

How does Single-Phase Inverter Work on a Three-Phase Supply?

In some cases, we often get asked: “What happens if we connect a single-phase inverter on a three-phase supply?” In this article, we will provide you the clear answer and recommendation based on such questions.

Technical aspect of connecting single-phase inverter to a three-phase supply

Connecting a three-phase inverter with a three-phase grid connection is always the preferred choice in large or industrial connections where the consumer is charged for kVA consumption and balancing three phases is important which influences the PF (Power Factor). Because a three-phase inverter will provide the exact power required by each phase, and there is no risk of leading any imbalance.

However, technically a single-phase inverter will easily synchronize with any one of the phases in a three-phase grid as well. Under the 6kW system, it will typically not cause any issues with smaller residential connections. Adding a single-phase Inverter will not cause any technical concerns in residential connections that have both single-phase and three-phase loads.

We need to ensure that the single-phase Inverter is connected to the phase which has the maximum load. In some applications with highly imbalanced three-phase loads, If the inverter is connected to the phase with the lower load it may cause a further imbalance which may affect the grid voltage and even trip it.

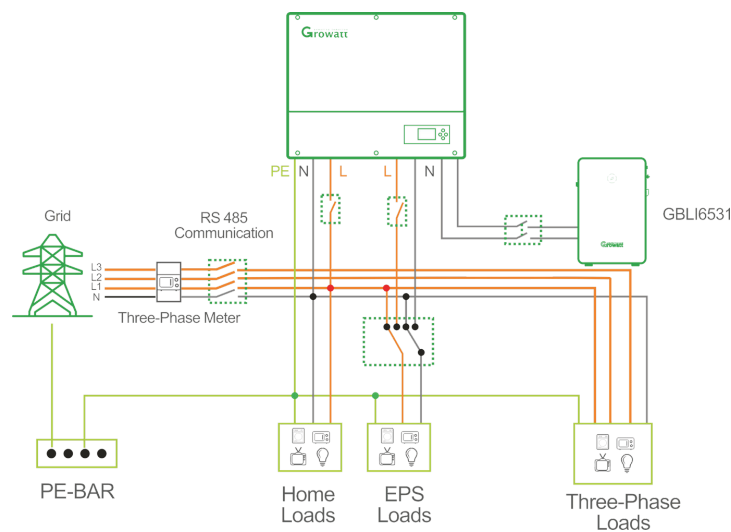
Does a single-phase inverter on a three-phase supply affect your self-consumption?

No, it doesn't. All three-phase meters must take into account the sum of all the power being used on all the phases and then subtract that from the amount of solar power being generated to calculate the import or export amount for billing. Thus, there will be no difference in billing for the case of smaller residential connections where the user is charged for kW consumed. However, with larger three-phase connections which are charged for kVA consumption, it is extremely important to balance the PF or preferable to go for a three-phase solar connection.

How does Growatt single-phase SPH & SPA work in a three-phase connection?

System diagram

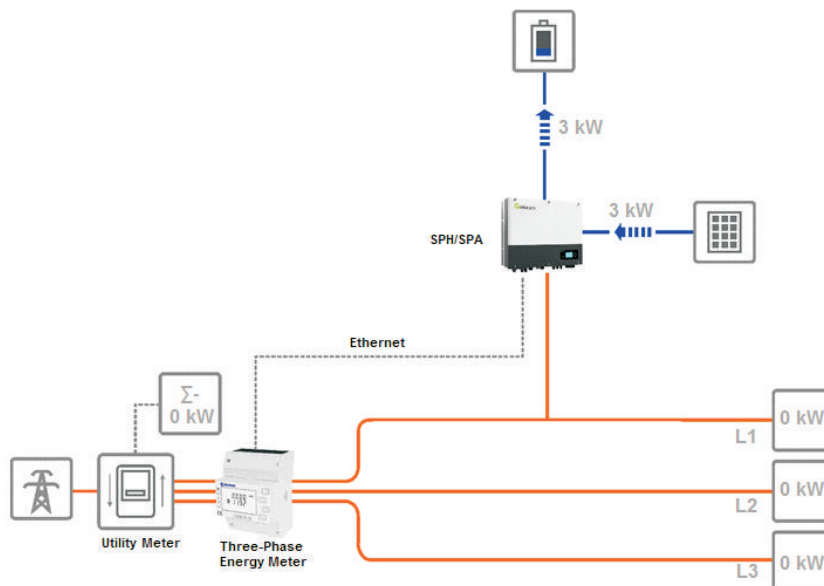
Single-phase SPA / SPH inverter is installed under one phase (L1-N) of a three-phase grid. When there are loads under the other two phases (L2, L3) of the three-phase grid, you should install a three-phase electric meter transmit the power information from the grid side to SPA / SPH. Then the SPA / SPH will discharge according to the total value of the three-phase load.



