ALLIS ELECTRIC CO.,LTD.


# Photovoltaic Inverter

Renewable Energy -
Environmentally Friendly and Low Cost Energy Solutions

Since 1968

# 1 Introduction

## 1.1 General

The TOUGH-3P series is a three phase grid-connected inverter solution from AEC. The grid-connected inverter converts DC power yielded from solar array into AC power for household consumption. The inverter operates intelligently under normal conditions and provides no backup power in case of power cut. The configuration is straightforward as shown below. Connect the PV wires from floating (ungrounded) PV array to the DC input of the inverter; also, connect the AC output to the service entrance. Please consult with your installer for PV array ratings and external protective devices if the electrical codes are stipulated locally.

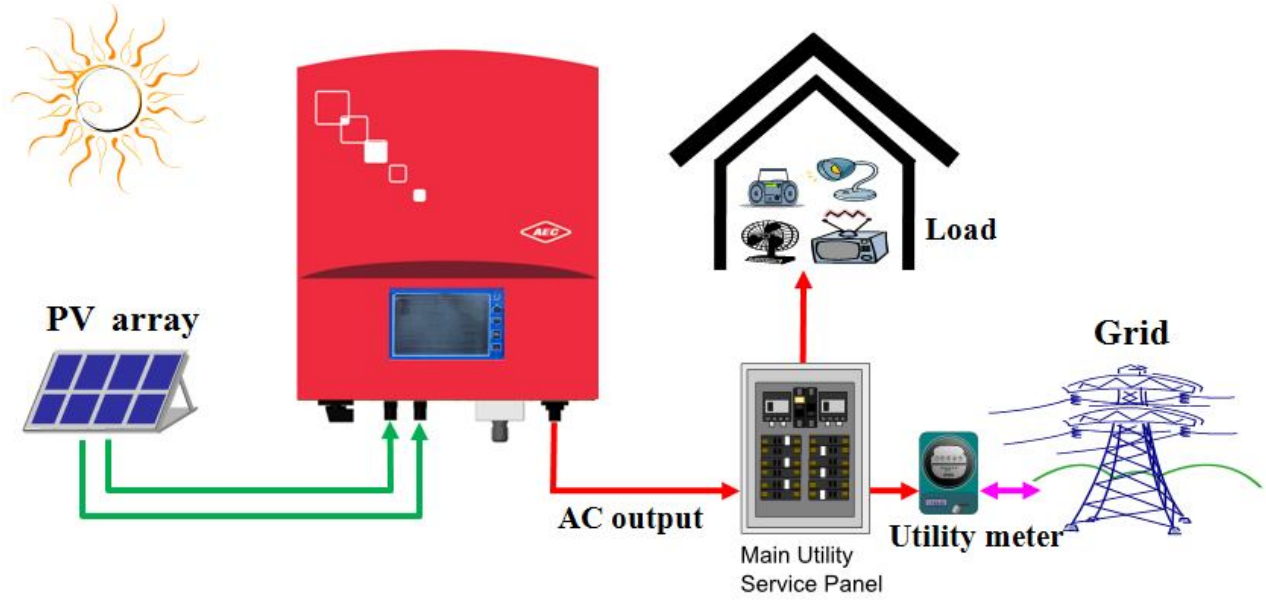



Fig 1: *Grid connected solar system overview*

## 1.2 Specifications

| Model | Tough-20K-3P | Tough-25K-3P | Tough-30K-3P |
|---|---|---|---|
| **Output Data (AC)** | | | |
| Maximum AC Output Power | 20,000VA | 25,000VA | 30,000VA |
| Maximum AC Output Current | 32 a.c.A | 40 a.c.A | 48 a.c.A |
| Nominal AC Voltage | 3x230 a.c.V/400 a.c.V | | |
| Grid AC Frequency | 50/60Hz, auto-selection | | |
| Power Factor | > 0.99 @ 20% load | | |
| Reactive Power Factor | 1 or adjustable from 0.8ind to 0.8cap* | | |
| Total Harmonic Distortion | < 5% | | |
| Max. output fault current (Inrush) | 92.4 $A_{peak}$ / 200 µs | | |
| Max. output overcurrent protection | 80 A | | |
| AC connection / Grid forms | 3P4W+PE / TN-C, TN-S, TN-C-S | | |
| **Input Data (Solar)** | | | |
| Maximum DC Power | 21,000W | 27,000W | 31,600W |
| Maximum DC Input Current(IscPV) | 2 x 30 d.c.A | 2 x 30 d.c.A | 2 x 35 d.c.A |
| Max. backfeed current to the array | 0 d.c.A | | |
| Max. number of MPP Trackers | 2 | | |
| Maximum DC Voltage | 1000 d.c.V | | |
| MPP Tracking Voltage Range | 300-900 d.c.V | | |
| Operating Voltage Range | 250-1000 d.c.V | | |

