MANUAL

User Manual
Sunways Solar Inverter

NT 2500, NT 3700, NT 4200, NT 5000

english

EN

sunways
Photovoltaic Technology

Introduction

Thank you for deciding in favour of a Sunways Solar Inverter of the NT series!

In doing so you have purchased an innovative, high-quality product with unique equipment features and a high, constant efficiency. This Solar Inverter is equipped with HERIC® topology and therefore enables operation on a large number of solar modules – as accustomed from Sunways – without the use of a transformer.

This user manual contains explanations on using the Sunways Solar Inverter. You will learn to recognise the many possibilities of the Solar Inverter. Information is provided on safety, installation, commissioning, operation and system monitoring.

Please observe the safety precautions exactly to ensure increased safety at the operating site of the Solar Inverter.

Content

Content

1 Product description

1.1 Proper use

The Sunways NT Solar Inverter is the link between your solar generator and the public power grid. The energy from the connected solar generator is converted to grid-conformant AC current and fed into the grid.

Solar modules which require earthing of the negative or positive terminal cannot be operated with the NT Solar Inverter. If in doubt, always ask your module manufacturer about a release!

1.2 Function description

Conversion from direct into alternating current
The NT Solar Inverter converts the direct current produced by the solar generator into alternating current. The alternating current is fed into the public power grid as a single-phase current.

Operating and display elements
Various interfaces are available for system configuration and monitoring:

· Operating field (LCD display and keyboard) for displaying operating and status values or for inputting system parameters

· Operating LED

· Integrated web server for display and configuration via a web browser

Interfaces
· Bus interface for connecting an analogue modem, ISDN modem or GSM/GPRS modem

· Ethernet interface for connecting a PC or for integration in existing networks

· CAN bus interface for interconnecting several Solar Inverters

· S0 pulse output for controlling large displays

· Alarm relay for realising simple monitoring locally

· Interface for connecting an irradiation and temperature sensor

Data logging
The NT Solar Inverter is equipped with internal data logging for recording and saving system data:

· 5-minute mean values of voltages, currents, output, temperature and irradiation (if sensor is installed)

· 5-minute, daily, monthly and annual values of energy yield

· 5-minute maximum and minimum values for AC output, irradiance, system output

· Memory for malfunction messages

Grid monitoring
The NT Solar Inverter assumes the task of grid monitoring for the protection of the device and persons. In case of abnormal grid conditions, feeding is immediately interrupted and the Solar Inverter disconnects from the grid by triggering the grid relay.

Functions resulting from the German Renewable Energy Act and the Medium- and Low-Voltage Directive
The Solar Inverter hardware already meets the requirements of the new Medium- and Low-Voltage Directive and will support all functions via software update by the end of the transitional period.

Output control through the PSC according to the 2009 amendment of the German Renewable Energy Act can be realised via the Power-Control Box accessory.

Design of Solar Inverter
The principle design of the NT Solar Inverters can be recognised from the block diagram (page 8).

Block diagram
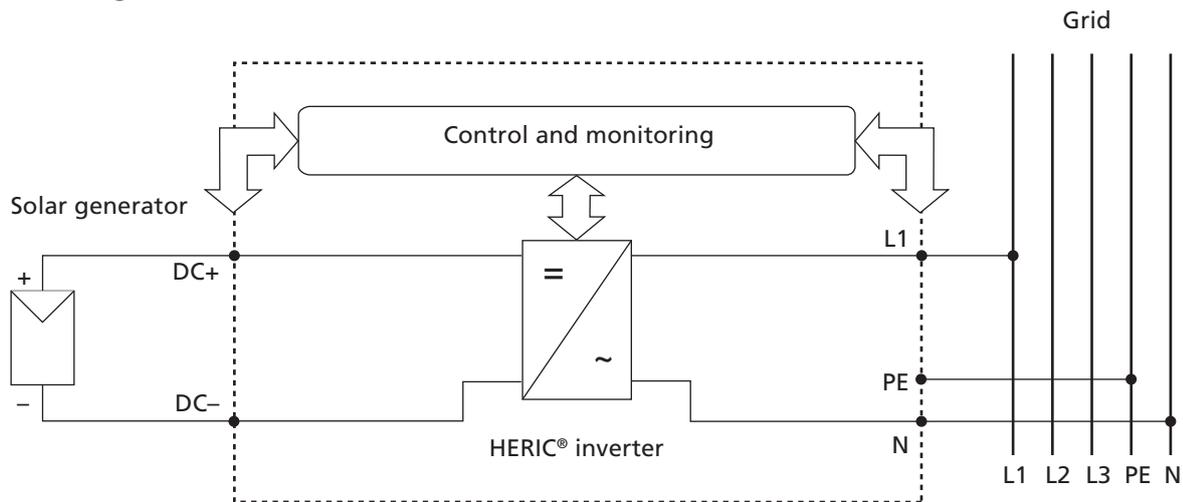
1.3 Integration in solar system

Design of solar generator

The technical data of the selected solar generator must be within the Solar Inverter's specifications (see Technical Data). Incorrect dimensioning can lead to reductions in the yield and to destruction of the device.

The design program Sunways Sundim may be helpful to you. Sunways Sundim is available on the included CD-ROM or at our homepage www.sunways.de.

Be sure to take the following points into account before planning your system:

· Watch the celestial alignment of the modules. A maximum yield is achieved in Central Europe with a module slope of 30° to the vertical and direction of the solar generator field directly to the south.

· The output of the cells decreases as the module temperature increases. Install your solar generator with sufficient ventilation from behind.

· Check your solar generator approx. every three years for soiling. This occurs especially on the lower edge of the modules and forms a veil that cannot be washed off even by heavy rain. Reduced yield can be prevented by cleaning with a wet cloth or a brush.

· Avoid switching off individual modules or solar cells of your system. This can lead to major decreases in yield.

Standard components of a solar system

Depending on the recommendations of your PV planning expert, your PV system consists of the following components:
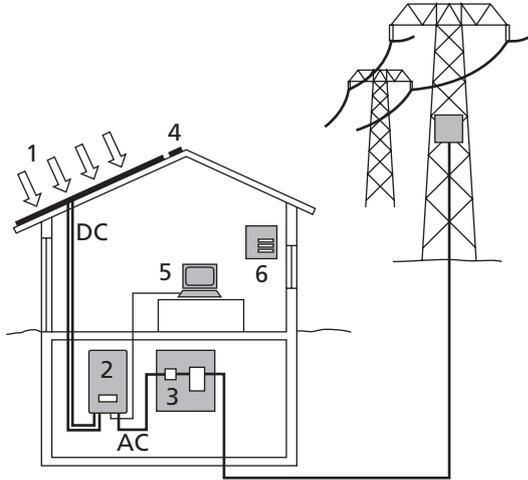
1   Solar generator
2   Solar Inverter with integrated DC load break switch
3   Mains fuse and energy meter

Options
4   Irradiation sensor with integrated temperature sensor
5   PC for monitoring system
6   Large display

1.4   Assembly description
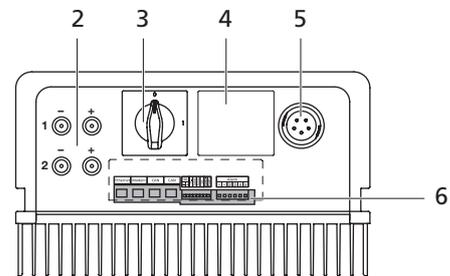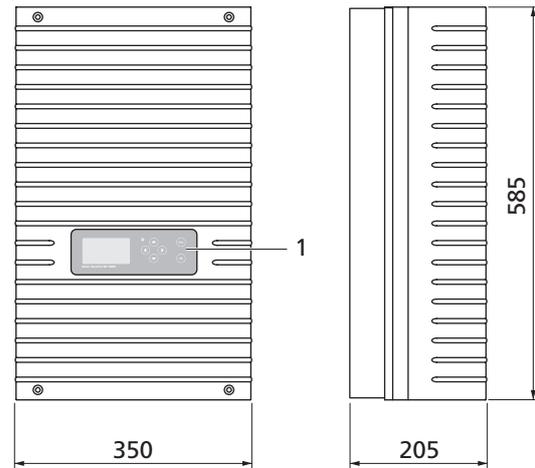
1   Operating field with LCD display, operating LED and keyboard
2   DC connections
3   DC load break switch
4   Rating plate
5   AC connection
6   Communication interfaces

1.5   Delivery scope

The delivery consists of:

·   Sunways Solar Inverter of the NT-Series
·   Wall bracket
·   2 pairs of Tyco Solarlok plug-in connectors
·   AC connector
·   CAN terminating resistor connector (connected)
·   Ethernet cable, 2 m (CAT 5e, 1:1)
·   Warranty registration
·   SETUP - quick reference guide
·   CD-ROM, including: Manual, Sunways Sundim design program, product and service information

Checking delivery

Before shipment our products are checked for proper condition. Despite careful, recyclable packing, transport damage may occur, for which the transport company is generally responsible.

Please check the delivered Solar Inverter thoroughly!

Should you discover damage to the packing or the Solar Inverter, please inform the transport company immediately. Your specialist dealer will be happy to support you if necessary. A possible damage report must always be received by the transport company in writing at the la-test seven days after receipt of the goods.

2 Safety precautions

2.1 General safety precautions

Observe information in operating manual!
The condition for the safe handling and malfunction-free operation of the NT Solar Inverter is a knowledge of the basic safety precautions.

This user manual contains the most important information on operating the system safely.

Each person concerned with the installation, commissioning, maintenance and operation of the Solar Inverter must have read and understood the entire user manual, and in particular the chapter entitled Safety Precautions.

In addition, the rules and regulations for accident prevention applicable for the operating site/plant must be observed.

Dangers when handling the NT Solar Inverter
The Solar Inverter has been built in accordance with the latest rules of techno-logy and the recognized safety rules and may only be used

· for its intended use

· when in proper condition with regard to safety.

Improper use may lead to dangers to the life and limb of the user or others, or can adversely affect the system or other property.

In case of malfunctions which can impair safety, the system must be shut down immediately and secured against being switched on again. The malfunction must then be eliminated immediately.

Warranty and liability

The Sunways AG „General Terms and Conditions of Sale and Delivery« always apply. Warranty and liability claims for personal injury or damage to property are excluded, if they were caused by one or more of the following:

· Improper use of the Solar Inverter

· Improper installation, commissioning, operation and maintenance

· Operation of the Solar Inverter with defective and/or non-operational safety and protective equipment

· Failure to observe the information in the user manual regarding installation, commissioning, operation and maintenance

· Unauthorised constructional modifications

· Insufficient monitoring of wearing parts

· Improperly conducted repairs

· Emergencies caused by external influence or force majeure

2.2 Explanation of symbols and warnings

To help you quickly understand this manual and safely use the Solar Inverter, the following warnings and symbols are used.

Warnings and symbols used in this user manual

DANGER

This symbol indicates an immediate danger which will result in death, injury or serious damage if the applicable safety regulations are not followed.

Extreme danger from electric shock!

This symbol indicates an immediate danger from electric shock which will result in death, injury or serious damage if the applicable safety regulations are not followed.

CAUTION

This symbol indicates an immediate danger which can result in damage if the applicable safety regulations are not followed.

Symbols used in this user manual

Information

This symbol indicates important information which contributes to a better understanding of the Solar Inverter.

Warnings and symbols on device

The following warnings on the housing of the Solar Inverter point out dangers. Always observe the warnings exactly.

This symbol indicates that the user manual must be read and understood before putting the device into operation.

IMPORTANT

Hot surface! The housing can heat up during operation.

The device must be disconnected from the mains supply and from the PV generator before opening the housing. The device still carries life-threatening voltage for approx. five minutes internally and at the connection terminals of the PV generator following disconnection from the PV generator. The energy storage capacitors are not completely discharged until after this time. You must wait at least five minutes after disconnecting the device from the mains supply and from the PV generator before opening the device.

Warning!
High leakage current,
earth connection essential before
connecting supply.

WARNING!

High leakage currents. Be sure to make an earthing connection before connecting the power supply circuit (AC system).

2.3 Basic safety measures

Electrical work on the Solar Inverter must be conducted by a qualified electrician while observing the VDE regulations, national and other regulations.

The Solar Inverter may only be opened by persons authorised by Sunways AG to do so.

When circuit breakers are tripped, the fault cause must be determined and eliminated before returning the device to operation.

Check electrical equipment regularly.

Retighten loose connections.

Replace damaged lines/cables immediately.

2.4 Safety concept

The following parameters are monitored and displayed continuously and simultaneously by the inverter controller:

· DC overvoltage
· Overvoltage L1, L2, L3
· Undervoltage L1, L2, L3
· Isolated operation
· Over- / underfrequency L1
· Surge error (brief overvoltage L1)
· DC share in AC current
· AFI residual current
· Overtemperature of heat sink

When a malfunction occurs, feeding is immediately interrupted and the Solar Inverter disconnects from the grid by triggering the grid relay.

The potential-free alarm relay is switched (except for grid undervoltage L1).

In addition, the following protective equipment in accordance with overvoltage category III is provided on the grid and on the solar generator side:

· Grid-side varistors
  These protect the power semiconductors in case of high-energy, short-term voltage peaks in the grid and provide for an energy reduction in reactor in case of a grid disconnection.

· Generator-side varistors
  Varistors offer protection against atmospheric overvoltages (e.g. caused by remote strikes during thunderstorms).

3   Installation

3.1   Mechanical installation

Requirements for installation location

DANGER

· The Solar Inverter may not be installed in rooms subject to explosion hazards.

· The Solar Inverter may not be exposed to caustic gases!

· No combustible or highly flammable materials may be stored within 3 metres of the Solar Inverter.

Protection against moisture and foreign bodies
· The high protection type IP 54 allows installation indoors and in roof-covered areas outdoors, however the Solar Inverter may not be directly exposed to rain.
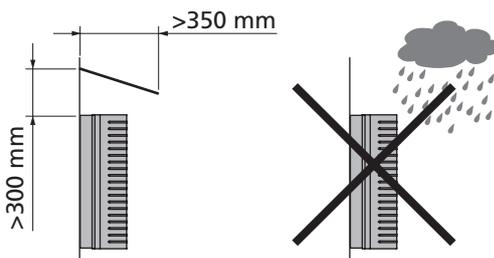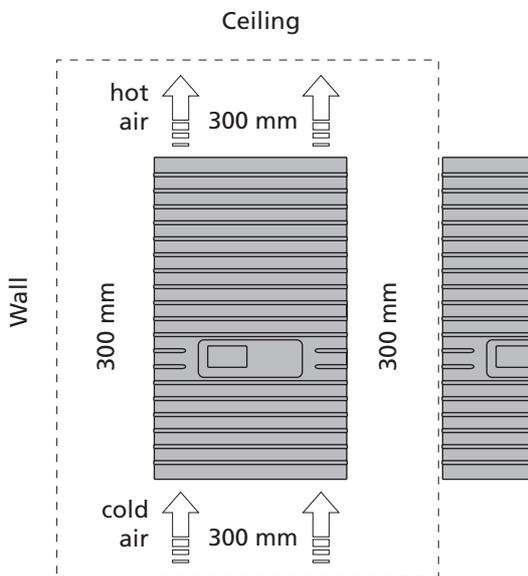
Mechanical load-bearing capacity
· Note during installation that the Solar Inverter weighs 26 kg. The installation surface must be firm and able to carry this weight in the long term.

