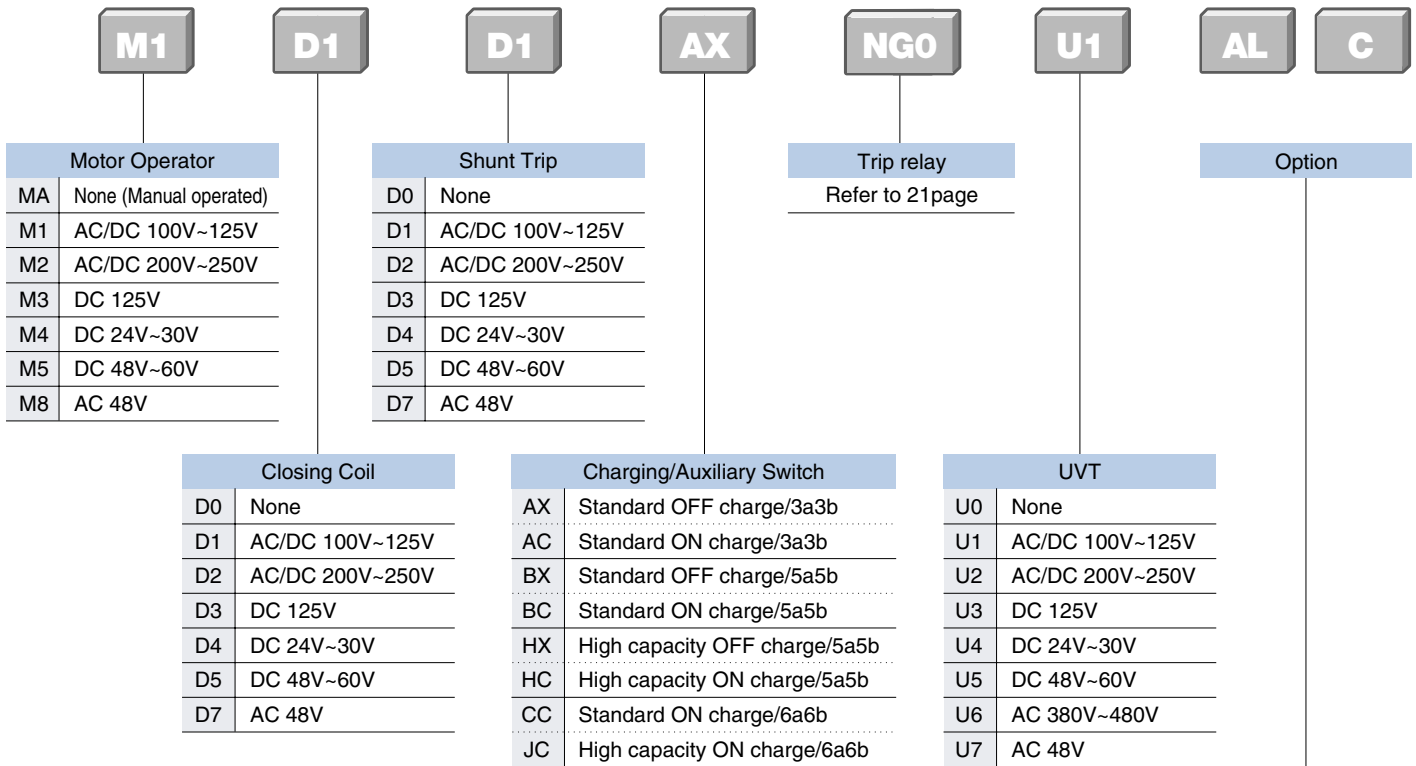
Breaker and Accessories

UAS	—	10	D	3	—	10	A
Frame Type	Frame Size	Phasing	Poles	Sensor Rating	Mounting and Terminal		
	08 800AF 16 1600AF	D 3/4P Standard RST(N) W 4P Reversed NRST	3 3P 4 4P	04~08 400A~800A 08~16 800A~1600A	Mounting		
					A Drawout		
					Fixed		
					H	Horizontal terminals	
					V	Vertical terminals	
					M	Horizontal for line	
						Vertical for load	
					N	Vertical for line	
						Horizontal for load	
					P	Front terminal	
					G	Horizontal-con type	
					W	Vertical-con type	

* Terminals for P type must be ordered separately
* G and W types can be applicable to UAS-08D, UAS-16D only

UAH	—	32	E	3	—	32
Frame Type	Frame Size	Phasing	Poles	Sensor Rating		
	08 800AF 16 1600AF 20 2000AF 25 2500AF 32 3200AF	E 3/4P Standard RST(N) X 4P Reversed NRST	3 3P 4 4P	04~08 400A~800A 08~16 800A~1600A 10~20 1000A~2000A 12~25 1200A~2500A 16~32 1600A~3200A		
	32 3200AF 40 4000AF 50 5000AF	G 3/4P Standard RST(N) Z 4P Reversed NRST	3 3P 4 4P	16~32 1600A~3200A 20~40 2000A~4000A 25~50 2500A~5000A		

UAA	—	16	D	3	—	00
Frame Type	Frame Size	Phasing	Poles	Sensor Rating		
	08 800AF 16 1600AF 20 2000AF 25 2500AF 32 3200AF 40 4000AF 50 5000AF	D 3/4P Standard RST(N) W 4P Reversed NRST E 3/4P Standard RST(N) X 4P Reversed NRST G 3/4P Standard RST(N) Z 4P Reversed NRST	3 3P 4 4P	Not applied		



Code	Description	Code	Description	
AL	AL1+MRB	M	MI Mechanical interlock	
A1	AL1+MRB +RES(AC110~130V) *AC only	D	DI or MOC Door Interlock or MOC(Mechanism operated cell switch)	
A2	AL1+AL2 +MRB	K	K1 Key Lock	
A3	AL1+MRB +RES(DC110~125V) *DC only	K2	K2 Key Interlock Set	
A4	AL1+MRB +RES(AC200~250V) *AC only	K3	K3 Key Interlock Double	
A5	AL1+MRB +Auto Reset	R	RCS Ready to Close switch	
A6	AL1+AL2 +MRB +Auto Reset	T	TM Temperature Monitoring	
A7	AL1+MRB +RES(DC110~125V) +Auto Reset *DC only	H1	SHT2 Note 2) AC/DC 100V ~125V, Double Shunt coil	
A8	AL1+MRB +RES(AC200~250V) +Auto Reset *AC only	H2		AC/DC 200V ~250V, Double Shunt coil
A9	AL1+MRB +RES(AC110~130V) +Auto Reset *AC only	H3		DC 125V, Double Shunt coil
C	C COUNTER	H4		DC 24V ~30V, Double Shunt coil
S	CS2 Charge switch communication	H5		DC 48V ~60V, Double Shunt coil
B	B On/Off Button lock	H7		AC 48V, Double Shunt coil

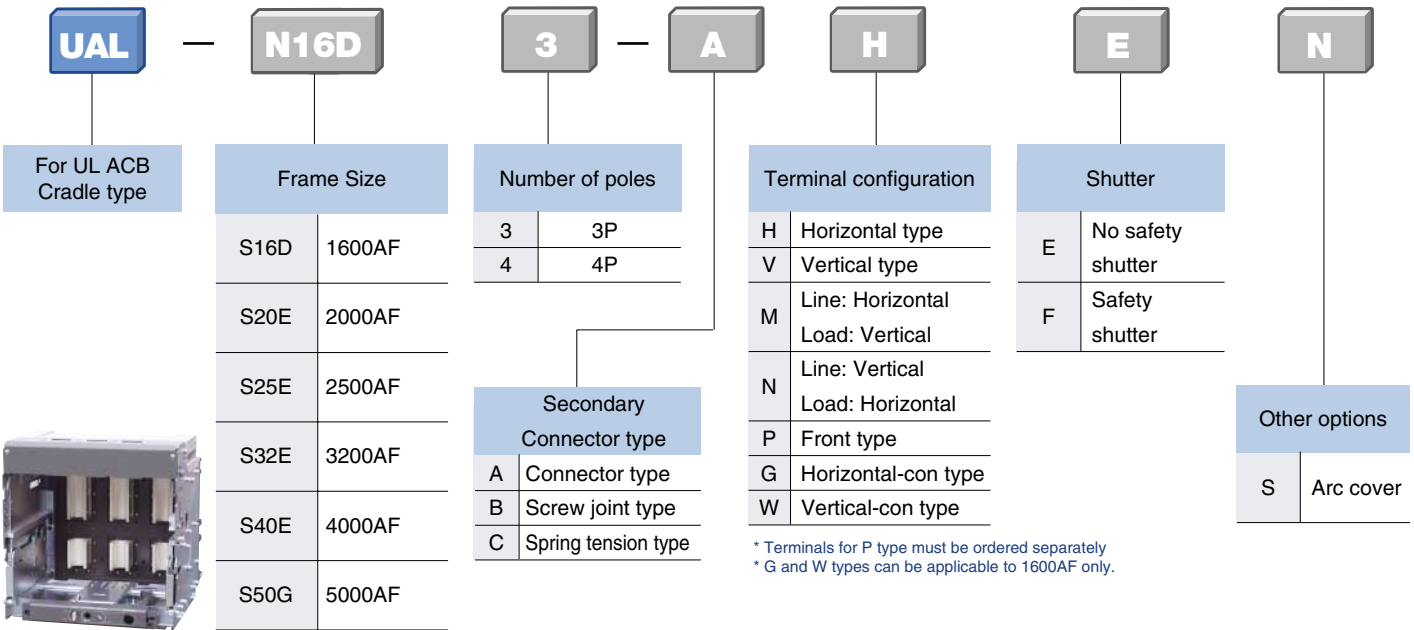
N01	A4 (AL1+MRB +RES(AC200~250V))+C(Counter)+B(ON/OFF Button Lock)+K(Key Lock)+R(Ready to Close switch)+M(Mechanic Interlock)+E(Spring Auto Release)
N02	AL (AL1+MRB)+K(Key Lock(OFF Lock))+R(Ready to Close switch)+D(Door Interlock or MOC)+H1(AC/DC 100V ~ 130V, Double Shunt coil)+E(Spring Auto Release)
N03	C(Counter)+B(ON/OFF Button Lock)+K2(Key Interlock Set)+R(Ready to Close switch)+T(Temperature Monitoring)
N04	A4(AL1+MRB+RES(AC200~250V))+B(ON/OFF Button Lock)+K(Key Lock(OFF Lock))+M(Mechanical Interlock)+T(Temperature Monitoring)
N05	A1(AL1+MRB+RES110~130V)+B(ON/OFF Button Lock)+K(Key Lock(OFF Lock))+R(Ready to Close switch)+M(Mechanical Interlock)+T(Temperature Monitoring)
N06	A2(AL1+AL2+MRB)+C(Counter)+K(Key Lock(OFF Lock))+R(Ready to Close switch)+T(Temperature Monitoring)

Note) * Codes for over 5 optional accessories are composed separately
 **UVT and SHT2 can not be selected together. Select one of two.

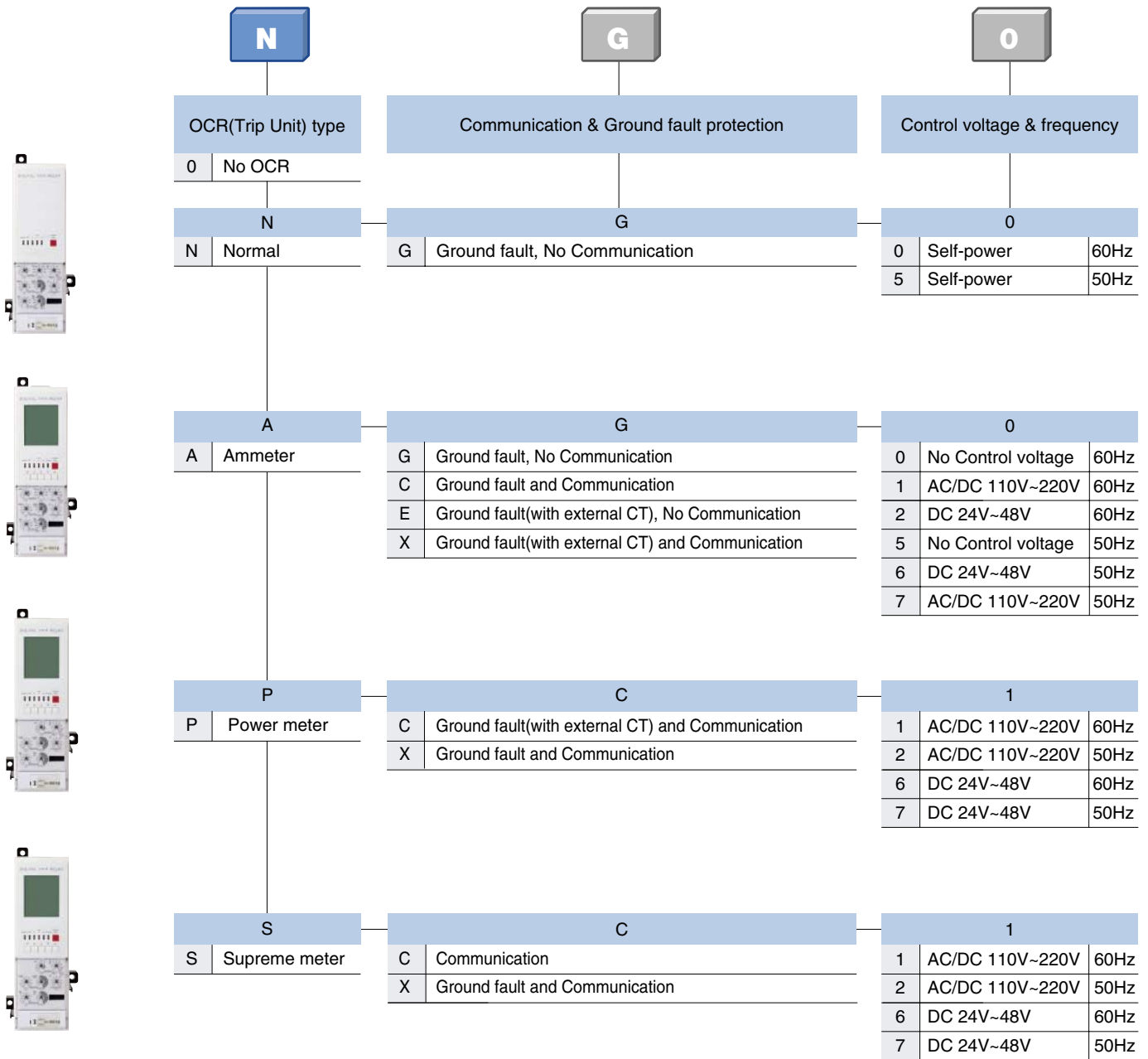
Ordering

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Product number structure



Trip relay



* Ground fault detection by internal CT Vector Sum

* In case of no control power supply communication and output contacts for L,S,I,G do not work except OCR LED

* P and S types require Voltage Module to be ordered separately.

Ratings for UL Listed/ANSI Certified Susol UA Circuit Breakers

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		TYPE				
		AF				
Rated current (In max)	(A)			at 40°C		
Rated current	(A)			at 40°C		
Rated Maximum Voltage	(V)					
Frequency	(Hz)					
Number of poles	(P)					
Type of Trip relay (Electronic trip device)						
Rated short circuit current (kA) (Sym.) UL 1066 ANSI C37.13		With instantaneous	AC	635V		
				508V		
				254V		
		Without instantaneous	AC	635V		
				508V		
				254V		
Rated short Time current	(kA)					
Operating time	(t)	(ms)	Maximum total breaking time			
			Maximum closing time			
Life cycle	ACB	(time)	Mechanical	Without maintenance		
				With maintenance		
			Electrical	Without maintenance		
				With maintenance		
Weight	lb (kg)	Drawout type	Main Body	3P		
			with Cradle	4P		
			Only Cradle	3P		
				4P		
			Fixed type	Motor charging type	3P	
					4P	
External dimension	Draw-out type	in (mm)	H×W×D	3P		
				4P		
			Fixed type	in (mm)	H×W×D	3P
						4P
Enclosure dimension		in (mm)	H×W×D	3P		
				4P		



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UAS-□□D	
08	16
800	1600
	800
400	1000
600	1200
630	1250
800	1600
254V / 508V / 635V	
50/60	
3P / 4P	
N, A, P, S (4 type)	
	65
	85
	85
	65
	65
	65
	65
	65
	50ms
	80ms
	12,500
	2,800
	154 (70)
	187 (85)
	71 (32)
	84 (38)
	77 (35)
	99 (45)
	16.93 × 13.15 × 16.02
	(430 × 334 × 407)
	16.93 × 16.5 × 16.02
	(430 × 419 × 407)
	11.81 × 11.81 × 11.61
	(300 × 300 × 295)
	11.81 × 15.16 × 11.61
	(300 × 385 × 295)
	19.69 × 15.75 × 13.39
	(500 × 400 × 340)
	19.69 × 19.69 × 13.39
	(500 × 500 × 340)



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UAH-□□E				
08	16	20	25	32
800	1600	2000	2500	3200
400	800	1000	1200	1600
600	1000	1200	1250	2000
630	1200	1250	1600	2500
800	1250	1600	2000	3000
	1600	2000	2500	3200
254V / 508V / 635V				
50/60				
3P / 4P				
N, A, P, S (4 type)				
85				
100				
100				
85				
85				
85				
85				
50ms				
80ms				
12,500			5,000	
2,800			1,000	
214 (97)			245 (111)	326 (148)
269 (122)			309 (140)	414 (188)
99 (45)			123 (56)	205 (93)
121 (55)			152 (69)	256 (116)
101 (46)			110 (50)	196 (89)
126 (57)			137 (62)	249 (113)
16.93 × 16.22 × 16.02 (430 × 412 × 407)				
16.93 × 20.75 × 16.02 (430 × 527 × 407)				
11.81 × 14.88 × 11.61 (300 × 378 × 295)				
11.81 × 19.41 × 11.61 (300 × 493 × 295)				
19.69 × 19.69 × 13.39 (500 × 500 × 340)				
19.69 × 24.21 × 13.39 (500 × 615 × 340)				

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UAH-□□G		
32	40	50
3200	4000	5000
1600	2000	2500
2000	2500	3000
2500	3000	3200
3000	3200	3600
3200	3600	4000
	4000	5000
254V / 508V / 635V		
50/60		
3P / 4P		
N, A, P, S (4 type)		
100		
130		
130		
100		
100		
100		
100		
50ms		
90ms		
5,000		
1,000		
489 (222)		
626 (284)		
276 (125)		
355 (161)		
227 (103)		
287 (130)		
18.11 × 30.91 × 16.02 (460 × 785 × 407)		
18.11 × 39.96 × 16.02 (460 × 1015 × 407)		
11.81 × 29.57 × 11.61 (300 × 751 × 295)		
11.81 × 38.62 × 11.61 (300 × 981 × 295)		
31.5 × 32.48 × 13.39 (800 × 825 × 340)		
31.5 × 41.54 × 13.39 (800 × 1055 × 340)		

Trip relay(OCR)

The trip relay of Susol ACB provides the additional protection functions for voltage, frequency, unbalance, and others in addition to main protection functions for over current, short-circuit, ground fault. It supports the advanced measurement functions for voltage, current, power, electric energy, harmonics, communication function, and others.

Analog trip function interlocked with mechanism enhanced a durability of devices as well as the breaking capacity of ACB.

Zone selective interlocking function makes the protective coordination more simple and thermal memory can be applied to various loads.







Contents

Trip relay types	25
N type: 「Normal」 type	26
A type: 「Ammeter」 type	28
P type: 「Power meter」 type	30
S type: 「Supreme meter」 type	32
Operation characteristic	34
Measurement function	36
Man machine interface	37
Protection element setting	38
Measurement element display	39
Characteristic curves	40
ZSI - Zone Selective Interlocking	45
Remote reset and digital I/O	46
Communication	47
Event & fault recording	48
System information	48
System block diagram	49

Trip relays

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Trip relay types

Classification	N type	A type	P type	S type
Externals				
Current protection	• L / S / I / G	• L / S / I / G / Thermal • ZSI(Protective coordination)	• L / S / I / G / Thermal(Continuous) • ZSI(Protective coordination)	• P type
Other protection	-	• Earth leakage (Option)	• Earth leakage(Option) • Over/Under current • Over/Under frequency • Unbalance(Voltage/Current) • Reverse power	• P type
Measurement function	-	• Current (R / S / T / N)	• 3 Phase Voltage/Current RMS/Vector • Power(P, Q, S), PF(3-Phase) • Energy(Positive/Negative) • Frequency, Demand	• 3 Phase Voltage/Current RMS/Vector • Power(P, Q, S), PF(3-Phase) • Energy(Positive/Negative) • Frequency, Demand • Voltage/Current harmonics (1st-63th) • 3 Phase Waveforms • THD, TDD, K-Factor
Fine adjustment	-	-	• Fine adjustment for long/short time delay/instantaneous/ ground	• P type
Pre Trip Alarm	-	-	• Overload protection relays : DO (Alarm) (Ground fault is not available when using Pre trip alarm)	• P type
Digital Output	-	• 3DO (Fixed) • L, S/I, G Alarm	• 3DO (Programmable) • Trip, Alarm, General	• P type
IDMTL setting	-	-	• Compliance with IEC60255-3 SIT, VIT, EIT, DT	• P type
Communication	-	• Modbus/RS-485 • Profibus-DP	• Modbus / RS-485 • Profibus-DP	• Modbus / RS-485 • Profibus-DP
Power supply	• Self Power - Power source works over 20% of load current.	• Self Power - Power source works over 20% of load current. - External power source are required for comm. • AC/DC 100~250V • DC 24~60V	• AC/DC 100~250V • DC 24~60V	• AC/DC 100~250V • DC 24~60V
RTC timer	• Available	• Available	• Available	• Available
LED for trip info.	• Long time delay • Short time delay/Instantaneous • Ground fault	• N type	• N type	• N type
Fault recording	-	• 10 records (Fault/Current/Date and Time)	• 256 records (Fault/Current/Date and Time)	• 256 records • Last fault wave recording (3 Phase)
Event recording	-	-	• 256 records(Content, Status, Date)	• P type
Operating button	• Reset button	• Reset, Menu Up/Down, Left/Right, Enter	• A type	• A type

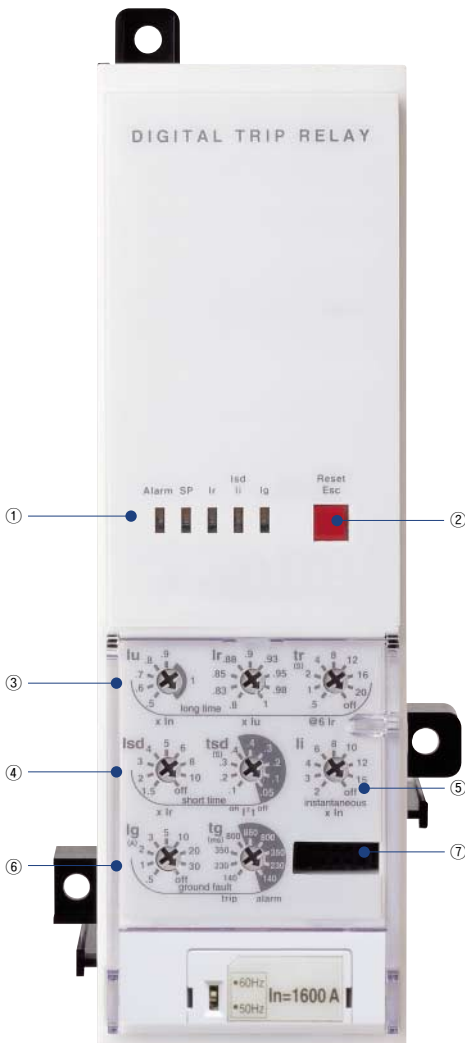
Basic protection function(L / S / I / G) is still under normal operation without control power.

Trip relays

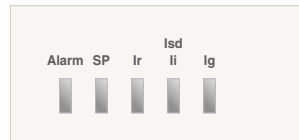
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N type: 'Normal' type

- Optimized protection function
- OCR, OCGR function according IEC60947-2
- Overload protection
 - Long-time delay
- Short-circuit protection
 - Short-time delay / Instantaneous
 - I²t On/Off optional (for short-time delay)
- Ground fault protection
 - I²t On/Off optional
- Self-Power



① LED: Indication of trip info. and overload state



- Ig: LED indicating ground-fault
- Isd/li: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

② Reset Key: Fault reset or battery check

③ lu, lr: Long-time current setting, tr: Long-time tripping delay setting

④ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑤ li: Instantaneous current setting

⑥ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

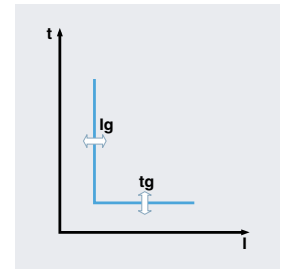
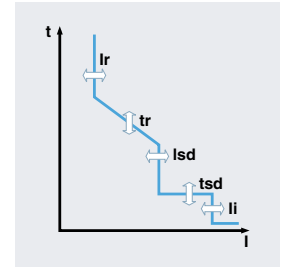
⑦ Test terminal: OCR test terminal (Connected with OCR tester)

Trip relays

Susol

Protection

Long time											
Current setting (A)	$I_u = I_n \times \dots$	0.5	0.6	0.7	0.8	0.9	1.0				
	$I_r = I_u \times \dots$	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0	
Time delay (s)	$t_r @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off	
Accuracy: $\pm 15\%$ or below	$t_r @ (6.0 \times I_r)$	0.5	1	2	4	8	12	16	20	Off	
100ms	$t_r @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off	
Short time											
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off	
Accuracy: $\pm 10\%$											
Time delay (s) @ $10 \times I_r$	t_{sd}	I^t Off	0.05	0.1	0.2	0.3	0.4				
		I^t On		0.1	0.2	0.3	0.4				
$(I^t \text{ Off})$	Min. Trip Time(ms)	20	80	160	260	360					
	Max. Trip Time(ms)	80	140	240	340	440					
Instantaneous											
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off	
Tripping time		below 50ms									
Ground fault											
Pick-up (A)	$I_g = I_n \times \dots$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off	
Accuracy: $\pm 10\%$ ($I_g > 0.4I_n$) $\pm 20\%$ ($I_g \leq 0.4I_n$)											
Time delay (s) @ $1 \times I_n$	t_g	I^t Off	0.05	0.1	0.2	0.3	0.4				
		I^t On		0.1	0.2	0.3	0.4				
$(I^t \text{ Off})$	Min. Trip Time(ms)	20	80	160	260	360					
	Max. Trip Time(ms)	80	140	240	340	440					

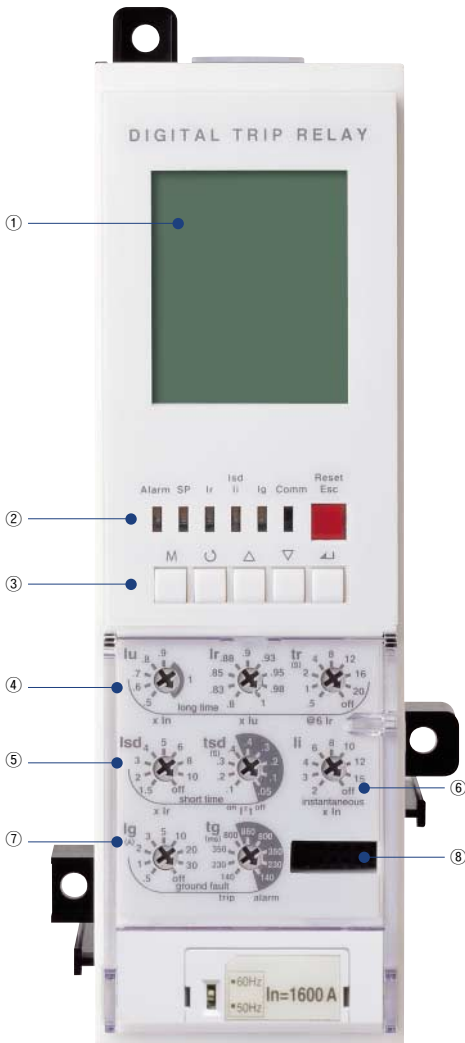


Trip relays

Susol

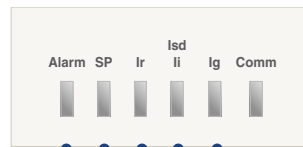
A type: 'Ammeter' type

- Overload protection
 - Long-time delay
 - Thermal
- Short-circuit protection
 - Short-time delay / Instantaneous
 - I_t On/Off optional (for short-time delay)
- Ground fault protection
 - I_t On/Off optional
 - Trip/Alarm selectable (need external power)
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- High-performance and high-speed MCU built-in
 - Accurate measurement with tolerance of 1.0%
- Fault recording
 - Records Max. up to 10 fault information about fault type, fault phase, fault data, occurrence time of fault
- SBO (Select Before Operation)
 - High reliability for control and setting change method
- 3 DO(Digital Output)
 - Fixed
- Communication
 - Modbus/RS485
 - Profibus-DP



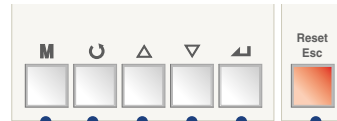
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



- Ig: LED indicating ground-fault
- Isd/II: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

③ Key: Move to menu or reset



- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

④ I_u, I_r: Long-time current setting, t_r: Long-time tripping delay setting

⑤ I_{sd}: Short-time current setting, t_{sd}: Short-time tripping delay setting

⑥ I_i: Instantaneous current setting

⑦ I_g: Ground fault current setting, t_g: Ground fault tripping delay setting

⑧ Test terminal: OCR test terminal (Connected with OCR tester)

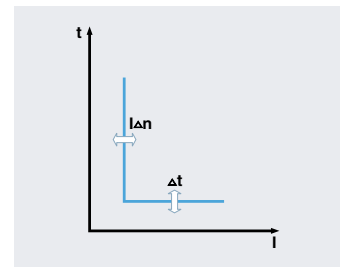
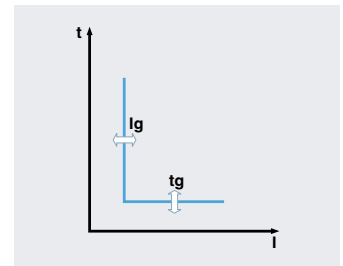
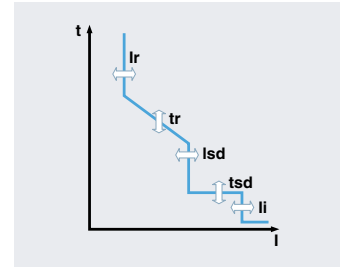
Trip relays

Susol

Protection

Long time											
Current setting (A)	$I_u = I_n \times \dots$	0.5	0.6	0.7	0.8	0.9	1.0				
	$I_r = I_u \times \dots$	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0	
Time delay (s)	$t_r @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off	
Accuracy: $\pm 15\%$ or below	$t_r @ (6.0 \times I_r)$	0.5	1	2	4	8	12	16	20	Off	
100ms	$t_r @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off	
Short time											
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off	
Accuracy: $\pm 10\%$											
Time delay (s) @ $10 \times I_r$	t_{sd}	I^t Off	0.05	0.1	0.2	0.3	0.4				
		I^t On		0.1	0.2	0.3	0.4				
$(I^t$ Off)		Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off	
Tripping time		below 50ms									
Ground fault											
Pick-up (A)											
Accuracy: $\pm 10\%$ ($I_g > 0.4I_n$) $\pm 20\%$ ($I_g \leq 0.4I_n$)	$I_g = I_n \times \dots$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off	
Time delay (s) @ $1 \times I_n$	t_g	I^t Off	0.05	0.1	0.2	0.3	0.4				
		I^t On		0.1	0.2	0.3	0.4				
$(I^t$ Off)		Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Earth leakage (Option)											
Current setting (A)	$I_{\Delta n}$	0.5	1	2	3	5	10	20	30	Off	
Time delay (ms)		140	230	350	800	950					
Accuracy: $\pm 15\%$	Δt	Alarm Time(ms)	140	230	350	800	950				
		Trip Time(ms)	140	230	350	800					

Note) Current setting values are secondary current of the external CT.
Recommend : not to use current setting values more than 10A.

