

The need for continuous power supply and its reliability has increased rapidly over the years, especially in all those areas where uninterrupted power supply is a must. Modern systems are power dependent. Their complexity has increased as continuous information and communications are needed to control automated process, be in industries, commercial complexes, hospitals, hotels or even modern residences.

The need, as such, for independent stand by power system has therefore increased manifold. The power distribution, control, monitoring and protection of stand by power system needs to be integrated. Stand by generator systems, for example, are required to cater to :-

- **Sensitive Loads** are supplied by UPS systems. The period of non-availability of power, before the stand by supply takes over, is bridged by battery banks. Typical loads are computers, hospital equipments, micro processor controlled industrial machines etc.
- **Critical Loads** mostly involve stand by generator systems which supply power to lighting systems, air conditioning, elevators etc in Airports, Hotels and commercial complexes.
- **Essential Loads** also use stand by generator systems mostly in process industries as they relate to high restarting times or high down times.

Automatic transfer from main supply to stand by supply is vital for all the above kinds of loads.

In the event of power failure, the stand by power is usually expected to take over automatically. Electrical starting equipment, battery bank and diesel generator are required for the automatic operation.

The automatic transfer is achieved mostly by automatic mains failure systems. The process of onload transfer has to be monitored & controlled for a smooth Changeover and within safety limits of all elements of the system. This is achieved by Automatic Transfer Switch (ATS).Range

#### Range

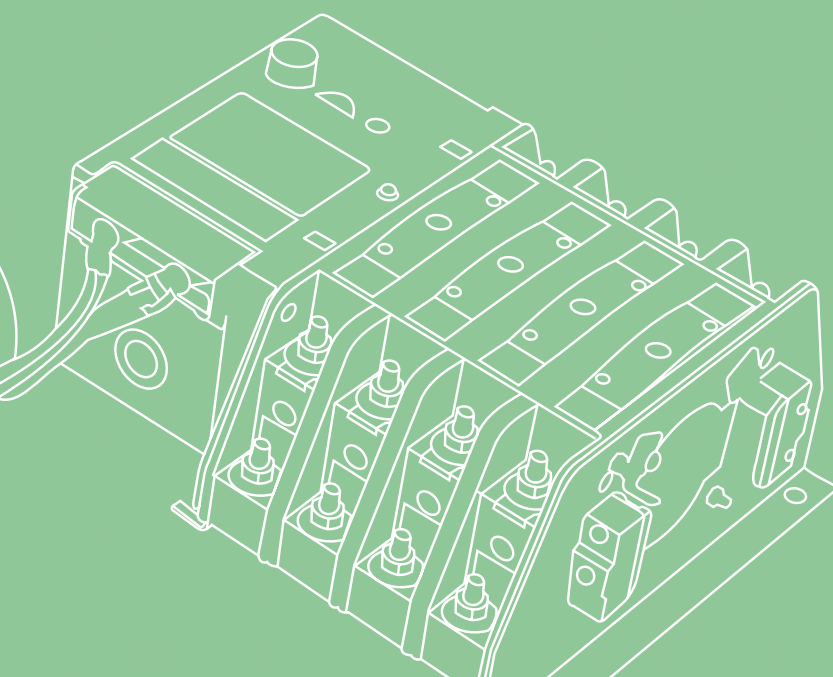
Current rating from 100A to 630A in three frame sizes in three pole and four pole execution.

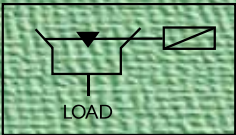
#### Specification

Conforms to IEC:60947-1 and IEC:60947-6-1 / IS:13947-1.

#### Features

- High speed transfer
- Superior making & breaking capacity
- Compact & light weight design
- Positive indication through flag indicator
- Neutral point transfer
- Liberal terminals
- Phase barriers Range





The Switch comprises of upto four symmetrical poles coupled with the Main Operating Mechanism. The switching mechanism is quick make, quick break type. Load terminals are given on the Lower side but can also be provided on the upper side.

#### Contact Mechanism

The contact system is housed in a frame made of Polyester reinforced glass material. Each pole has two independent set of Moving contact assemblies for Main & standby supply and one Fixed contact assembly for the common outgoing load terminals. The Moving assemblies are mechanically operated by Cams when rotated by the Main Operating Mechanism. Moving Contacts make on to Fixed Contacts under constant pressure with backup spring. Main Contacts are made of Silver-Tungsten to ensure anti-weld characteristics. The Arc Chute plates placed in the path of contact, efficiently quench the Arc and there by enhance the life of the contacts.

#### Main Operating Mechanism

The main mechanism independently actuates two sets of Cam linkages, which in turn operate the two independent moving contact assemblies.

