User Manual

Temperature
and Humidity Sensor

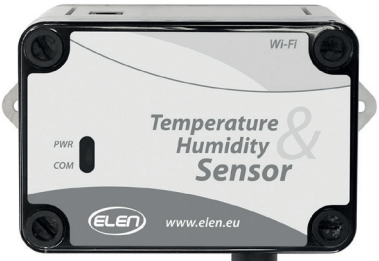
THS Sensor 40 12DC WiFi

The **THS SENSOR 40 12DC WiFi** is an air temperature and humidity sensor with WiFi LAN interface for transmitting measured values to a master device. It can be used in computer controlled measurement systems or as a peripheral device to a large-size LED display, which displays the measured values.

External power supply adapter 230VAC/12VDC is required to power the sensor (included).

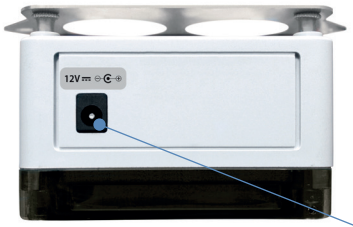
Software for data logging is available for download from:

https://www.elen.sk/files/download/dataloggerth_setup_1_20_03_en.zip



Detachable sensor probe
3,5 mm Jack connector

Konektory



WiFi interface

Default network setup:

IP address: 192 . 168 . 0 . 68
Subnet mask: 255 . 255 . 255 . 0

Or as specified by customer when ordering.

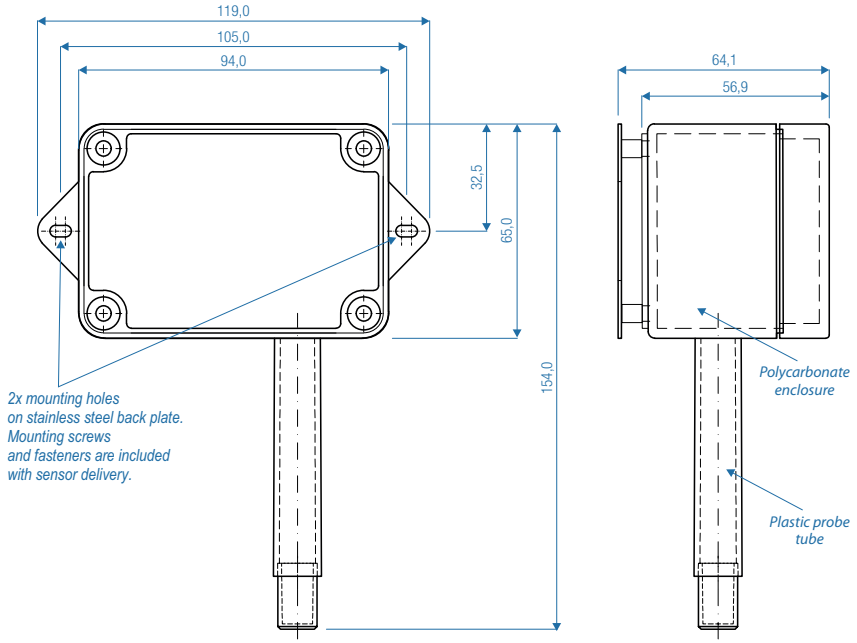
1x Power supply
12 VDC / 500mA

Sensor protection stainless steel sintered cap

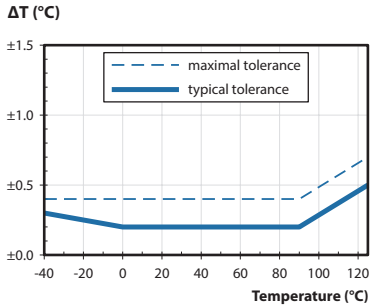
Technical Specifications

Sensor type	Sensirion SHT31-DIS
Temperature range	–40 °C to +80 °C
Typical temperature accuracy	±0,3 °C (±0,2 °C for T>0 °C)
Relative humidity range	0 to 100 % RH
Typical relative humidity accuracy	±2 % RH
Communication interface	Wireless LAN WiFi, IEEE 802.11a/b/g (2.4 GHz only) Supports: WEP(Client only), WPA-Personal, WPA2-Personal
Communication protocol	Modbus TCP
Software	*DataLoggerTH* for Windows (available for download)
Environment of use	Interior (IP 40)
Power supply	Adapter 12 VDC/500 mA (included)
Compatibility	Used with LED displays ELEN, NDA series, or stand-alone

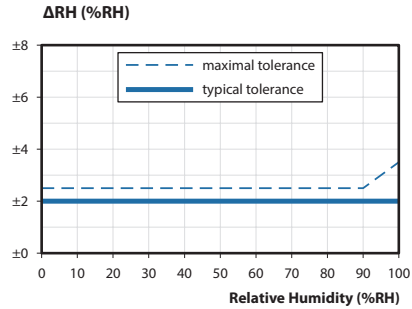
Dimensional Drawing (mm)



Graphs - Sensirion SHT31 parameters



Graph No. 1: Accuracy for temperature in °C.



Graph No. 2: Accuracy for relative humidity at 25°C .

