EKOPOWER Measuring, Monitoring & Control Systems for Energy & Environment

MANUAL of
DATALOGGER / WEBSEVER
TYPE iBOX (with Ethernet)

Version   : aug 2009 version 7

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

Recommendation: adjust the logger with:
- sample interval standard 3 seconds
- record interval 10 minutes

A.0 GENERAL DESCRIPTION & OPERATION of iBOX system

The iBOX is an easy-to-use, accurate and reliable **internet enabled datalogger system** with built-in web server with versatile inputs :1 up to 40 analog & digital inputs and serial inputs (optional wireless inputs) , see datasheet.
The iBOX **has integrated internet connectivity** with Ethernet connector and a **SD memory card** (128Mbyte up to 2 Gbyte) for data storage. Optional possibility: wirelessGPRS router for mobile or remote applications in Wireless WAN.

It is an essential tool for state of the art iP measurements for e.g. meteorology, environmental monitoring, wind energy feasibility studies, but also for general purpose projects**: complete systems according your requirements and specifications can be supplied.**!
Controlling and working with the IBOX is made easy with the built-in webserver (with help functions).

The iBOX 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.
From version 4 and later the iBOX the SD card can be programmed via a separate software package for adjusting parameters quickly (without using the webserver) like adjusting ip nr, subnet mask, gateway address (=address of router connected to internet)

The logger configuration (which is stored at the SD card) can only be changed by EKOPOWER or by authorized users by using special iBOX 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
- timing variables (do not change)

 The iBOX can send automatically data files via FTP to a specified server(e.g. the server of your website) 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 webdisplays or online (historical) graphs, using graph hosting at our server.
The graphs can easily be integrated into your own website using copy and past of supplied html file.
EKOPOWER can supply standard graphs or design special graphs.   Example of standard graphs:
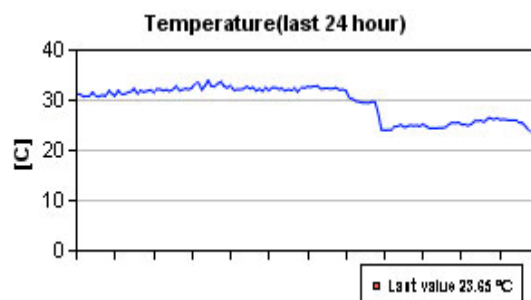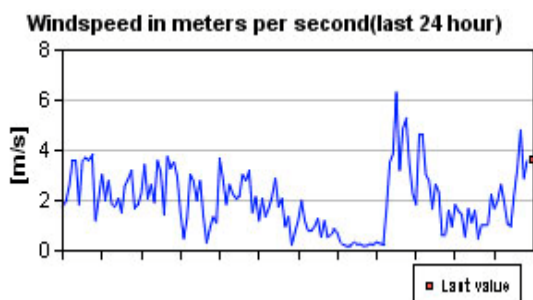
By using the embedded webserver of the iBOX it is possible (by using your browser):
1. to set the logger parameters like:
   - time and date, sample and record interval
   - internet upload parameters: adjusting IP address of server (destination of data) , directory and the upload frequency of
     > instantaneous & last recorded values values (and status): after adjustable number of samples
     > recorded values (data files): after adjustable number of record intervals
2. Read current and last recorded values, the status of thesystem and the present logger configuration
    Note setting ip numbers of the iBOX itself can only be done with use of control software!

Optional wireless connections:
a) via WiFi wireless LAN (WLAN) or
b) GPRS router (GPRS/HSDPA/3G) for Wireless WAN applications (WWAN)

NEW: ALSO An Ultra Low Power version of iBOX is available for remote or mobile applications. See A.12
NOTE: A different (but similar) design of the iBOX is the EKO21N, which has no Ethernet but serial RS232 / USB communication with ultra low power consumption (ideal for remote sites). EKO21N with optional GPRS internet connection (called EKO21N-iP) can send datafiles wireless to a specified server, with ultra low power consumption. By using a small battery pack it will operate during appr 5-10 years with one upload/day. Ask your supplier about the availability.
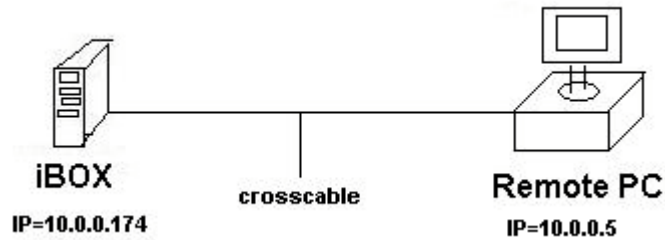For best possible performance of the system as a whole read this manual carefully before using the iBOX.

