

iNode LAN

Instruction manual

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1. About iNode

We would like to introduce a family of iNode devices working in the Bluetooth Low Energy ®. We will show you that it's not just tags to find lost keys, whether location tags, but still something more.

Our devices are capable of:

- these are mainly battery device.
- work without battery replacement for up to 12 months, depending on the type of application and usage.
- have memory for logging events, readings of measurements, etc.
- contain precise temperature, humidity sensors, accelerometer or magnetometer which allow home automation control, care of older persons or vehicle detection.
- as a remote control device, although a small power consumption, have a large range and features unavailable to other competitive facilities - password protection, AES encryption, control directly from the smartphone with BT 4.0.
- a unique encryption technology ensures the safety of the JPEG images recorded by our cameras.
- BT4.0 - LAN or BT4.0 - GSM gateways connect iNode sensors with the Internet.

iNode can also help to control the movement of people or goods, saving the time of appearance and disappearance (active RFID ® long range). New features related to the development of the product is also not a problem – this allows to remote firmware update with PC or smartphone with Bluetooth 4.0 ® and Low Energy Bluetooth enabled ® (Smart Bluetooth ®).

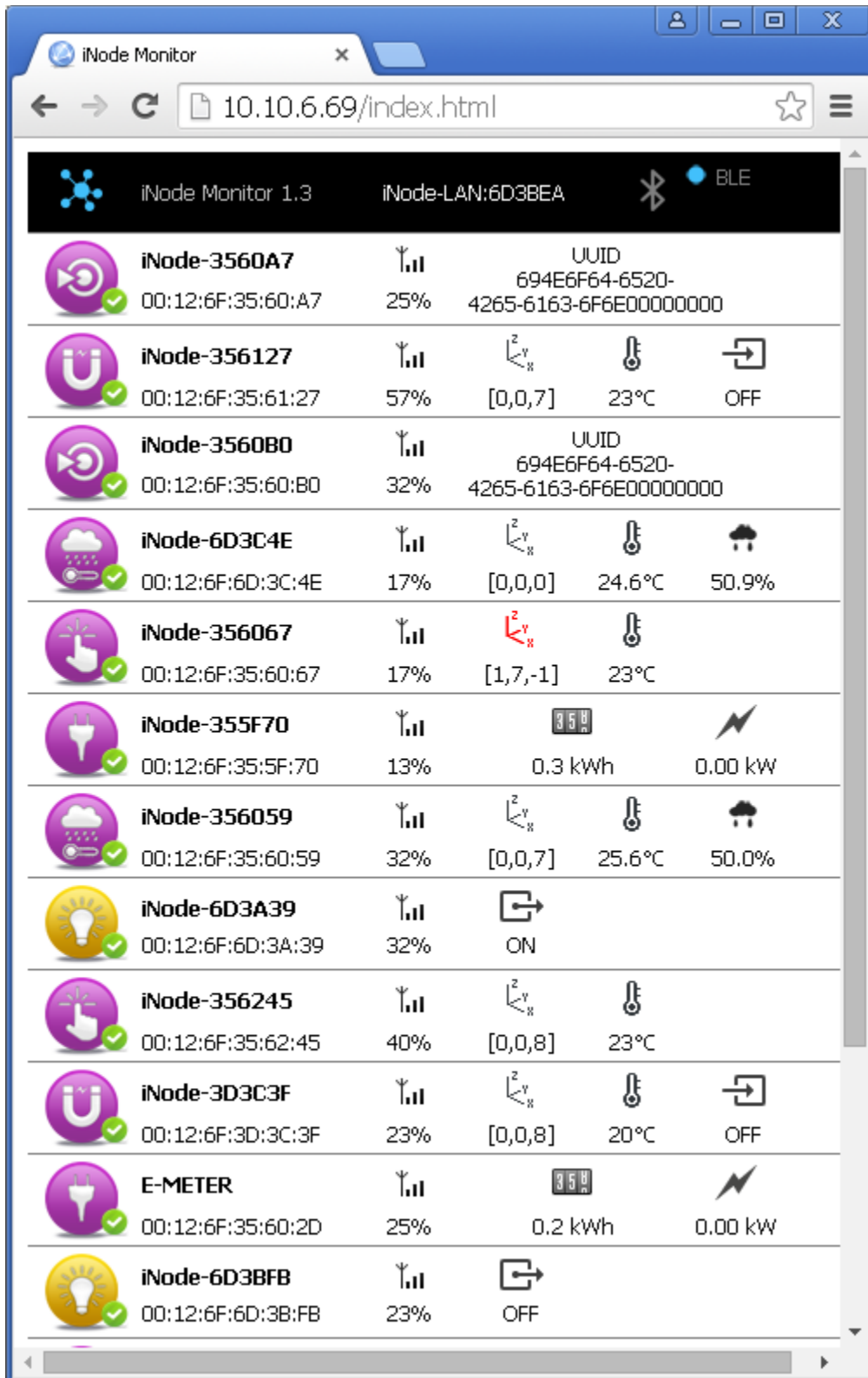
iNode LAN allows the existence of BLE devices (Bluetooth Smart, IoT-Internet of Things) in the IP protocol networks: LAN, Wi-Fi and the Internet. Using the iNode LAN you can for example extend the range of the sensors iNode Care Sensor in the building (unique technology transmit packets from the LAN to the BLE - BLE over UDP) or keep track of on-line location of iNode Nav. iNode Care Central provides e-mail sending event notifications received alarm from the iNode Care Sensors. Output can be set on/off autonomously on the basis of the iNode identifiers list, or remotely (through LAN) for example from the iNode Lock.exe application. Web application iNode Monitor gives you remote access to the iNode sensors. Using simple HTML page with WebSocket technology and JavaScript you can easily in real time sniff and display BLE advertising packets content. The same control features can be achieved using TCP/IP telnet.


Trademarks or registered trademarks:

Bluetooth Low Energy ®, Bluetooth 4.0 ®, RFID®,CSR®,Windows®, Android, Google, Microsoft are used for informational purposes only. All trademarks are property of their respective owners.