1. Default sensor settings

The THS Sensor 40 12DC WiFi sensor device is delivered with the following factory default settings:

Mode	Access Point
IP Adress	192 . 168 . 0 . 68
Subnet Mask	255 . 255 . 255 . 0
Port	502

** In some cases the sensor may be delivered with different settings as requested by customer when ordering.*

2. Displaying and recording measured values using DataLoggerTH software application

DataLoggerTH is a simple application for computers running the Windows operating system, which is used to display and store measured data from temperature and humidity monitoring systems. These systems may consist of one or more sensors and large size LED displays. After installing the displays and sensors and connecting them to the RS485 or LAN Ethernet TCP / IP serial line, the data logging software can be used to record the measured values and display them on a remote computer. The computer running DataLoggerTH software must be connected to the same network as scanning devices and displays.

The DataLoggerTH software and the manual for its use can be downloaded from the ELEN website:

https://www.elen.sk/en/support/Software/DataloggerTH-Air-temperature-and-humidity-datalogger-software.html

3. Using the sensor in Access Point mode

Connect the sensor to the mains power source using the supplied 12 VDC / 500 mA power adapter.

Then connect the computer to the WiFi network which is transmitted by the sensor. The SSID of this network is „**XpicoWiFi_XXXXXX**“ (instead of „XXXXXX“ there are letters and numbers). The connection password is „**XPICOWIFI**“ (without the quotation marks).

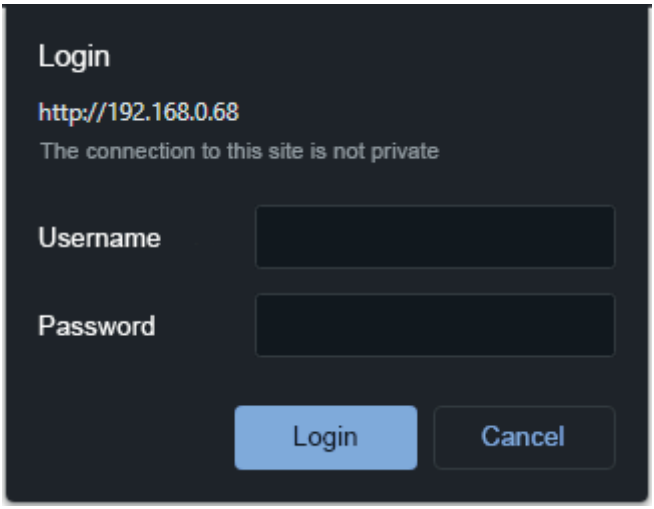
Then open the DataLoggerTH software settings and enter the default values, which are listed in section 6. Sensor default settings. If the values are entered correctly, the software will start communicating with the sensor and display the measured temperature and humidity data.

4. Changing sensor device settings

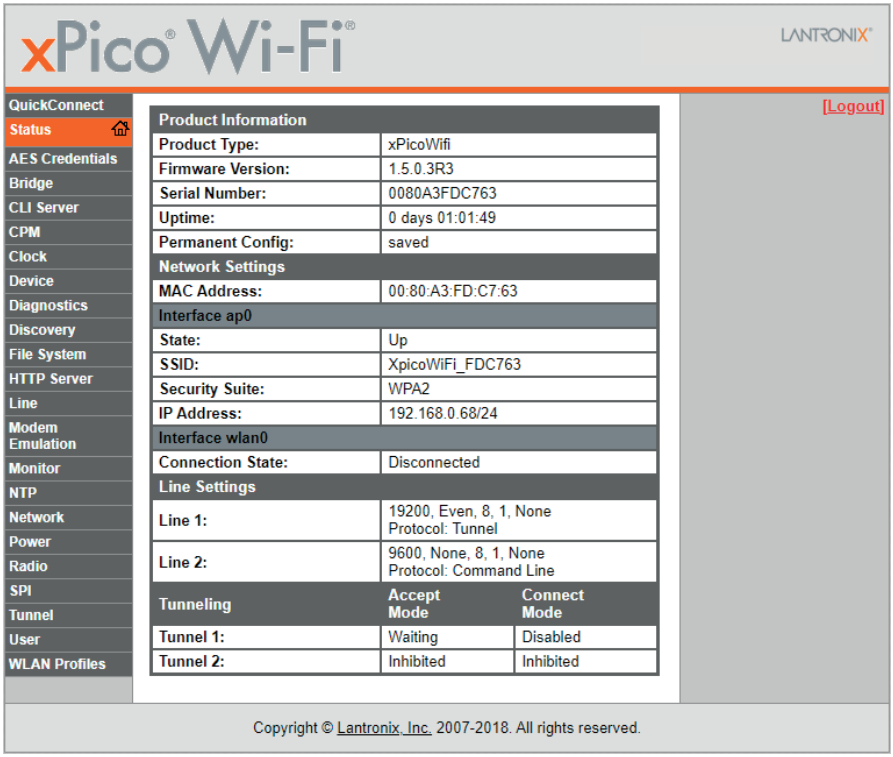
By default, the sensor operates in Access Point mode. However, if it is necessary to use multiple sensors or integrate the sensor into an existing network, it is advisable to change their operation to Client Mode with a fixed IP address. The following information describes how to make these changes.

Then connect the computer to the WiFi network which is transmitted by the sensor. The SSID of this network is „**XpicoWiFi_XXXXXX**" (instead of „XXXXXX" there are letters and numbers). The connection password is „**XPICOWIFI**" (without the quotation marks).