The closing command is through a Solenoid Coil supplied with 220V AC. The operating mechanism always responds by closing on the main supply side and not on to standby supply side, when both supplies are present.

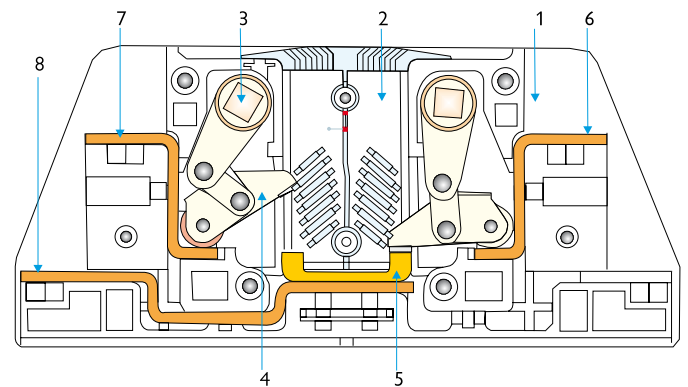
The tripping coil, when energised, is used to bring the ATS to OFF / Neutral position.

Closing on to the standby supply is achieved through the selective coil. The energisation of selective coil, disengages the main mechanism and prevents closing on to the main supply. The

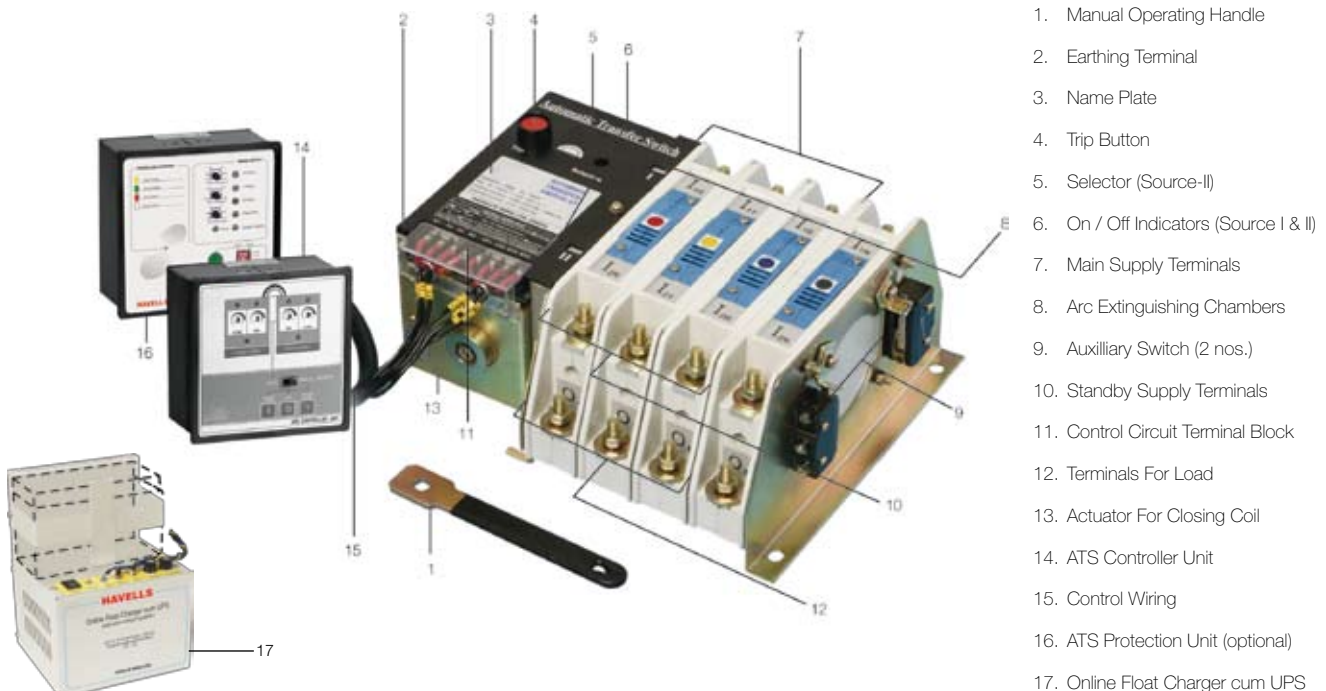
solenoid coil can then close the second set of moving contacts on to the standby supply.

The moving contact mechanism of the main supply and the standby supply are inherently mechanically interlocked through a double throw arrangement, which ensures that at no point of time two supplies are paralleled.

