MCCB

Digital MCCB

Changeover Switch

MCCB Panel Board

Contactor & Overload Relay

Motor Starter

Switch Disconnector Fuse

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Camlock fuse holder

HRC Fuse

Motor

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Havells India Ltd.
QRG Towers, 2D, Sector -126, Expressway, Noida - 201 304 (UP), Ph. +91-120-4771000
E-mail: marketing@havells.com, www.havells.com
Consumer Care No.: 1800 11 0303 (Tollfree), 011-4166 0303 (Landline)


HAVELLS
INDUSTRIAL

# Titania
air circuit breaker

C³ technology

630 A to 4000 A in 3 frame sizes with 2, 3 & 4 Pole execution

Catalogue 2009


HAVELLS
INDUSTRIAL

## Introduction

"Titania" range of Air Circuit Breakers are available from 630 A to 4000 A rating in 2 pole, 3 pole and 4 pole execution, with breaking capacity of 50kA to 100kA. These ACBs have been designed keeping in mind the present day complex requirement of electrical systems which makes it essential to have a reliable product which can give un-interrupted service through out the product life meeting all the stresses that the system encounters.

These ACBs are most compact in size. The height, depth and panel door cut out are same through out the entire range. The accessories are common for the entire range and are front accessible , easy to fit without the need for cabling.

**Features:**

- Compact size, wide range & high breaking capacity
- 630A to 4000A available only in 3 frame sizes
- First frame available upto 2000A
- Common height, depth and panel door cutout
- Front accessible accessories without requiring any cabling
- Common accessories for the entire range
- Modular construction for pole unit
- Easily replaceable arcing contacts
- Available with communication facility




## Construction

**Operating Mechanism** is of stored energy type, which operates using pre-charged springs. The springs are charged manually with the help of charging handle or with the help of charging motor, if provided. The same operating mechanism is used for the entire range. Mechanism has been developed using less number of parts resulting in more reliability, longer mechanical life and requiring very less maintenance.

**Contact Mechanism**

**Conductor Unit** is of modular design. Each pole consists of Main and Arcing contacts which are housed in the moulded housing The contacts are made from sintered silver alloy for reliability, longer life and anti-weld properties. The construction of the contact is such that arcing contact closes before and opens later than the main contact, this substantially reduces erosion of main contact under normal and short circuit conditions.
The current transformer is placed inside the pole unit around the lower terminal.

**Arc Chutes** are provided for quenching the arc. Arc chute comprises of grid plates mounted in parallel in the insulated housing. The arc is divided between these grid plates which helps in its fast quenching. The arc is thus confined, divided and extinguished in the arc chute. The excellent insulation between the conducting parts and better energy dissipation after short circuit makes it possible to make the *load and line connections on either side*

The **tripping mechanism** comprises of magnet holder trigger which is linked to the trip bar unit. The electronic circuit gives a signal to this unit in case of over current fault and this unit mechanically trips the Circuit Breaker.

In **Over current protection** the sensing of the current is through the current transformers fitted on the main terminals. In case of any fault the secondary output of the CT increases. This secondary output of CT goes to the micro controller based electronic circuit. The micro controller is programmed to give a signal as per inverse time characteristics. The signal in the form of dc supply is given to magnet holder trigger which trips the ACB. The required tripping time and tripping current can be set with the help of the switches provided on the front panel of the electronic release.

## Technical Information

Standard Conformity : IEC 60947-2 & IS 13947-2

| Performance Series | | E | S | H | V |
|---|---|---|---|---|---|
| Rated Current (In)<br>(Ref. Temp. 45°C) | (Amps.) | 630<br>800<br>1000<br>1250<br>1600<br>2000 | 630<br>800<br>1000<br>1250<br>1600<br>2000 | 2000<br>2500 | 2500<br>3200<br>4000 |
| Rated Service voltage (Ue) | V | 690 VAC<br>250 VDC | 690 VAC<br>250 VDC | 690 VAC<br>250 VDC | 690 VAC<br>250 VDC |
| Rated Insulation voltage (Ui) | V | 1000 V | 1000 V | 1000 V | 1000 V |
| Rated impulse<br>withstand voltage (Uimp) | kV | 12 kV | 12 kV | 12 kV | 12 kV |
| Frequency | (Hz) | 50/60 | 50/60 | 50/60 | 50/60 |
| No. of Poles * | | 3, 4 | 3, 4 | 3, 4 | 3, 4 |
| Rated short-circuit breaking<br>capacity (Ics=100%Icu) | (kA) | | | | |
| -220/380/415/440VAC | | 50 | 65 | 75 | 100 |
| -500/660/690 VAC | | 40 | 55 | 65 | 85 |
| -250 VDC | | 40 | 55 | 65 | 75 |
| Rated short-time<br>withstand current (Icw) | | | | | |
| 1sec | (kA) | 50 | 55 | 65 | 85 |
| 3sec | | 36 | 40 | 50 | 65 |
| Rated short-circuit making capacity<br>(peak value) (Icm) | (kA) | | | | |
| -220/380/415/440 | | 105 | 143 | 165 | 220 |
| -500/660/690 | | 84 | 121 | 143 | 187 |
| Utilization category | | B | B | B | B |
| Isolation behavior | | Yes | Yes | Yes | Yes |
| Closing time | (msec) | <70 | <70 | <70 | <70 |
| Break time (max) | (msec) | 30 | 30 | 30 | 30 |
| Mechanical life (No. of operations)<br>(with regular maintenance) | | 25000 | 25000 | 20000 | 15000 |
| Electrical life (at 415VAC)<br>(No. of operations) | | 630, 800A -15000<br>1000,1250A -12000<br>1600A -12000<br>2000A -10000 | 630, 800A -10000<br>1000,1250A -10000<br>1600A -8000<br>2000A -8000 | 10000 | 5000 |
| Overall Dimensions | (mm) | | | | |
| Fixed (LxHxD) 3P | | 291x421x307 | | 400x421x307 | 561x421x307 |
| 4P | | 381x421x307 | | 525x421x307 | 741x421x307 |
| Draw out (LxHxD) 3P | | 330x460x386 | | 435x460x386 | 600x460x386 |
| 4P | | 420x460x386 | | 560x460x386 | 780x460x386 |

* 2 Pole ACBs are available on request





## Over Current Release

***Over Current Release***

IPR range of over current releases (OCR) are highly- reliable, multi-functional, dedicated protection unit using advanced micro-controller with full benefits of microprocessor technology offering Overload, Short Circuit, Instantaneous and earth fault protection besides enhanced feature of field testing for all models.