| | | | |
|---|---|---|---|
| **Efficiency** | | | |
| MPPT Efficiency | | >99.9% | |
| Maximum Efficiency | 98.1% | 98.2% | 98.3% |
| Euro. Efficiency | 97.3% | 97.4% | 97.5% |
| Consumption:<br>Operating (standby) / Night | | <20W / <1W | |
| **General Specification** | | | |
| Dimensions (W x H x D) in mm | | 505 x 666 x 185 | |
| Weight | | 37kg | |
| Cooling Concept | | Forced Air Cooling | |
| Acoustic Noise Level | | < 45dB(A) | |
| Maximum Operating Temperature Range without derating @ normal voltage | | +50 °C | +45 °C |
| Ambient Temperature Range<br>Storage / Transportation Condition | | -25 to +60 °C | |
| Relative Humidity<br>Storage / Transportation Condition | | 4 to 95%, non-condensing | |
| Operating Altitude | | 2000 m | |
| Pollution Degree | | PD3 | |
| Protection Class of Enclosure | | IP65 | |
| Protection Class | | Class I | |
| Overvoltage Category | | OVC Ⅱ (PV) / OVC Ⅲ (Mains) | |
| Topology | | Transformerless | |

| Features | |
|---|---|
| DC Connection | PV4, Tyco, MC4 |
| DC Disconnect | Option |
| AC Connection | AC connectors |
| Display | Large Iconic LCD screen |
| Communication Interface | RS485 , Ethernet/WiFi (Option) |
| EMC & Low Voltage Directives | 2004/108/EC & 2006/95/EC |
| Standards | IEC/EN 62109-1/-2 , VDE-AR-N 4105 |
| Warranty | 5 years |

* Adjustable from 0.9 overexcited to 0.9 underexcited with VDE-AR-N 4105.

Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating.

## Adjustable voltage, Frequency and Reconnection Settings

| Setting | VDE-AR-N 4105 | |
|---|---|---|
| | Range | Default |
| Over-frequency (Hz) | 50.05~51.50 (60.05~61.50)* | 51.5 (61.5)* |
| Over-frequency disconnection time (cycle) | 1~10 | 8 |
| Under-frequency (Hz) | 47.50~49.95 (57.50~59.95)* | 47.50 (57.50)* |
| Under-frequency disconnection time (cycle) | 1~10 | 8 |
| Over-voltage (Vac) | 235~264.5 | 264.5 |
| Over-voltage disconnection time (cycle) | 1~10 | 8 |
| Under-voltage (Vac) | 184~225 | 184 |
| Under-voltage disconnection time (cycle) | 1~10 | 8 |
| DC injection tripping current (A) | 0.1~1.0 | 1.0 |
| DC injection disconnection time (cycle) | 1~150 | 8 |
| Insulation resistance trip setting (MΩ) | 0.5~10 | 0.5 |
| PV start voltage (Vdc) | 150~500 | 150 |
| Reconnect delay** (s) | 5~300 | 60 |

* This inverter product is compatible on the frequency of 50Hz or 60Hz.

** Once a grid failure occurs, the inverter waits 5~300 seconds before the next connection to the utility grid. The default setting is 60 seconds for VDE-AR-N 4105.

# Success Applications

## Oversea

- Project: 50kW Off-Grid System
- Model: Central Inverter Series
- Location: Indonesia
- Application: Micro grid for no utility island

- Project: 6kw Self-Consumption System
- Location: Central Japan International Airport ,Nagoya

- Project: 45 kW Self-Consumption System
- Model: Selfnergy Series
- Location: Ho Chi Minh, Vietnam
- Application: PV-Genset Fuel saving solution

- Project: 30kW Self-Consumption System
- Model: Trinergy plus Series
- Location: South Africa

- Project: 15kW Self-Consumption System
- Model: Tough Series
- Location: Philippines
- Application: Home power saving solution

- Project: 10kW net metering
- Model: Tough Series
- Location: Cebu, Philippines

- Project: 5kW Self-consumption system
- Model: Selfnergy Series
- Location: Cebu, Philippines

- Project: 5kW Self-Consumption System
- Model: Selfnergy Series
- Location: Philippines
- Application : Home power storage solution