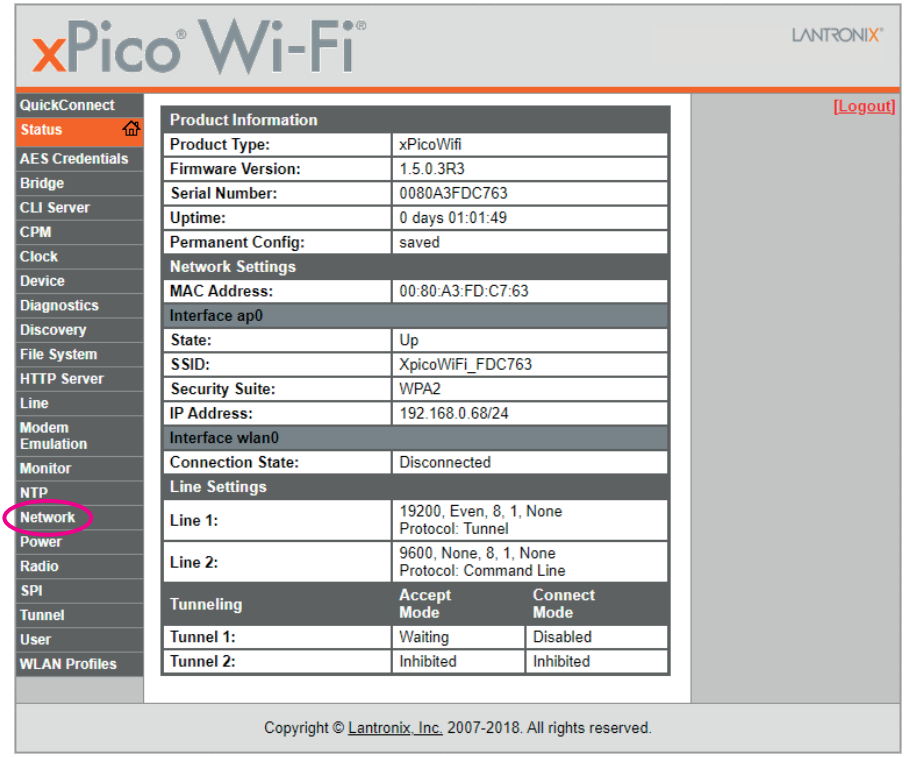
Launch an Internet browser on your computer. Since the factory-set IP address is **192.168.0.68**, enter this IP address into the browser's URL address field. You will be prompted for a username and password. The username is „**admin**" and the password is „**PASSWORD**" (without quotes).



The initial page of the sensor's WiFi network settings and status is displayed.



Click „**Network**“ in the left column.



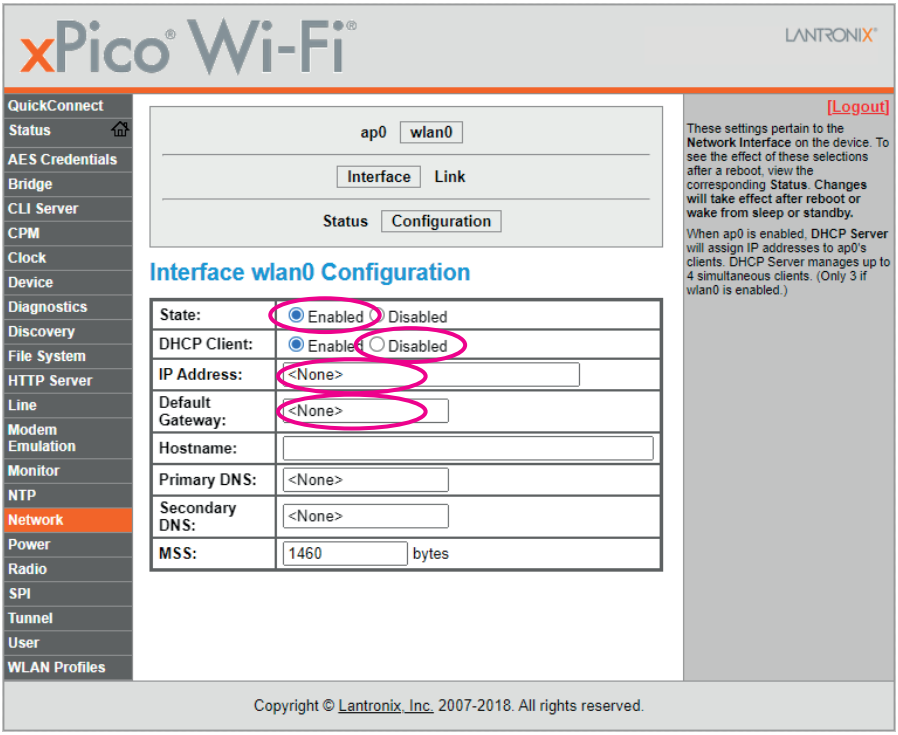
In the network settings, first click on „**wlan0**“ and then on „**Configuration**“.

You will enter the wlan0 interface settings. It is important that „**Enabled**" is checked in the first row of the „**State**" table and „**Disabled**" is checked in the second row of „**DHCP Client**".

