

## Power Pack

### Application Notes

#### **Guidelines for Selection of Input/Output Ratings of Power Pack :**

##### **"Stored Output" of Power Pack :**

1. This is the 'Primary' Output of Power Pack [for which the Product is meant for]. This Output provides "Stored" DC Energy to Shunt Trip & Close Coil Operations.
2. It is generally recommended that ONE Power Pack shall be used per Circuit Breaker.
3. Trip Coil of Breaker shall & must be connected ONLY to "Stored Output" of Power Pack.
4. It should be understood that the 'Primary' function of Power Pack is to Trip the Breaker using "Stored Output" even during the worst-case condition: viz., when Input AC to the Installation & to Power Pack has failed.
5. Depending upon type of Circuit Breaker, Close Coil may also be connected to "Stored Output" of Power Pack. In such cases, care should be taken to include this Close Coil load while calculating the "WSec" Rating of "Stored Output" of Power Pack.
6. Other than Trip Coil & Close Coil of Circuit Breaker, no other Load should be connected to "Stored Output" of Power Pack, to ensure beyond doubt that Stored Energy of Power Pack is not wasted/drained unnecessarily.
7. Suitable 'Inter-locks' by means of Series Contacts of Relay/Contactors shall have to be provided in Trip Circuit of the Scheme; in a manner that connection from "Stored Output" of Power Pack to Trip/Close Coil be 'Instantaneously' cut-off once either a Trip or a Close is complete. This ensures that Stored Energy of Power Pack is not wasted/drained unnecessarily.

##### **"Non Stored Output" of Power Pack :**

1. This Output is an 'Optional' Output of Power Pack and is provided only when specified.
2. This Output provides 'simple' rectified DC Output, without any storage facility for Energy and hence becomes instantaneously 'Zero Volts' when Input AC to Power Pack has failed/Off.
3. Depending upon type of Circuit Breaker, Close Coil may also be connected this Output.
4. This Output may be used for illuminating 'Indicating Lamps' & other misc. loads.
5. Since this Output becomes instantaneously 'Zero Volts' when Input AC to Power Pack has failed/Off, it is generally recommended that operating voltages of loads such as 'Indicating Lamps' & other misc loads, may as well be chosen to work directly on Input AC Voltage and shall be connected to accordingly.
6. Foregoing shall help in reducing the general burden on Power Pack and also shall greatly help in reducing the Unit Price of Power Pack.
7. Foregoing points shall be taken into consideration while finalising Loads and further, care should be taken to sum-up total "Watts" of "Non Stored Output" required from Power Pack.

## **DC Output Voltage of Power Pack :**

1. During manufacture, No Load DC Output Voltage of Power Pack, is always set at 110% to 115% of Rated DC Output Voltage.

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## **Maximum OFF Time :**

1. On fully Charged condition of Capacitors [and Power Pack], when Input AC to Power Pack fails /switched-OFF, the Maximum Time for which the Power Pack retains/maintains 80% of Rated Output Voltage on No Load condition = **02 to 04 Hours**.

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## **'Shelf-Life' factor of Capacitors & associated 'Pre-Conditioning' :**

1. Power Pack employs Aluminium Electrolytic can-type Capacitors. "Electrolyte" is a high-density Insulating Liquid present inside Capacitors.
2. During normal operation of a Capacitor [ie., when Input Voltage is applied to Power Pack and when Power Pack is in Service], this 'Electrolytic liquid' is homogeneously circulated well inside the 'can' housing the Capacitor and the Capacitor exhibits its normal Properties.
3. When Power Pack is kept 'Unused' [ie., when No Input Voltage is applied to Power Pack] for a prolonged length of time [say, beyond TWO weeks], the Electrolytic liquid slowly 'settles' to the bottom of the 'can' housing the Capacitor.
4. During this condition when Input Voltage to Power Pack is suddenly applied, the Capacitors [due to settling down of Electrolyte] may not exhibit its normal Properties instantaneously. It might take a little amount of time for the Capacitor to exhibit its normal Properties, ie., until Electrolyte spreads homogeneously inside.
5. This phenomenon is known as : **'Shelf-Life' factor of Capacitors**.
6. To overcome this 'Shelf-Life' factor, '**Pre-Conditioning**' of Capacitors is done by applying Rated Input AC Voltage to Power Pack for about 2 to 3 Hours, to ensure homogeneous circulation/distribution of Electrolyte inside Capacitor.
7. This 'Pre-Conditioning' enables Capacitor to Charge to and deliver the Rated/desired Output.