#### Cross Sectional View of Single Pole of ATS



- 1 Frame
- 2 Housing for Arc Chute
- 3 Operating Shaft for Contacts
- 4 Moving Contact
- 5 Fixed Contact
- 6 Main Supply - Incoming Terminals
- 7 Standby Supply - Incoming Terminals
- 8 Common outgoing - Load Terminals



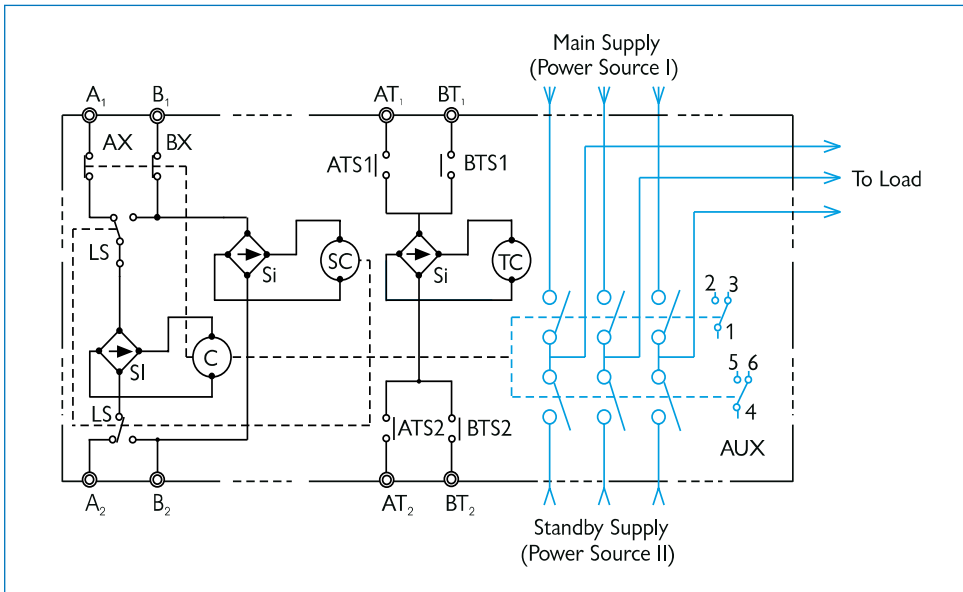
1. Manual Operating Handle
2. Earthing Terminal
3. Name Plate
4. Trip Button
5. Selector (Source-I)
6. On / Off Indicators (Source I & II)
7. Main Supply Terminals
8. Arc Extinguishing Chambers
9. Auxilliary Switch (2 nos.)
10. Standby Supply Terminals
11. Control Circuit Terminal Block
12. Terminals For Load
13. Actuator For Closing Coil
14. ATS Controller Unit
15. Control Wiring
16. ATS Protection Unit (optional)
17. Online Float Charger cum UPS



## Operation (Automatic)

In the event of main supply being available, the ATS can be instantaneously switched ON, by the closing coil C, through terminals A<sub>1</sub>, A<sub>2</sub>, from its OFF / Neutral position.

If the ATS is ON at the standby supply position, then it is first tripped by the trip coil TC, through terminals BT<sub>1</sub> - BT<sub>2</sub>. This ensures that the two sources of supply are not paralleled. A suitable external control circuit will ensure this, as shown in circuit diagram for Automatic Instantaneous Changeover mode.



The Auxiliary Switches AX or BX, disconnect the closing coil C, once the ATS is ON, thereby the power consumption of the coil C is zero, when the ATS is closed.

To switch the ATS to standby supply, the selective coil SC is first energised. Then the closing coil C is powered through limit switches LS and terminals B<sub>1</sub>, B<sub>2</sub>.

The Trip Coil TC, can be energised through AT<sub>1</sub> - AT<sub>2</sub> or BT<sub>1</sub> - BT<sub>2</sub> to switch off the main supply or standby supply.

## Operation (II Emergency)

In an emergency, the ATS can be operated manually, but as an off-load switch only.

Close on to Main Supply

A manual handle rotates the operating shaft by about 45° in anticlockwise direction, to achieve closure, under off-load conditions.

Close on to Standby Supply

Closure on to standby supply side is achieved, when the "selective" mode is continuously pressed and the manual handle rotates the operating shaft by about 45° in anticlockwise direction.

Trip

Tripping can be achieved manually by pressing momentarily through the "Trip Button".