Thermal interaction
· The installation surface must consist of flame-retardant material (not suitable: surface of wood or plastic; suitable: concrete and masonry), as the frame of the Solar Inverter can heat up to a maximum of 70°C.

· A minimum distance of 300 mm to other devices, cabinets, ceilings, cable ducts, etc. must be maintained above, below and to the sides of the housing. See the figure Requirements for installation location.

· The Solar Inverter must be installed vertically to enable sufficiently free convection.

· Several Solar Inverters may not be mounted over each other to prevent them from heating each other.

· Ensure sufficient heat dissipation when installing the Solar Inverter in a switch cabinet or closed room.

· The ambient temperature may not drop below or exceed -25°C and +45°C respectively. At ambient temperatures above 45°C, the inverter automatically reduces its output.

· The Solar Inverter must not be exposed to direct sunlight, to protect it from unnecessary external warming.

Installation

Proceed as follows to install the Solar Inverter:

1. Hold the wall bracket at the point at which you want to attach the Solar Inverter and mark the mounting holes.
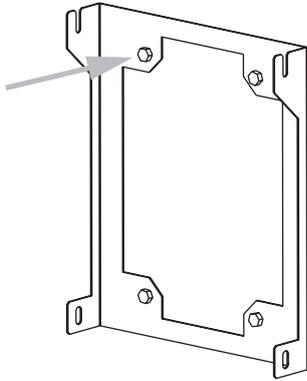
2. Drill the holes with a 10 mm dia. drill bit. A drilling template with exact dimensioning can be found in the appendix.

3. Install the wall bracket with corresponding screws and dowels depending on the surface condition.

4. Unscrew the locking screw of the Solar Inverter at the lower left with an Allen key

5. Hook the Solar Inverter into the cut-outs of the installation frame at the top on both sides.

6. Secure the Solar Inverter by tightening the locking screw.
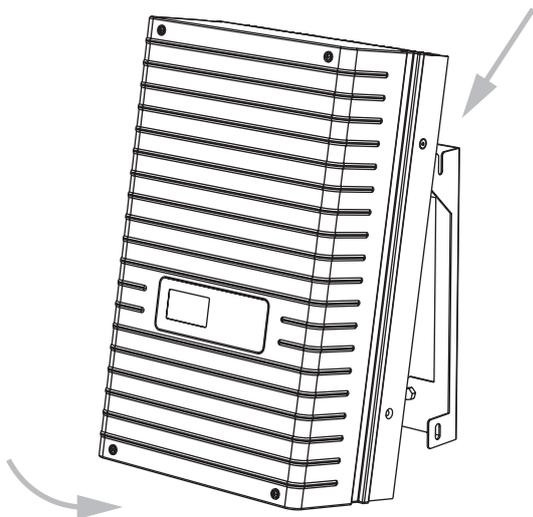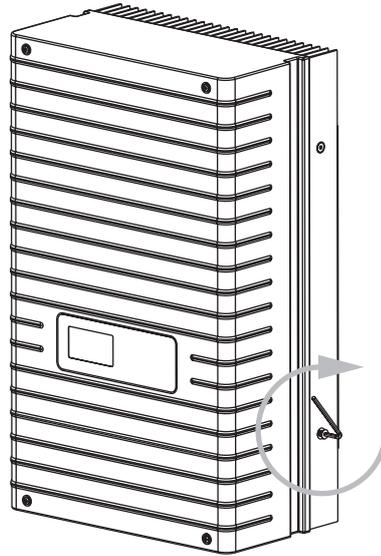
3.2   Electrical installation

Solar generator connection

Extreme danger from electric shock!

· Touching live parts can result in death.

· All electrical work must be conducted by a quali-
fied electrician while observing the VDE regula-
tions, national and other regulations!

· Execute the direct current wiring in accordance
with the system dimensioning of your planning
expert.

· Prepare all solar generator cables before you
carry out the connection of the solar generator
to the Solar Inverter.

· Check each solar generator string for proper
operation with an open-circuit voltage and
short-circuit current measurement.

· Check using the rating plate on the Solar Inverter
whether it is approved for the maximum solar
generator voltage.

· The positive and negative lines must be kept
electrically separate from the earth potential.

· Touchable, live parts of the solar generator (e.g.
metal frame, carrying structure, etc.) must be
earthed (connection with PE).

· Check the solar generator against short-circuits
to earth.

· Before connecting the solar generator to the
Solar Inverter, the integrated DC load break
switch must be opened quickly (position 0).

· After the PV solar generator is connected to
the Solar Inverter and the DC load break switch
is switched on, the direct generator voltage is
present internally.

· The connectors may not be separated while
under load.

· Always separate the grid connection first by
switching off the corresponding mains fuse and
then the solar generator side by quickly opening
the DC load break switch.

Survey
The solar generator can be directly connected to the
Solar Inverter with two strings. The connection is
made via the shockproof Tyco Solarlok plug-in con-
nection system accessible from outside.

The Solar Inverter has two electrically connected
DC inputs, which are arranged in pairs on the
underside.

· The solar generator strings must be identically
dimensioned and comply with the specifications
of the Solar Inverter.

· No external DC load break switch is required. A
DC load break switch as required in accordance
with DIN VDE 0100-712 is integrated in the Solar
Inverter.
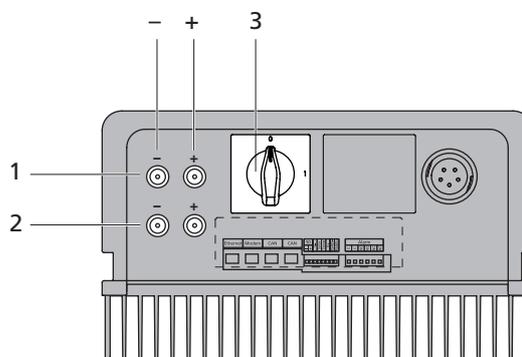
1   Connection of solar generator string 1
2   Connection of solar generator string 2
3   DC load break switch

Tyco Solarlok plug-in connection system
The Solarlok plug-in connection system is used for the simple, reliable connection of individual solar generators up to the Solar Inverter.

Components
The following connectors are used:

·   Positively coded connector
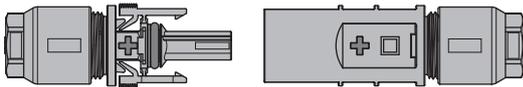
·   Negatively coded connector
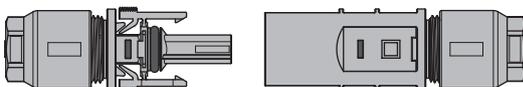
·   Neutral connector
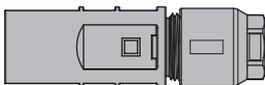
The neutral connector can be used to connect both positively and negatively coded sockets.

Installation

Extreme danger from electric shock!

·   Touching live parts can result in death.

·   All electrical work must be conducted by a qualified electrician while observing the VDE regulations, national and other regulations!

·   Tyco Solarlok connectors are only reliable for connection on permanently installed lines.

·   Only the Tyco-Solarlok hand crimping pliers may be used to crimp the connectors.

·   During preassembly, the connectors must be separated from all other voltage sources.

·   The connectors may not be separated while under load. The circuit must be opened at a suitable point for this purpose.

·   Provide the lines with corresponding stickers as close as possible to the connectors to prevent confusion.

·   Any kind of soiling (dust, moisture, etc.) has a negative effect on the connector system with regard to function over the intended period of use. This particularly applies to the suitability for use of the seals and the crimping of the contacts. Therefore, extreme care must be taken to achieve proper processing during assembly.

·   Various circular contacts are used for different conductor cross-sections with the Tyco Solarlok connectors. The correct tool insert must be used in accordance with this cross-section. The included Tyco Solarlok connectors are equipped with circular contacts for a cable cross-section of 4 mm² to 6 mm².

·   The seals and clamping baskets used in the preassembled connectors are approved for cable sheath diameters from 4.5 mm to 6.9 mm. Special seals and clamping baskets must be used for cables with a sheath diameter greater than 6.9 mm.

·   The Tyco Solarlok hand crimping pliers can be purchased from your sales partner.

The following sequence must be observed during assembly:

1. Stripping the voltage-free line.
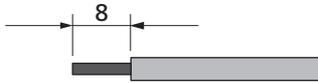
2. Crimping on the circular contact with the Tyco Solarlok hand crimping pliers.

3. Sliding the cable gland onto the line and engaging the contact in the connector housing.
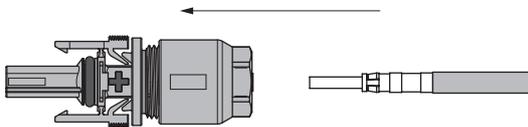
4. Tightening the cable gland with 1.5 Nm.
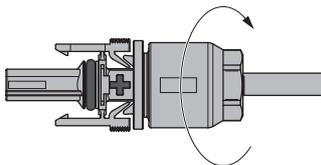
Handling
The positively/negatively coded connectors are marked with polarity symbols and a coloured ring (blue = negative, red = positive). They are equipped with coding ribs for assignment, which ensures that only connectors of the same polarity can be connected to each other.

Connecting socket and plug. The system is only correctly locked if the locking hooks are recessed flush in the mating piece.
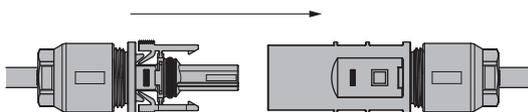
CAUTION

The connectors may not be separated while under load. The circuit must be opened at a suitable point for this purpose.

Release the locking device by pressing on the ribbing of the locking hooks and pulling them apart.
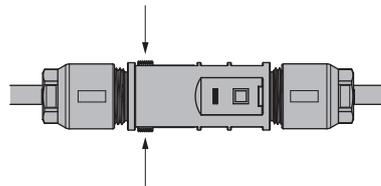
Connection example
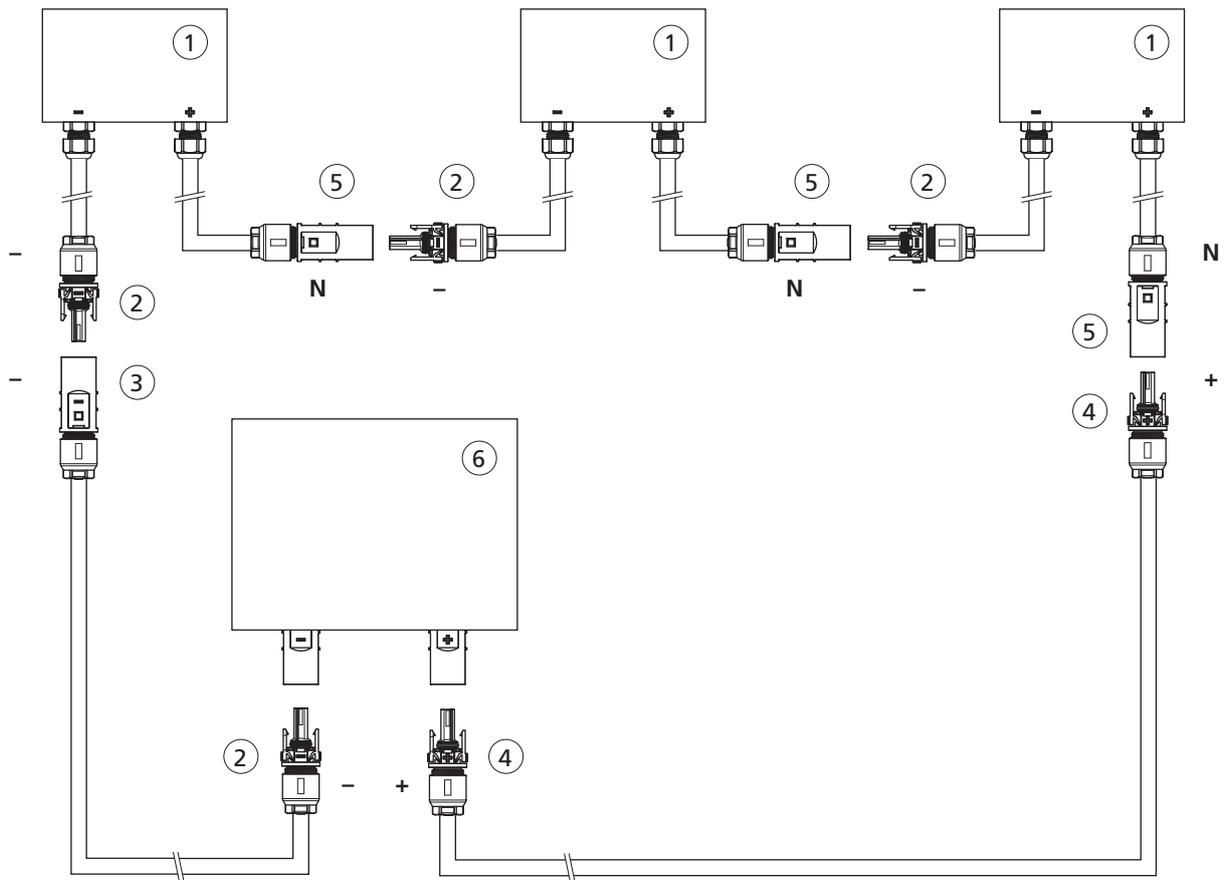
1   Solar module box
2   Negatively coded socket
3   Negatively coded plug
4   Positively coded socket
5   Neutral connector
6   Solar inverter

Grid connection

Extreme danger from electric shock!

· Touching live parts can result in death.

· All electrical work must be conducted by a quali-
  fied electrician while observing the VDE regula-
  tions, national and other regulations!

· Observe the pin assignment of the AC bayonet
  connector. An incorrect assignment can result in
  the device being destroyed.

· No consumers may be connected to the supply
  line from the Solar Inverter to the mains fuse.

· Always separate the grid connection first by
  switching off the corresponding mains fuse and
  then the solar generator side by quickly opening
  the DC load break switch.

If the voltage on the AC connection exceeds the
permissible value due to a long line length or an
insufficient cable cross-section, the Solar Inverter
will disconnected from the grid. In power grids with
a low output and a high solar generator output, this
can lead to individual Solar Inverters being switched
off and then on again several times.

