

# **WiHartGateway & WiNSuite**

## **Installation Guide and Manual**



## Abstract

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# 1. Installation

## 1.1 Automatic Software Installation

The Setup will start automatically when the Installation CD is put into the CD drive. If the “autorun” function of your computer is turned off, you can start the Installation process by executing the WiNSuite\_VERSION.exe, located in the folder NSIS of the installation CD.



Figure 1: Installer - Welcome page

The installer will check your system for the required software and install the following components if there is no other version already installed.

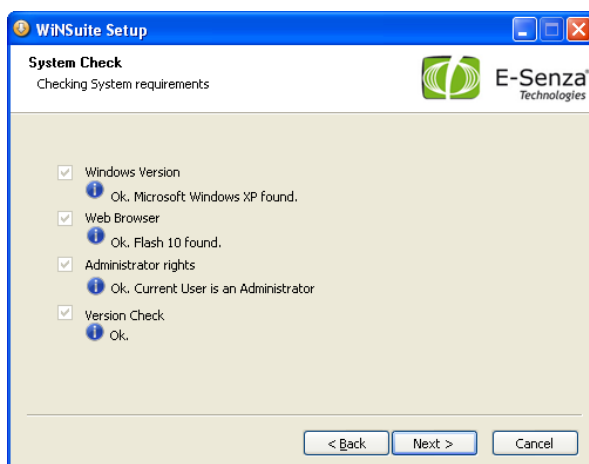


Figure 2: Installer - Checklist

Java Runtime Environment 1.6  
PostgreSQL 8.2  
Apache Tomcat 6  
Adobe Flash Browser Plug-in 10  
Adobe Acrobat Reader 9.3 (optional)

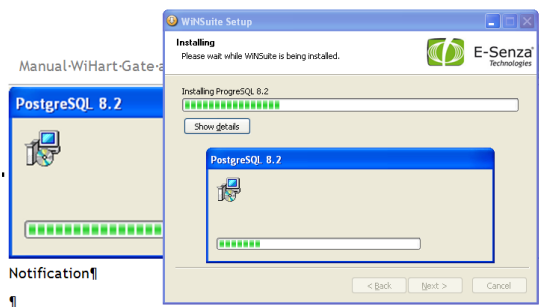


Figure 3: Installer - User Account Notification

A system account is created to run PostgreSQL as a service. The account name will be “E-SENZA\_WiNSuite”.

When the installation finishes, you can start the software on your preferred browser. The finish page of the installer will start the Internet Explorer by default.

## 1.2 Manual Installation

If you have already installed Tomcat, PostgreSQL or Java on your machine and you do not wish to reinstall these applications, you still can use the Installer. It will automatically detect the installed components, if the version of the third party tools is same. If you want to use another version of Tomcat or PostgreSQL to work together with WiNSuite you have to follow up the next steps.

### 1.2.1 Existing PostgreSQL

In case you already have installed PostgreSQL 8.2, enter a PostgreSQL user and password in the installer, assigning the corresponding rights to create DB, insert, select and update tables. If you want to use any other version of PostgreSQL you can import the file `db_dump.sql` from following location on the CD: `Manual Installation\postgresql\` with user `db_user` and password `db_pass`.

You also have to modify the login data in file `WiNSuite.xml` located on your hard disk at the following location (in case you already have installed the Tomcat & WiNSuite):

`Program Files\Apache Software Foundation\Tomcat 6.0\conf\Catalina\localhost\`

Enter your database user, password and database name. Save the file and restart Tomcat.

### 1.2.2 Existing Apache Tomcat installation

In case you have already installed Tomcat 6.0, please import the WiNSuite.war file into Tomcat Manager from the CD location

Manual Installation\Tomcat

If the standard Tomcat service is running, you can achieve this by opening the browser at port 8080 using address <http://localhost:8080>. Go to Tomcat Manager and load the WiNSuite.war file from the CD location mentioned above.

If you have already installed Tomcat 6.0, the installer will find it, and deploy the corresponding files.

#### Note: Earlier Version

It is important that the version ID of your existing installations correspond to the one mentioned on the CD Installer. The Installer is installing Tomcat 6.0, but if you have Tomcat 5.0 on your PC, the installer will install the new version.

