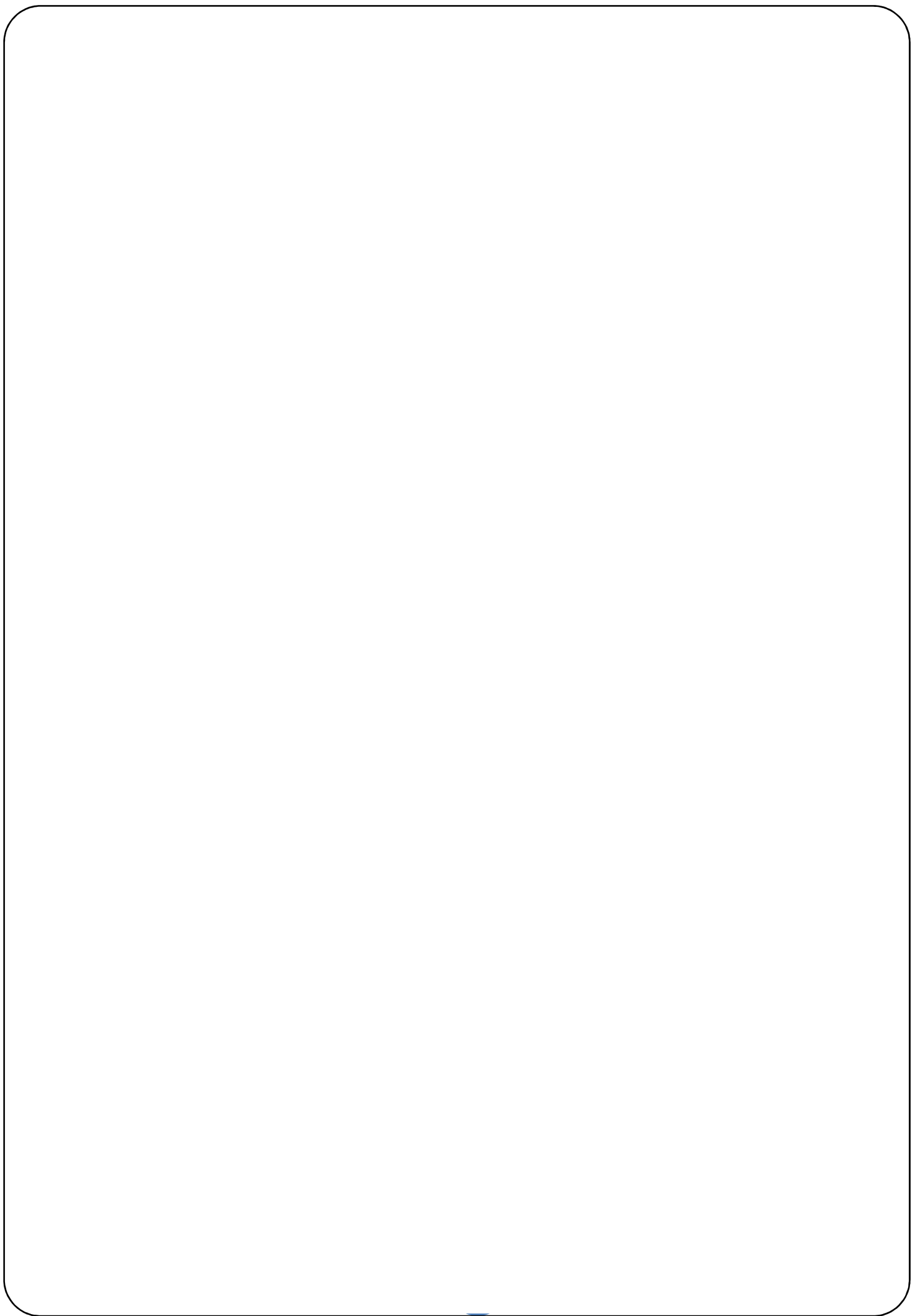




USER MANUAL

TSC010-TSC020
Solar Converter



SAFETY WARNINGS

IMPORTANT NOTICES

1. This manual must be carefully read before applying any power to the Solar Converter unit.
2. All warnings in the manual should be adhered to.
3. All operating instructions should be followed.
4. Power input cords of the Solar Converter should be routed carefully so that they are not to be walked on.
5. Please save this manual.
6. Please save or recycle the packaging materials.

WARNING !!!

- Do not apply electrical power to the Solar Converter equipment before arrival of authorized service personal.
- Installation and commissioning of Solar Converter must be performed by a qualified technician.
- Adequate protection against input over currents must be provided, considering the nominal current rating of the Solar Converter.
- Do not insert any object into ventilation holes or other openings.
- To reduce the risk of fire or electric shock, install the unit in temperature and humidity controlled indoor area free of flammable and corrosive substances.
- If input power is connected risk of electric shock is valid.

WARNING !!!

- **Since it is high voltage equipment, the Solar Converter contains dangerously high voltages. The risk of contact with these voltages is minimized using special design features and internal safety shields in accordance with IP20 standards.**
- **All maintenance and installation procedures requiring access to the inside of the device must be exclusively performed by trained personal.**
- **SOLAR CONVERTER DOES NOT HAVE AUTOMATIC PROTECTION AGAINST VOLTAGE RETURNING TO THE INPUT. POWER SWITCHES OR FUSES OUTSIDE THE SOLAR CONVERTER MAY HAVE VOLTAGES ON THEIR CONNECTION TERMINALS EVEN WHEN THEY ARE TURNED OFF.**
- **SERVICE PERSONNAL MUST INSULATE THE SOLAR CONVERTER (BY TURNING OF ITS OUTPUT and BATTERY SWITCHES and disconnecting the PV panels) BEFORE WORKING ON THE UNIT.**
- **Installation and commissioning of this device must be performed by qualified service personal trained and authorized by the manufacturer (or distributor)**
- **Risk of electric shock, do not remove cover. No user serviceable parts inside, refer to qualified service personal for high quality and secure servicing.**
- **Risk of electric shock, hazardous live parts inside.**

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I. GENERAL DESCRIPTION

1.1 Introduction

Aim of this user manual is to inform user and authorized technical service personnel on **TESCOM TSC series** solar converters.

Authorized technical service personnel and user are responsible to read this user manual thoroughly in order to install/use the device properly.

Manufacturer does not accept any liability in respect of any damage which is caused by negligence of aforementioned rules.

