SKYTRONIC

230 VOLT INVERTERS

Model:
TL INV600
12V 600W

Model:
TL INV600/24
24V 600W

Model:
TL INV1000
12V 1000W

Model:
TL INV1000/24
24V 1000W

Operation Manual

MODEL Nos:	TL INV600	TL INV600/24
Output power continuous	600W	600W
Output power surge	1500W	1500W
AC Output voltage	230V	230V
Regulation	±10%	±10%
Output wave form	Modified Sine Wave	Modified Sine Wave
DC input voltage	10-15V	20-30V
Low battery alarm	DC 10.5V ±0.5V	DC 21V ±1V
Low battery shut-down	DC 10V ±0.5V	DC 20V ±1V
Frequency ±1%	50Hz	50Hz
Efficiency	90%	90%
No load current draw	<0.95A	<0.4A
Over temperature protection	55°C ±5°C	55°C ±5°C
Cooling fan	YES	YES
Overload protection	YES	YES
Input short circuit protection	YES	YES
Dimensions (LxWxH)	290 x 205 x 73mm	290 x 205 x 73mm
Net weight	2.1kgs (approx.)	2.1kgs(approx.)

MODEL Nos:	TL INV1000	TL INV1000/24
Output power continuous	1000W	1000W
Output power surge	2000W	2000W
AC Output voltage	230V	230V
Regulation	±10%	±10%
Output wave form	Modıfied Sine Wave	Modified Sine Wave
DC input voltage	10-15V	20-30V
Low battery alarm	DC 10.5V ±0.5V	DC 21V ±1V
Low battery shut-down	DC 10V ±0.5V	DC 20V ±1V
Frequency + 1%	50Hz	50Hz
Efficiency	85-90%	85-90%
No load current draw	<1.35A	<0.7A
Over temperature protection	55°C ±5°C	55°C ±5°C
Cooling fan	YES	YES
Overload protecton	YES	YES
Input short circuit protection	YES	YES
Dimensions (LxWxH)	393 x 242 x 80mml	393 x 242 x 80mm
Net weight	3.15kgs	3.15kgs

SKYTRONIC INVERTERS

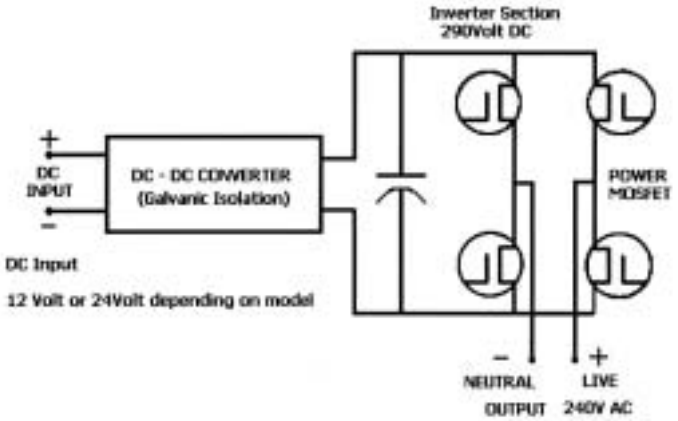
An Inverter is an electronic device that converts low voltage DC (Direct Current) electricity from a battery or other power source to standard 240 Volts AC (Alternating Current) household power.

The Inverter converts power in two stages. The first stage is a DC to DC amplification which raises the low voltage DC at the inverter input to 290 Volts DC. The second stage is the actual inverter stage which converts the high voltage 290 Volts DC into 240 Volts AC.

The DC to DC stage uses a high frequency power conversion technique that eliminates the need for bulky transformers found in more traditional inverters. The benefit of this is a significant reduction in size and weight.

The inverter stage uses advanced power MOSFET transistors in a full bridge configuration, which means that the inverter has a much stronger load handling capability.

Fig 1 Inverter - Principle of Operation



A power inverter converts DC power into conventional AC power which can run all kinds of household products such as: kitchen appliances, microwaves, power tools, TVs, radios, computers and more. You just connect the inverter to a battery, and plug your AC devices into the inverter and you've got power on the go.