#### Note: Tomcat Port

It is very important that you keep Port 8080, as predefined. Later on you will access the WiNSuite Portal from your webbrowser using address <http://localhost:8080/WiNSuite/>. If you change the port address, then you will have to access WiNSuite through a modified address:

<http://localhost:YOURPORT/WiNSuite>

#### Note: Tomcat as Windows Service

Please note down the user and password which you enter for the Tomcat Webserver, if you install it manually. You can select Install tomcat as service on the advanced installation menu. With this selection, Tomcat will be started automatically, with each restart of your PC.

## 1.3 Starting the WiNSuite

The WiNSuite starts automatically after the installer has finished. You can also start it from the Windows Start menu. Or entering the URL: <http://localhost:8080/WiNSuite/> in your web browser.

## 2. User Manual

### 2.1 Login



Figure 4: WiNSuite - Login Screen

The default Login for the WiNSuite

Username: **admin**

Password: **admin**

### 2.2 Setting up Gateway and Network

After login you see the Network overview. First you have to setup the right EU164 of the Gateway. Choose a description for your network.

At this time you can also specify the join- and network key and the desired RF Channels that should be used. The unique WiHart ID of the Gateway has to be entered here as well.

Network ID can be changed at startup, when there is no connection to the gateway.

The Ethernet settings can only be changed if the gateway is connected.

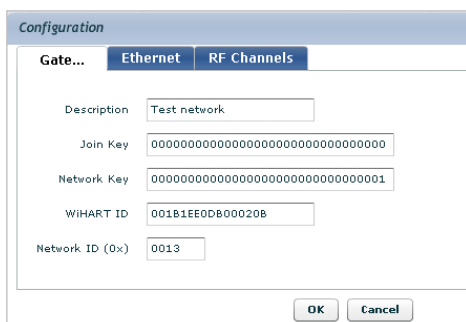


Figure 5: WiNSuite - Network configuration

The state of the Gateway in the WiNSuite is updated when you click the “Refresh” button in the upper right corner or by switching between different tabs inside the WiNSuite.



Status	Description
 Offline	No TCP connection
 Online	TCP connection established

Tabella 1: WiNSuite - Gateway status

Power on the Gateway, and observe the ‘MGR’ LED. ‘MGR’ will blink at 5Hz for 10 seconds. If, during this time the factory reset button is pressed, the settings will be reset to factory default values.

The factory default values are

Gateway IP : 192.168.0.126

Subnet Mask : 255.255.255.0

TCP Network Server IP : 192.168.0.0

The ‘MGR’ LED blinks at 2Hz with the Gateway is trying to locate a suitable Network Manager. Once a suitable Network Manager is located the ‘MGR’ LED remains ‘ON’.

After about 40 seconds after the ‘MGR’ LED turns ‘ON’, the ‘RF’ LED turns ‘ON’. This is indicative that the Network Access Point of the Gateway is now active. Once, this LED turns ‘ON’ the field devices may be powered ‘ON’. If field devices are already powered on, and scanning the radio for a suitable Gateway, then they should also connect to this Gateway.

The Ethernet settings can be changed only if the Gateway is connected to the WiNSuite.

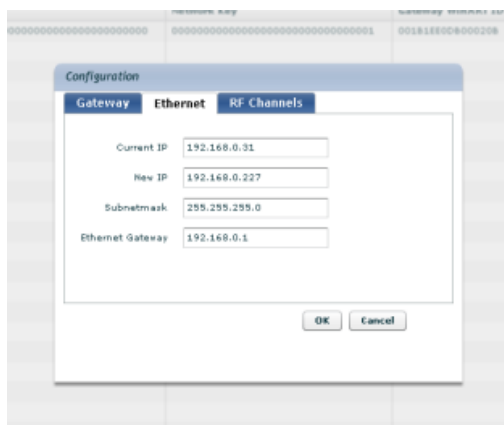


Figure 6: WiNSuite - Ethernet Settings



## 2.3 Setting Up Devices

At the 2<sup>nd</sup> tabulator you can see all devices from the current network. This includes all field devices and adapters.

To add a new device, press the “Add Device” button.



A popup window comes up and asks for EUI64, Nickname, Description and Update rate.