TESCOM TSC series solar converters are devices which are produced and designed with PWM and IGBT technologies and have enhanced communication interfaces.

TESCOM TSC series solar converters supply continuous power to loads from PV input power. It monitors input, battery, output voltage and currents, if any one of them is out of tolerance; The Solar Converter arranges power redundancy automatically.

Model	Output power
TSC010	10000 Watts
TSC020	20000 Watts

Table 1 TSC series solar converter models

Advantages of solar converters:

- Increased power quality
- Battery current control
- No mechanical components
- Remote monitoring of solar converter
- Power event logging

Features:

- Central DSP controlled structure
- High efficiency
- Rack and wall mount options
- Enhanced diagnostic
- INPUT
 - IGBT technology is used
 - PV voltage low limit
 - PV voltage high limit
- BATTERY
 - Flexible battery quantity
 - Adjustable battery charging current limit
- OUTPUT
 - Short circuit protection
 - Output fuse protection
 - Adjustable output voltage. (Service)
- COMMUNICATION and INTERFACE
 - RS232 interface and RS485
 - Interactive control command protection
 - EPO-External remote emergency power off input (N.O)
 - LCD front panel ,2 buttons ,indicator lamp and buzzer on front panel
 - Modbus adaptor
 - 200 alarms logging with time and date
 - Input voltage and current, output voltage and current, cabinet inside temperature, battery current measurements

1.2 Design

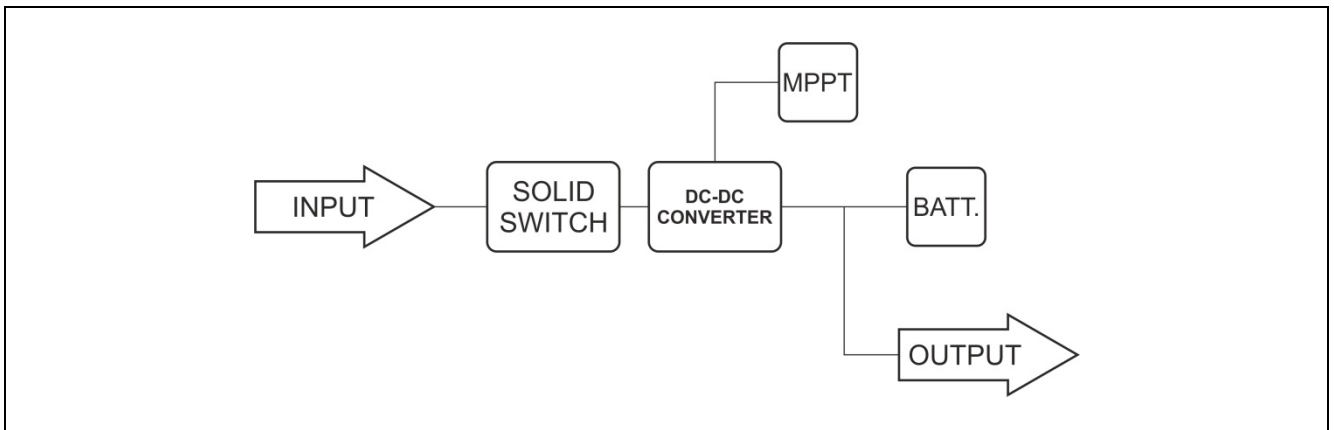


Figure 1 TSC series solar converter block diagram

Input: is Solar Panels, which are the power source of the unit.

Solid State Switch: is for switching solar power on and off.

Boost DC-DC converter: is the booster part of the unit, which boosts low solar voltage to a proper level, which is determined by user.

MPPT: is the maximum power point tracker, which controls voltage levels at a certain point where maximum power from solar panels is harvested.

Battery: is the battery group, which is reserve power for load

Output: is the load of the system.