The power inverter draws its power from a 12 Volt or 24 Volt battery, or several batteries wired in parallel. The battery will need to be recharged as the inverter draws the power out of it. The battery recharges by running the automobile motor, gas generator, solar panels, or wind and not with the power inverter. During blackouts, an inverter can be used for emergency power by use with a car battery with the vehicle running and an extension cord running into the house, where you can then plug in electrical appliances.

Using the SkyTronic 230V inverters

The SkyTronic range of inverters transform 12/24V battery voltage into 230V mains voltage, thus enabling you to use your domestic equipment everywhere you want e.g. on camping, on a boat, in your car, etc. The regulated output voltage makes the inverters suitable for use with sensitive devices such as TV sets, video and audio devices, PCs or laptops and many more.

General features of SkyTronic inverters

- high performance at low heat production
- 50Hz stable output frequency
- regulated 230V output voltage
- protection against short circuit and overheating
- with SkyTronic battery protection system. If the battery voltage drops to 10.5V (21V for 24V batteries) the inverter emits an alarm signal. If the battery voltage drops even further, the inverter shuts off automatically. This advanced protection system avoids to over discharge the battery.

WARNING

SkyTronic inverters supply an output voltage of 230V which is as dangerous as the domestic mains voltage! Therefore only use double-insulated devices and replace immediately leads that are in bad condition. Don't expose the inverters to humidity and place them in a well ventilated area. The inverters with an earth connector can be connected to a grounding point such as a metal part of a boat or the car chassis.

Important!

Under full load, high current is flowing through the battery cables. Therefore it is recommended to use only the supplied cables and no extension cables in order to avoid unacceptable voltage losses. If necessary, use an extension cord in the 230V circuit to the connected unit. To comply with the legal standards, the inverter may only be used with the supplied low voltage cables. Do NOT extend them.

The connected battery must be in good condition and fully charged. After some time, it may be necessary to start the car or boat in order to recharge the battery. At that moment, the inverter must be switched OFF beforehand in order to avoid damage due to excessive battery voltage.

On/off switch

Connect the inverter to the battery (red is positive, black is negative). Make sure that all connections are of good quality. First switch on the inverter and afterwards the unit to be powered. Switch off in reverse order.

Thermal protection

All SkyTronic inverters are protected against thermal overload. If the temperature of the inverter rises above 55°C, the protection circuit is automatically activated and the unit is switched off. First switch off the connected unit and then the inverter. Let the units cool down before you switch them on again. Check if the cooling fan is not obstructed and make sure that there is sufficient air flow around the unit.

TROUBLESHOOTING

If you experience problems with appliances not operating correctly when there are two or more devices connected to the same circuit, the only remedy is to disconnect one of the units to reduce the load. If the inverter overheats when the load is at the rated maximum, try running the vehicle engine while running the inverter. (REMEMBER to switch OFF the inverter when starting the enginee.) This will boost the battery voltage allowing the inverter to operate more efficiently, allowing use of the inverter for longerperiods of time in high load applitcations.

CAUTION: RECHARGEABLE APPLIANCES

Certain rechargers for small nickel cadmium batteries can be damaged if connected to the 2500W INVERTER.

Two particular types of equipment are prone to this problem:

1) small battery-operated appliances such as flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.

2) certain bartery chargers for battery packs used in hand power tools. These chargers will have a warning label stating that dangerous voltages are present at the battery terminals. DO NOT USE INVERTERS WITH THE ABOVE EQUIPMENT.

TV Hint

If you power a (portable) TV set, it might be necessary to switch the set on several times in increments of about 5 seconds before it begins to work.

Audio Systems

Some inexpensive portable stereo systems will emit a buzzing noise through the speakers when operated by an inverter. This is because the power supply in the stereo unit does not adequately filter the modified sine wave produced by the inverter. The only solution is to use a stereo system with a more efficient power supply.