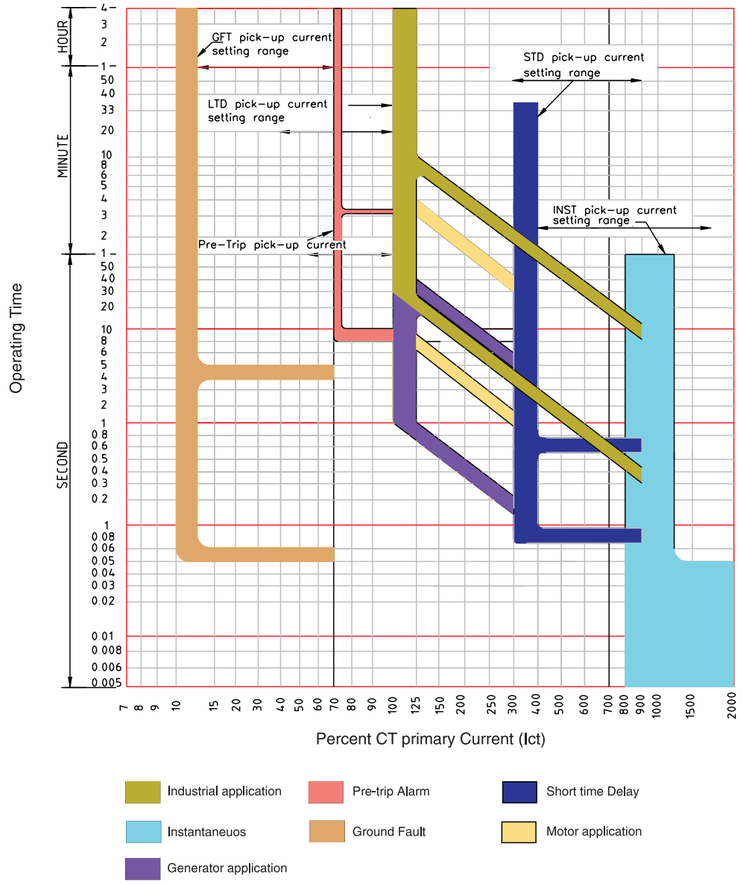
These OCRs are true RMS sensing over current trip devices, requiring no external supply for their basic functioning.

Salient features include :

- Error free and user friendly settings of current and time delay
- True RMS sensing with immunity to system disturbances
- More reliable and repetitive accuracy, using high end 16 bit micro-controller
- Self powered by built in Current Transformer
- Three phase protection and Earth fault protection in same unit
- LED Indication for all the tripping faults
- Function 'OFF', setting available


***IPR-3 Release***

## TIME -CURRENT CHARACTERISTIC CURVE



## Specifications

***Setting of Overload Current (LTD)***
**LTD Current ($I_1$)** : 40% to 100% of $I_{CT}$ with function blocking option.
**LTD Time (at 6$I_{CT}$)** : 1sec to 35sec.

***Setting of Short Circuit Current (STD)***
**STD Current ($I_2$)** : 300% to 900% of $I_1$ with function blocking option.
**STD Time** : 50ms to 700ms.

***Setting of Instantaneous Current (INST)***
**INST Current ($I_3$)** : 400% to 1600% of $I_1$ with function blocking option.

***Ground fault Setting (GFT)***
**GFT Current($I_g$)** : 10% to 70% of $I_1$ with function blocking option.
**GFT Time** : 100ms to 5000ms.

*IPR-1 Release*

**Besides these protection functions IPR-3 provides the following additional features also:**

**RS Communication** : Through RS232 / 485 port

**Pre Trip Alarm Function**
**Current Setting (Ip)** : 60 to 100% of LTD current setting
**Time Setting (Tp) (definate)** : 10 to 200 sec

**Measurement function** :
- 3 phase current
- 3 phase voltage
- Tripping time
- KVA
- KWH
- Power factor
- Max. demand (KVA & KWH)
- Breaker terminal temperature


*IPR-2 Release*

**Under Voltage/ Over Voltage tripping** : Under Voltage setting is available from 40 to 85% of rated voltage, with a time delay of 50 to 400 msec and over voltage setting from 110 to150% with a time delay of 50 to 400 msec

**Fault History** : To record and display the last 100 faults (50 faults in IPR2)

**Self Monitoring** : To monitor the condition of controller and in case of any fault same is indicated by "CPU FIT" LED .

**Temperature sensing** : To monitor the temperature of Micro-controller and give an indication if the temperature exceeds the set value.

**Breaker fault** : When any mechanical fault prevents the tripping of the fault zone breaker, the release of that breaker gives the tripping command to the upper zone breaker (if externally connected).

**Potential free contacts** : Potential free contacts for LTD, STD/INST, PTA, GFT, TEMP, under and over voltage.

**LED Indications** : LED Indications for faults.

**Function Blocking** : This feature is available for LTD, STD, INST and GFT

**Operation counter** : It records the number of operations of ACB by counting the number of trip operations through OCR and stores them in 2 different categories:
a) Current less than 300%,
b) Current more than 300%.

**Function Check** : Field testing of LTD, STD & INST function can be performed with help of Field Testing Kit.

**Specifications for IPR-E**

LTD Current ($I_1$) : 55% to 100% of $I_{CT}$ rating.
LTD Time : 5 Sec. fixed at 6$I_{CT}$ inverse time characteristics.
INST Current : Fixed at 6 $I_1$.