Survey
An AC bayonet connector on the underside of the
unit is used for the three-wire grid connection (L, N,
PE) of the Solar Inverter. The grid connection should
always be 1-phase. Feeding is single-phase via AC
terminal 2.
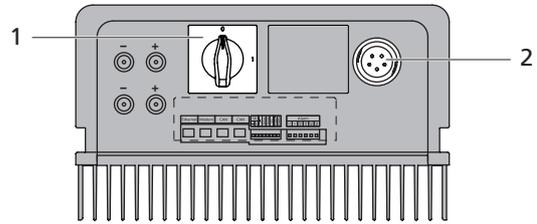
1   DC load break switch
2   AC connection

A basic distinction is made between two different
connection options of the Solar Inverter to the pub-
lic power grid:

· 3-phase AC grid (e.g. Germany)

· 1-phase AC grid (e.g. Italy, Spain)

CAUTION

· Observe the regional regulations for the grid
  connection.

The Solar Inverter always only feeds via AC terminal
2. If several Solar Inverters are operated in parallel
in a 3-phase grid, AC terminal 2 of the device must
be distributed uniformly among the grid phases L1,
L2 and L3 to avoid unequal loading.

3-phase grid connection (3-phase AC connection)

Inverter 1   Inverter 2   Inverter 3
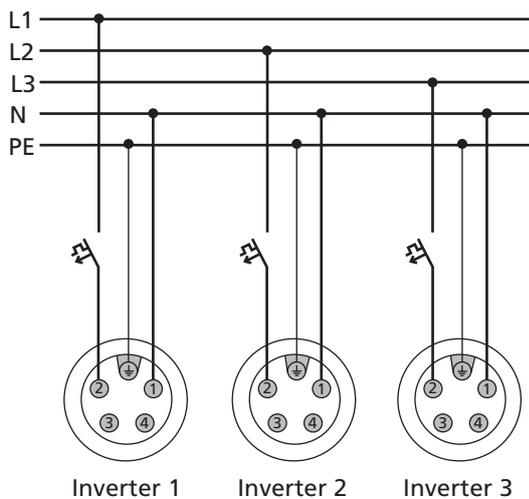
1-phase grid connection (AC connection)

Inverter 1   Inverter 2   Inverter 3
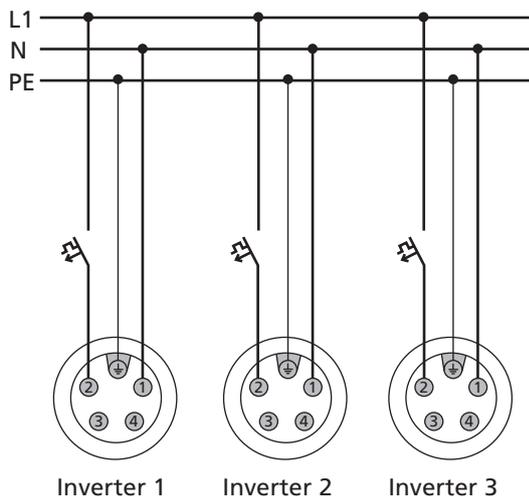
A corresponding circuit breaker is recommended as a line protection element in the grid feed direction:

NT 2500: 16 A
NT 3700: 25 A
NT 4200: 32 A
NT 5000: 32 A
with slow-blow characteristic B

· Depending on the grid operator and the feed point, a three-phase meter or a single-phase meter must be used.

· Some grid operators require the use of a reverse-current-capable meter.

AC bayonet connector
The AC bayonet connector is permissible for cable sheath diameters from 13 mm to 20 mm.

The following sequence must be observed during assembly:

1. Strip the voltage-free line and the cable ends.
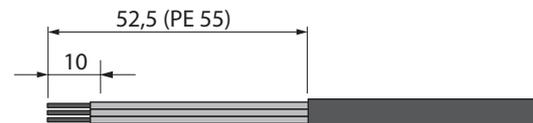
For lines with a cable sheath diameter from 16 to 20 mm, the cable gland must be adapted accordingly. To do this, cut out the inner section of the blue sealing ring.

2. Slid the cable gland and the plug housing onto the line.
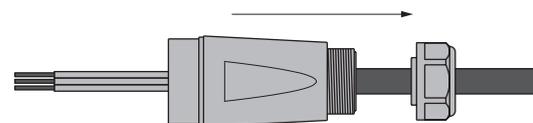
3. Connect the cable ends to the plug terminals in accordance with the pin assignment.
    Tightening torque: 0.7 Nm.

CAUTION

Incorrect pin assignment may result in destruction of the unit!

Pin assignment for AC bayonet connector

The diagram shows the connections inside the AC connector, as indicated by the cut-out at the PE connection.
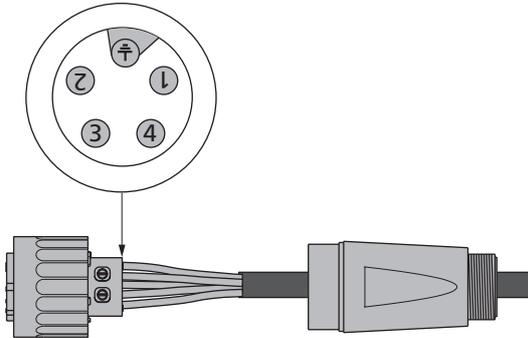
1 = N
2 = L (feed-in phase)
3 = not used
4 = not used
⏚ = PE (protective earth conductor)

4. Screw plug housing to plug. To do this, press the outer ring of the plug toward the plug housing. Tightening torque: 1-2 Nm.
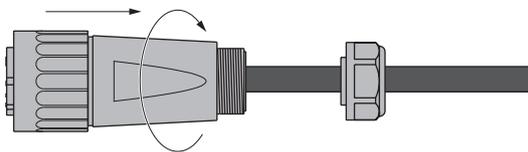
5. Tighten the cable gland.

Make sure the line is provided with a strain relief device. When using cables with a diameter < 16 mm, the line must be relieved just behind the connector.

Tightening torque for cable sheath diameters from 13 to 20 mm = 6 to 8 Nm
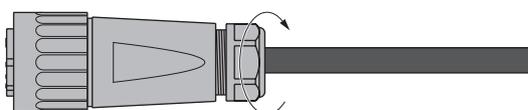
3.3   Installing communication

The interfaces are located behind the weather-proof connection box on the underside of the Solar Inverter.
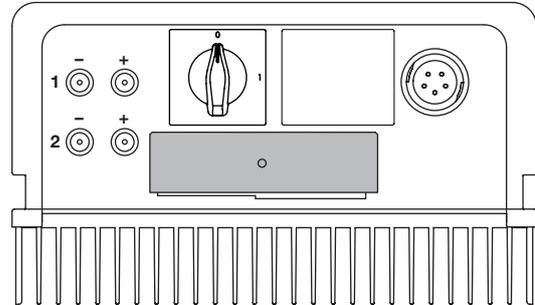
To open the connection box, loose the centre screw. Then carefully pull way the box toward the front.

After you have installed the connection cable, close the box again by guiding the locking hooks into the notches in the housing and then pressing the box onto the housing.

Retighten the mounting screw.

Interface overview
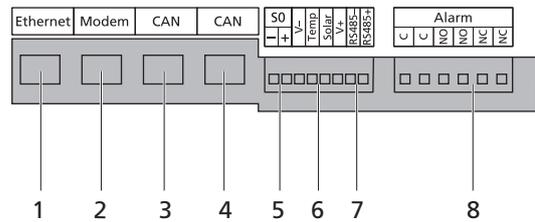
1   Ethernet connection
2   Modem connection
3   CAN IN
4   CAN OUT
5   S0 interface (pulse output, e.g. for large display)
6   Connection for temperature and irradiation sensor
7   RS485 interface
8   Connection for alarm relay

Networking Solar Inverters via CAN bus

Solar Inverters from the NT, AT und PT series can be networked via the CAN bus interface. Use the included Ethernet cable to network the Solar Inverters with each other. Connect a terminating resistor at the first and last Solar Inverter in the series. The pluggable terminating resistors are included in the delivery.

Device 1   Device 2 ...
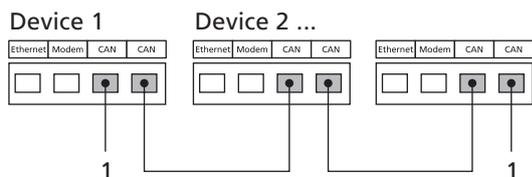
1 Terminating resistor

Pin assignment

87654321 87654321 87654321
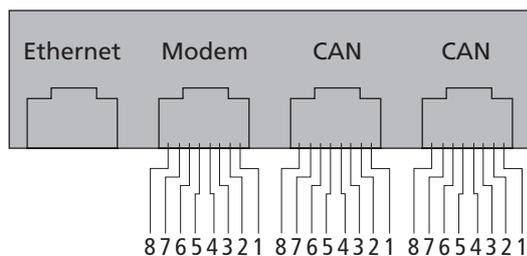
The connectors for the CAN interfaces CAN IN and CAN OUT and for the modem interface have the following pin assignment

CAN

Pin	ID	Meaning
1	N.C.	
2	CAN_GND	0 V / GND
3	CAN_H	bus line (dominant high)
4	CAN_L_T	termination
5	CAN_H_T	termination
6	CANL	bus line (dominant low)
7	CAN_SHLD	optional CAN Shield
8	N.C.	

Modem

Pin	ID	Meaning
1	>1	TXh
2	>2	TX1
3	<3	RXh
4	-4	VCC
5	-5	GND
6	<6	RXI
7	<7	R1h
8	<8	R1I

The total length of the CAN bus depends on the selected bit rate. The following table shows the possible bit rates and the resulting bus lengths.

Bit rate	Bus length
100 kbit/s	650 m
125 kbit/s	500 m
250 kbit/s	250 m
500 kbit/s	100 m

Solar Inverters of the PT series are delivered with a default setting of 125 kbit/s. The default setting for Solar Inverters of the NT and AT series is 500 kbit/s.

When Solar Inverters from different series are networked the bit rate in all units must be identical. The rate can be set via the Solar Inverter display or the Sunways Browser.

Setting the bit rate via the display menu:
«Settings – Network – CAN Bus – Baud rate»
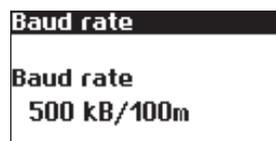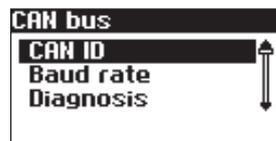
Up to 99 NT, PT and AT series units can be net-
worked via a CAN bus. The following table shows
the recommended cable cross-sections depending on
the bus length and the number of nodes:

Bus length / Number of nodes	32	64	100
100 m	0,25 mm² or AWG 24	0,25 mm² or AWG 24	0,25 mm² or AWG 24
250 m	0,34 mm² or AWG 22	0,5 mm² or AWG 20	0,5 mm² or AWG 20
500 m	0,75 mm² or AWG 18	0,75 mm² or AWG 18	1,0 mm² or AWG 16

In cases where the values specified in the table can-
not be adhered to, a CAN bridge for boosting the
signal must be installed, through which the length
of the CAN bus can be extended by up to 500 m.
The requirement to install a CAN bridge is therefore
determined by the bus length, the number of nodes
and the cable cross-sections.

Network length / number of nodes /
cable cross-section outside the table
values – 1 or several CAN bridge(s)
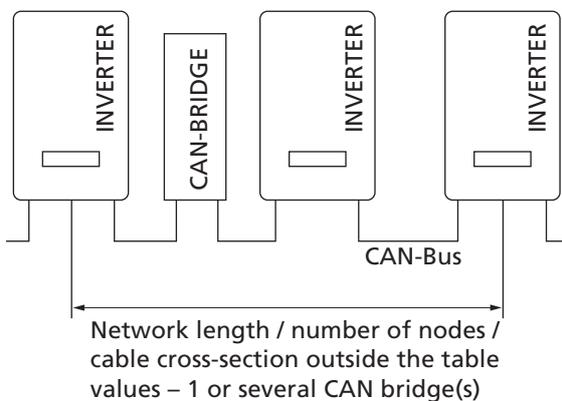
The CAN bridge is available from Sunways. For
further information please contact the Technical
Hotline.

The CAN bridge subdivides the bus into two physi-
cally independent segments. The maximum cable
length of each segment is determined by the set bit
rate. With a bit rate of 125 kbit/s two segments with
a maximum length of 500 m each are possible. The
total line length can therefore be up to 1 km under
ideal conditions.

In systems with Solar Inverters from the PT series the CAN bridge can be integrated directly in the PT Solar Inverter and supplied via the 24 V DC power supply unit of the inverter. In systems with AT Solar Inverters and units from the new NT series (900 V) the CAN bridge can be integrated in the AC distribution. In this case an external 24 V DC supply is required (power consumption 1.5 W).

Networking Solar Inverters via RS485 interface

For joint monitoring of a solar system with Sunways Solar Inverters from the older NT generation (750 V or 850 V) you can use the RS485 interface integrated in the Solar Inverters. The system networked with the RS485 interface can be monitored with the Sunways Communicator.

· Use a twisted two-wire cable to network the Solar Inverters with each other.

· Mount the terminating resistor on the last Solar Inverter.
  NT 8000/10000: Jumper **RS485MATCH**
  NT 2600...NT 6000: Jumper **JP400**

Networking via RS485 interface
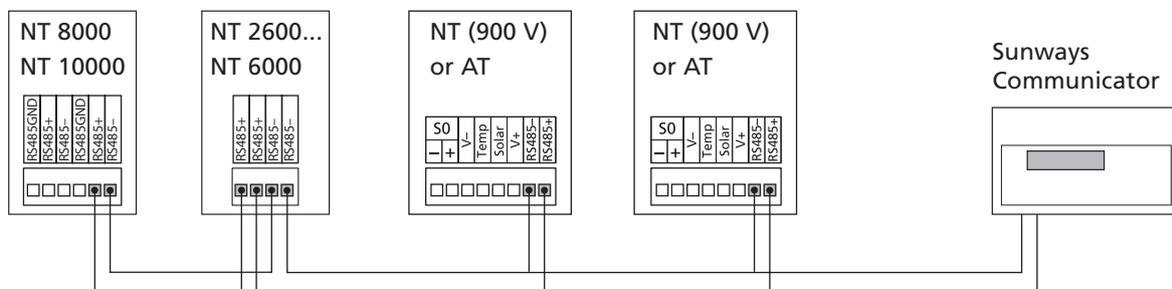
S0 interface

The S0 pulse output enables, for example, the connection of a large display (Sunways Display) for displaying the momentary output, the energy yields and the CO_2 reduction.