GENERAL SAFETY

1. Always operate the inverter from the correct power source, 12V or 24V battery (As applicable).

2. When connecting the cables from the battery to the inverter observe the correct polarity, RED is positive (+) and BLACK is negative (-).
REVERSING the polarity will damage the inverter and is not covered under warranty.

3. Ensure the DC input connections are secure, because a loose contact can result in excessive voltage drop and can cause overheated wires and melted insulation.

4. Locate the inverter and power source (battery) away from any inflammables to avoid any possible fire or explosion. NOTE. It is normal to experience sparks when connecting the positive terminal of the inverter from the battery. This is due to the current flow charging the capacitors in the inverter.

5. Where applicable, always ground the inverter before operation to avoid possible shock.

6. Check that the power consumption of the appliance to be operated is compatible with the output capacity of the inverter. Care should be taken with microwave ovens as the power quoted on the front panel is usually the heating power and not the actual power drawn. For appliances with no power rating (W or watts) shown then the current rating (A or Amps) can be multiplied by 230 to give an approximate power rating.

7. The battery must be of adequate capacity (ampere-hour) to run the inverter at the power required. The maximum current ratings for the various inverter models are'

12V - 600W = 68A	24V - 600W = 31A
12V - 1000W = 110A	24V - 1000W = 50A

Ampere-hour (Ah) capacity is a measure of how many amperes a battery can deliver for 20 hours,

e.g. a typical marine or RV battery rated @ 100Ah can deliver 5 amps for 20 hours (5A x 20hrs = 100Ah)

12V / 24V 600W to 1000 models. Under full load a very high current is drawn , therefore the battery must be in good condition and fully charged. After some time of usage it may be necessary to start the engine of the vehicle or boat to recharge the battery. During this process SWITCH OFF the inverter to avoid damage by a too high battery voltage.

8. In the event of a continuous audible alarm or automatic shut off, immediately switch off the inverter until the problem has been identifled and rectifed.

9. Disconnect the inverter when not in use.

10. Do not expose the inverter to moisture or site near sources of heat and inflammable materials.

INSTALLATION

1. Install inverter in a cool, dry and well ventilated area away from any inflammable material.

2. Ensure the DC power cables are as short as possible (<2m) and of suitable size to handle the current required. This is to minimise any voltage drop when the inverter draws high currents. Remember solid, secure, clean connections are essential for optimum performance.

3. Grounding. Connect the chassis ground lug (where applicable) to earth ground or car chassis using # 8 AWG wire, preferably with green / yellow insulation.

4. Battery Type and Size. Make sure the battery has enough capacity to run the inverter at the power needed. Inverters up to 300w can be powered by normal car batteries but it is recommended to start the engine every 30 - 60 minutes and let it run for about 10minutes to recharge the battery.
Remember to switch OFF the inverter.

For the larger inverters or where extended operating times are required, then Deep Cycle leisure or traction type lead acid batteries arerecommended as they are designed for deep discharge where they will be repeatedly discharged and recharged.

When sizing your battery it is better to have extra capacity as you will have more reserve and the battery will not be discharged as deeply.

To obtain sufficient battery capacity you may need to use more than one battery. Two identical batteries can be connected in parallel (+) to (+) and (-) to (-) to double the capacity.

CAUTION: Do not connect batteries of different makes or AMP- hour (Ah) rating.
Connections to battery post must be made with solid secure connectors that provide a reliable, low resistance connection. Clean terminals regularly.

OPERATION

1. Ensure the ON / OFF switch is in the OFF position.

2. Connect the DC power cables to the input terminals on the rear panel, observing the correct polarity. Check the connections are secure.

3. Ground the inverter.

4. Connect the DC cables to the battery again observing the right polarity.

5. Plug appliance into the AC outlet socket on the front panel. The appliance should be in the OFF mode.

6. Turn on the inverter.

7. Switch ON the appliance to be operated. NOTE: If you are operating more than one device then turn them ON separately so that the inverter does not have to deliver start up loads all at the same time. Some appliances such as refrigerators, motors, pumps etc require very high start up currents to operate, therefore before attempting to power up this type of equipment make sure all connections have properly been made and the battery is fully charged.

