

SmartDER™

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Distributed Energy Resource Monitoring
& Control Device

A Strategic Partner of



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A. Product Overview

SmartDER is a device developed and manufactured by ATS for reliable connection, monitoring, and grid-compatible power control of distributed energy resources including roof-top solar power. Its compact, flexible, expandable design also makes it ideal for installation in any distribution generation source.

SmartDER not only provides the ability to connect various devices at field by standard protocols, but also works as data exchange interface between plant and Dispatch Centers, to connect and share data with dispatch centers and customer's office through secure connection channel (Internet/3G/4G VPN). The integrated PPC function can perform on-site power plant control of roof-top solar PV in particular and distributed energy sources in general, ensures that the power plant runs efficiently and helps stabilize the utility grid.

APPLICATIONS

SmartDER can be deployed at distribution generation unit of any size which needs to be managed and controlled remotely from Dispatch Centers.

ADVANTAGES

- ◆ **Compatible with various connection standards and a variety of DER devices from different manufacturers:** inverter, datalogger, power meters, weather station, etc.
- ◆ **PPC function** complies with national and international grid codes
- ◆ **Optimized hardware and software** in design and manufacture
- ◆ **Provides ease of use:** facilitates integration, expansion and adjustment of system to suit customers' needs
- ◆ **Supports variety types of connections:** 02 Ethernet port, 02 Serial ports (RS232/RS485)
- ◆ **Supports standard protocol:** Stability-proven ATS SmartIO™ software program, that supports various channels types (Modbus, IEC101, IEC104, DNP, etc) and is certified by DNV-GL
- ◆ **Supports device management feature:** checking usage data, account status, signal strength, modem status
- ◆ **Meets industry standards** for electromagnetic environment, temperature, humidity, smoke, dust, etc.