How to get started?

Ethernet connection can be carried out in several ways:

1. Via direct cross cable:

How to use the iBOX Webserver over crosscable

Step 1
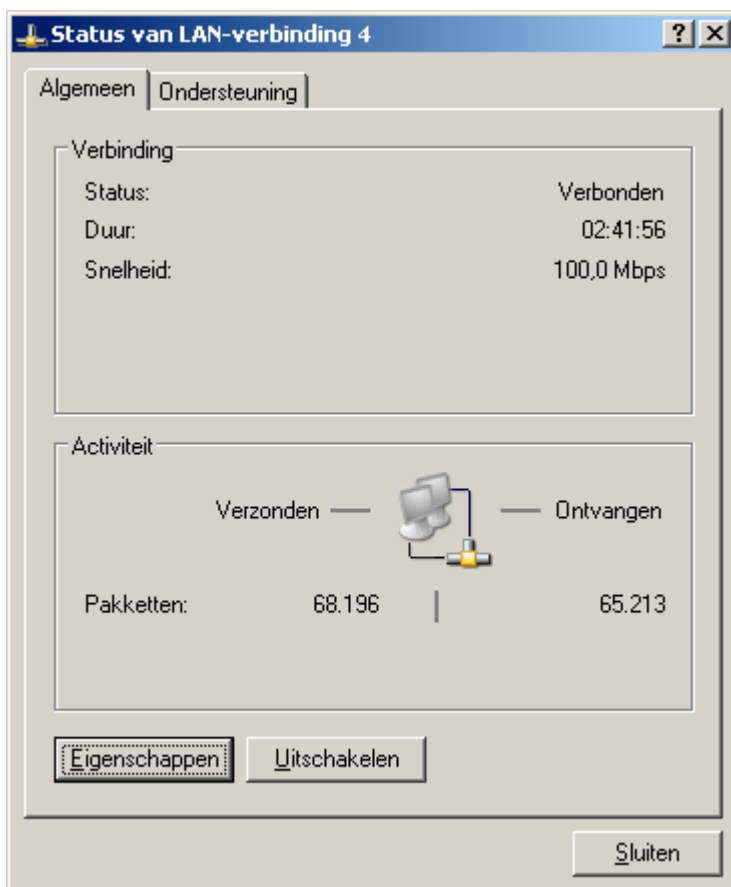Make a direct connection between your iBOX and your PC with a cross-cable.