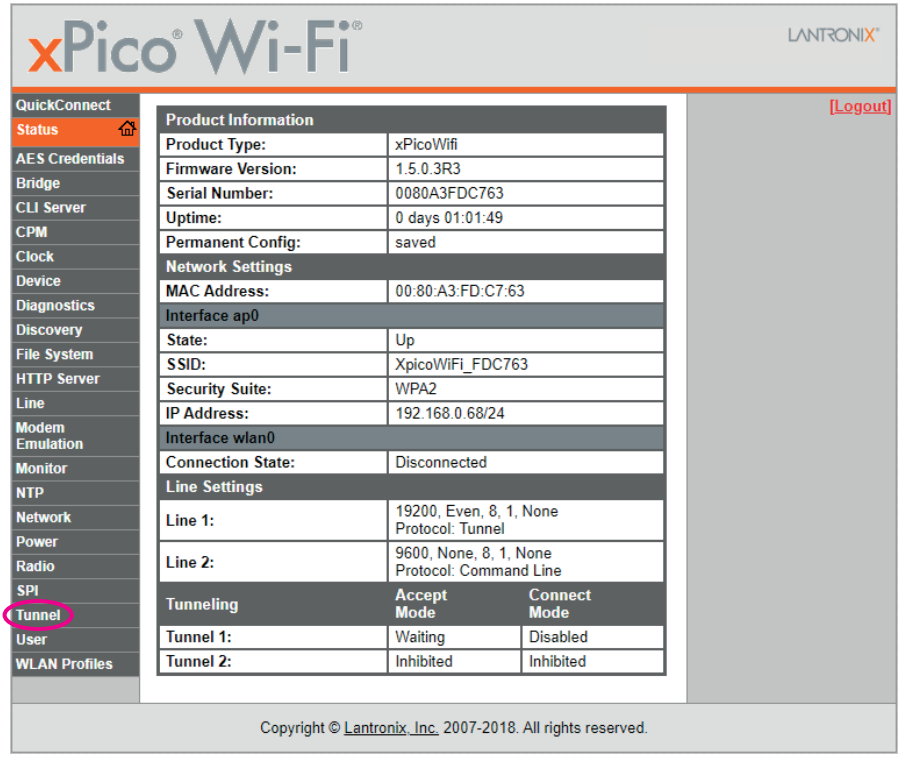
The third line „**IP Address**" shows the current IP address of the sensor in CIDR (Classless Inter-Domain Routing) format. The number 24 after the slash therefore means that the subnet mask is 255.255.255.0. Here it is possible to change this IP address (before the slash) to the required value.

In the fourth line „**Default Gateway**" enter the IP address of the router to which the sensor will connect.

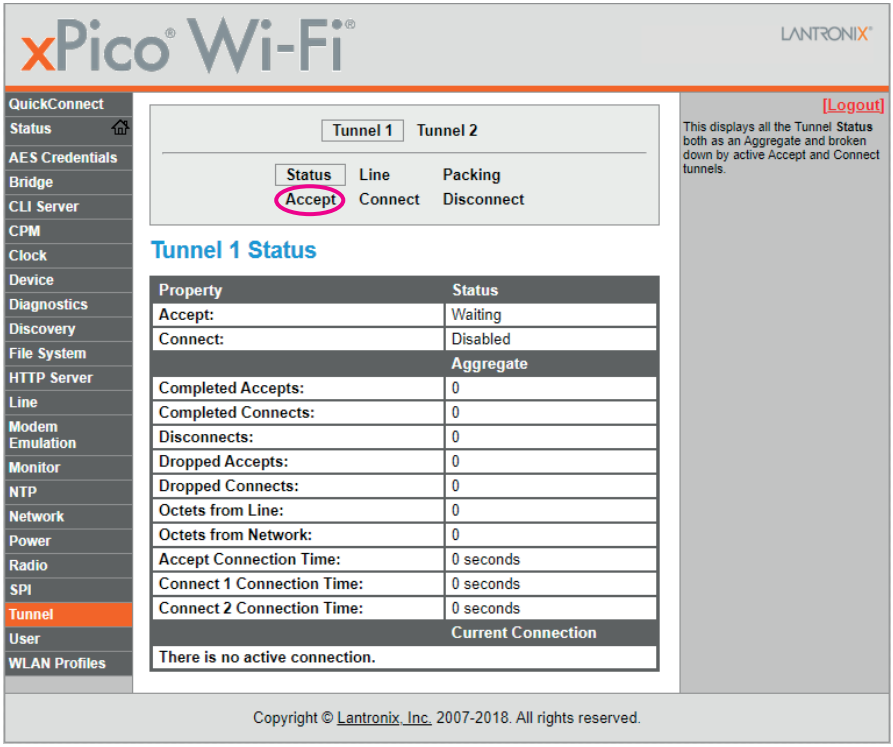
The values in the remaining rows do not need to be changed.



Then click on „**Tunnel**“ in the menu.



The following window will appear. Click on „**Accept**“.