You can use the S0 interface on the master if you want to transmit the entire line yields as a sum to a large display.

The S0 interface is adjusted via the display on the inverter. Go to the menu «Settings – Network – Interfaces».
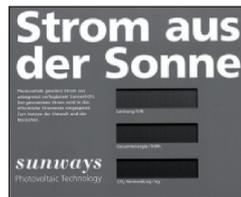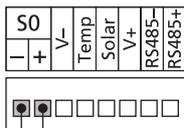
· Please note that the maximum pulse rate may not be greater than 15 pulse/sec. Calculate the pulse rate depending on the size of the solar system using the following formula:

**Pulse rate [pulses/kWh] =
50,000/system size [kWp]**

· The pulse rate must be set on your Solar Inverter and on the large display.

Connection of temperature and irradiation sensor

The optional addition of an irradiation sensor (model Si-01TC-K from Ingenieurbüro Mencke & Tegtmeyer) with an integrated PT-100 temperature sensor for temperature measurement enables the acquisition of irradiation data and the corresponding module temperature and storage in the internal data memory as a 5-minute mean value. This additional measuring device helps analyse the system output. Based on the values, any errors on the PV generator, e.g. shading or failure of solar cells, can be detected.

The sensor is activated via the display. In the menu «Settings – Network – Interfaces» you can select the sensor type in the «Irrad.» and «Temp.» field.
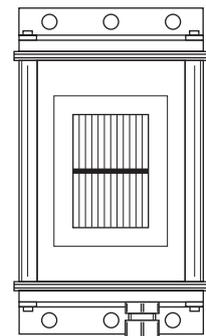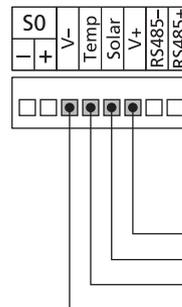
Assignment of sensor connection

Sensor connector pin assignment	Sensor connection designation	Solar Inverter connection
Pin 1	Plus signal temperature	Temp
Pin 2	Plus signal irradiance	Solar
Pin 3	Reference earth	V-
Pin 4	Plus connection for supply +5V	V+

Connecting alarm relay

The Solar Inverters are equipped with a potential-free alarm relay as standard. The relay can be designed as a make-contact element or as a break-contact element and is actuated for all malfunctions signalled by the device. This ensures a faster, more reliable indication of a possible fault in the PV system on site. For PV systems with several Solar Inverters, the individual relays can be switched in parallel and connected via a common indicator lamp.

The master also signals faults from other devices in the CAN network via the alarm relay. It is therefore sufficient for simple alerting to connect the alarm relay of the master.

CAUTION

The alarm relay is designed for 230 V/2 A. Higher outputs/voltages can result in the relay being destroyed. The connected signalling device must be fused separately. The terminals are intended for a cable cross-section of 0.2 mm^2 to 1.5 mm^2. When dimensioning the cross-section, also take the current consumption of the connected signalling device into account.

Wiring diagram for a single device
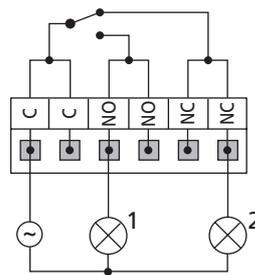
Wiring diagram for several devices
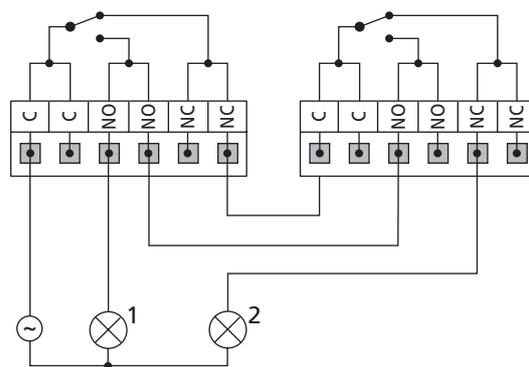
1 Indicator lamp, red
2 Indicator lamp, green

The Solar Inverter is supplied by the feed-in phase from the AC grid. If the feed-in phase fails the alarm relay cannot switch, even in the event of a fault.

4 Commissioning

4.1 Connecting and disconnecting Solar Inverter

CAUTION

· Ensure proper mechanical and electrical installation before commissioning the Solar Inverter.

· Check the proper condition of the electrical lines.

· Always separate the grid connection first by switching off the corresponding mains fuse and then the solar generator side by quickly opening the DC load break switch.

· The Tyco Solarlok connectors of the solar generator connection may not be disconnected while under load. The DC load break switch must be quickly switched to the switching position 0.

The Solar Inverter is supplied from the grid. The Solar Inverter switches on automatically when sufficient solar generator output is available. Corresponding switch-on and switch-off thresholds have been defined for this purpose.

Connecting

1. Switch on the grid connection with the external circuit breakers.

2. Switch on the solar generator voltage by quickly closing the DC load break switch (switching position 1). The Solar Inverter takes up operation when sufficient input voltage is available.
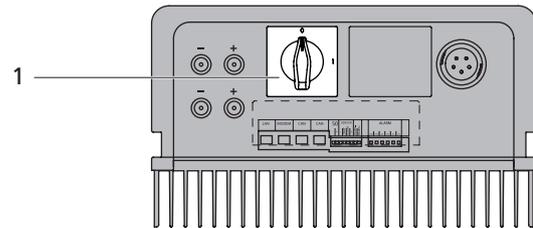
1 DC load break switch

The operating LED lights up in accor-dance with the operating state.

The commissioning menu opens when the Solar Inverter is connected for the first time.

Switching off

1. Open the grid connection by switching off the circuit breaker.

2. Disconnect the solar generator side by quickly opening the DC load break switch (switching position 0)

4.2   Commissioning

The commissioning menu is automatically opened the first time the Solar Inverter is connected. It helps you make the standard settings.

For a better understanding of keyboard operation, please also see the chapter Operation.

The commissioning of the Solar Inverter as

· a single device

· a master and slaves with several networked devices

is described in detail in the following.

Please note:
Once the system has been commissioned, the country can no longer be changed via the menu. To change the country retrospectively, please contact the technical hotline on Tel +49 (0)7531 996 77-577.

Commissioning single device

System with one Solar Inverter

Single device
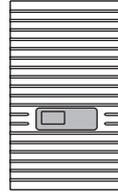
1. The commissioning process starts with setting of the display language. Select required language with ⬆ / ⬇.
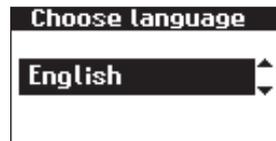
Confirm selected language with ⓞⓚ.

2. Select the country ⬆ / ⬇.

Confirm the country of installation.

Your Solar Inverter will only start feeding electricity once the country of installation has been confirmed.

3. Select «Single device» with ⬆ / ⬇.

Confirm with ⓞⓚ.

4. Set date and time.

```
Date/Time
  15.11.2008
  14:17:01
```


Please proceed with caution for time settings, as they directly affect data logging. For example, if you set the time back by 1 hour, then the existing data for the last hour will be overwritten. Select date with ⊙ . Change selected number with ⊙ / ⊙ and jump to next number with ⊙ / ⊙.

Save the set date with ⊙ then set the time accordingly.

Save the set time with ⊙

5. Set password. Select password ⊙
    Default password is:
    * * * * * * * *
    A new password can be set with ⊙ / ⊙ / ⊙ / ⊙ as an option.

Please note:

Numerals from 0 – 9 and letters from a – z and from A – Z are admissible.

The password always has 8 characters. If the password you choose is fewer than 8 characters in length, the remainder, up to the full 8 characters, is filled with "*" symbols.

For example:
You choose "Solar" as your password. This password has 5 characters. The system therefore then automatically adds three "*" symbols, meaning that your password becomes "Solar***".

```
New password

Password:
      * * * * * * *
```

Confirm password with ⊙.

6. Completion of commissioning

```
Commiss. completion
Mode:   Single device
CAN ID:           --
No. of devices:   --
              'OK' >>
```

Confirm overview with ⊙.

Commissioning several networked devices

System with several Solar Inverters

master   slaves (secondary units)
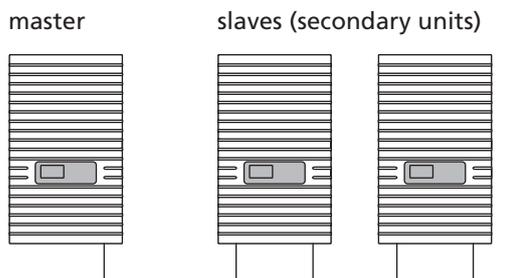
Before commissioning, all devices must be inter-connected via the CAN bus interface. See section Networking Solar Inverters via CAN bus.

Switch on all devices following installation. Commissioning begins with the master you have selected.

Compatibility between Sunways Solar Inverters
The following table provides an overview of which devices can be networked with each other and how, and lists any special considerations:

	NT Series (900 V)	PT series	AT series	NT series (850 V)
NT series (850 V)	**with RS485:** · Sunways Portal: with Sunways Communicator	**NT with RS485 / PT with CAN bus:** · Sunways Portal: connect NTs with Sunways Communicator, PTs with Sunways Modem or DSL/network to the Internet · Sunways Browser: only available for PT	**with RS485:** · Sunways Portal: with Sunways Communicator · Sunways Monitor	**with RS485:** · Sunways Portal: with Sunways Communicator · Sunways Monitor: with interface converter
AT series	**with separate CAN networks:** · Sunways Browser · Sunways Portal: NT devices (900 V) must be operated in a separate CAN network with independent main unit	**with CAN bus:** · Sunways Browser · Sunways Portal · The PT Solar Inverter must be the main unit.	**with CAN bus:** · Sunways Browser · Sunways Portal	
PT series	**with separate CAN networks:** · Sunways Browser · Sunways Portal: NT devices (900 V) must be operated in a separate CAN network with independent main unit	**with CAN bus:** · Sunways Browser · Sunways Portal		
NT Series (900 V)	**with CAN-Bus (CANopen/CiA437):** · Sunways Browser · Sunways Portal			

Commissioning the master

1. The commissioning process starts with setting of the display language. Select required language with ▲ / ▼.

```
Choose language

English                    ▲
                           ▼
```

Confirm selected language with (ok).

2. Select the country ▲ / ▼.

```
Country

Country
 Germany
```

Confirm the country of installation.

```
Confirm Country
Country
 Germany

  Yes        No
```
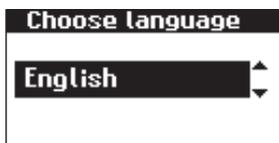

Your Solar Inverter will only start feeding electricity once the country of installation has been confirmed.

3. Select «Master» with ▲ / ▼ .

```
Commissioning

Device mode:
Master                     ▲
                           ▼
```

Confirm with (ok) .

The other devices in the CAN network are automatically configured as slaves.

4. Set the data and time centrally for all connected devices.
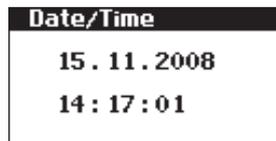
```
Date/Time
   15.11.2008
   14:17:01
```


Please proceed with caution for time settings, as they directly affect data logging. For example, if you set the time back by 1 hour, then the existing data for the last hour will be overwritten.

Select date with (ok). Change selected number with ▲ / ▼ and jump to next number with ◀ / ▶ .

Save the set date with (ok) then set the time accordingly.

Save the set time with (ok).

5. Start the device search from the main unit.

The IDs for the secondary units can be allocated automatically or manually. When manual ID allocation is selected the ID must be requested at the secondary unit. With automatic ID allocation this step is not required, since the device IDs are assigned automatically.

```
Device search
Secondary units
ID allocation
 Automatic                 ▲
                           ▼
```
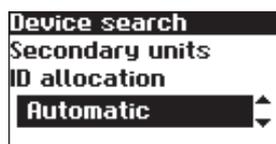
The following display appears during the device search:

```
Device search
No. of devices         4
Search running
▮▮▮▮▯▯▯▯▯▯
```

Depending on the size of the network, it may take a moment until the master has found all slaves and added them to the list.

```
Devices:           2
In network:        1
```

Devices = total number of devices found in CAN network, including master

In network = number of configured devices, including master

After the master has found all connected slaves, these must be configured before commissioning of the master is continued. The device list is updated and extended whenever a slave is configured.

```
Devices:           4
NT5000 - 1
AT5000 - 2
NT4200 - 3
NT4200 - 4
```

Confirm with ok.

6. Set password. Select password ok
   Default password is:
   * * * * * * * *
   A new password can be set with ▲ / ▼ / ◄ / ►
   as an option.

Please note:
Numerals from 0 – 9 and letters from a – z and from A – Z are admissible.

The password always has 8 characters. If the password you choose is fewer than 8 characters in length, the remainder, up to the full 8 characters, is filled with "*" symbols.

For example:
You choose "Solar" as your password. This password has 5 characters. The system therefore then automatically adds three "*" symbols, meaning that your password becomes "Solar***".

```
New password
Password:
    * * * * * * *
```

Confirm password with ok.

7. Completion of commissioning

```
Commiss. completion
Mode:         Master
CAN ID:            1
No. of devices:    2
              'OK' >>
```

Confirm overview with ok.

Commissioning slaves
The procedure for commissioning secondary units depends on the type of device search. Once a main unit has been defined and manual ID allocation was selected (e.g. for systems with AT and PT), each secondary unit automatically displays a CAN ID request. If automatic ID allocation was selected on the main unit, this step is skipped. In this case completion of commissioning must be confirmed with ok at each secondary unit.

1. For manual device search only:
   Request CAN ID. Request next highest free ID from master with ▲ or next lowest free ID with ▼. The master assigns a free ID to the slave. Confirm the ID with ok within 5 seconds.

```
CAN bus
CAN ID:      1 ▲▼
```

Request further IDs ▲ / ▼.

```
CAN bus
CAN ID:      4 ▲▼
Get new ID?
  Yes      No
```

Confirm CAN ID with ok within 5 seconds.

· The data for the individual slaves can be assigned in the Sunways Browser and in the menu of the master based on the IDs.

· The CAN-ID 1 is automatically assigned to the master. This means the slaves can be assigned IDs between 2 - 99.

· Commissioning cannot continue until an ID has been requested from the master.

2. Completion of commissioning

Confirm overview with .

3. Carry out commissioning for all other slaves as described above.

Later commissioning

If you add new devices or replace existing ones in your solar system, then you can display the device list in the display on the master under «Settings – Network – CAN bus». The new device can then be put into operation in accordance with the description for commissioning slaves.