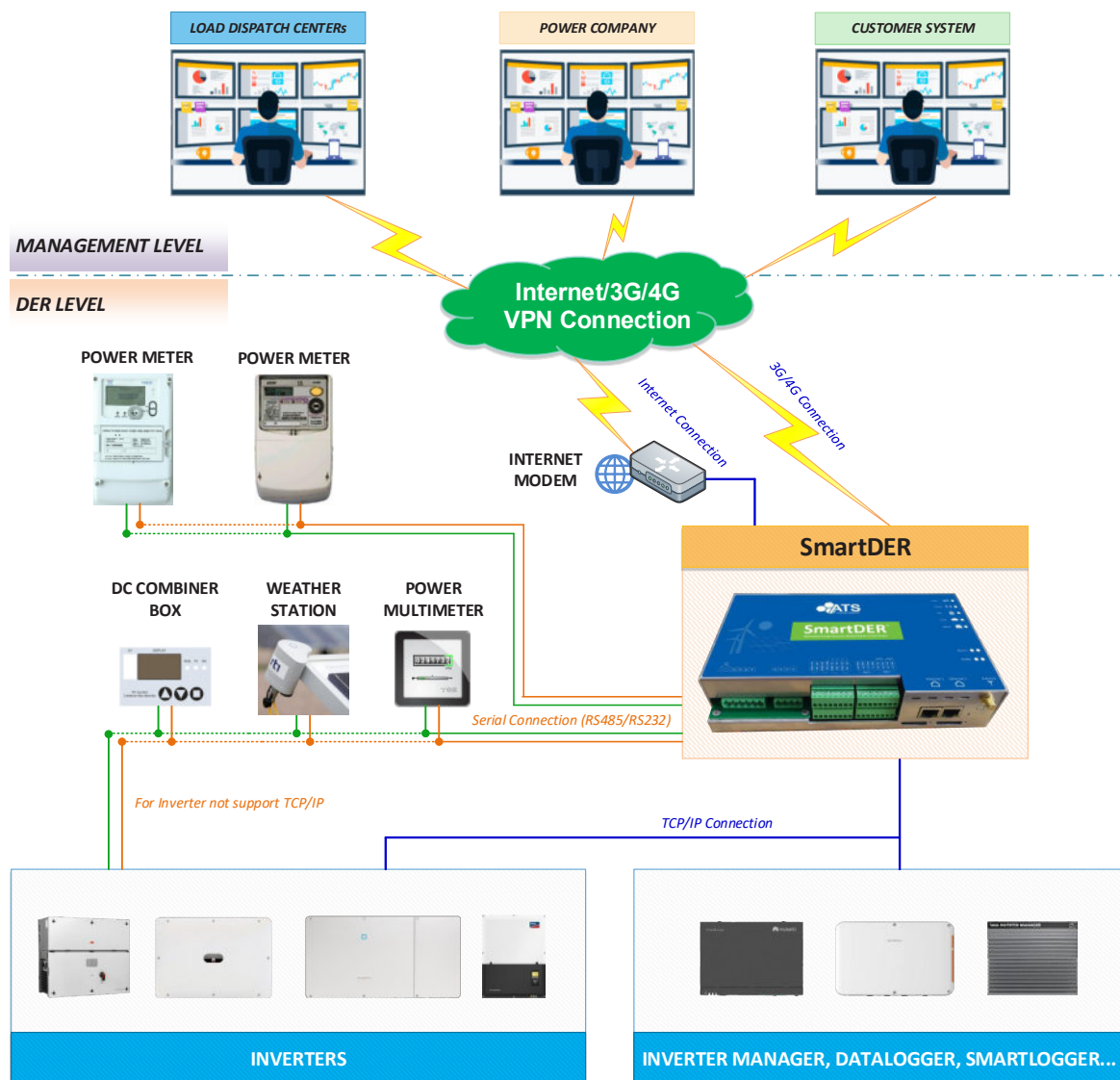


Figure 1. Typical Communication Diagram for Connection of Rooftop Solar System

1. HARDWARE SPECIFICATIONS

1.1. Hardware design

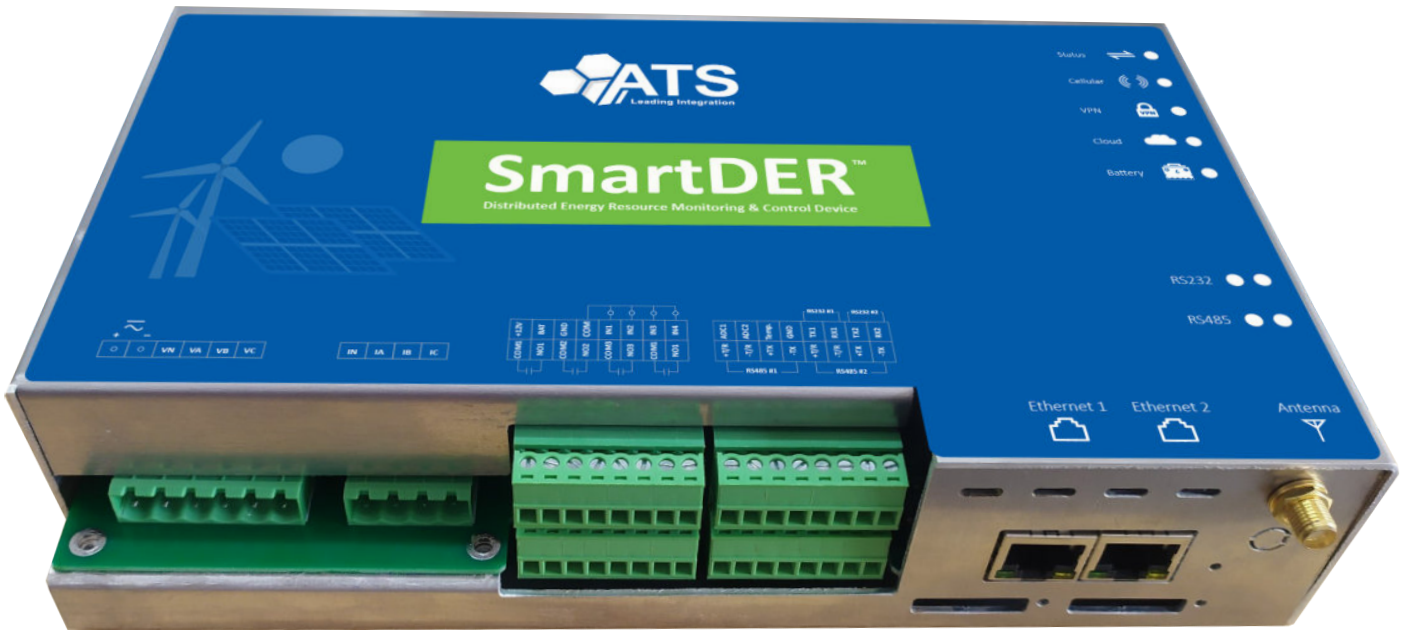


Figure 2. SmartDER Device

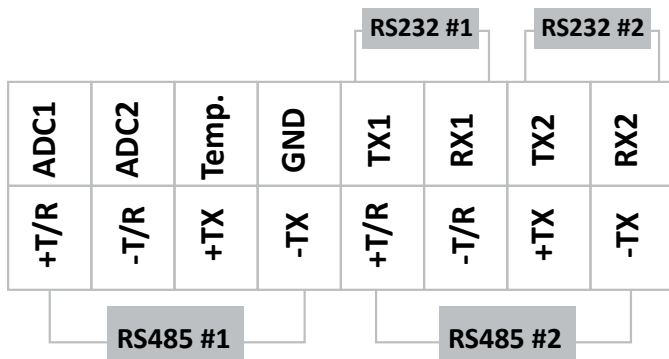


Figure 3. Wiring Connection for Serial Port

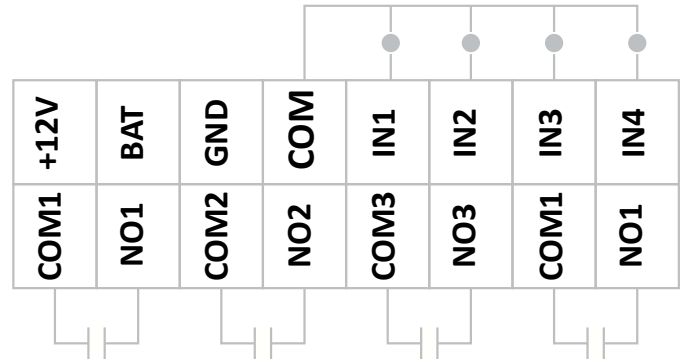


Figure 4. Digital Inputs and Outputs Configuration

Main Components:

- ◆ 01 SMA antenna connector,
- ◆ 01 or 02 SIM trays (option) (mini SIM 1.8V/3V)
- ◆ 09 LEDs
- ◆ 02 Ethernet ports (10/100 Mbps)
- ◆ 04 Serial ports
- ◆ 01 power input
- ◆ 03 voltage channels and 04 current channels for measurement inputs
- ◆ 04 x DI/ 4 x DO

General Specifications:

- ◆ Dimensions without base (W/H/D): 225/50/130 mm
- ◆ Weight: depending on the order
- ◆ Mounting type: DIN / panel mount
- ◆ Material type: Aluminum sheet

B. Technical Highlights

1.2. Communication

Number of supported connections:	Max 100 device connections
Telecontrol protocols (optional):	IEC60870-5-101 Master/Slave IEC60870-5-104 Master/Slave Modbus Master/Slave (including RTU/TCP) IEC61850 Client/Server DNP3 IEC62056-21

1.3. Interfaces

10/100 fast ethernet port	2
RS232 port:	2
RS485 port:	2 (2W/4W mode configurable)
Measure inputs:	3 x Voltage channels, 0 .. 300VAC 1% 4 x Current channels , 0 .. 3A 1%
Digital inputs/outputs:	2 x General analog inputs, 0..30VDC 4 x DI 4 x DO