Step2
Go to Start >(Settings) > Control Panel > Network Connection and click on the LAN pictogram.
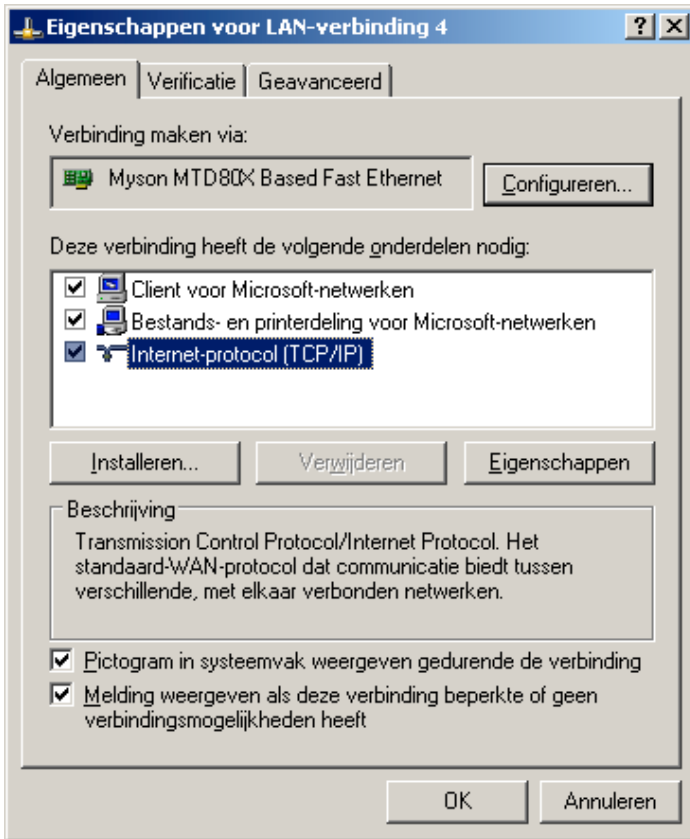
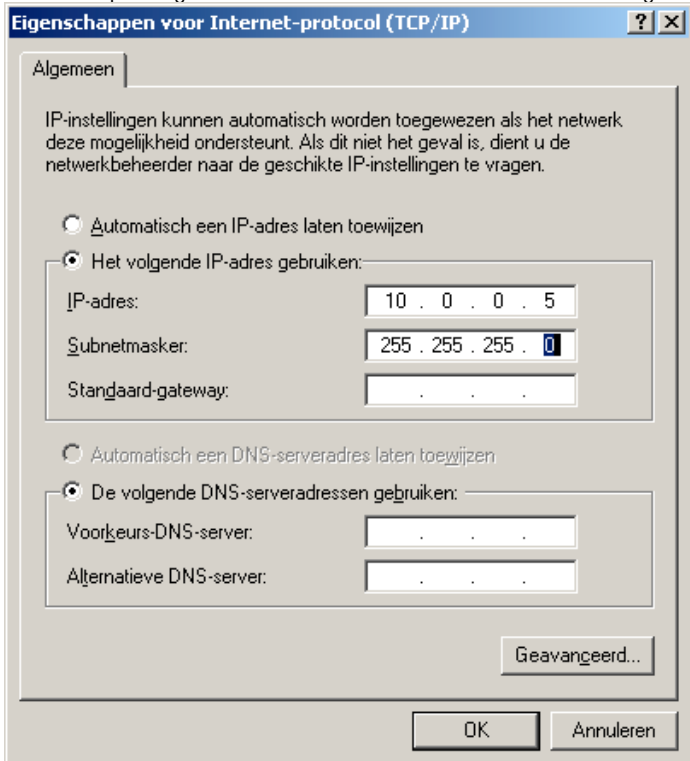**Step 3**
Click on the Properties pictogram.

Step 4
Select the option Internet-protocol(TCP/IP) and then click on Properties.

Step 5
Fill in the options given below and then click on OK. Click on OK again.

Step 6

Test the communication between iBOX and the PC by entering the internal IP address of the supplied iBOX (default :http: //10.0.0.174) in your browser. When the communication is OK picture in Step 7 will appear on the screen.

Step 7

Fill in the Username and Password provided by Ekopower.

Step 8 The webserver is available. *See the online* demo *of the operation of the webserver via WAN.*
SEE HELP file at: http://www.ekopower.nl/manual-ibox/webserver-v7a.html

Status - Values - Parameters - Control - Inputs - Help - Ekopower

Status

Status: OK	
Logger Code: 140	**Logger Description:** demo
Number of Channels: 11	**Sample Interval:** 1 Second(s)
Date On Logger: 03.08.09	**Record Interval:** After 2 Sample(s)
Time On Logger: 11:40:12	**Sample Delay:** Enabled
Card Size: 121 Mb	**FTP Server IP Address:** 77.241. 87.243
Loggings Since Reset: 3719	**FTP Interval (Current):** 0 Samples
Logging Time Left: 17 Day(s)	**FTP Interval (Data):** 1800 Loggings
System Power: Ok	**FTP Directory (Current):** test
Power Voltage: 8.57 V	**FTP Directory (Data):** test
Switch1: OFF **Switch2:** OFF **Switch3:** OFF	**Firmware Version:** 7.0.2-5

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2. Ethernet connection via LAN or WAN:
(for Connection to WiFi WLAN or Wireless WAN –**WWAN**- via GPRS/3G router refer to seperate instructions)

