

SOLARWARE® SERIES

Utility Scale PV Inverter
Outdoor and Indoor Solutions



WWW.TMEIC.COM

Photovoltaic generation offers a powerful alternative to secure our energy supplies. Photovoltaic generation is **clean** and ultimate **environment-friendly** technology since it does not emit CO₂.

TMEIC is the world's leading brand in manufacturing and supplying energy efficient, sustainable and reliable advanced multi-level PV inverters. TMEIC's SolarWare® Inverters deliver high energy efficiency (99%), lower switching losses by 56%, lower equipment footprint and weight thus leading to unparalleled yield on customer investment.

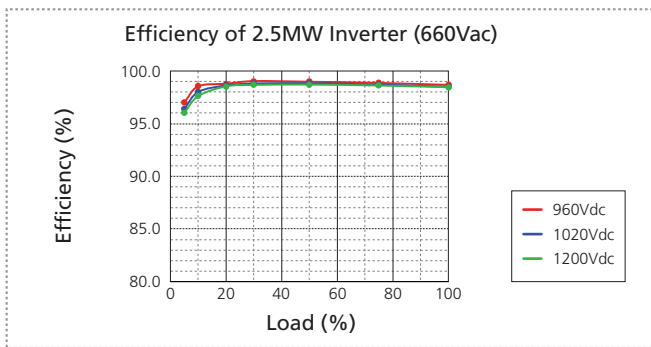


Indoor Inverter: SolarWare® 2500 1500V 2.5MW

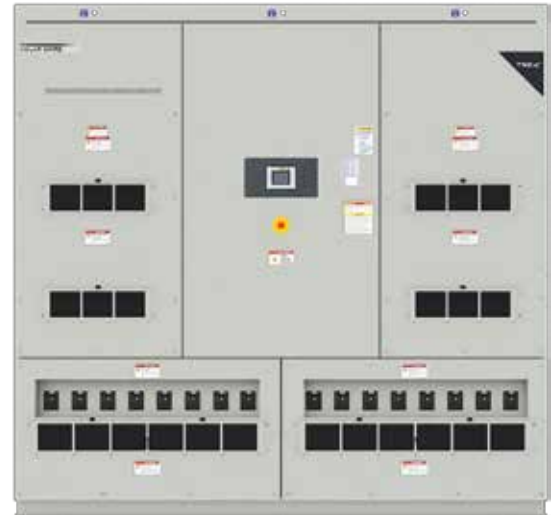
Features

- ▶ Large capacity & wide MPPT model (2.5MW/2.5MVA)
- ▶ World leader for compact size (1.4MVA/m²)
- ▶ No de-rating up to 50°C
- ▶ Built-in Night-time Var Injection (24hrs operation is also possible)
- ▶ Negative grounding kit with optional Insulation monitoring
- ▶ Zone monitoring (Optional)
- ▶ Low opex cost
- ▶ Less number of components & high reliability

Premium Efficiency ⇒ 99%



Max. Efficiency: 99%



* Appearance may differ.

Electrical Specifications

DESCRIPTION		PVH-L2500EQ-2
Output side (AC)	Rated power	2500kW/2500kVA @50°C 2780kW/2780kVA @25°C
	Rated voltage	660V ±10%/3Ø3W
	Rated frequency	50Hz/60Hz
	Rated power factor	Over 0.99
	Rated current	2187A@50°C
	Maximum current	2432A@660Vac @25°C
Input side (DC)	Maximum power	2836kWp@98% efficiency
	Maximum voltage	1500V
	MPPT operation range	960~1300Vdc
Maximum efficiency		99.00%
EU efficiency		98.69%@960V
Weight		<2500kg
Inverter dimensions (D x W x H)		≤700 x 2,600 x 2,200mm
Floor space (W x D)		≤1.82m ²
Enclosure protection ratings		IP21
Installation		Indoor
Ambient temperature range		-20~50°C (-4~122°F) No de-rate up to 50°C
Communication type		Modbus/TCP, Ethernet
Standards compliance		IEC62109-1,2/IEC61000-6-2, 4
Standard number of input		16 inputs as standard
Standard control power supply		Control power supply from inverter output and capacitor back up circuit (3 sec. Compensation)

Outdoor Inverter: Universal PCS 1500V 920kW (Expandable up to 5 MW)



* Appearance may differ.