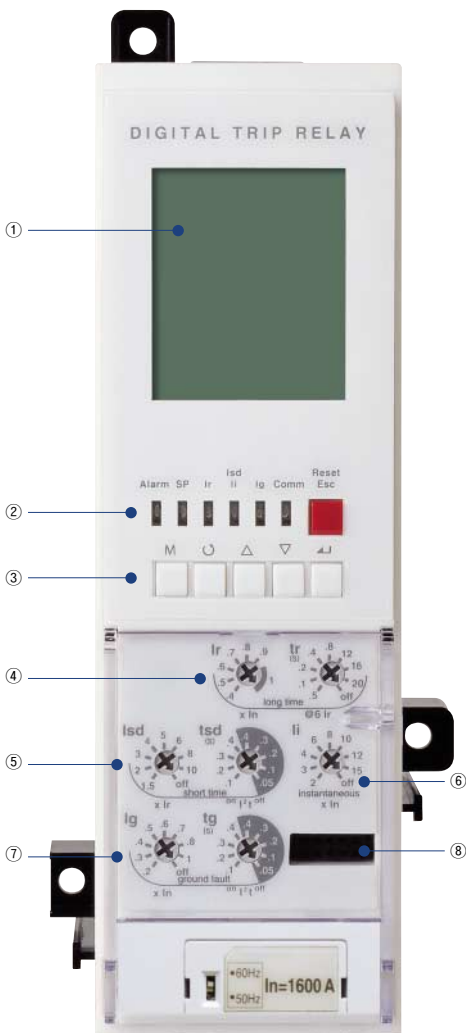


Trip relays

Susol

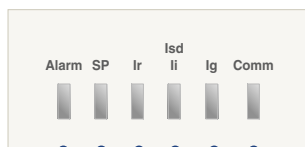
P type: 「Power meter」 type

- Overload protection
 - Long-time delay
 - Thermal
- Short-circuit protection
 - Short-time delay / Instantaneous
 - I_t On/Off optional (for short-time delay)
- Ground fault protection
 - I_t On/Off optional
 - Trip/Alarm selectable (need external power)
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and Key
- IDMTL setting (SIT, VIT, EIT, DT curve)
 - Basic setting : "None". Thermal curve.
- Measurement and Display Function
 - High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
 - 128 x 128 Graphic LCD
 - Indicates current/voltage Vector Diagram and Waveform
- Fault recording
 - Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
- Event recording
 - Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
 - High reliability for control and setting change method
- 3 DO(Digital output)
 - Programmable for alarm, trip and general DO
- Communication
 - Modbus/RS485
 - Profibus-DP



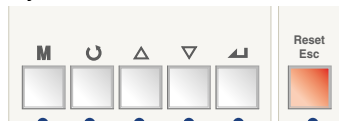
① Graphic LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



- Comm: LED indicating comm. state (Blink when running)
- Ig: LED indicating ground-fault
- Isd/li: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

③ Key: Move to menu or reset



- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display → Measurement display

④ Ir: Long-time current setting, tr: Long-time tripping delay setting

⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑥ li: Instantaneous current setting

⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

⑧ Test terminal: OCR test terminal (Connected with OCR tester)

Trip relays

Susol

Protection

Long time										
Current setting (A)	$I_r = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.9	1.0		
Time delay (s)	$t_r @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off
Accuracy: $\pm 15\%$ or below	$t_r @ (6.0 \times I_r)$	0.5	1	2	4	8	12	16	20	Off
100ms	$t_r @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off

Short time										
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off
Accuracy: $\pm 10\%$										
Time delay (s) @ $10 \times I_r$	t_{sd}	I^t Off	0.05	0.1	0.2	0.3	0.4			
		I^t On	0.1	0.2	0.3	0.4				
(1 st Off)		Min. Trip Time(ms)	20	80	160	260	360			
		Max. Trip Time(ms)	80	140	240	340	440			

Instantaneous										
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off
Tripping time		below 50ms								

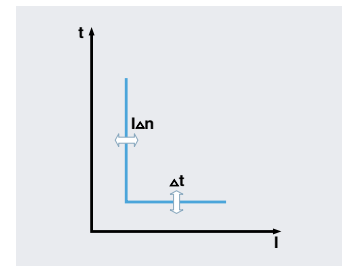
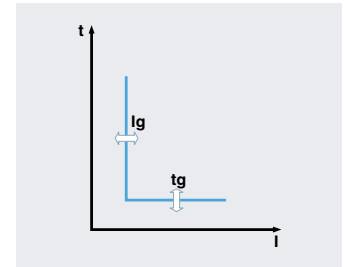
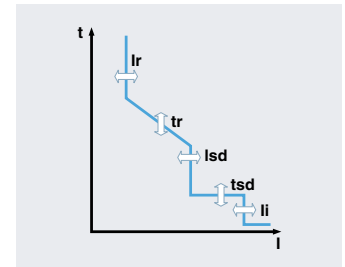
Ground fault										
Pick-up (A)										
Accuracy: $\pm 10\%$ ($I_g > 0.4 I_n$) $\pm 20\%$ ($I_g \leq 0.4 I_n$)	$I_g = I_n \times \dots$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ $1 \times I_n$	t_g	I^t Off	0.05	0.1	0.2	0.3	0.4			
		I^t On	0.1	0.2	0.3	0.4				
(1 st Off)		Min. Trip Time(ms)	20	80	160	260	360			
		Max. Trip Time(ms)	80	140	240	340	440			

Earth leakage (Option)										
Current setting (A)	$I_{\Delta n}$	0.5	1	2	3	5	10	20	30	Off
Time delay (ms)										
Accuracy: $\pm 15\%$	Δt	Alarm Time(ms)	140	230	350	800	950			
		Trip Time(ms)	140	230	350	800				

Note) Current setting values are secondary current of the external CT.
Recommend : not to use current setting values more than 10A.

PTA(Pre Trip Alarm)										
Current setting (A)	$I_p = I_r \times \dots$	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Time delay (s)	$t_p @ (1.2 \times I_p)$	1	5	10	15	20	25	30	35	Off
Accuracy: $\pm 15\%$										

Other protection	Pick-up			Time delay(s)		
	Setting range	Step	Accuracy	Setting range	Step	Accuracy
Under voltage	80V ~ 0V_Pick-up	1V	$\pm 5\%$	1.2~40sec	0.1sec	± 0.1 sec
Over voltage	UV_Pick-up ~ 980V	1V	$\pm 5\%$			
Voltage unbalance	6% ~ 99%	1%	$\pm 2.5\%$ or ($* \pm 10\%$)			
Reverse power	10~500 kW	1kW	$\pm 10\%$	0.2~40sec		
Over power	500~5000 kW	1kW	$\pm 10\%$			
Current unbalance	6% ~ 99%	1%	$\pm 2.5\%$ or ($* \pm 10\%$)	1.2~40sec		
Over frequency	60Hz UF_Pick-up ~ 65	1Hz	± 0.1 Hz			
	50Hz UF_Pick-up ~ 55	1Hz	± 0.1 Hz			
Under frequency	60Hz 55Hz ~ OF_Pick-up	1Hz	± 0.1 Hz			
	50Hz 45Hz ~ OF_Pick-up	1Hz	± 0.1 Hz			

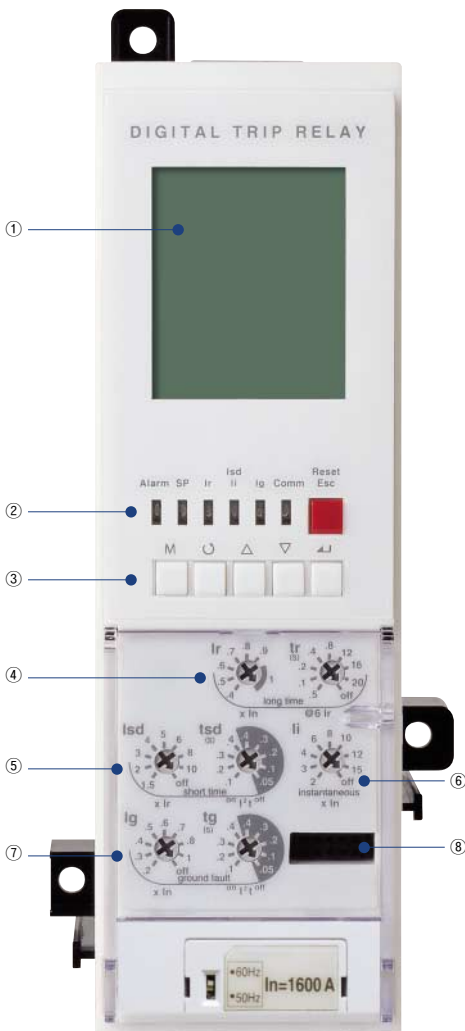


Trip relays

Susol

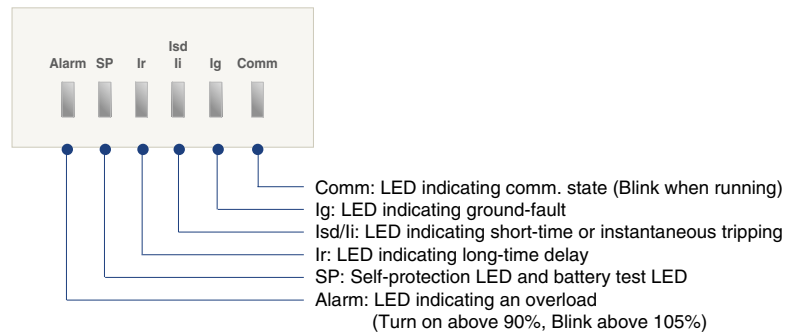
S type: 'Supreme meter' type

- Overload protection
 - Long-time delay
 - Thermal
- Short-circuit protection
 - Short-time delay / Instantaneous
 - I²t On/Off optional (for short-time delay)
- Ground fault protection
 - I²t On/Off optional
 - Trip/Alarm selectable (need external power)
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and Key
- IDMTL setting (SIT, VIT, EIT, DT curve)
 - Basic setting : "None". Thermal curve.
- Measurement and Display Function
 - High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
 - 128 x 128 Graphic LCD
 - Indicates current/voltage Vector Diagram and Waveform
- Fault recording
 - Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
 - Fault wave recording: records the latest fault wave
- Event recording
 - Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
 - High reliability for control and setting change method
- Power quality analysis
 - Measurement for 1st-63th harmonics
 - THD, TDD, k-Factor
 - Voltage/current waveform capture
- 3 DO(Digital output)
 - Programmable for alarm, trip and general DO
- Communication
 - Modbus/RS485
 - Profibus-DP

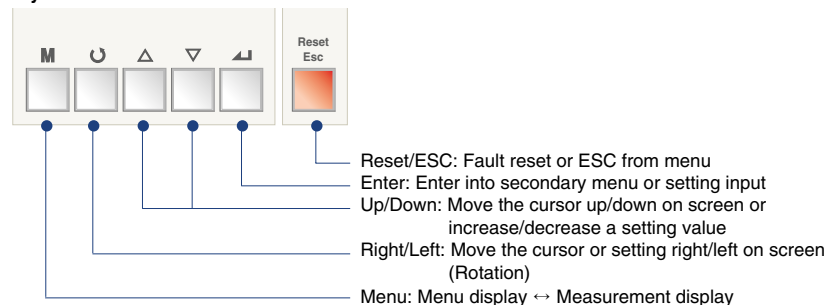


① Graphic LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



③ Key: Move to menu or reset



④ Ir: Long-time current setting, tr: Long-time tripping delay setting

⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑥ ii: Instantaneous current setting

⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

⑧ Test terminal: OCR test terminal (Connected with OCR tester)

Trip relays

Susol

Protection

Long time										
Current setting (A)	$I_u = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.9	1.0		
Time delay (s)	$t_r @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off
Accuracy: $\pm 15\%$ or below	$t_r @ (6.0 \times I_r)$	0.5	1	2	4	6	12	16	20	Off
100ms	$t_r @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off

Short time										
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off
Accuracy: $\pm 10\%$										
Time delay (s) @ $10 \times I_r$	t_{sd}	I^2t Off	0.05	0.1	0.2	0.3	0.4			
		I^2t On	0.1	0.2	0.3	0.4				
(1 st Off)		Min. Trip Time(ms)	20	80	160	260	360			
		Max. Trip Time(ms)	80	140	240	340	440			

Instantaneous										
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off
Tripping time		below 50ms								

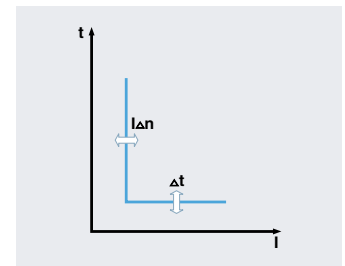
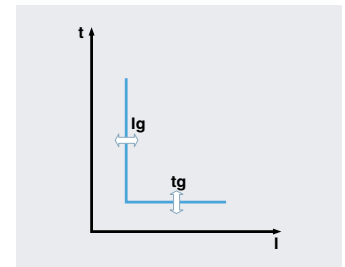
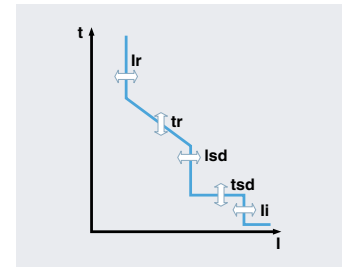
Ground fault										
Pick-up (A)										
Accuracy: $\pm 10\%$ ($I_g > 0.4 I_n$) $\pm 20\%$ ($I_g \leq 0.4 I_n$)	$I_g = I_n \times \dots$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ $1 \times I_n$	t_g	I^2t Off	0.05	0.1	0.2	0.3	0.4			
		I^2t On	0.1	0.2	0.3	0.4				
(1 st Off)		Min. Trip Time(ms)	20	80	160	260	360			
		Max. Trip Time(ms)	80	140	240	340	440			

Earth leakage (Option)										
Current setting (A)	$I_{\Delta n}$	0.5	1	2	3	5	10	20	30	Off
Time delay (ms)										
Accuracy: $\pm 15\%$	Δt	Alarm Time(ms)	140	230	350	800	950			
		Trip Time(ms)	140	230	350	800				

Note) Current setting values are secondary current of the external CT.
Recommend : not to use current setting values more than 10A.

PTA(Pre Trip Alarm)										
Current setting (A)	$I_p = I_r \times \dots$	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Time delay (s)	$t_p @ (1.2 \times I_p)$	1	5	10	15	20	25	30	35	Off
Accuracy: $\pm 15\%$										

Other protection	Pick-up			Time delay(s)		
	Setting range	Step	Accuracy	Setting range	Step	Accuracy
Under voltage	80V ~ 0V_Pick-up	1V	$\pm 5\%$	1.2~40sec	0.1sec	$\pm 0.1sec$
Over voltage	UV_Pick-up ~ 980V	1V	$\pm 5\%$			
Voltage unbalance	6% ~ 99%	1%	$\pm 2.5\%$ or ($* \pm 10\%$)			
Reverse power	10~500 kW	1kW	$\pm 10\%$	0.2~40sec		
Over power	500~5000 kW	1kW	$\pm 10\%$			
Current unbalance	6% ~ 99%	1%	$\pm 2.5\%$ or ($* \pm 10\%$)	1.2~40sec		
Over frequency	60Hz UF_Pick-up ~ 65	1Hz	$\pm 0.1Hz$			
	50Hz UF_Pick-up ~ 55	1Hz	$\pm 0.1Hz$			
Under frequency	60Hz 55Hz ~ OF_Pick-up	1Hz	$\pm 0.1Hz$			
	50Hz 45Hz ~ OF_Pick-up	1Hz	$\pm 0.1Hz$			



Trip relays

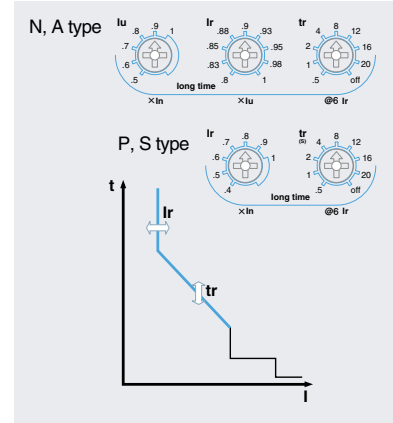
Susol

Operation characteristic

Long-time delay (L)

The function for overload protection which has time delayed characteristic in inverse ratio to fault current.

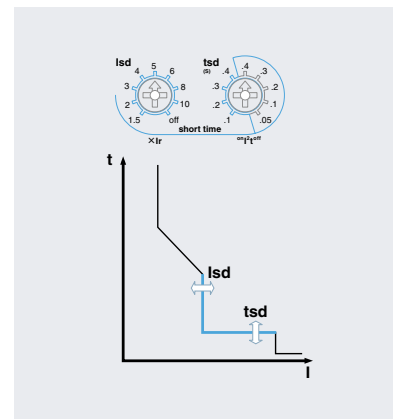
- Standard current setting knob: I_r
 - Setting range in P type and S type: $(0.4-0.5-0.6-0.7-0.8-0.9-1.0) \times I_n$
 - Setting range in N type and A type: $(0.4 \sim 1.0) \times I_n$
 - I_u : $(0.5-0.6-0.7-0.8-0.9-1.0) \times I_n$
 - I_r : $(0.8-0.83-0.85-0.88-0.9-0.93-0.95-0.98-1.0) \times I_u$
- Time delay setting knob: t_r
 - Standard operating time is based on the time of $6 \times I_r$
 - Setting range: 0.5-1-2-4-8-12-16-20-Off sec (9 modes)
- Relay pick-up current
 - When current over $(1.15) \times I_r$ flows in, relay is picked up.
- Relay operates basing on the largest load current among R/S/T/N phase.



Short-time delay (S)

The function for fault current (over current) protection which has definite time characteristic and time delayed in inverse ratio to fault current.

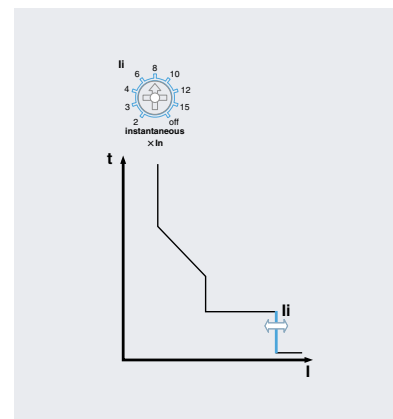
- Standard current setting knob: I_{sd}
 - Setting range: $(1.5-2-3-4-5-6-8-10-Off) \times I_r$
- Time delay setting knob: t_{sd}
 - Standard operating time is based on the time of $10 \times I_r$.
 - Inverse time (I^2t On): 0.1-0.2-0.3-0.4 sec
 - Definite time (I^2t Off): 0.05-0.1-0.2-0.3-0.4 sec
- Relay operates basing on the largest load current among R/S/T/N phase.
- When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.



Instantaneous (I)

The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.

- Standard current setting knob: I_i
 - Setting range: $(2-3-4-6-8-10-12-15-Off) \times I_n$
- Relay operates basing on the largest load current among R/S/T/N phase.
- Total breaking time is below 50ms.



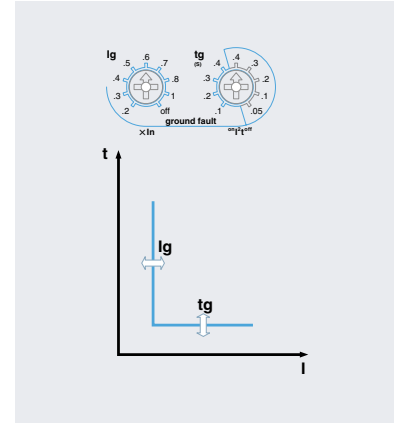
Trip relays

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Ground Fault (G)

The function for breaking ground fault current above setting value after time-delay to protect the circuit from ground fault.

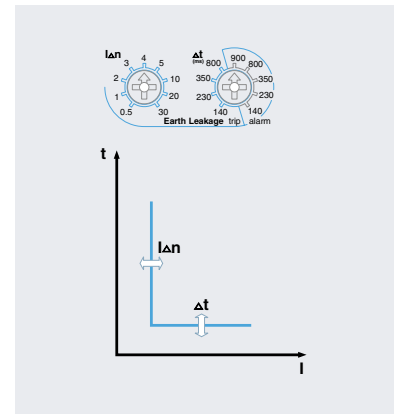
- Standard setting current knob: I_g
 - Setting range: $(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off) \times I_n$
- Time delay setting knob: t_g
 - Inverse time (I^t On): 0.1-0.2-0.3-0.4 sec
 - Definite time (I^t Off): 0.05-0.1-0.2-0.3-0.4 sec
- Ground fault current is vector sum of each phase current. Therefore, 3Pole products may operate under its phase-unbalance including ground fault situations.(R+S+T+(N) Phase)
- When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.
- Ground-fault functions are basically provided with products equipped with a trip relay through its internal CT that is embedded in each phase.(But, it can't be used with earth-leakage protection function at the same time)



Earth Leakage (G) - Option

The function for breaking earth leakage current above setting value after time delay to protect the circuit from earth leakage. (A, P, S type)

- Standard setting current knob: $I_{\Delta n}$
 - Setting range: 0.5-1-2-3-4-5-10-20-30-Off (A)
- Time delay setting knob: Δt
 - Trip time: 140-230-350-800 ms
 - Alarm time: 140-230-350-800-950 ms
- Settings within its alarm range will prevent its breaker from tripping but activating its alarm.
- This function is enabled and can be used only with private external CT(secondary output 5A) selected by customers.
- When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.

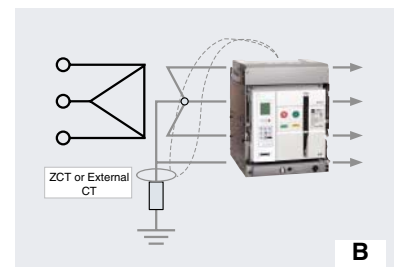
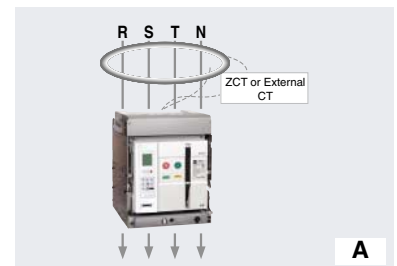


※ Use cautions with earth-leakage current settings

- When using other CT selected by customers, the setting range is from 0.5 to 5A based on its secondary current.(Secondary output rating : 5A)
Hence, under 100:5A CT, if trip relay is set to 0.5A, earth-leakage exceeding 10A will activate its operation ($0.5A \times 20 = 10A$)

※ Guideline for the external CT usage

- Earth-leakage protection characteristics using the standard CT which is installed inside of ACB can protect currents from 20 to 100% range on its rated current.
- As rated currents on ACB increases, current that is covered by its standard CT increase as well. This can not protect against small leakage currents.
ex) 400A ACB Min. Earth-leakage current $400A \times 20\% = 80A$
4000A ACB Min. Earth-leakage current $4000A \times 20\% = 800A$
- Therefore, customers are advised to install an external CT in accordance with its rated currents within its systems. And choose trip relay(E, X type) which is required with external CT usage in order to provide earth-leakage functions.



Trip relays

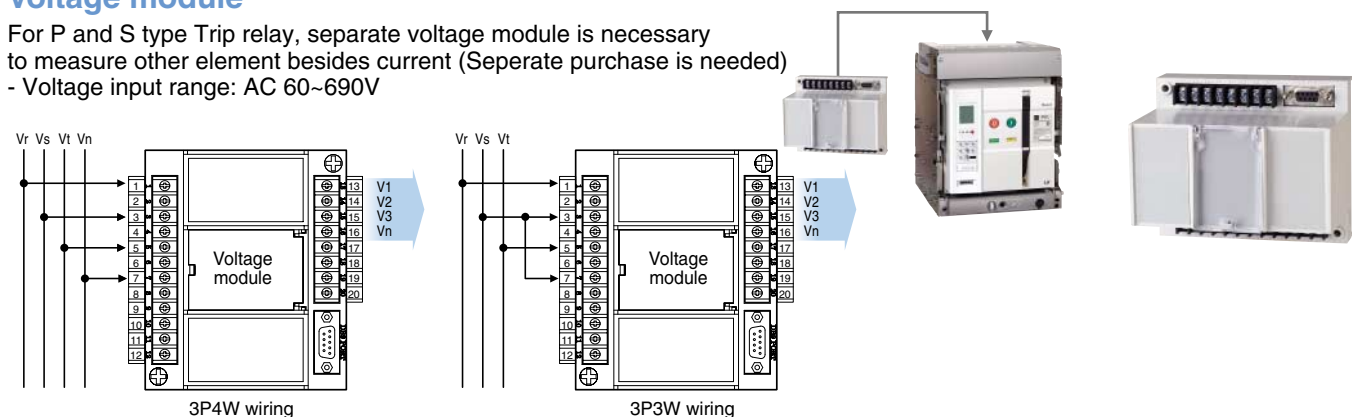
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Measurement function

Class.	Measurement element	Detailed element	Unit	Display range	Accuracy
Current	Line current	I_a, I_b, I_c	A	80A~65,535A	±3%
	Normal current	I_1			
	Reverse current	I_2			
Voltage	Line voltage	V_{ab}, V_{bc}, V_{ca}	V	60~690V	±1%
	Phase voltage	V_a, V_b, V_c			±1%
	Normal voltage	V_1			
	Reverse voltage	V_2			
Angle	Line-to-line	$\angle V_{abla}, \angle V_{b\Delta}, \angle V_{c\Delta}$	°	0~360°	±1°
	Line-to-current	$\angle V_{ab}V_{bc}, \angle V_{ab}V_{ca}$			±1°
	Phase-to-phase	$\angle V_aV_b, \angle V_aV_c$			±1°
	Phase-to-current	$\angle V_aI_a, \angle V_bI_b, \angle V_cI_c$			±1°
Power	Active power	$P_{a(ab)}, P_{b(bc)}, P_{c(ca)}, P$	kW	1kW~99,999kW	±3%
	Reactive power	$Q_{a(ab)}, Q_{b(bc)}, Q_{c(ca)}, Q$	kVar	1kVar~99,999kVar	±3%
	Apparent power	$S_{a(ab)}, S_{b(bc)}, S_{c(ca)}, S$	kVA	1kVA~99,999kVA	±3%
Energy	Active energy	$WH_{a(ab)}, WH_{b(bc)}, WH_{c(ca)}, WH$	kWh MWh	1kWh~9999.99MWh	±3%
	Reactive energy	$VAR_{Ha(ab)}, VAR_{Hb(bc)}, VAR_{Hc(ca)}, VAR_H$	kVarh Mvarh	1kVarh~9999.99MVarh	±3%
	Reverse active energy	$rWH_{a(ab)}, rWH_{b(bc)}, rWH_{c(ca)}, rWH$	kWh MWh	1kWh~9999.99MWh	±3%
Freq.	Frequency	F	Hz	45~65Hz	
Power factor	Power factor(PF)	$PF_{a(ab)}, PF_{b(bc)}, PF_{c(ca)}, PF$		+ : Lead, - : Lag	
Unbalance	Unbalance rate	$I_{unbalance}, V_{unbalance}$	%	0.0~100.0	
Demand	Active power demand	Peak demand	kW	1kW~99999kW	
	Current demand	Peak demand	A	80A~65,535A	
Harmonics	Voltage harmonics	1st~63th harmonics of $V_{a(ab)}, V_{b(bc)}, V_{c(ca)}$	V	60~690V	
	Current harmonics	1st~63th harmonics of I_a, I_b, I_c	A	80A~65,535A	
	THD, TDD		%	0.0~100.0	
	K-Factor		-	0.0~100.0	

Voltage module

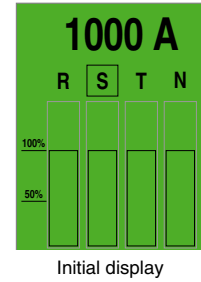
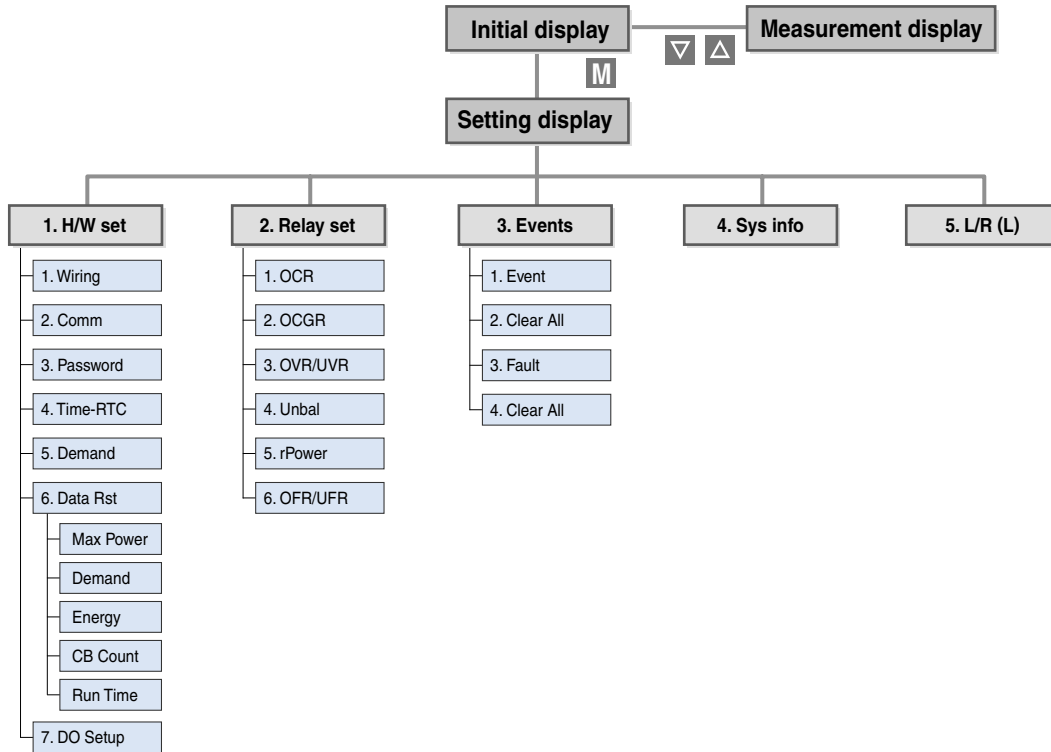
For P and S type Trip relay, separate voltage module is necessary to measure other element besides current (Separate purchase is needed)
- Voltage input range: AC 60~690V



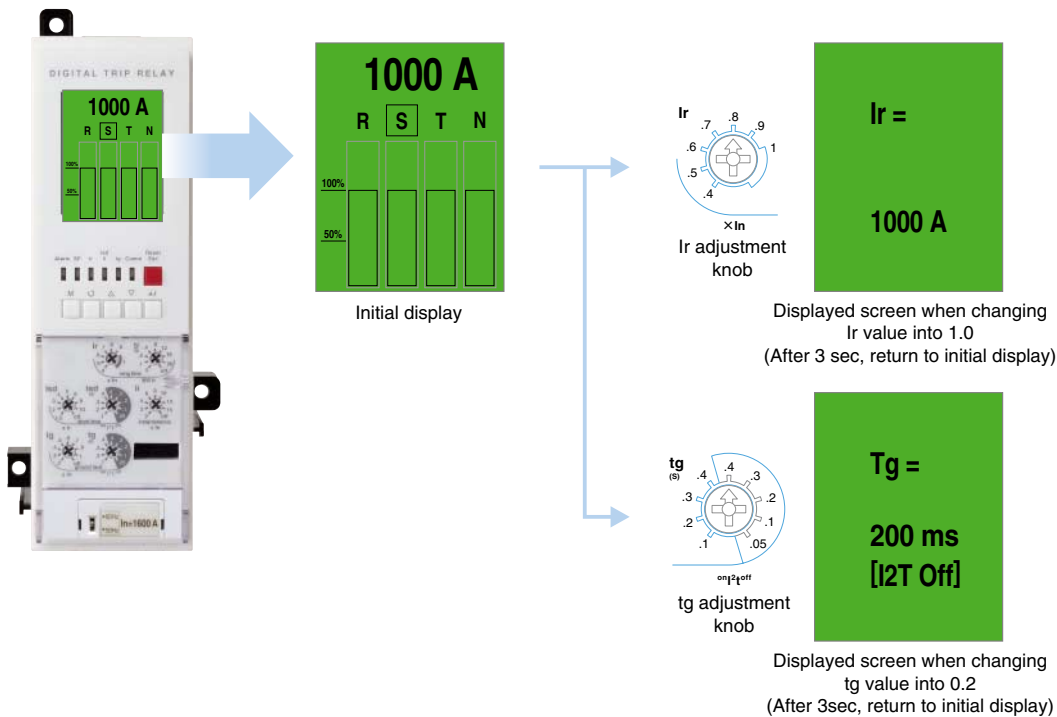
Trip relays

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Man machine interface



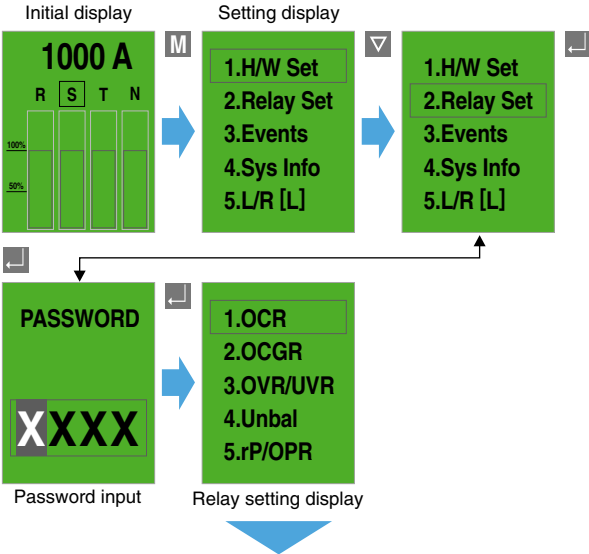
An example of graphic LCD display



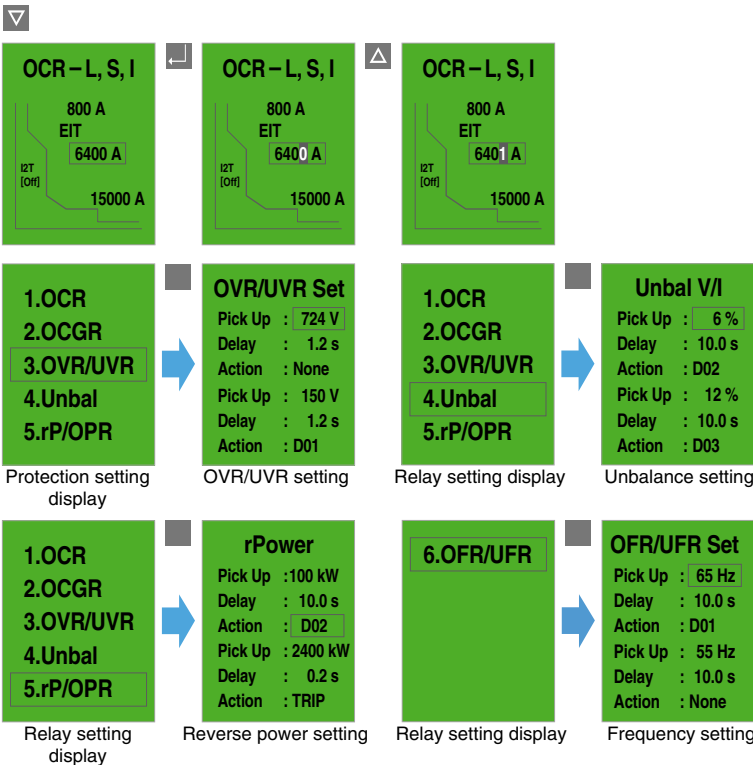
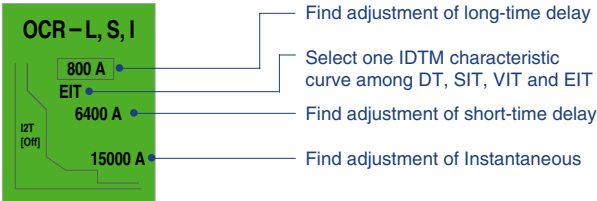
Trip relays

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Protection element setting



Find adjustment of protection setting current



- OCR and OCGR's current setting is basically controlled by knob's setting values.
- The fine current that cannot be controlled by knob is adjustable by using ∇ , Δ key.
- Fine adjustment is only adjustable in the present knob and next knob's setting range, when moving knob, the adjusted data becomes reset state.