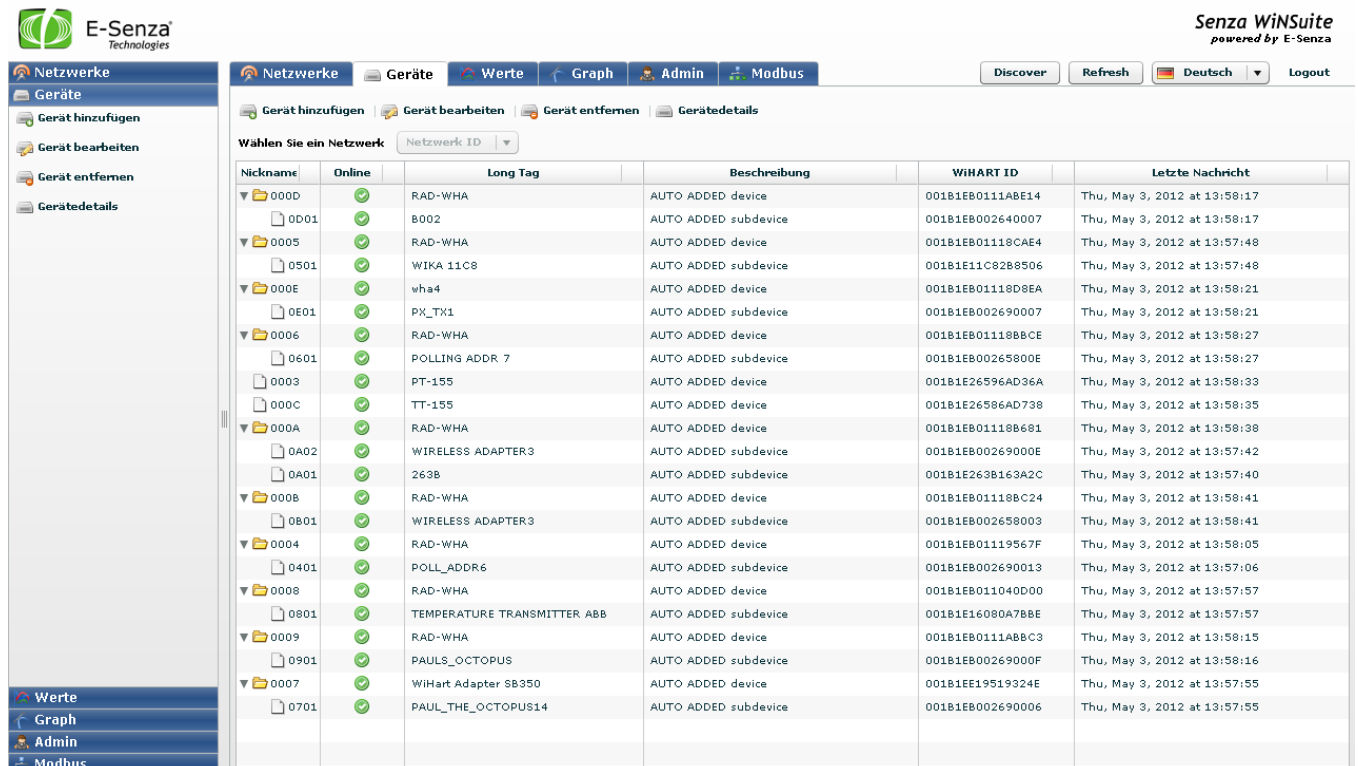
*EUI64* - the HART ID of the device

*Nickname* - a number between 2 and 52 (0x0034) in hexadecimal format. The scheduling for the devices depends on the nick name.

*Description* - User specified description for easier identification

*Update rate* - time in seconds between each PV request. Only multiply of 10 are allowed, 0 disables the polling.

The description and update rate can be modified later by editing the device again, EUI64 and nickname are fixed.



The screenshot shows the WiNSuite interface with the 'Geräte' (Devices) tab selected. The main area displays a table of devices. The table has the following columns: Nickname, Online, Long Tag, Beschreibung, WIHART ID, and Letzte Nachricht. The devices listed are:

Nickname	Online	Long Tag	Beschreibung	WIHART ID	Letzte Nachricht
000D	✓	RAD-WHA	AUTO ADDED device	001B1EB0111ABE14	Thu, May 3, 2012 at 13:58:17
0D01	✓	B002	AUTO ADDED subdevice	001B1EB002640007	Thu, May 3, 2012 at 13:58:17
0005	✓	RAD-WHA	AUTO ADDED device	001B1EB01118CAE4	Thu, May 3, 2012 at 13:57:48
0501	✓	WIKA 11C8	AUTO ADDED subdevice	001B1E11C828B8506	Thu, May 3, 2012 at 13:57:48
000E	✓	wha4	AUTO ADDED device	001B1EB01118D8EA	Thu, May 3, 2012 at 13:58:21
0E01	✓	PX_TX1	AUTO ADDED subdevice	001B1EB002690007	Thu, May 3, 2012 at 13:58:21
0006	✓	RAD-WHA	AUTO ADDED device	001B1EB01118BBCE	Thu, May 3, 2012 at 13:58:27
0601	✓	POLLING ADDR 7	AUTO ADDED subdevice	001B1EB00265800E	Thu, May 3, 2012 at 13:58:27
0003	✓	PT-155	AUTO ADDED device	001B1E26596AD36A	Thu, May 3, 2012 at 13:58:33
000C	✓	TT-155	AUTO ADDED device	001B1E26596AD738	Thu, May 3, 2012 at 13:58:35
000A	✓	RAD-WHA	AUTO ADDED device	001B1EB01118B681	Thu, May 3, 2012 at 13:58:38
0A02	✓	WIRELESS ADAPTER3	AUTO ADDED subdevice	001B1EB00269000E	Thu, May 3, 2012 at 13:57:42
0A01	✓	263B	AUTO ADDED subdevice	001B1E263B163A2C	Thu, May 3, 2012 at 13:57:40
000B	✓	RAD-WHA	AUTO ADDED device	001B1EB01118BC24	Thu, May 3, 2012 at 13:58:41
0801	✓	WIRELESS ADAPTER3	AUTO ADDED subdevice	001B1EB002658003	Thu, May 3, 2012 at 13:58:41
0004	✓	RAD-WHA	AUTO ADDED device	001B1EB01119567F	Thu, May 3, 2012 at 13:58:05
0401	✓	POLL_ADDR6	AUTO ADDED subdevice	001B1EB002690013	Thu, May 3, 2012 at 13:57:06
0008	✓	RAD-WHA	AUTO ADDED device	001B1EB011040D00	Thu, May 3, 2012 at 13:57:57
0801	✓	TEMPERATURE TRANSMITTER ABB	AUTO ADDED subdevice	001B1E16080A78BE	Thu, May 3, 2012 at 13:57:57
0009	✓	RAD-WHA	AUTO ADDED device	001B1EB0111ABBC3	Thu, May 3, 2012 at 13:58:15
0901	✓	PAULS_OCTOPUS	AUTO ADDED subdevice	001B1EB00269000F	Thu, May 3, 2012 at 13:58:16
0007	✓	WIHart Adapter SB350	AUTO ADDED device	001B1EE19519324E	Thu, May 3, 2012 at 13:57:55
0701	✓	PAUL_THE_OCTOPUS14	AUTO ADDED subdevice	001B1EB002690006	Thu, May 3, 2012 at 13:57:55

Figure 7: WiNSuite - Device View

When a device is added to the WiNSuite, you can see the current state of the device.

Status	Description
 Offline or unknown	
 Joining	join request received and setting the device
 Online waiting for data	Join process successful, no data to be polled
 Online, data available	Join process successful and data available

Table 1: WiNSuite - Device Status

Status will only updated by pressing the refresh button at the upper right corner or if you switch between different tabs.

To avoid errors with typing of the WiHart ID of the device, wireless devices are added automatically to the network, and they appear as auto added devices. They can be edited exactly like the manually added devices.

Devices which are added with another device beneath are adapters with their subdevices.

▼ 0008		RAD-WHA	AUTO ADDED device	001B1EB0111ABE72
0801		POLL_ADDR8	AUTO ADDED subdevice	001B1EB002690010

In order to see the subdevices of adapters, this process has to be triggered manually by the “Discover” Button.



Do press this button whenever you feel that new subdevices have to be detected or rediscovered into the network. This process is not being started automatically.

### 2.3.1 Polling vs. Bursting

Most of the Wireless Hart devices would be preconfigured in burst mode, which means that it automatically starts sending data at a predefined rate. Therefore it would be immediately possible to see data in the data tab. Same is the case for the subdevices of the adapter.

If devices are not in burst mode it is possible to request data via the user interface and through following update rate command. Default update rate is 0, but user can set it to any value in minutes to give PV in that particular rate.

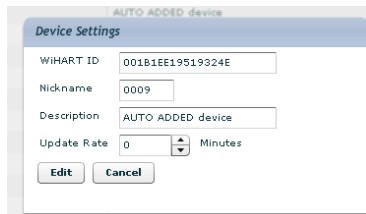


Figure 8: WiNSuite - Device Settings

It is not recommended for bursting devices to add any value in the update rate, as it would increase the traffic of the wireless network and data would come double.