1.3 Physical Appearance

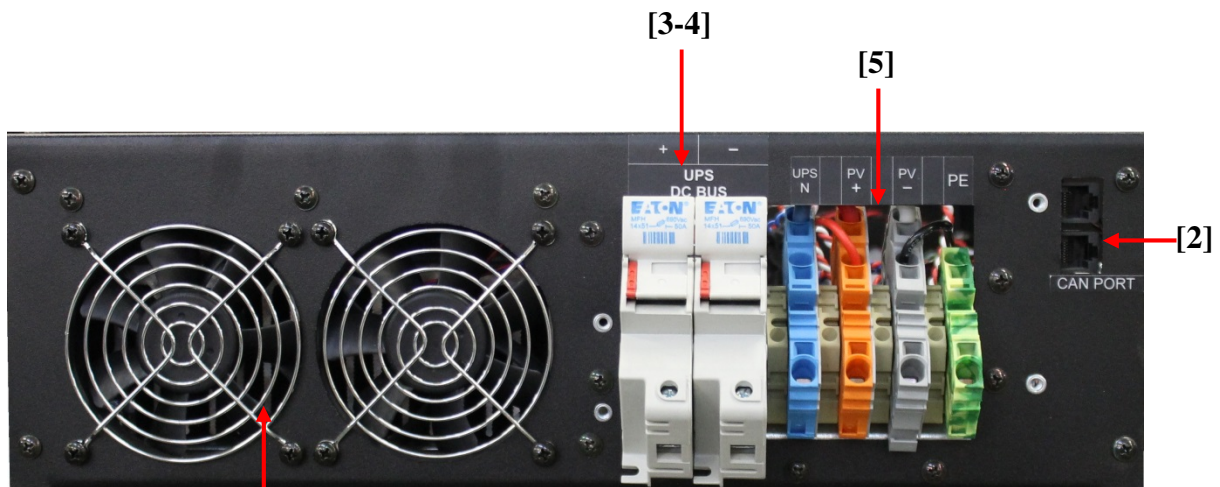


Figure 2 TSC series solar converter rear view

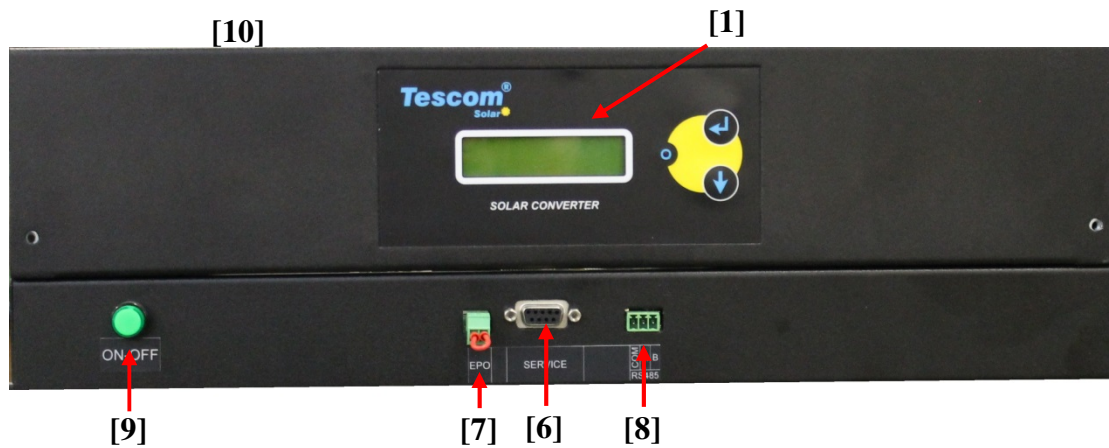


Figure 3 TSC series solar converter front views

1. Control panel
2. CAN communication port
3. SW1
4. SW2
5. Input and output terminals
6. RS232 communication port
7. EPO input connector
8. RS485 communication port
9. ON-OFF Button
10. Cool Fans

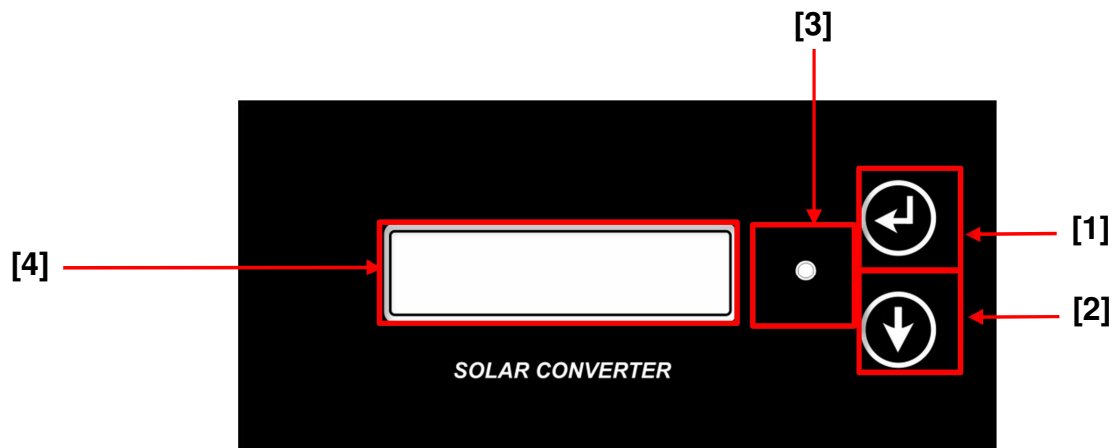


Figure 4 Control panel detailed view

1. ENTER button
2. DOWN button
3. STATUS led
4. LCD display

Status LED has 2 modes for indicating system status:

- No Flash : System is operating normally
- Flash : System is Fault Mode

Alphanumeric LCD panel has two lines:

- Top line displays menu items and measured parameters
- Bottom line displays alarms

1.4 Technical Specification

MODEL	TSC010	TSC020
INPUT		
MPP voltage range	150-600V	
MPP voltage range for full power	400-600V	
Maximum input voltage	600V	
Start-Up DC input voltage (Vstart)	200V	
Maximum input current	50A-DC	
Number of MMPT tracker	1	
Suggested PV power for input	10000W < S.P. < 11000W	20000W < S.P. < 22000W
Night energy consumption	5W	
Poles	3 (Positive, Negative and Earth)	
OUTPUT		
Maximum output power	10000W	20000W
Rated output voltages	± 405VDC (Dependent of Battery Number)	
Maximum output currents	±33,3A	
Efficiency	> 97%	
Poles	3 (Positive, Negative and Neutral)	
FRONT PANEL		
Panel features	Two line, 16 characters alphanumeric LCD screen	
COMMUNICATION		
RS232	Service	
RS485	Standard	
CAN	Standard	
EPO input	Available – Standard (N.O)	
PC software	Available - Standard	
Software management	Available - Standard	
MECHANICAL DATA		
Dimensions (HxWxD)	(3U)133x430x490	
Weight (kg)	17,5	
Mounting system	Wall Bracket/Cabinet System	
Connection type	Both Input and Output Terminals(800V 16mm ²)	
ENVIRONMENT CONDITION		
Operating temperature	0°C – 40°C	
Storage temperature	0°C – 40°C	
Altitude	2000m @ nominal power	
Humidity	< 90% (non-condensing)	
COMPLIANCE		
Quality standard	ISO9001	
Protection level	IP20	
PROTECTIONS		
Input	Optional 700V-DC Lightning/surge arrester and 700V 50A Fuse	
Input(Power supply)	250V 2A Fuse	
Output	700V 50A Fuse	

II. INSTALLATION

2.1 Introduction

WARNING!

- Do not apply electrical power to the Solar Converter equipment before the arrival of authorized service personnel.
- The Solar Converter equipment should be installed only by qualified service personnel.
- Eye protection should be worn to prevent injury from accidental electrical arcs. Remove rings, watches and all metal objects. Only use tools with insulated handles. Wear rubber gloves.
- The company may not be held liable for any damage caused by incorrect connections or by operations that are not described in this manual.

This section describes installation of the device.

2.2 Preliminary controls

The storage area must have the following characteristics

Temperature : 0 C to +40 C

Relative humidity : 95% max.

During storage keep the output switch always "OFF" (0 position).

2.3 Unpacking

Solar Converter is packed and enclosed in a structural cardboard carton to protect it from harm. Before unpacking, inspect for damage that may have occurred during the shipment. If any damage is noted, call the shipper immediately and retain the shipping carton and Solar Converter. If there is no damage in packaging, unpack Solar Converter carefully and take box out. Package contents are as follows;

- User manual
- CC05 coded RS232 connection cable
- CAN connection cable
- Warranty certificate

2.4 Equipment installation site and positioning

When choosing the site in which to install the Solar Converter, the following points should be taken into consideration:

- Avoid dusty environments
- Check that the floor is level and capable of withstanding the weight of the Solar Converter
- Avoid cramped environments that could impede the normal maintenance activities
- The relative humidity should not exceed 90%, non-condensing.
- Check that the ambient temperature, with the Solar Converter running, remains between 0 C and 40 C
- Avoid installing the equipment in places exposed to the direct sunlight and hot air.