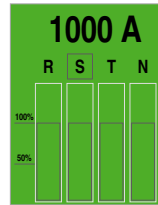
- The setting method of OCGR is same with OCR's, fine adjustment is available.

Trip relays

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Measurement element display

Load current



Measurement overview

Metering Overview VR 220 V ∠ 0.0 IR 1000 A ∠ 330.0 P 986 kW Q 589 kVar PF 0.866 F 60.0 EP 56 kWh EQ 32 kVarh	Demand Current [A] R : 1000 S : 1000 T : 1000 Max Demand [kW] 986 2007/05/14 11:15:00	Max Power [kW] 987 2007/05/14 10:00:00
--	---	--

Voltage/Current vector diagram

Vector Diagram 	VOLTAGE [V] VR : 220 ∠ 0.0 VS : 220 ∠ 240.0 VT : 220 ∠ 120.0 CURRENT [A] IR : 1000 ∠ 330.0 IS : 1000 ∠ 210.0 IT : 1000 ∠ 90.0 IN : 0	V unbal 3Phase Vpos : 220 V Vneg : 0 V Unbal : 0.0 % I unbal 3Phase Ipos : 1000 A Ineg : 0 A Unbal : 0.0 %
---------------------------	--	---

Power and power factor

Power Diagram 	Active Power [kW] R : 328 Total S : 328 986 T : 328 Reactive [kVar] R : 189 Total S : 189 589 T : 189	Apparent [kVA] R : 379 Total S : 379 1139 T : 379 Power Factor R : 0.87 Total S : 0.87 0.866 T : 0.87
--------------------------	--	--

Energy

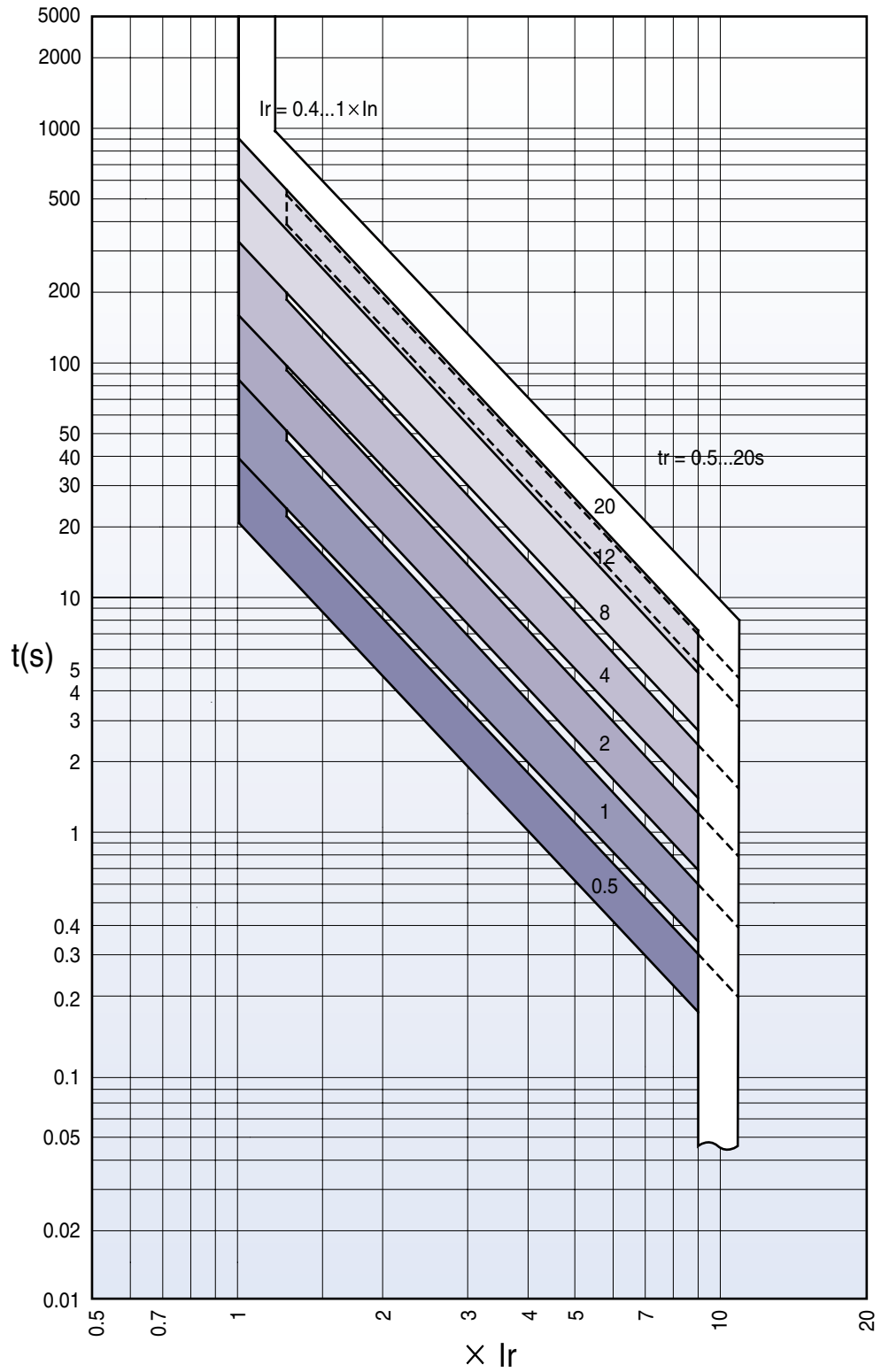
Forward Energy P+ : 1051 kWh Q+ : 607 kVarh Reverse Energy P- : 0 kWh Q- : 0 kVarh	Forward P [kWh] R : 360 Total S : 360 1080 T : 360 Forward Q [kVarh] R : 210 Total S : 210 630 T : 210	Reverse P [kWh] R : 0 Total S : 0 0 T : 0 Reverse Q [kVarh] R : 0 Total S : 0 0 T : 0
---	---	--

Voltage/Current harmonics (S type)

Volt Wave & FFT [%] THD[S] : 25.0 	S Volt Harmonics [V] H1 220 H8 0 H2 0 H9 0 H3 55 H10 0 H4 0 H11 0 H5 0 H12 0 H6 0 H13 0 H7 0 H14 0	S Volt Harmonics [V] H15 0 H22 0 H16 0 H23 0 H17 55 H24 0 H18 0 H25 0 H19 0 H26 0 H20 0 H27 0 H21 0 H28 0	S Volt Harmonics [V] H57 0 H58 0 H59 0 H60 0 H61 0 H62 0 H63 0	
Curr Wave & FFT [%] THD[R] : 3.0 	R Curr Harmonics [A] H1 1000 H8 0 H2 0 H9 3 H3 15 H10 0 H4 0 H11 1 H5 20 H12 0 H6 0 H13 1 H7 0 H14 0	R Curr Harmonics [A] H15 1 H22 0 H16 0 H23 1 H17 1 H24 0 H18 0 H25 1 H19 1 H26 0 H20 0 H27 1 H21 1 H28 0	R Curr Harmonics [A] H57 0 H58 0 H59 0 H60 0 H61 0 H62 0 H63 0	TDD 3Phase R : 0.1 % S : 0.1 % T : 0.1 % Current K - Factor R : 1.2 S : 1.2 T : 1.3

Characteristic curves

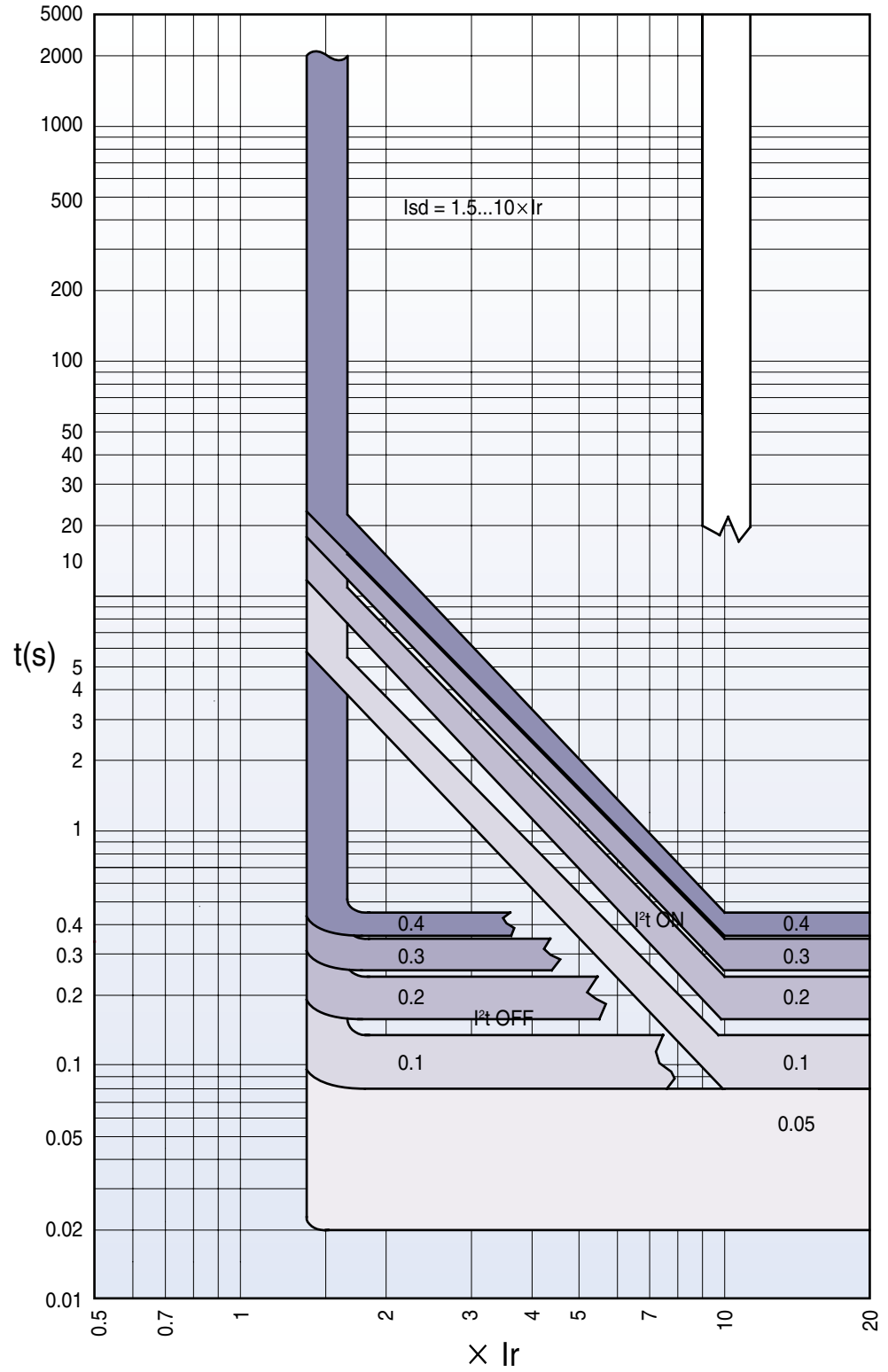
Long-time delay (L)



Trip relays

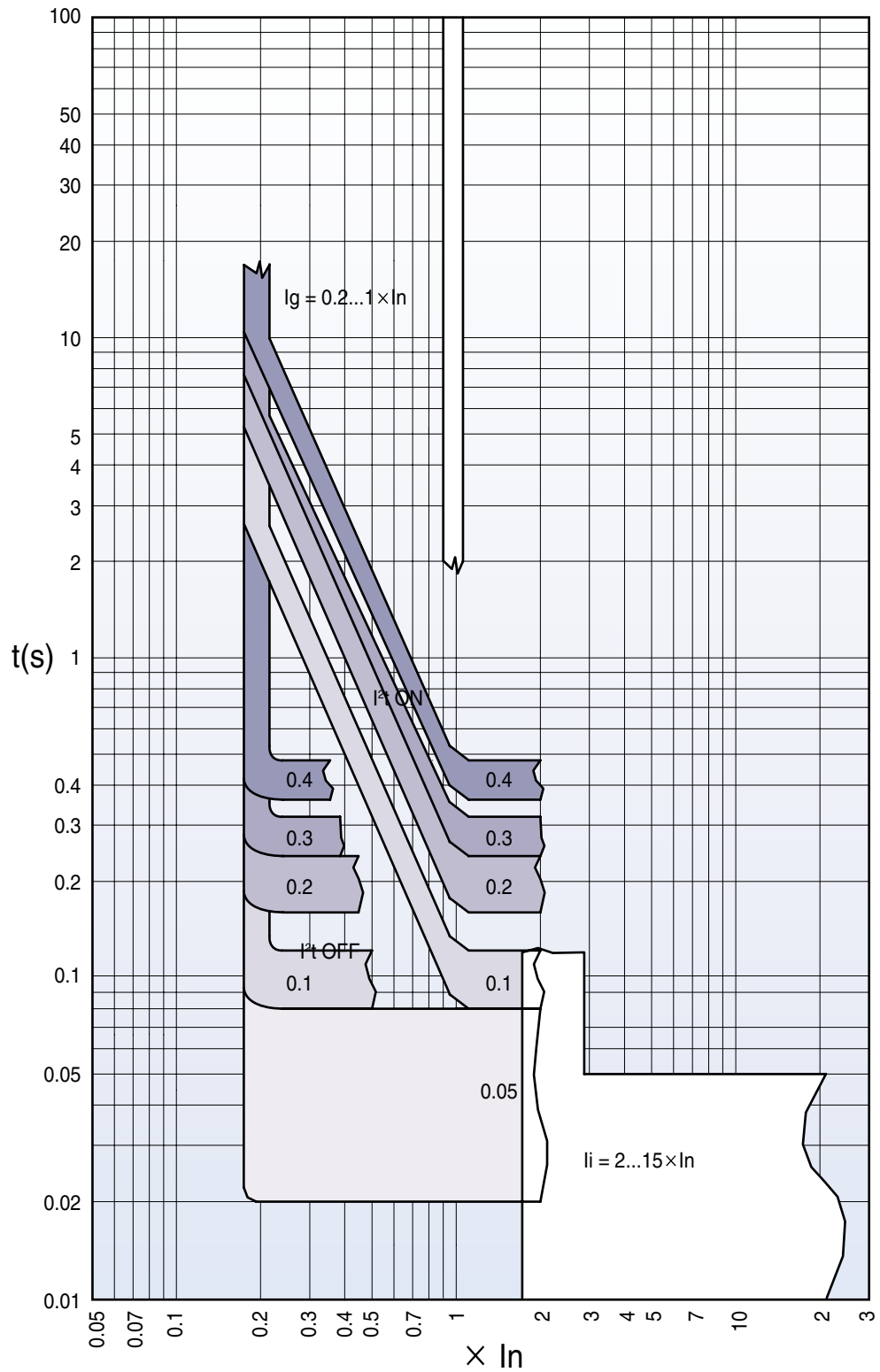
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Short-time delay (S)



Characteristic curves

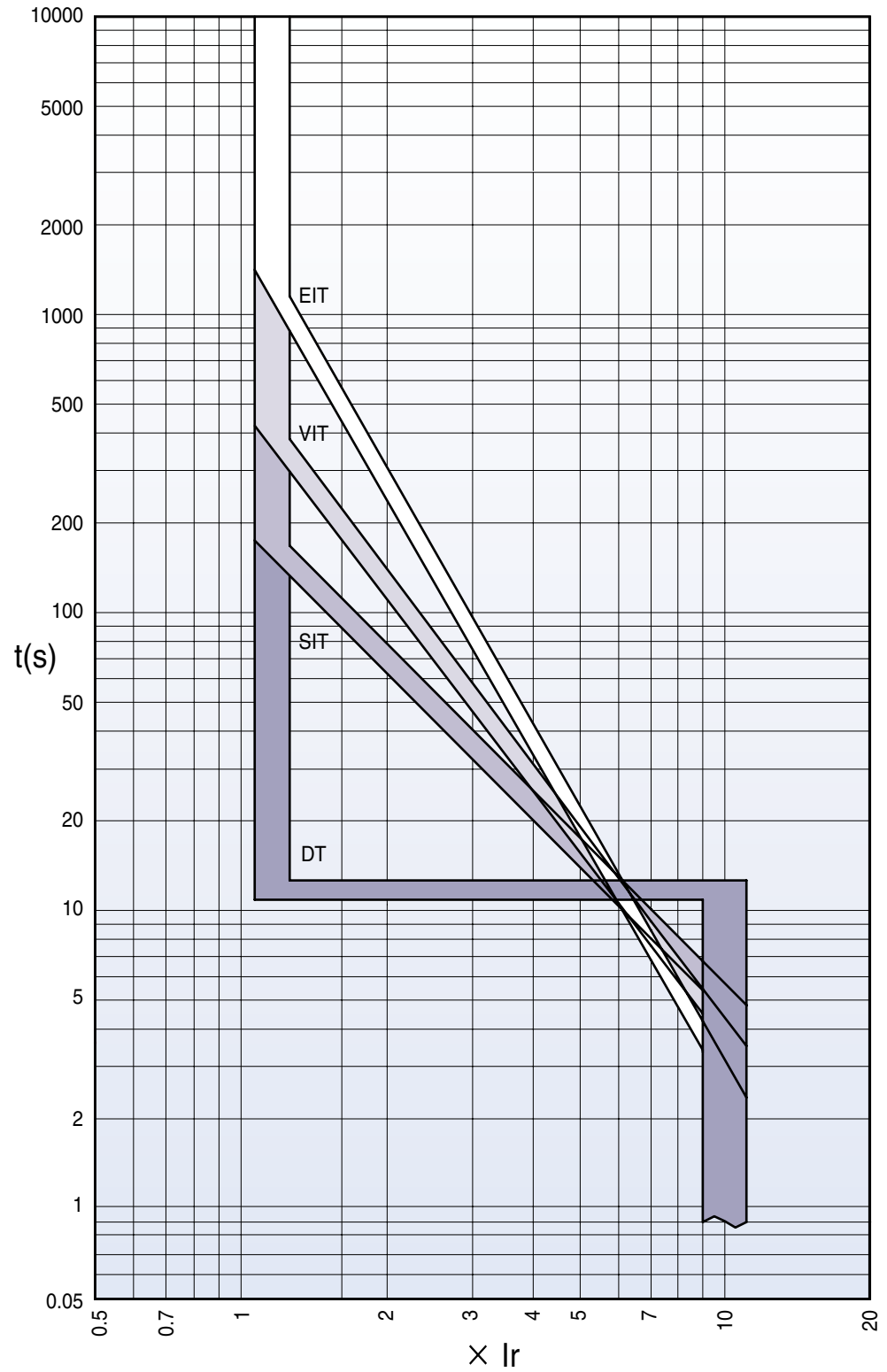
Instantaneous (I)
Ground fault (G)



Trip relays

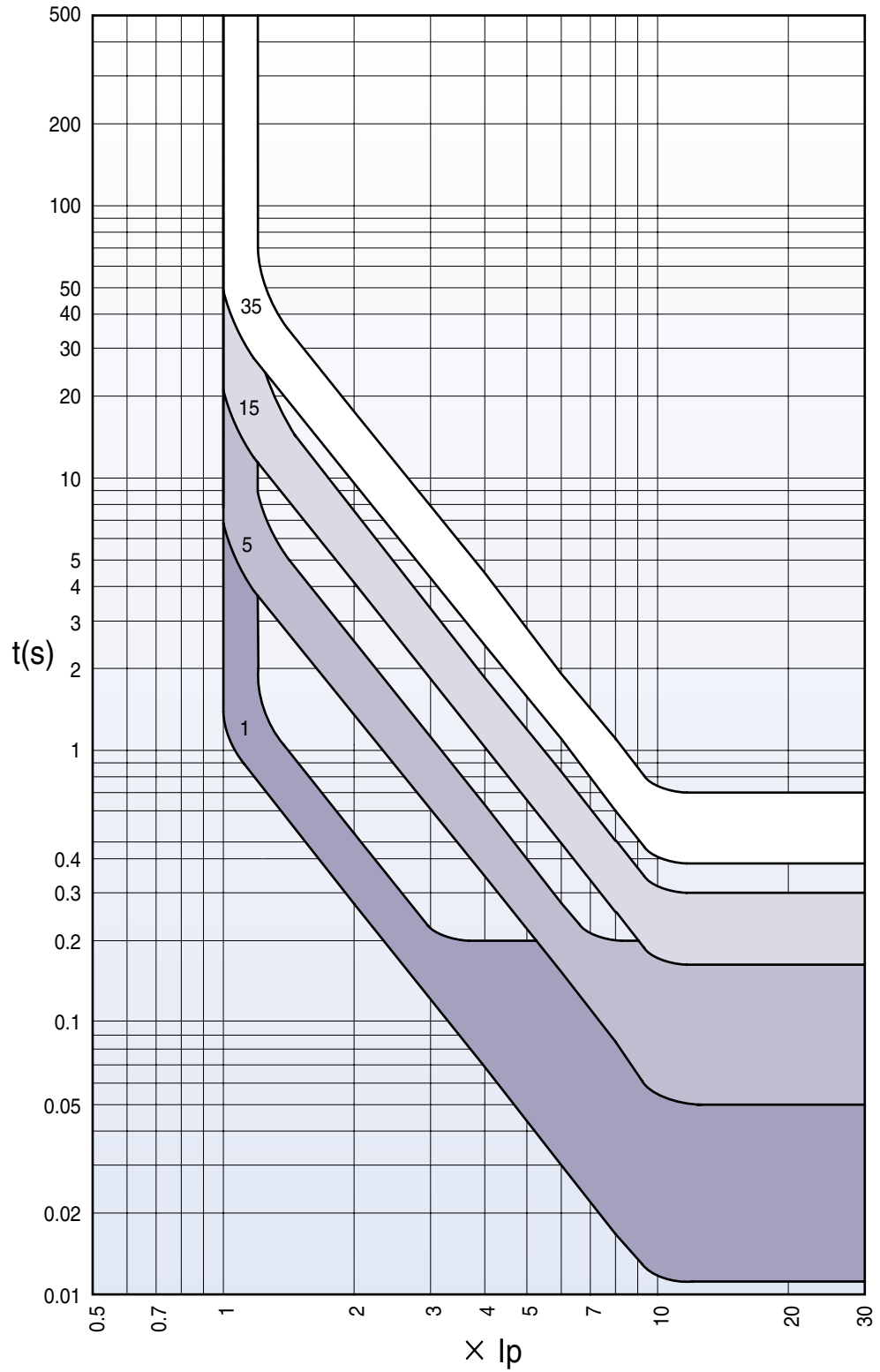
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IDMTL



Characteristic curves

Pre Trip Alarm



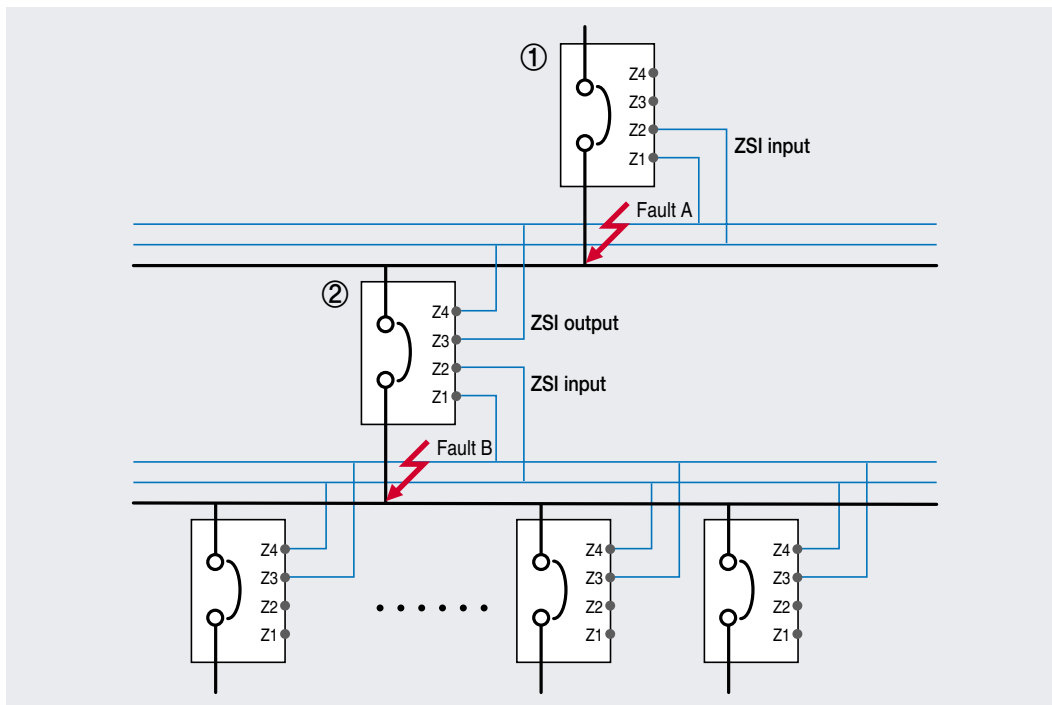
Trip relays

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ZSI - Zone Selective Interlocking (A, P, S type)

Zone-selective interlocking drops delay time that eliminates faults for breakers. It minimizes the shock that all kinds of electric machineries get under fault conditions.

1. In case of that short time-delay or ground fault accident occurs at ZSI built in system, the breaker at accident site sends ZSI signal to halt upstream breaker's operation.
2. To eliminate a breakdown, trip relay of ACB at accident site activates trip operation without time delay.
3. The upstream breaker that received ZSI signal adhere to pre-set short time-delay or ground fault time-delay for protective coordination in the system. However upstream breaker that did not receive its signal will trip instantaneously.
4. For ordinary ZSI operation, it should arrange operation time accordingly so that downstream circuit breakers will react before upstream ones under overcurrent/short time delay/ground fault situations.
5. ZSI connecting line needs to be Max. 3m.



- 1) Occurrence of fault A
 - Only breaker ① performs instantaneous trip operation.
- 2) Occurrence of fault B
 - Breaker ② performs instantaneous trip operation, breaker ① performs trip operation after prearranged delay time
 - But if breaker ② did not break the fault normally, breaker ① performs instantaneous trip operation to protect system.

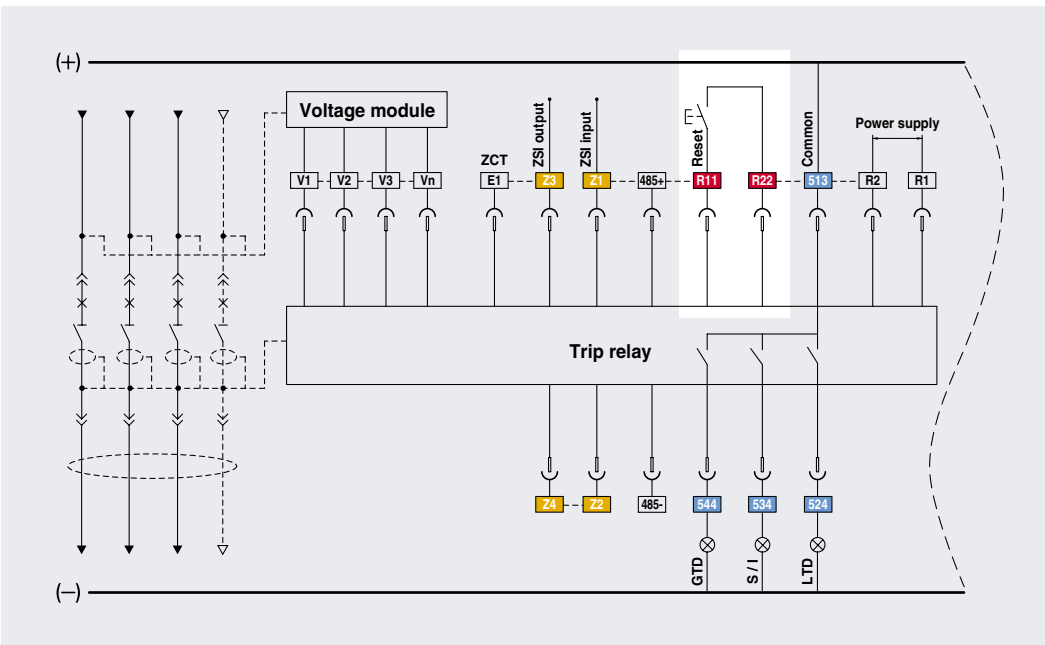
Trip relays

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Remote reset and digital I/O (A, P, S type)

In case of that ACB operates due to accidents or over current, Trip relay indicates the information of the accident through the LED and LCD. Trip relay A, P and S type is possible to perform the remote reset by digital input, and have 3 DO(Digital output).

1. Methods to reset Trip relay is to push the Reset button on the frontal side and to use the remote reset.
2. Digital input
 - [R11-R22] input: Remote reset
 - [Z1-Z2] Input: ZSI input
 - [E1-E2] Input: ZCT for earth leakage detection or external CT input
- ※ All DI are dry contact that has 3.3V of recognition voltage. When inputting close by SSR(Solid State Relay) or open-collector(Drain) to R11.
3. Digital output 3a(524, 534, 544-513)
 - Fault output: Long/Short time delay, Instantaneous, Ground fault, UVR, OVR, UFR, OFR, rPower, Vunbal, Iunbal (Maintains state as Latch form until user pushes reset.)
 - General DO: when setting L/R as remote, it is available to control close/open remotely by using communication.