5 Operation

5.1 Operating elements

Operating field

The Solar Inverter is operated via the operating field on the front.
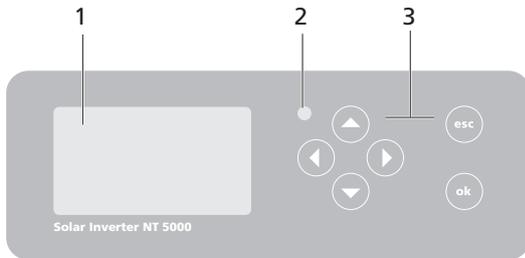
1 LCD display (lighted)
2 Operating LED
3 Keyboard

LCD display

A graphics-capable, monochrome dot matrix display is integrated in the operating field. In standard operation the momentary output, daily yield and status are displayed. The bar graph shows the energy feed-in of the current day.

Press any key to activate the display lighting. If no key is pressed for approx. 1 minute, the display lighting goes out.

Important!
The LCD display is not a calibrated measuring device. It is characterised by a slight, system-dependent difference of a few percent. Exact accounting of the data with the power supply company requires a calibrated meter.

Keyboard

The keyboard can be used to navigate in the menu, edit text fields, select entries from lists and enter numbers consecutively and digit by digit. User entries can only be made if the value to be changed is selected. The cursor changes visibly in the editing mode and indicates the digit to be changed.

▲ -key		Scroll up.
▼ - key		Scroll down.
▶ - key		Select menu item.
◀ - key		Back one menu level.
ok -key		Select menu item and confirm your entries.
esc -key		Cancel.

Operating LED

The combined red/green LED indicates the device status of the Solar Inverter:

· LED off
  Solar Inverter is not active (night mode)

· LED green, continuously lit
  Solar Inverter is active and feeds into power grid (MPP mode)

· LED green, flashing
  Solar Inverter is active and feeds into power grid, however with current, output or temperature limitation.

· LED red, continuously lit
  an error has occurred (malfunction)

· LED red, flashing
  a warning has been issued

Standard screen (single device)

The standard screen is always shown when no keyboard entry is made for more than 1 minute. It can also be called up manually with the menu item «Solar Inverter – Instantaneous Values».
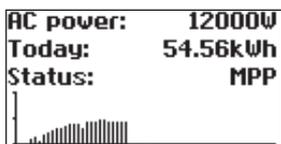
The standard screen shows the main data at a glance. The first line shows the current feed-in power. The second line shows the energy fed in during the current day.

The status line indicates the device status with the following messages:

MPP   Feeding in MPP mode

AC cur.lim.   Feeding with AC current limitation

DC cur.lim.   Feeding with DC current limitation

Temp.lim.   Feeding with temperature limitation

Output lim.   Feeding with output limitation

Feed.   Feeding

Warning   A warning is active

Error   An error has occurred

Night   Night mode

Start   Device initialisation phase

Com Upd.   The communication software is being updated

Cnt. Upd.   The control software is being updated

Mon. Upd.   The monitoring software being updated

Wif Upd.   The web interface is being updated

DWifUpd.   The dynamic web interface is being updated

MenSUpd.   The menu structure is being updated

MenEUpd.   The menu error texts are being updated

WifSUpd.   The web interface status texts are being updated

RWP.Upd.   The read/write parameters are being updated

ROP.Upd.   The read only parameters are being updated

ParaUpd.   The parameters are being updated

Min Upd.   The minute values in the data logger files are being updated

Day Upd.   The daily values in the data logger files are being updated

Mon Upd.   The monthly values in the data logger files are being updated

YearUpd.   The annual values in the data logger files are being updated

SMinUpd.   The minute values in the system data logger files are being updated

SDayUpd.   The daily values in the system data logger files are being updated

SMONUpd.   The monthly values in the system data logger files are being updated

SYrUpd.   The annual values in the system data logger files are being updated

The graphic in the lower section of the screen shows the output curve for the current day as a bar graph. The current period is shown as a flashing bar, as it is still increasing.

Standard screen (system)

This screen shows the system data for a CAN-net-worked system.
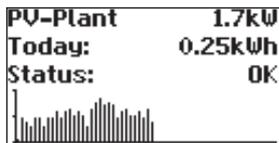
Next to the total current system output, you also see the energy yield of your solar system and any status messages of all connected devices. These are provided with the inverter number. «M» means that the error has occurred in the master.

· The various functions are accessed via the menu. The main menu is opened from the standard screen by pressing [esc] twice.

· You can always return to the standard screen by pressing and holding the [esc] key.

· If a status message is shown, then you can open the error list directly with [ok].

· You can access other instantaneous values from the standard screen with [▽] and [△].

5.2   Access rights

Operation of the Solar Inverter is divided into various areas protected with passwords.

The password has 8 digits or characters.
The password can be entered in the menu item «Settings – Login».

After a correct password entry the login remains active for 5 minutes. The device then switches back to guest mode. Pressing any key during the login period extends resets the period to > 5 minutes.

Customer area

The customer password must be entered to access this area. All settings can be made which are required for installation and commissioning of the Solar Inverter.

· The password for the customer area is:
  * * * * * * * *

· The password is preset and is directly confirmed with [ok].

· As an option you can assign a personal password in the Commissioning menu. Digits between 0 – 9 and letters between a – z and A – Z are permitted.

· The password always has 8 characters. If the password you choose is fewer than 8 characters in length, the remainder, up to the full 8 characters, is filled with "*" symbols.

· For example:
  You choose "Solar" as your password. This password has 5 characters. The system therefore then automatically adds three "*" symbols, meaning that your password becomes "Solar***".

Installer area

In this area the installer can make special settings on the Solar Inverter which are available after consulting the Technical Hotline. Request a device-specific password from the Technical Hotline. These passwords are only relevant for the Sunways Browser. All commissioning procedures are accessible from the customer area.

Technical Hotline +49 (0)7531 996 77-577

Country password

Changing the country setting after commissioning requires an installer password, which can be obtained from the technical hotline. The last 8 digits of the installer password form the country password.

Each country has specific regulations for grid connection of inverters. By selecting the country the settings for the switch-off parameters are set according to the standards for this country.

5.3   Menu structure

The menu provides access to all Solar Inverter screens. Open the main menu by pressing the left arrow key twice from the standard screen.

START

| Standard screen |
| Instantaneous values 1 |
| Instantaneous values 2 |

Instantaneous values
Energy yield
Events
History
Information

| Yield for week |
| Yield for 15 days |
| Yield for month |
| AC output |
| DC values |
| AC values |
| Max. output |

Solar Inverter
Solar system
Settings

Instantaneous values
Energy yield
Events
System history
System info

| Yield for week |
| Yield for 15 days |
| Yield for month |
| Total output |
| Max. output |

| Firmware |
| Memory |
| Mode |

General information
Login
Network*
Commissioning*
Change country*
Self-testing**

| Language |
| LCD contrast |
| Date/Time* |
| Receiving time* |
| Firmware* |
| New password* |

| Ethernet |
| CAN bus |
| Interfaces |

i

· The areas highlighted in grey are only available in the master

· *) after entry of customer password
Standard password: ******** (= 8 times star key)

· **) This is only shown if the configured country of installation is Italy.

5.4   Overview of screen displays

Display	Description	Menu selection
Instantaneous Values – Device		
AC power: 12000W Today: 54.56kWh Status: MPP	Current feed-in power, daily energy yield and device status MPP:Feeding in MPP mode	The screen appears automatically when you have not made any entries with the keyboard for several minutes. Solar Inverter – Instantaneous values
Actual values 1 DC voltage 482V DC current 2.6A AC voltage 221V AC current 6.4A	Display of voltages and currents from solar generator and grid	Solar Inverter – Instantaneous values – 🔽
Actual values 2 Temp. inv. 30°C Temp. module 18°C Irrad. 168W/m²	Interior temperature of device (Temp. Inv.) and temperature and irradiation values (if sensor is connected)	Solar Inverter – Instantaneous values – 🔼
Instantaneous values – yields		
Yield h. kWh Today 1:41 48.48 10.01 0:40 20.91 09.01 0:09 1.91	AC yields and operating hours from today, yesterday and the day before yesterday	Solar Inverter - Engergy yield
Yield h. kWh Week 02 2:47 74 Week 01 0:02 6 01/2008 2:50 80 12/2007 4:00 150	AC yields and operating hours for the current week, the previous week, the current month and the previous month	Solar Inverter – Energy yield – 🔽
Yield h. kWh 2008 1 29.20 2007 2 55.16 Total 3 84.36	AC yields for the current year and the previous year	Solar Inverter – Energy yield – 🔽
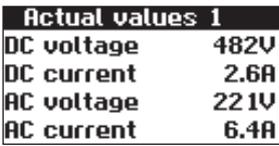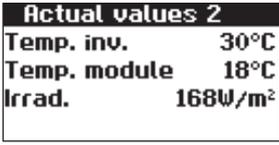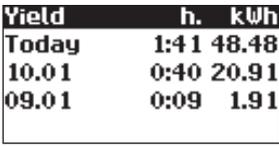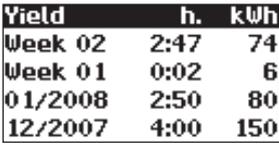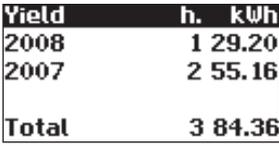
Display	Description	Menu selection
Events – Device		
Events Start: **15**. 11. 2008	Select starting data for event display	Solar Inverter – Events
Events 15.11.08 10:39 919:Service 10:11 919:Service 08:02 919:Service 15:02 919:Service	Display event list	Solar Inverter – Events – ok
#919 15.11.08 Start: 10:39:42 Duration: 01:00:34 Today: 1	Display event details (error number, data, starting time, duration and number of occurrences per day)	Solar Inverter – Events – ok – ok
History – Device		
Yield 11.2008 76kWh 38kWh 0 11.11 12.11	Daily yield for 1 week	Solar Inverter – History – Yield for week
Yield 11.2008 76kWh 38kWh 0 01.11 15.11	Daily yields for 15 days	Solar Inverter – History – Yield for 15 days
Yield 2008 484kWh 242kWh 0 JFMAMJJASOND	Monthly yields	Solar Inverter – History – Yield for month
AC power 15.11.08 5.0kW 2.5kW 0 08:30 14:45 21:00	AC output (5-min. values)	Solar Inverter – History – AC output
DC voltage 15.11.08 430V 245V 0 08:30 14:45 21:00	DC voltage (5-min. values)	Solar Inverter – History – DC output
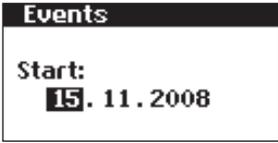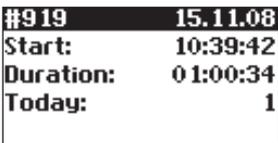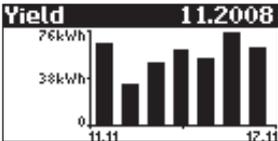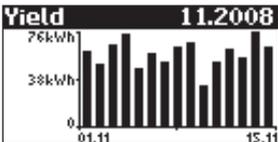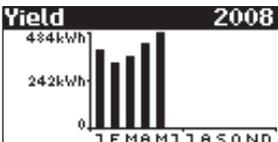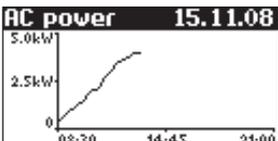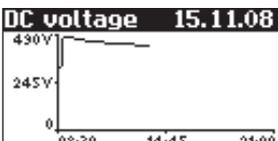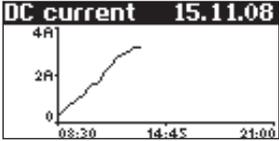
Display	Description	Menu selection
	DC current (5-min. values)	Solar Inverter – History – DC values – ⬇
	AC voltage (5-min. values)	Solar Inverter – History – AC values
	AC current (5-min. values)	Solar Inverter – History – AC values – ⬇
	Max. output Daily maximum values	Solar Inverter – History – Max. output
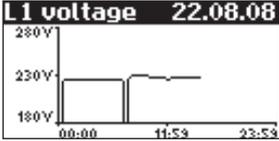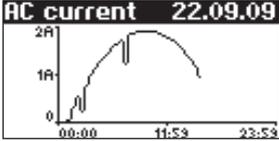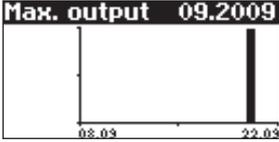
Information – Device

	Firmware	Solar Inverter – Information – Firmware
	Memory card	Solar Inverter – Information – Memory
	Device mode	Solar Inverter – Information – Mode
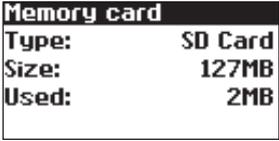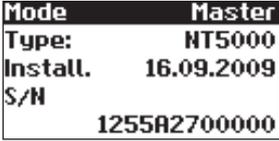
Instantaneous values – Solar system (only on master)

	Current system feed-in power, daily energy yield and system status	The screen appears on the master automatically when you do not make any entries with the keyboard for several minutes. Solar system – Instantaneous values

Display	Description	Menu selection

Yields – Solar system (only on master)

Display	Description	Menu selection
Yield kWh 03.01 — 21.07 02.01 — 50.49 01.01 — 18.70	AC system yields and operating hours from today, yesterday and Day before yesterday	Solar system – Energy yield
Yield Week 05 — 490 Week 04 — 77 02/2008 — 210 01/2008 — 859	AC system yields for the current week, the previous week, the current month and the previous month	Solar system – Energy yield – ⌄
Yield kWh 2009 — 50.55 2008 — 94.45 Total — 145.0	AC system yields for the current year and the previous year	Solar system – Energy yield – ⌄

Events – Solar system (only on master)

Display	Description	Menu selection
Events Start: 15 . 11 . 2008	Select starting data for system event display	Solar system – Events
Events 15.11.08 10:39 919:Service 10:11 919:Service 08:02 919:Service 15:02 919:Service	Display event list for entire system	Solar system – Events – (ok)
#919 15.11.08 Start: — 10:39:42 Duration: — 01:00:34 Today: — 1	Display event details (error number, data, starting time, duration and number of occurrences per day)	Solar system – Events – (ok) – (ok)