Closing ATS manually to source-I  
Switch to source-I (mains) by rotating the handle upwards through an angle (approximately 45°)

Closing ATS manually to source-II

1. Keep selector pressed using a screwdriver through the selector hole as shown
2. Switch to source-II (mains) by rotating the handle upwards through an angle (approximately 45°)



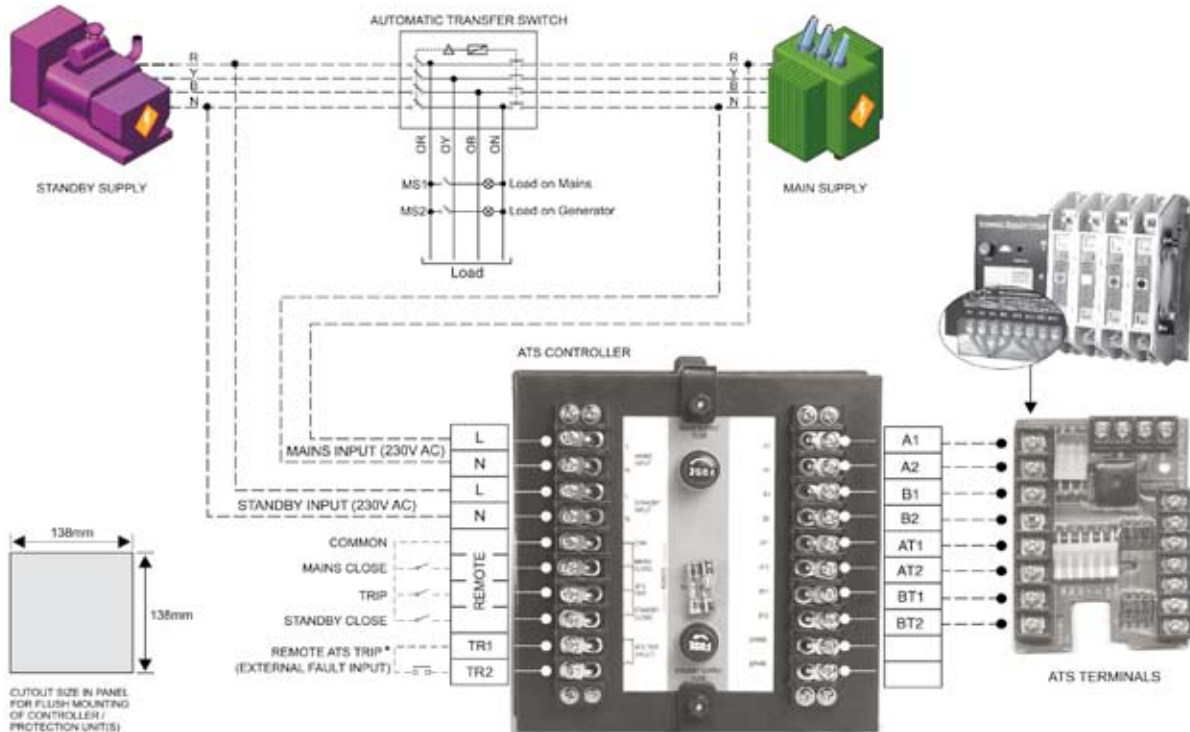


| Frame Size                                       |                   | TNFO1                   |           | TNFO2             |           | TNFO3             |            |
|--------------------------------------------------|-------------------|-------------------------|-----------|-------------------|-----------|-------------------|------------|
| Rated Operational Current I <sub>e</sub>         | A                 | 100                     | 160       | 200               | 315       | 400               | 630        |
| No. of Poles                                     |                   | 3P / 4P                 | 3P / 4P   | 3P / 4P           | 3P/4P     | 3P / 4P           | 3P / 4P    |
| Rated Insulation Voltage U <sub>i</sub>          | V                 | 1000                    | 1000      | 1000              | 1000      | 1000              | 1000       |
| Rated Operational Voltage U <sub>e</sub>         | V                 | 440V AC/125V DC         |           | 440V AC / 125V DC |           | 440V AC / 125V DC |            |
| Rated frequency                                  | Hz                | 50                      | 50        | 50                | 50        | 50                | 50         |
| Class                                            |                   | PC                      | PC        | PC                | PC        | PC                | PC         |
| Utilization Category                             |                   | AC 31A                  | AC 31A    | AC 31A            | AC31A     | AC 31A            | AC31A      |
| Dielectric Strength                              | KV                | 5                       | 5         | 5                 | 5         | 5                 | 5          |
| Rated Impulse withstand Voltage U <sub>imp</sub> | KV                | 10                      | 10        | 10                | 10        | 10                | 10         |
| Rated making capacity at 440V (Cosφ = 0.80) A    |                   | 1000                    | 1600      | 2000              | 3150      | 4000              | 6300       |
| Rated breaking capacity at 440V (Cosφ = 0.80) A  |                   | 800                     | 1280      | 1600              | 2520      | 3200              | 5040       |
| Rated short time withstand current (1 sec)       | KA <sub>rms</sub> | 5                       | 7         | 10                | 12        | 12                | 15         |
| Fuse protected S/C withstand current             | KA <sub>rms</sub> | 80                      | 80        | 80                | 80        | 80                | 80         |
| Rated Short circuit making capacity              | KA <sub>rms</sub> | 12.5                    | 17.5      | 25                | 30        | 30                | 37.5       |
| Mech. Life (No. of ops.)                         |                   | 50,000                  | 50,000    | 40,000            | 40,000    | 30,000            | 30,000     |
| Elect. Life (No. of ops.)                        |                   | 15,000                  | 15,000    | 12,000            | 12,000    | 10,000            | 10,000     |