Features

INDIVIDUAL MODULAR INVERTER DESIGN

- ▶ High availability, maintenance possible per module unit
 - Each modular inverters consist of same hardware regardless of inverter capacity
 - Individual DC input & common AC output
- ▶ Standardization
 - PV-inverter & ESS-Inverter basically are same hardware
 - Reduce spare parts

INDIVIDUAL CONTROLLER AND DC INPUT

- ▶ Individual MPPT for each inverter module

INCLUDED DC-BOX FUNCTION

- ▶ Each inverter has DC-Switches for maintenance and protection
- ▶ Similarly, each inverter has MCCB of grid-side for maintenance

OUTDOOR DESIGN

- ▶ Suitable for Marine environments (except heavy salt damage area), low temperature (-25°C)
- ▶ Cooling system - Heat pipe technology
- ▶ Compact and lightweight, can be stored in containers, reduce transportation costs

HIGH RELIABILITY, HIGH EFFICIENCY, LONG LIFE, SAFETY

- ▶ ACB less, LCD less (Built-in Wi-fi), 3-level

GROUNDING SYSTEM

- ▶ High resistance negative grounding

OTHER

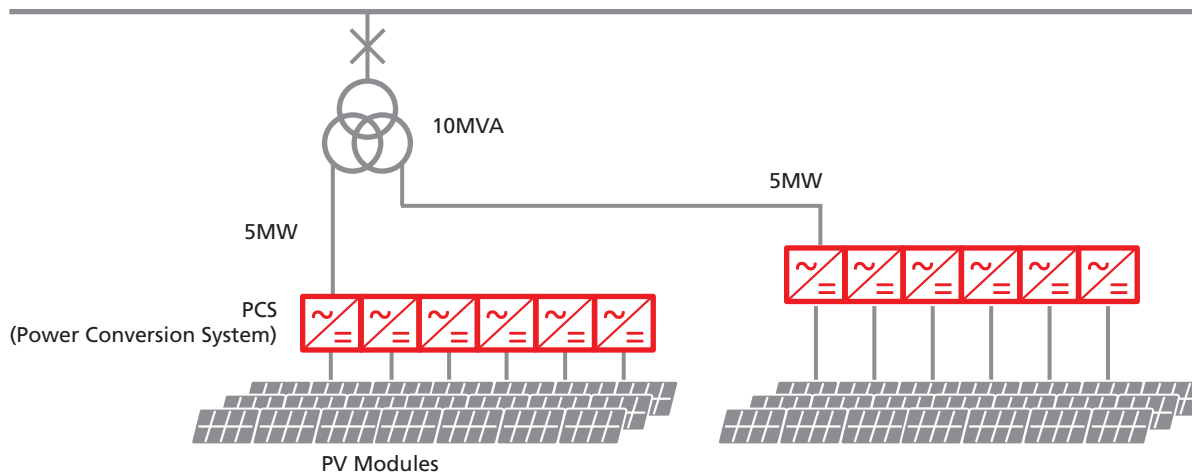
- ▶ Var at night (option), GFDI (standard), String current monitor (standard)
- ▶ High speed communication
- ▶ UL, IEC standard

Electrical Specifications

DESCRIPTION		PVU-L0920ER
Output side (AC)	Rated power	920kW / 920kVA
	Rated voltage	690V (+10%, -12%)
	Rated frequency	50Hz/60Hz (+0.5Hz, -0.7Hz)
	Rated current	702Arms@50°C
	Maximum current	770Arms@25°C
Input side (DC)	Maximum power	939kWp@98% efficiency
	Maximum voltage	1500Vdc
	MPPT operation range	1005Vdc~1300Vdc (starting-up from 1450V)
Maximum efficiency		99.1%
EURO efficiency		98.69%
Weight		<1000kg
Inverter dimensions (H x W x D)		1900 x 1100 x 1100mm
Floor space (W x D)		1.21m ²
Enclosure protection ratings		IP55/NEMA3R
Installation		Outdoor
Ambient temperature range		-20~50°C
Maximum altitude		2000m. >2000m power derating (Max. 4000m)
Communication type		Modbus, Ethernet
Standards compliance		UL1741, UL1745A/IEEE1547/NEC2017 IEC62109-1,2/IEC61000-6-2,4/IEC61727, IEC62116/ IEC61400, BDEW/IEC61683/IEC60068
Standard number of input for PV		6 (Maximum 8 per inverter)
AC protection		Fuses
DC protection		Fuses
MPPT number for PV		1
Standard control power supply		Control power supply from inverter output and capacitor back up circuit (3 sec. Compensation)