Trip Relay	Digital Output	Long time	Short time	Instantaneous	Ground	Overload Alarm	OVR	UVR	rPower	Vunbal	Iunbal	OFR	UFR	OPR	Note
P, S type	DO1(524)	●	○	○	○	○	○	○	○	○	○	○	○	○	Programmable
	DO2(534)	○	●	●	○	○	○	○	○	○	○	○	○	○	
	DO3(544)	○	○	○	●	○	○	○	○	○	○	○	○	○	
A type	DO1(524)	●	×	×	×	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Fixed
	DO2(534)	×	●	●	×										
	DO3(544)	×	×	×	●										

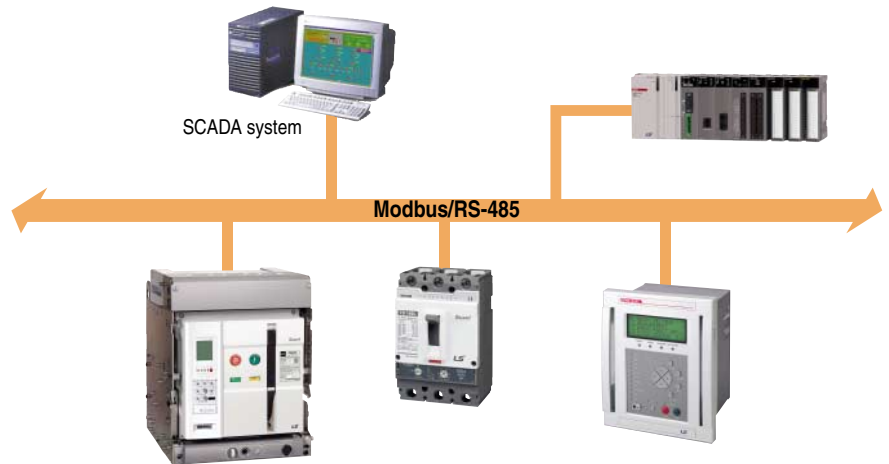
Trip relays

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Communication

Modbus/RS-485

- Operation mode: Differential
- Distance: Max. 1.2km
- Cable :
General RS-485 shielded twist 2-pair cable
- Baud rate :
9600bps, 19200bps, 38400bps
- Transmission method: Half-Duplex
- Termination: 150Ω

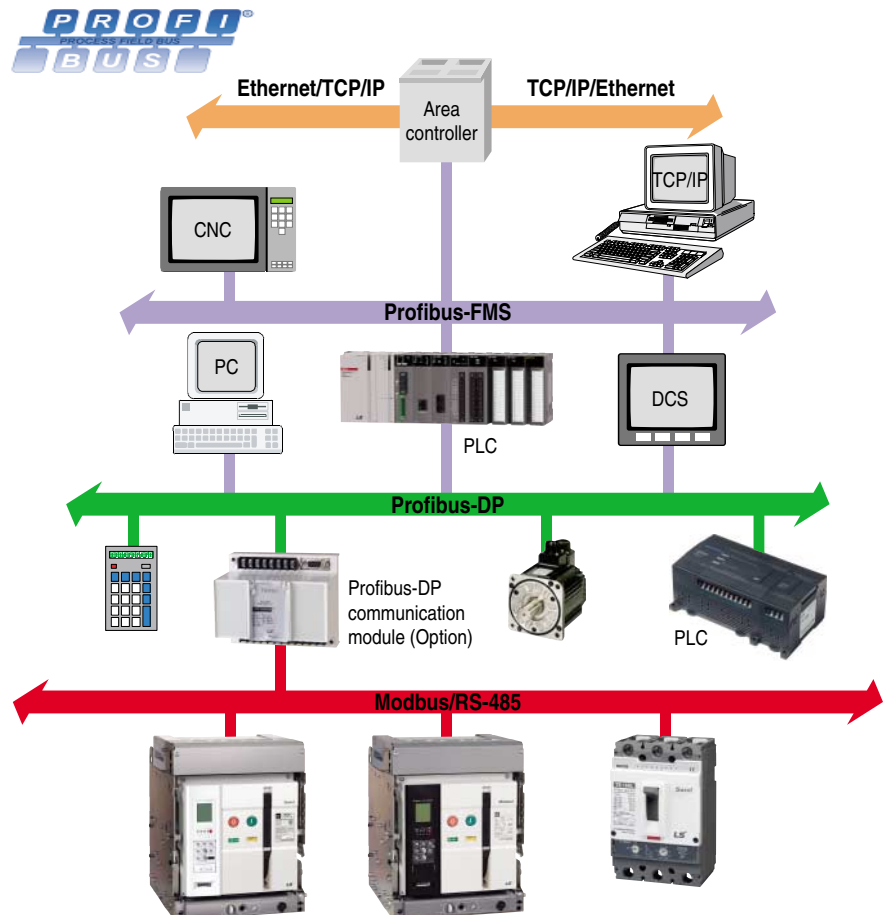


Profibus-DP

- Profibus-DP module is installed separately (Option)
- Operation mode: Differential
- Distance: Max. 1.2km
- Cable :
Profibus-DP shielded twist 2-pair cable
- Baud rate: 9600bps~12Mbps
- Transmission method: Half-Duplex
- Termination resistor: 100Ω
- Standard: EN 50170 / DIN 19245



Profibus-DP communication module (Option)



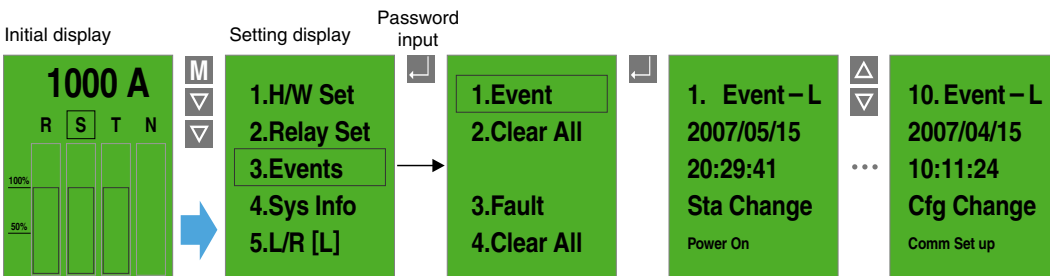
Trip relays

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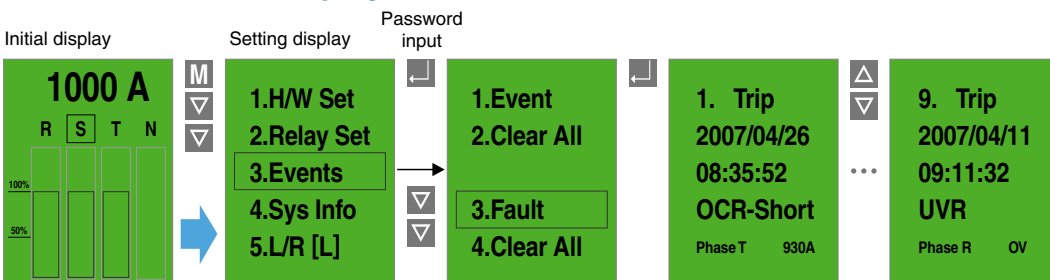
Event & fault recording (P, S type)

When there are events such as setting change, Info. change, error of self-diagnose, state change, P and S type record Max. up to 256 information of the events in accordance with time(ms). In addition, they can record Max. up to 256(up to 10 for A type) information of the faults such as fault cause, fault phase, fault value and so on in accordance with time(ms).

Event information display



Fault information display

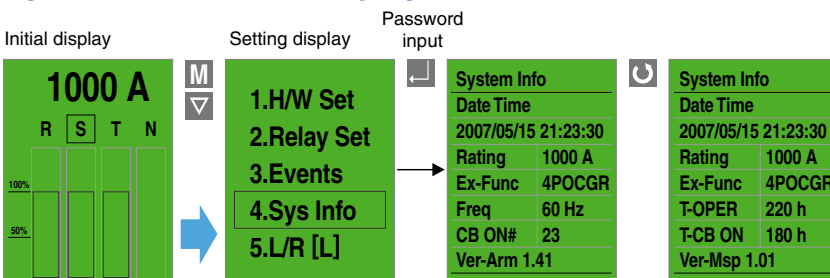


System information

P and S type can indicate information as followings with the information of the ACB.

- Present time: year/month/date/hour/minute/ms
- ACB current ratings
- N-phase current ratings: 100%
- Frequency information: 60Hz / 50Hz
- Closing numbers of breaker: CB ON numbers
- Trip relay operating time: OCR ON time
- ON time of breaker: CB ON time
- S/W ver. information

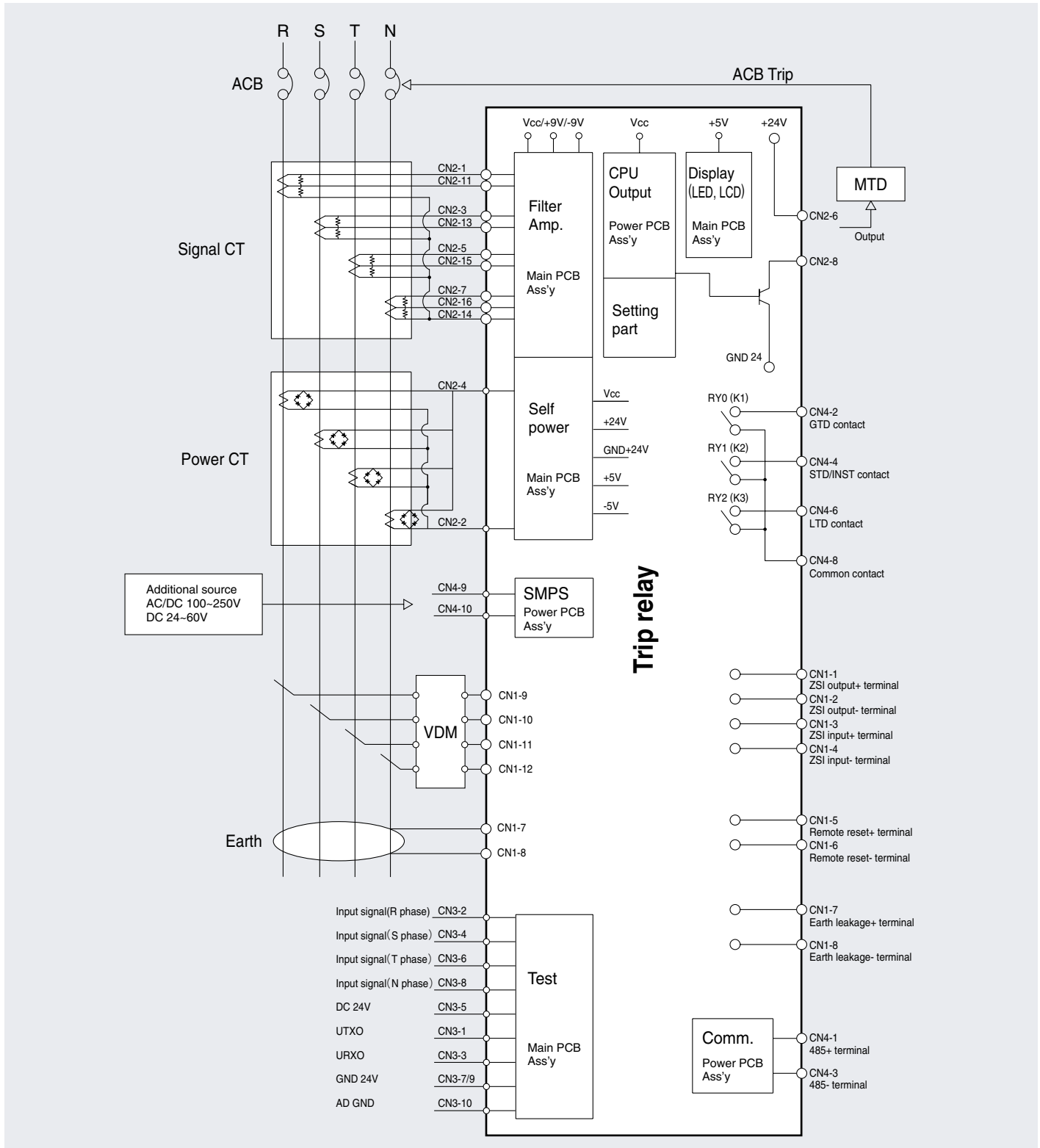
System information display



Trip relays

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System block diagram



Accessories

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Mounting	Accessories		AH		Page
			Standard	Option	
Internal	SHT1	Shunt Coil	●		52
	SHT2	Double Shunt Coil		○	53
	CC	Closing Coil	●		54
	M	Motor	●		55
	CS1	Charge Switch	●		55
	CS2	Charge Switch Communication *		○	55
	UVT	Under Voltage Trip Device		○	56
	AL	Trip Alarm Contact *		○	57
	MRB	Manual Reset Button *		○	57
	RES	Remote Reset Switch		○	58
	RCS	Ready to Close Switch		○	58
	C	Counter	●		65
	AX	Auxiliary Switch		○	59
	TM	Temperature Alarm *		○	74
	External	K1	Key Lock		○
K2		Key Interlock Set		○	60
K3		Double Key Lock		○	61
B		On/Off Button lock		○	61
LH		Lifting Hook		○	62
CTD		Condenser Trip Device *		○	62
ATS		Automatic Transfer Switch Controller *		○	63
DC		Dust Cover		○	65
DF		Door Frame		○	68
OT		OCR Tester *		○	64



* Non UL Listed.

** Separate purchasing is not allowed. Each item should be purchased with the main body.

Accessories

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Mounting	Accessories		AH		Page
			Standard	Option	
Trip relay	N	N type		<input type="radio"/>	26
	A	A type		<input type="radio"/>	28
	P	P type		<input type="radio"/>	30
	S	S type		<input type="radio"/>	32
	VM	Voltage Module		<input type="radio"/>	
Cradle	SBC	Shorting "b" Contact *		<input type="radio"/>	
	MI	Mechanical Interlock		<input type="radio"/>	67
	ST	Safety Shutter		<input type="radio"/>	68
	MIP	Miss Insertion Prevent Device		<input type="radio"/>	72
	MOC	Mechanical Operated Cell Switch		<input type="radio"/>	66
	CEL	Cell Switch		<input type="radio"/>	69
	DI	Door Interlock		<input type="radio"/>	67
	BSP	Body Supporter		<input type="radio"/>	70
	RI	Racking Interlock		<input type="radio"/>	70
	PL	Pad Lock/ Position Lock	●		71
	UDC	UVT Time Delay Controller		<input type="radio"/>	73
Other	RCO	Remote I/O		<input type="radio"/>	75
	PC	Profibus-DP comm. module		<input type="radio"/>	



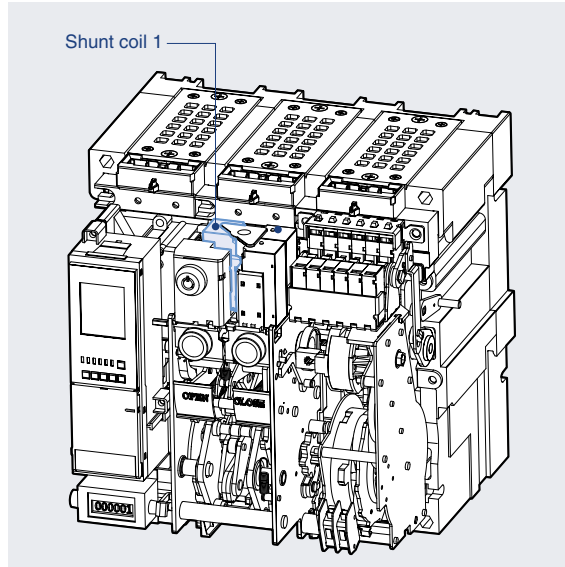
* Non UL Listed.
 ** Separate purchasing is not allowed. Each item should be purchased with the main body.
 *** Voltage module should be purchased with P/S type trip relay.
 **** It is available only when the control block is in the mode of auto-connection.
 ***** Trip unit P type & S type are under development, coming soon.

Accessories

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Shunt Coil [SHT1]

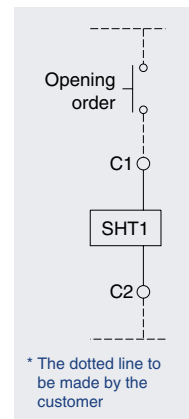
- SHT1 is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 200ms to coil terminals(C1, C2).
- When UVT coil is installed, its location is changed.



1. Rated voltage and characteristics of Trip coil

Rated voltage [Vn]		Operating voltage range [V]	Power consumption (VA or W)		Trip time [ms]
DC [V]	AC [V]		Inrush	Steady-state	
24~30	-	14 ~ 33	200	5	Less than 40ms
48~60	48	28 ~ 66			
100~125	100~125	70 ~ 140			
200~250	200~250	140 ~ 280			
-	380~480 *	266 ~ 528			

Note) Operating voltage range is the min. rated voltage standard for each rated voltage(Vn).
* Non UL Listed.



* The dotted line to be made by the customer

Wiring Diagram

2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

The maximum wire length

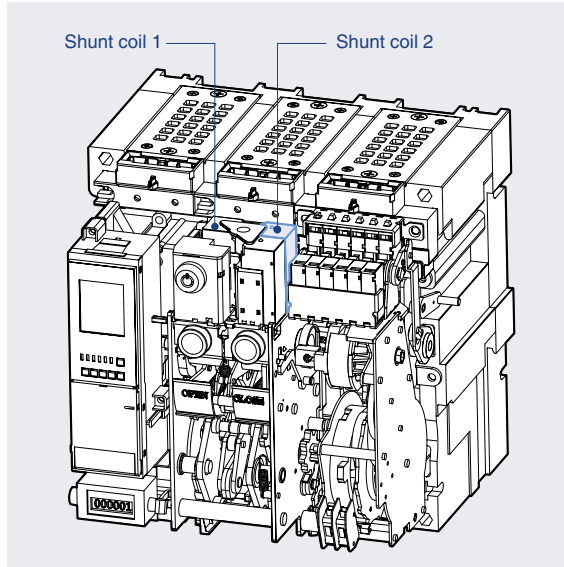
		Rated voltage [Vn]			
		DC 24~30 [V]		DC/AC 48 [V]	
Wire type		#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)	#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

Accessories

Susol

Double Shunt Coil [SHT2]

- SHT2 is a control device which trips a circuit breaker doubly from the outside. When SHT1 doesn't operate normally, it can trip a circuit breaker safely.
- Shunt coil 1: Install it at existing location.
- Shunt coil 2: Install it on the right side of the Shunt coil 1
- It is not available with UVT coil when installing double shunt coil.



1. Rated voltage and characteristics of Trip coil

Rated voltage [Vn]		Operating voltage range [V]	Power consumption (VA or W)		Trip time [ms]
DC [V]	AC [V]		Inrush	Steady-state	
24~30	-	14 ~ 33	200	5	Less than 40ms
48~60	48	28 ~ 66			
100~125	100~125	70 ~ 140			
200~250	200~250	140 ~ 280			
-	380~480 *	266 ~ 528			

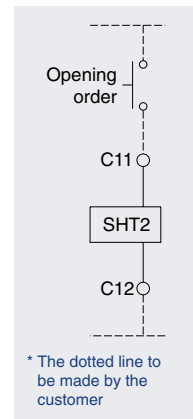
Note) Operating voltage range is the min. rated voltage standard for each rated voltage(Vn).
* Non UL Listed.

2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

The maximum wire length

		Rated voltage [Vn]			
		DC 24~30 [V]		DC/AC 48 [V]	
Wire type		#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)	#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m



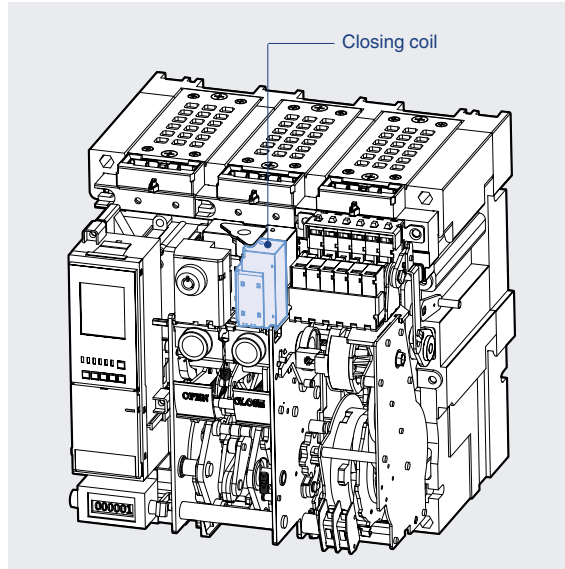
Wiring Diagram

Accessories

Susol

Closing Coil [CC]

- It is a control device which closes a circuit breaker, when the voltage is applied continuously or instantaneously over 200ms to the coil terminals (A1, A2).



1. Rated voltage and characteristics of Closing coil

Rated voltage [Vn]		Operating voltage range [V]	Power consumption (VA or W)		Close time [ms]
DC [V]	AC [V]		Inrush	Steady-state	
24~30	-	14 ~ 33	200	5	Less than 80ms **
48~60	48	28 ~ 66			
100~125	100~125	70 ~ 140			
200~250	200~250	140 ~ 280			
-	380~480 *	266 ~ 528			

Note) Operating voltage range is the min. rated standard for each rated voltage (Vn).

* Non UL Listed.

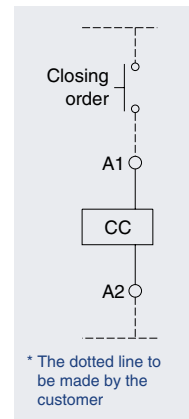
** Close time of G frame (3200~5000A) is less than 95ms.

2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

The maximum wire length

		Rated voltage [Vn]			
		DC 24~30 [V]		DC/AC 48 [V]	
Wire type		#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)	#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m



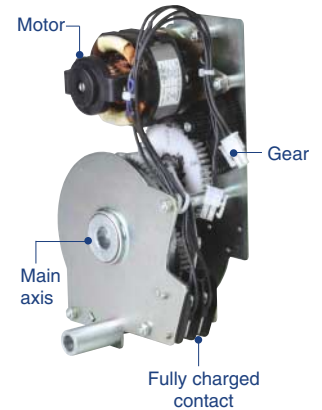
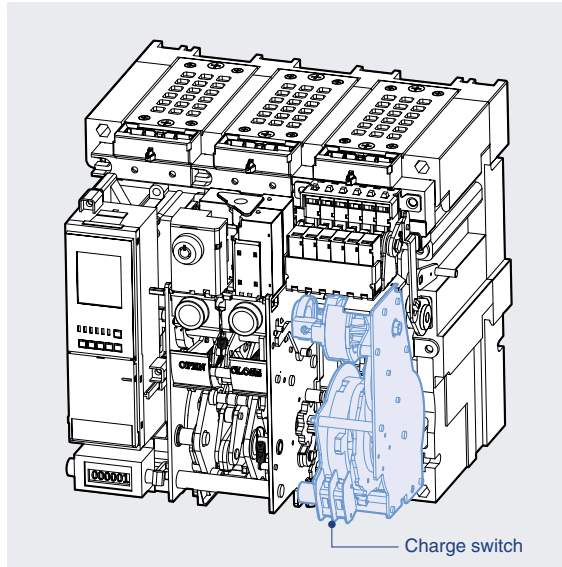
Wiring Diagram

Accessories

Susol

Motor [M]

- Charge the closing spring of a circuit breaker by the external power source. Without the external power source, charge manually.
- Operating voltage range 85%~110%Vn



Input voltage(V)	DC 24~30V	AC/DC 48~60V	AC/DC 100~130V	AC/DC 200~250V	AC 380V	AC 440~480V
Load current(max.)	5A	3A	1A	0.5A	0.3A	0.3A
Starting current(Max.)	5 times of load current					
Load rpm(Motor)	15000 ~ 19000 rpm					
Charge time	Less than 5sec.					
Dielectric strength	2kV/min					
Using temperature range	-20° ~ 60°					
Using humidity range	Max. RH 80% (No dew condensation)					
Endurance	15,000 cycle (Load connection, 2 times/min)					
Charge switch	10A at 250VAC					

* Non UL Listed.

Charge Switch [CS1]

Charge Switch Communication [CS2]

- It is a built-in contact which sends the signal to the outside, when motor charging is completed. (2a)
- It has a “1a” contact for communication and the other “1a” contact for complete charging.
- When using an extra communication module (Remote I/O), the state of contacts can be displayed through the network.

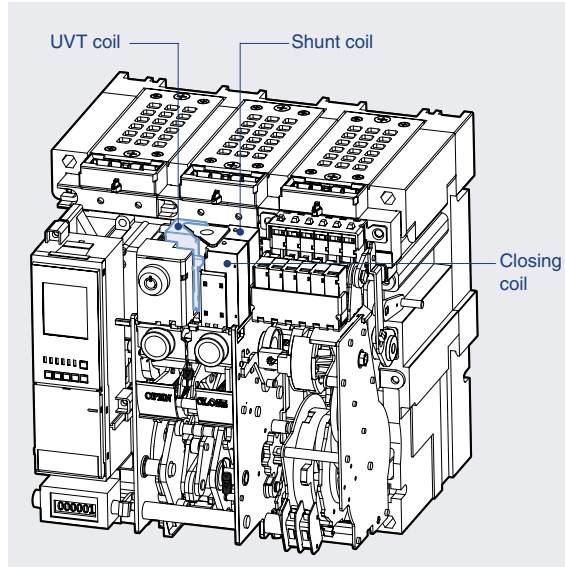
Classification	Standard		Remark
Contactor Capacity	250/125 Vac	10 A	
	250 Vdc	0.3 A	
	125 Vdc	0.6 A	
	48 Vdc	3 A	
	24 Vdc	5 A	

Accessories

Susol

Under Voltage Trip device [UVT]

- If the voltage of the main or the control power is under voltage, UVT which is installed inside of the breaker breaks the circuit automatically. Please connect with UVT time-delay device in order to present the time-delay function because UVT is technically instantaneous type.
- The closing of a circuit breaker is impossible mechanically or electrically if control power not supplied to UVT. To close the circuit breaker, 65~85% of rated voltage should be applied to both terminals of UVT coil (D1, D2).
- When using UVT coil, the double trip coil can not be used, and the location of trip coil is changed.



1. Rated voltage and characteristics of UVT coil

Rated voltage [Vn]		Operating voltage range [V]		Power consumption (VA or W)		Trip time [ms]
DC [V]	AC [V]	Pick up	Drop out	Inrush	Steady-state	
24~30	-	0.65~0.85 Vn	0.3~0.6 Vn	200	5	Less than 50ms
48~60	48					
100~130	100~130					
200~250	200~250					
-	380~480					

Note) Operating voltage range is the min. rated standard for each rated voltage (Vn).

2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

The maximum wire length

		Rated voltage [Vn]			
		DC 24~30 [V]		DC/AC 48 [V]	
Wire type		#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)	#14 AWG (2.08mm ²)	#16 AWG (1.31mm ²)
Operating voltage	100%	48.5m	30.5m	233.2m	143.9m
	85%	13.4m	8.8m	62.5m	39.3m

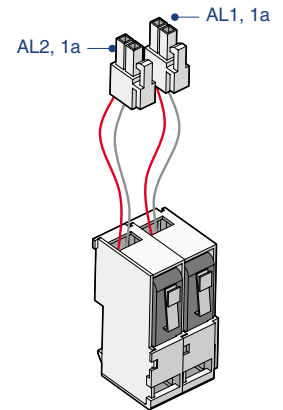
Note) In case of using UVT coil, the location of Shunt coil is changed.

Accessories

Susol

Trip Alarm Contact [AL]

- When a circuit breaker is tripped by OCR which operates against the fault current (Over Current Relay), Trip Alarm switch provides the information regarding the trip of circuit breaker by sending the electrical signal from the mechanical indicator on main cover of main circuit breaker or internal auxiliary switch. (Installed at the inside of circuit breaker)
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the main cover and the switch (AL) which sends control signal electrically is conducted to output the information occurred from fault circuit breaker.
- MRB and AL can be operated only when tripping by OCR, but doesn't be operated by Off button and OFF operation of trip coil.
- To re-close a circuit breaker after a trip, press MRB to reset it for closing.
- 2pcs of electrical trip switch (AL1, AL2, 1a) are provided (Option)
- Trip alarm contact and MRB(Manual reset bottom) need to be purchased together.

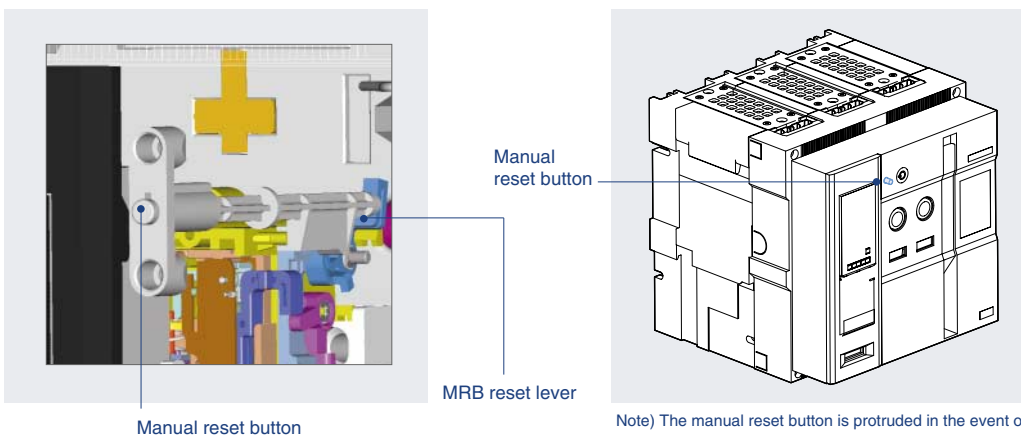
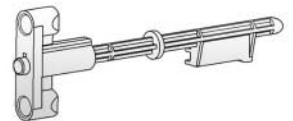


1. Electrical characteristics of trip alarm contact

Classification	Standard		Remark
Contactor Capacity	250/125 Vac	10 A	
	250 Vdc	0.3 A	
	125 Vdc	0.6 A	
	48 Vdc	3 A	
	24 Vdc	5 A	

Manual Reset Button [MRB]

- It is a function which resets a circuit breaker manually when a circuit breaker is tripped by OCR.
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the main cover and the switch(SDE) which sends control signal electrically is conducted to output the information occurred from fault circuit breaker.
- MRB can be operated only by OCR but not by OFF operation of circuit breaker. To re-close a circuit breaker after a trip, press MRB to reset it for closing.



Accessories

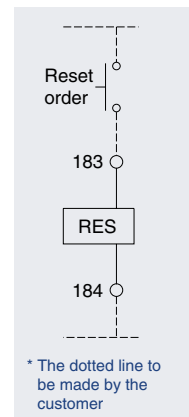
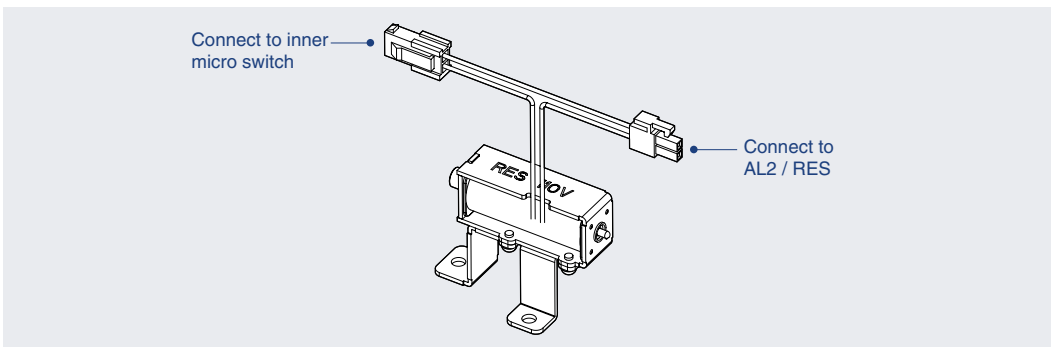
Susol

Remote Reset Switch [RES]

- Following tripping, this function resets the "fault trip" alarm contacts(AL) and the mechanical indicator(MRB) and enables circuit breaker closing.
Push button switch : AC 125V 10A, AC 250V 6A, DC 110V 2.2A, DC 220V 1.1A Resistive load
- In case of auto reset type circuit breaker
Following tripping, a reset of Manual Reset Button(MRB) or Remote Reset Switch(RES) is no longer required to enable circuit breaker closing.
The mechanical indicator(MRB) and electrical indicator(AL) remain in fault position until the reset button is pressed.
- AL2 and RES are alternative.