2.5 Electrical connections

	TSC010	TSC020
Nominal output power	10000 kW	20000 kW
Operating temperature	0 C – 40 C	
Storage temper.	0 C – 40 C	
Max. relative humidity	90% (non-condensing) during operation	
Max. installation altitude	2000 m at nominal power rating	
Dimensions (WxDxH)	(3U)133x430x490	
Weight (kgs)	17,5	
Protection level	IP20	
Cables inlet	From rear side	
Communication	RS485 standard RS232 service CAN for system	
LCD panel	Available - Standard	
Software management	Available - Standard	
EPO input	Available – Standard (N.O)	

ELECTROMAGNETIC COMPATIBILITY

This Solar Converter conforms to the class C2 specifications (in accordance with the provisions laid down by the EN62040-2 standard: CONVERTER – EMC requirement). In home environment, it may cause radio interference. The user may have to take supplementary measures.

This product is designed for professional use in industrial and commercial environments. Connections to the RS485 connectors should be made with the cables provided or, in any case, with shielded cables less than three meters long.

INSTALLING THE SOLAR CONVERTER

When installing the equipment the following points should be considered:

- The air outlet and inlet of the Solar Converter is on the rear and front respectively, because of this do not prevent air ventilation from the rear and front side.
- No objects should be left on its top surface
- Sufficient space should be left in front of the equipment for it to be turned on/off and maintenance operations to be performed on it (>1 m)
- Keep out of your equipment from the explosive and flammable items

DIAGRAMS OF CONNECTION TO THE ELECTRICAL SYSTEM

Basic connection



Figure 5 Electrical system

CABLE SIZES / FUSES

The input/output cables can be sized to suit the Solar Converter rating according to the table below

Cables		TSC010 - TSC020
Input	3x16 mm ² (Positive + Negative + Earth)	
Output	3x16 mm ² (Positive + Negative + Neutral)	

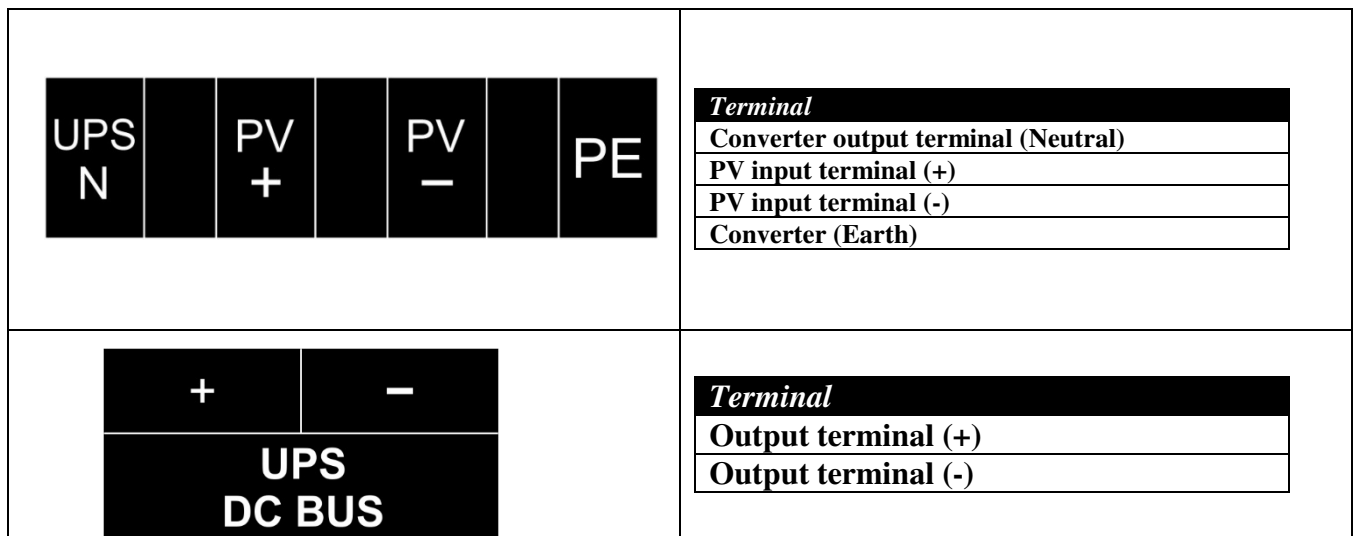
Fuses		TSC010 - TSC020
Input	Solar Box	
Output	50A	

CONNECTIONS

TSC Series Solar Converter runs only on PV panel supplies with Positive and Negative lines.

Before making power connections to the unit, ensure that the incoming power sources are de-energized and insulated.

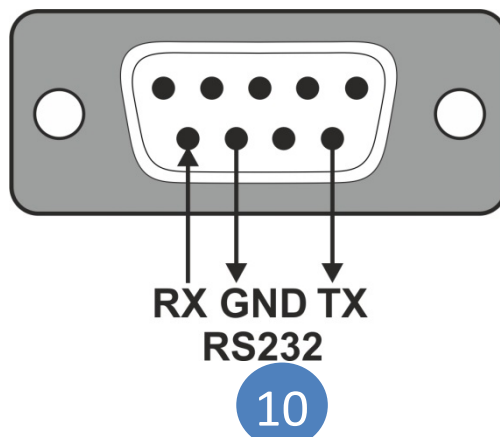
All control cables should be screened and run in a separate trunking to the power cables.



RS232 CONNECTOR

RS232 communication connector of the TSC series Solar Converter is a D-type, 9 pins, female connector. RS232 data pins are isolated from Solar Converter circuits.