### 2.3.2 Device Details

Based on the health report of each device, WiNSuite collects that data statistically and would show it in this view.

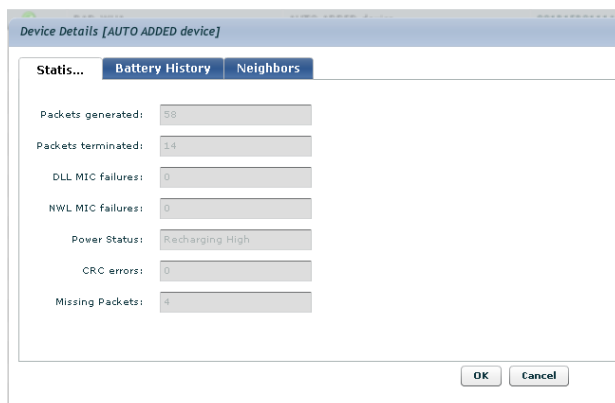


Figure 9: WiNSuite - Device Statistics

Battery history is only available for battery based devices. All other devices would not show any data.

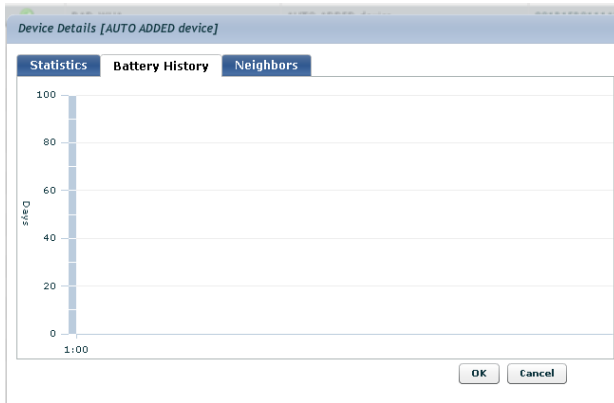


Figure 10: WiNSuite - Battery History

Through the neighbour health and the wireless discovery process, the selected device would show the neighbours it has detected.

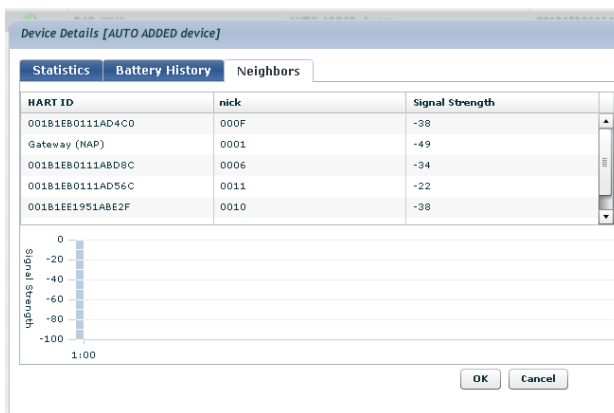


Figure 11: WiNSuite - Neighbour List

## 2.4 Data Values

The Values tabulator shows the list of all devices, and their last primary values, if they are available.

You can also switch to a single device to show their data history as a table or graph.