TMEIC System Configuration for 10MW Block

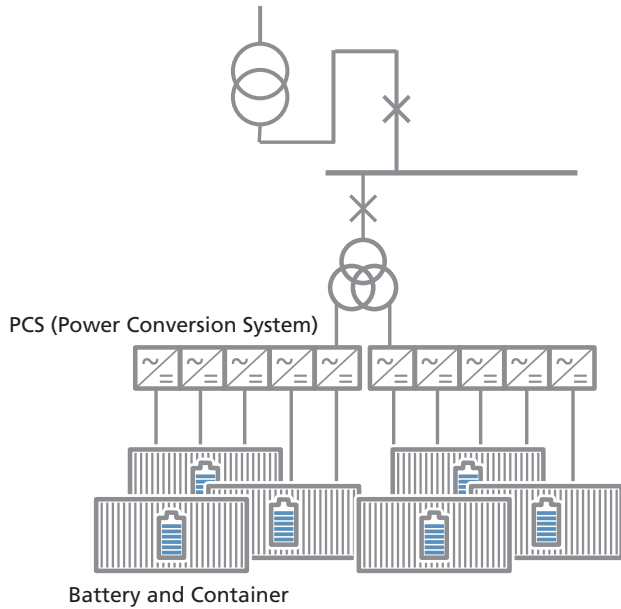
TMEIC PV System provides flexibility and reduces system losses & BOS cost



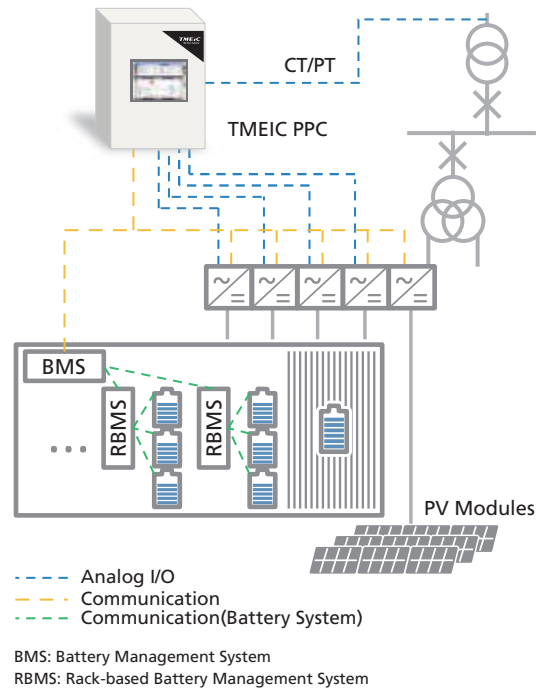
TMEIC Energy Storage System

High reliability, Flexibility, High energy

System Configuration



PPC (Power Plant Controller) and Control Architecture



System Specifications

Power	From 570kW per PCS Max.3.825MW per PCS Line UP
AC Voltage	480-630VAC
DC Voltage	710-1300VDC
Reactive Power	PF 0.80 leading and lagging
Round Trip Efficiency	>85% >88% >89% >90% (30min) (1hr) (2hrs) (4hrs)
Availability	>98.0%
Operating Temperature	-25 ~ 50°C
Altitude	<2,000m, Upto 3.5000m with de-rating
Standards	IEC, UL, IEEE, CQC, BDEW, FRT, LVRT Certified
Control	TMEIC Power Plant Controller

PPC Capability

- ▶ Response time <100msec
- ▶ Frequency control and containment
- ▶ Power factor control
- ▶ Reactive power control
- ▶ Renewable firming application
- ▶ Ramp rate control
- ▶ HYBRID PV+ESS control
- ▶ Spinning reserve
- ▶ Energy arbitrage
- ▶ Peak shaving
- ▶ Black start