**How to use the iBOX Webserver over Local Area Network (LAN)
and over the internet: Wide Area Network (WAN)**
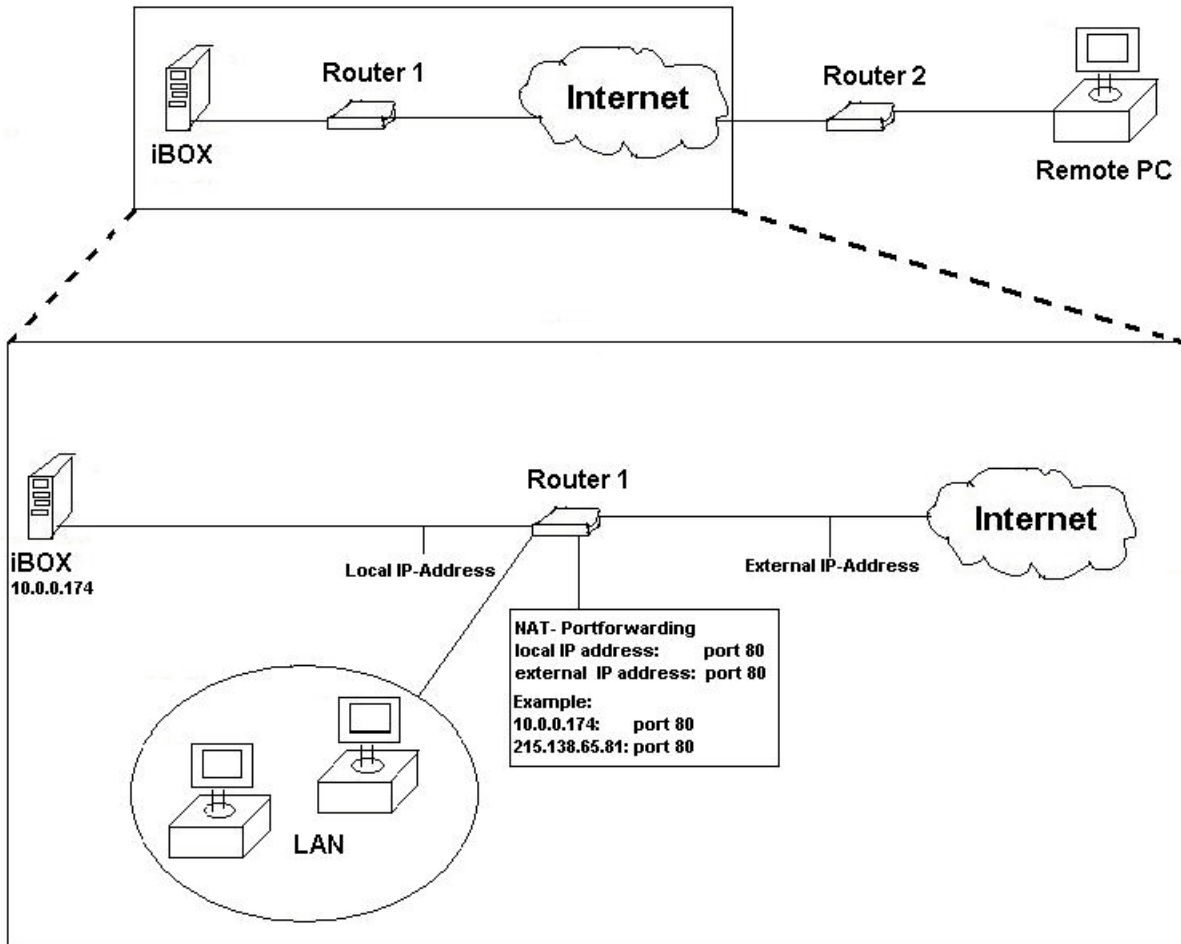
picture 1

Step 1
Plug the iBOX in your router or modem.

Step 2 (LAN Connection)
Test the communication between iBOX and a PC in the Local Area Network (LAN)
by entering the internal IP address of the supplied iBOX, **eg : http: //10.0.0.174 your browser**.
When the communication is OK picture 2 will appear on the screen, see step 4.