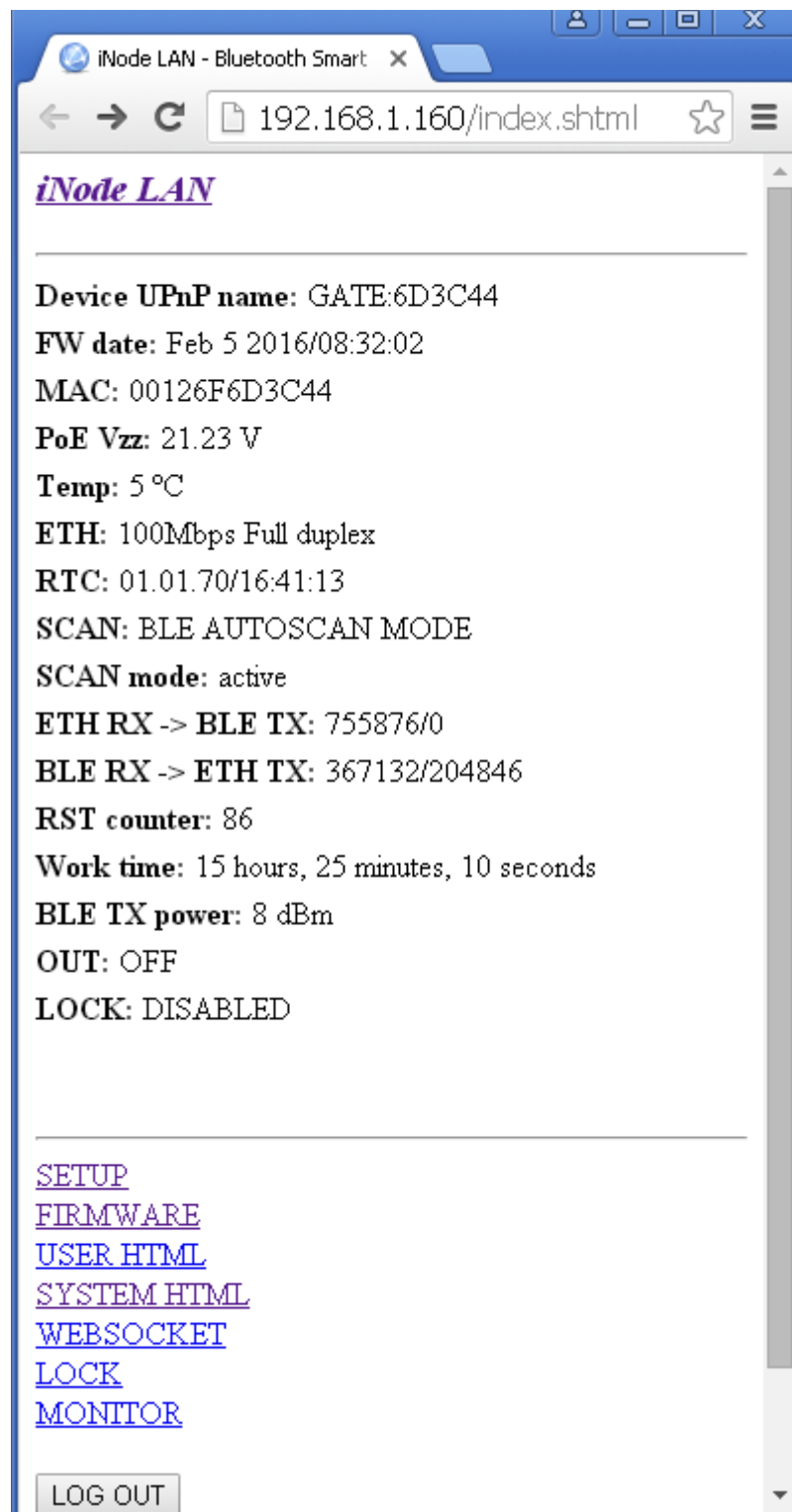
2. iNode LAN configuration

Device has factory enabled DHCP mode – this way it obtains network address in 10/100Mbps LAN. Device has built-in UPnP protocol which enables Windows to find it and to show in My Network Places. Double click on the device icon display default HTML page – iNode Monitor in a web browser.