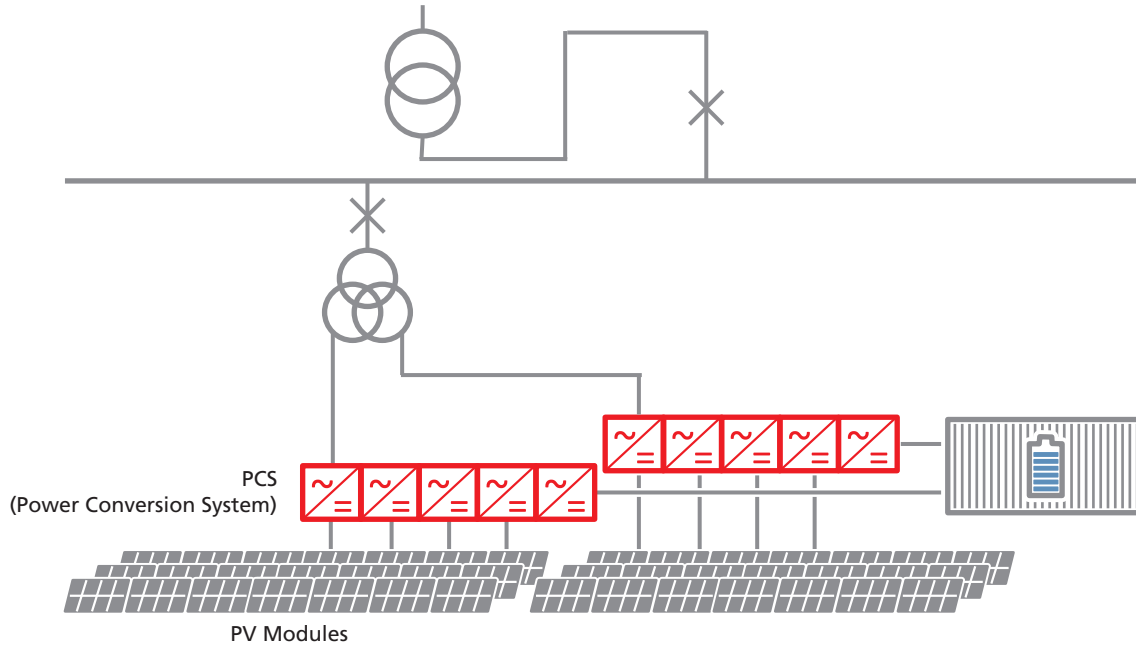
Concepts and Benefits:

- ▶ TMEIC Energy Storage System allows; High reliability/ Flexibility/ High energy
- ▶ Wide DC volatage range; Battery flexibility and high power system allowing reduction of BOS cost
- ▶ High energy density up to 4MWh/ 40ft container
- ▶ High speed response time based on extremely fast processing speed PLC and analog signal control

TMEIC Hybrid PV+ESS System

TMEIC PV+ESS System provides flexibility and reduces system losses & BOS cost

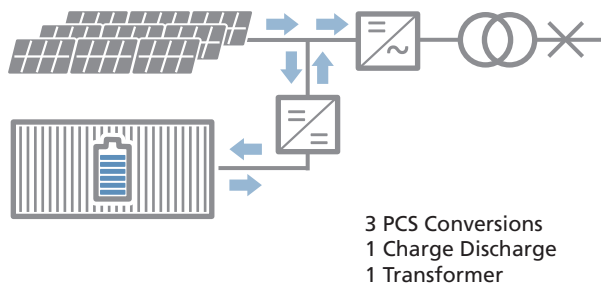
LV Coupling System Configuration



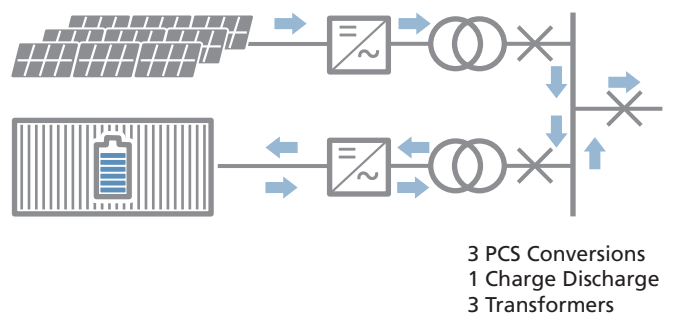
*TMEIC HYBRID SOLUTION consists of identical PCS Units for both PV and ESS.