RS232 hardware	
Baud rate	2400
Connection	3 wire (RX,TX,GND)
Bits	8 bits
Parity	None
Flow	None
Stop bit	1



<i>Pin nr.</i>	<i>Description</i>
Pin 6	RS232 data receive pin
Pin 7	RS232 Ground pin
Pin 9	RS232 data transmit pin

EXTERNAL EPO BUTTON

EPO input is the screw terminal pair at the rear next to the RS232 connector. The selectable options are:

Function	Description
NO contact	If EPO input terminals are shorted emergency power off will applied

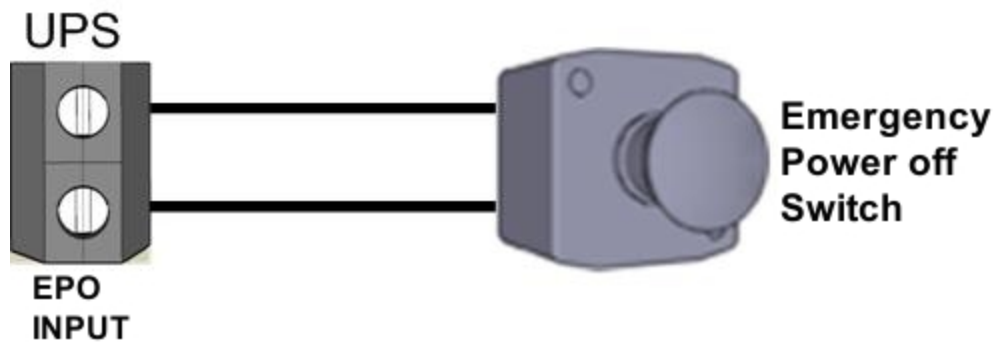


Figure 6 Emergency power off switch

This isolated input is used to turn off the Solar Converter remotely in case of emergency. The Solar Converter is supplied from the factory with EPO terminals short-circuited, if those two terminals are open circuit; Solar Converter shuts-down the output voltage and send error message.

The EPO circuit is self-powered; no external power supply voltage is therefore required. If the external EPO switch is pressed (at least 1 second) Solar Converter turns off its output.

WIRING PROCEDURE

Input Power Connections

1. During connection match Positive cable to positive input, Negative cable to negative input.

Output Connections

2. For output connections you have three outlets at the back of the Solar Converter
 - You can directly plug the load cable into this output.
 - During connection of the load, match Positive cable to positive output, Negative cable to negative output and Earth cable to earth output.

Note: These auxiliary cables must be shielded and double insulated. (Recommended cross-section =1mm²)

ATTENTION!!! Failure to follow adequate grounding procedures can result in electric shock hazard to people or risk of fire.

III. OPERATION

DESCRIPTION

The purpose of the Solar Converter is to provide maximum power, which is in predefined limits, available from the PV panels. While the input voltage is in acceptable tolerances, The Solar Converter converts the DC voltage provided by the PV panels into the required DC voltage level at the output. If the voltage at the input is out of the predefined tolerance, the Solar Converter stops and waits until the voltage at the input is in range again.

PROTECTIONS INSIDE THE SOLAR CONVERTER

OUTPUT SHORT CIRCUIT PROTECTION

In the event of a fault on the load, like short circuit, Solar Converter shuts-down the output voltage. To restart after a short circuit, find out the short circuit on the load side and disconnect it from the output of the Solar Converter. Then restart the Solar Converter again.

FUSES

There are some fuses on the Solar Converter:
Power supply fuse (on-board glass fuse)
Output fuse

BATTERY PROTECTION

Battery charge current limit (adjustable)

INPUT PROTECTIONS

Input DC voltage high protection
Input DC voltage low protection

OUTPUT PROTECTIONS

Output DC voltage high protection (adjustable)

OTHER

EPO Emergency Power Off feature.

PRELIMINARY OPERATIONS

- Visual check of the connections
Check that all the connections have been made following the information given in the “Connections” paragraph.

POWERING ON FOR THE FIRST TIME

- Make sure that the voltages at the input and the output of the system within the range.
- For the first time operation, The system wait for press Start/Stop Button.
- If there is no fault, the Solar Converter will start harvesting energy from the PV panels and pump current into the load side after press Start/Stop Button.

WARNING: The electronic circuitry of the Solar Converter although is supplied by the voltage at the output, turning OFF the output switch will not cause the system to turn off due to self-supply. Therefore, if the output switch is turned OFF, NEVER turn it on while the system ON. Turn OFF the system completely and then follow commissioning procedure from the beginning.

WARNING: Check CAN connection between solar converter and UPS

Switching On (Normal Operation) the Solar Converter from Off Position

- Engage the fuses
- Press to Start/Stop button
- If there is no fault the Solar Converter will start producing energy.



Figure 7 Power ON

Switching Off (Normal Operation) the Solar Converter from On Position

- Press to Start/Stop button
- The Solar Converter will stop producing energy.
- Deactivate the fuses.



Figure 8 Power OFF

IV. FRONT PANEL

4.1 Introduction

Solar Converter front panel has a LCD display (2 lines), 2 buttons and 1 LED.

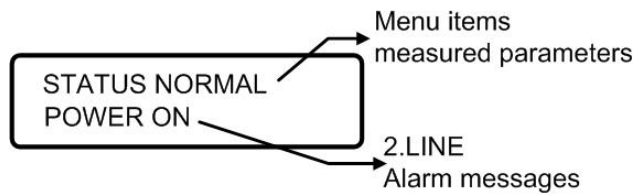
DISPLAY

At the center of the control panel, there is a 2 lines/16 alphanumeric characters display, which provides a detailed overview of the current status of the Solar Converter. Directly from front panel you can control the Solar Converter, monitor the electrical values of the inputs, output etc. and change the main settings.

The LCD display has 2 lines and the functions of lines are as follows:

First line: Menu items and measured parameters

Second line: Time shared indication of alarms



The tag SXX at the beginning of the fault messages on the second line are the standard fault codes for a fault condition. The remaining message part can be different in each language.

STATUS LED

There is a single LED for fault indication on the control panel of the Solar Converter.