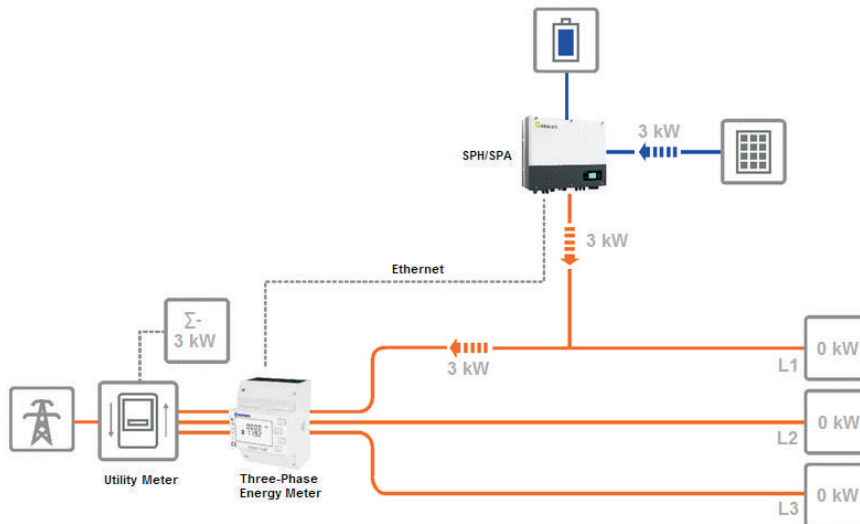
System Block Diagram

System Running

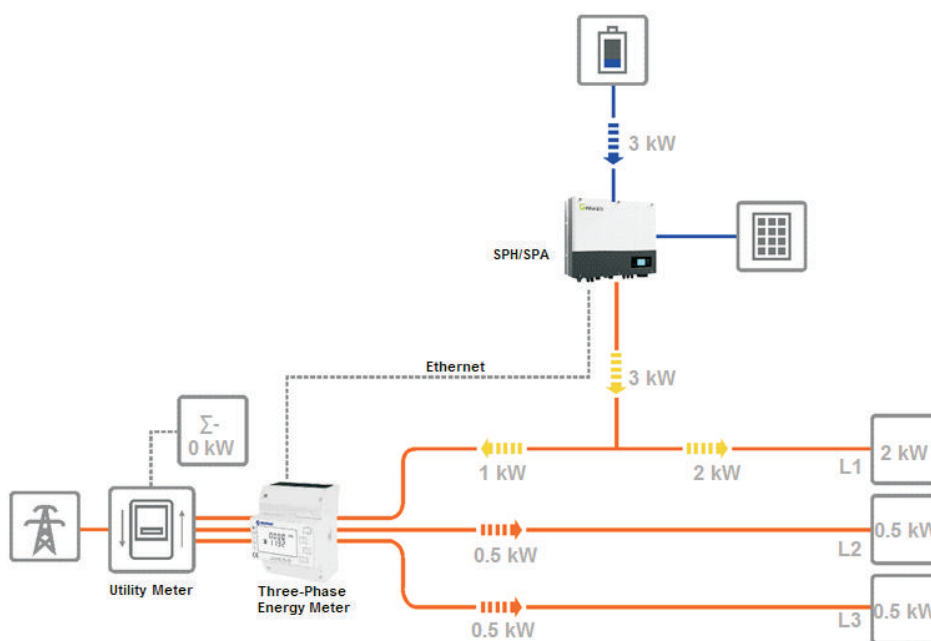
1. In the sunlight hours, assuming that it's no-load consumption, the solar power being generated will charge the battery through SPH/SPA until the battery system is full.



2. The solar power will export into the grid when the battery system is full and there is no load consumption (The solar power will be limited once set up the zero-export function of SPH & SPA, and no power will export into the grid).



3. At night, assuming that L1 phase, L2 phase, L3 phase will absorb the power of 2kW, 0.5kW, 0.5kW from the grid, the three-phase energy meter will show SPH/SPA the total value of load consumption is 3kW, and the battery system will discharge 3kW through the SPH to L1 phase, the power of 2kW is for a load of L1 phase, and the other 1kW power will feedback into the grid. As a result, the utility meter will sum up the value of the power consumption of three-phase from grid and presents 0KW.



Recommendations

1. If the client has a single-phase grid connection, and the single-phase hybrid inverter is recommended, as the series of Growatt SPH 3000-6000TL BL.
2. If the client has a three-phase grid which is metered for kW consumption and needs at least 6kW hybrid inverter for their home, and we suggest a three-phase hybrid inverter for the client, like the series of Growatt SPH 4000-10000TL3 BH.
3. If the installer would like to provide the solution of a single-phase inverter working on a three-phase system, the installer should audit the client's phase of maximum load consumption. A single-phase connection is suggested to be connected on the phase which is maximum load consumption.