*IPR-E Release*



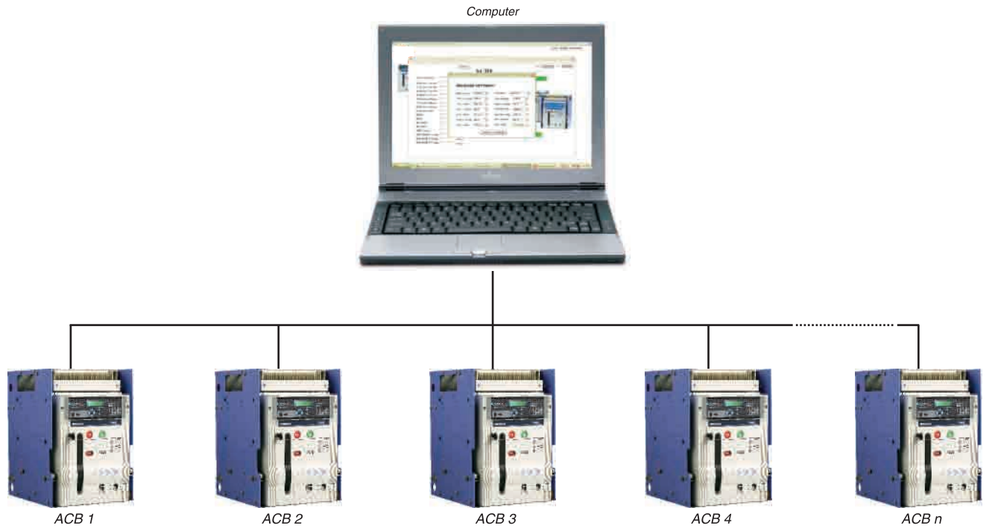


## Features Available In Different Models Of Over Current Release (IPR)

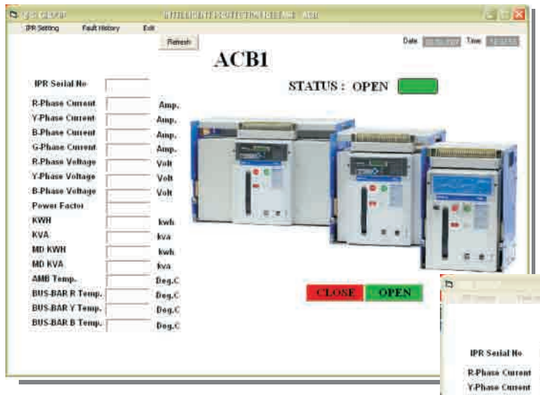
| Functions | IPRE | IPR1 | IPR2 | IPR3 |
|---|---|---|---|---|
| Overload Function (LTD) | ● | ● | ● | ● |
| Short Circuit Function (STD) | | ● | ● | ● |
| Instantaneous Function (INST) | ● | ● | ● | ● |
| Ground fault Function (GFT) | | ● | ● | ● |
| Function blocking feature for all the above 4 functions | | ● | ● | ● |
| Pre trip alarm function | | | ● | ● |
| Measurement function | | | | |
| • 3 phase current | | | ● | ● |
| • 3 phase voltage | | | | ● |
| • Tripping time | | | ● | ● |
| • KVA | | | | ● |
| • KWH | | | | ● |
| • Power factor | | | | ● |
| • Max.demand (KVA & KWH) | | | | ● |
| • Breaker terminal temperature | | | | ● |
| Under voltage / Overvoltage tripping | | | | ● |
| Fault History | | | ● | ● |
| Self Monitoring | | | ● | ● |
| Temperature sensing | | | | ● |
| Breaker fault | | | ● | ● |
| Potential free contacts | | | ● | ● |
| LED Indications | ● | ● | ● | ● |
| Operation counter | | | ● | ● |
| Function Check | ● | ● | ● | ● |
| LCD display | | | ● | ● |
| Communication Port RS 232 / 485 | | | | ● |

● Available

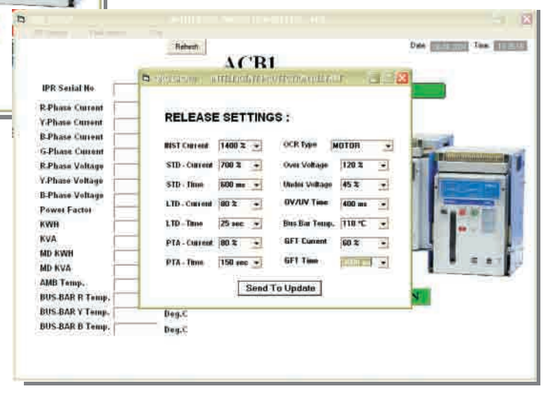
## Communication Facility




Intelligent over current microprocessor release type IPR3 is available with two way communication facility through RS232/485 port. The communication facility enables the user to monitor the entire system from his controlroom on a PC/Laptop. Through this facility it is also possible to control/modify the setting of the IPR release from the PC/Laptop as per the user requirement. The complete fault history record can also be stored in the computer. The software required for this system is offered by Havells as optional.