Fault indication: Red LED flashing

Status OK: Red LED No flash

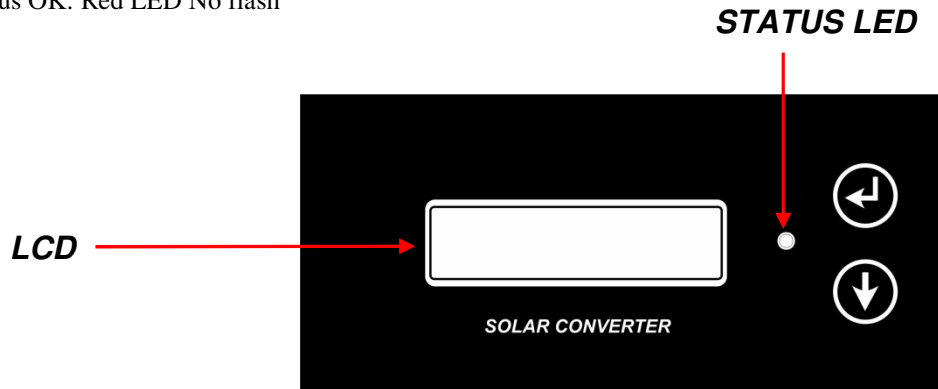


Figure 9 Control panel

KEY SYMBOLS

There are 2 control keys which provide flexible move on menus, these are:

- ← ENTER button to enter menu or to confirm a selection
- ↓ Navigate through menu items

SOLAR CONVERTER CHANGE DEVICE ID METHODS

Two method one used to give the slave ID to the solar converter(SC)

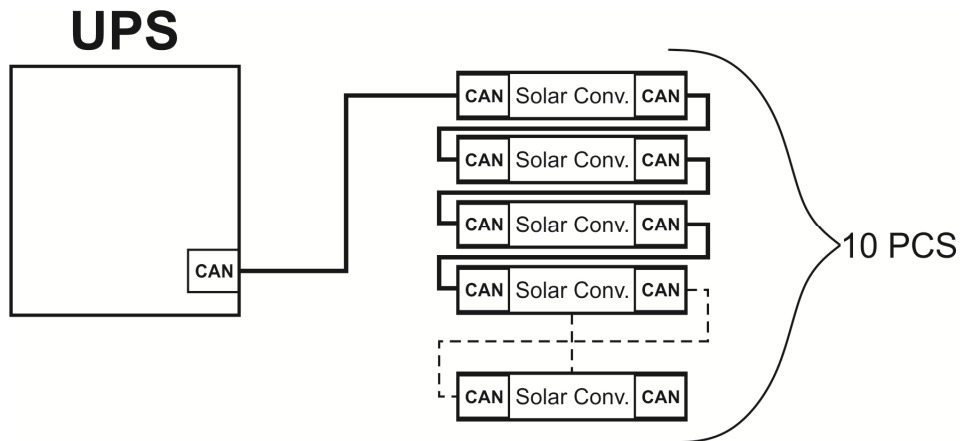
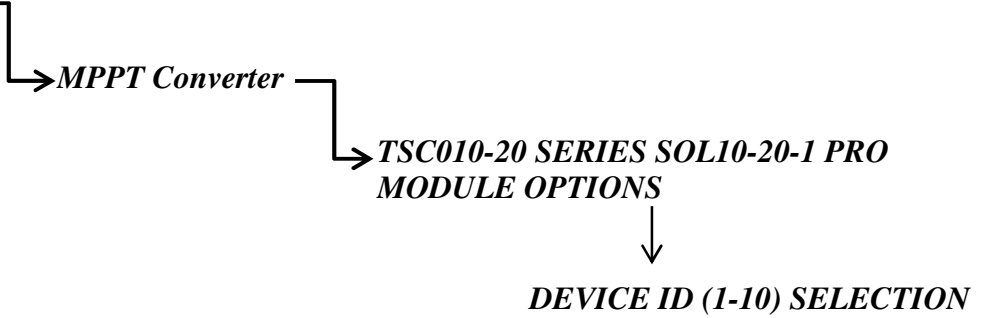
METHOD 1

**Check the descriptions in the service section in the “Front Panel Menu Explanations”*

METHOD 2

**Follow the steps below in the “Device calibration” program.*

**Device calibration*



DISPLAY MENUS

The function of LCD panel is arranged as a 2 level menu structure.

- Main menu
- Sub menus

4.2 Front panel menu explanations

Down button enables user to navigate through menu options. Enter button enables user to select a menu option. Each menu option has an "EXIT" option at the bottom of selection. User can exit menu selection by

Level 1	Level 2	Level 3	Explanation
1.Measurement			User can find various measurements related to system under this menu.
	Power: XXXX W		Power being drawn from the PV panels in Watts.
	PV VOLTAGE: XXXX V		Input voltage from the PV panels in Volts.
	PV CURR: XX.X A		Input current from the PV panels in Amperes.
	VDC POS+: XXXX V		Positive bus output voltage supplied to the loads in Volts.
	VDC NEG-: XXXX V		Negative bus output voltage supplied to the loads in Volts.
	IDC POS+: XX.X A		Positive bus output current supplied to the loads in Amperes.
	IDC NEG-: XX.X A		Negative bus output current supplied to the loads in Amperes.
	Sink: XX.X C		Heat sink temperature
	Energy: XXXX kWh		Total energy harvested from the PV panels in kWh.
	Exit		Exits from Measurement menu.
2.Time			User can see date and time from this menu
	Date		Displays date of the system.
	Time		Displays time of the system.
	Time Sync		Displays time synchronization of the system.
	Exit		Exits from Time menu.
3.Information			User can see information about of the system in this menu.
	Hourmetr		User can see total working hours in this menu.
	Rack no		User can see device number in this menu.

	Version		User can see version in this menu.
	Exit		Exits from Information menu.
4.Options			User can see options under this menu
4.1 General Options			User can see general options under this menu
	Buzzer		User can change buzzer on or off.
	Language		User can change language.
	Exit		Exits from Options menu.
5. Service			This menu only use by the authorized persons.
	Hourmetr		User can see total working hours in this menu.
5.1 Com options			There are communication options in this menu.
5.1 Com options	Baud rate		Change baud rate of the communication.
5.1 Com options	Slave ID		Device number of the communication.
5.1 Com options	Exit		Exits from Com Options menu.
	Fault reset		If select this menu, generated errors are reset.
	Log out		Authorized persons have to use this option after have finished working.
	Exit		Exits from Service menu.