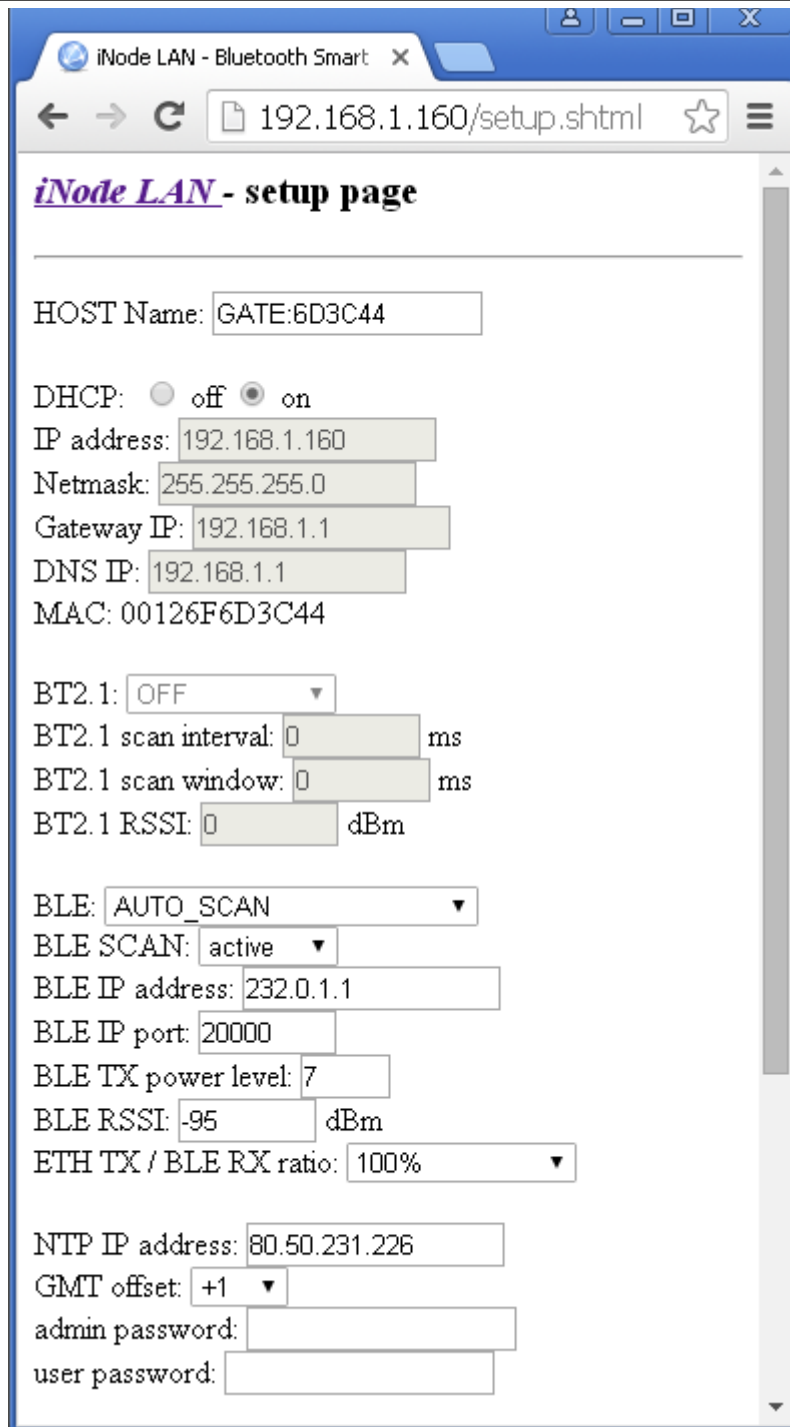
iNode Monitor HTML page is a JavaScript application which runs in a web browser. If you click on the picture  in the upper left corner of the window the browser shows administrative pages. The main page displays statistical information about iNode LAN device, its name, temperature, work time from last reset, PoE power supply voltage and the output state.

You can choose further configuration pages (**SETUP, FIRMWARE, USER HTML, SYSTEM HTML, LOCK**) or test it (**WEBSOCKET, MONITOR**).



At the **SETUP** page you can modify IP address mode gathering. If **DHCP off** is checked then **IP address**, **Netmask**, **Gateway IP**, **DNS IP** are active and you should type correct values in them to **iNode LAN** can work in the ethernet. Default setting is **DHCP on** – all network parameters are for example obtained from the DHCP server from ADSL router.

You can change default device name typing a new one in **HOST name** text box. Device name length is 16 characters maximum.



In BLE **iNode LAN** can work in one of the following modes:

1. **AUTO SCAN** – after powering, BLE environment is scanned in active mode and results are sent to LAN using IP/UDP as multicast/unicast or broadcast frames. You can easily receive them on any IP enabled device with any OS like Linux, Windows or Android. A data structure is something different from this given in **iNode Serial Transceiver USB/UART**. This mode is switched off when other client is connected to **iNode LAN**. It can be for example iNodeSetup.exe or iNode Thermo through TCP/IP or web browser websocket.
IP multicast is a technique for one-to-many communication over an IP infrastructure in a network – defined by multicast group and port. For iNode-LAN it is 232.0.1.1:20000. Unicast messaging is used for all network processes in which a private or unique resource is requested. In computer networking, broadcasting refers to transmitting a packet that will be received by every device on the network. In practice, the scope of the broadcast is limited to a broadcast domain. Broadcast a message is in contrast to unicast addressing in which a host sends datagrams to another single host identified by a unique IP address.
2. **REPEATER** – after powering, device starts receiving from LAN IP/UDP frames sent by other **iNode LAN** device or devices. If content of received UDP frame is correct then data from them is sent to BLE environment as ADV_NONCONN_IND frame. **iNode LAN** does not sent to BLE advertisement ADV_NONCONN_IND type.
3. **AUTO SCAN / REPEATER** – after powering, device starts to work in both above modes.
4. **OFF** – after powering, device is not active in any manner in BLE environment but still can work with iNodeSetup.exe (in AUTO SCAN and REPEATER mode it is also possible). **iNode LAN** has to be connected to the same LAN as a computer running iNodeSetup.exe application. It should be automatically found and can be chosen by clicking at the picture Using any telnet application like Hyper Terminal you can connect to **iNode LAN** at port 5500. It can work like **iNode Serial Transceiver USB** through COM port.

BLE Scan chose type of the BLE scanning – active or passive. In active mode **iNode LAN** sends request to each scanned device so you should remember that this type of scanning can drain more the battery of the scanned device. **BLE IP address** and **BLE IP port** determine a receiving server IP address and port. **iNode LAN** will send to this server UDP datagrams with the received BLE data frames (in **AUTO SCAN** mode). **iNode LAN** in **REPEATER** mode if multicast addressing is used should have the same group and port settings like **iNode LAN** in **AUTO SCAN** mode. At **BLE RSSI** you can set in dBm the threshold level for received BLE frames which exceeding activate the built-in output. The output is activated for the period of ms set in **OUT pulse** if received identifier is on the identifier list (edition through the LOCK page).

ETH TX / BLE RX ratio - you to chose here the time of the scan during which the received BLE packets are sent through the ethernet. This feature can limit the number of transmitted packets from BLE to LAN.

In **BLE TX power level** you can set the TX Power value in **REPEATER** or **AUTO SCAN / REPEATER** mode and during active scan. Relations between TX power level and TX Power in dBm is showed in a table below:

<i>BLE TX power level</i>	<i>TX Power [dBm]</i>
0	-18
1	-12
2	-10
3	-4
4	-2
5	+2
6	+6
7	+8

In ***NTP IP address*** you can set the NTP server address. In case of wrong server address the time in device will not be set but the device still will be working. The ***GMT offset*** enable you the change the timezone.

