Powerhouse Distribution

Reliable Power Solutions

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Check the details

With over 25 years experience in the backup power industry the directors at PHD Powerhouse have pretty much seen it all. However the one thing that consumers consistently fail to understand is battery sizing for backup power systems.

Very often consumers will opt for a lower cost quote on a backup system without looking at the finer detail. In an attempt to win orders, unscrupulous vendors will often skimp on the batteries, making ludicrous claims on run times. By offering smaller battery capacities huge savings can be realised but the runtime claims are often unachievable.

Here's how PHD Powerhouse recommends you calculate battery requirements to ensure that you get what you are asking for.

There are a number of factors which influence battery selection:

1. Load
2. Required runtime
3. DC Bus
4. UPS Efficiency (inverter)
5. Battery type
6. Charger size

1. Load

It stands to reason that the bigger the load that one wants to support the greater the capacity of the batteries should be. In our example we will use a load of 1000W

2. Required runtime

As in point 1 above the longer the required runtime the greater the battery capacity will have to be. In our example we will use a required runtime of 1 hour

3. Charger Type

UPS's cannot accommodate an infinite battery capacity. The battery capacity is therefore limited to the size of the charger. Usually, the battery capacity should be no more than 12 x the maximum charge current ie. A 5A charger can only accommodate 60AH of batteries (5 x 12 =60) however if discharges are expected to be less frequent than once in every 10 Days one may in extreme cases go to 20 x the maximum charge current. We will assume that our UPS has a 10A Charger.

4. DC Bus

The DC Bus is the Voltage required by the Inverter to operate and dictates the number of batteries in series required to drive the inverter. This information is available from the UPS supplier and should be clearly indicated in their spec sheets. DC Busses range from 12V (1 x Battery) to 480V (40 X batteries). We will assume a DC bus of 36V (3 x Batteries)

5. UPS Efficiency (Inverter)

Inverters use some of the energy supplied by the batteries to run the internal electronics and so not all of the battery capacity is available to run the load. Also some of the energy is lost due to cabling and connections particularly if there are long run's of DC cables. For our example we'll assume a 70% inverter efficiency.

6. Battery Type

There are many types of batteries available on the market today and since PHD is not a battery specialist we will not make recommendations here. However as a rule we use fully sealed, maintenance free, deep cycle lead acid batteries which are common to the industry.

It is important to remember that batteries discharge exponentially faster at higher loads than at lower loads, so if a battery provides 1 hour runtime at 5A it will provide significantly less than 30min at 10A - usually in the order of 10 to 15% less. For total accuracy it is important to refer to the discharge curves of the particular battery manufacturer however PHD uses a few rules of thumb to increase runtime accuracies.

1. For runtimes below 2 hours a factor of 1.5 is applied to the final required battery current.
2. For runtimes above 2 hours a factor of 1.3 is applied to the final required battery current.

Calculation.

From the above information we have the following:

Load = 1000W

DC Bus = 36V (3 x 12V Batteries)
Required runtime = 60min's
Inverter efficiency = 70%
Charger = 10A

First we need to calculate the Current required to run the load and the inverter:

I = Load ÷ (70%) ÷ (DC Bus)
I = 1000 ÷ 0.7 ÷ 36
I = 39.68A

From the above we can see that to supply our load and inverter for 1 hour the battery will have to supply 39.68A for 1 hour = 39.68AH

However using our rule of thumb for the exponential nature of battery discharge curves we need to increase the required current by a factor of 1.5

I = 39.68 x 1.5
I = 59.52

A 59.52AH Battery will therefore be required to provide 1 hour's runtime to the load of 1000W. However manufacturers do not manufacture batteries of 59.52 AH so the next biggest standard size should be selected. In this case a 65AH battery.

Finally since the DC Bus requires a 36V input 3 x 12V, 65AH Batteries connected in series will be required to complete the system.

The above calculations may seem a little daunting and many consumers may feel it unnecessary to learn something that they may need once in a life time. So here's a basic rule to ensure that when comparing quotes one compares apples with apples. Remember "the devil is in the detail" so always ask for a breakdown when getting a quote for a backup system. Ensure that the UPS, batteries, cabinets and installation are each quoted on a separate line with a full description including the number and capacity of batteries. That way one is easily able to understand the discrepancies between competing quotes.

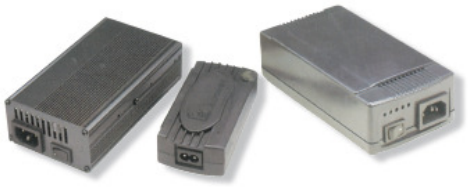
PHD Powerhouse Distribution

We have recently updated our wedpage with a library of help pages, from Surge protection to UPS systems, for more information go our web page www.phdpowerhouse.co.za and click on the following pages.

UPS systems help pages

Inverter help pages

Voltage stabilizer help pages



Surge protection help pages (PDF)

Difference between Watts and VA

Surge protection selection

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