*Online information of ACB*

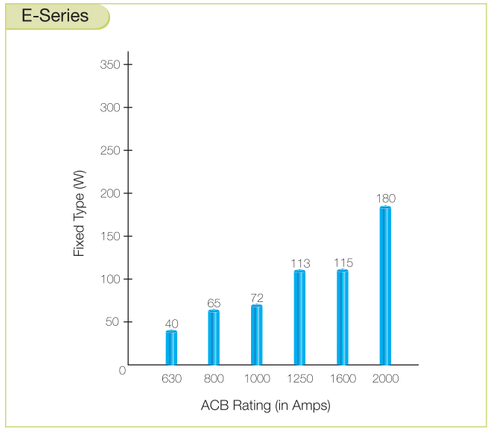


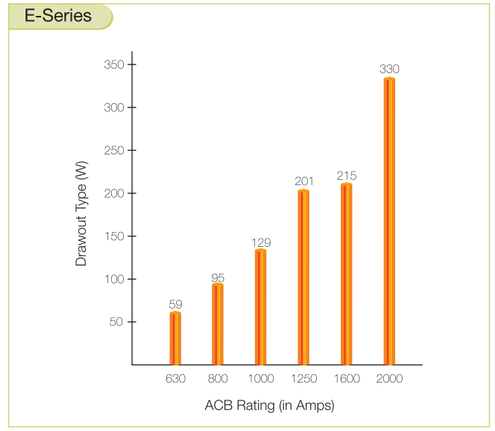

*Modification of release parameters from computer*

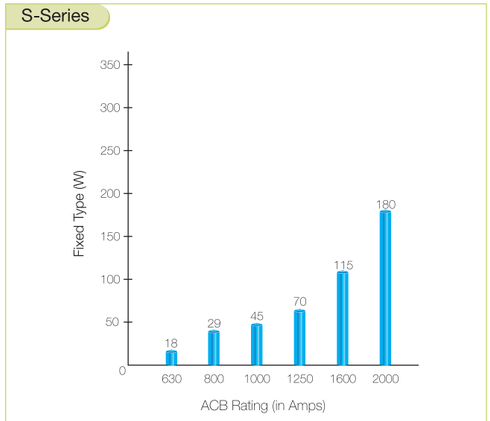


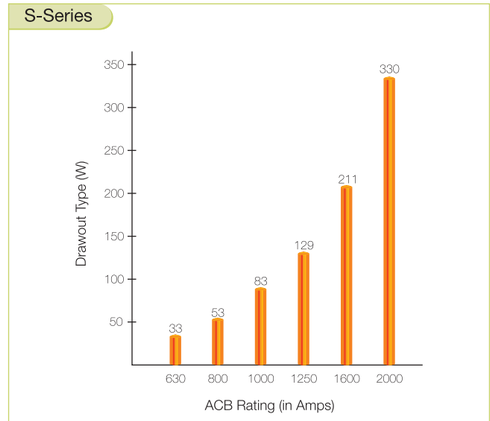


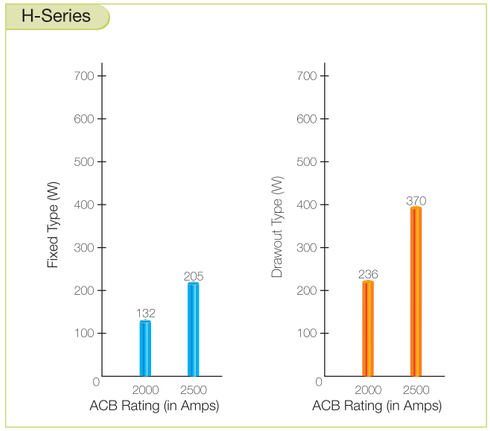
## Watloss Chart (total for 3 Pole ACB)

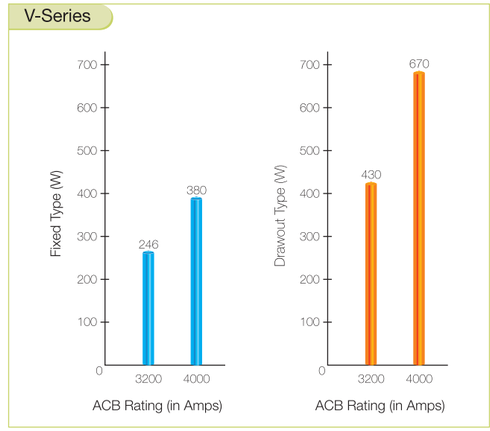



Fixed Type  Drawout Type

## Accessories

*Electrical Accessories:*

**Charging Motor:**

It is provided in an electrical operated ACB to charge the closing springs automatically. These are available in 110V and 220V AC/DC. The VA burden of this motor is 150 VA only and the charging time is 3 to 4 seconds.

**Shunt Trip Coil / Closing Coil :**

These coils are used for electrical tripping and closing of ACB.These coils are available in 24V, 110VAC/DC, 220VAC/DC & 415VAC. The same coil can be used as a shunt trip coil or closing coil. The inrush power is 200VA.

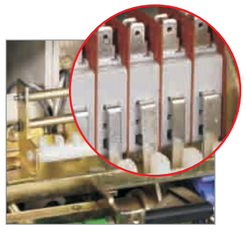
**Undervoltage release :**

This release trips the ACB in case the voltage drops below the required level. It is necessary to energise the under voltage release coil before attempting to close the circuit breaker as in de- energized condition, it mechanically locks the breaker and the same can not be closed . These coils are available in 24V DC, 110V AC/DC, 220V AC/DC & 415V AC.

For energizing this coil minimum 85% of the rated voltage is required and if the voltage drops below 50% of the rated voltage it automatically trips the ACB. Inrush power of this coil is 200VA and the continuous power is 5VA only.

**Auxillary Contacts :**

A set of five changeover switches are provided in the circuit breaker which can be used for external circuit . Additional five changeover switches can also be provided as optional.



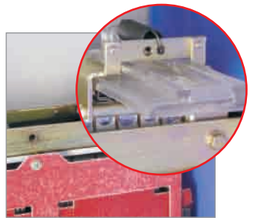
*Drawout Accessories:*

**Safety Shutter for main circuit :**

It is provided on the cradle which automatically isolates the Main circuit terminals when the breaker is drawn out. A provision is also there for locking the safety shutter in the closed position with the help of Pad Lock (not supplied with ACB).

**Position Indication Switch :**

A set of 5 micro switches is provided in the cradle which indicates the position of breaker in the cradle i.e. CONNECTED, TEST, or DISCONNECTED position. Two switches each are provided for CONNECTED AND DISCONNECTED position and one switch is for TEST position.



**Adaptor terminals for Cradle :**

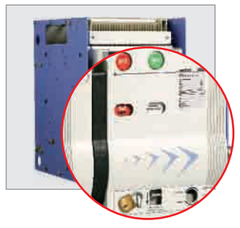
Special Adaptor Terminals can also be provided for Ist frame ACB which can make the terminals suitable for taking horizontal as well as vertical bus bar connections. The standard cradles are supplied with horizontal terminals.Adaptor terminals are factory fitted and are available at extra cost.

**Mal insertion prevention device :**

It prevents the breaker of a different rating being inserted into the cradle of different rating.

**Drawout position lock :**

This feature is available to lock the breaker into different drawout positions i.e. CONNECTED, TEST, or DISCONNECTED position with the help of padlock (not supplied with ACB).







## Accessories

*Other Accessories :*

**Close open cycle Counter :**

It indicates the number of mechanical operations of the circuit breaker and the same is visible on the front of ACB Cover.