Concepts and Benefits

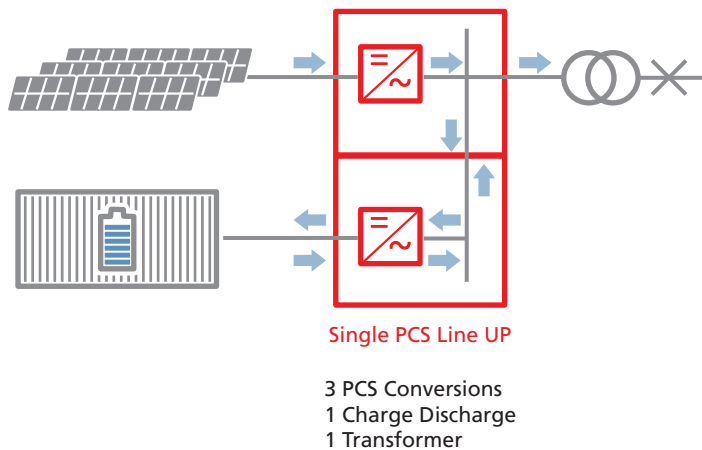
1. DC Coupling



2. MV AC Coupling (Conventional)



3. LV AC Coupling (TMEIC HYBRID PV+ESS)



HYBRID PV+ESS AC Coupling provides coupling at the low voltage side, thereby reducing transformer losses and BOS cost.

LV: Low voltage MV: Medium voltage

SCADA Monitoring System

Key Features

- ▶ Intuitive visualization
- ▶ Remote and real time diagnostics to minimize the downtime
- ▶ Remote user access using web browser
- ▶ Real-time data acquisition and role based supervisory control
- ▶ Historical data collection & analysis and user-configurable security mode
- ▶ Communication using all industry standard protocols

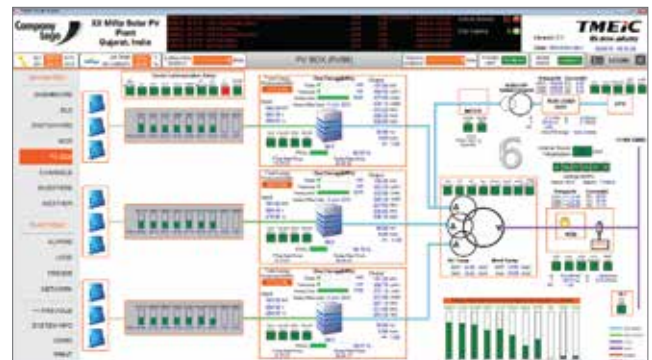
Key Benefits

- ▶ Preconfigured application database and graphics reduce application engineering deployment and testing effort
- ▶ System accepts industry leading and standard communications interface (Modbus TCP, DNP3, etc.)
- ▶ High-resolution historical data storage facilitates diagnostic analysis and troubleshooting
- ▶ Comprehensive security model allows personalized access based on user login
- ▶ Modular and scalable to support easy expansion with minimal engineering effort

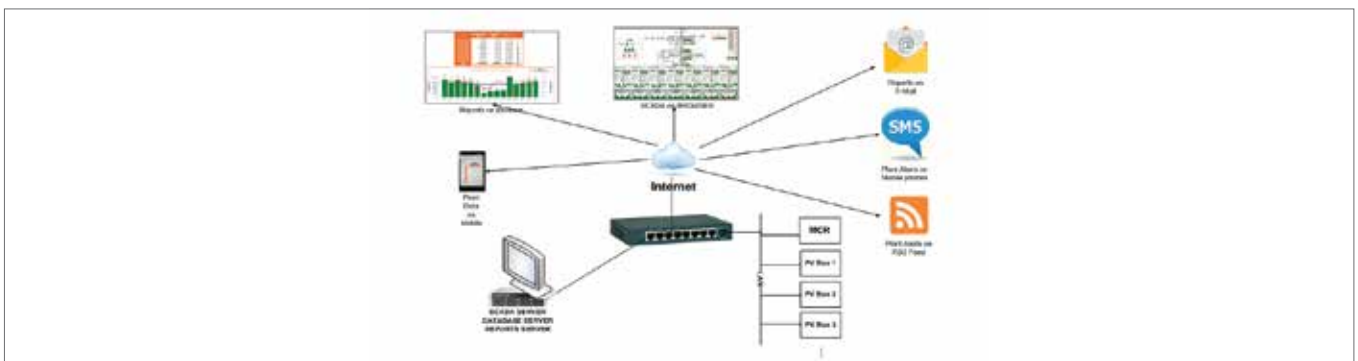
PLANT OVERVIEW



PV BOX OVERVIEW



REMOTE CONNECTIVITY



All Inverter Status and Faults at a Glance

Alarms and Diagnostics

Historical and Real-time Trends

Reports



TMEIC Innovative Product Solutions

Next-generation TMUPS® Solutions

TMUPS® Series Uninterruptible Power Supply (UPS) design with its patented conversion technology delivers the highest efficiency in the industry to go along with the quality and reliability that users are accustomed to when specifying TMUPS®.