System history – Solar system (only on master)
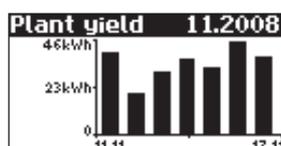
Display	Description	Menu selection
Plant yield 11.2008	Solar system daily yield for 1 week	Solar system – System history – Yield for week
Plant yield 11.2008	Solar system daily yield for 15 days	Solar system – System history – Yield for 15 days
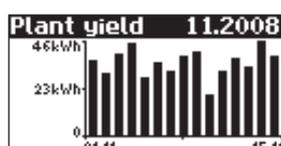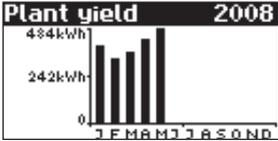
Display	Description	Menu selection
	Solar system monthly yields	Solar system – System history – Yield for month
	Solar system AC output (5-min. values)	Solar system – System history – AC output
	Maximum system output Daily maximum values	Solar system – System history – Max. output
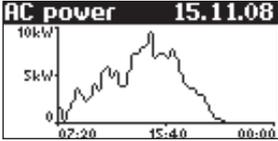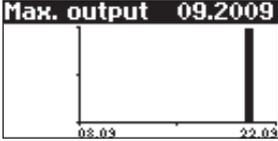
System info – Solar system (only on master)
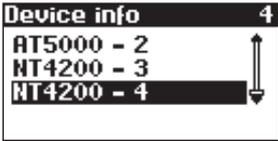
Display	Description	Menu selection
	Device list for selecting a device	Solar system – System info
	Selection of information	Solar system – System info – ok
	Firmware	Solar system – System info – Firmware
	Memory card	Solar system – System info – Memory
	Device mode	Solar system – System info – Mode
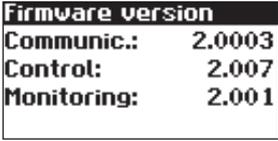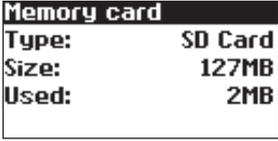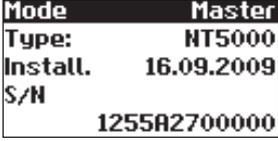
Display	Description	Menu selection
Settings – General		
Choose language **English**	Display language	Settings – General – Language
LCD contrast 50 %	LCD contrast	Settings – General – LCD contrast
Date/Time 15.11.2008 14:17:01	Set date/time (only possible with customer password)	Settings – General – Date/Time
Receipt time State: Off Start: 01:00 Duration: 02:00	Set receiving time (starting time and duration in which the device can also be addressed in the night mode via the network). (only possible with customer password)	Settings – General – Receiving time
Firmware Actual: 1.0059 Backup 1.0058 Start: Actual:	Firmware versions	Settings – General – Firmware
New password Password: ✱ ✱ ✱ ✱ ✱ ✱ ✱	Changing the customer password (only possible with customer password)	Settings – General – Password
Settings – Login		
Login User: Guest Password: ✱ ✱ ✱ ✱ ✱ ✱ ✱	Password entry to access advanced settings (necessary for commissioning)	Settings – Login
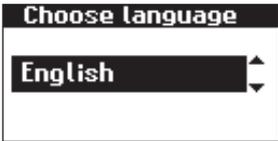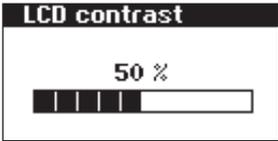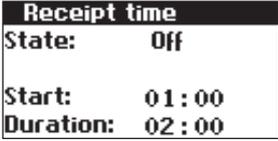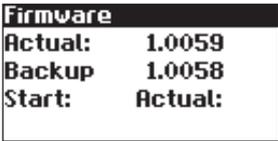
Display	Description	Menu selection
Settings – Network (only possible with customer password)		
Ethernet 1 DHCP: On IP address: 192 . 168 . 030 . 050	Network settings (Screen 1)	Settings – Network – Ethernet
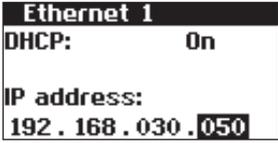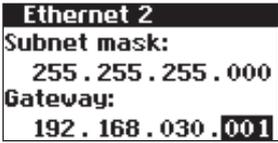
Ethernet 2
Subnet mask:
  255 . 255 . 255 . 000
Gateway:
  192 . 168 . 030 . 001
	Network settings (Screen 2)	Settings – Network – Ethernet – ⬇
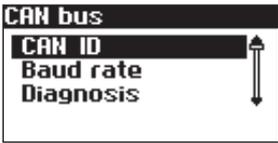
CAN bus CAN ID Baud rate Diagnosis	Only for secondary unit	Settings – Network – CAN bus
CAN bus CAN ID: 1 ⬍	Only for secondary unit with manual CAN ID setting: CAN ID request	Settings – Network – CAN bus – CAN ID
CAN bus Secondary units Baud rate Diagnosis	Main unit only	Settings – Network – CAN bus
Device search Secondary units ID allocation Automatic	Selection at the main unit: type of ID allocation for the secondary units	Settings – Network – CAN-Bus – Secondary units
Baud rate Baud rate 500 kB/100m	Setting the baud rate	Settings – Network – CAN-Bus – Baud rate
Diagnosis Bus Ok Error counter Tx 0 Rx 0	Function test for the CAN connection	Settings – Network – CAN-Bus – Diagnostics
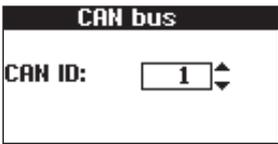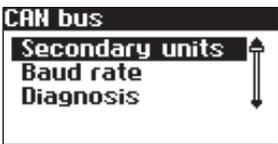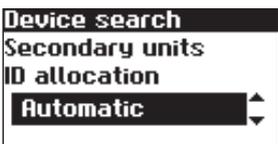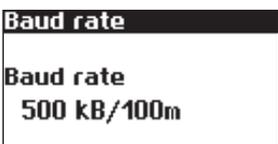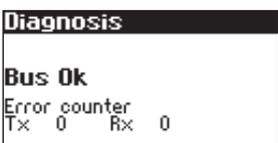
Display	**Description**	**Menu selection**
| ```
┌─────────────────────┐
│ ■Interfaces■        │
│ Irrad.    ■Si-01TC-T■◆│
│ Temp.:         none │
│ ─────────────────── │
│ S0 rate/kWh:      0 │
│ S0 output:       On │
└─────────────────────┘
``` | Setting of the irradiation and temperature sensor and configuration of the S0 pulse output | Settings – Network – Interfaces |

5.5   Malfunction displays

The Solar Inverter indicates malfunctions in the LCD display and saves these in the internal error memory.

The malfunction display consists of a number and a short designation. Based on the first number you can quickly recognise which area the error has occurred in:

1: Error in the area of the solar generator
2: Error in the area of the AC network
3: Error in the area of the inverter
4: Error in the area of the interfaces/communication
5: Warnings in the area of the interfaces/ communication
9: Service error

If an error is shown in the standard display, then you can look up the exact error message in the menu under «Solar Inverter – Events».

i

· A restart may be attempted in the event of an error message.

· Please note the serial number of the device and the error number before contacting the Technical Hotline.

· The Technical Hotline can be contacted on +49 (0)7531 996 77-577 during weekdays from 7:30 am to 6:00 pm.

Display message	Description	Cause and possible remedies
Solar generator fault		
101:U-DC max	Your NT Solar Inverter is approved for a maximum open-circuit voltage of the solar generator of 900 V. All components of the DC input are sufficiently dimensioned with a safety factor. If the threshold is exceeded, the Solar Inverter stops feeding.	The maximum DC voltage was exceeded. · Check the dimensioning of your PV generator. Too many modules are connected in series. · Reduce the number of modules and carry out commissioning again.
102:Insulat.	Before each connection, your Solar Inverter checks the PV system for a possible earth fault or insulation faults. Should this kind of error be detected, no feeding takes place. The mode of operation is conformant with DIN VDE 0126-1-1.	The Solar Inverter has discovered an insulation fault in the PV system during start-up. · Check your PV system for possible insulation faults (pinched-off DC lines etc). The measured insulation resistance must be at least 900 kohms.

Display message	Description	Cause and possible remedies
103:AFI>30mA **105:AFI>60mA** **106:AFI>150mA**	Your Solar Inverter is equipped with a universally sensitive AFI according to DIN VDE 0126-1-1. This monitoring device has detected a relative residual current jump.	A residual current jump has occurred during operation of the Solar Inverter. · Check your PV system for possible insulation faults.
104:AFI>0.3A	Your Solar Inverter is equipped with a universally sensitive AFI according to DIN VDE 0126-1-1. This monitoring device has detected an absolute fault current of > 300 mA.	A residual current has occurred during operation of the Solar Inverter. · Check your PV system for possible insulation faults.

AC network fault

Display message	Description	Cause and possible remedies
201:Surge e.	Your Solar Inverter continually monitors the quality of the AC grid. During high voltage peaks on the phase feeding in, the Solar Inverter stops feeding and attempts a restart.	The Solar Inverter has detected a high voltage peak on the phase feeding in. · After malfunction elimination the Solar Inverter restarts automatically. Should the error occur frequently, please contact your power supply company. A monitoring phase and a directly earthed conductor were exchanged when connecting the AC side.
202:UAC1>10%	Your Solar Inverter continually monitors the voltage level of the phase feeding in. If the maximum permissible limit is exceeded, the Solar Inverter stops feeding and does not start up again until the voltage value drops below the maximum permissible limit.	The cable cross-section in the AC supply line to the solar inverter is too small. Your inverter feeds into a spur line, which is insufficiently dimensioned. · Check the design of your grid connection (energy meter) or the grid feed point to your power supply company (PSC). · Ask your power supply company (PSC) about grid stability and design.

Display message	Description	Cause and possible remedies
203:UAC1>Max **205:UAC2>Max** **207:UAC3>Max**	Your Solar Inverter continually monitors the voltage level of the phases L1, L2 and L3. When the maximum permissible limit is exceeded, the Solar Inverter stops feeding and does not start up again until the voltage value drops below the maximum permissible limit.	The cable cross-section in the AC supply line to the Solar Inverter is too small. Your inverter feeds into a spur line, which is insufficiently dimensioned. · Check the design of your grid connection (energy meter) or the grid feed point to your Electric Utility. · Ask your Electric Utility about grid stability and design.
204:UAC1<Min **206:UAC2<Min** **208:UAC3<Min**	Your Solar Inverter continually monitors the voltage level of the phases L1, L2 and L3. When the minimum permissible limit is dropped below, the Solar Inverter stops feeding and does not start up again until the voltage value exceeds the minimum permissible limit. If the voltage drops below 160 V, the Solar Inverter cannot be supplied.	· Ask your Electric Utility about grid stability and design.
210:Frq1>Max **211:Frq1<Min**	The Solar Inverter continually monitors the grid frequency of the phase feeding in. If this is outside the permitted range, the Solar Inverter stops feeding and does not start up again until the value is within the tolerance range.	· Ask your Electric Utility about grid stability and design.
212:DC share	Your Solar Inverter continually monitors the quality of current fed in. If an increased DC share is found in the current fed in, the Solar Inverter stops feeding.	· Restart the Solar Inverter. If the error still occurs, please contact the technical hotline. The phone number is provided on the back of the manual.
213:UAC1>10% **(Warning)**	The voltage of the phase feeding in is higher than 10% above the nominal value. If this is the case for longer than ten minutes, the inverter stops feeding and does not switch on again until the voltage drops below this limit again.	The cable cross-section in the AC supply line to the Solar Inverter is too small. Your inverter feeds into a spur line, which is insufficiently dimensioned. · Check the design of your grid connection (energy meter) or the grid feed point to your Electric Utility. · Ask your Electric Utility about grid stability and design.

Display message	Description	Cause and possible remedies
224:AC P. fail	Your Solar Inverter has detected a mains power failure.	· Ask your Electric Utility about grid stability and design.
225:UV excon **226:OV excon**	You Solar Inverter is equipped with a high-quality redundant grid monitoring function according to DIN VDE 0126-1-1 and constantly monitors the grid. If one of the phases fails, or if the phase position between the individual conductors changes, the Solar Inverter stops feeding and does not start up again until the error is eliminated.	· Check phases L2 and L3. · Ask your power supply company (PSC) about grid stability and design.
227:L1	Your Solar Inverter continuously monitors the output current. Excessive current rise was detected.	· Ask your power supply company (PSC) about grid stability and design.
Inverter fault		
301:AFI over	The integrated sensor for measuring the residual current has been operated outside its measuring range.	A residual current was detected during start-up. · Restart the Solar Inverter. If the error still occurs, please contact the technical hotline. The phone number is provided on the back of the manual.
303:Overtmp.	Your Solar Inverter is designed for an ambient temperature of up to +45°C. When a specified temperature threshold of the heat sink is reached, the output power is reduced linearly. Should the heat sink temperature nevertheless continue to increase, feeding is stopped. After the heat sink temperature drops, the Solar Inverter starts up again automatically.	The maximum permissible ambient temperature has been exceeded. · The installation location is not suitable. Please find another installation location. The necessary air circulation was not taken into account during installation. · Clean the Solar Inverter, if dirt prevents cooling. · Observe the installation distances specified in the manual. Objects were laid on the heat sink and unimpaired convection was prevented. · Remove the objects.

Display message	Description	Cause and possible remedies
304:Grid re.	The NT Solar Inverter checks the operation of the mains relay prior to every switch-on. An error was detected during this check.	· Restart the Solar Inverter. If the error still occurs, please contact the technical hotline. The phone number is provided on the back of the manual.
305:AFI test	The NT Solar Inverter checks the operation of its residual-current monitoring device prior to every switch-on. An error was detected during this check.	· Restart the Solar Inverter. If the error still occurs, please contact the technical hotline. The phone number is provided on the back of the manual.
306:T. meas.	The NT Solar Inverter is equipped with a temperature sensor that monitors the heat sink temperature. This message appears if the sensor reports a value outside its value range or in case of a sensor cable break.	The ambient temperature of the Solar Inverter is outside the permissible range (< -25°C). · Wait until the temperature reaches the permissible operating range. A cable break has occurred in the sensor which monitors the heat sink temperature. · Please contact the technical hotline. The phone number is provided on the back of the manual.
307:Overtmp. (Warning)	Your Solar Inverter is designed for an ambient temperature of up to +45°C. When a specified temperature threshold of the heat sink is reached, the output power is reduced linearly. Should the heat sink temperature nevertheless continue to increase, feeding is stopped. This warning appears when the current heat sink temperature is just below the switch-off threshold.	The maximum permissible ambient temperature has been exceeded. · The installation location is not suitable. Please find another installation location. The necessary air circulation was not taken into account during installation. · Clean the Solar Inverter, if dirt prevents cooling. · Observe the installation distances specified in the manual. Objects were laid on the heat sink and unimpaired convection was prevented. · Remove the objects.

Display message	Description	Cause and possible remedies
308:M incom 309:Control	The software version of the control and the monitoring software is incompatible.	· Carry out a software update.
310:no config	No country is set.	Contact the technical hotline for the installer password. (The phone number is provided on the back of the manual.) Reset the country according to the explanatory note 4.2 Commissioning, page 29

Interface/communication fault

401:SD card	The Solar Inverter cannot find an SD card.	· Restart the Solar Inverter. If the error still occurs, please contact the technical hotline. The phone number is provided on the back of the manual.
402:SD card	The SD card is write-protected.	· Restart the Solar Inverter. If the error still occurs, please contact the technical hotline. The phone number is provided on the back of the manual.
403:CAN user	Communication error with CAN user.	· Check whether an error has occurred in the CAN slave. Restart slave and master if necessary.
404:CAN bus	CAN bus not in operation.	No communication is possible via the CAN bus. · Check the bus lines and the terminating resistors. · Check whether the maximum permissible line lengths have been complied with. · Check whether the bus lines have been routed parallel to power cables. Separate bus lines and power cable from each other spatially if necessary.

Display message	Description	Cause and possible remedies
405:CAN user	CAN user does not respond.	· Check whether an error has occurred in the CAN slave. Restart slave if necessary.
406:file def	Language file could not be loaded.	· Restart your Solar Inverter. Carry out a software update for the language file.
407:file def	Website could not be loaded.	· Restart your Solar Inverter. Install the latest file for the website via a software update.
408:file def	File with error messages could not be loaded.	· Restart your Solar Inverter. Install the latest error messages file via a software update.