**Key Lock/ key Interlock :**

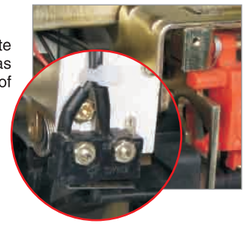
It is provided to lock the ACB in open position. Once the ACB is locked it can not be switched on. For interlocking purpose three locks with two keys or two locks with one key can be supplied.


**ON/OFF push button cover :**

A special cover can be provided on the front cover on which a pad lock (not supplied with ACB) can be fitted for locking the ON & OFF push buttons.

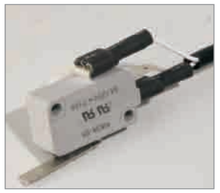

**Trip Indication switch :**

It is provided to get a remote signal indicating that ACB has tripped due to the operation of over current release.



**Spring charge Indication switch :**

A micro switch is provided to get a remote signal indicating the status of Circuit Breaker closing spring.



**Door interlock**

It prevents the opening of panel door, if the ACB is in closed(ON) position. When this interlock is fitted in the Circuit Breaker it is necessary to switch OFF the breaker, before opening the panel door.

**Lifting Plates**

Titania Air Circuit Breakers are fitted with specially designed lifting plates which makes the lifting of these ACBs very convenient

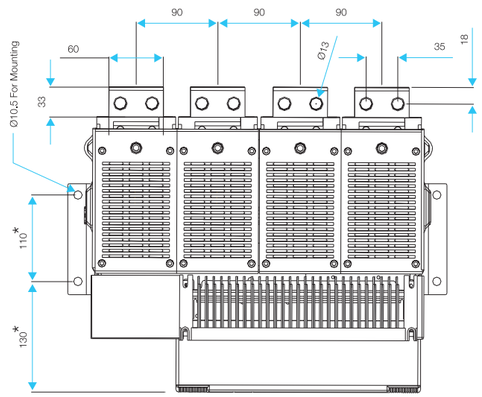
**Safety shutter padlock feature**

For the safety of the personnel, safety shutter can be padlocked once the breaker has been withdrawn from the cradle.

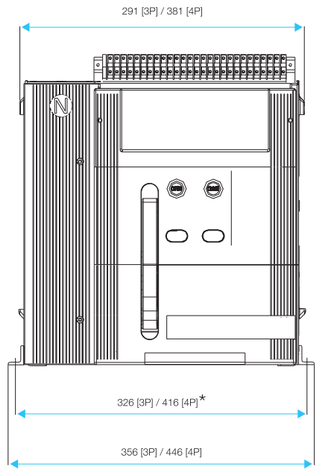
## Out Line Dimensions, Mounting Detail & Terminal Arrangement

***Rating: 630A to 2000A (E & S Series)***
***Fixed Type***

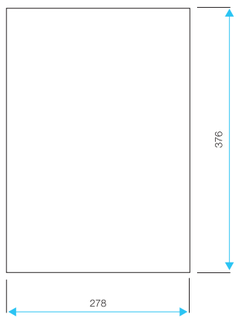
Top View



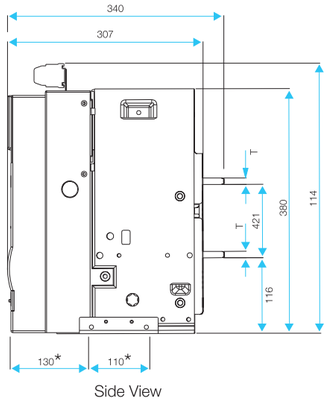

Front View




DOOR FRAME




Panel Door Cutout




Side View

***Thickness - 'T'***

| | E- Series | S- Series |
|---|---|---|
| 630-800A | 10 | 20 |
| 1000-1250A | 15 | 20 |
| 1600A | 20 | 20 |
| 2000A | 25 | 25 |

✱ Mounting hole dimensions
All dimensions are in mm.

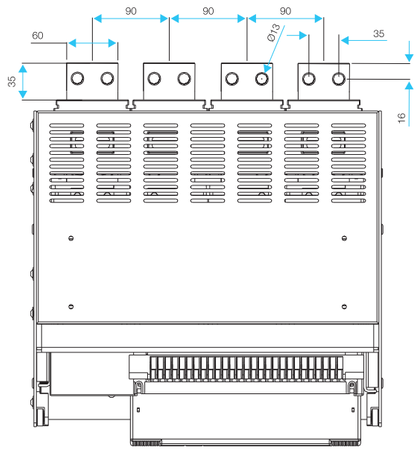




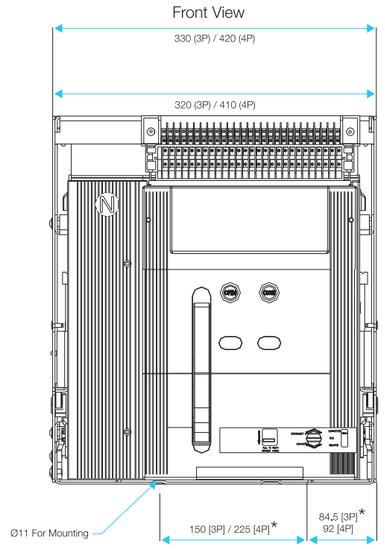
## Out Line Dimensions, Mounting Detail & Terminal Arrangement