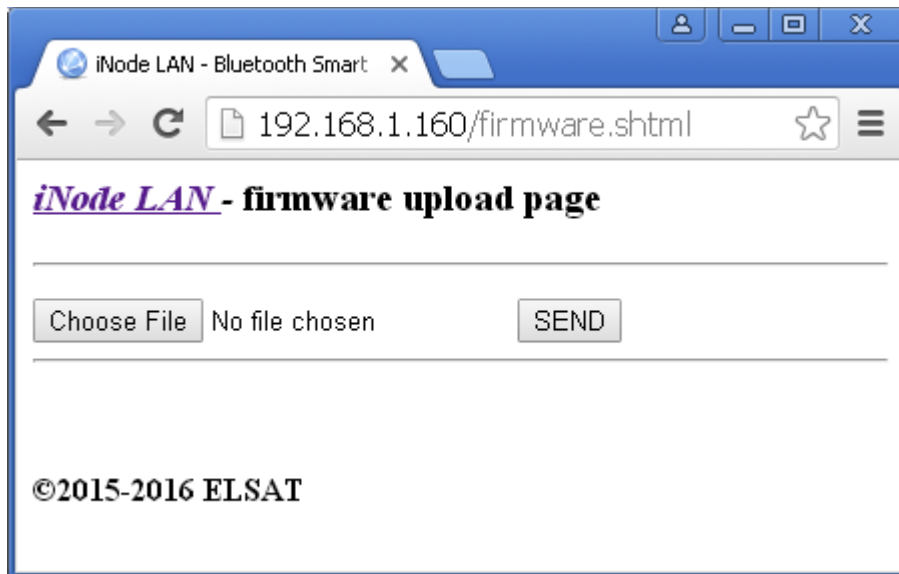
You can set the ***admin password*** (system HTML pages) and ***user password*** (user HTML pages) for built-in HTTP server.

The output type (NC or NO) is set by ***OUT type***. The output is activated for the period of ms set in ***OUT pulse*** if received identifier is on the identifier list (edition through the LOCK page).

To save changes in the device you should click on the ***SAVE*** button. Correct result of operation will be confirmed by a message done: OK. After about 3-5 seconds the device will be restarted and new settings will be used. In case of LAN settings you have to be sure that network parameters are correct.

You can always restore default settings by powering device while the RESET button placed at the bottom of the device is pressed.

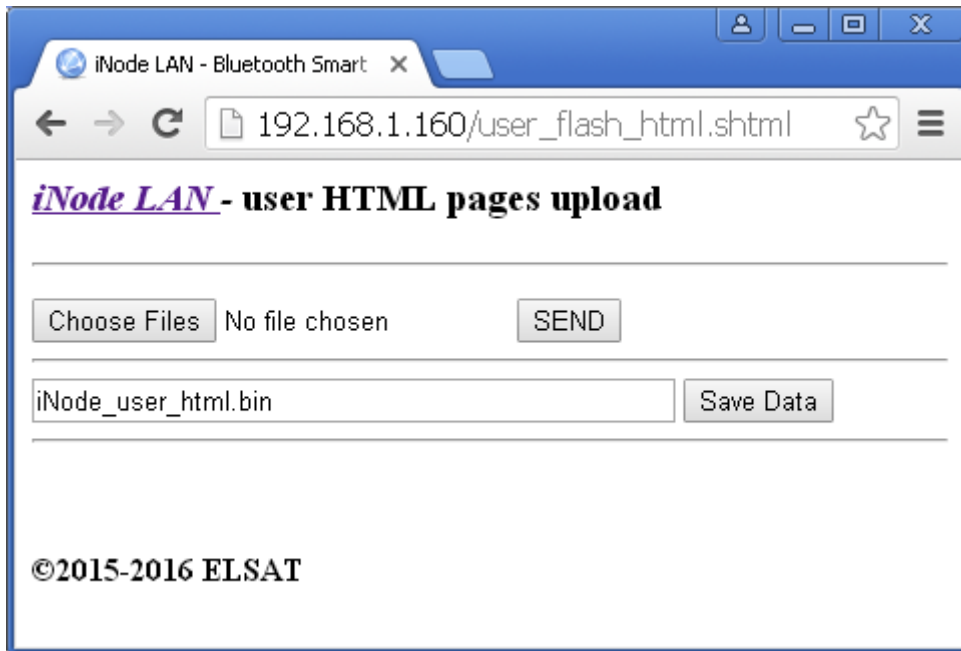
The **FIRMWARE** page allows changing the firmware in the device.



You can select a file with a new firmware after click on the **Choose File** button. Firmware uploading is done after click on the **SEND** button and a message **uploading ...** is showing. After successful termination is replaced by **done: OK** and after a while by **restarting ...**. If firmware is correct (proper for this type of device) and operation will be successful a message **done: OK** will be showed. After about 3-5 seconds the device will be restarted and the new firmware will be used. In case of DHCP enabled you should wait a moment the device gets a new network settings from the DHCP server.

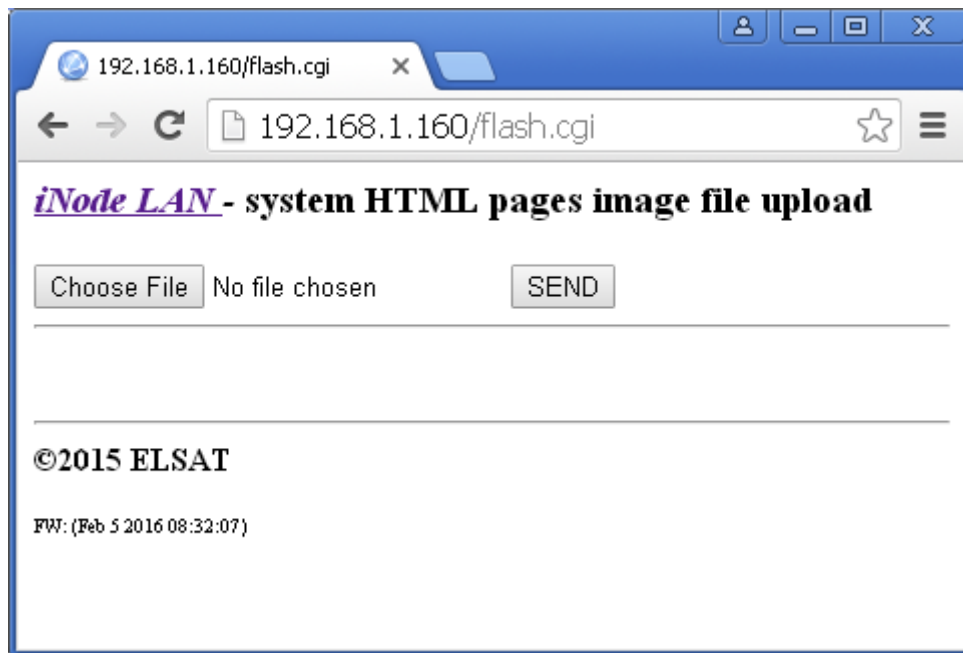
Firmware **fep** files or applications can be downloaded from our technical support: <http://support.inode.pl/> user **inode**, without a password.