Code	Message	Class	Explanation
S01 PV IN HIGH	FAULT		If PV voltage is high than default value, this fault occurs. The system start automatically after the fault is repair.
S02 PV IN LOW	FAULT		If PV voltage is low than default value, this fault occurs. The system start automatically after the fault is repair.
S03 FUSE BROKE	FAULT		If output fuse is broken, this fault occurs. The system start automatically after the fault is repair.
S04 IPM FAULT	FAULT		If overcurrent from the IPM module, this fault occurs.
S05 DC DOWN	FAULT		If the DC voltage of device is low than default value, this fault occurs.
S06 DCBUS HIGH	FAULT		If the DC voltage of device is high than default value, this fault occurs.
S07 POSBUS LOW	FAULT		If the positive output voltage is low than desired value, this fault occurs.
S08 NEG BUS LOW	FAULT		If the negative output voltage is low than desired value, this fault occurs.
S09 HIGH TEMP	FAULT		If the sink temperature is high than default value, this fault occurs.
S10 FAN FAULT	FAULT		If the fan is broken, this fault occurs.
S11 LOCK OPEN	FAULT		If the button is not pressed, this fault occurs.
S12 EEPROM	FAULT		If error occurs when writing EEPROM, this fault occurs.
S13 CRC ERROR	FAULT		If data inconsistency in EEPROM, this fault occurs.
S14 EMERGENCY	FAULT		If pressed the emergency button, this fault occurs.
S15 CUR. SEN.	FAULT		If socket of current sensor is not affixed, this fault occurs.
S16 OUTDIODE	FAULT		If output diode is broken, this fault occurs.
S17 BMS FAULT	FAULT		If connection problem occurs between device with BMS module, this fault occurs.
S18 UPS FAULT	FAULT		If connection problem occurs between device with UPS, this fault occurs.

V. COMMUNICATION INTERFACE AND REMOTE MANAGEMENT

TESCOM TSC series Solar Converters have communication interfaces listed hereunder.

<i>Possible connections to Solar Converter unit</i>	
RS232	Serial communication (Service)
RS485	Available (Standard)
CAN interface	Available (Optional)
Modbus connection	Over RS485 available (optional)

The following information contains standard communication interface for TSC series Solar Converter. For special requirements CAN interface is also available on the system.

The following communication interfaces are available for Solar Converter units

RS232 hardware	
Baud rate	9600 baud
Connection	3 wire (RX,TX,GND)
Bits	8 bits
Parity	None
Flow	None
Stop bit	1

RS232 CONNECTION TO PC

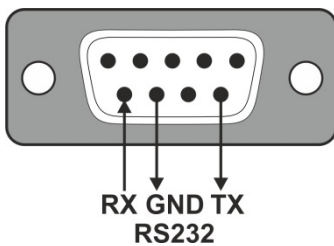
To connect Solar Converter to any PC from RS232 use CC05 cable for connection.



Notes

- CC05 cable is not a standard RS232 cable, PC side is standard RS232 pins but the Solar Converter side pin functions are different from a standard RS232 cable.
- Maximum cable length of the RS232 interface is 25 meters.

RS232 Pin outs



RS232 security

The UPS serial port is interactive with PC computer so the PC can send any command to Solar Converter, in this case unauthorized users can change parameters and send unwanted commands to Solar Converter. To prevent unauthorized access to Solar Converter from serial port security is provided.

A special command is required by the Solar Converter before accepting the RS232 commands. If this command is not provided to the Solar Converter, the incoming commands from RS232 will be cancelled.