***Rating: 630A to 2000A (E &S Series)***
***Drawout Type***

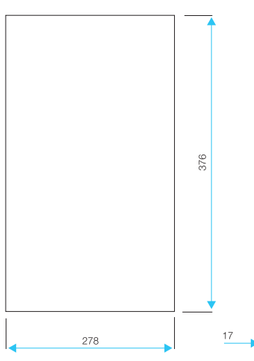
Top View



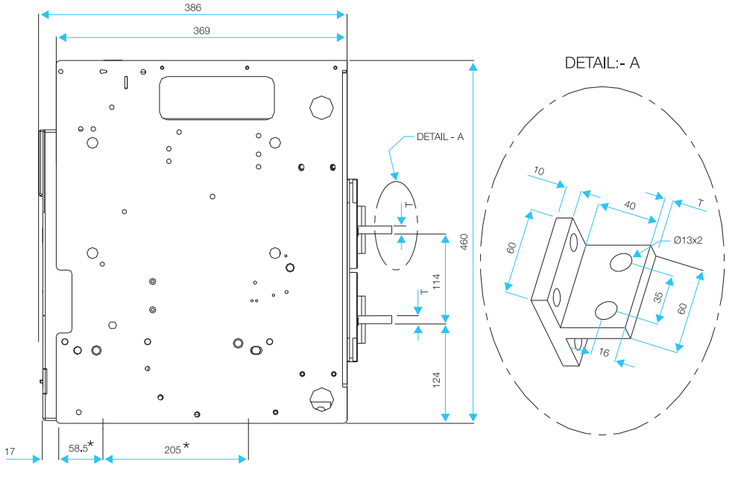

Front View




DOOR FRAME




Panel Door Cutout




***Thickness - 'T'***

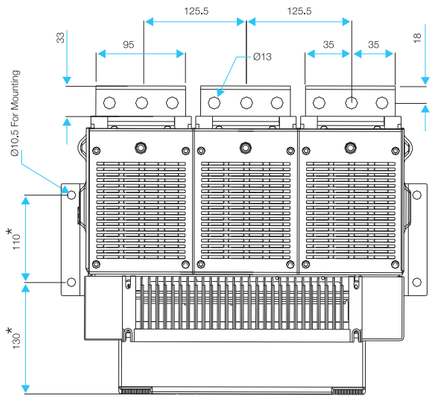
| | E- Series | S- Series |
|---|---|---|
| 630-800A | 10 | 20 |
| 1000-1250A | 15 | 20 |
| 1600A | 20 | 20 |
| 2000A | 25 | 25 |

✱ Mounting hole dimensions
All dimensions are in mm.

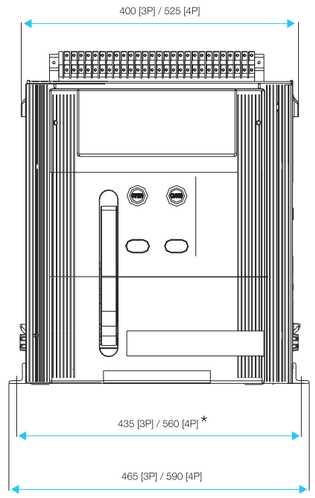
## Out Line Dimensions, Mounting Detail & Terminal Arrangement

***Rating: 2500A (H Series)***
***Fixed Type***

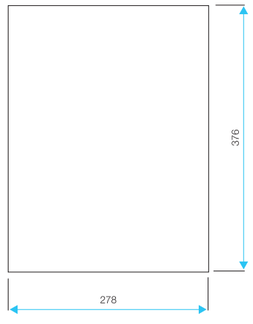
Top View



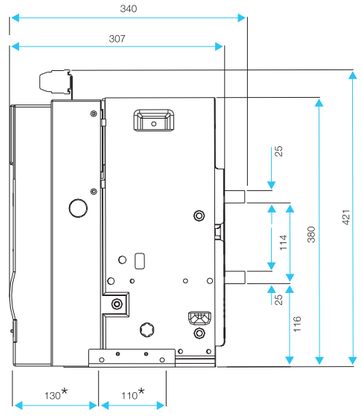

Front View




DOOR FRAME




Panel Door Cutout




Side View

✱ Mounting hole dimensions
All dimensions are in mm.



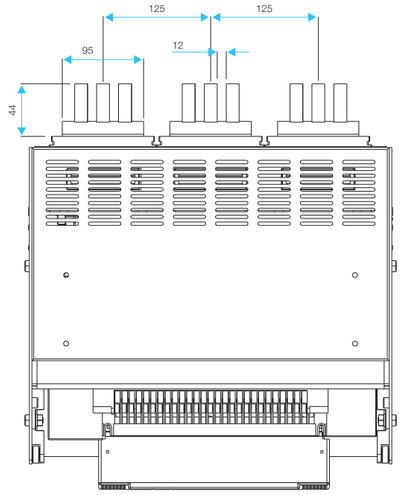




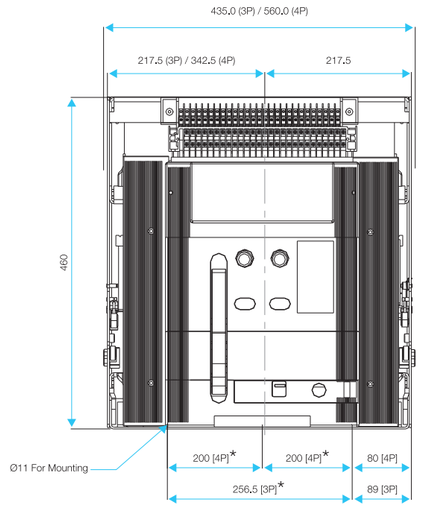
## Out Line Dimensions, Mounting Detail & Terminal Arrangement

***Rating: 2500A (H Series)***
***Drawout Type***

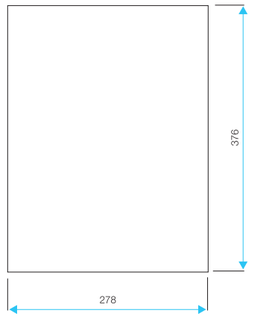
Top View



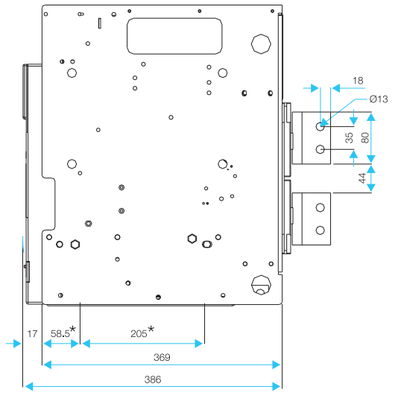

Front View




DOOR FRAME




Panel Door Cutout



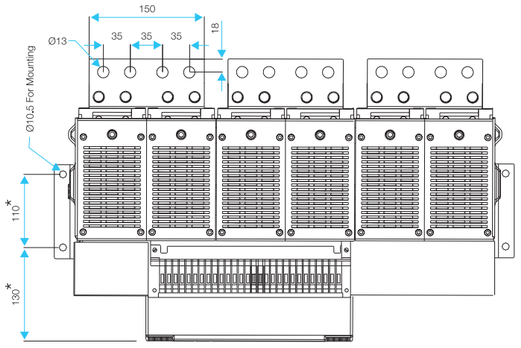

Side View

✱ Mounting hole dimensions
All dimensions are in mm.