The **USER HTML** page allows uploading to the device user HTML pages. There is up to 6.9 MB for them. All files (pages, pictures, scripts) have to be in the same directory. There is a limit for number of them – 512 and their names cannot be longer than 40 characters.



You can select a HTML page files and other files (pictures, scripts etc.) or one binary image file after click on the **Choose Files** button. Uploading is done after click on the **SEND** button and a message **reading files: done, uploading file of xxx kbytes** is showing. After successful termination is replaced by **done: OK**. You can save on local disk drive binary image of the user HTML pages after click on the **Save Data** button. Such a file can also be uploaded to the device like for example iNode Monitor application.

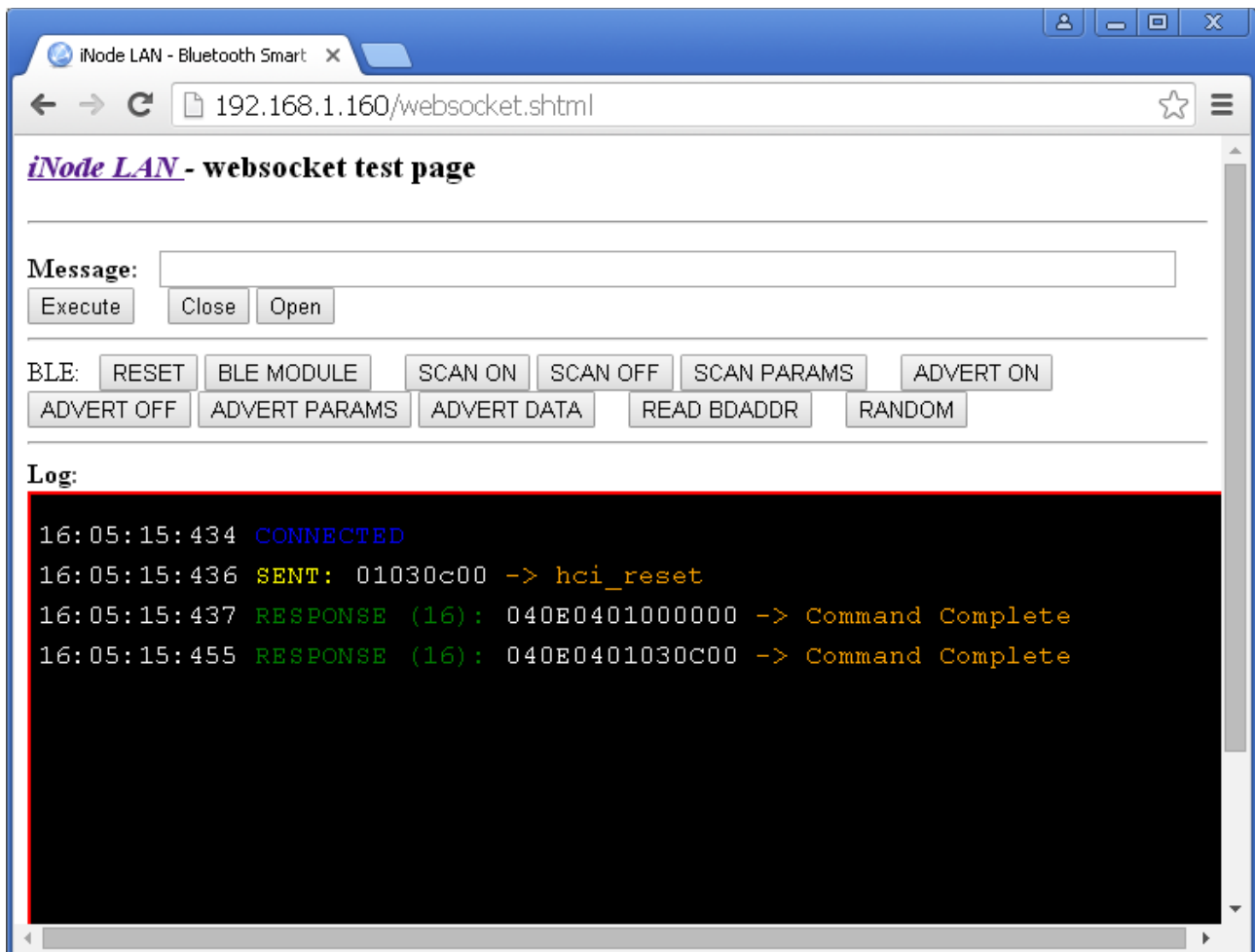
The **SYSTEM HTML** page allows uploading to the device system HTML pages. You can always connect with this page after typing in the browser flash.cgi. The system HTML pages can be uploaded as one bin file or separately like user ones.



You can select a HTML page files and other files (pictures, scripts etc.) or one binary image file after click on the **Choose File** button. Uploading is done after click on the **SEND** button and a message **reading files: done, uploading file of xxx kbytes** is showing. After successful termination is replaced by **done: OK**. At the bottom of page there is an information about creation date of the current firmware in a device: FW: (.....)