1. Rated voltage and rated current of RES

Rated voltage	Operating current(Max.)		Operating time	Wire spec.
	AC	DC		
AC/DC 100~130V	AC	6A	Less 40ms	#14 AWG (2.08 mm ²)
	DC	5A		
AC/DC 200~250V	AC	3A		#16 AWG (1.31 mm ²)
	DC	2.5A		

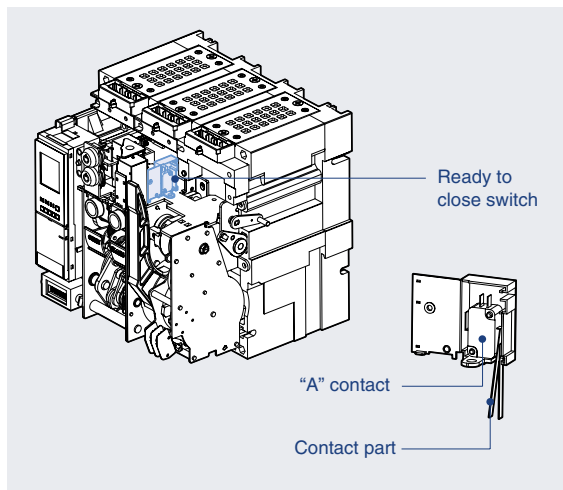


Wiring Diagram

Ready to Close Switch [RCS]

- It interlocks with mechanism of circuit breaker.
- It indicates the status that the circuit breaker is ready to do closing operation.
- When mechanism is in OFF position or in Charge, contact is output with "ON" and it indicates that mechanism can be closed.

Classification	Standard		Remark
Contactor Capacity	250/125 Vac	10 A	
	250 Vdc	0.3 A	
	125 Vdc	0.6 A	
	48 Vdc	3 A	
	24 Vdc	5 A	



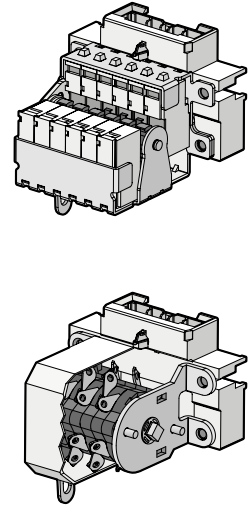
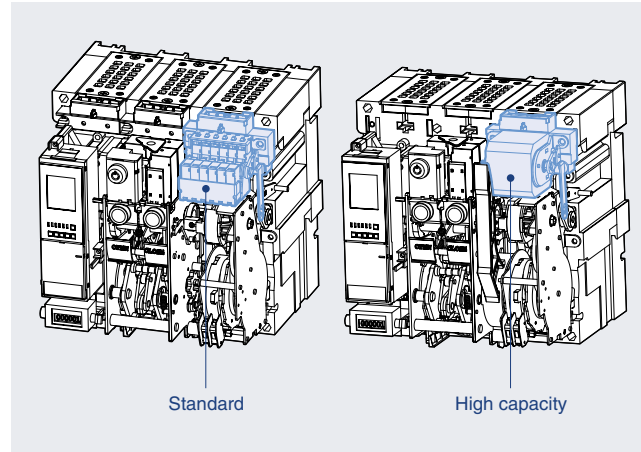
Accessories

Susol

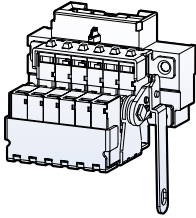
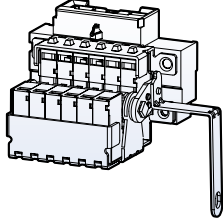
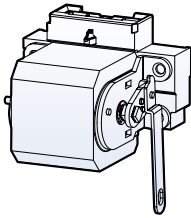
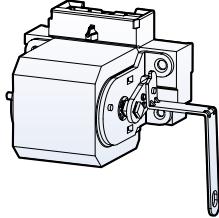
Auxiliary switch [AX]

- It is a contact used to monitor ON/OFF position of ACB from remote place.

AUX. contact & charging types	
AX	Standard OFF charge 3a3b
AC	Standard ON charge 3a3b
BX	Standard OFF charge 5a5b
BC	Standard ON charge 5a5b
HX	High capacity OFF charge 5a5b
HC	High capacity ON charge 5a5b
CC	Standard ON charge 6a6b
JC	High capacity ON Charge 6a6b



Standard classification

Standard		High capacity	
2000, 5000AF	4000, 6300AF	2000, 5000AF	4000, 6300AF
			

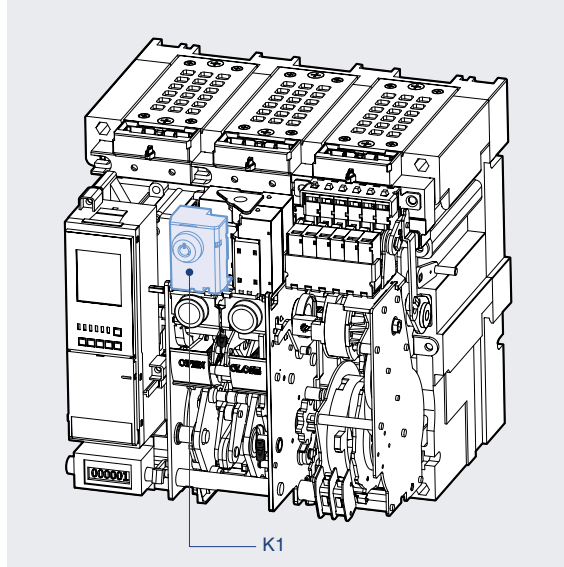
Classification		Standard		High capacity		Remark
Contactor Capacity		250/125 Vac	10 A	250/125 Vac	10 A	
		250 Vdc	0.3 A	250 Vdc	3 A	
		125 Vdc	0.6 A	125 Vdc	5 A	
		48 Vdc	3 A	48 Vdc	10 A	
		24 Vdc	5 A	24 Vdc	10 A	
No. of Contact that can be used	AX	3a3b		-		Standard charging type
	BX	5a5b		-		
	HX	-		5a5b		
	AC	3a3b		-		Rapid auto-reclosing charging type
	BC	5a5b		-		
	CC	6a6b		-		
	HC	-		5a5b		
	JC	-		6a6b		

Accessories

Susol

Key Lock [K1]

- It is a device for locking which prevents a certain circuit breaker from being operated by user's discretion when two or more circuit breakers are used at the same time.
- K1: Preventing mechanical closing



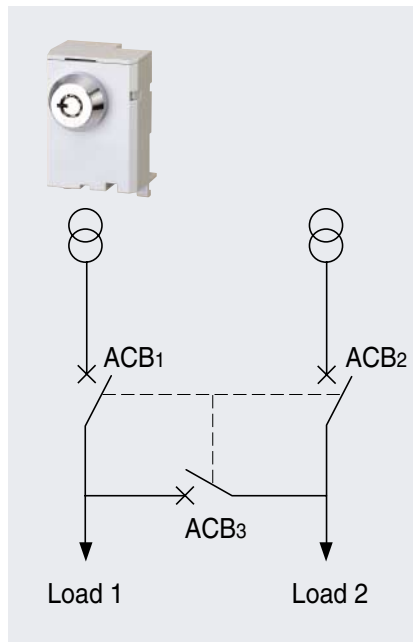
Key Interlock Set [K2]

- 3 circuit breakers can be arranged for the continuous power supply to the load side and be interlocked mutually by using Key Lock embedded in each circuit breaker.

ACB-1	ACB-2	ACB-3	Status	
			LOAD1	LOAD2
●	●	●	OFF	OFF
●	○	○	ON	ON
○	●	○	ON	ON
○	○	●	ON	ON
●	●	○	OFF	OFF
●	○	●	OFF	ON
○	●	●	ON	OFF

○: Release ●: Lock

Wiring

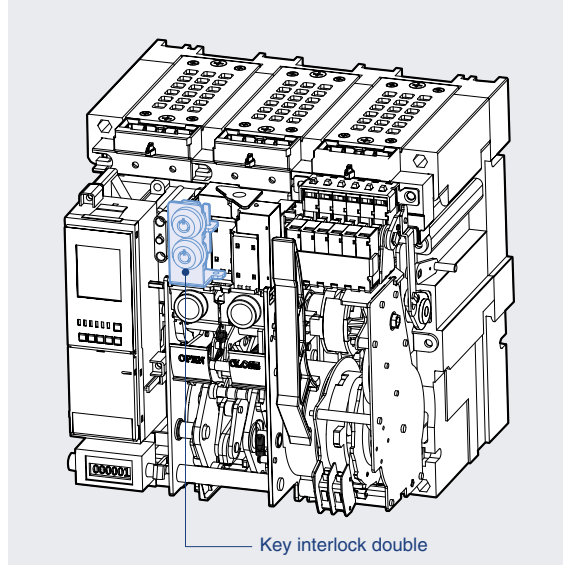


Accessories

Susol

Double Key Lock [K3]

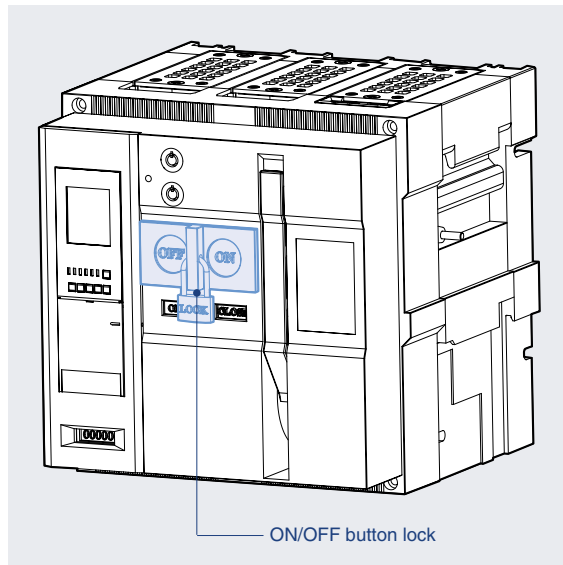
- When only two keys are released at the same time, circuit breakers operate. Handling method is same as K1.



ON/OFF Button Lock [B]

- It is to prevent manual operation of ACB's closing/tripping button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.

Note) Padlocks(Ø5 ~ Ø6) are not supplied.

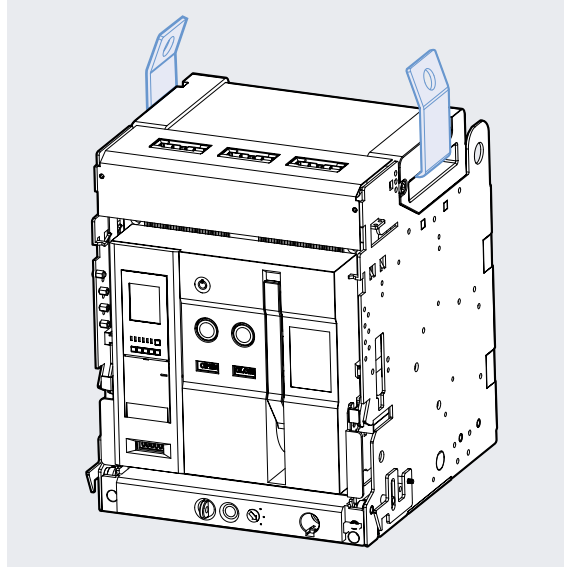


Accessories

Susol

Lifting Hook [LH]

- It is a device to make an ACB easy to shift.
- Please hang it to both handles of the arc cover.



Condenser Trip Device [CTD]

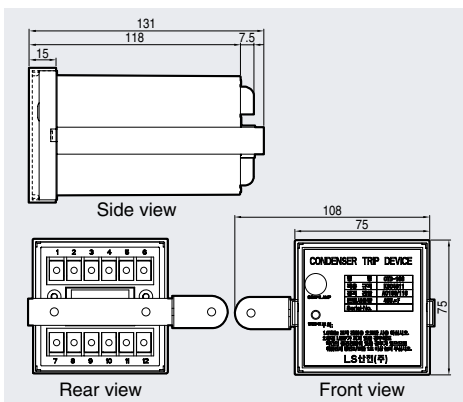
- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, It can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.

Ratings

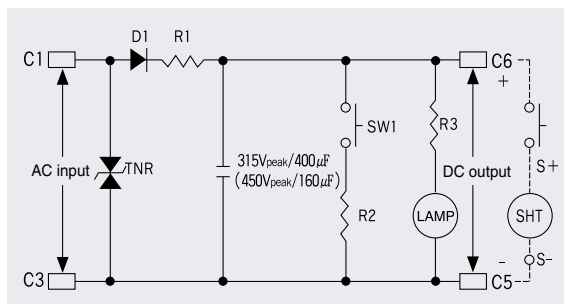
	Ratings	Specification
Model	CTD-100	CTD-200
Rated input voltage (V)	AC 100/110	AC 200/220
Frequency (Hz)	50/60	50/60
Rated charge voltage (V)	140/155	280/310
Charging time	Within 5S	Within 5S
Trip possible time	Over 3 MIN	Over 2 MIN
Range of Input voltage (%)	85~110	85~111
Condenser capacity	400 μ F	160 μ F



External dimension



Circuit diagram



* Non UL Listed.

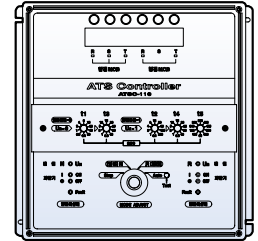
Accessories

Susol

Automatic Transfer Switch Controller [ATS]

Ratings

Model type	ATSC-110	ATSC-220
Rated voltage	AC 110V	AC 220V
Voltage range	AC 93.5(±5%) ~126.5V(±5%)	AC 187(±5%) ~ 253V(±5%)
Frequency	50Hz/60Hz	
Power consumption (apparent power)	15.4W	
4-location switch (stop, N, R, Auto)	■	■
Test function	■	■
Generator control function	■	■
N power source setting (phase-to-phase/ 3phases)	■	■
Time setting (T1~T6)	■	■
Fault function (OCR/Circuit breaker trouble)	■	■
Output contact (Auto, Load burden)	■	■
Communication function (RS-485)	-	-



- T₁: The delayed time from when UN (power supply of electric company) is tripped to when generator start-up signal contact is closed. (t₁: 0.2, 0.5, 1, 2, 4, 8, 15, 30, 40, 50secs)
- T₂: The delayed time from when UN is closed to when ACB₂ is tripped. (t₂: 0.2, 1, 2, 4, 8, 15, 30, 60, 120, 240secs)
- T₃: The delayed time from when ACB₁ is tripped to when ACB₂ is closed. (t₃: 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40secs)
- T₄: The delayed time from when ACB₂ is tripped to when ACB₁ is closed. (t₄: 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40secs)
- T₅: The delayed time when ACB₁ is closed to when generator start-up signal contact is opened. (t₅: 60, 120, 180, 240, 300, 360, 420, 480, 540, 600secs)
- Stop-mode: This mode is for compulsory trip of ACB₁(electric power company) or ACB₂ (power station) when UN (power supply of electric power company) or UR (power supply of power station) is available
*UN or UR should be kept in ON position
- N-mode: This mode is for compulsory closing of ACB₁ when UN is available.
* it does not matter to be ON or OFF position of UR and if converting to N-mode while using UR, generator start-up signal contact is opened.
- R-mode: This mode is for compulsory closing of ACB₂ during the use of UR regardless of that UN is available or not.
- Auto-mode: This mode is for transferring a circuit breaker automatically to available power supply of UN or UR. In short, it trips the circuit breaker where power supply is not available and it close the circuit breaker where power supply is available.

* Non UL Listed.

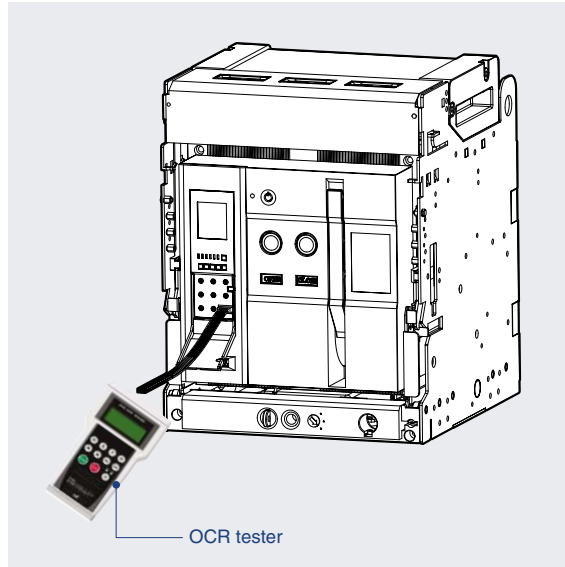
Accessories

Susol

OCR Tester [OT]

- It is a device which can test for the operation of Trip Relay under no power condition.

- Maximum 17 times rated current can be inputted.
- It is possible to enter the current value and phase on each of R/S/T/N
- Frequency is adjustable.
- It is available to test for long time delay/short time delay/instantaneous /ground fault.



Configuration



R S T N	R, S, T, N phase signal input
↶ ↷	Increase/Decrease signal input
ENT. ESC	Signal setting/Delete
START STOP	Waveform generation/Stop
50Hz 60Hz Hz	Select frequency

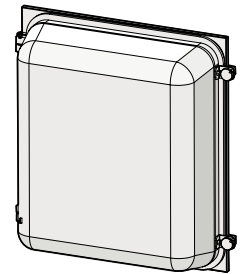
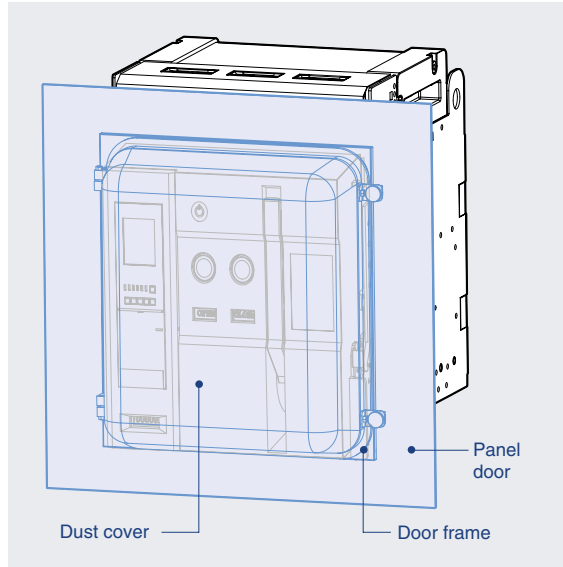
* Non UL Listed.

Accessories

Susol

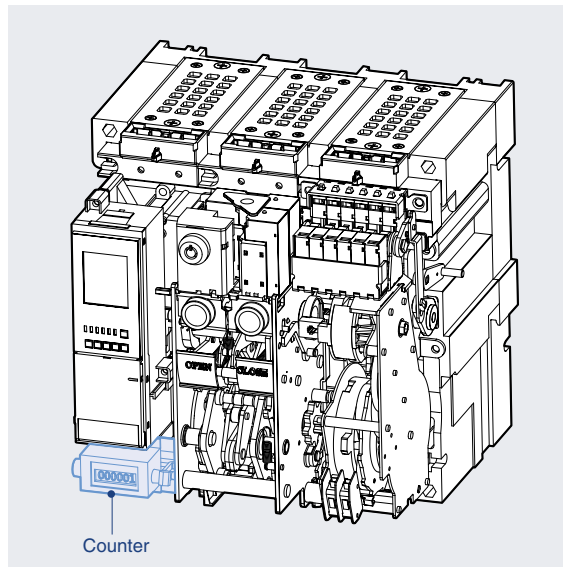
Dust Cover [DC]

- Attach it to the door frame.
- It protects the product against the dust (IP5X) which may cause fault operation and enhances the sealing degree by being mounted to protrude type of panel.
- It is transparent so that the front side of ACB is visible and the Cover can be opened/closed even if ACB is drawn out to until TEST position.



Counter [C]

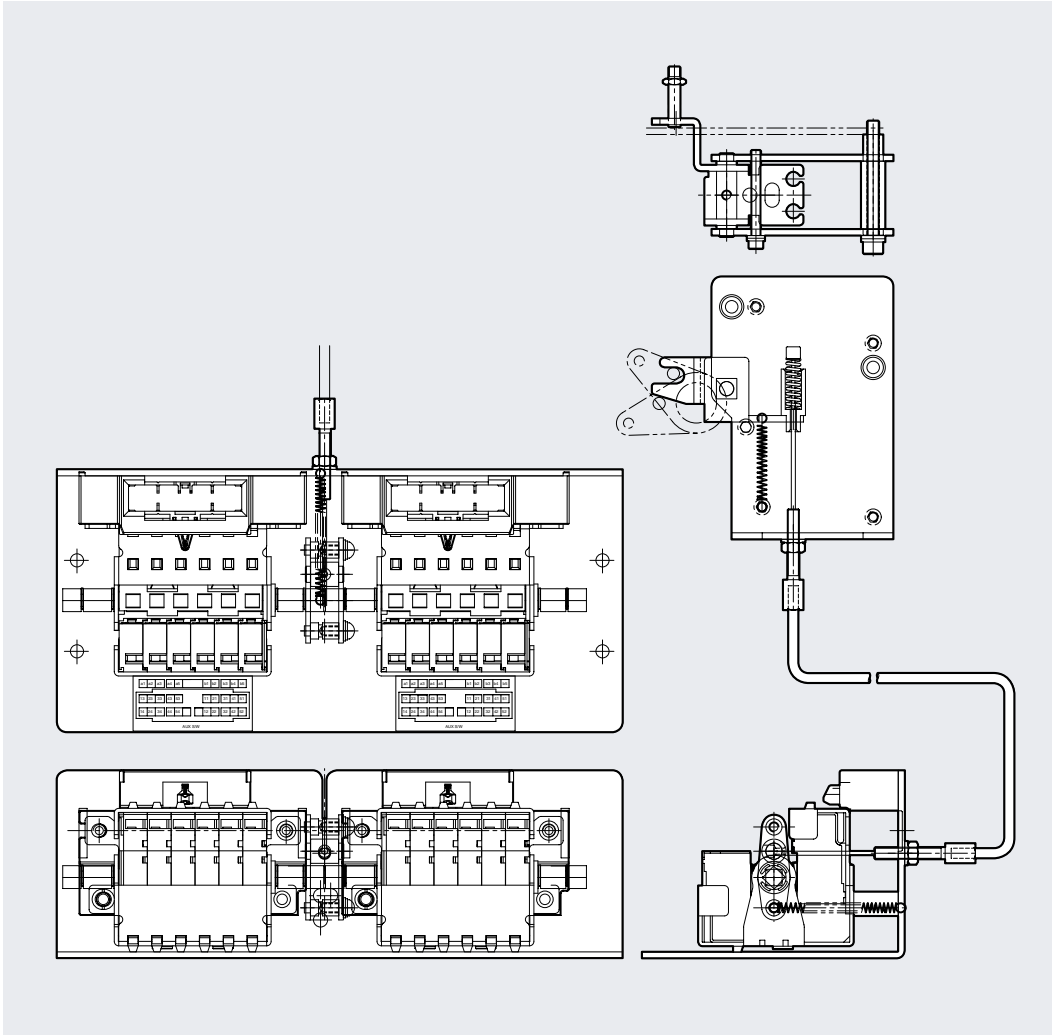
- It displays the total number of ON/OFF operation of ACB.



Accessories

Susol

Mechanical Operated Cell Switch [MOC]

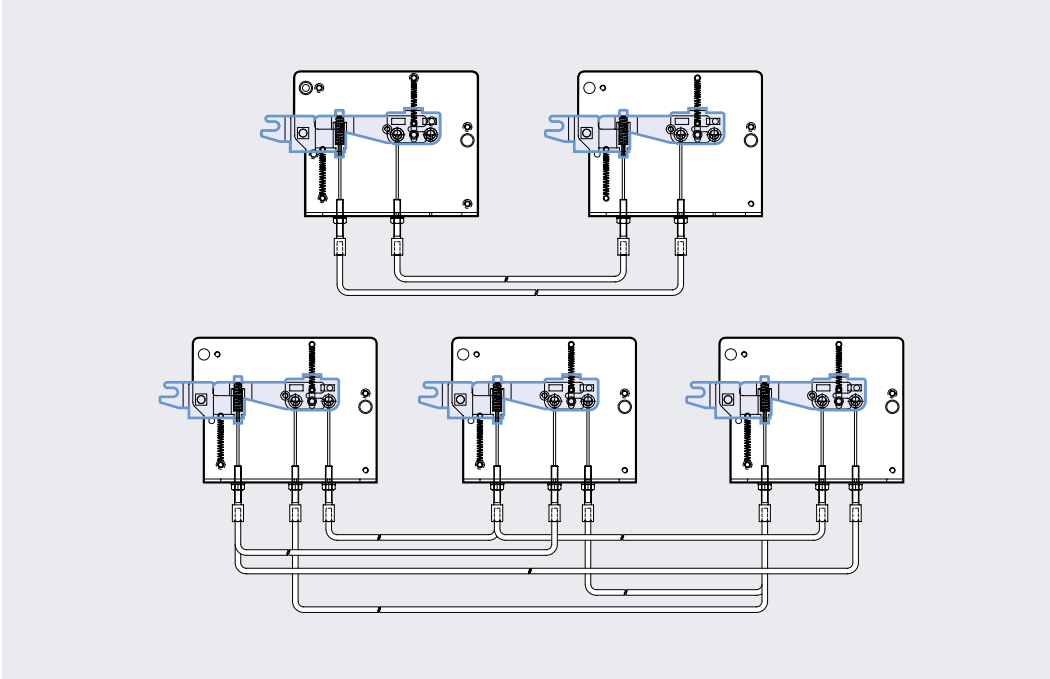


- It is the contact (10a10b) which displays the ON/OFF condition of ACB.
It mechanically operates only when the breaker is "CONNECTED" position.
A standard type and a high capacity type is available.
- The contact capacity is as same as the ratings of aux. contacts.
- When MOC link is installed to cradle, MOC can be equipped with the inside of panel.

Accessories

Susol

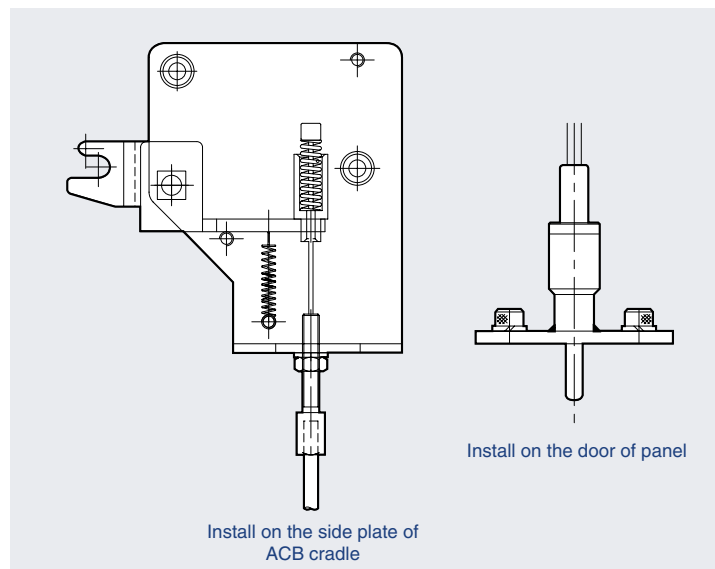
Mechanical Interlock [MI]



- It is used to interlock closing and trip between two or three breakers mechanically so as to prevent unintended operation at the same time.
- Wire type interlock can be applied upto 3 breakers

Door Interlock [DI]

- It is a safety device which does not allow the panel door to open when a circuit breaker is in the "ON" position.



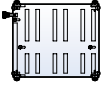
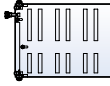
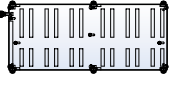
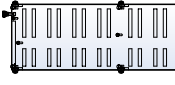


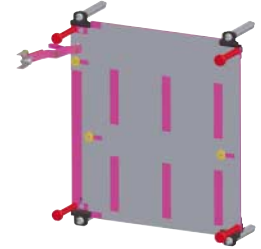
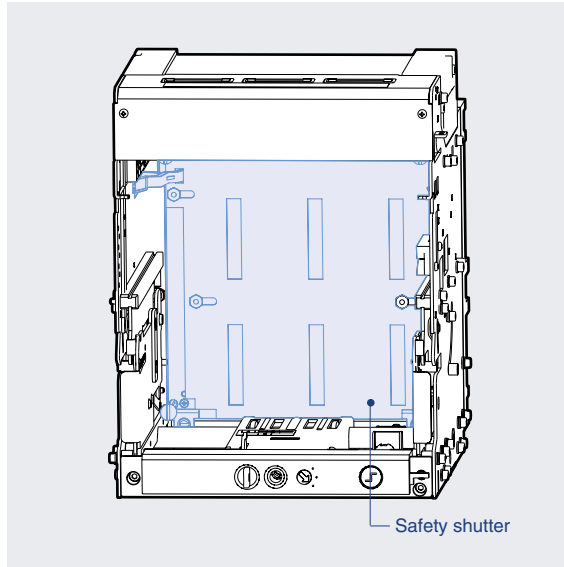
Accessories

Susol

Safety Shutter [ST]

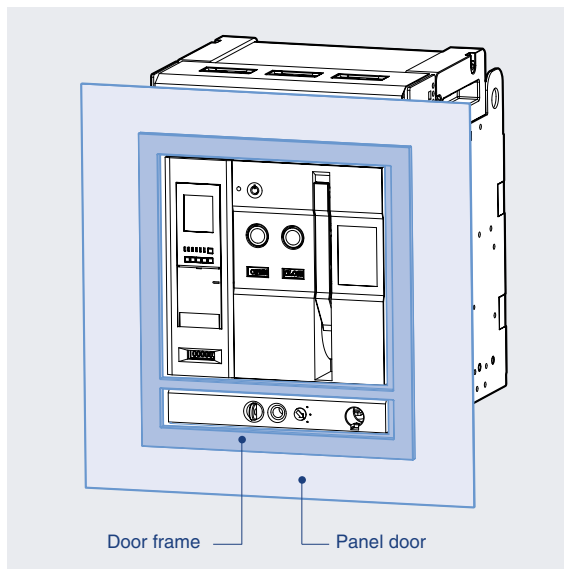
- It is the automatic safety device to protect the connectors of main circuit by cutting off dangerous contact from outside while the breaker is drawn out. When the ACB is drawn in, the shutter is automatically opened.
- There are 4 types of Safety Shutter and they are divided as shown in figure below.

The types of safety shutter plate	
1600AF, 3P	1600AF, 4P
	
3200AF, 3P	3200AF, 4P
	
5000AF, 4P	5000AF, 4P
	



Door Frame [DF]

- When structuring the embedded type of ACB panel, it protects the protrude front of ACB and the cutting side of panel door by attaching it to the panel door.



Accessories

Susol

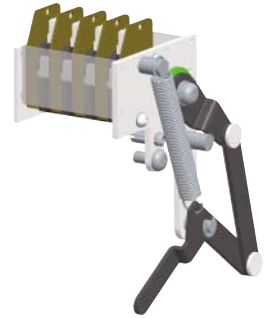
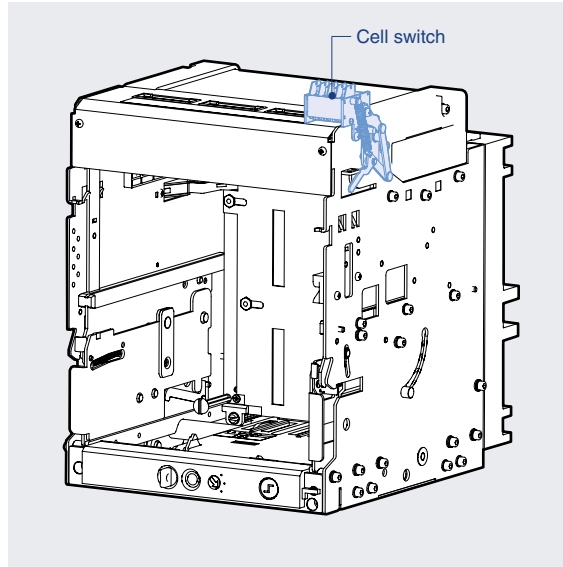
Cell Switch [CEL]

- It is a contact which indicates the present position of ACB. (CONNECTED, TEST, DISCONNECTED)

<Contact configuration>

4C: 1Disconnected +1Test +2Connected

※ Contact configuration can be changeable if necessary.