- ▶ Reliable and green energy UPS system with a capacity ranging from 100kVA to 2100kVA
- ▶ Expandable upto 6 units in parallel to meet the redundancy requirements
- ▶ Compact footprint design delivers more power density per sq.ft. in the industry
- ▶ Multi-level power conversion enhances the lifetime of capacitors to 15 years
- ▶ Most suitable for high density data center and industrial application



TMdrive MV Variable Frequency Drives (VFDs)

TMdrive-MVe2 & TMdrive-MVG2 are Medium Voltage, Variable Frequency AC Drive System with multi-level near Sine Wave Output are suitable for applications using standard Induction and Synchronous Motors.



- ▶ Power rating 200KVA-19500KVA
- ▶ Voltage class 3.3KV-11KV
- ▶ High efficiency: 97%
- ▶ Premium Power Factor: >0.99
- ▶ Harmonics less than 2%
- ▶ Reactive Power Compensation
- ▶ Regenerative feature: Higher energy saving
- ▶ Motor-friendly wave form
- ▶ High MTBF means less failures & high uptime
- ▶ Modular construction resulting to low MTTR

Squirrel Cage Induction Motors

From Design to Quality Control - All made the TMEIC Way

Motors designed & manufactured in our factory in India, strictly in accordance with TMEIC Japan processes & practices, comply to Indian & international standards and bring unmatched value to our customers.

- ▶ IEC Frame size: 315-900
- ▶ Power rating: 160-23000kW
- ▶ Voltage class: 380V-13.8kV
- ▶ Enclosure: TEFC / TEAAC / TEWAC / WPPI
- ▶ Certifications: Baseefa, CSA, CCOE
- ▶ Combined testing of Motors & Drives
- ▶ High power to weight ratio - Smaller footprint
- ▶ Ease of operation & maintenance
- ▶ Rugged construction to suit demanding application
- ▶ Suitable for severe corrosive & hazardous environment
- ▶ Maximum uptime for high return of investment
- ▶ Designed for Inverter Duty Applications – TMEIC Make Motor & Drive for better performance



Built on the proud history of **Toshiba** and **Mitsubishi Electric**, TMEIC continues their legacy of providing high performance and high power solutions to customers around the world.

TOSHIBA

(TOSHIBA CORPORATION)
established in **1896**
Tokyo Electric Co. Ltd.



mitsubishi

(MITSUBISHI ELECTRIC)
established in **1921**
Mitsubishi Electric Corporation

ROTATING MACHINES, POWER ELECTRONICS & INDUSTRIAL SYSTEMS DEPARTMENTS

TMEiC

(TOSHIBA MITSUBISHI ELECTRIC INDUSTRIAL SYSTEMS CORPORATION)
established in **2003**

TMEIC is a world-class leader in industrial systems integration, contributing to production technology and management of the environment with cutting-edge technology.

As an industrial system integrator, we are focused on the future of 'industry', 'society' and 'environment' in order to respond to the on-site needs of production and to facilitate the harmonization of social development & beautiful global environment.

Our core technologies lie in the power electronics which transforms and controls the required electric power, and the engineering that extends from planning to operations of the plant as a whole. Our cutting-edge technology in these core areas contributes to production and environment management.

'We are TMEIC. We Drive Industry.'

Global Presence



Manufacturing Facility



▲ Rotating Machine Factory & Power Electronics Factory (Tumakuru, Near Bengaluru)

50+ years of manufacturing experience

in pioneering cutting-edge inverter and converter technology allows us to deliver our customers the best performing, energy-efficient and the most reliable products.

Our world-class manufacturing plant has the state-of-the-art production, testing facility, quality, SCM capabilities and products that meet IEC standards.

We have well trained employees having expertise in development of PV inverters, UPS systems and MV motors & drives.

It is our endeavour to bring full capabilities of our Japanese operations to India as we take on the new challenge of building a better tomorrow for India.



▲ Assembly Line



▲ Test Bench



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