The **WEBSOCKET** page allows you to test a communication between web browser and BLE environment. Command which we want to be executed in **iNode LAN** should be typed in *Message* text box. It is send after pressing the **Execute** button. The **Close** button is closing a WebSocket connection but the **Open** one is opening it. The only condition of using WebSocket to communication with **iNode LAN** is using web browser with WebSocket technology supports. Using WebSocket and JavaScript you can write any application using Bluetooth Low Energy devices. The command string sent by WebSocket are the same like sent by COM port (**iNode Transceiver USB**) or TCP/IP (**iNode LAN**). There is a limit of such connections to one – through the WebSocket, or through a TCP/IP (for example from iNodeSetup.exe application) or through a telnet connection.

There are some predefined HCI commands at buttons: **RESET**, **SCAN ON**, **SCAN OFF**, **SCAN PARAMS**, **ADVERT ON**, **ADVERT OFF**, **ADVERT PARAMS**, **ADVERT DATA**, **READ BDADDR**, **RANDOM**.



All **iNode** devices use to communication the Bluetooth 4.0/4.1 standard. More information about it you can find at <https://www.bluetooth.org/en-us/specification/adopted-specifications>

The data structure is described in Core_V4.0.pdf: Volume 2 Part E, Section 5.4.

When connection with remote BLE device is established, communication with them is performed using the Attribute Protocol encapsulated in HCI ACL DATA packets. The followings PDUs (Core_V4.0.pdf: Volume 3 Part F) can be used – see table below. Asterisk in Imp column means that that attribute is implemented in **iNode LAN**.

More information about WebSocket you can find at
<https://www.websocket.org/aboutwebsocket.html>

Attribute PDU Name	Attribute Opcode	Imp	Parameters
Exchange MTU Request	0x02		Client Rx MTU
Exchange MTU Response	0x03		Server Rx MTU
Find Information Request	0x04		Starting Handle, Ending Handle, UUID
Find Information Response	0x05		Format, Information Data
Find By Type Value Request	0x06		Starting Handle, Ending Handle, Attribute Type, Attribute Value
Find By Type Value Response	0x07		Handles Information List
Read By Type Request Section 3.4.4.1	0x08	*	Starting Handle, Ending Handle, UUID
Read By Type Response Section 3.4.4.2	0x09	*	Length, Attribute Data List
Read Request Section 3.4.4.3	0x0A	*	Attribute Handle
Read Response Section 3.4.4.4	0x0B	*	Attribute Value
Read Blob Request Section 3.4.4.5	0x0C	*	Attribute Handle, Value Offset
Read Blob Response Section 3.4.4.6	0x0D		Part Attribute Value
Read Multiple Request	0x0E		Handle Set
Read Multiple Response	0x0F		Value Set
Read by Group Type Request	0x10		Start Handle, Ending Handle, UUID
Read by Group Type Response	0x11		Length, Attribute Data List
Write Request Section 3.4.5.1	0x12	*	Attribute Handle, Attribute Value
Write Response Section 3.4.5.2	0x13	*	-
Write Command Section 3.4.5.3	0x52	*	Attribute Handle, Attribute Value
Prepare Write Request	0x16		Attribute Handle, Value Offset, Part Attribute Value
Prepare Write Response	0x17		Attribute Handle, Value Offset Part Attribute Value
Execute Write Request	0x18		Flags
Execute Write Response	0x19		-
Handle Value Notification Section 3.4.7.1	0x1B	*	Attribute Handle, Attribute Value
Handle Value Indication Section 3.4.7.2	0x1D	*	Attribute Handle, Attribute Value
Handle Value Confirmation Section 3.4.7.3	0x1E	*	
Signed Write Command	0xD2		Attribute Handle, Attribute Value, Authentication Signature

iNode LAN sent/received UDP datagram data structure

The data in UDP datagram are ASCII HEX encoded; The UDP datagram length is fixed and is equal 174 bytes.

D00A4A61356F1200DE001D0002010619FF1293011000001700AB18951F485435BE5B809D6F571E40E800000011000D09694E6F64652D333536313441020A0200000000000000000000000000000000126F370863AAD9

D00A -> 0x0AD0 -> UDP datagram counter (allows discarding replicated datagrams from the particular iNode LAN or iNode Care Central – in case of multicast and some network components).

4A61356F1200 -> 0x00126F35614A (remote device BLE address)

DE -> 0xDE remote device BLE signal strength value in dBm as 2's complement number – in this case RSSI = -34dBm.

00 -> 0x00 type of advertisement frame. In this case it is ADV_IND: *connectable undirected advertising event*. Description you can find at Core_V4.0.pdf: Volume 6 Part B, Section 2.3.

1D00 -> 0x001D the number of bytes in received from remote BLE device in advertisement frame – in this case 29.

02010619FF1293011000001700AB18951F485435BE5B809D6F571E40E8000000 ->
02010619FF1293011000001700AB18951F485435BE5B809D6F571E40E8FE0000
advertisement frame received from remote BLE device; always 32 bytes encoded as ASCII HEX (in this case the number of valid bytes is 0x1d - 29); maximum is 31 bytes.

1100 -> 0x0011 the number of bytes in received from remote BLE device in scan response frame – in this case 17.

0D09694E6F64652D333536313441020A0200000000000000000000000000000000000000 ->
0D09694E6F64652D333536313441020A0200 scan
response frame received from remote BLE device; always 32 bytes encoded as ASCII HEX (in this case the number of valid bytes is 0x11 - 17); maximum is 31 bytes.

00126F370863 -> 0x00126F370863 MAC address of iNode LAN, which sent this UDP datagram.