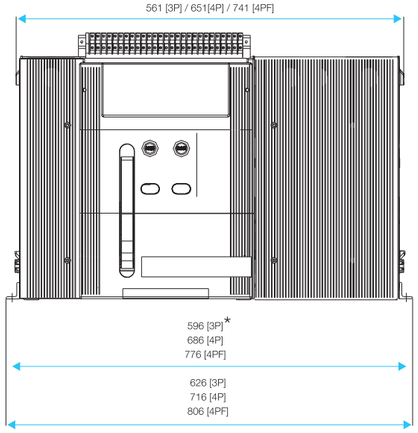
## Out Line Dimensions, Mounting Detail & Terminal Arrangement

***Rating: 3200A to 4000A (V Series)***
***Fixed Type***

Top View

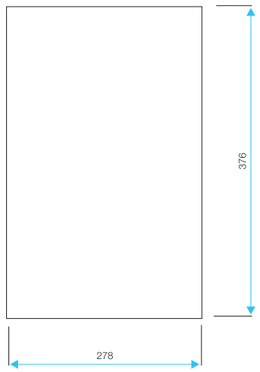



Front View

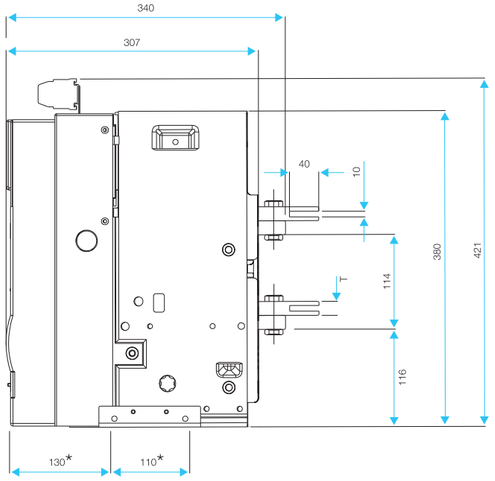



4P- 50% RATED NEUTRAL
4PF- 100% RATED NEUTRAL

DOOR FRAME




Panel Door Cutout




Side View

| RATING | `T' |
|---|---|
| 3200A. | 20mm. |
| 4000A. | 25mm. |

✱ Mounting hole dimensions
All dimensions are in mm.



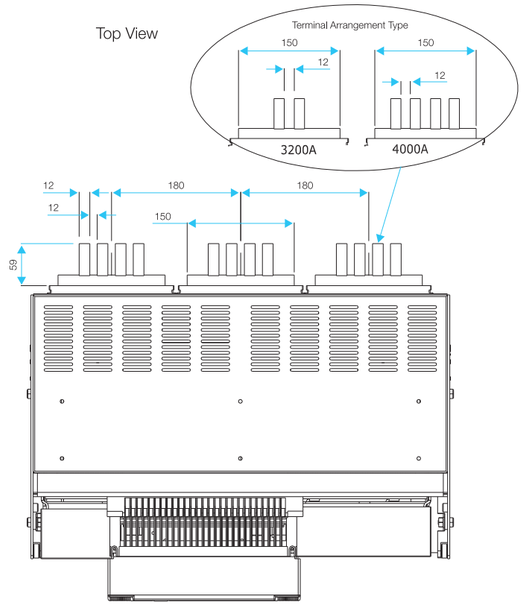


Titania air circuit breaker

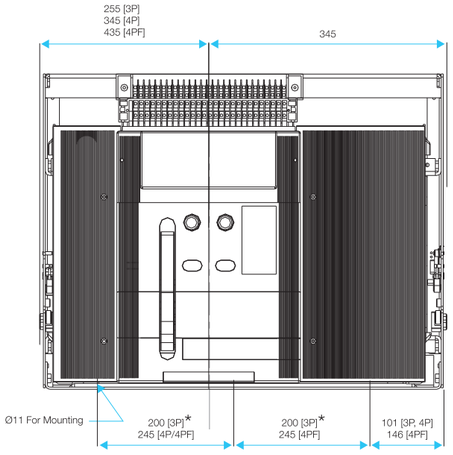
## Out Line Dimensions, Mounting Detail & Terminal Arrangement

***Rating: 3200A to 4000A (V Series)***
***Drawout Type***

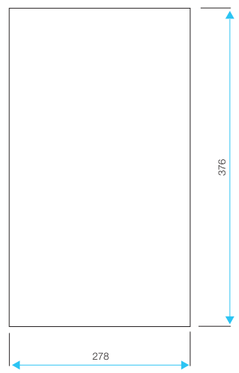
Top View



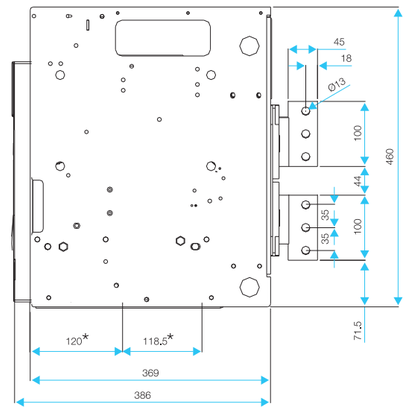

Front View




DOOR FRAME

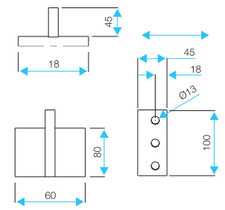



Panel Door Cutout



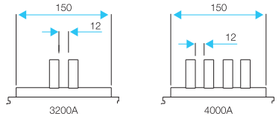

Side View

4P- 50% RATED NEUTRAL
4PF- 100% RATED NEUTRAL




50% N-POLE FOR
4000A - 4P ACB

TERMINAL ARRANGEMENT TYPE




✱ Mounting hole dimensions
All dimensions are in mm.