FREQUENTLY ASKED QUESTIONS AND ANSWERS

Can I operate a microwave with a power inverter?

The power rating used with microwave ovens is the "cooking power" which refers to the power being "delivered" to the food being cooked. The actual operating power requirement rating is higher than the cooking power rating (for example, a microwave with "advertised" rating of 600 watts usually corresponds to almost 1100 watts of power consumption). The actual power consumption is usually stated on the back of the microwave. If the operating power requirement cannot be found on the back of the microwave, check the owner's manual or contact the manufacturer.

What battery do I need to run my inverter ?

Batteries are the heart of an inverter-powered electrical system, storing power for use on demand. The most basic way to draw electrical power from a battery is direct current (DC) at the nominal voltage of the battery. Your car radio, for example, uses 12 volts DC (12Vdc), the same voltage as your car battery. Many off-grid electrical systems (those not powered by electricity from a utility company) use 12-volt DC power to run simple loads such as lights. (Any consumption of electrical power is called a load.) Such systems are commonly referred to as low-voltage DC systems. Powered by a 12-volt DC system, you can enjoy the benefits of electric lights, entertainment systems, laptop computers, and other devices that can be operated off a car battery. However, you can't run power tools, kitchen appliances, or office machines, without the help of some device that generates "household" electricity.

An ideal way to run these devices is from a DC power sources such as vehicle batteries using an inverter.

An inverter is a device that converts battery power (DC) into alternating current (AC) of a higher voltage. DC-to-AC inverters have been around for a long time. Energy loss in this conversion process at first was very high: the average efficiency of early inverters hovered around 60%. In other words, you would have to draw 100 watts of battery power to run a 60-watt bulb.

A new way to build inverters was introduced in the early 1980s. These fully solid state inverters boosted efficiency to 90%.
The key to SkyTronic reliability is the elegance of our design. We use a sophisticated Field Effect Transistor (FET) circuitry to convert the batteries' DC voltage (usually 12 or 24 Vdc) into AC. The resulting low voltage AC is then transformed into a higher voltage, usually 120 or 220 Vac. All of the power shaping - conversion to AC - and waveform shaping takes place on the low voltage side of the transformer.

One note of caution: Batteries only have a limited power storage capacity. To avoid draining a battery and thus avoid the possibility of damaging it, you need to calculate and monitor the electrical consumption or your device.

If you are using a 150W or 300W SkyTronic Inverter, a standard 12v vehicle (50/75A) battery is ideal, as the inverter only draws a small amount of power. It comes with a vehicle cigarette lighter connection as standard, so you can use it in your car while you're on the move, or you can attach it directly to the battery, all the necessary leads are included.

For larger SkyTronic Inverters, we recommend a deep cycle lead/acid battery as the need for recharging is more important and prolongs the battery's life. This type of battery is commonly found in caravans, motor homes, Recreational Vehicles and boats.

How much power does the Inverter take from the battery ?

This obviously depends on the load connected to the inverter and the following is a basic calculation only.

Divide the load of the device connected to the SkyTronic Inverter by 10 (12V) or by 20 (24V).

For example: For a 400w appliance connected to a 12v inverter/battery, the power used would be 400 divided by 10 = 40A.

GLOSSARY OF TERMS

Absorption Charge

The second stage of three-stage battery charging. Voltage remains constant and current tapers as internal battery resistance increases during charging. (Ensures complete charging.)

Alternating Current (AC)

The type of electrical power supplied by utilities or made when a generator is run. The unique characteristic of this form of electricity is that it reverses direction at regular intervals. For example, 240 Vac 50 Hz. power reverses flow 50 times a second, hence the rating 50 Hz. (cycles).

Amp (Ampere)

Measurement of the flow of electrical current. One amp is equal to the electric force of one volt acting across the resistance of one ohm.