AAD9 -> 0xD9AA CRC.

at the end of the data is always 0x0d, 0x0a

Data coding scheme in advertisement frame and response for active scan. Information about **AD Type** codes can be found in a Core_V4.0.pdf: Volume 3 Part C, Section 8. and at the page <https://www.bluetooth.org/en-us/specification/assigned-numbers/generic-access-profile>

advertisement frame:

02010619FF1293011000001700AB18951F485435BE5B809D6F571E40E8FE0000

020106

02 -> length of the data field: 2 bytes

0106 -> data

01 -> 0x01 -> EIR Data Type = 0x01 -> «Flags»

06 -> 0x06 -> EIR Data = 0x06 -> LE General Discoverable Mode (bit 1), BR/EDR Not Supported (bit 2)

19FF1293011000001700AB18951F485435BE5B809D6F571E40E8

19 -> length of the data field: 25 bytes

FF1293011000001700AB18951F485435BE5B809D6F571E40E8 -> data (25 bytes)

FF -> 0xFF -> EIR Data Type = 0xFF «Manufacturer Specific Data»

1293011000001700AB18951F485435BE5B809D6F571E40E8->

1293 -> 0x9312 -> 0x93XX iNodeCareSensor #3 identifier; 0xXX1X version 1; 0XXX2 since last memory readout lasts 24 hours;

0110 -> 0x1001 type -> bit 15 to bit 12 -> reserved, bit 11 to bit 0 -> sensor group address

0000 -> 0x0000 flags ->

SENSOR_ALARM_MOVE_ACCELEROMETER=1,
 SENSOR_ALARM_LEVEL_ACCELEROMETER=2,
 SENSOR_ALARM_LEVEL_TEMPERATURE=4,
 SENSOR_ALARM_LEVEL_HUMIDITY=8,
 SENSOR_ALARM_CONTACT_CHANGE=16,
 SENSOR_ALARM_MOVE_STOPPED=32,
 SENSOR_ALARM_MOVE_GTIMER=64,
 SENSOR_ALARM_LEVEL_ACCELEROMETER_CHANGED=128,
 SENSOR_ALARM_LEVEL_MAGNET_CHANGE=256,
 SENSOR_ALARM_LEVEL_MAGNET_TIMER=512

1700 -> 0x0017 value1

/* motion sensor */

0x8000 sensor is in move (bit 15 =1)

bit 14 to 10:

X-axis (5 bit value as 2's complement number) -> 0x00= 0

bit 9 to 5:

Y-axis (5 bit value as 2's complement number) -> 0x00= 0

bit 4 to 0:

Z-axis (5 bit value as 2's complement number) -> 0x17= -9

AB18 -> 0x18AB value2

/* temperature sensor */

Temperature= ((175.72 * Temp_Code)/65536)-46.85 [°C]

Temp_Code = 0x18AB *4 = 0x62AC = 25260

Temperature = 20,879 °C

951F -> 0x1F95 value3

/* humidity sensor */

%RH= ((125*RH_Code)/65536)-6 [%]

RH_Code = 0x1f95 *4 = 0x7e54 = 32340

%RH= 55,68 %

485435BE -> 0x5448BE35 time (time stamp; number of seconds since 01.01.1970)

5B80 9D6F 571E 40E8 -> an AES128 digital signature of all data

response for an active scan:

0D09694E6F64652D333536313441020A0200000000000000000000000000000000

0D09694E6F64652D333536313441

0D -> length of the data field: 13 bytes

09694E6F64652D333536313441 -> data

09 -> 0x09 -> EIR Data Type = 0x09 -> «Complete Local Name»

694E6F64652D333536313441 -> iNode-35614A

020A02

02 -> length of the data field: 2 bytes

0A02 -> data

0A-> 0x0A -> EIR Data Type = 0x0A -> «Tx Power Level»

02 -> 0x02 -> Tx Power Level = +2dBm

The **LOCK** page allows you edition of the list of identifiers (iNode tags, phones or tablets) contained in **iNode LAN**. Buttons **Read LOCK file** and **Write LOCK file** are respectively for reading and writing the identifiers list read earlier from device (the list is read automatically during LOCK page loading; after correct reading there is a message at bottom of page LOCK: OK). The new identifier can be add by the **NEW** button after earlier typing them in text box on the left (the rule of typing is following: 54:92:BE:05:8B:9E). You can remove a particular identifier if you select it on the list and press the **DELETE** button.



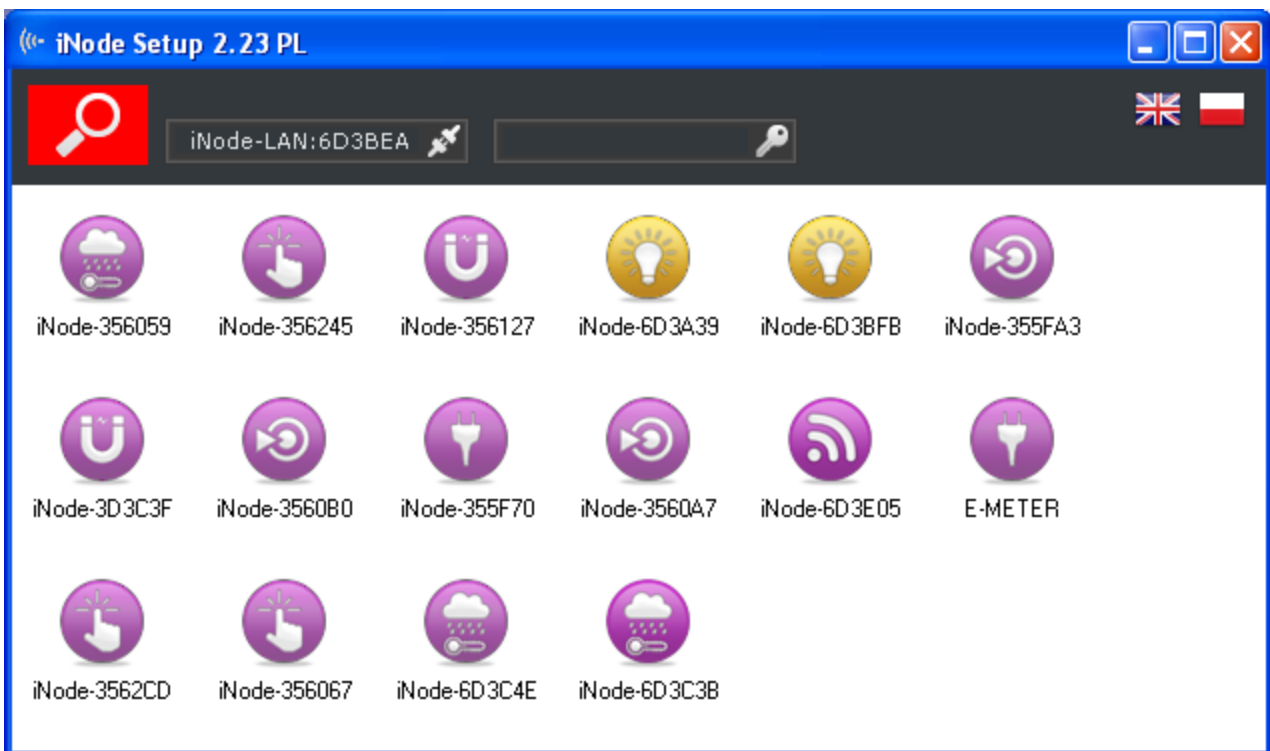
To store changed identifiers list into the device you should press the **SAVE** button. Correct result of operation will be confirmed by a message done: OK. The new identifiers list is used directly after storing it for autonomous access control. The distance from which all identifiers from the list activate the output is set at the **SETUP** page at **BLE RSSI** area.