VI.MODBUS RTU HOLDING REGISTER MAP

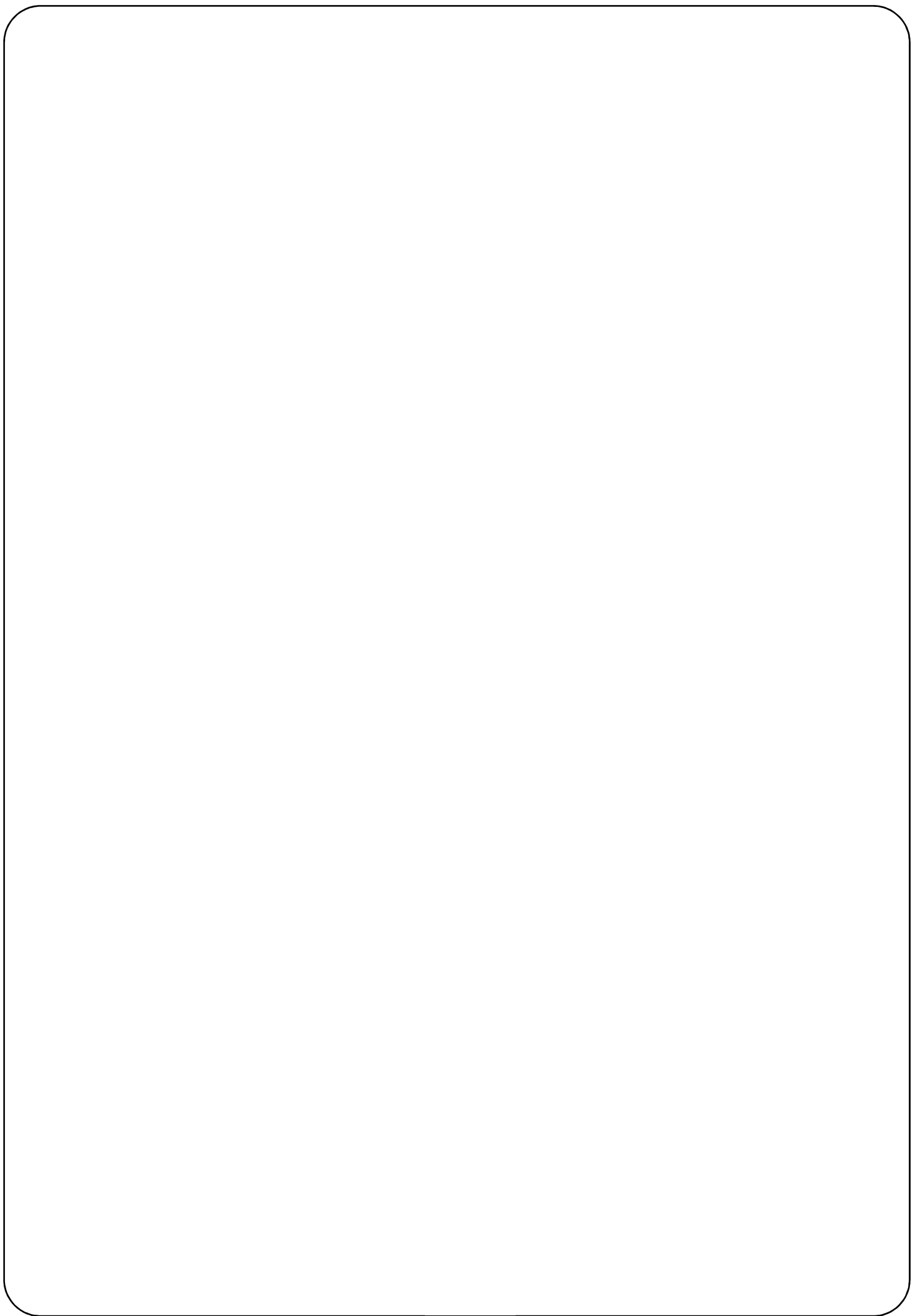
<i>ver2202</i> ve <i>yukarı</i>	<i>ver2201</i> ve <i>ver2200</i>			
Addr	Addr	Parametre	Açıklamalar	Tip
800	575	DeviceNumber	2. 0-99	ushort
801	117	Service Login Status	0-> Logout, 10->Servis girişi	ushort
802	180	PV Voltage	xxx.x Volt (x0,1)	ushort
803	-	PV Current	xxx.x Ampere (x0,1)	ushort
804	99	PV Power	xxxxx Watt	ushort
805	182	Positive Output Voltage	xxx.x Volt (x0,1)	ushort
806	183	Negative Output Voltage	xxx.x Volt (x0,1)	ushort
807	188	Positive Output Current	xxx.x Ampere (x0,1)	ushort
808	189	Negative Output Current	xxx.x Ampere (x0,1)	ushort
809	98	Total Output power	xxxxx Watt	ushort
810	151	Ambient Temperature	xx.x Celcius (x0,1)	ushort
811	152	Sink Temperature	xx.x Celcius (x0,1)	ushort
812	2	Fan Speed	%0 - %100	ushort
813	496	Maximum Total Output Power	xxxxx Watt	ushort
814	42	Alarmbits High Word		ushort
815	43	Alarmbits Low Word		ushort
816	44	Warning Bits		ushort
817	46	FaultCode	Açıklama tablosu sayfa 22'de	ushort
818	45	StatusCode	Açıklama tablosu sayfa 22'de	ushort
819	68	UPS Voltage Reference	xxx.x Volt (x0,1)	ushort
820	69	UPS Boost voltage Reference	xxx.x Volt (x0,1)	ushort
821	-	UPS Charge Current Reference	xxx.x Ampere (x0,1)	ushort
822	-	Mother Board Program Version		ushort
823	590	Positive Energy High Word	xxxxxxxx.x kWh (x0,1)	ushort
824	591	Positive Energy Low Word	xxxxxxxx.x kWh (x0,1)	ushort
825	592	Negative Energy High Word	xxxxxxxx.x kWh (x0,1)	ushort
826	593	Negative Energy Low Word	xxxxxxxx.x kWh (x0,1)	ushort
827	594	Total Energy High Word	xxxxxxxx.x kWh (x0,1)	ushort
828	595	Total Energy Low Word	xxxxxxxx.x kWh (x0,1)	ushort
829	596	Total Energy High word after first start-up	xxxxxxxx.x kWh (x0,1)	ushort
830	597	Total Energy Low word after first start-up	xxxxxxxx.x kWh (x0,1)	ushort
831	580	ChasisNumber Digit – 0	Ascii ('A', etc.)	ushort
832	581	ChasisNumber Digit – 1	Ascii ('A', etc.)	ushort
833	582	ChasisNumber Digit – 2	Ascii ('A', etc.)	ushort
834	583	ChasisNumber Digit – 3	Ascii ('A', etc.)	ushort
835	584	ChasisNumber Digit – 4	Ascii ('A', etc.)	ushort
836	585	ChasisNumber Digit – 5	Ascii ('A', etc.)	ushort
837	-	Selected Language	ENG (0) – TR (1)	ushort
838	575	Modbus ID	0-99	ushort
839	578	Modbus BaudRate	115200 (0) – 57600 (1) – 56000 (2) – 38400 (3) – 19200 (4) – 9600 (5) – 4800 (6)	ushort
840	49	Log Count	0-200	ushort
841	5	Total Hour from First Start-up	xxxxx saat	ushort

VII. DESCRIPTION OF FAULT CODES

1001	BAL_LEM_ERROR	BALANSE CURRENT SENSOR FAULT
1002	EEPROM_MEMORY_ERROR	EEPROM WRITE FAULTI
1003	EEPROM_MEMORY_CRC_ERROR	EEPROM CHECKSUM FAULT
1004	IGBT_SAT_FAIL_ERROR	IGBT Sat Over 4 fault in 10 minutes
1005	TEMP_FAIL_ERROR	Over 4 minutes out of temperature tolerance fault with in 30 minutes

VIII. DESCRIPTION OF STATUS CODES

1401	ISO_SUPPLY1_ERROR	PCB SUPPLY FAULT 1
1402	ISO_SUPPLY2_ERROR	PCB SUPPLY FAULT 2
1403	BOOSTER_DC_POS_BUS_HIGH_ERROR	POS. BOOSTER BUS HIGH VOLTAGE
1404	BOOSTER_DC_NEG_BUS_HIGH_ERROR	NEG. BOOSTER BUS HIGH VOLTAGE
1405	BOOSTER_DC_POS_BUS_LOW_ERROR	POS. BOOSTER BUS LOW VOLTAGE
1406	BOOSTER_DC_NEG_BUS_LOW_ERROR	NEG. BOOSTER BUS LOW VOLTAGE
1407	BUCK_DC_POS_BUS_LOW_ERROR	POS. BUCK LOW VOLTAGE
1408	BUCK_DC_NEG_BUS_LOW_ERROR	NEG. BUCK LOW VOLTAGE
1409	SOLAR_TEMP_HIGH_ERROR	TEMP. HIGH FAULT
1410	IPM_FAULT_ERROR	IPM FAULT
1411	EMERGENCYSTOP_ERROR	EMERGENCY STOP FAULT
1412	LOCKKEYOPEN_ERROR	ON-OFF SW FAULT
1413	CANUPS_ERROR	UPS CAN FAULT
1414	UPSSTOP_ERROR	UPS STOP FAULT
1415	UPSBATTEST_ERROR	UPS BATTERY TEST FAULT
1416	CANBMSERROR_ERROR	BMS CAN FAULT
1417	PV_DC_BUS_HIGH_ERROR	PV HIGH VOLTAGE FAULT
1418	PV_DC_BUS_LOW_ERROR	PV LOW VOLTAGE FAULT
1419	FANFAULT_ERROR	FAN FAULT



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