Step 3 (WAN Connection)
Start your internet browser*) at a PC in the Local Area Network (LAN), select the internal network IP address of Router 1 (e.g. 10.0.0.138)
and configure your router for the required NAT (port forwarding): Network Address (Port) Translation-settings, see picture 1.
Refer to the manual or help of your router. If the NAT is successfully entered, then you can reach the iBOX with the remote PC:
By entering the **external IP address of the router 1 (eg** in the browser of the remote PC
(see example 215.138.65.81) you will have direct contact with the iBOX webserver!
The external ip address of the router 1 can be obtained via a PC connected at router 1 and go to website
eg : http://www.ip-adress.com/ip_tracer/

Step 4

Fill in the username and password provided by Ekopower.

picture 2

Step 5

The webserver is available, see above . *SEE HELP file at:* http://www.ekopower.nl/manual-ibox/webserver-v7a.html

See the online demo *of the operation of the webserver via WAN.*

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> 052_current.log   : file with current values (052= logger number)
> Data file name format:
The data file name format is: date time.log, e.g.: ascii datafile on the server: **i052-20060104144600.txt**
So in this case the file is made 4 january 2006 at 14h46, from ibox NUMBER 052 (written in advance specified directory!)

> Data files are in TEXT format, direct to import in Excel AND EASY TO COMBINE IN BIG FILE USING A TEXT EDITOR :copy/paste

> 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 can also be changed using the optional iBOX control software (iBOX-EKO21N software),
 menu: Change parameters – Ethernet settings
 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:
- instanteneous 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 !).

> FTP server and login properties should be entered
  (ftp address, username and password of server: you may use the server of your website)

> HOW to find the outside iP adres of an internet connection /server? Use http://www.ip-adress.com/ip_tracer/   or:

The iBOX 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
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) **Always prepare card after changing parameters!!**
Note that input types cannot be changed or added in software: it must also be present in hardware!

Install the control software (called: iBOX-EKO21N) for the iBOX on a windows PC
Note: this software is also for the EKO21N!

Installing the iBOX 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.173 (173 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 : **http://www.ekopower.nl/manual-iBOX-EKO21N-v7**

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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)
 $v = af + b$ v=wind speed (m/s), a=slope, f = frequency (Hz), b=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 The new range for a calibrated anemometer is obtained by new slope
   multiplyed by old range/0,77
 For the MAX40+ anemometer with standrard calibration is: offset = 0,4 , slope = 0,77 and range =50 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 iBOX)
- Connect the Ethernet connector to a network (see next chapters)

If the iBOX 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 oder 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 themistor 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 (see also Universal Sensor Munting Arm)
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 iBOX 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 equiped with sensors for (air) temperture, rel. humidity,atm. pressure a.s.o., place these
sensors in a weather screen. Mount the cabinet with cable inputs faced to ground.

CONNECTIONS
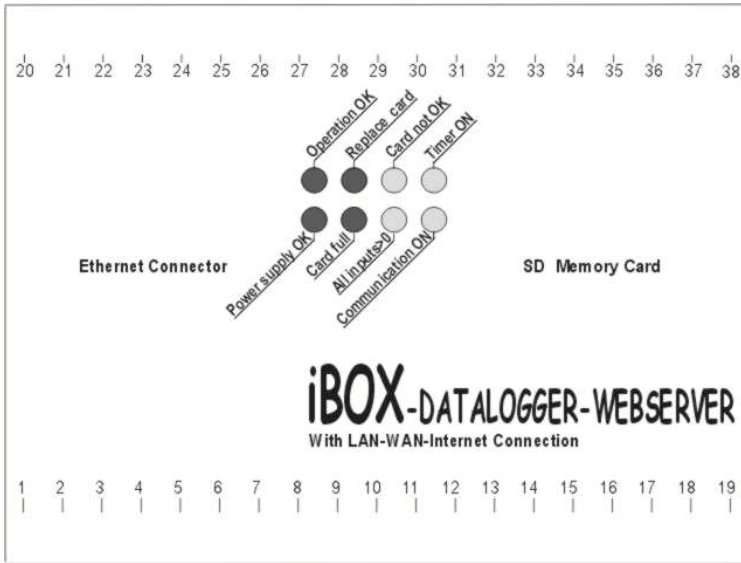
Input Connections
Open the extra case (if supplied). Now the connectors of the IBOX are accessable.
The cable should be connected to these connectors. First put the cable through the plugs of the extra cabinet.