| Switching frequency (ops. per Hr)                |                   | 120                     | 120       | 120               | 120       | 120               | 120        |
| Terminal Position                                |                   | Front                   | Front     | Front             | Front     | Front             | Front      |
| Terminal Capacity - Cu (cable)                   | mm <sup>2</sup>   | 35                      | 70        | 95                | 185       | 240               | ---        |
| Al (cable)                                       | mm <sup>2</sup>   | 50                      | 95        | 150               | 240       | 300               | ---        |
| Busbar                                           | mm                | ---                     | ---       | ---               | ---       | 40 x 5 x 2        | 40 x 8 x 2 |
| Weight 3P Kg                                     |                   | 8.3                     | 8.7       | 10.5              | 11.0      | 18.0              | 19.5       |
| 4P Kg                                            |                   | 9.3                     | 9.7       | 11.5              | 12.0      | 21.0              | 22.5       |
| Mounting                                         |                   | Vertical                | Vertical  | Vertical          | Vertical  | Vertical          | Vertical   |
| Coil                                             |                   |                         |           |                   |           |                   |            |
| Operating Voltage                                | V                 | 200 / 220               | 200 / 220 | 200 / 220         | 200 / 220 | 200 / 220         | 200 / 220  |
| Operating Current                                | A                 |                         |           |                   |           |                   |            |
| Main Coil 3P / 4P                                |                   | 3.0 / 3.5               | 3.0 / 3.5 | 4.0 / 4.5         | 4.0 / 4.5 | 8.0 / 10.5        | 8.0 / 10.5 |
| Trip Coil                                        |                   | 0.5                     | 0.5       | 0.5               | 0.5       | 0.7               | 0.7        |
| Operating Time                                   | (ms)              |                         |           |                   |           |                   |            |
| Main Power Source Make                           |                   | 55                      | 55        | 55                | 55        | 60                | 60         |
| Break                                            |                   | 20                      | 20        | 20                | 20        | 25                | 25         |
| Standby Power Source Make                        |                   | 80                      | 80        | 80                | 80        | 90                | 90         |
| Break                                            |                   | 20                      | 20        | 20                | 20        | 25                | 25         |
| Changeover time                                  |                   | (Using Controller Mode) |           |                   |           |                   |            |
| Changeover time                                  |                   | min                     | -         | 0.5 m sec         |           |                   |            |
|                                                  |                   | max                     | -         | 60 sec            |           |                   |            |