1.4. 3G/4G Connection

General features

Multi-Band :	LTE-TDD/LTE-FDD/HSPA+/TD-SCDMA/EVDO
Dual-Band:	GSM/GPRS/EDGE 900/1800
Sim Interface:	2 x SIM, 1.8/3V

Specification

LTE CAT4:	Uplink up to 50Mbps, Downlink up to 150Mbps
TD-SCDMA:	Uplink up to 128Kbps Downlink up to 384Kbps
TD-HSDPA/HSUPA:	Uplink up to 2.2 Mbps Downlink up to 2.8 Mbps
HSPA+:	Uplink up to 5.76 Mbps Downlink up to 42 Mbps
UMTS:	Uplink/Downlink up to 384Kbps
EDGE Class:	Uplink/Downlink up to 236.8Kbps
GPRS:	Uplink/Downlink up to 85.6Kbps

1.5. Center Processor

CPU:	Arm Cortex-A7, industrial CPU
Data storage:	Flash 8GB

1.6. Control Function

Advanced control and regulation functions:	P, Q, V, Pf control Frequency regulation function Close loop control, open loop control
--------------------------------------------	-----------------------------------------------------------------------------------------------

1.7. Power Supply

Main power supply:	85 ~ 305 VAC, 100 ~ 430 VDC
Internal electricity supply:	12VDC battery pack

1.8. Ambient conditions during operation

Ambient temperature:	-10 to 55 °C
Permissible range for relative humidity (non-condensing):	5 to 95%, no condensation
Maximum operating altitude above MSL:	2000m

2. SOFTWARE SPECIFICATIONS

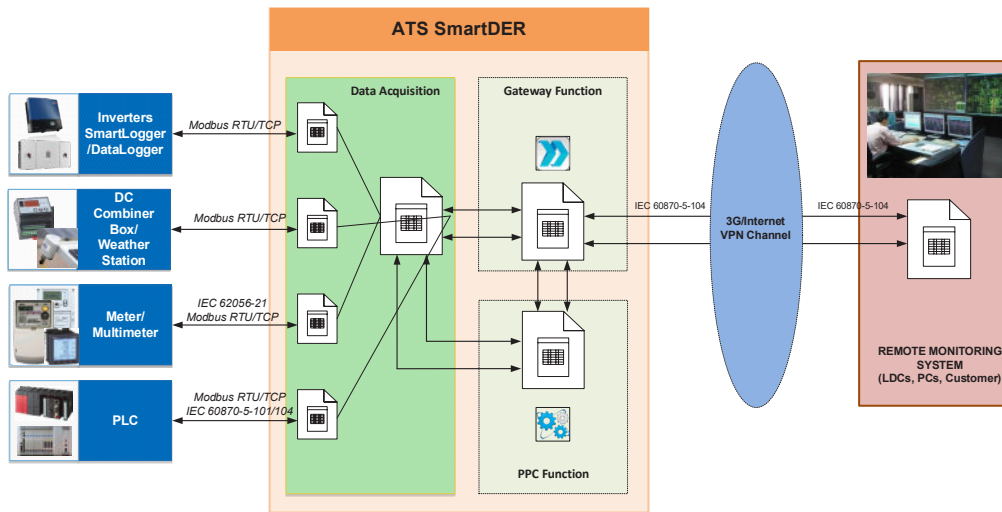


Figure 5. Software Structure of SmartDER

Main function blocks include:

- ◆ **Data Acquisition:** Collects control and monitoring data from the DER devices by standard protocols.
- ◆ **Power plant controller (PPC).**
- ◆ **Gateway function:** Synthesize data, connect and share data with SCADA systems of Dispatch Centers, Power Companies, and also owner's office.