3. iNode LAN and iNode Setup application

Install application **iNode Setup** and BT4.0 drivers on PC. Next run **iNode Setup** application (on Windows 7 to 10 with administrative rights), and press the red button with magnifying glass picture. If a BLE device you want connect to has password enabled you should type it text box with a key. If you press the button you can change the type of adapter USB BT4.0 which will be used to communication – standard BT4.0 (signed CSR ...), **iNode Serial Transceiver** (signed COM ...) or **iNode LAN** (signed the name of the device).

In case the application cannot start or system error you should try to install **Microsoft Visual C++ 2005 Service Pack 1 Redistributable Package MFC Security Update** from that page:

<http://www.microsoft.com/en-us/download/confirmation.aspx?id=26347>.



4. Technical information

Bluetooth Low Energy & Ethernet:

- configurable from your PC:
 - BLE mode: AUTO SCAN or REPEATER;
 - the BLE power with which the device operates from -18dBm to + 8dBm (maximum range up to 200 m in open space);
 - LAN settings: IP address (static or dynamic - DHCP), network mask, gateway, DNS, NTP server;
 - the name of the device in LAN & BLE;
 - IP address & port for UDP broadcasting received BLE packets; multicast, unicast or broadcast for UDP is configured automatically depend on IP address;
 - user password;
 - admin password;

Power Supply:

- 5V Mini USB; 85mA @ 10Mbps; 130mA @ 100Mbps
- or POE 6-30V DC; 40mA @ 100 Mbps 24V; 60mA @ 100 Mbps 12V; 120mA @ 100Mbps 6V

Housing:

- metal case;
- dimensions: 81 mm x 38 mm x 22 mm;

Other:

- ratio scan window/scan interval = 1 -> receiving from BLE all the time;
- remote firmware update using web browser;
- remote control using TCP/IP telnet connection at port 5500 (the same control features like using WebSocket);
- LEDs: ethernet LINK i STATUS;
- HTTP server:
 - 6,9MB for user HTTP pages (www) and 1MB for HTTP system pages (www);
 - WebSocket;
 - max. 2 sockets simultaneously;
- output: 60V DC or 40V AC 500 mA 2.5 Ω (solid state relay type PhotoMOS);
- RJ-45 connector 10Mbps/100Mbps Ethernet, 10BaseT; protocols: ARP, SSDP, UDP, TCP/IP, DHCP, SNTP, HTTP;
- reset button (restore factory settings);
- temperature sensor with a resolution of 1 °C;
- operating temperature: from -20 to 45 °C;
- humidity: 35-80 % RHG.
- weight: 45 g;

Software:

- any web browser;
- built-in iNode Monitor (Javascript/Websocket HTML application);

Chipset:

- CSR 1011
- W5500

5. Disposal



All the packaging materials are recyclable and are labeled as such. Dispose of the packaging in accordance with local regulations. Keep the materials out of children reach, as the materials can pose a hazard.

Proper disposal:

- According to WEEE Directive (2012/19/UE) the crossed-out wheeled bin symbol (shown on the left) is used to label all electric and electronic devices requiring segregation.
- Do not dispose of the spent product with domestic waste: hand it over to an electric and electronic device collection and recycling point. The crossed-out wheeled bin symbol placed on the product, instruction manual or package communicates this requirement.
- Plastics contained in the device can be recycled in accordance with their specific marking. By recycling materials and spent equipment you will help to protect the environment.
- Information on electric and electronic devices collection locations is available from local government agencies or from the dealer.
- Spent or fully discharged single-use and rechargeable batteries must be discarded in dedicated labelled bins, handed over to hazardous waste collectors or returned to electric equipment dealers.

DECLARATION OF CONFORMITY 1/11/2014

(according to ISO/IEC Guide 22)

Producer: **ELSAT s.c.**

Address: **Warszawska 32E/1, 05-500 Piaseczno k/Warszawy POLAND**

Declares that the product:

Product: **iNode LAN**

Model: **iNode:0x0c00**

Conforms to the following Product Specifications and Regulations:

PN-EN 60950-1:2007/AC:2012

PN-ETSI EN 301 489-1 V1.9.2:2012

PN-ETSI EN 301 489-3 V1.6.1:2014-03

PN-ETSI EN 301 489-17 V2.2.1:2013-05

PN-ETSI EN 300 328 V1.8.1:2013-03

PN-EN 62479:2011/Ap1:2013-07

The product herewith complies with the requirements of the Low Voltage Directive 73/023/EEC, the EMC Directive 89/336/EEC, the RoHS Directive 2011/65/EU and carries the CE - marking accordingly.

Place of issue:
Piaseczno k/Warszawy

Signed on behalf of producer: Paweł Rzepecki
Function: Co-owner

Date of issue:
25.11.2014

Signature: 