



MANUAL of DATALOGGER EKO21N / EKO21N-iP (with GPRS Internet)

Version : sept 2006 version 2a

**SEE SEPARATE PROJECT SHEETS WITH SPECIFICATIONS OF THE SUPPLIED PROJECT
like inputs, ranges, connections, passwords etc and ORDER list with ordered items**

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Recommendation: adjust the logger with:

- sample interval standard 3 seconds
- record interval 10 minutes

A.0 GENERAL DESCRIPTION & OPERATION of EKO21N / EKO21N-iP

The EKO21N is an easy-to-use, accurate and reliable **ultra low power datalogger system with battery life up to 10 years, ideal for remote or mobile applications** and with versatile inputs :1 up to 40 analog & digital inputs and serial inputs (optional wireless inputs), see datasheet.

The EKO21N has standard a **RS232 serial** communication port (with optional **USB cable and modem**) and a Secure Digital (**SD**) **memory card** (128Mbyte up to 2 Gbyte) for data storage.

Type **EKO21N-iP** has **wireless GPRS internet connection**, see the details below.

The EKO21N dataloggers are an essential tool for state of the art measurements for e.g. meteorology, environmental monitoring, wind energy feasibility studies, but also for general purpose projects: **complete systems according your requirements and specifications!** Controlling and working with the EKO21N is made easy with the EKO21N control software (with help functions).

The EKO21N logger configuration (number and type of input channels) and the logger parameters (like sample and record interval) are stored on the SD memory card. Besides the logger configuration also the recorded data is secure stored at the SD card.

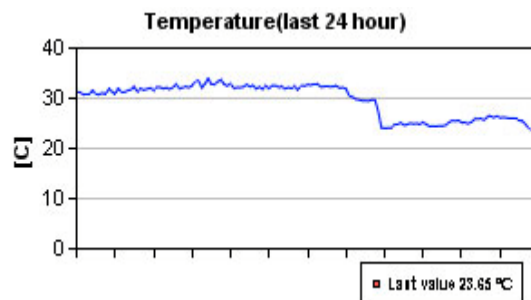
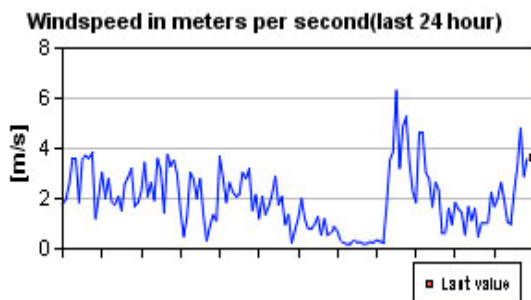
The logger configuration (which is stored at the SD card) can only be changed by EKOPOWER or by authorized users by using EKO21N control software (menu part: logger configuration , password available from your supplier). In this menu can be set:

- ranges and units (preset at factory: do not change as this must be according to the physical inputs boards and connected sensors/signals!!)
- alarms: software alarms via e-mail (or SMS using GPRS) and hardware alarms: open collector output (if present in hardware)
- timing variables (do not change)

The **EKO21N-iP can send (wireless) data files via FTP to a specified server -also with ultra low power consumption-** at pre-adjusted intervals:

- file with instantaneous values and /or
- file with recorded values (eg average values with optional min/max/standard deviation during each record interval)

Moreover the data can be presented at a website with **online (historical) graphs**, using optional software running at the server, e.g. the server of your website or a PC with Windows XP-Prof, configured as server. See demo at www.ekopower.net . The graph software is running under php (not in safe mode) and supported by several platforms: Windows, Linux, FreeBSD, Solaris, Mac OS X (PowerPC, Intel). Ask your supplier about the details & conditions. EKOPOWER can supply standard graphs or design special graphs and can assist you to setup the server and to install the graph software. Example of standard graphs:



By using the EKO21N control software it is possible via RS232 / USB interface and/or via SD memory card slot (of notebook or SD reader):

1. To set the logger parameters like:

- time and date, sample and record interval
- internet upload parameters for EKO21N-iP: adjusting IP address of server (destination of data) , directory and the upload frequency of :
 - > instantaneous & last recorded values values (and status): after adjustable number of samples (with optional online graphs, see www.ekopower.net)
 - > recorded values (data files): after adjustable number of record intervals

2. Read current and last recorded values, the status of the system and the present logger configuration.

The **optional wireless GPRS modem for EKO21N-iP** can be programmed in advance and loaded with the communication parameters in memory registers, like FTP server, passwords, data GPRS provider etc.