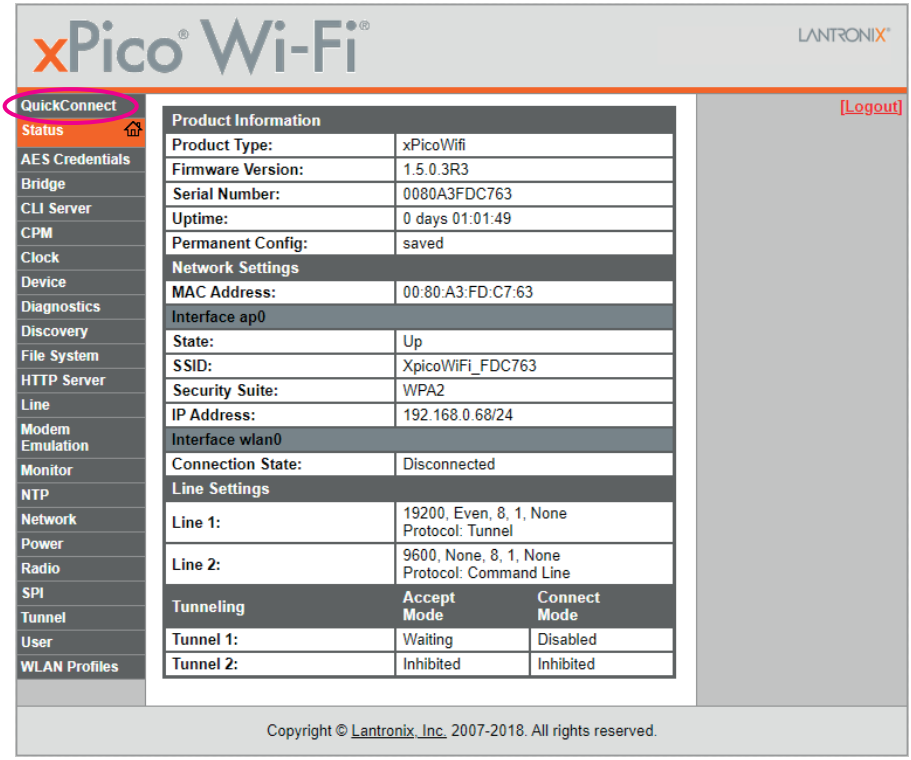
The following table is displayed. The second row „**Local Port**“ shows the currently set port number. For communication via the ModBus TCP communication protocol, the entered port number value must be „**502**“.

The values in the remaining rows do not need to be changed.

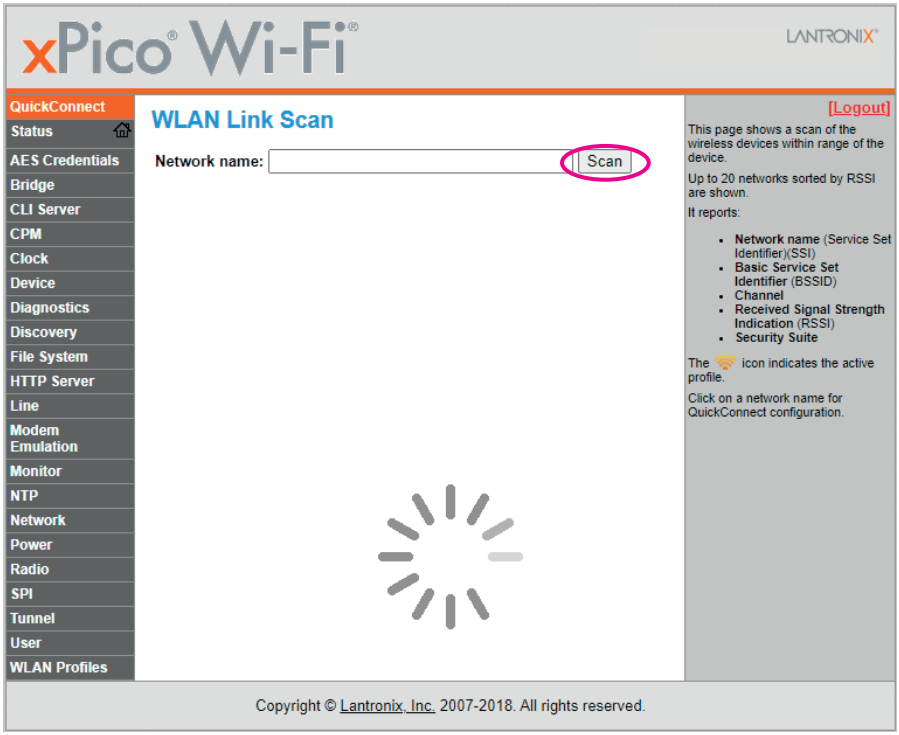
Once all changes have been made, these changes must be saved.
In the left column, click on „**Device**“, then on „**Save**“ and finally on „**Reboot**“.

If you have changed the IP address of the sensor, you must enter this new IP address in the address bar of the Internet browser and log in again.