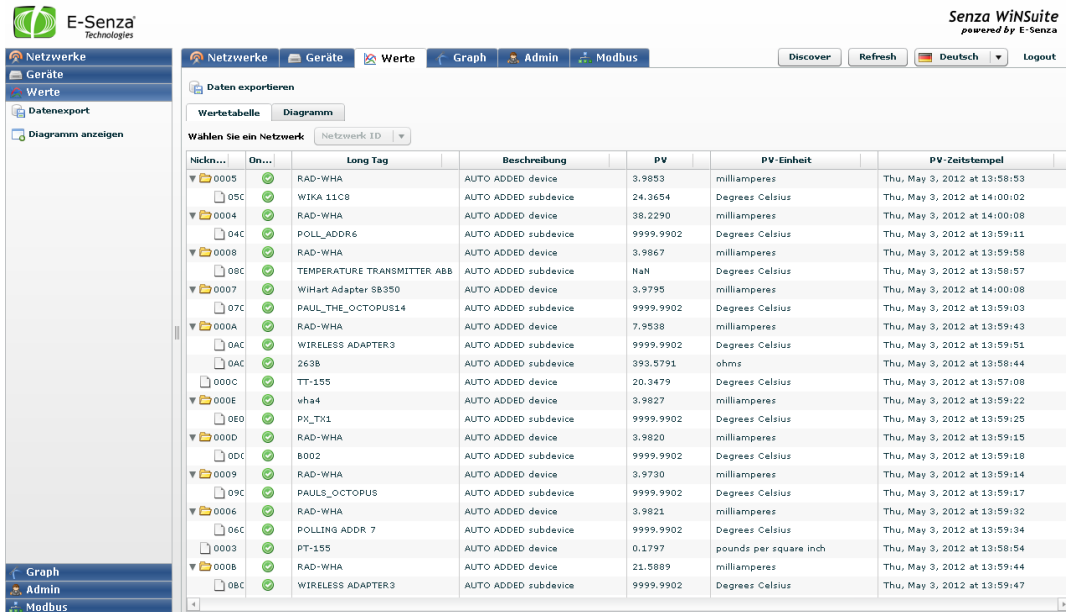


Figure 12: WiNSuite - PV of Online Values

### 2.4.1 Data Graph

The chart view shows a graph and a data history of a specified device.

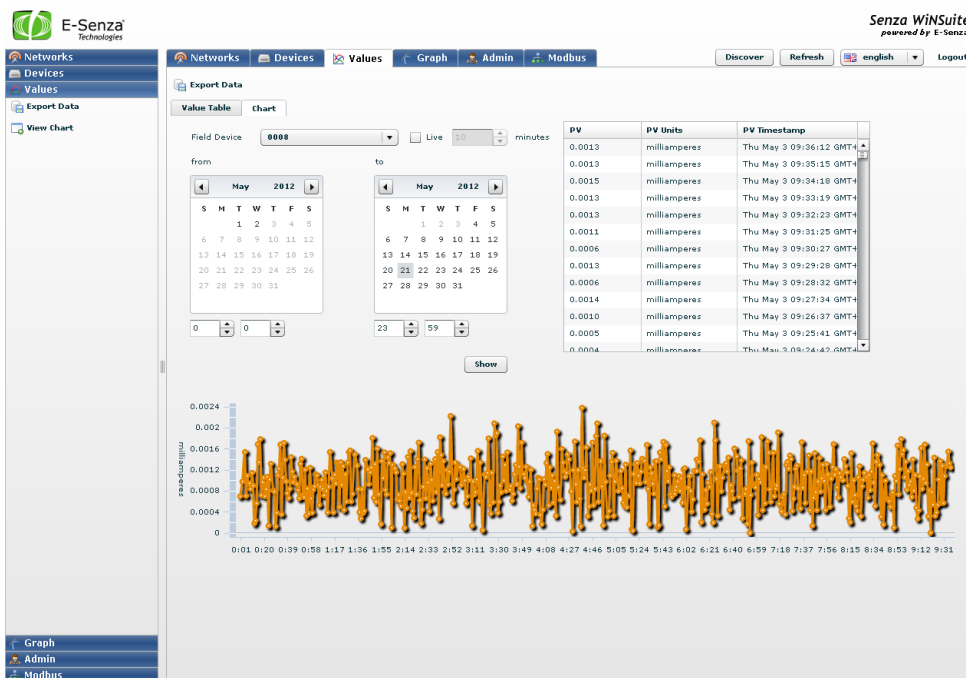


Figure 13: WiNSuite - Value Chart

Select a device and specify the dates from when to when you want to show the data, or check the live checkbox to show the last N minutes. Where N is between 1 and 1440 (1 day). When live the live mode is selected, the view is updated automatically every 10 seconds.

Note: If you press the refresh button while the live mode is on, the view may jump to the first device in list.

## 2.4.2 Data export

You can also export the data of the whole network as a XML file. The XML format match the following DTD

```
<?xml version="1.0" encoding="UTF-8"?>
<!ELEMENT Dataexport ( Record+ ) >
<!ELEMENT Record ( MAC, Timestamp, UnitId, Value, UnitStr, FloatValue ) >
<!ATTLIST Record id NMTOKEN #REQUIRED >
<!ELEMENT MAC ( #PCDATA ) >
<!ELEMENT Timestamp ( #PCDATA ) >
<!ELEMENT UnitId ( #PCDATA ) >
<!ELEMENT Value ( #PCDATA ) >
<!ELEMENT UnitStr ( #PCDATA ) >
<!ELEMENT FloatValue ( #PCDATA ) >
```

## 2.5 Graph

This view would show the routing graph of the wireless network and the connections it created via other wireless nodes. Redundant paths would build up in time and they tend to change with the radio environment.