Communication warnings

Display message	Description	Cause and possible remedies
501:Solar (Warning)	No sensor found on sensor channel 1 (solar).	If you have connected a sensor: · Check the connection to your sensor. If you have not connected a sensor: · Check the configuration with the Sunways Browser.
502:Temp. (Warning)	No sensor found on sensor channel 2 (temperature).	If you have connected a sensor: · Check the connection to your sensor. If you have not connected a sensor: · Check the configuration with the Sunways Browser.
503:CAN com. (Warning)	Communication malfunctions occur repeatedly on the CAN bus.	A malfunction occurs in the data transmission on the CAN bus. However, a data exchange continues to be possible. · Check whether all connectors of the bus lines and the terminating resistors are properly mounted. · Check whether the bus lines have been routed parallel to power cables. Separate bus lines and power cable from each other spatially if necessary.

Display message	Description	Cause and possible remedies
504:CAN cfg. (Warning)	CAN bus is in the configuration mode. No measured values are transferred.	At least one device is in the menu item «Settings – Network – CAN bus».
		· Close this menu for all devices.
505:SMPT ser. (Warning)	Warning: SMTP server cannot be reached.	Fault during e-mail delivery.
		Re-attempt e-mail delivery.
506:SMTP soc. (Warning)	Warning: SMTP no socket available.	· If the fault recurs check the e-mail settings via the Sunways Browser
507:SMTP cm. (Warning)	Warning: SMTP faulty communication with server.	
508:DNS fehl. (Warning)	Warning: DNS has failed.	Communication fault between the integrated web server and an Internet browser in conjunction with the Sunways Browser.
509:HTTP con. (Warning)	Warning: HTTP client connection has failed.	These warnings are non-critical and can be ignored if they only occur occasionally.
510:HTTP aut. (Warning)	Warning: HTTP client authorisation has failed.	These warnings have no influence on the energy production of the inverter.
511:HTTP tim. (Warning)	Warning: HTTP client timeout.	
512:HTTP soc. (Warning)	Warning: HTTP client no socket available.	
513:HTTP soc. (Warning)	Warning: HTTP client error with socket.	
514:HTTP met. (Warning)	Warning: HTTP client incorrect method.	
515:HTTP pro. (Warning)	Warning: HTTP client error with protocol.	
516:HTTP wr. (Warning)	Warning: HTTP client write error.	
517:HTTP re. (Warning)	Warning: HTTP client read error.	

Display message	Description	Cause and possible remedies
518:CAN init. (Warning)	Warning: CAN initialisation error.	CAN bus initialisation fault during device startup. · Restart the Solar Inverter. If the error persists, please contact the technical hotline. The phone number is provided on the back of the manual.
519:Time syn (Warning)	Warning: Time synchronisation with the NTP server has failed.	Firewall port 123 is blocked. · Select an alternative time server.
Service fault		
9xx: Service fault **9xx: Service warning**	A service fault has occurred.	· Disconnect the Solar Inverter from the grid and from the solar generator and reconnect it. If the error occurs again, please contact the Technical Hotline. The phone number is provided on the back of the manual.

6   System monitoring

6.1   General information

The basis for the system monitoring is the data logger integrated in the NT Solar Inverter. The Solar Inverters of the NT series are equipped with a broad range of monitoring options for your solar system:

·   The Sunways Browser offers the display of instantaneous values, stored operating data and settings.

·   With active alerting information about faults in the solar system can be sent to a selected recipient via e-mail.

·   With the Sunways Portal connection the NT Solar Inverter can send the operating data of your solar system to the Sunways Portal daily without additional hardware. This enables you to track your yields via the Internet.

To enable access to the system monitoring data, the Solar Inverter must be networked via the Ethernet connection. Three different networking options are available:

·   Direct connection via an Ethernet cable (see chapter 6.3 Direct Ethernet connection, page 58) or internal network (see chapter 6.6 Connection via an existing Ethernet network, page 62)

![info icon]

With a direct connection or an internal network without gateway to the Internet the Solar Inverter is unable to send e-mails. Portal connection and active alerting is therefore not possible.

·   Connection via the Internet, e.g. connection of the Solar Inverter to a DSL connection (see chapter 6.7 Remote access via a DSL router, page 63)

·   Connection via a Sunways Modem (see chapter 6.8 Connection via the Sunways Modem, page 63)

6.2   Integrated data logger

The integrated data logger of the NT Solar Inverter stores the operating data of your solar system. In addition to 5-minute mean values, energy yields are also stored as 5-minute, daily, weekly, monthly and annual values. Up to 200 status changes (warnings and errors with start and end) are also stored. Each data record contains the data and time. The data logger is designed as a circulating memory, i.e. the respective oldest data are overwritten with new data.

Operating data (5-min. mean values)

Number	Value
4500	DC current
4500	DC voltage
4500	AC current
4500	AC voltage
4500	AC output
4500	Device temperature
4500	Module irradiance (optional)
4500	Module temperature (optional)

With this data memory volume approx. 30 days' worth of values can be stored before the first value in the ring buffer is overwritten again.

Energy yields (for 20 years except for minute values)

Number	Value
4500	5-minute yield
7300	Daily yield
250	Monthly yield
20	Annual yield
1	total yield since commissioning

Status messages

Number	Value
200	Status changes

6.3   Direct Ethernet connection

The Solar Inverters are equipped with an Ethernet interface as standard for system monitoring and configuration with a PC.

Connect your PC and the Solar Inverter with the included Ethernet cable. X-patch cables can also be used.

The PC is connected to the master as standard. Basically all Solar Inverters – including Solar Inverters configured as secondary units or single units – dispose of an own web server so that a connection can be established with each device.

· To always find the suitable configuration for installation and commissioning on the PC, we recommend the use of a second network card (e.g. PCBus, PCMCIA), which you can configure to match the default setting of the Solar Inverter.

· The PC and the Solar Inverter must have suitable IP addresses and net masks. The network settings can be adjusted either directly on the Solar Inverter via the LCD display or on your PC.

· If two network cards are used the IP addresses must be in separate subnets, e.g. 192.168.30.XXX and 192.168.40.XXX.

6.4   Network settings on Solar Inverter

·   The Solar Inverter is supplied with the following,
     preset IP address: **192.168.30.50**

·   In the default setting the Solar Inverter does
     not support a DHCP (Dynamic Host Configura-
     tion Protocol). Therefore, the IP address is not
     assigned automatically. It is possible to activate
     the DHCP protocol via the Settings menu.

·   IP addresses may only be assigned once within
     the network.

If required you can assign your own IP address for
the Solar Inverter via the Settings menu.

1.   Open the menu «Settings – Login».

2.   Enter the default password (******** = 8 times
     star key) or your chosen password.

Please note:

Numerals from 0 – 9 and letters from a – z and from
A – Z are admissible.

The password always has 8 characters. If the pass-
word you choose is fewer than 8 characters in
length, the remainder, up to the full 8 characters, is
filled with "*" symbols.

For example:
You choose "Solar" as your password. This password
has 5 characters. The system therefore then auto-
matically adds three "*" symbols, meaning that your
password becomes "Solar***".

3.   Open the menu «Settings – Network – Ethernet».

4.   Enter an IP address suitable for use with your PC.
     This means the first three number blocks must be
     identical, and the last number block different.

Example:
If your PC has the IP address 192.168.1.1, enter
192.168.1.2 for your Solar Inverter

5.   Use ⬇ to access further settings.

6.   Enter the subnet mask 255.255.255.0.

7.   Enter the IP address of your PC in the gateway.

8.   Confirm with ⓞⓚ.

After the network configuration is completed you
can start the Sunways Browser by entering the IP
address of the Solar Inverter in the address line of
your web browser.

6.5   Network settings on the PC

To enable your PC to communicate with the Solar Inverter certain network settings are required. The procedure differs slightly depending on the operating system. A configuration example for Windows® XP is shown below.

IP addresses may only be assigned once within the network.

1. Select «Start – Settings».

2. Select «Network Connections».

3. Double-click on the LAN connection through which you are connected to the Solar Inverter.

4. Click in the Status window on «Properties».

5. Select «Internet Protocol (TCP/IP)» and click «Properties» again.

6. Now assign an unused IP address **192.168.30.XXX** and enter the subnet mask **255.255.255.0**.

7. Click OK to confirm your entries.

8. In the «Status» menu item you can check the correctness of your entries and the status of your connection

After the network configuration is completed you can start the Sunways Browser by entering the IP address of the Solar Inverter in the address line of your web browser.

For more complex network configurations please contact your network administrator.

6.6   Connection via an existing Ethernet network

If an existing home or company network is available you can integrate the NT Solar Inverter directly in the network as a network device.

Connect your PC and the Solar Inverter with a CAT5 Ethernet cable with 1:1 RJ45 sockets.

The master is connected to the network as standard.

With DHCP
If a DHCP server is present in your network, you can activate DHCP on the Solar Inverter. In this case the Solar Inverter obtains the network settings automatically. You can display the assigned IP address via the LCD display (menu «Settings – Network – Ethernet»)

Without DHCP
If there is no DHCP server in your network, you must set an unused IP address on the NT Solar Inverter (see section Solar Inverter network setting settings).

Ask your network administrator for suitable settings for IP address, net mask and gateway.

After the network configuration is completed you can start the Sunways Browser by entering the IP address of the Solar Inverter in the address line of your web browser.

6.7   Remote access via a DSL router

If a DSL connection or a network with Internet access is available you can make the Solar Inverter accessible via the Internet.

Requirement:
Your DSL modem or Internet router supports static IP address services, e.g. www.dyndns.org
Your router supports port forwarding.

1. Connect your Solar Inverter with your DSL router. Use a CAT5 Ethernet cable with 1:1 RJ45 sockets. The master is connected to the network as standard.

2. Register free of charge at www.dyndns.org, for example

3. Create an alias for accessing your Solar Inverter, e.g. nt-sunways.dyndns.org. You can then access your Solar Inverter via this address.

4. Configure your DSL router such that the IP address is regularly reported to www.dyndns.org (follow the procedure described in the manual for your DSL router for this purpose).

5. Configure your DSL router such that it accepts requests from the Internet via Port 80, for example, and forwards them internally to the Solar Inverter (port forwarding).

6. Also note that the port for access from the Internet set in your firewall must be enabled.

Instructions for configuring common DSL routers are available for download from the Sunways AG website.

6.8   Connection via the Sunways Modem

A modem connection can be used to bridge longer distances during system monitoring and configuration. Connect the Sunways Modem with the Solar Inverter. The Sunways Modem is available as an analog, ISDN and GSM type.

1. Connect your the Solar Inverter and your PC with a crossed or 1:1 Ethernet connection cable, type CAT5 with RJ45 sockets.

In a networked system only the master should be connected to the remote modem as standard.

2. Connect an external modem to your PC or, if available, use the internal modem of the PC. For commissioning please refer to the Sunways Modem user manual.

The following modem combinations are permitted:
ISDN – ISDN
analog – analog
analog – GSM
GSM – analog
GSM – GSM

Connecting a Sunways Modem

1   Telephone connection
2   RS232 interface
3   LVDS for NT and PT Solar Inverters
4   Power supply device

6.9   Dial-up connection from a PC to the Solar Inverter

To establish a connection between your Solar Inverter and a PC via the modem you have to establish a dial-up connection in Windows. The procedure under Windows® XP is described below.

1. Run the wizard for a new connection via Start – Settings – Network Connections.

    Click «Next» to open the first selection screen.

2. Select «Connect to the network at my workplace».

3. Confirm your selection with «Next» and select «Dial-up connection» on the next screen and confirm with «Next».

4. A list of installed modems appears. Select the required modem and click «Next».

5. Enter a connection name and click «Next».

6. Specify the phone number for your Sunways Solar Inverter.

When entering the telephone number, you may have to include one or more digits to connect to an outside line. (An outside line is usually obtained by placing a «0» before the actual telephone number.)

Click «Next».

7. You can now specify whether this connection is available to all users of this PC. If in doubt, enter «all users» and click «Next».

8. Click the checkbox to place a shortcut on your desktop and click «Finish».

9. The connection window appears automatically once the connection has been established. (Alternatively via the icon on your desktop or via «Start – Settings – Network Connections».)

Further settings are required in the «Properties» section.

10. First click the «Networking» tab and select
«Internet Protocol (TCP/IP)».

Select «Properties».

11. Enter the following data:
Obtain an IP address automatically
Obtain DNS server address automatically

12. Enter «customer» as the user name and the
standard password (******** = 8 times star key)
or the password you entered previously.

The password matches the customer password on
the device.

13. Click «Dial» to establish the connection. After
the connection is established you can start the
Sunways Browser by entering the IP address of
the Solar Inverter in the address line of your web
browser.

In contrast to the normal IP address for a modem
connection the IP address of the Solar Inverter is set
to **192.168.20.50** by default.

7   Sunways Browser

7.1   General information

The Sunways Browser can be called up via a standard Internet browser, e.g. Mozilla Firefox. One of the four possible connections between a PC and the Solar Inverter is required for this purpose (see chapter 6 System monitoring, page 57)

Please note: Your browser must be set to UTF-8 character coding in order to ensure that all characters are displayed correctly.

The start screen opens once the IP address of the Solar Inverter has been entered in the address line of the browser:

Here you can select from eleven different languages.

The browser offers the following functions:

· Display of the operating mode and instantaneous values for a single device or for a CAN-networked system

· Display of energy yields as 5-minute, daily, monthly, annual and total values

· 5-minute mean values of solar generator current and voltage, grid current and voltage and feed-in power

· Settings, e.g. for date/time, interface configuration, alerting options, communication parameters etc.

· Configuration of the output control parameters according to the German Renewable Energy Act and the Low- and Medium-Voltage Directive

· Communication software update (LCD display, interfaces,communication and Sunways Browser) and the control software (control and monitoring)