NOTE: A different (but similar) design of the EKO21N is the iBOX , which has Ethernet (no serial communication), with embedded webserver, see separate datasheet.

For best possible performance of the system as a whole read this manual carefully before using the EKO21N.

How to get started?

- Install the control software (called: iBOX-EKO21N) for the EKO21N on a windows PC

Note: this software is also for the iBOX!

Installing the EKO21N Control Software on a Windows 95/98/NT/2000/XP based PC.

Put the iBOX-EKO21N Control Program CD ROM in your CD drive.

Press the *START* button and choose the *RUN* option.

Select Setup.EXE and press the *OK* button.

The Install Wizard will guide you through the installation process.

Tip: When the Install Wizard prompts you for a destination directory in which to install the software change its name into a shorter and easier to use directory name by pressing the *Change Directory* button e.g. C:\iBOX-EKO21N (C:\ or D:\ depends on the hard drive you want to use).

After installing the Control Software you have to copy the supplied Configuration file into the same folder in which the iBOX-EKO21N Control Software is installed:

- iBOX with extension E (Ethernet) eg: Configuration-E.003 (003 is logger identification code)
- EKO21N with extension R (RS232 interface) and for eg: Configuration-R.005 (005 is logger identification code)
- EKO21N-iP with extension G (GPRS+RS232 interface) eg: Configuration-G.009 (009 is logger identification code)

Using the Control Software for the first time

After installing the program you can start using the program.

Press the *START* button and choose *PROGRAMS*. Select the iBOX-EKO21N option to start the program.

(Refer to the Windows Help about making a shortcut to the Desktop).

EKO21N control software manual is available at : www.ekopower.nl/manual-iBOX-EKO21N

For authorized users the iBOX-EKO21N control software is available for changing logger configuration & reprogramming the SD card.

The EKO21N logger configuration (ranges of input channels and the logger parameters, like sample and record interval) are stored on the SD memory card. The logger configuration can only be changed by EKOPOWER or by authorized users by using the iBOX-EKO21N control software menu part: logger configuration (password available from your supplier). In this menu can be set:

- ranges and units (preset at factory: do not change as this must be according to the physical inputs boards and connected sensors/signals!!)
- alarms: software alarms via e-mail (or SMS using GPRS) and hardware alarms: open collector output (if present in hardware)
- timing variables (do not change)

Note that input types cannot be changed or added in software: it must also be present in hardware!

Additional notes about the operation with the EKO21N

> 001_current.log : file with current values (001= logger number)

> Data file name format:

The data file name format is: date time.log, e.g.: ascii datafile on the server: 20060104144600.log which can be imported in Excel etc.
So in this case the file is made 4 january 2006 at 14h46.

> Data files are in ASCII format, direct to import in Excel

> One logging is in most cases less then 100 bytes (depending on configurtaion and resolution)

So the number of logging at one 128Mbyte SD card is appr 1.280.000 records.

If record interval is 10 minutes: a record period of 213000 hours (many years!)

> The upload frequency (and other upload data) for EKO21N-iP can be changed using the iBOX-EKO21N control software, menu: Change parameters – GPRS settings. Afterwards the memory card needs to be prepared : choose Memory Card Menu.
(all new parameters are saved on the card and the logger reads this data at start-up)

> The default values for upload are:

- instantaneous values after each 200 samples: with sample interval 3 sec this result in one upload each 10