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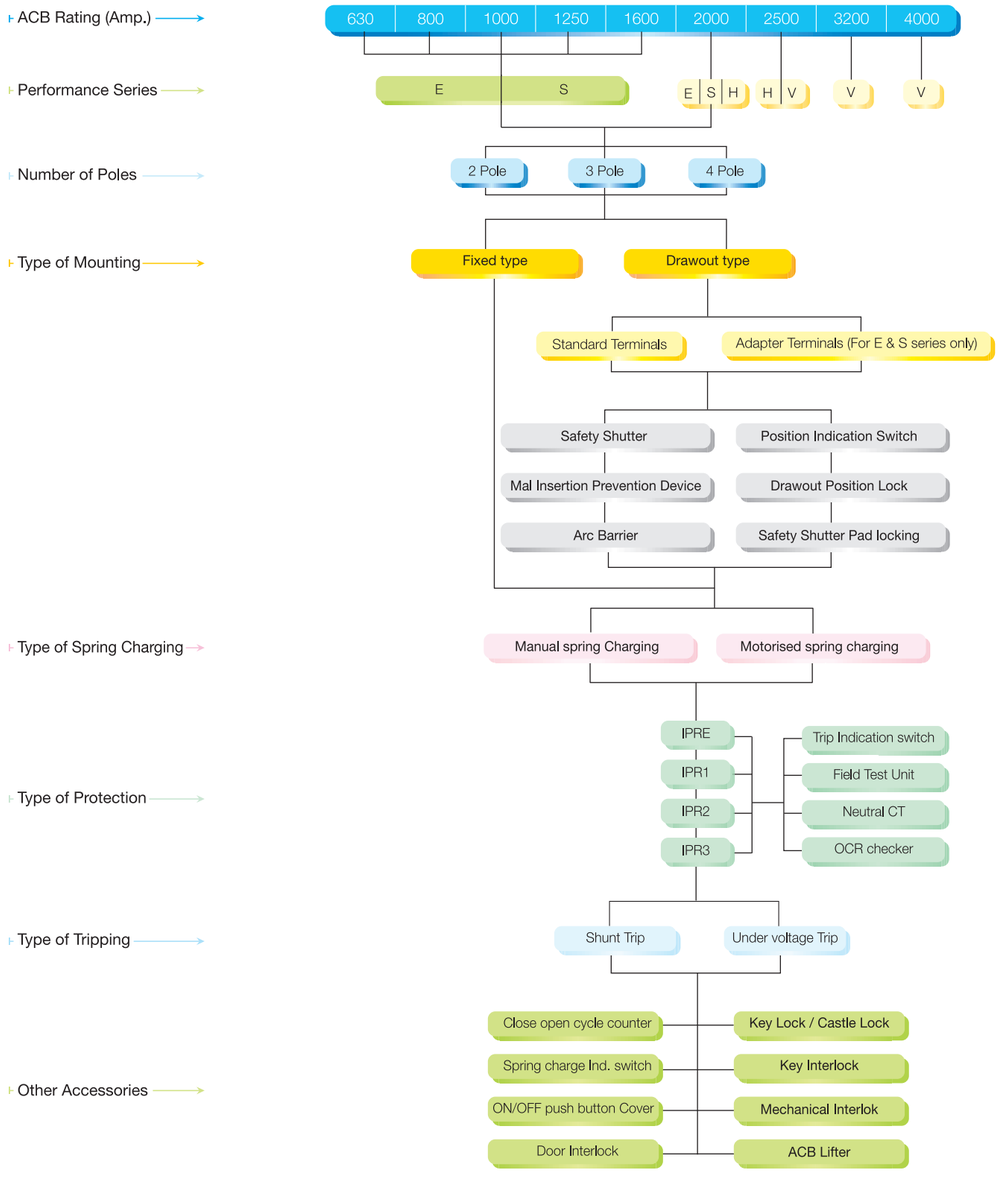
## Selection Chart








Titania air circuit breaker

## Order Form

Please check ☑ in front of appropriate box. Fill seperate sheet for each type of ACB

| CUSTOMER/ DEALER NAME | ORDER NO./DATE | END USER NAME |
|---|---|---|
| | | |

| | | |
|---|---|---|
| Rating of ACB | 630A ☐ 1000A ☐ 1600A ☐ 2500A ☐ 4000A ☐<br>800A ☐ 1250A ☐ 2000A ☐ 3200A ☐ | Qty. |
| Series | E ☐ S ☐ H ☐ V ☐ | |
| No. of Poles | 2 ☐ 3 ☐ 4 ☐ (100% Neutral) 4 ☐ (50% Neutral for V-Series only) | |
| Mounting | Fixed ☐ Drawout ☐ — * Horizontal Terminals (H,V) ☐ ; Adaptor Terminals (for E & S series only) ☐<br>* *For E & S series - Horizontal terminals are standard, for H & V series vertical terminals are standard. Please specify if other combination is required.* | |
| Spring Charging Operation | Manual ☐ Electrical ☐ — Closing Coil _____VAC/DC ; Tripping Coil_____ VAC/DC ; Motor _____ V | |
| Release | Without Release ☐ IPR E ☐ IPR 1 ☐ IPR 2 ☐ IPR 3 ☐<br>CT Rating _____A, Neutral CT ☐<br>Setting: O/L _____ A, S/C _____ A,<br>Inst. _____ A, GFT _____ A,<br>**Note:** Unless otherwise specified O/L will be set at maximum value and all other settings would be set at mid values. | |
| Other Accessories | ON/OFF Button Cover ☐ ; Close open cycle counter ☐ ; Field test unit ☐ ; Position Indication Switch ☐ ; Spring Charge Indication Switch ☐ ; Mechanical Interlock ☐ ; Mal Insertion Prevention device ☐ ; Door Interlock ☐<br>Five c/o additional Aux. contacts ☐ ; Shunt Trip Coil ☐ ; UVT ☐ .....V ; Trip Ind.sw. ☐ ; Key Lock ☐ ; Key Interlock — 2L+1K ☐ ; 3L+2K ☐ | |

OFV-5

***Note :***

1. Please specify the voltages for closing coil, shunt trip coil and UVT, available voltages are 24VDC, 110VAC/DC, 220VAC/DC and 415V AC and for motor available voltages are 220V AC / DC and 110V AC / DC.
2. For details of Over current release, please refer the technical catalogue.

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