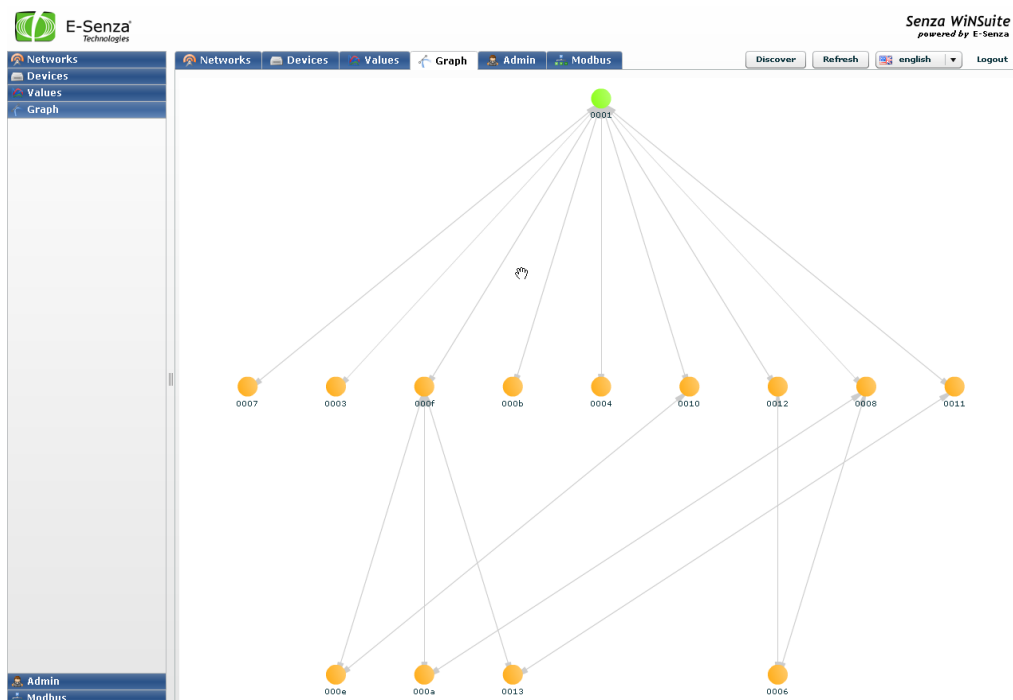


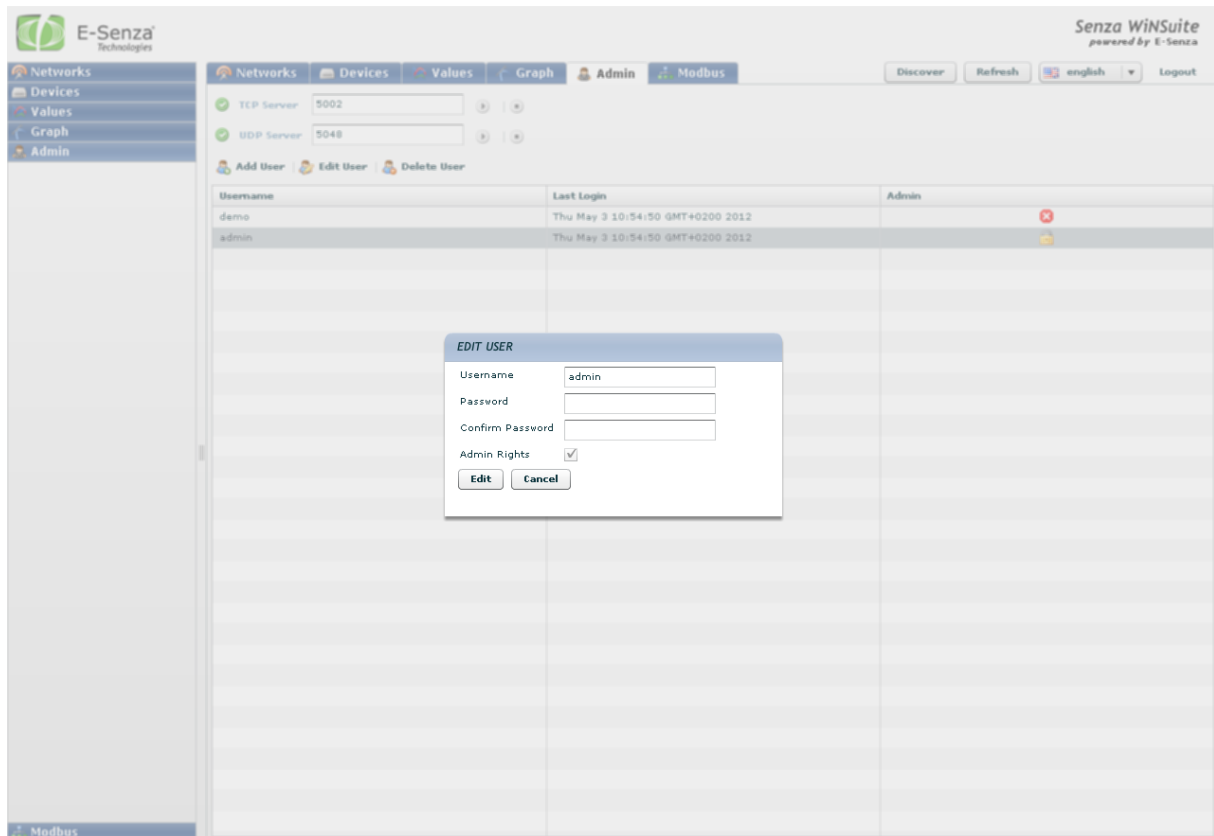
Figure 14: WiNSuite - Routing Graph

## 2.6 Login

Under the tab Admin there is a complete User Management Library where users can add users with respective roles as admin and user.

The user role has only reading options, while the admin rights can edit all the functions.

With the button Logout, the user can log out and a new user can get logged in.



## 2.7 Changing language

The WiNSuite comes in two languages: English and German.