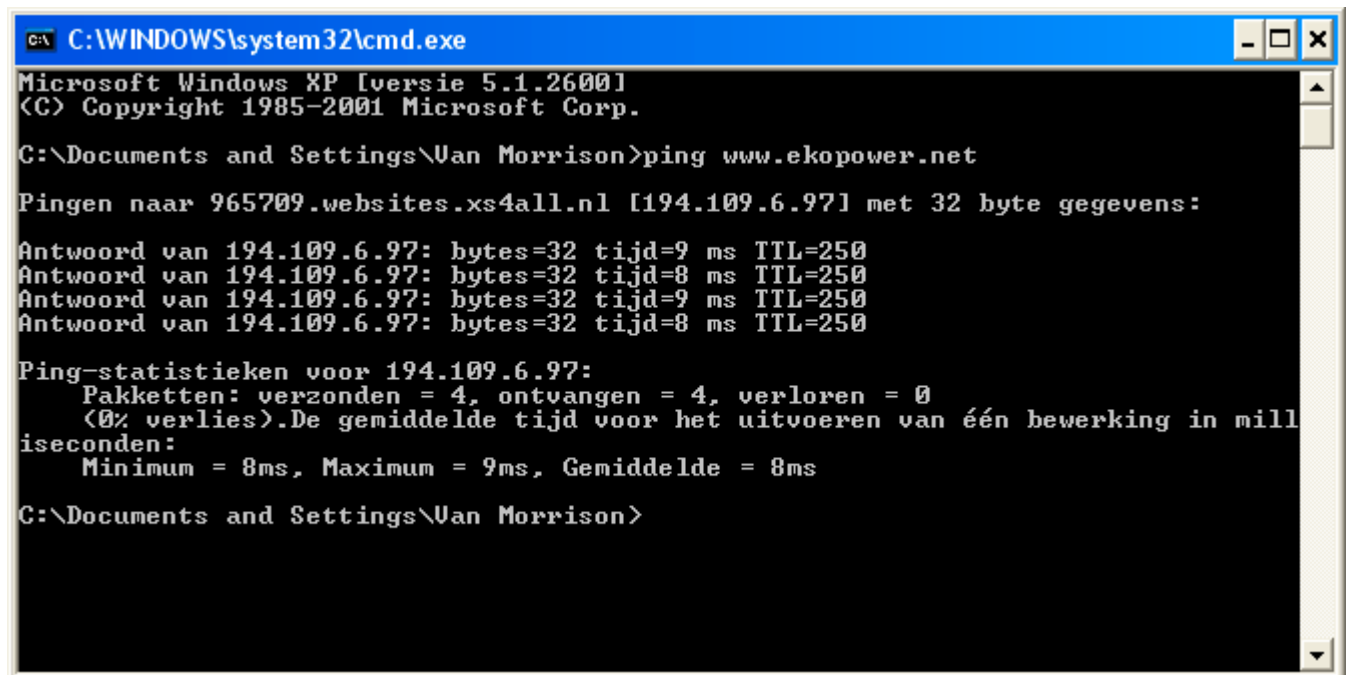
Minutes. For this upload interval (10 min) standard daily graphs are available from Ekopower.

- data files: after 144 records: with record interval of 10 minutes this result in a daily datafile upload (**note: file at least 512byte in size !**).

> HOW to find the iP adres of a server?

Start – execute – cmd<enter>

Ping www.servername.com<enter>



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [versie 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Van Morrison>ping www.ekopower.net

Pingen naar 965709.websites.xs4all.nl [194.109.6.97] met 32 byte gegevens:

Antwoord van 194.109.6.97: bytes=32 tijd=9 ms TTL=250
Antwoord van 194.109.6.97: bytes=32 tijd=8 ms TTL=250
Antwoord van 194.109.6.97: bytes=32 tijd=9 ms TTL=250
Antwoord van 194.109.6.97: bytes=32 tijd=8 ms TTL=250

Ping-statistieken voor 194.109.6.97:
    Pakketten: verzonden = 4, ontvangen = 4, verloren = 0
    (0% verlies).De gemiddelde tijd voor het uitvoeren van één bewerking in mill
iseconden:
    Minimum = 8ms, Maximum = 9ms, Gemiddelde = 8ms