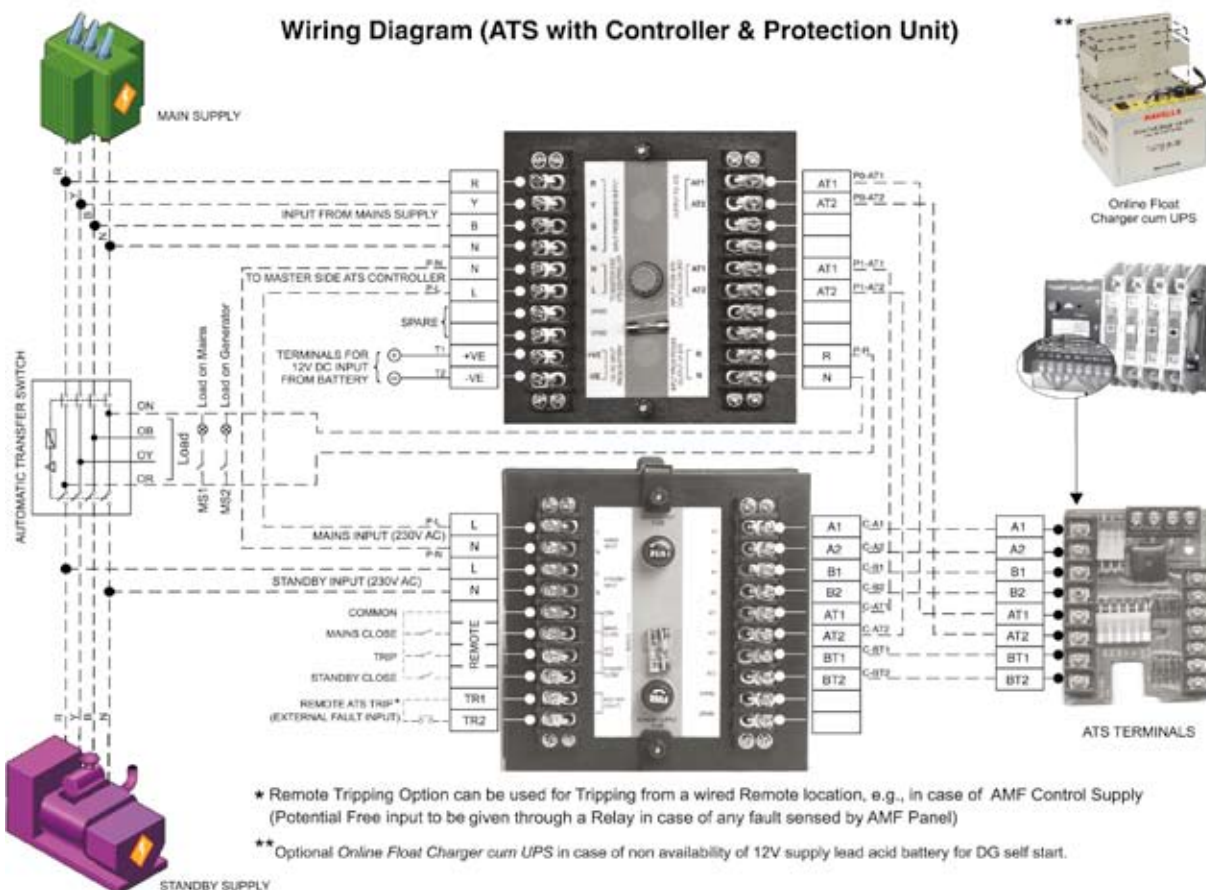
3 P - Three Pole

4 P - Four Pole

### Wiring Diagram (Controller to ATS)



### Wiring Diagram (ATS with Controller & Protection Unit)



\* Remote Tripping Option can be used for Tripping from a wired Remote location, e.g., in case of AMF Control Supply (Potential Free input to be given through a Relay in case of any fault sensed by AMF Panel)

\*\* Optional Online Float Charger cum UPS in case of non availability of 12V supply lead acid battery for DG self start.

### Utilization Scope

Auto Transfer Switch is a self-acting equipment containing the transfer switching devices and other necessary devices for monitoring supply circuits and for transferring one or more load circuits from one supply to another.

The operating sequence of ATS consists of an automatic transfer of a load from the normal supply to an alternate supply in the event of a monitored supply deviation and automatically returning the load to the normal supply when quality of mains supply is restored. The transfer is with a predetermined time delay and includes an interim off position.

In case of both the normal and the alternate supplies being present, the ATS shall assume the normal supply position, which is termed as 'preferred supply'.

The various utilization categories show the most popular applications of Auto Transfer Switch, as per IEC-60947-6-1.

### Utilization Scope

| Nature of current   | Utilization Category                 |                                      | Typical applications                                                                                                    |
|---------------------|--------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
|                     | Frequent Operations                  | Infrequent operations                |                                                                                                                         |
|                     | AC-31A                               | AC-31B                               | Non-inductive or slightly inductive loads<br>Motor loads or mixed loads including motors, resistive loads and up to 30% |
|                     | AC-33A                               | AC-33B                               |                                                                                                                         |
| Alternating Current | AC-35A<br>AC-36A<br>DC-31A<br>DC-33A | AC-35B<br>AC-36B<br>DC-31B<br>DC-33B | incandescent lamp loads<br>Electric discharge lamp loads<br>Incandescent loads<br>Resistive loads                       |
| Direct Current      | DC-36A                               | DC-36B                               | Motor loads or mixed loads including motors<br>Incandescent lamp load                                                   |

### Three Pole - Basic Unit



| Current Rating (A) | Cat. No.       | Cat. No.                     |
|--------------------|----------------|------------------------------|
|                    | STANDARD MODEL | WITH PRIMARY SIDE PROTECTION |
| OPEN EXECUTION     |                |                              |
| 100                | IHYTSA0100     | IHY#PD0100                   |
| 160                | IHYTSA0160     | IHY#PD0160                   |
| 200                | IHYTSA0200     | IHY#PD0200                   |
| 315                | IHYTSA0315     | IHY#PD0315                   |
| 400                | IHYTSA0400     | IHY#PD0400                   |
| 630                | IHYTSA0630     | IHY#PD0630                   |
| IN ENCLOSURE       |                |                              |
| 100                | IHYTSAE100     | IHY#PDE100                   |
| 160                | IHYTSAE160     | IHY#PDE160                   |
| 200                | IHYTSAE200     | IHY#PDE200                   |
| 315                | IHYTSAE315     | IHY#PDE315                   |
| 400                | IHYTSAE400     | IHY#PDE400                   |
| 630                | IHYTSAE630     | IHY#PDE630                   |