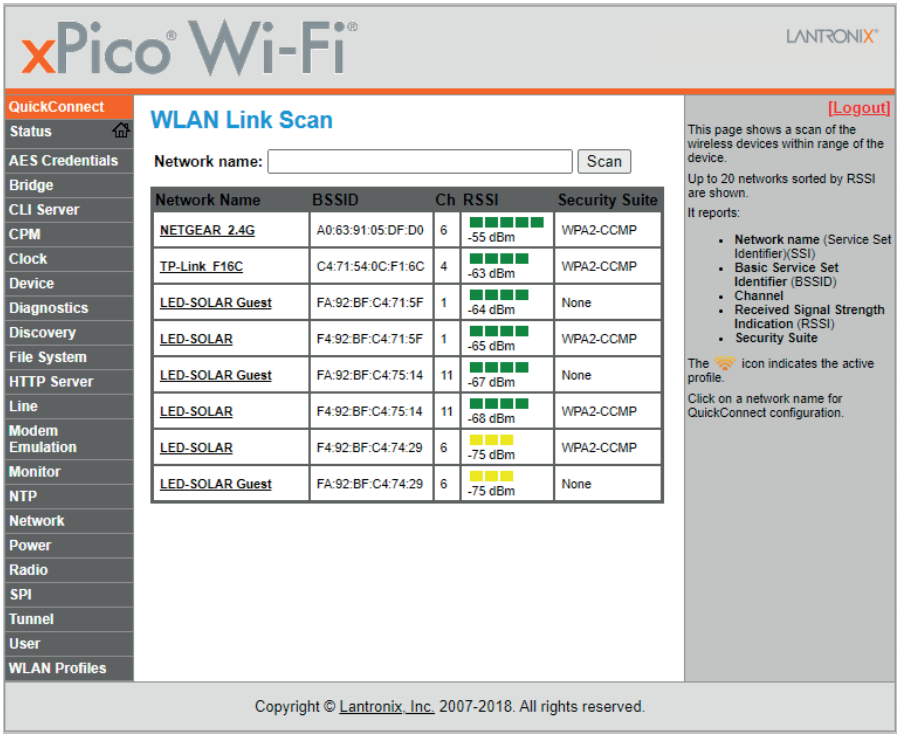
Then click on the first menu item in the left column „**QuickConnect**".



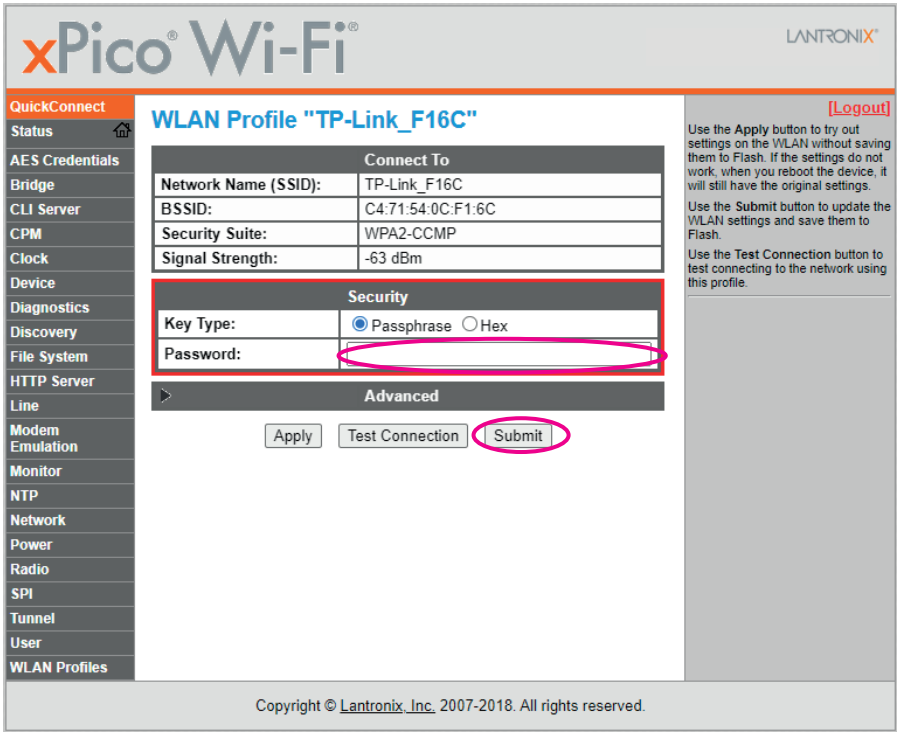
The sensor scans the available WiFi networks and displays them. If scanning does not start automatically, click the „**Scan**“ button.



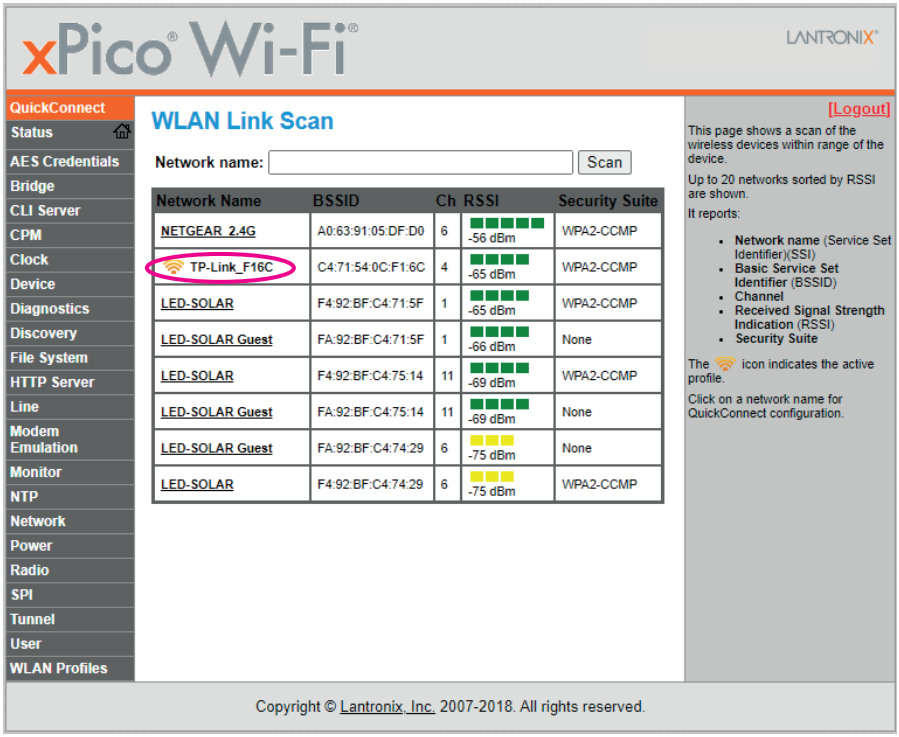
From the list of available WiFi networks it is necessary to select the WiFi network of the router to which the sensor will be connected.