C:\Documents and Settings\Van Morrison>
```

A.1 CHANNEL SPECIFICATIONS

>>> See separate sheet!

*** Password for change of channel specifications: on request

DO NOT CHANGE CONFIGURATION AND RANGES WITHOUT CONSULTING YOUR SUPPLIER.

Procedure for changing the sensor recalibration or exchange: (only for authorized users)

When a calibrated sensor must be exchanged, the channel configuration should be changed of that logger, according to the calibration data.

Follow this procedure:

- * download all old data from cards, using the **original** configuration
- * choose Memory Card, logger configuration and enter the password (available from your supplier)
- * select in channel configuration the corresponding pyranometer input channel
- enter new maximum of the range (see above)
- * save the new configuration
- * put the memory card of the logger in the SD Card slot of the PC
- * prepare the card with the new configuration and put the memory card in the logger again

Example for anemometer:

Procedure for changing the anemometer calibration:

When a calibrated anemometer must be exchanged, the channel configuration should be changed of that logger, according to the anemometer calibration data.

Follow this procedure:

- * download all old data from cards, using the **original** configuration
 - * choose Memory Card, logger configuration and enter the password
 - * select in channel configuration the corresponding wind input channel
- note that: the calibration curve of a linear anemometer is expressed by: (refer to calibration certificate)
- $$v = af + b \quad v = \text{wind speed (m/s)}, a = \text{slope}, f = \text{frequency (Hz)}, b = \text{offset (m/s)}$$
- so in order to calibrate the datalogger according to the calibration data of the anemometer:
- enter the new offset of the new anemometer (e.g. 0.365 m/s)
 - enter new maximum of the range (e.g. 50,45 m/s) The new range for a calibrated anemometer is obtained by new slope multiplied by 51,15/0,77 (for standard calibration certificate) and 51,15/0,385 (for MEASNET certificate)
- (e.g. when new slope of anemometer with standard calibration certificate is 0.76 the new maximum of the range is: 50.48 m/s)
- For the MAX40+ anemometer with standard calibration(without certificate): offset = 0,4 , slope = 0,77 and range = 51,15 m/s
- * save the new configuration
 - * put the memory card of the logger in the SD Card slot of the PC
 - * prepare the card with the new configuration and put the memory card in the logger again

A.2 MOUNTING AND CONNECTIONS

The installation is very simple and is carried out in the following steps:

- Mount cabinet at DIN rail (or in extra cabinet with DIN rail)
- Connect sensors and signals, according to separate connection diagram and connect external power supply
- Prepare memory card if not already done and put (prepared) SD memory card in slot (supplied with EKO21N)
- Connect the Ethernet connector to a network (see next chapters)

If the EKO21N datalogger is placed in the field, it should be protected against vandalism and harsh environmental conditions (direct sunshine, rain etc.) The best solution is to place the logger in an additional case with lock, which can also be supplied by Ekopower. The cabinet can be fixed to a wall or pole, with cable plugs faced to ground. Always close the cabinet carefully before you leave.

Some general used sensors are: (refer to your order list and our website for more details of the sensors)

- wind speed : MAXIMUM, type 40+
- wind direction : DIR 21+ (low cost), both with long-life potentiometer
- temp/humidity : TS21 and HUM21 with precision thermistor for temperature

For windvane DIR 21+: The > mark at the windvane should be directed to **South** (equal to 180 degrees).

Or direct upper part of the vane to south and turn lower part of the vane, so the reading (at the display of the PC with serial connection) is 180 degrees. Then fix the bold.