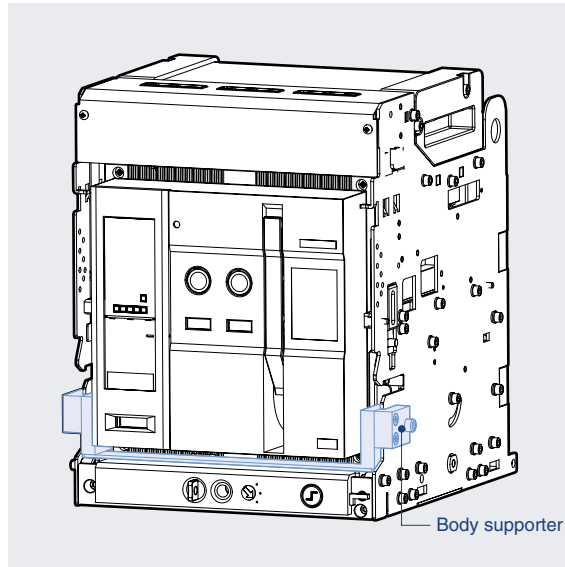
ACB position		DISCONNECTED		CONNECTED
Draw-in and draw-out position		DISCONNECTED	TEST	CONNECTED
Contact operation	CL-C (Connected)	OFF	OFF	ON
	CL-T (Test)	OFF	ON	ON
	CL-D (Disconnected)	ON	OFF	ON
Classification		Standard		
Contact capacity		250/125 Vac		10 A
		250 Vdc		0.3 A
		125 Vdc		0.6 A
		48 Vdc		3 A
		24 Vdc		5 A
Contact number		4C		

Accessories

Susol

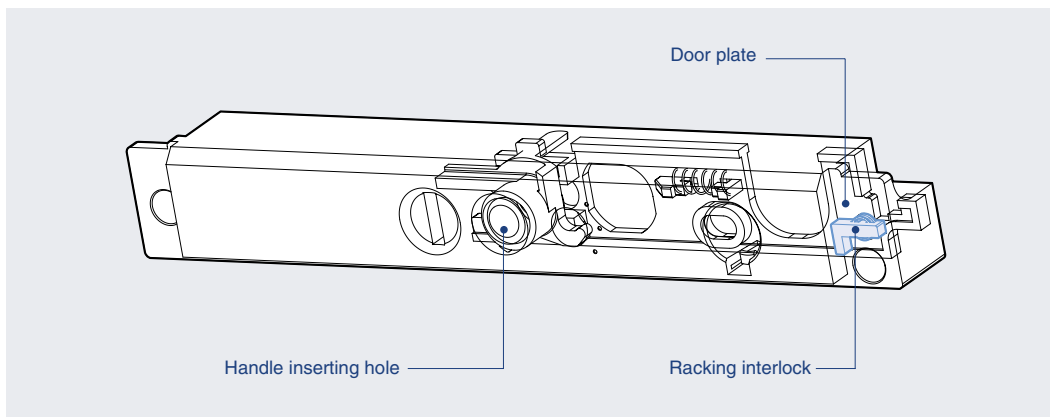
Body Supporter [BSP]

- It interlocks the main body of circuit breaker and cradle mechanically to fix the former in connected position. Therefore, all draw-in/outs are not available.



* Non UL Listed.

Racking Interlock [RI]

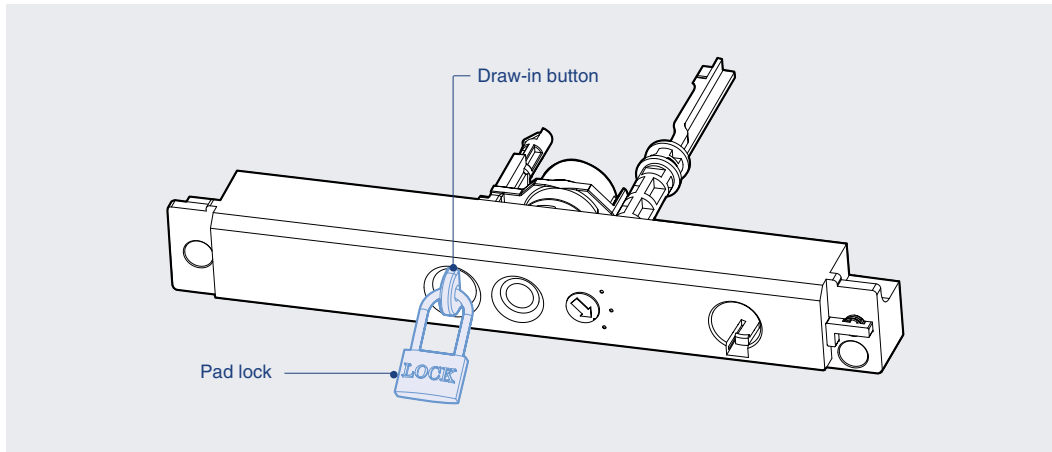


- When panel door is opened, Draw in/out handle doesn't be inserted. Thus, panel handle can be inserted only when panel door is closed.

Accessories

Susol

Pad Lock / Position Lock [PL]



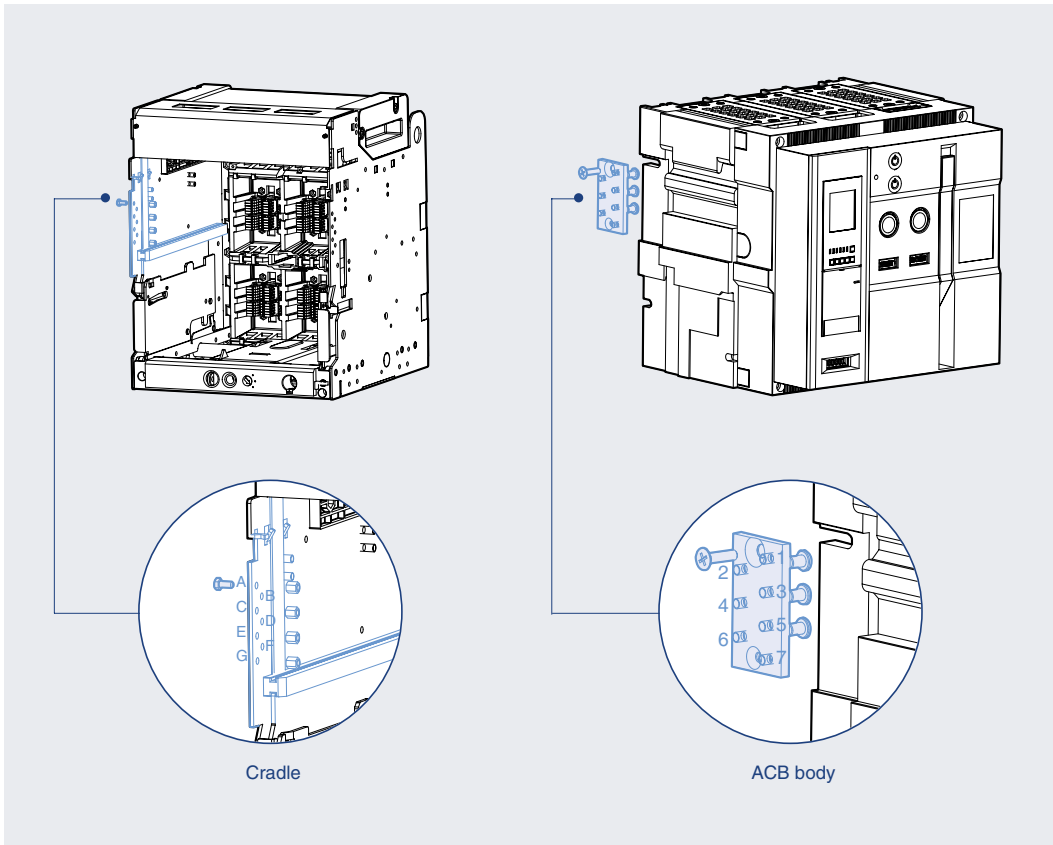
ACB is subject to restriction regarding moving in connected, test, disconnected when drawing in or out. If main body of ACB is placed in 3 positions, it is locked and stopped when drawing in or out.

- As shown in the figure, if draw-in/out button pops out, it means locking is operating.
- To continue Draw-in/out operation, release lock by pushing Draw-in/out button
- In case it is locked as shown in the figure above, main body of ACB can not be drawn in or out into the cradle.
- For the lock device, user has to purchase it. ($\varnothing 5 \sim \varnothing 6$)

Accessories

Susol

Miss Insertion Prevent Device [MIP]



- When the main body of ACB is inserted to the cradle, if the ratings of ACB does not match with cradle, it mechanically prevents ACB from being inserted into cradle of ACB.
- The installation method is variable according to ratings.

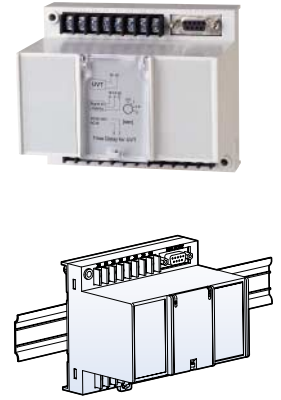
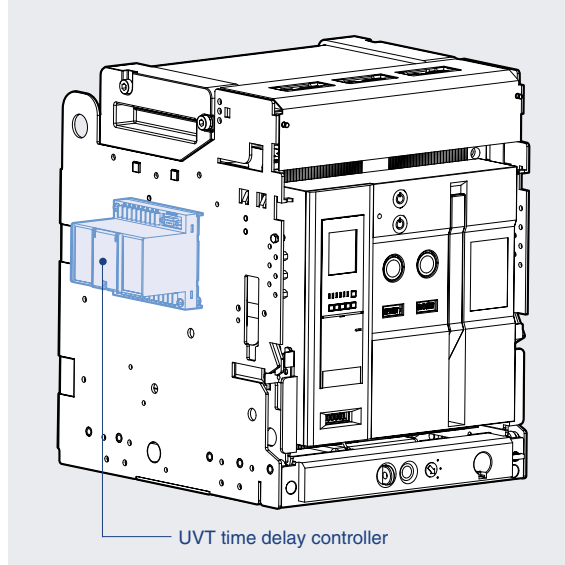
Cradle	ACB	Cradle	ACB	Cradle	ACB	Cradle	ACB
ABCD	567	ADEF	237	ABEG	346	BCEG	146
ABCE	467	ADEG	236	ABFG	345	BDEF	137
ABCF	457	ADFG	235	ACDE	267	BDEG	136
ABCG	456	AEFG	234	ACDF	257	BDFG	135
ABDE	367	BCDE	167	ACDG	256	CDEF	127
ABDF	357	BCDF	157	ACEF	247	CDEG	126
ABDG	356	BCDG	156	ACEG	246	CEFG	124
ABEF	347	BCEF	147	ACFG	245	DEFG	123

Accessories

Susol

UVT Time Delay Controller [UDC]

- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown. There are two types, Instantaneous type and time delay type.
- It can be installed on the rail or to the cradle.
- Instantaneous type: only available with UVT coil.
- Time delay type: available by connecting UVT coil and UVT time delay controller.
- Common use for the all types.

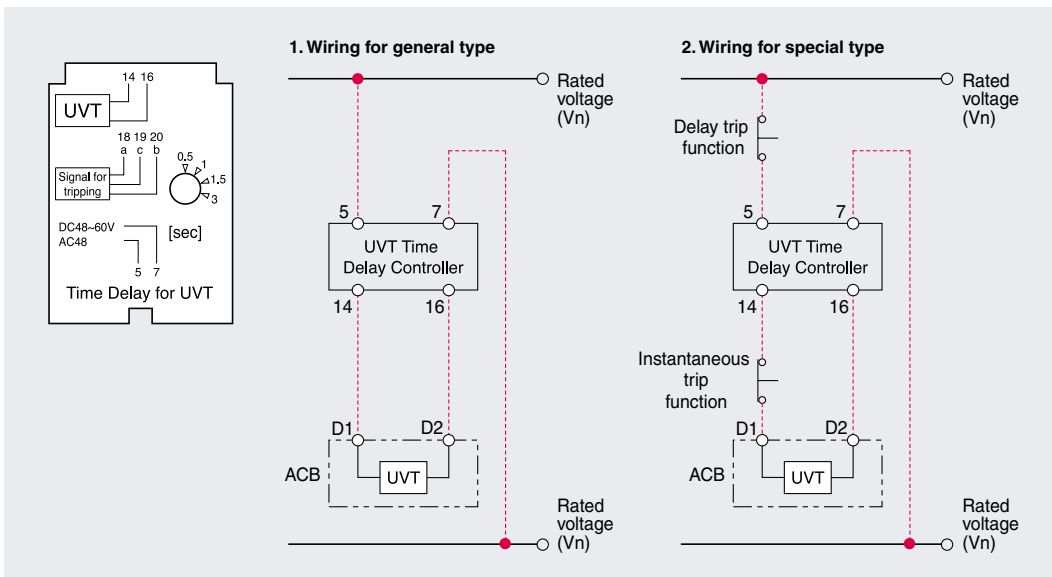


1. The rated voltage and characteristic of UVT time delay controller

Rated voltage [Vn]		Operating voltage range [V]		Power consumption (VA or W)		Trip time[s]
DC [V]	AC [V]	Pick up	Drop out	Inrush	Steady-state	
48~60	48	0.65~0.85 Vn	0.4~0.6 5Vn	200	5	0.5, 1, 1.5, 3
100~130	100~130					
200~250	200~250					
-	380~480					

Note) Operating voltage range is the min. rated standard for each rated voltage (Vn).

2. Wiring



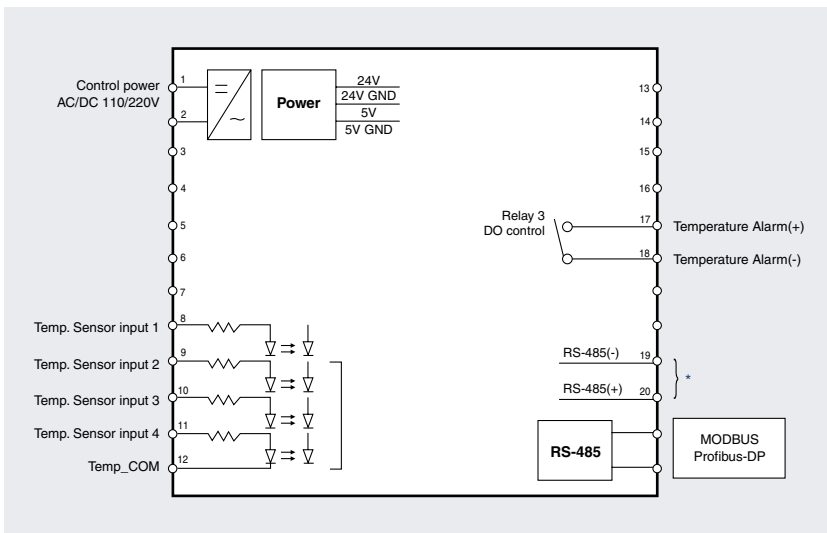
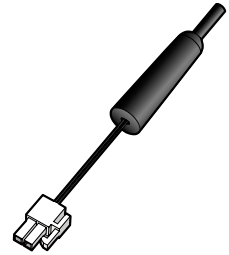
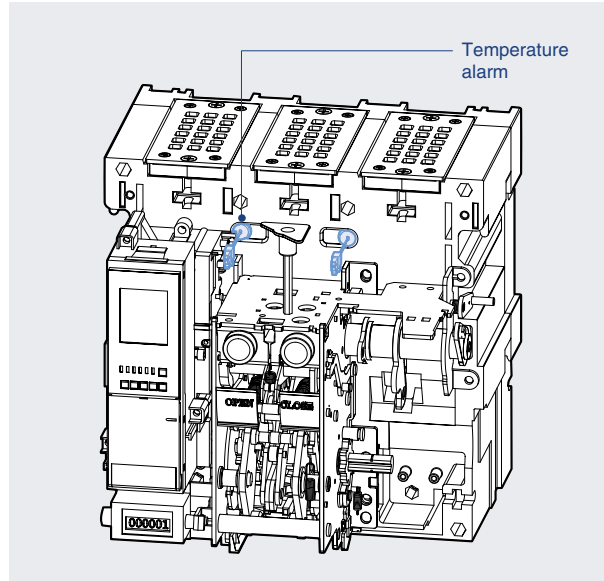
* The wiring presented with red color should be set by users.

Accessories

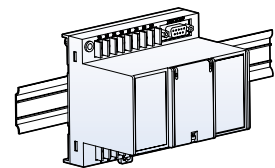
Susol

Temperature Alarm [TM]

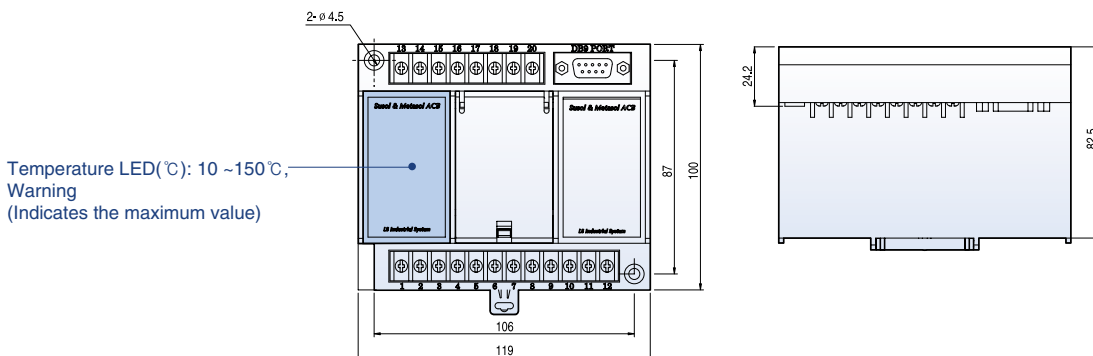
- Temperature Alarm Unit is a device to show the temperature through a sensor inside of ACB.
- The temperature sensor can be installed up to 4 and the output is connected to control terminal blocks.
- It displays the maximum temperature of them and transmits through a network.
- If the temperature is higher than a standard, an alarm can occur.
- Temperature alarm unit communicates with Modbus / RS-485 basically, Profibus-DP need to be purchased separately.
- Temperature alarm unit is installed on the cradle or the inside of panel.



Temperature alarm



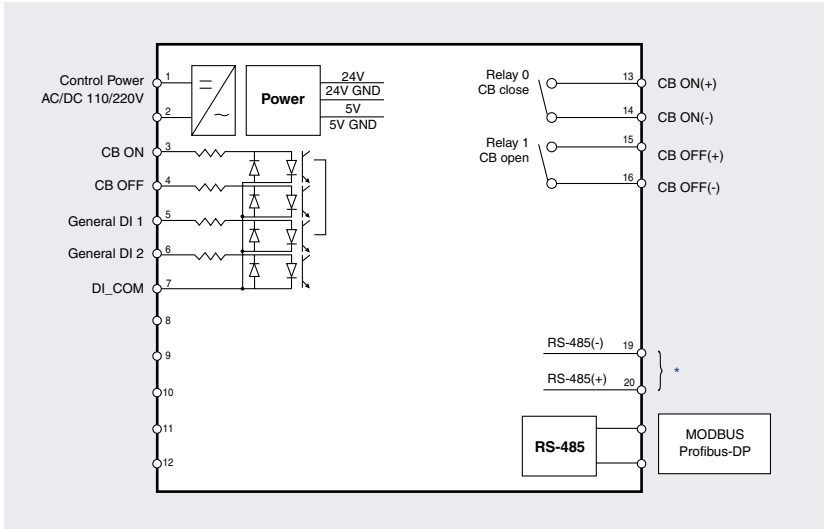
*In case of using Profibus-DP communication, it needs to communicate with ACB trip relay.



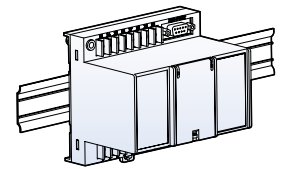
Accessories

Susol

Remote I/O Unit [RCO]

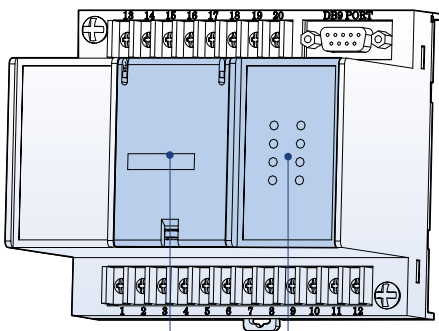


Remote I/O Unit



*In case of using Profibus-DP communication, it needs to communicate with ACB trip relay.

Classification		Applied range	Remarks
CB control	Contact switching capacity	AC230V 16A / DC30V 16A	
	Max. switching capacity	3680VA, 480W	
Alarm	Contact switching capacity	AC230V 6A / DC25V 6A	Induction load (cos ϕ =0.4, L/R=7ms)
	Max. switching capacity	1880VA, 150W	



- Baud rate setting
- Comm. address setting
- Temperature setting

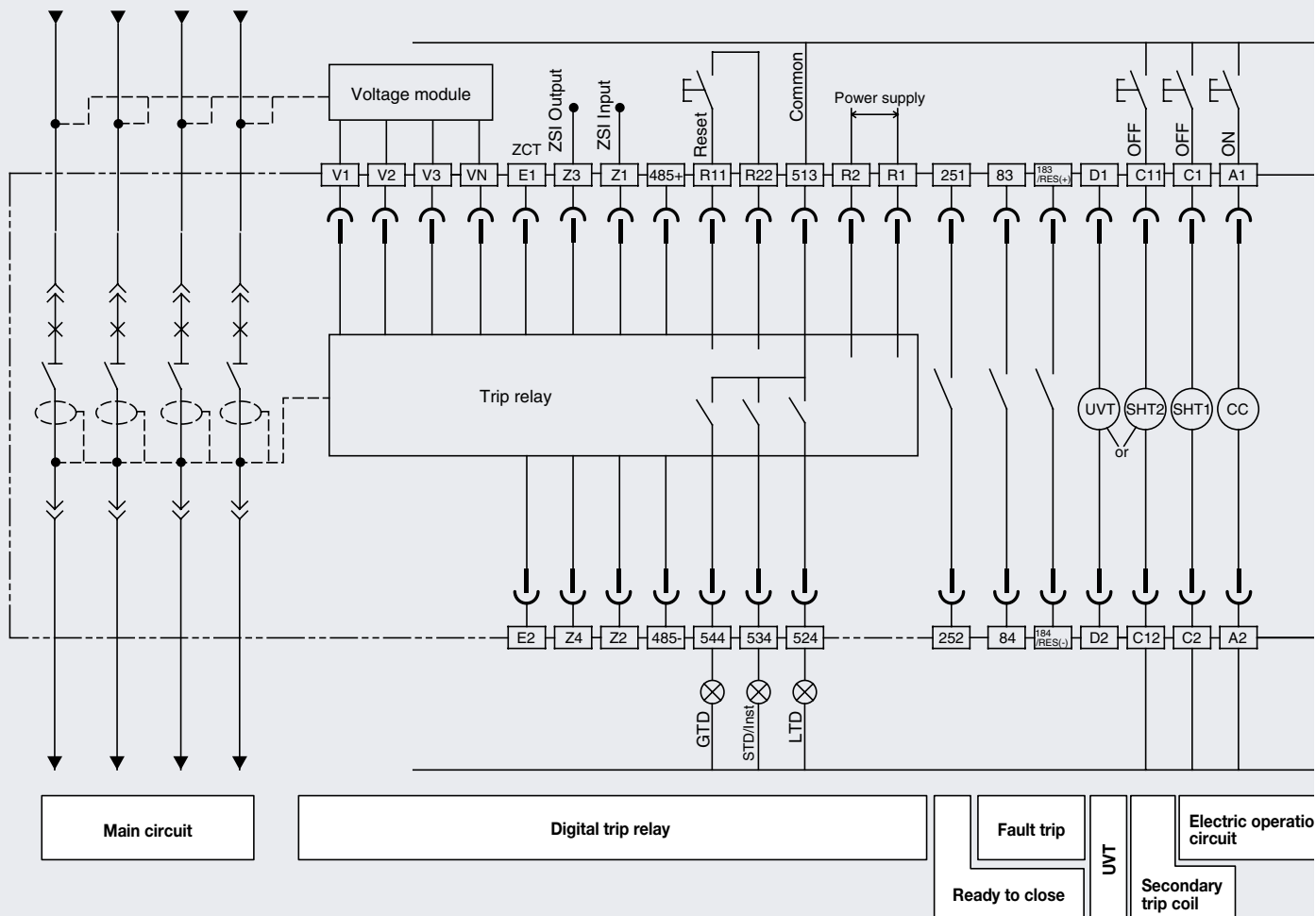
- Remote I/O unit has the I/O contact which can trip or close the ACB from the remote site by communication.
- For the General DO, the output of DI1 or DI2 is selectable.
- Remote I/O Unit communicates with Modbus / RS-485 communication basically, Profibus-DP need to be purchased separately.
- It supports SBO (Select Before Operation) function and guarantees the control reliability.
- Remote I/O Unit can be installed on the cradle of ACB or the inside of panel.

LED	Status
1	DI1 Indicates digital Input #1condition
2	DI2 Indicates digital Input #2condition
3	DO ON Indicates temperature alarm output is ON
4	DO OFF Indicates temperature alarm output is OFF
5	CB ON Indicates circuit break close condition
6	CB OFF Indicates circuit break open condition
7	RUN LED Indicates unit run condition
8	CB ERROR Indicates circuit break terminal Disconnection / control Err condition

Electrical diagram

Susol

This diagram is based on "CONNECTED" position of a circuit breaker and Opening, Motor charging, Releasing of locking plate should be normal condition.

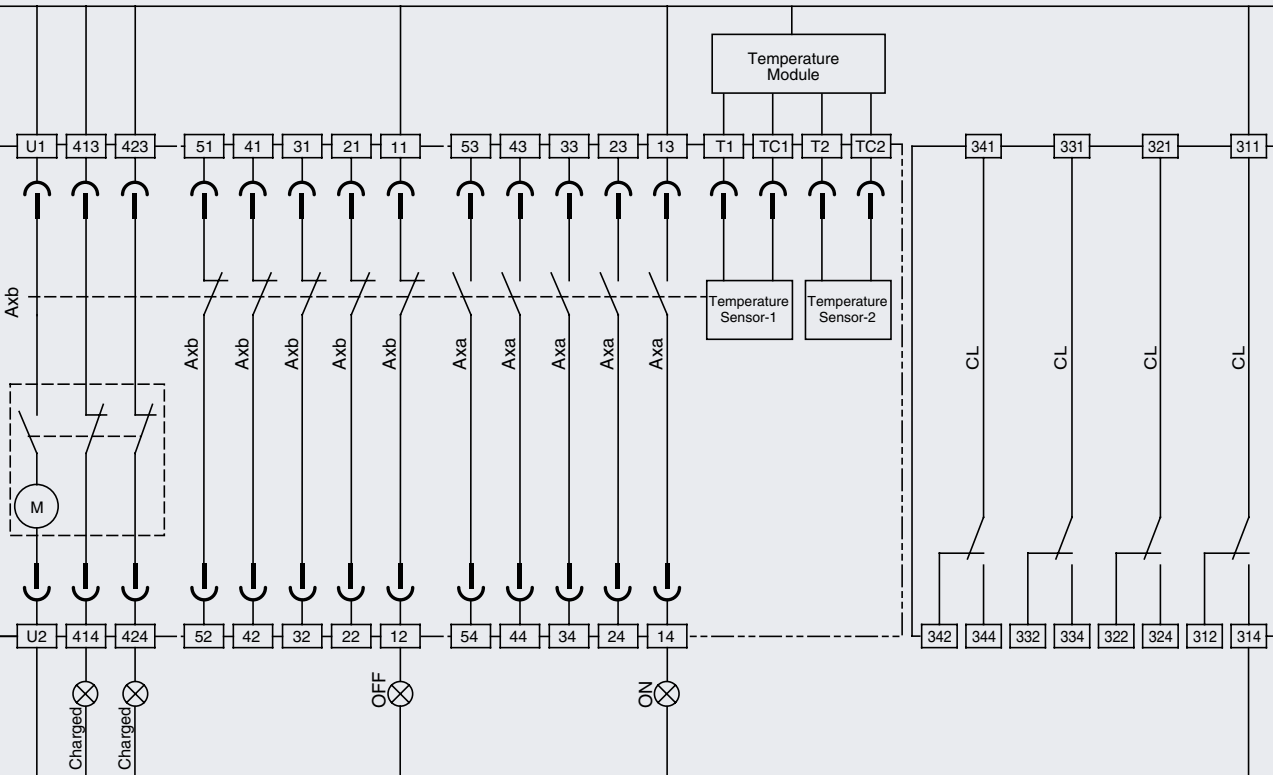


Terminal code description

13	14	~	63	64	Auxiliary switch "a"
11	12	~	61	62	Auxiliary switch "b"
413	414				Charged signal
423	424				Charged signal communication
U1	U2				Motor charging
A1	A2				Closing coil
C1	C2				Shunt trip
C11	C12				2nd shunt trip

D1	D2	Voltage input terminal of UVT
83	84	Alarm1 "a"
183	184	Alarm2 "a"
251	252	Ready to close switch
R1	R2	Control power
513	~ 544	Alarm contact
R11	R22	Alarm reset (Trip cause LED, Alarm contact)
485+	485-	RS-485 communication

- Note) 1. The diagram is shown with circuits de-energized, all devices open, connected and charged and relays in normal position
 2. Relay is normal condition and charging type is "ON-Charging"
 3. The standard of auxiliary contact is 3a3b. The auxiliary switch in above diagram is composed of 5a5b. See 48 page for more detail on auxiliary switches.
 4. Option
 - Ready to close contact, Trip alarm contact, UVT coil, Fully charged contact, secondary trip coil
 - Cell switch, Temperature module, Voltage module, Remote close-open module, ZCT, ZSI
 5. Please consult us for the use of ZSI (Zone selective Interlocking).
 6. Refer to the page 33 for the connection of Trip relay and the page 43 for UVT.
 7. For connecting RS-485 verify if the polarity is correct



Charge completion contact

Auxiliary switch

Thermal, communication remote control module

Cell switch

Accessory code description

Z1 Z2	ZSI input
Z3 Z4	ZSI output
E1 E2	ZCT
VN ~ V3	Voltage module
TC1 , TC2 ~ T1 , T2	Temperature module
311 ~ 344	Position switch

Ax	Auxiliary switch
LTD	Long time delay trip indicator
STD/Inst	Short time delay/instantaneous
GTD	Ground fault trip indicator
CL	Cell switch
(M)	Motor
(CC)	Closing coil
(ST1)	Shunt tripping device 1
(ST2)	Shunt tripping device 2
(UVT)	UVT coil

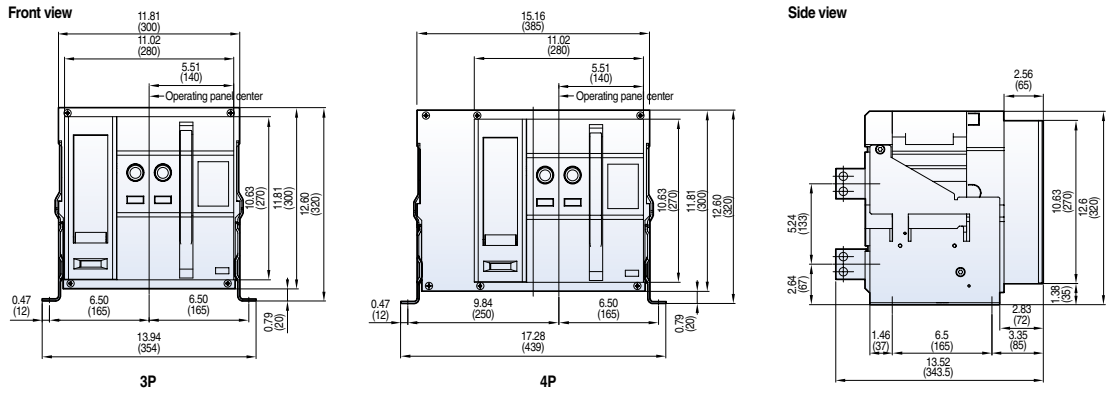
—	Internal wiring
—	External wiring (by customer)
⌋	Connector of the control circuit terminal of drawout type