Amp Hour

One amp of electrical current flowing for one hour. Expresses the relationship between current (amps) and time. (OHMS law A =V/R)

Array

A group of solar electric modules or batteries wired together.

Bulk Charge

The first stage of three-stage battery charging. Current is sent to batteries at the maximum rate they will accept while voltage rises to full charge level.

Current

The rate of flow of electrical charge. The flow of amps is often expressed as current.

Direct Current (DC)

The type of electricity stored in batteries and generated by solar electric devices. Direct Current flows in a single direction.

Electrolyte

A conductive medium in which the flow of electricity takes place; this is the liquid found inside storage batteries.

Float Charge

The third stage of three-stage battery charging. After batteries reach full charge, charging voltage is reduced to a lower level to reduce gassing (boiling of the electrolyte) and prolong battery life. This is often referred to as a maintenance charge, since rather than charging a battery, it keeps an already-charged battery from self-discharging.

Ground Fault Protection (GFP)

A circuit protection device that prevents the flow of electrical current to earth if a short circuit is present. Usually required in wet locations e.g. for outdoor, kitchen and bathroom circuits.

Hertz (Hz.)

The frequency, or number of times per second, that the flow of AC electricity reverses itself. Also referred to as cycles (see alternating current).

High Battery Protection

A control circuit that disconnects charge current flowing to battery(s) when voltage reaches a dangerously high threshold. Prevents damage created by excess gassing (or boiling) of electrolyte.

Idle Current

The amount of electrical power required to keep an inverter ready to produce electricity on demand.

Kilowatt (kW)

One thousand watts of electricity. Ten 100-watt light bulbs use one Kilowatt of electrical power.

Kilowatt hour (kWh)

One kW of electrical power used for one hour. The most common measurement of electrical consumption, most grid connected electrical meters measure kW/h for billing purposes.

Line Loss

A voltage drop caused by resistance in wire during transmission of electrical power over distance.

Load

Any device that consumes electricity in order to operate. Appliances, tools, and lights are examples of electrical loads.

Low Battery Protection

A control circuit that stops the flow of electricity from batteries to loads when battery voltage drops to dangerously low levels.

Modified Sine Wave

An AC wave form (generated by many inverters) that is a pulse width modified square wave. It consists of a number of very small on/off steps rather than a fully smooth wave.

Overload/Over current Protection

A control circuit designed to protect an inverter or similar device from loads exceeding its output capacity. (A fuse, for example, is an over current protection device.) All SkyTronic inverters have internal circuitry to protect themselves from overload/over current conditions.

Parallel Wiring

A group of electrical devices, such as batteries or PV modules, wired together to increase current, while voltage remains constant.

E.g. Two 100 amp hour 12 Vdc batteries wired in parallel will form a 200 amp-hour 12 Vdc battery bank.

Series Wiring

A group of electrical devices, such as batteries, wired together to increase voltage, while current remains constant.

E.g. Two 100 amp hour 12 Vdc batteries wired in series form a 100 amp hour 24 Vdc battery bank.

Sine Wave

The output wave form of an electric generator or utility. A smooth wave going above and below zero is created. This wave form is also produced by pure sine wave inverters.

Surge Capacity

The amount of current an inverter can deliver for short periods of time. Most electric motors draw up to three times their rated current when starting. An inverter will "surge" to meet these motor-starting requirements. Most SkyTronic inverters have surge capacities of at least twice their continuous ratings.

Volts

A unit of measure of the pressure in an electrical circuit. Volts are a measure of electric potential. Voltage is often explained using a liquid analogy-comparing water pressure to voltage: a high pressure hose would be considered high voltage, while a slow-moving stream could be compared to low voltage.

Watt(s)

A quantitative measurement of electrical power. Watts are calculated by multiplying volts times amps. (watts = volts x amps)

Watt Hour (Wh)

Electrical power measured in terms of time. One watt hour of electricity is equal to one watt of power being consumed for one hour. (A 100w light operated for one hour would consume 100 Wh of electricity.)