Use a compass and or map to determine South and North. Do not use the compass close to metal!!

Use the waterproof cable connector to extend the cable (if ordered), see also part A.14.

The radiation shield ("weather screen") of the temperature/humidity sensor can be mounted at the mast by using the stainless steel mast clamps.

Booms, mounting brackets

If the windvane is mounted at a boom of a mast, mount the vane so that the vane is in the right position after erection of the mast ! For mounting the vane to a boom of a mast an extra mounting adaptor can be supplied.

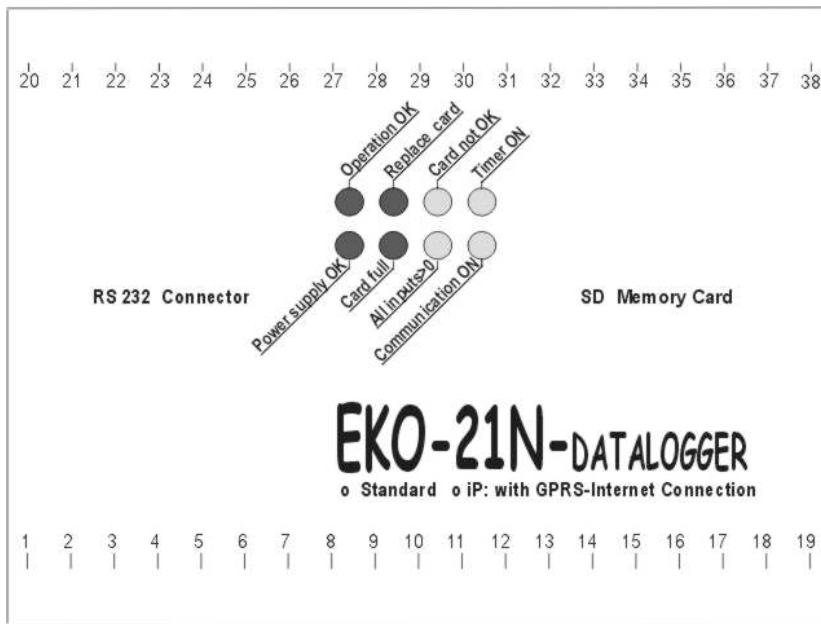
Fix the booms to the mast using the mast mounting materials (stainless steel mast clamps).

For detailed instructions for mounting the mast refer to the manual of the mast.

Although the EKO21N is protected against overvoltage, the additional lightning conductor will protect the instrument better against close atmospheric discharges.

If a Wind Energy Conversion System (WECS) is monitored follow the recommendations of the IEA, concerning the position of the sensors. If the system is equipped with sensors for (air) temperature, rel. humidity, atm. pressure a.s.o., place these sensors in a weather screen. Mount the cabinet with cable inputs faced to ground.

CONNECTIONS



Input Connections

Open the extra case (if supplied). Now the connectors of the EKO21N are accessible.

The cable should be connected to these connectors. First put the cable through the plugs of the extra cabinet.

Connect the cable, according to the separate connection table.

Insert the wires into the screw connectors (with wire protection is recommended!).

Take your time for connecting the sensors and transducers to the datalogger system.

Wrong connections can result in wrong measurements!

Connections of the SENSORS: **>>>>SEE SEPARATE PROJECT SPECIFICATION SHEET!**

Calibrated sensors should be connected to the right datalogger and input: refer to calibration reports and connection table at the datalogger

Cables may be extended using the connection kit with waterproof wire isolation.

Connections to the computer or network: via Ethernet cable.

A.3 SIGNAL CONDITIONING

The average values are determined using the sample technique; for the determination of the average wind direction the discontinuity at 0-360 degr. is taken in account (polar averaging).

The maximum gust is determined by measuring the 1 sec average value of the wind speed during the record interval.

Note that the record interval is the same for all the channels in use, so after each record interval the channels are recorded simultaneously

Instantaneous values can be read using the EKO21N webser, this is ALSO possible during recording.

The instantaneous value of integrating inputs (e.g. pulscount) is the current value of the integrator at the end of the record interval.

"Instantaneous" values of maximum, standard deviation are not available during the meter function as they are determined (and recorded) at the end of each record interval.

Instead of average values also "instantaneous" values can also be logged.

In that case there is only 1 sample during the record interval. Only after each record interval a sample is recorded in that case.

SEE THE ORDER SHEET FOR SPECIFICATIONS OF THE POSSIBLE extra ITEMS.

A.4 CALIBRATION CERTIFICATE

Sensors are calibrated according to factory standard calibration or according to ordered calibration certificate.

A.5 CABINET & CABLE

- extra cabinet (stainless steel/polyester)
- cable:

A.6 RECORD AND SAMPLE INTERVAL

Record interval: adjustable, sample interval: adjustable

A.7 BATTERIES/POWER -supply :

The EKO21N has external power supply: mains adaptor, batteries or Lithium power pack..

A.8 MEMORY

* non volatile PREPARED SD card (standard 128 mByte)

Size: o 64 Mb o 128 Mb o 256Mb o 512 Mb o 1GB o 2GB

SD reader for notebook (PCCARD to SD adaptor) or for PC (USB) external SD card drive is available