Dimensions

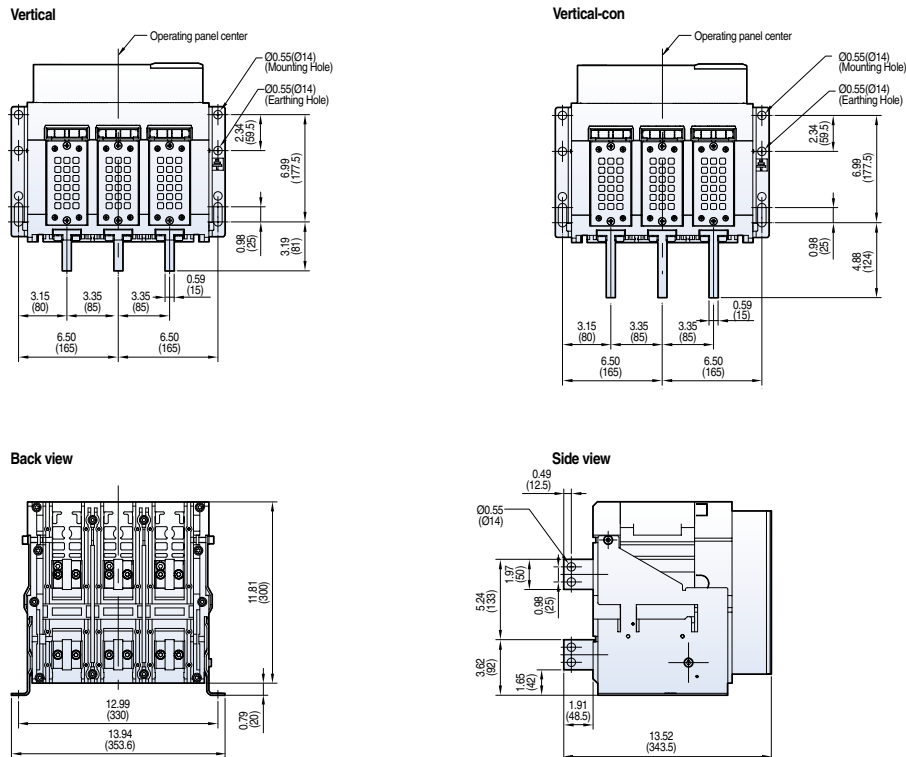
Susol

Fixed type 800~1600A (UAS-08/16D)

Front view



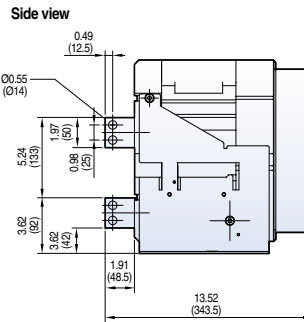
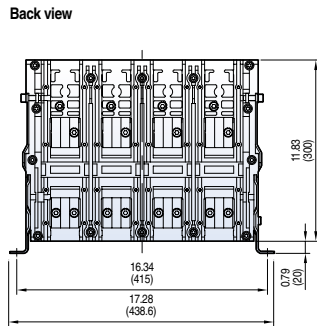
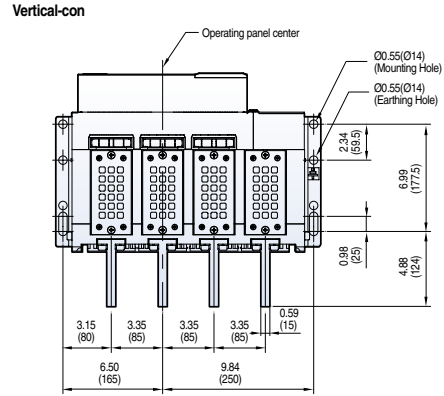
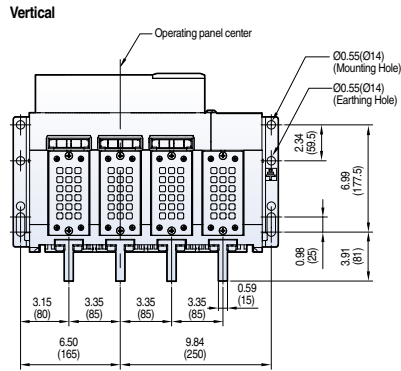
Vertical type_3P



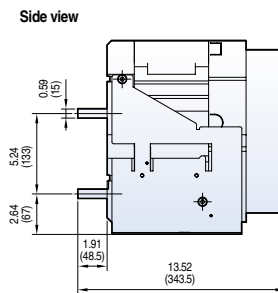
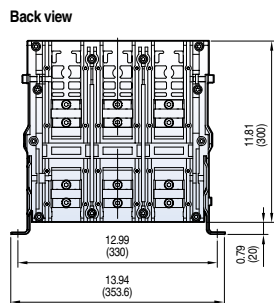
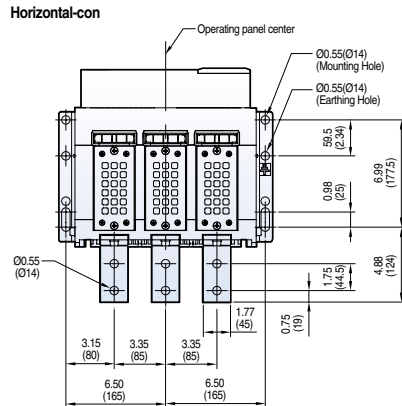
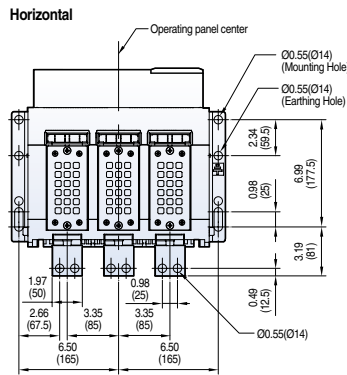
Dimensions

Susol

Vertical type_4P



Horizontal type_3P

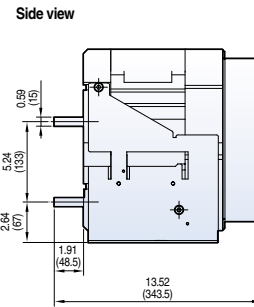
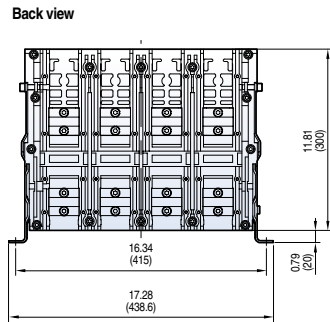
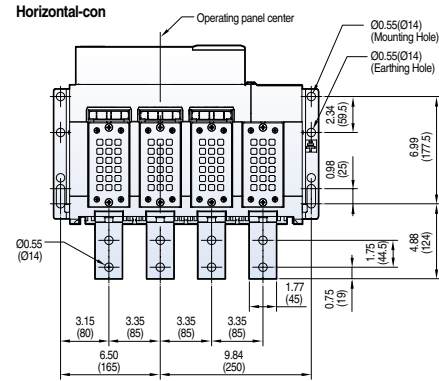
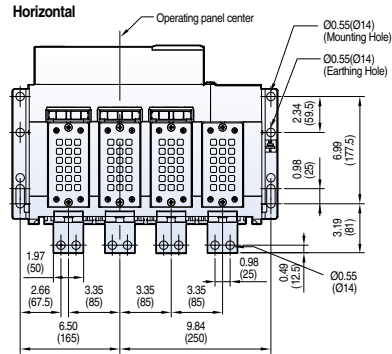


Dimensions

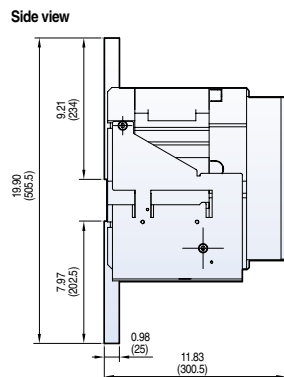
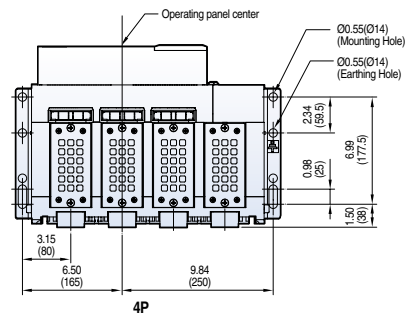
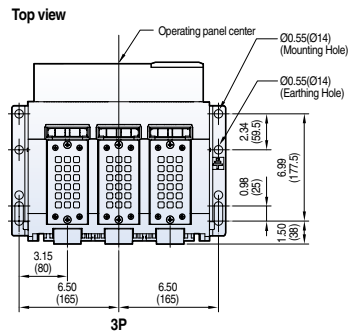
Susol

Fixed type 800~1600A (UAS-08/16D)

Horizontal type_4P



Front connection type



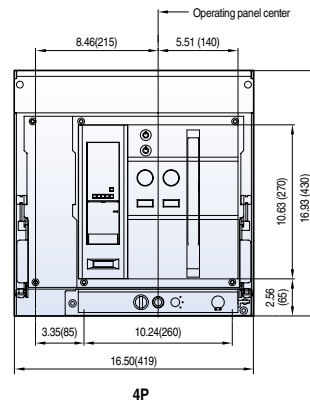
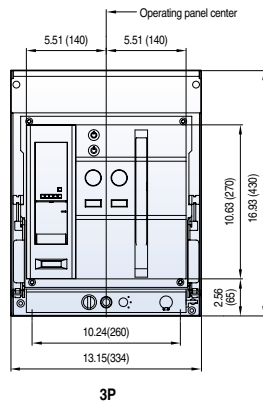
Dimensions

Susol

Draw-out type 800~1600A (UAS-08/16D)

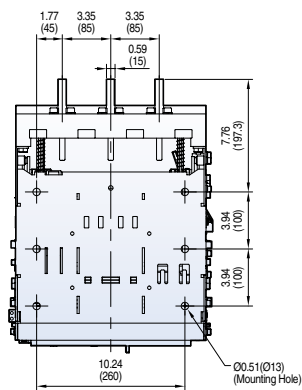
Front view

Front view

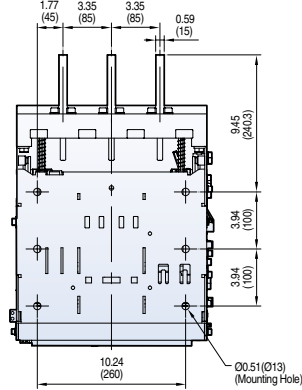


Vertical type_3P

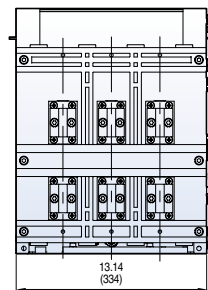
Bottom view



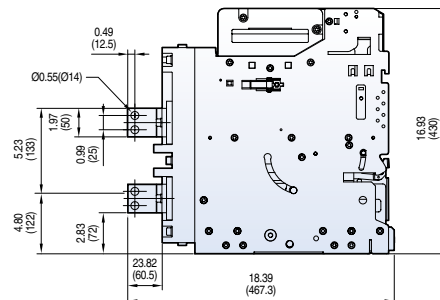
Vertical-con



Back view



Side view

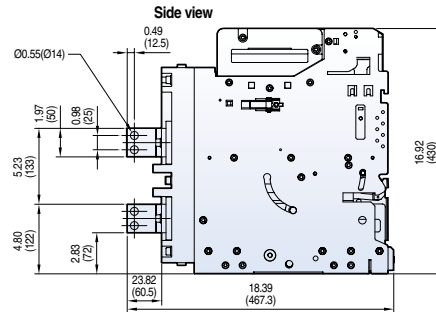
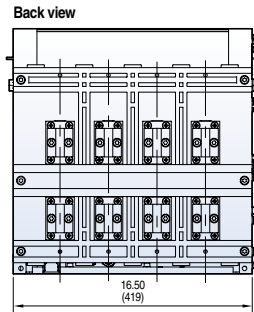
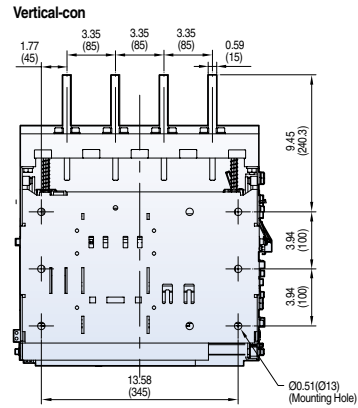
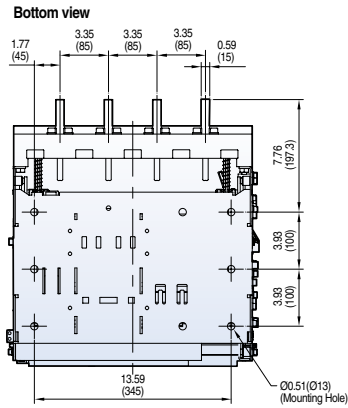


Dimensions

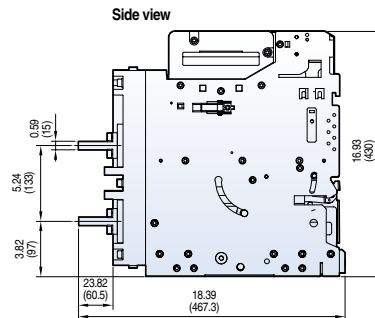
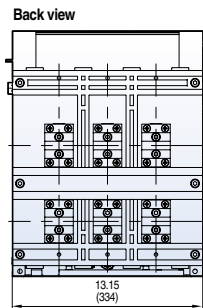
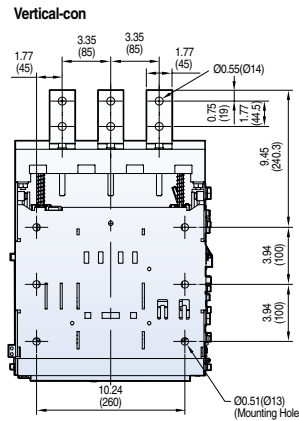
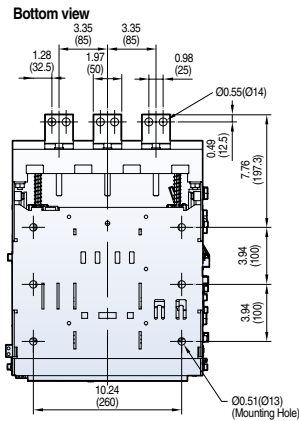
Susol

Draw-out type 800~1600A (UAS-08/16D)

Vertical
type_4P



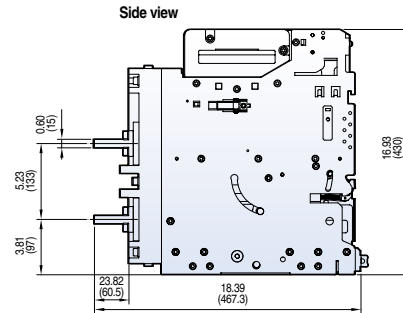
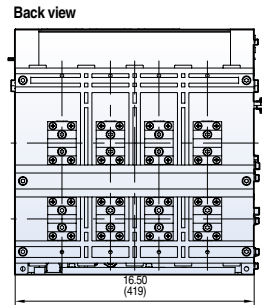
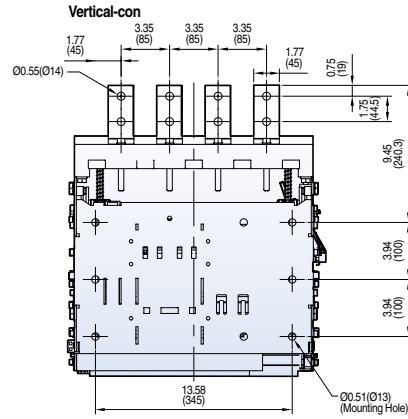
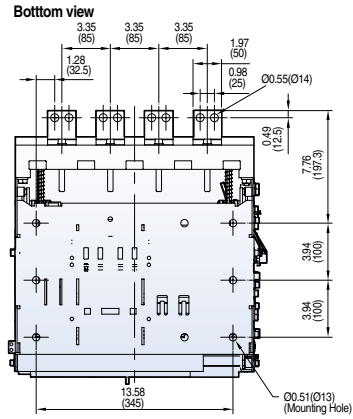
Horizontal
type_3P



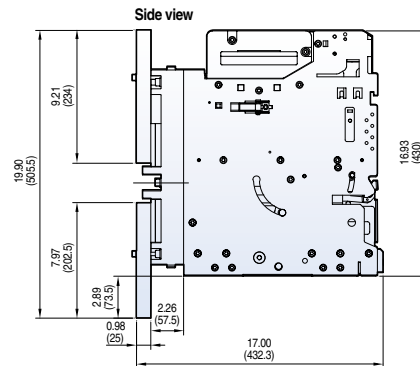
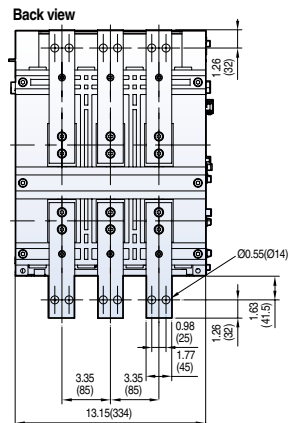
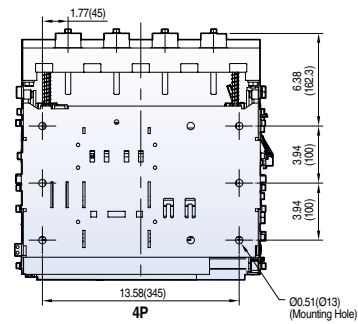
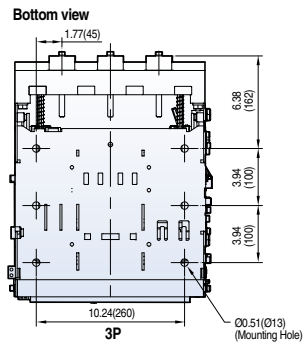
Dimensions

Susol

Horizontal type_4P



Front connection type

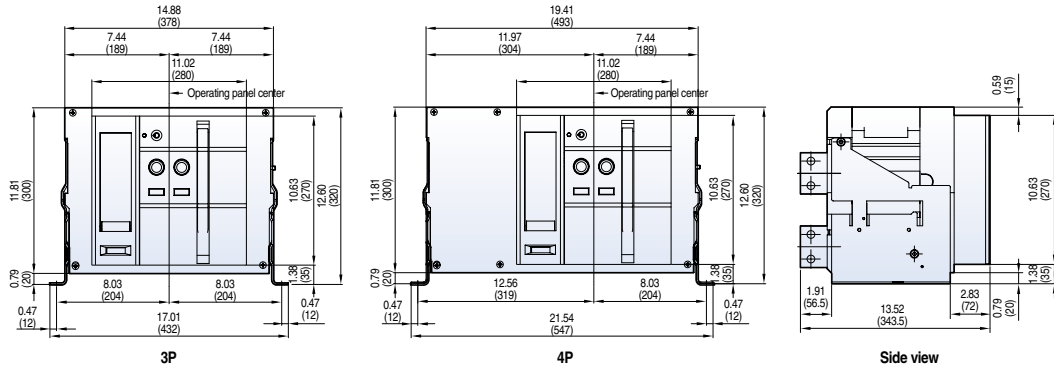


Dimensions

Susol

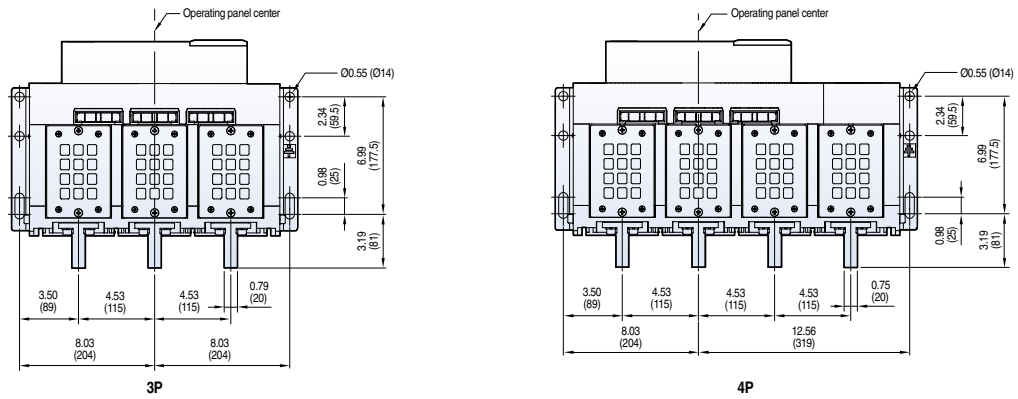
Fixed type 800~2000A (UAH-08~20E)

Front view

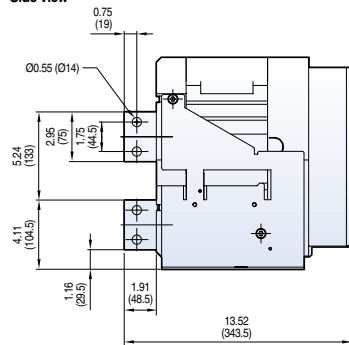


Vertical type

Top view



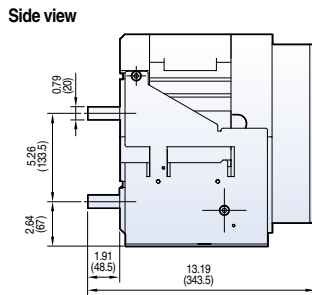
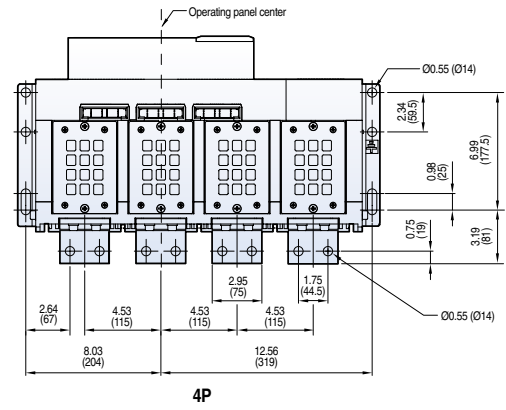
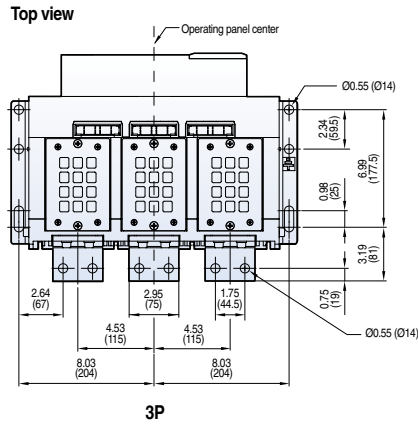
Side view



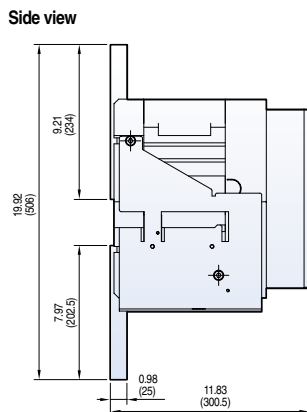
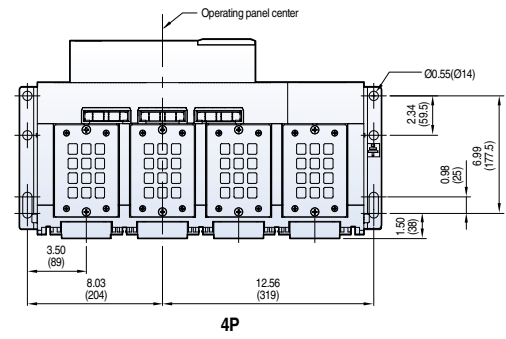
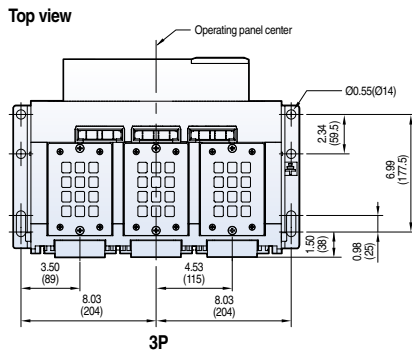
Dimensions

Susol

Horizontal type



Front connection type

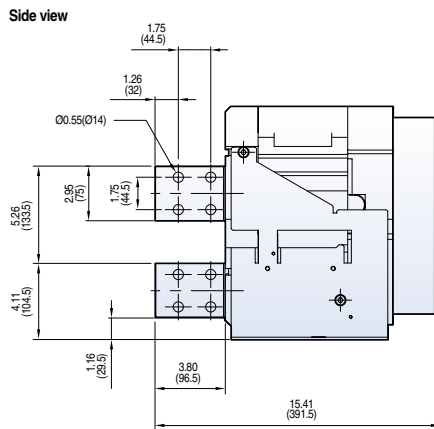
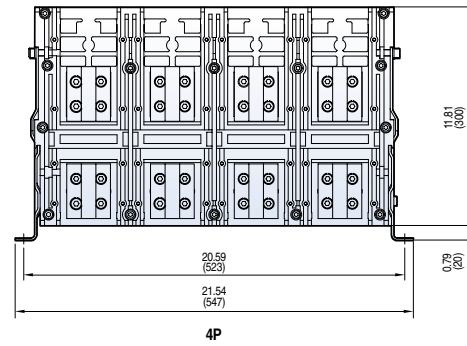
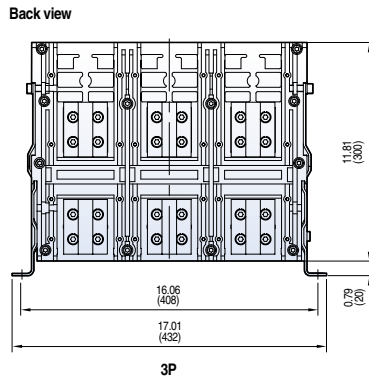
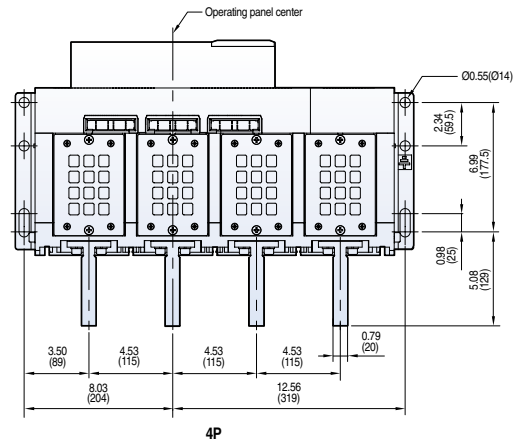
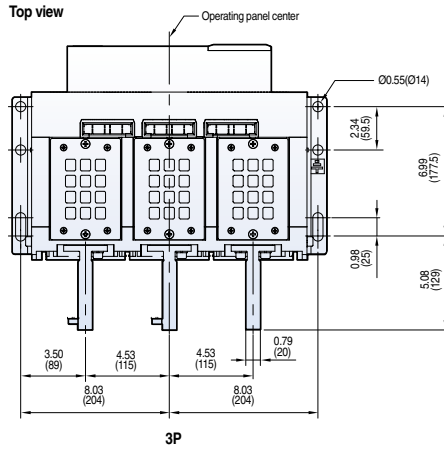


Dimensions

Susol

Fixed type 2500A (UAH-25E)

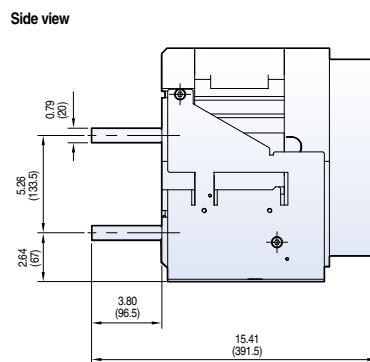
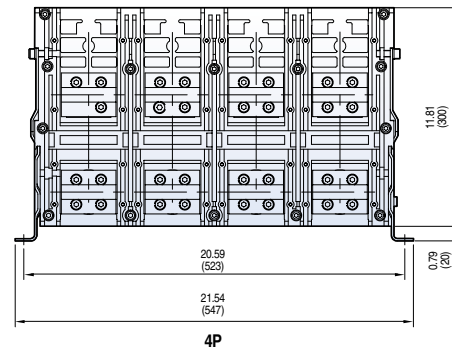
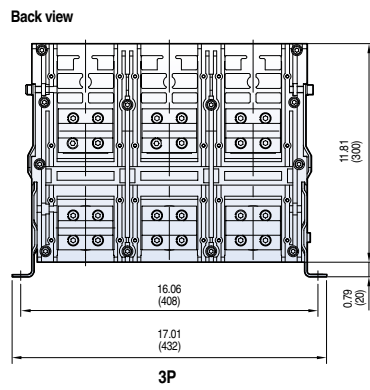
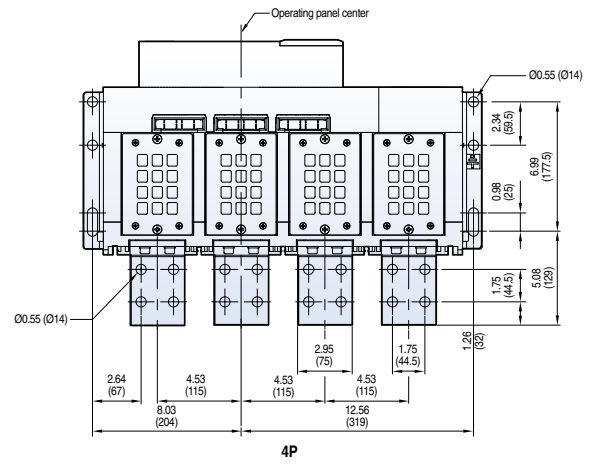
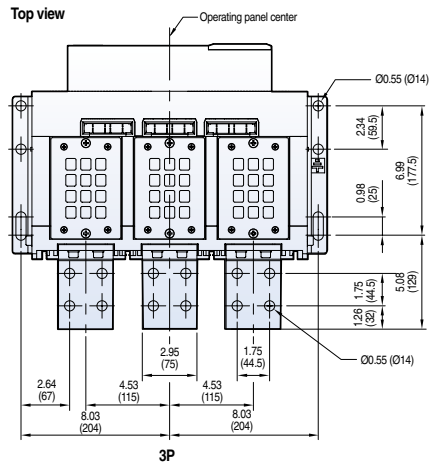
Vertical type



Dimensions

Susol

Horizontal type



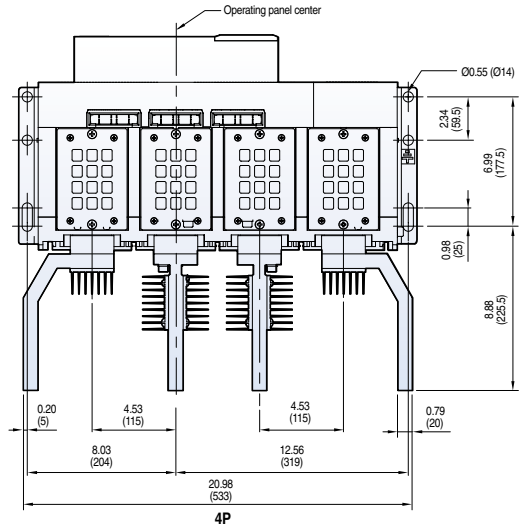
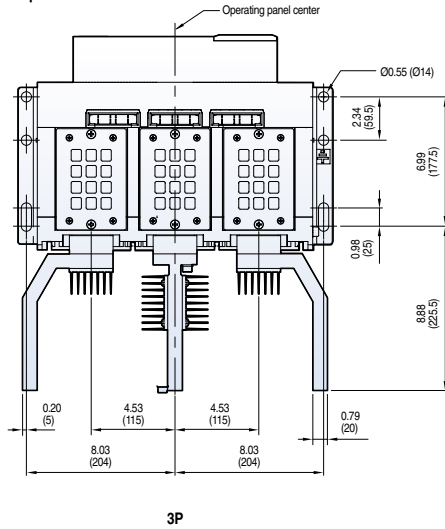
Dimensions

Susol

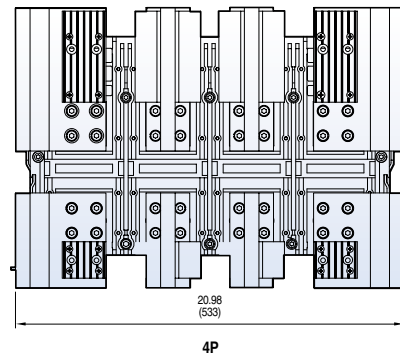
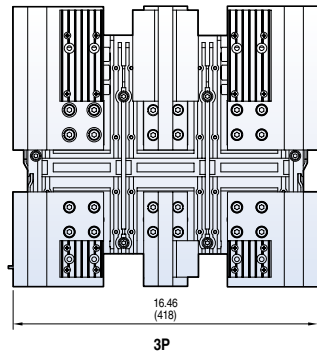
Fixed type 3200A (UAH-32E)