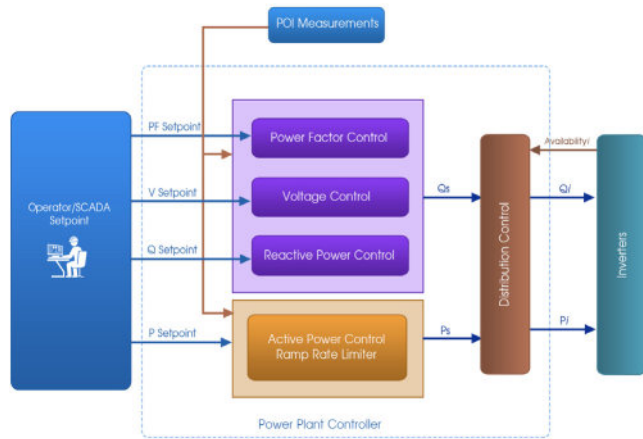


Figure 6. Principle of PPC Function

Power Plant Controller (PPC) will be implemented at plant-level logic and utilizes closed-loop control schemes with POI (point of interconnection). Real-time commands will be sent to each inverter via industrial protocols such as Modbus, DNP3, IEC 61850, etc... to achieve fast and reliable regulation of power plant generation.

Main PPC functions:

- ◆ **Active Power Control:** Keeps the output at fixed commanded Setpoint or respond to curtailment commands from Operators or Load Dispatch Centers. Ensure that output of power plant does not exceed specified limit.
- ◆ **Reactive Power Control:** Keeps output at a specific reactive power output level or adjust reactive power output to meet measured voltage at POI.
- ◆ **Power Factor Control:** Allows for maintaining a desirable power factor at the point of connection.
- ◆ **Voltage Control:** Allows for dynamically reactive power support, based on system voltage.
- ◆ **Power plant start-up/shutdown.**

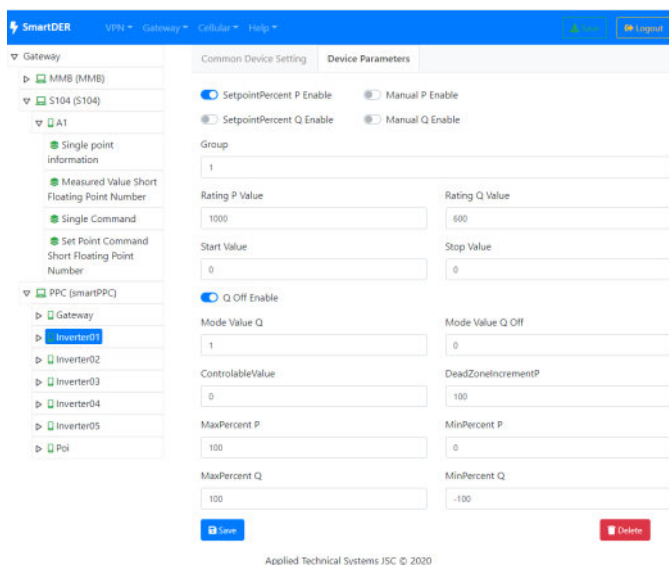


Figure 7. PPC Configuration Screen

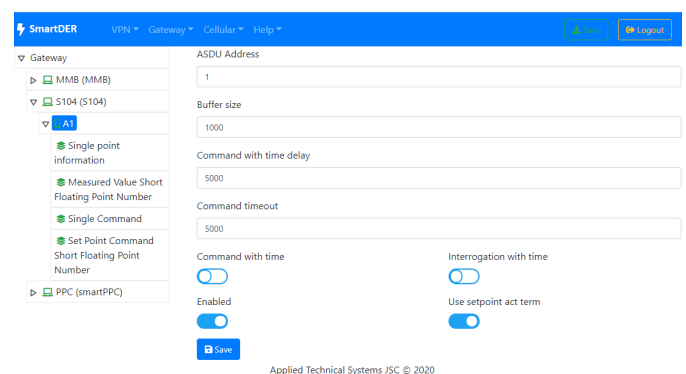


Figure 8. Gateway Channel Configuration Screen



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