A.9 SILICAGEL

In order to keep the humidity inside the cabinet at a low level a set of dessicators (which are filled with active silicagel) is placed in the cabinet. The dessicators has to be replaced by (supplied) regenerated ones at the start of the datalogger operation. Replacement has also to take place if the enclosed humidity indicator (at the upper cover of the cabinet) is turning to a light-red colour instead of blue. The time in which this may occur depends of the local climatic circumstances, but should be at least one month in very hot and humid environments. The dessicators can be replaced by taking them out of the cabinet. A dessicator can be regenerated in a stove at a temperature < 130 C. Keep it dry by storing it in a well closed plastic bag. It is recommended to replace the dessicator at the same time when the batteries are replaced.

A.10 HOW TO USE THE WATERPROOF SPLICE CONNECTORS FOR CABLE EXTENSIONS

- for reliable, easy and quick cable connections-

Use them as follows:

0. Open the connector by turning counter clockwise and take out the wire splice connectors.

1. Strip the outside isolation of the cables over a length of about 4 cm.

2. Do NOT strip the individual wires!!

3. Take a (un-stripped) wire from one of the cables and place it in one of the holes of a splice connector.

Make sure you pushed the wire all the way in!

You can check this by looking through the clear side of the splice connector.

IF shielded cable: connect shields to screw connector!

4. Take the corresponding wire from the other cable and place it (also un-stripped) in the other hole of the splice connector, which you used in step 3.

5. Use a set of pliers to snap the yellow cap into the splice connector, press for securing the wires. Press firmly so the wires are fixed.

6. Repeat steps 3-5 for the other wires.

7. Close the connector by turning clockwise. Fix the connector e.g. with 2 ty-raps.

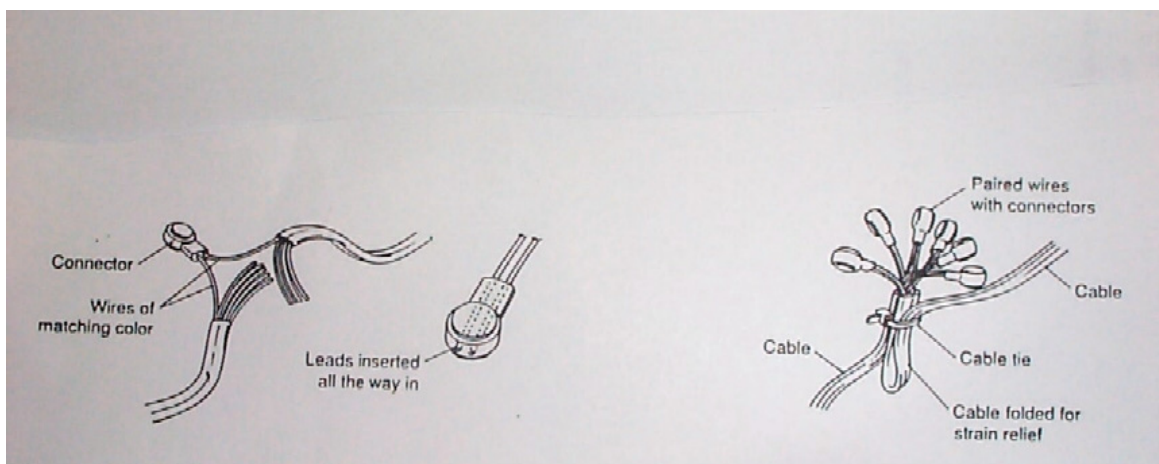
8. Fasten the cable plugs (do not turn the cables)

For the best and most reliable connections note the following recommendations:

- * Do not dig this connection in the ground

- * Fasten the box and the cable using ty raps, so the cables cannot move.

- * It is a good practical to leave an extra length of cable, for future use and for fixing the cable together.



A.11 OTHER OPTIONS, SPARE PARTS & ACCESSORIES: (SPECIFY AT ORDER)

- * sensors and transducers (for all kinds of applications)
- * extra weather screen and/or "vandalism resistant" cabinet for EKO21N
- * for air temperature and/or humidity sensor: small weather screen
- * connection cables from EKO21N to computer (LC-21) and to modem (RC-21)
- * remote control software / modems
- * remote alarm reporting feature
- * computer system
- * notebook PC with SD Card drive
- * SD Card drive (USB)
- * RS232 / USB converter (for PC without RS 232 connector)
- * Lithium power pack
- * solar power supply including backup
- * 220 V AC adaptor with power line filter
- * standard software for dataprocessing
- * meteo-mast for sensors
- * batteries
- * testplugs, extra dessicators, cable for sensors

IMPORTANT INSTRUCTIONS

To start operation:

1. Make all sensor input connections
2. Check if a prepared SD memory card in the EKO21N slot
3. Apply power
4. Check the green LED is flashing: OK
5. Connect to LAN or WAN

A.12 GPRS unit for EKO2N-iP

EKO21N-iP settings

The EKO21N-ip system is –usually- supplied with **programmed ready for use GPRS unit**.
Including the GPRS provider data: username, password and APN data.

Also the server settings (the address for sending the datafiles) are **default** entered for the **www.ekopower.net** for testing purposes. **After receipt you need to enter your own server data, see procedure below.**

Configuring GPRS unit using the iBOX-EKO21N software

In order to set or change the preset FTP and or GPRS settings follow this procedure.