7.2   Access protection

The Sunways Browser is provided with password protection so that unauthorised persons cannot access your Solar Inverter.

The following user data are set in the delivered state:

User: **customer**
Password: *** * * * * * ***

· It is recommended that you change this password to an 8-digit/character password.

· This password is identical to the password entered via the LCD display for settings and commissioning.

· Numerals from 0 – 9 and letters from a – z and from A – Z are admissible.

· The password always has 8 characters. If the password you choose is fewer than 8 characters in length, the remainder, up to the full 8 characters, is filled with "*" symbols.

· For example:
You choose "Solar" as your password. This password has 5 characters. The system therefore then automatically adds three "*" symbols, meaning that your password becomes "Solar***".#

· If you cannot remember the password you can request a device-specific password from the Technical Hotline +49 (0)7531 996 77-577 so that you can access your Solar Inverter again. In this case you need the serial number and the MAC address, which can be found on the type label.

7.3   Overview – Menu

Home – Displays the start page

Solar Inverter – Displays the instantaneous values, stored operating data, Solar Inverter status

Solar System – Displays a system overview with status, total output, yields and access to slaves (only available if the device is connected with the master).

Information – Device information, e.g. serial number

Settings and software update for the device or the networked system

System information for your solar system such as name, capacity, geographical location, a photograph and details of the components.

7.4   Language selection

You can display the web pages in the following eleven languages. Click on the respective country flag to select the language.

· German
· English
· Spanish
· Italian
· French
· Greek
· Czech
· Slovenian
· Portuguese
· Dutch
· Bulgarian

7.5   Setting the date/time

This function can be accessed via Settings – Date/Time. If you have selected the correct time zone and an Internet connection is available, you can automatically synchronise the time of the Solar Inverter with a time server with the NTP button.

Alternatively you can transfer the PC time to the Solar Inverter.

Please proceed with caution for time settings, as they directly affect data logging. For example, if you set the time back by 1 hour, then the existing data for the last hour will be overwritten.

7.6   Software update

The software update is used to extend the functionality of your Solar Inverter. The communication software (responsible for LCD display, interfaces, communication and Sunways Browser) and the control software or the monitoring software can be updated.

1. Select «Settings – Software Update». This function requires entry of a password (default: ******** = 8 times star key or the password you entered previously).

2. The upper screen section shows the current software versions. If a new version is available on our website (www.sunways.de), you can download the file and load it via the Sunways Browser. Select the file on your hard disk via the «Browse...» button and confirm with OK.

3. Select a software package.

4. Click Update to copy the software update to the Solar Inverter.

5. Use the COM Reset button to restart the communication unit and load the new software.

Alternatively the system update may be distributed to the slaves via the software master. Please contact our Technical Hotline for further information. The phone number is provided on the back of the manual.

During the update process, update information is displayed in the status indicator in the standard window of the Solar Inverter's LCD display. The display messages have the following meaning:

Display text	Update type
Cnt. Upd.	control software
Mon. Upd.	monitoring software
Com Upd.	communication software
Wif Upd.	web interface
DWifUpd.	dynamic web interface
MenSUpd.	menu structure
MenEUpd.	menu error texts
WifSUpd.	web interface status texts
RWP.Upd.	read/write parameters
ROP.Upd.	read only parameters
ParaUpd.	parameter update
Min Upd.	update of the minute values in the data logger files
Day Upd.	update of the daily values in the data logger files
Mon Upd.	update of the monthly values in the data logger files
YearUpd.	update of the annual values in the data logger files
SMinUpd.	update of the minute values in the system data logger files
SDayUpd.	update of the daily values in the system data logger files
SMONUpd.	update of the monthly values in the system data logger files
SYrUpd.	update of the annual values in the system data logger files

7.7   Internet dial-up via modem

Modem settings

If you use a modem to connect to the Internet, the modem must be set up via the Sunways Browser. First establish a connection between your PC and the Solar Inverter (see section Direct Ethernet connection). Enter the following settings via «Settings – Modem» in your web browser:

Modem type
Select the modem type:
analog, ISDN or GSM

Internet dial-in number
Dial-in number for your Internet provider (ISP)

Outside line
If you have a telephone system, you may have to enter 0, for example. A comma results in a dialling pause of 1 second

Provider login
User name defined by your Internet provider

Provider password
Password defined by your Internet provider

PPP-IP
You can reach the Solar Inverter by entering this IP address in your web browser. The address is set to 192.168.20.50 by default.

MSN
MSN for the modem extension (ISDN modem). This is usually the extension number of without the area code.

SIM card PIN
SIM card PIN for GSM modem.

APN
Access Point Number. You can obtain the APN from your mobile communications provider.

Always connected
Select this option if you have a GPRS mobile tariff in order to ensure that the device is always online.

Please note: With time-based tariffs (e.g. modem connection with GSM or analog) this function can result in very high telephone costs!

Function buttons
Click «Send» to save the settings in the Solar Inverter.

Click «Read» to display the current Solar Inverter settings.

Click «Modem Test» to test the connection between the modem and the ISP. You receive a reply as to whether dialling in was successful.

Click «Info» to obtain additional information about the modem.

Click «Initialise» to re-initialise the modem.

· Before conducting the modem test, the settings must be stored in the Solar Inverter by clicking «Send».

· Cheap ISP dial-up numbers are available from www.teltarif.de/internet or www.billiger-surfen.de, for example. Here you will find not only tariff information, but also the access data (phone number, user name, password).

E-mail settings

To enable the Solar Inverter to send E-mails, the E-mail settings must be stored via the Sunways Browser. The settings can be accessed via «Settings – Network» in the «Email Settings» section.

Requirements:
· When dialling in via modem, the correct dial-up settings must be stored (see Internet dial-up via modem).

SMTP provider
SMTP server for sending e-mails, e.g. mail.gmx.net (max. 30 characters). Alternatively an IP address can be entered.

SMTP user
User name for your e-mail provider (generally your e-mail address), e.g. sunwaysNT@gmx.net (max. 50 characters)

SMTP password
Password for your e-mail provider

Function buttons
Via «SMTP Test» you can send a test e-mail to the e-mail address stored for active alerting.

· Before conducting the SMTP test, the settings must be stored in the Solar Inverter with «Send».

· During the SMTP test an e-mail is sent to the e-mail address stored in the monitoring system (active alerting). Before starting the test check whether a valid e-mail address is stored under active alerting.

· If no login is set up on the configured SMTP server, the password field must be left empty. The login field is entered as the sender address for the e-mail. If no login is specified, the Solar Inverter sends the e-mail as nt-inverter@sunways.de

Click «Send» to save the settings in the Solar Inverter.

Click «Read» to display the current Solar Inverter settings.

7.8   Active alerting

General information

With active alerting you can receive status messages (errors and warnings) for your solar system by e-mail. If a status message was active for longer than 15 minutes or occurred 5 times in one day, you will receive an e-mail at the next full hour under the e-mail address stored in the Solar Inverter.

The master sends the status messages of all Solar Inverters if they are CAN-networked.

Requirements:
· The master must be connected to the Internet via a network or modem.

· When dialling in via modem, the correct dial-up settings must be stored (see Internet dial-up via modem).

· Correct e-mail settings must be stored in the Sunways Browser (see «Email settings»).

Alerting settings

The alerting settings can be accessed with the but-
ton «Settings – System Monitoring» in the «Active
Alerting» section».

Active Email alerting
Activation or deactivation of the active alerting
function.

Email address
In the «Email address» field enter the e-mail address
to which messages should be sent.

Function buttons
Click «Send» to save the settings in the Solar
Inverter.

Click «Read» to display the current Solar Inverter
settings.

7.9   Sunways Portal connection

General information

The operating data of your solar system can be
transferred to the Sunways Portal for remote moni-
toring via the Internet. This is possible without using
a Sunways Communicator.

The portal connection is configured via the Sunways
Browser. Following activation the master auto-
matically sends a registration e-mail containing the
system data (e.g. number of devices, serial number,
etc.) to the Sunways Portal.

After activation the operating data are e-mailed
to the Sunways Portal on a daily basis before the
master is switched off for the night. Alternatively a
shorter interval can be selected. If a change is made
to your solar system (e.g. additional device), then
the change is automatically reported to the Sunways
Portal.

A basis access for the Sunways Portal for displaying
the yield data is available to every Sunways cus-
tomer free of charge. Expanded functions, e.g. the
setpoint-actual comparison in the Sunways Portal,
can also be purchased for a fee.

The master sends the status messages of all Solar
Inverters if they are CAN-networked.

Requirements:
·   The master must be connected to the Internet via
    a network or modem.

·   Correct Email settings must be stored in the Sun-
    ways Browser (see «Email settings»)

·   Correct portal settings must be stored in the
    Sunways Browser.

Setup

Check whether all requirements are met. Configure the specified settings if necessary.

Open the settings page in the Sunways Browser. This can be accessed under «Settings – System Monitoring» in the «Sunways Portal» section.

Portal connection
Activation or deactivation of the portal connection.

Portal address
Preset for the Sunways Portal

Mailbox file
Preset for the Sunways Portal

System ID
System ID assigned by the portal. This is generated automatically after portal activation and sent to the Solar Inverter. It can take up to 4 minutes before the Solar Inverter displays the system ID.

Portal Email
Preset for the Sunways Portal. Alternatively you can enter a different address if you wish to analyse the operating data yourself.

Email interval
Select the e-mail interval. If you operate the system on a DSL modem, you can set a short interval. If you use a modem connection, select a longer interval (e.g. daily) to avoid excessive telephone charges.

User Email
Enter an e-mail address for the confirmation e-mail sent by the portal. It contains a link for activating your system in the Sunways Portal.

User SMS
As an option you can specify an SMS number to which an SMS message is sent after your system is successfully set up in the portal.

Function buttons
With «Portal Test» you can test the portal connection. You receive an e-mail at the address specified under «User e-mail» and an SMS if you have entered your mobile phone number under «User SMS».

Before the portal test you must transmit the settings to your Solar Inverter via «Send». If the test was successful, a message is sent to the user e-mail address or the user SMS address.

Click «Send» to save the settings in the Solar Inverter.

To view your system data in the Sunways Portal, you require a user account. This will be issued to you if you follow the link in the confirmation e-mail and fill out the registration form.

Alternatively you can enter an existing user name with the correct password to assign the system to an existing user account.

8   Appendix

8.1   Technical data

Model	NT 2500	NT 3700	NT 4200	NT 5000
Article no.	**SI225NT0C**	**SI237NT0C**	**SI242NT0C**	**SI250NT0C**
DC Input				
Rated DC power	2625 W	3885 W	4410 W	5250 W
Maximum DC current	7,5 A	11,0 A	13,0 A	18,0 A
Nominal DC voltage	340 V			
MPP voltage range	340 V...750 V			
Maximum voltage DC	900 V			
Number of inputs per MPP tracker	2 x Tyco Solarlok			
Number of MPP trackers	1			
AC output				
Rated AC output power	2500 W	3700 W	4200 W	4600 W
Maximum AC power	2500 W	3700 W	4200 W	5000 W
Nominal AC current	10,9 A	16,1 A	18,3 A	21,7 A
Maximum AC current	12,0 A	17,8 A	20,2 A	24,0 A
Nominal frequency	50 Hz			
Frequency tolerance range	47,5 Hz...50,2 Hz (according to DIN VDE 0126-1-1)			
Grid voltage	230 V			
AC voltage range	-20%...+15% (according to DIN VDE 0126-1-1)			
Distortion factor at Pn	< 2%			
Reactive power factor (cos phi)	1 or adjustable from -0,9 to +0,9			
Grid voltage monitoring	single-phase (according to DIN VDE 0126-1-1)			
Earth fault protection	RCD (according to DIN VDE 0126-1-1)			
Insulation, frequency and DC current monitoring	integrated according to DIN VDE 0126-1-1			
Required phases, number of grid connections	1 (L, N, PE)			
Number of feed-in phases (230 V single-phase)	1			
Performance				
Stand-by consumption	4,0 W			
Night-time consumption	< 0,1 W			
Maximum efficiency	97,8%	97,8%	97,8%	97,8%
European efficiency	97,4%	97,4%	97,3%	97,2%
MPP efficiency (static)	> 99%			
Switching concept	HERIC® / FP topology, transformerless			

Other

DC switch	internal			
Grid-connection fuse layout	16 A	25 A	32 A	32 A
Data interfaces	Ethernet, CAN, RS485, voltageless alarm relay, S0 pulse output, modem			
Sensor interfaces	irradiation, temperature			
Display	LCD, backlit, 128 x 64 pixels			
Plant supervision	Active alarm via e-mail, Sunways Browser, Sunways Communictor, Sunways Portal			
IP degree of protection according to IEC 60529	IP 54			
Max. relative humidity	95%			
Cooling	free convection			
Ambient temperature	-25°C...45°C (at full load)			
Overload behaviour	working point adjustment			
Dimensions (height x width x depth)	59 x 35 x 21 cm			
weight	26 kg			
Type of installation	wall installation			
Noise development	< 35 dB (A)			
Standard warranty (option)	5 years (10/15/20/25 years)			
Certificates	CE, DIN VDE 0126-1-1			

8.2   Drilling template for wall bracket

You can use the following template to install the
wall bracket. All distances and measures are shown
on this drawing.

8.3   General liability disclaimer

Although information contained in this manual has been checked with the greatest care for its accuracy and completeness, not liability whatsoever can be accepted for errors or omissions.

·   Sunways AG reserves the right to change the hardware and software features described here at any time without prior notice.

·   This manual may only be reproduced, passed on, copied or translated into other languages in whole or in part in any form or with any means the prior written approval of Sunways AG.

·   Sunways AG shall assume no guarantee for damage caused by faulty or lost data, due to incorrect operation or the malfunction of the Solar Inverter, the software, additional devices or PCs.

Registered trademarks
The Sunways logo is a registered trademark of Sunways AG, Konstanz.
HERIC® is a registered trademark of Fraunhofer Gesellschaft, Munich.

Sunways AG
Photovoltaic Technology
Macairestraße 3 - 5
D - 78467 Konstanz
Telefon +49 (0)7531 996 77-0
Fax +49 (0)7531 996 77-444
E-Mail info@sunways.de
www.sunways.de

Technische Hotline +49 (0)7531 996 77-577

sunways

Photovoltaic Technology