Connect the cable,according to the seprate connection table.
Insert the wires into the srew 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 iBOX 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 iBOX has external power supply   usual 5-6V (depending on configuration!)

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 slice connector,
   which you used in step 3.
5. Use a set of pliers to snap the yellow cap into the slice 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.

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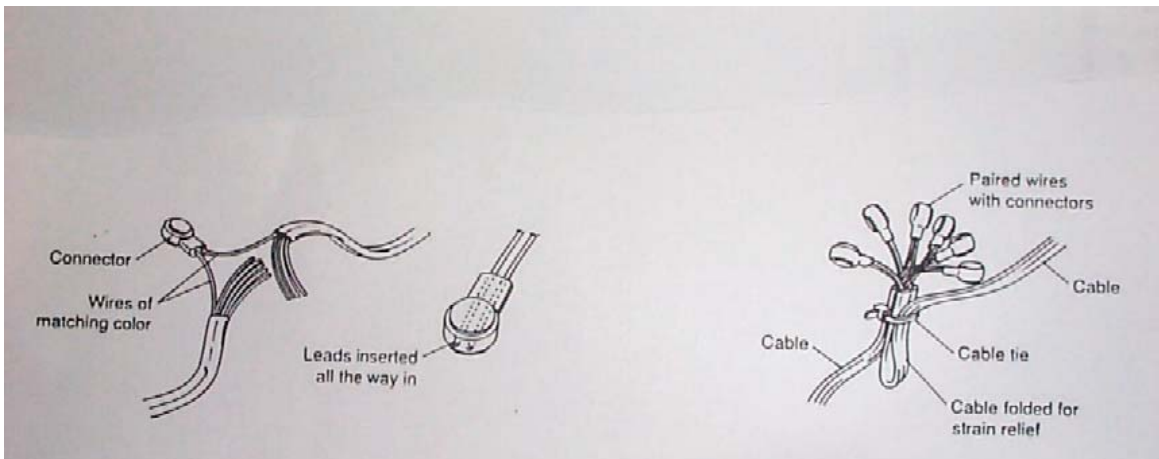
A.11 OTHER OPTIONS, SPARE PARTS & ACCESSORIES: (SPECIFY AT ORDER) see also www.ekopower.nl
* sensors and transducers (for all kinds of applications)
* extra weather screen and/or "vandalism resistant" cabinet for IBOX
* for air temperature and/or humidity sensor: small weather screen
* connection cables from IBOX to computer
* WiFi module
* routers wireless (GPRS/3G)
* remote alarm reporting feature
* online webdisplay and online graphs
* notebook PC with SD Card drive
* SD Card drive (USB)
* 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

A.12   Wireless GPRS/3G router and Ultra low power version

When a (wireless) Router (or WiFi Bridge) is used for ultra low power application at remote site you can adjust
(in advance) some parameters:
> Wait time is the time the system wait for a respons from the network
> Keep alive time is the time the system is available for contact, see also the notes below:
- for iBOX: now also Ultra Low Power version (ULP) is available (version 7 and higher) and with an energy saving
  switch for switching the router (eg 12 V DC) on only during communication
  so it can operate with a battery or small solar power supply at remote sites.
- When a GPRS/3G router is used an ultra low power wireless system is possible, ideal for remote sites.
  The router will switch automatically on when the iBOX want to send data (at adjustable intervals).
- When you use a wireless router we recommend to use a sim card with fixed ip number,
  so you can make direct contact with the webserver for reading values and changing parameters
  (see also manual of iBOX)
  (additional instructions available when GPRS/3G router is supplied with the system)

**NOTE: when the iBOX is supplied in ultra low power mode you can make only direct contact with the iBOX when you connect
the Ethernet cable first to the (at least one minute unpowered) iBOX and then connect the power supply to the iBOX !
Low power mode is enabled again after you disconnect and connect the power of the iBOX is again and carried out *without*
Ethernet cable connected!**

IMPORTANT INSTRUCTIONS

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