To enable the GPRS modem for sending data using your own FTP server you need to know:

- FTP server and login properties (ftp address, username and password of server: you may use the server of your website)
- GPRS server and login properties (APN setting are provided by the GPRS network provider)
- Install the iBOX-EKO21N control software
- Copy supplied configuration file to the same map where software is installed
- Run software and fill in Setup dialog (note: choose port number for **serial port** eg nr1)
- Put a sim card in the slot of the GPRS modem: GPRS data card, with **de-activated pin code** (you can do that with a mobile phone)
- Connect GPRS modem to PC using the supplied serial cable with GPRS adaptor.
Connect this cable to the pc-com port (selected in the setup) and the GPRS unit and connect power to GPRS unit (apply voltage between 6 and 15V Volt, red =+!)
- Press Change parameters – GPRS settings and fill in the dialog :FTP server (default pre-adjusted the www.ekopower.net server with logger code as directory: e.g. htdocs/007, if logger code =007) and APN settings, available from the GPRS provider, e-mail data is not required for correct operation of FTP data transfer.
Note: if no APN password and username is specified leave these fields open!

After entering all the required settings, **press save** and after that the modem can be(re) programmed using the "Initialize modem" button. After succesful programming of the GPRS modem disconnect power from the GPRS modem , **wait for 1 minute and re-apply power again.**

Then (after network is found) try to send a testfile by pressing the "Send Test File" button.

Then check the testfile is received at the server, using FTP program.

If email is implemented do the same for email (send test email). Note that some email providers require password for sending mail!

The software alarms via SMS or e-mail (if implemented) can be set or changed using the menu: Configuration (with required password)- Miscellaneous you can enter the mobile tel number to receive a SMS alarm message for the specified alarm(s)
Afterwards the memory card needs to be prepared (all new parameters are saved on the card and the logger read this data at start-up).

For operation with the EKO21N connect GPRS modem to power via the timer connectors 17=+(=red) and 16=minus(=black).

The timer on/off switch-function at these connections of the EKO21N is activated to save energy.

Note that the red led on the GPRS modem is on constantly during searching network and flashing when network is found.

Now connect the supplied **GPRS** connection cable from EKO21N-ip RS232 port to the port of the GPRS modem.

Instructions for operation:

- Get data from the server.

By using a standard FTP program (eg Cute FTP) you can download the data from your server.

> 001_current.log : file with current values (001= logger number) (with optional online graph possibilities)

> Data file name format:

The data file name format is: date time.log, e.g.: ascii datafile on the server: 20060104144600.log which can be imported in Excel etc.

So in this case the file is made 4 january 2006 at 14h46.

> Data files are in ASCII format, direct to import in Excel

- The upload frequency can be changed using the iBOX-EKO21 control software, menu: Change Parameters – Upload intervals
Afterwards the memory card needs to be prepared: Choose memory card
(all new parameters are saved on the card and the logger reads this data at start-up)
The default values for upload are:
- instantaneous values after each 200 samples: with sample interval 3 sec this result in one upload each 10 Minutes. For this upload interval (10 min) standard daily graphs are available from Ekopower.
- data files: after 144 records: with record interval of 10 minutes this result in a daily datafile upload (**note file at least 512byte!**).
- the gprs modem is default swithed on only when required.