## Taiwan

- Project: 300kW Grid- tide System
- Model: Tough Series
- Location: Taichung
- Application Environment: Install on the roof of railway stations

- Project: 2MW Grid- tide System (FIT)
- Model: Trinergy Plus Series
- Location: Taoyuan

- Project: 70kW Grid- tide System (FIT)
- Model: Tough Series
- Location: Taichung
- Application: Roof top PV site of a Motor Factory

- Project: 850kW Grid- tide System (FIT)
- Model: Trinergy Plus Series
- Location: Wufeng Industrial Park, Taichung
- Application: Roof top PV site at a Steel Factory

- Project: 1MW Grid- tide System (FIT)
- Model: Trinergy Plus Series
- Location: Changhua Coastal Industrial Park
- Application: land mount PV site

- Project: 499kW Grid- tide System (FIT)
- Model: Trinergy Plus Series
- Location: Changhua Coastal Industrial Park
- Application: Roof top PV site at a Belt Factory

- Project: 100kW Grid- tide System (FIT)
- Model: Tough Series
- Location: Gangshan District, Kaohsiung
- Application Environment: Piggery

*Have installed more than 200MW PV sites since 2011...*

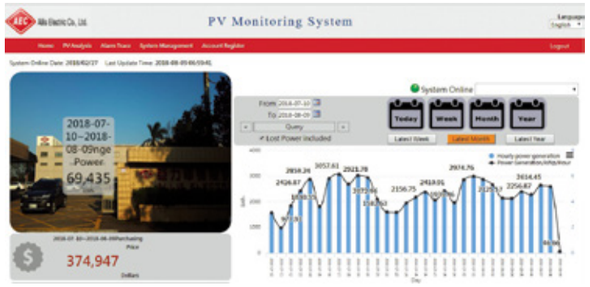
# Solar Power System Demonstration

## Feed-in Tariff Application at Yangmei Factory

- System Capacity：498 kW
- PV Modules：295W × 1,961 pieces
- Inverter Model：Trinergy plus 30 kW × 14 units and 20 kW × 2 units
- Average power generation estimated by year: ≒ 492,104 kWh
  ( about 2.9 kWh/day/kW × 498 kW × 365days)

Rooftop Mounting PV System

Trinergy plus PV Inverter




Advanced Web Monitoring System

## Why Solar Power…

- Electrical bill saving
- Safe, reliable and efficient power generator
- Reduce carbon footprint and emit no pollution
- Versatile and convenient
- Customized design

## Why Allis' Inverter…

- Optimum productivity
- Wide range of MPPT voltage
- Full range product line from 3.3kW to 1,260kW, single to three phase
- 50 years stable operation company with professional experience in power electricity

## Product Catalog

| Model | Max. DC Voltage (d.c.V) | Max. Input Current (d.c.A) | Max. DC Input Power (W) | MPPT | Battery |
|---|---|---|---|---|---|
| Tough-3300 | 650 | 10 × 2 | 3,600 | 2 | No |
| Tough-5000 | | 15 × 2 | 5,300 | 2 | |
| Trinergy Plus-10kW | 1,000 | 12.5 × 2 | 11,000 | 2 | |
| Trinergy Plus-20kW | | 25 × 2 | 20,800 | 2 | |
| Trinergy Plus-30kW | | 33 × 2 | 33,000 | 2 | |
| Trinergy Plus-40kW | 1,100 | 74 × 1 | 55,000 | 1 | |
| Trinergy Plus-50kW | | 90 × 1 | 66,000 | 1 | |
| Trinergy Plus-60kW | | 120×1 | 72,000 | 1 | |
| Trinergy Plus-70kW | | 120×1 | 77,000 | 1 | |
| Selfnergy-3300 | 650 | 18 × 1 | 3,600 | 1 | Yes |
| Selfnergy-5000 | | 24.5 × 1 | 5,300 | 1 | |
| Selfnergy-L 3.6K | 550 | 11 × 2 | 4,000 | 2 | |
| Selfnergy- L 5K | | 11 × 2 | 5,500 | 2 | |
| AEC500K-B | 1,000 | 1,200 × 1 | 560,000 | 1 | No |
| AEC630K-B | | 1,350 × 1 | 710,000 | 1 | |
| AEC1000K-B | 1,000 | 2 × 1,200 × 2 | 1,120,000 | 2 | |
| AEC1260K-B | | 2 × 1,350 × 1 | 1,420,000 | 2 | |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