### Four Pole - Basic Unit

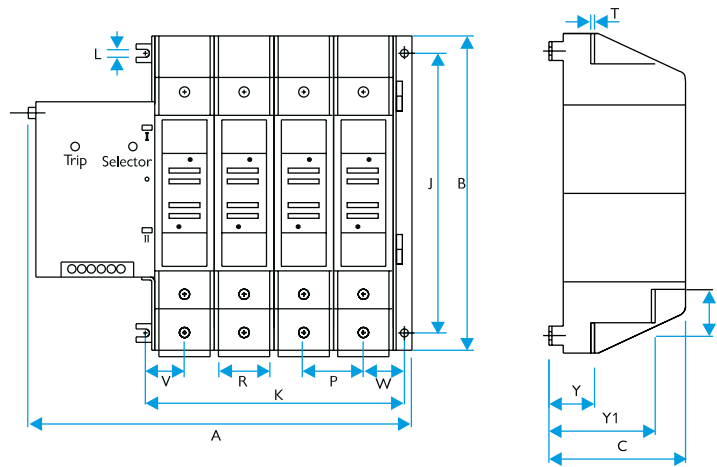


| Current Rating (A) | Cat. No.       | Cat. No.                     |
|--------------------|----------------|------------------------------|
|                    | STANDARD MODEL | WITH PRIMARY SIDE PROTECTION |
| OPEN EXECUTION     |                |                              |
| 100                | IHYFSA0100     | IHY#PD0100                   |
| 160                | IHYFSA0160     | IHY#PD0160                   |
| 200                | IHYFSA0200     | IHY#PD0200                   |
| 315                | IHYFSA0315     | IHY#PD0315                   |
| 400                | IHYFSA0400     | IHY#PD0400                   |
| 630                | IHYFSA0630     | IHY#PD0630                   |
| IN ENCLOSURE       |                |                              |
| 100                | IHYFSAE100     | IHY#PDE100                   |
| 160                | IHYFSAE160     | IHY#PDE160                   |
| 200                | IHYFSAE200     | IHY#PDE200                   |
| 315                | IHYFSAE315     | IHY#PDE315                   |
| 400                | IHYFSAE400     | IHY#PDE400                   |
| 630                | IHYFSAE630     | IHY#PDE630                   |

**Note :** Primary side protections include single phasing, over voltage, under voltage and phase reversal. While the trip coil operates using 220V AC available from either of the electrical sources, the protection unit requires 12 DC battery input for its functioning. The same needs to be made available from an uninterrupted source such as external battery being used for self start generator set.