Vertical
type

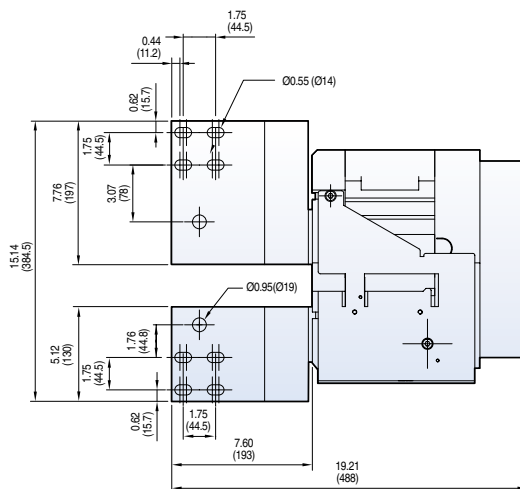
Top view



Back view



Side view

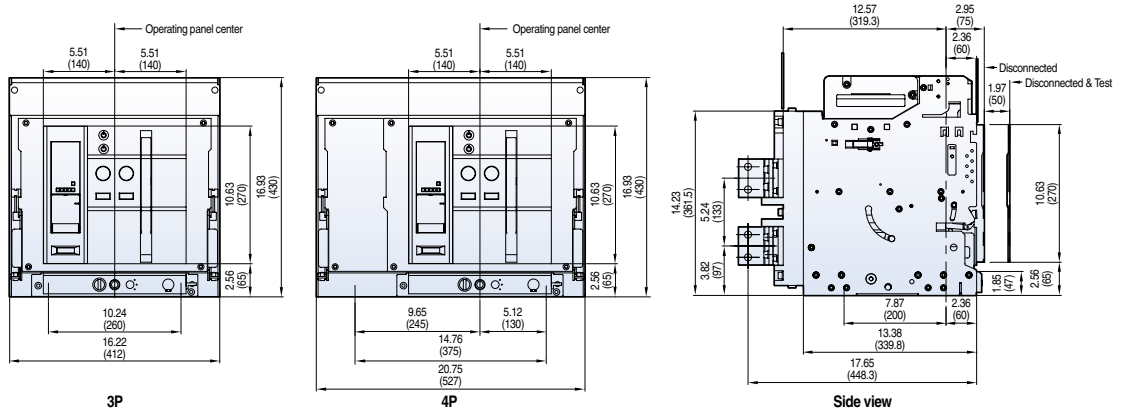


Dimensions

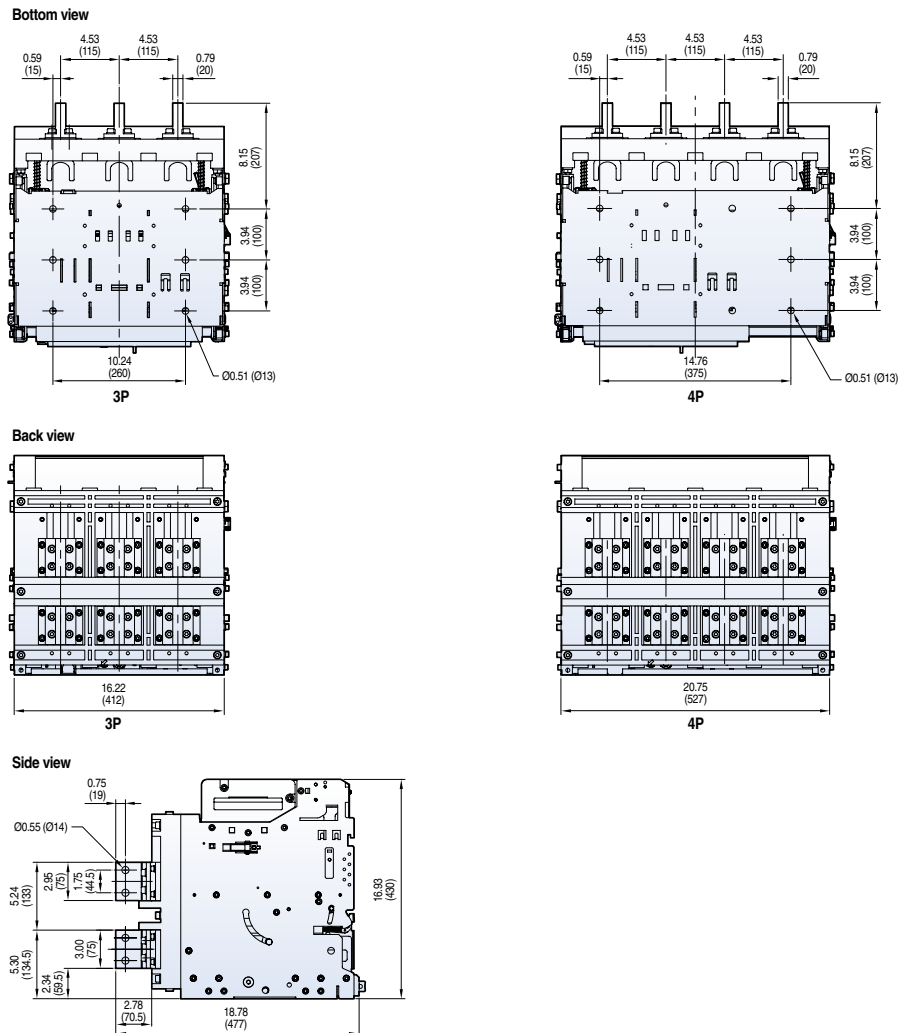
Susol

Draw-out type 800~2000A (UAH-08~20E)

Front view



Vertical type



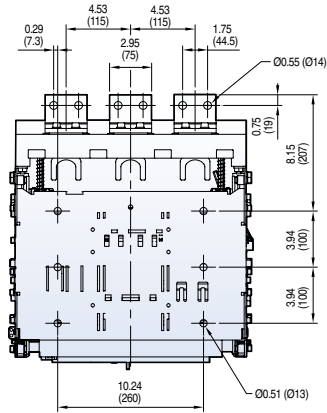
Dimensions

Susol

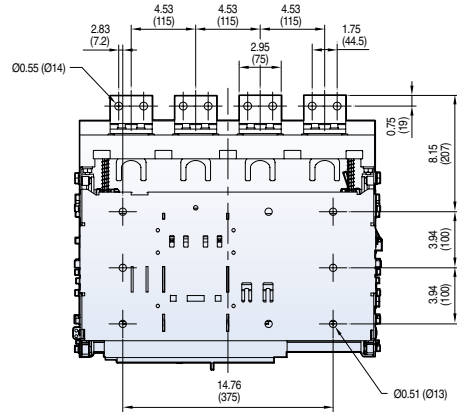
Draw-out type 800~2000A (UAH-08~20E)

Horizontal
type

Bottom view

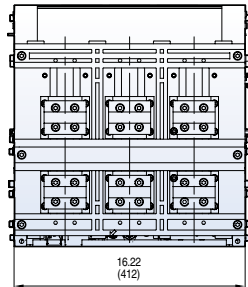


3P

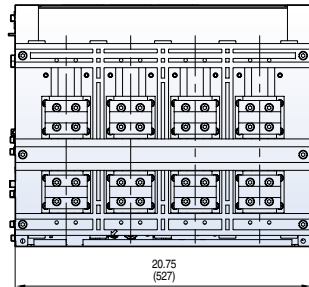


4P

Back view

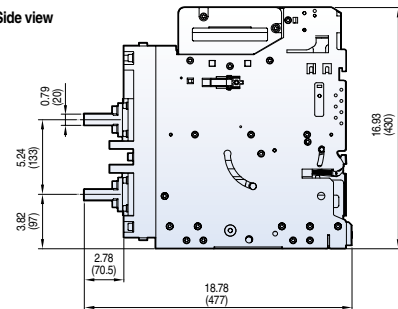


3P



4P

Side view

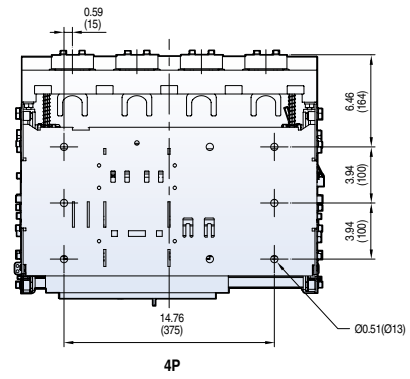
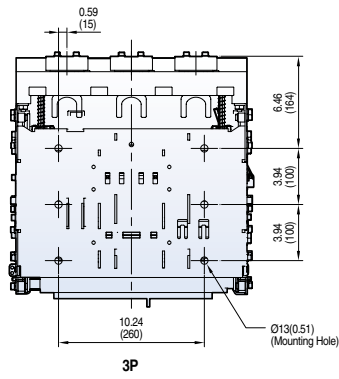


Dimensions

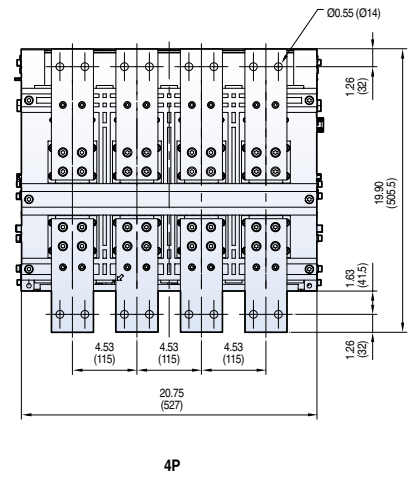
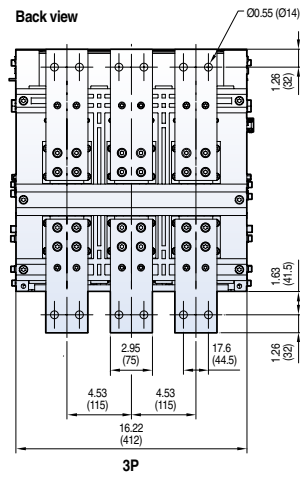
Susol

Front connection type

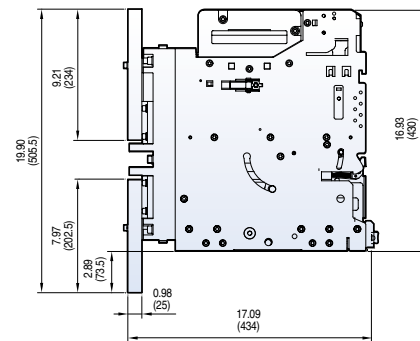
Bottom view



Back view



Side view



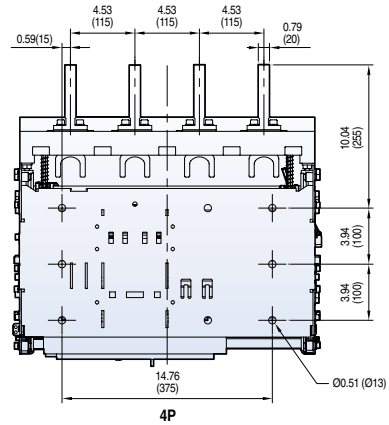
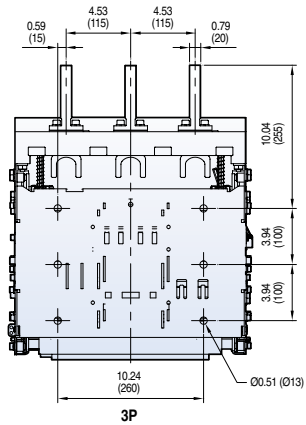
Dimensions

Susol

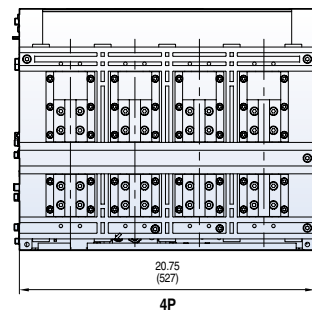
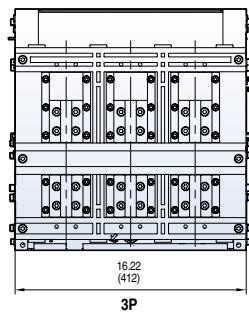
Draw-out type 2500A (UAH-25E)

Vertical
type

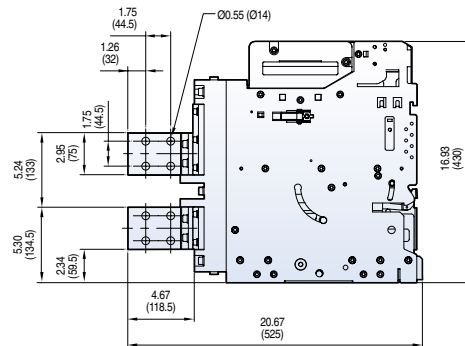
Bottom view



Back view



Side view

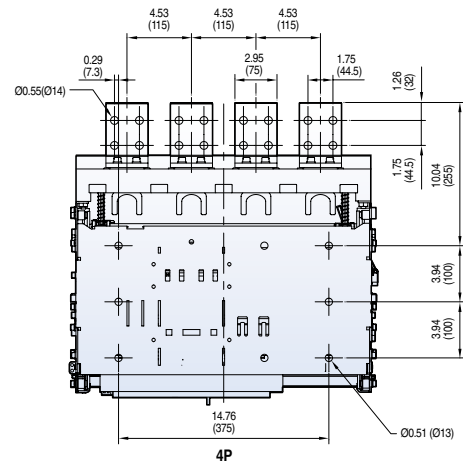
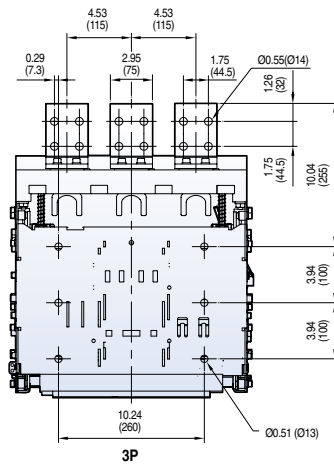


Dimensions

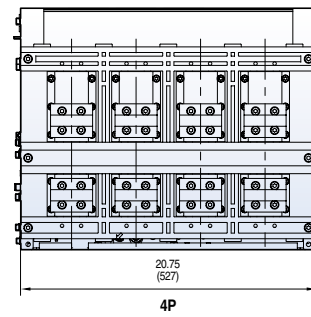
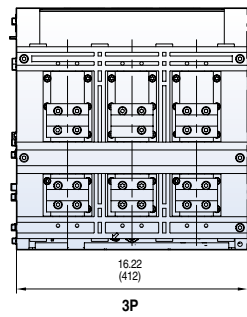
Susol

Horizontal type

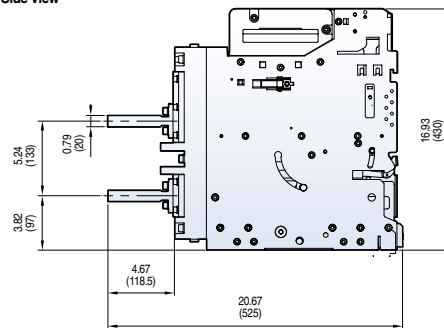
Bottom view



Back view



Side view



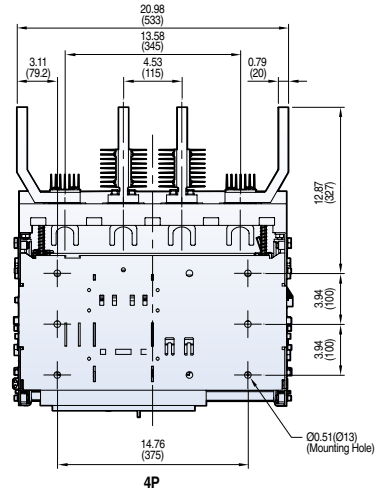
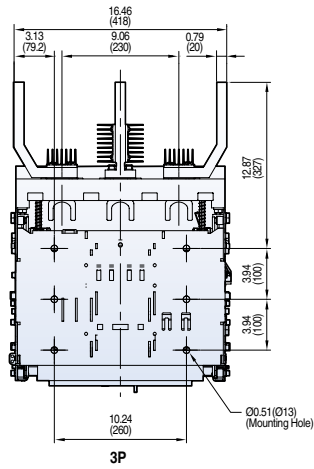
Dimensions

Susol

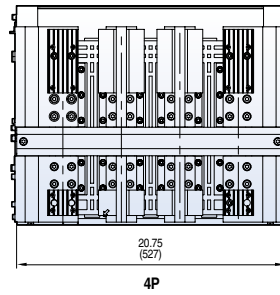
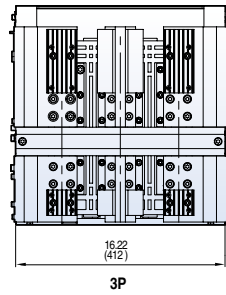
Draw-out type 3200A (UAH-32E)

Vertical
type

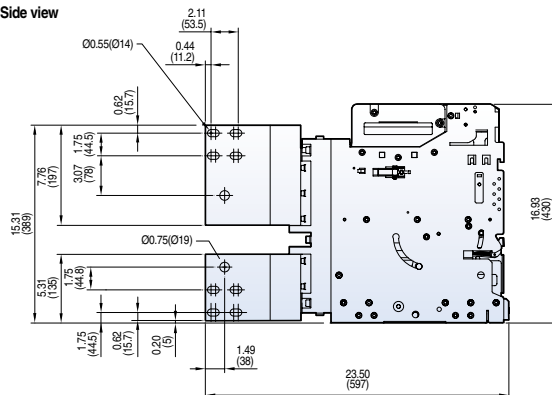
Bottom view



Back view



Side view

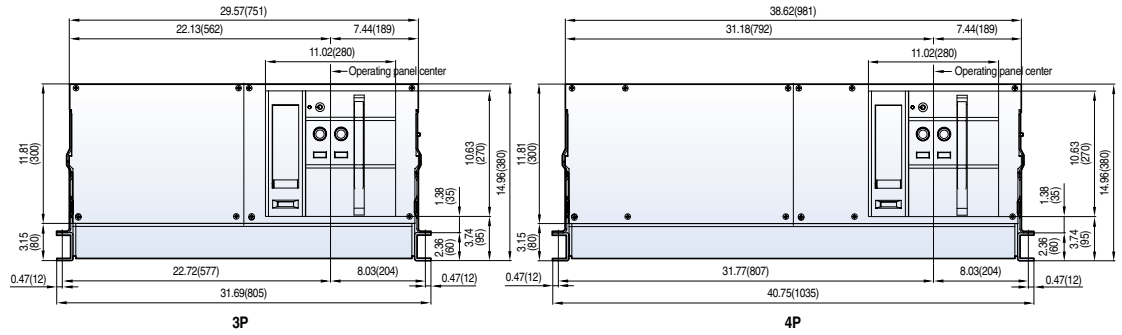


Dimensions

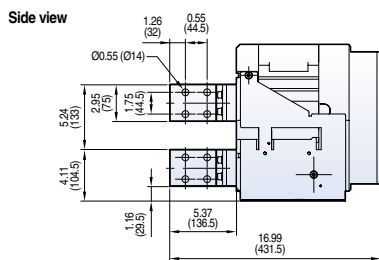
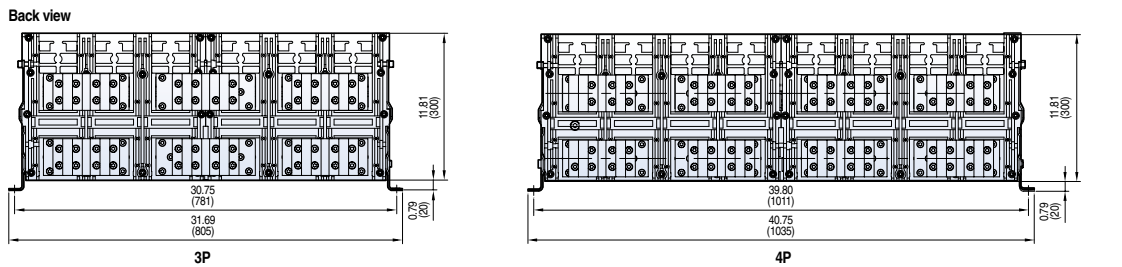
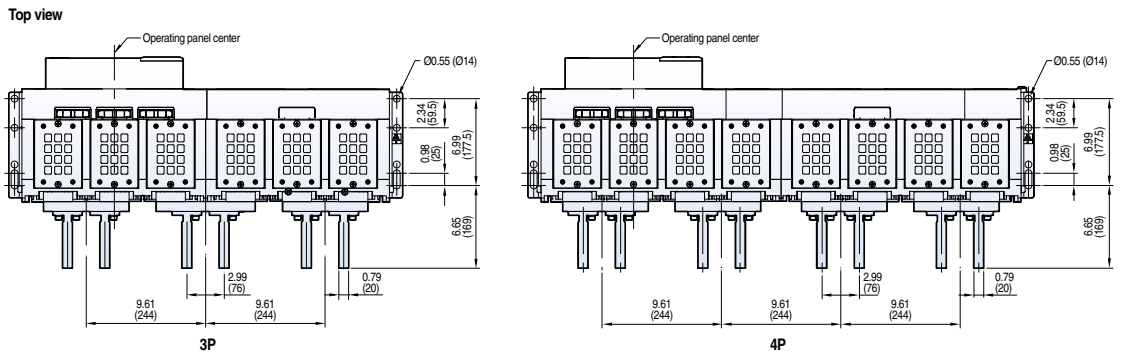
Susol

Fixed type 3200~5200A (UAH-32~50G)

Front view



Vertical type

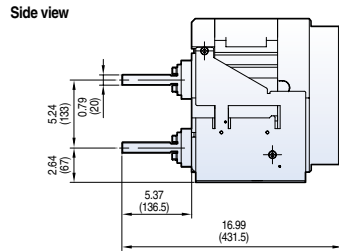
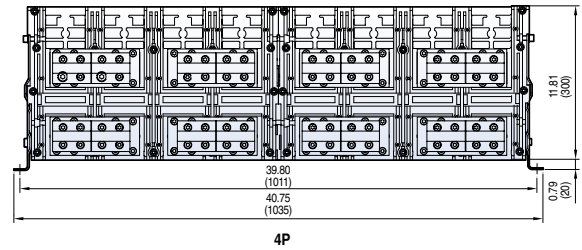
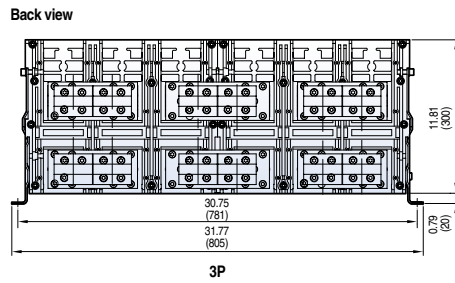
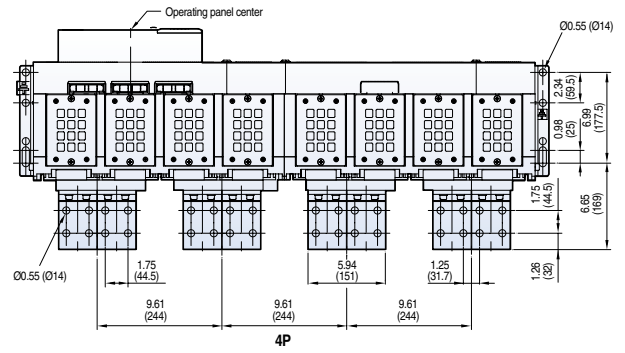
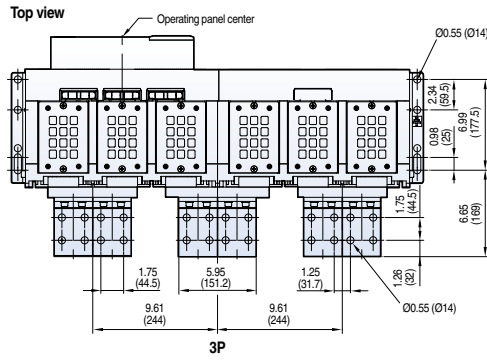


Dimensions

Susol

Fixed type 3200~5200A (UAH-32~50G)

Horizontal
type

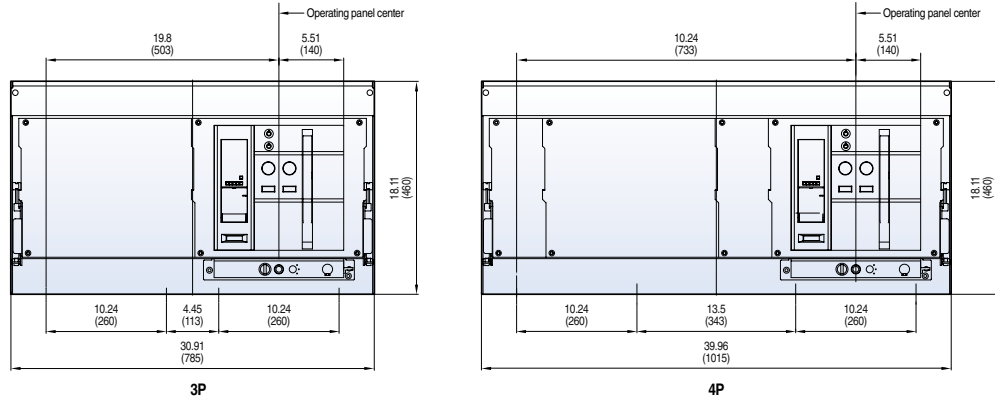


Dimensions

Susol

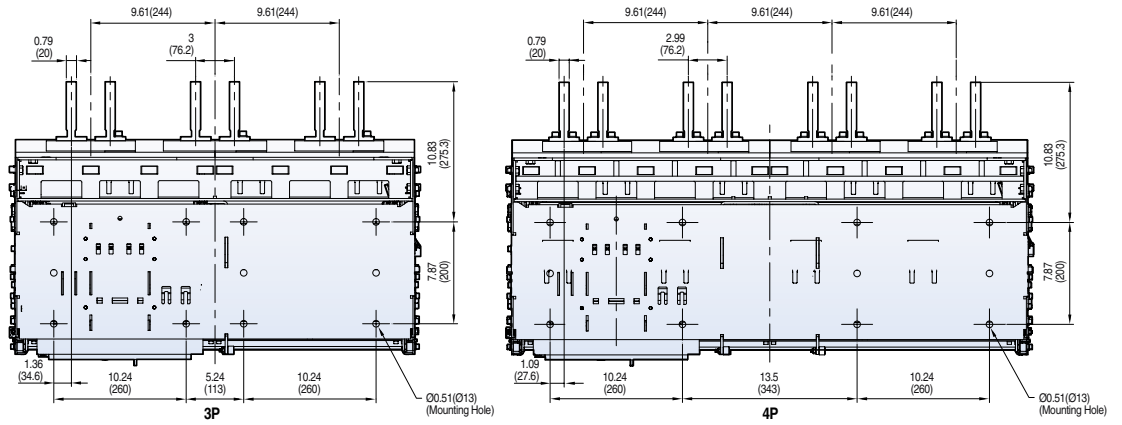
Draw-out type 3200~5200A (UAH-32~50G)

Front view

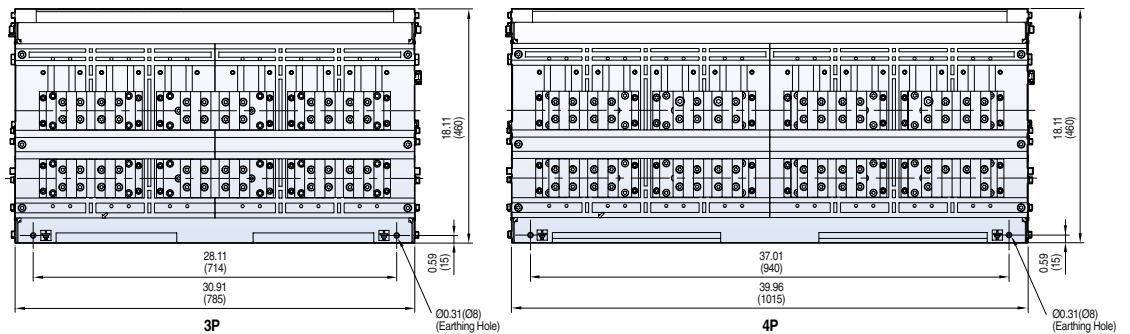


Vertical type

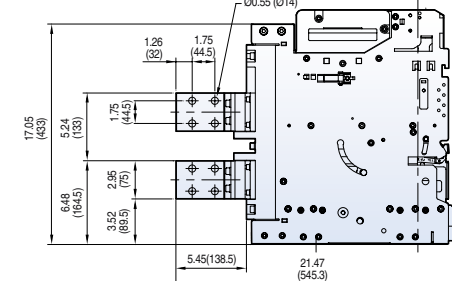
Bottom view



Back view



Side view



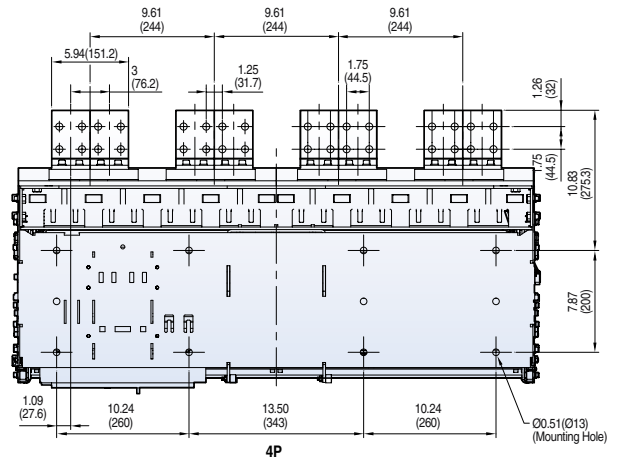
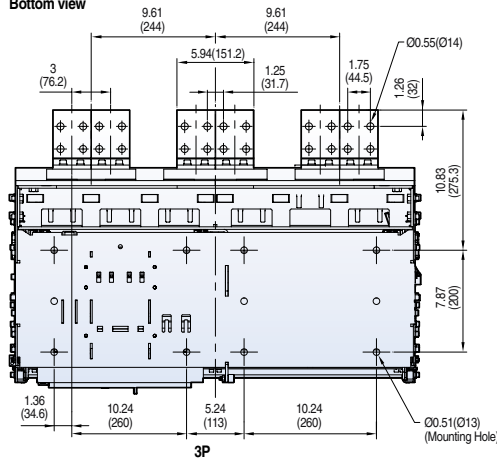
Dimensions

Susol

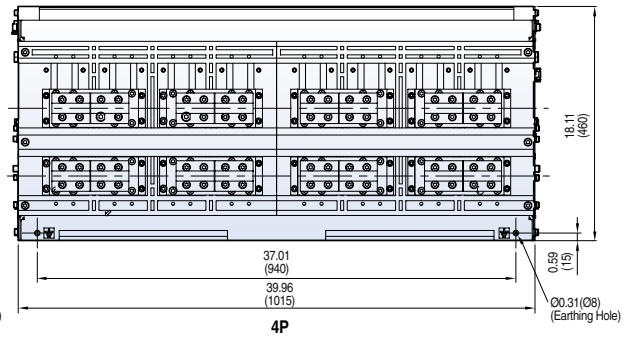
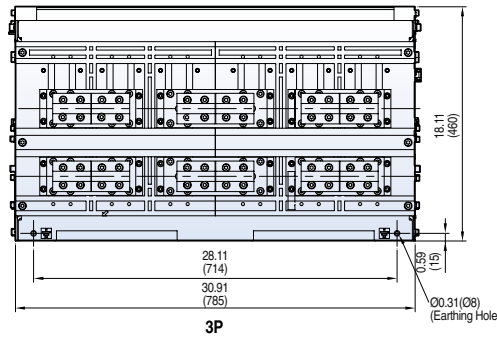
Draw-out type 3200~5200A (UAH-32~50G)

Horizontal
type

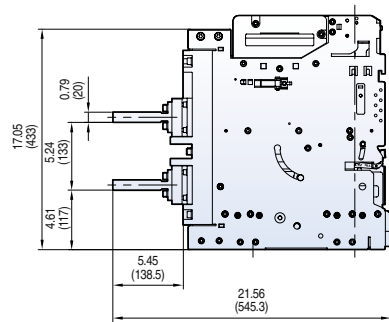
Bottom view



Back view



Side view



Green Innovators of Innovation



Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact a qualified service technician when you need maintenance. Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

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