Click on the name of the desired WiFi network and the scanner will prompt you to enter the password of this WiFi network. Enter the password and then click the „**Submit**“ button.



Return to „**QuickConnect**“. If everything went well, next to the name of the router's WiFi network you connected to will be an icon:



5. Router setup

For the THS Sensor 40 12DC WiFi sensor to work properly in client mode, it is important that it has its own **fixed IP address**, which will not change, and that it be **on the same network** as the computer running the DataLoggerTH software. We described the IP address setting of the sensor in the previous section. Now you need to set up the router so that it assigns the same IP address to the sensor every time.

There is a large number of manufacturers and models of routers on the market, so it is not possible to describe their settings in more detail. However, the basic condition is that the router must be able to assign fixed IP addresses to the devices connected to it, based on the MAC addresses of these devices.

For example, if the sensor has a MAC address **00:80:A3:FD:C7:63**, you must set the router to assign **only one and the same IP address** to this MAC address. The MAC address and factory default IP address of the sensor are printed on a label located on the side of the sensor.

MAC Address: 00:80:A3:FD:C7:63
IP Address: 192.168.0.68
Subnet Mask: 255.255.255.0
Port: 502

As was already mentioned, the sensor must be **on the same network** as the computer running the DataLoggerTH software application. This means that if the selected network has a range of assigned IP addresses, for example 192.168.**0**.1 to 192.168.**0**.255, then the sensor cannot have an IP address, for example 192.168.**2**.40. Therefore, it is first necessary to determine which network will be used to connect the sensor and the computer to (or what is the range of IP addresses assigned by the router) and what IP address, within this network, should be assigned to the sensor.

6. Service center address

In case of any issues please contact the manufacturer:

ELEN, s.r.o.
Lubochnianska 16
080 06 Lubotice
SLOVAKIA

E-mail: sales@elen.sk
Web: www.elen.sk

MODBUS Communication Description of Available Registers and Functions THS Sensors v. 2.1

(rev. 1.0)

1. THS Sensor Configuration

The sensor device contains registers, which are divided into groups and are used to store various configuration settings. Functions **Read Holding Registers (0x03)**, **Write Single Register (0x06)**, or **Write Multiple Registers (0x10)** can be used to access these registers. Although each register is 16 bits wide, its LSB (Least Significant Byte) is used only. All values are entered as ASCII characters, except for the Modbus address and offset correction, which are binary. Functions 0x03 and 0x10 support both reading and writing of certain registers, while the address of the first and last registers must be within the valid range.

Read Holding Registers (0x03) / Write Single Register (0x06) / Write Multiple Registers (0x10)				
Address	**Description**	**Valid Values**	**Default Value**	**Data Type**
1000	Modbus address	1 – 247	1	uint8_t
1001	Communication speed	'0' – 1200 Bd '1' – 2400 Bd '2' – 4800 Bd '3' – 9600 Bd '4' – 14400 Bd '5' – 19200 Bd '6' – 38400 Bd '7' – 57600 Bd '8' – 115200 Bd	'5'	ASCII
1002	Number of data bits	'5', '6', '7', '8'	'8'	ASCII
1003	Parity	'N', 'O', 'E'	'E'	ASCII
1004	Number of stop bits	'1', '2'	'1'	ASCII
1005	CONTROL	0 – 255	0	uint16_t
1006	Reserved			
1007	Behavior in case of configuration error	'0' – set default settings '1' – use configuration settings	'0'	ASCII
1008	Type of sensor device element	'1' – SHT21 '2' – DS18B20 '4' – STS21 '5' – SHT31 '6' – STS31	'5'	ASCII
1009	Communication protocol	'1' – YDN v.1, 9600 '2' – YDN v.2, 19200 '3' – MODBUS '4' – MODBUS TCP	'3'	ASCII
2000	Correction of temperature in tenths of °C	-99 – 99	0	uint16_t
2001	Temperature units		'C'	ASCII
2200	Correction of temperature in tenths of %RH		0	uint16_t

Notes:

- *Writing a new value into register has no influence on device functionality until the application restarted (off/on), or when the corresponding value into the CONTROL register is written (REINIT).*
- *Communication speed is the speed of application with the configurator as well as the speed of communication with a host, (reading measured values, configuration, version, etc.).*
- *Application behavior in case of configuration error:*
  - *‚0' - default values will be set, while the application will continue with these default values*
  - *‚1' - application will enter status when communication with configurator will be possible only (configuration protocol) – this is indicated with fast blinking of the LED. It is not possible to read measured values (communication with sensor is off).*
- *Protocol YDN v.2 is essentially the same as YDN, the only difference is in communication parameters, which are fixed to 19200-8-E-1.*

2. Reading Firmware Version

Device firmware version is stored in two registers starting from address 5000. These registers can be accessed using function **Read Holding Registers (0x03)**. Data is stored in ASCII format and LSB of the register is used only.