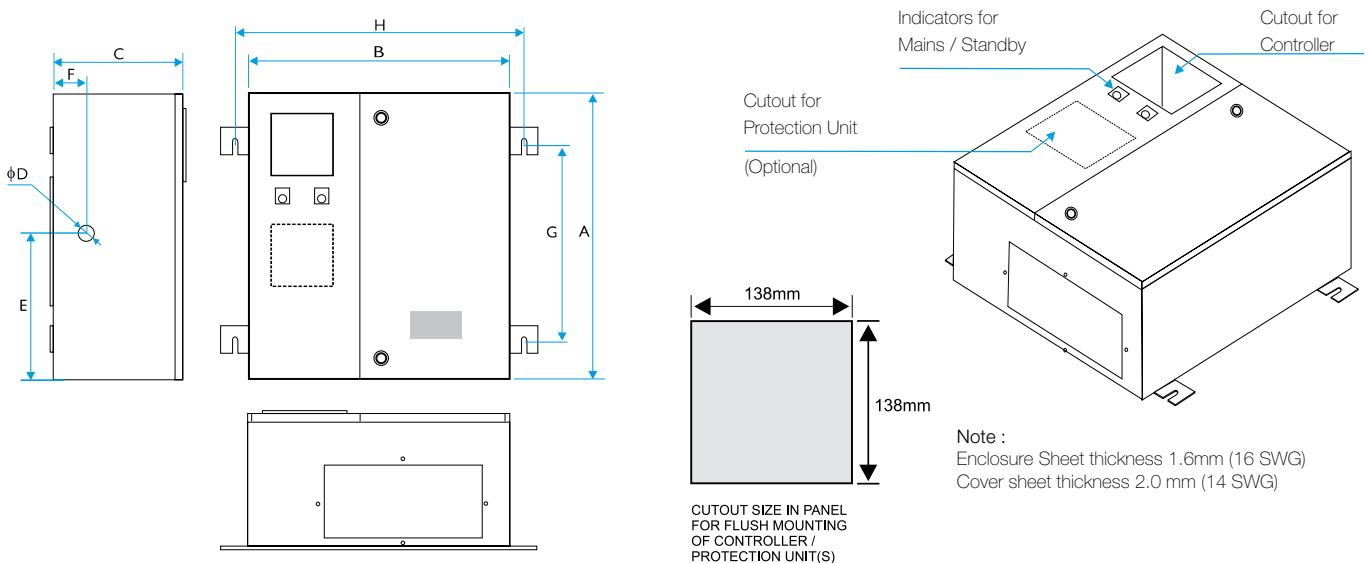
## Dimensions (in mm) - Open Execution

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| Frame Size | Current Rating (A) | No. of Poles | Over All Dimensions |     |     | Switch Mounting |     |     | Connection Terminals |    |    |   |    |    |    |     | Terminal Bolt Size | Weight |
|------------|--------------------|--------------|---------------------|-----|-----|-----------------|-----|-----|----------------------|----|----|---|----|----|----|-----|--------------------|--------|
|            |                    |              | A                   | B   | C   | J               | K   | L   | P                    | R  | S  | T | V  | W  | Y  | Y1  |                    |        |
| 1          | 100                | 3P           | 257                 | 241 | 122 | 201             | 132 | φ9  | 38                   | 15 | 30 | 4 | 29 | 29 | 40 | 90  | M8x30MM            | 8.3Kg  |
|            | 100                | 4P           | 295                 | 241 | 122 | 201             | 170 | φ9  | 38                   | 15 | 30 | 4 | 29 | 29 | 40 | 90  | M8x30MM            | 9.3Kg  |
| 1          | 160                | 3P           | 257                 | 241 | 122 | 201             | 132 | φ9  | 38                   | 15 | 30 | 4 | 29 | 29 | 40 | 90  | M8x30MM            | 8.7Kg  |
|            | 160                | 4P           | 295                 | 241 | 122 | 201             | 170 | φ9  | 38                   | 15 | 30 | 4 | 29 | 29 | 40 | 90  | M8x30MM            | 9.7Kg  |
| 2          | 200                | 3P           | 290                 | 253 | 122 | 213             | 167 | φ9  | 48                   | 30 | 30 | 5 | 34 | 34 | 40 | 90  | M8x30MM            | 10.5Kg |
|            | 200                | 4P           | 338                 | 253 | 122 | 213             | 216 | φ9  | 48                   | 30 | 30 | 5 | 34 | 34 | 40 | 90  | M8x30MM            | 11.5Kg |
| 2          | 315                | 3P           | 290                 | 253 | 122 | 213             | 167 | φ9  | 48                   | 30 | 30 | 5 | 34 | 34 | 40 | 90  | M8x30MM            | 11.0Kg |
|            | 315                | 4P           | 338                 | 253 | 122 | 213             | 216 | φ9  | 48                   | 30 | 30 | 5 | 34 | 34 | 40 | 90  | M8x30MM            | 12.0Kg |
| 3          | 400                | 3P           | 340                 | 337 | 144 | 290             | 218 | φ10 | 60                   | 40 | 40 | 5 | 42 | 34 | 38 | 110 | M10x40MM           | 19.5Kg |
|            | 400                | 4P           | 400                 | 337 | 144 | 290             | 278 | φ10 | 60                   | 40 | 40 | 5 | 42 | 34 | 38 | 110 | M10x40MM           | 21.0Kg |
| 3          | 630                | 3P           | 340                 | 337 | 144 | 290             | 218 | φ10 | 60                   | 44 | 40 | 7 | 42 | 34 | 38 | 110 | M10x40MM           | 21.0Kg |
|            | 630                | 4P           | 400                 | 337 | 144 | 290             | 278 | φ10 | 60                   | 44 | 40 | 7 | 42 | 34 | 38 | 110 | M10x40MM           | 22.5Kg |

## Dimensions (in mm) - in Enclosure



| Rating    | A   | B   | C   | D      | E   | F  | G   | H   |
|-----------|-----|-----|-----|--------|-----|----|-----|-----|
| 100A-315A | 550 | 450 | 240 | φ 25.4 | 322 | 60 | 503 | 510 |
| 400A-630A | 550 | 520 | 236 | φ 25.4 | 332 | 65 | 503 | 580 |