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## **LED + Push Button provided for 'DC Healthy Test' :**

1. 'DC Healthy Test' LED with Push Button is provided, if specified by User, to check for 'Healthiness' of DC Output Voltage present in Power Pack.
2. This 'DC Healthy Test' LED glows as long as Push Button is kept pressed and thereby provides only an 'Indication' to User.
3. The glow of this 'DC Healthy Test' LED indicates **only the presence of DC Output Voltage**. This glow **does not** in any way represent **either** the quantum of desired Stored DC Charge **or** the magnitude of Rated DC Output Voltage required/suitable for the Load [for Trip/Close].

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### Application Notes

*Contd..*

### `Capacitor` based Power Packs ... vs ... `Battery` based Power Packs

•	<b>`Energy Storage Device`</b> : As the very name implies, suits `Capacitor` based Power Packs, which have are conventional in design with many inherent advantages, traditionally preferred by most Circuit Breaker & End-Users, all though the years.
•	There are, however, `Battery` based Power Packs available in the Market. These are Marketed with vehemence. It is for the User to understand the implications & inherent disadvantages of this variety of Product, before procuring the same.
•	Few Points are Listed hereunder, comparing the TWO Varieties, with a view to educate the User & highlight the implications.

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		`Capacitor` based Power Packs	`Battery` based Power Packs
1.	<b>Charging Time [after total drain-out]</b>	Less than 2 to 3 Seconds	Approx. 6 to 8 Hours
2.	<b>Maximum No. of Charge-Discharge</b>	Infinite No. of Times [No upper limit]	Approx. 50 to 200 Times ONLY [as recommended by Battery Manufacturer]
3.	<b>Component dependability</b>	`Capacitors` are widely used in all Electronic Circuits and are proven for longivity & dependability	Batteries consists of `Cells` of 1.5 V each. As evident, `Electro-Chemical Reaction` takes place inside `Cells` to produce 1.5 V. [A 12 V Battery has 8 Cells & 24 V Battery has 16 Cells] • Say ~ 110 V is made of 9 Nos. 12 V Batteries [ie., 8 Cells x 9 = 72 Cells] • If `Electro-Chemical Reaction` fails in <b>ONE Cell</b> , then balance 71 Cells Discharge into this defective Cell, resulting in <b>ZERO Volts</b> available for Tripping.
4.	<b>Guarantee for quantum of Stored DC</b>	<u>Guaranteed.</u> Since `Capacitance` Value remains Constant, always	Quantum of Stored DC <b>cannot be Guaranteed.</b> Following Values are Time-bound. due to constant `Electro-Chemical Reaction`, :- • 1.5 V produced by each Cell decreases • Ampere-Hour Rating of Batteries decreases
5.	<b>Maintenance</b>	Practically `Zero- Maintenance`, [since it is `Passive` Electronic Component]	• Require Periodic Maintenance [by `Topping-up` Acid & Distilled Water, etc.,] • Even if claimed to be `Maintenance-Free` Batteries, above Periodic Checks are to be conducted.
6.	<b>Simplicity in Circuit</b>	Simple `Rectifier` Circuit	To `Float-Charge` Batteries, "Invertor" Circuit is used. • "Invertor" Circuits are complicated and involves many `Active` Semi-Conductor Components. • Failure of any `Active` Semi-Conductor Component leads to <b>TOTAL failure</b> of Power Pack.

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