Read Holding Registers (0x03)			
Address	**Description**	**Example**	**Data Type**
5000	Major version	'2' (0x0032)	ASCII
5001	Minor version	'1' (0x0031)	ASCII

3. Reading Measured Values

The measured temperature, relative humidity, or CO2 concentration value are stored in 21 registers starting from address 0. These values are in binary format and can be read with function **Read Holding Registers (0x03)** or **Read Input Registers (0x04)**. If the sensor chip does not support certain measurement, it is disconnected, or there is communication error, returned value will be 9999, which corresponds to 999.9°C, or 999.9 %RH. In case the sensor chip is faulty, the application will try to reinitialize it every 5 seconds.

Read Holding Registers (0x03) / Read Input Registers (0x04)			
Address	**Description**	**Example**	**Data Type**
0	Measured temperature in tenths of °C or °F (sensor 0)	0x00DF (223) = 22,3 °	int16_t
10	Measured relative humidity in tenths of % (sensor 0)	0x01C2 (450) = 45,0 %	int16_t

4. Identification of Device

In order to identify the sensor in MODBUS network, THS supports function **Report Slave ID (0x11)**. THS sensor will send message with:

- Device ID, which depends on the actual sensor type used:
  - 0x01 SHT21
  - 0x02 DS18B20
  - 0x06 SHT31
  - 0x07 STS21
  - 0x08 STS31
- Indication of running 0xFF, if sensor is functional, or 0x00, if sensor is disconnected or there is communication failure with the sensor.

5. CONTROL Register

Address 1005 holds the CONTROL register. It is accessible with functions **Read Holding Registers (0x03)** and **Write Multiple Registers (0x10)** or **Write Single Register (0x06)**. This register is initialized to 0 during startup. Writing into register is protected with password, which is the MSB value of register. LSB is value, which in case of correct password, is written into CONTROL register. CONTROL register stores binary value, while each bit has its assigned unique function.

Read Holding Registers (0x03) / Write Multiple Registers (0x10)		
Address	**Description**	**Meaning of bits**
1005	CONTROL register	0 – Loading configuration and initialization (restart of application) 1 – Setting default values 2 ... 7 – Not used

MSB – ACCESS PASSWORD							
15	14	13	12	11	10	9	8
1	0	1	0	0	1	0	1

LSB – CONTROL							
7	6	5	4	3	2	1	0
–	–	–	–	–	–	DEFLT	REINIT

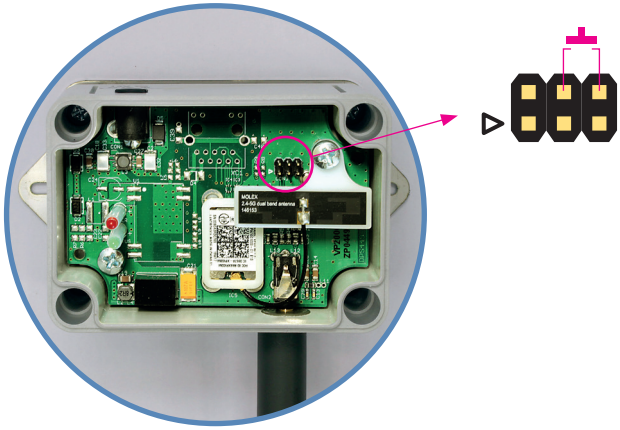
Notes:

- *Password for access to register is 0xA5.*
- *It is advised to use function REINT after making changes in configuration registers, which were performed using one of the accessible Modbus functions. After execution of function it is set to 0.*
- *Function DEFLT can be used to set default values into the configuration registers. Changes will take affect after application restart (off/on), same as when writing configuration, or after writing corresponding value into CONTROL register (REINIT). In this case, the REINIT function responds at the rate at which the request was triggered. The communication speed will not change until the acknowledgment is sent. When the function is performed its value is set to 0.*
- *DEFLT and REINIT functions can also be requested at the same time (with one entry into the register).*

6. Reset to Default Settings (valid for firmware version 3.2 and up)

If needed, it is possible to recover default settings for UART "19200-8-E-1" and sensor address "1". Perform the following procedure:

1. Disconnect the power supply from sensor. (For PoE devices disconnect sensor from LAN.)
2. Use jumper to short pins 4 and 6 of the header connector (see picture below).
3. Connect the power supply to sensor.
4. Depending on what is the desired communication protocol, leave the jumper in position or power applied for the following time period.
    a. t > 5 seconds…..default settings + MODBUS RTU protocol, green LED turns ON.
    b. t > 10 seconds...default settings + MODBUS TCP protocol, green LED turns OFF.
5. Remove jumper from the header connector!



© **ELEN, s.r.o.**, Lubochnianska 16, 080 06 Lubotice, Slovakia
Phone: +421 51 773 3700, Mobile: +421 905 637 717, +421 911 637 716
E-mail: sales@elen.sk, http://**www.elen.eu**