User can change between the two of them.

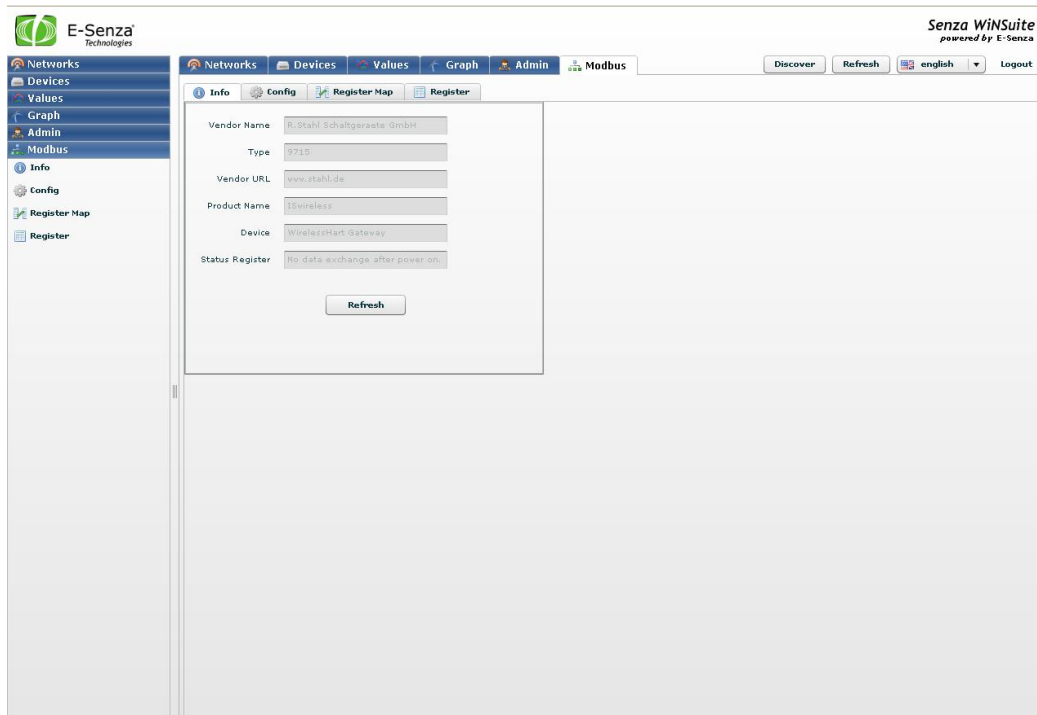
## 3. Modbus Interface

The WiHart Gate supports a Modbus communication channel. The WiNSuite has an UI interface where user can configure all required settings for connecting their Modbus client to the gateway.

### 3.1 Info Panel

The Info Panel contains some information like:

- Vendor Name
- Product Code
- Vendor Url
- Product Name
- Model Name
- Status Register
- 

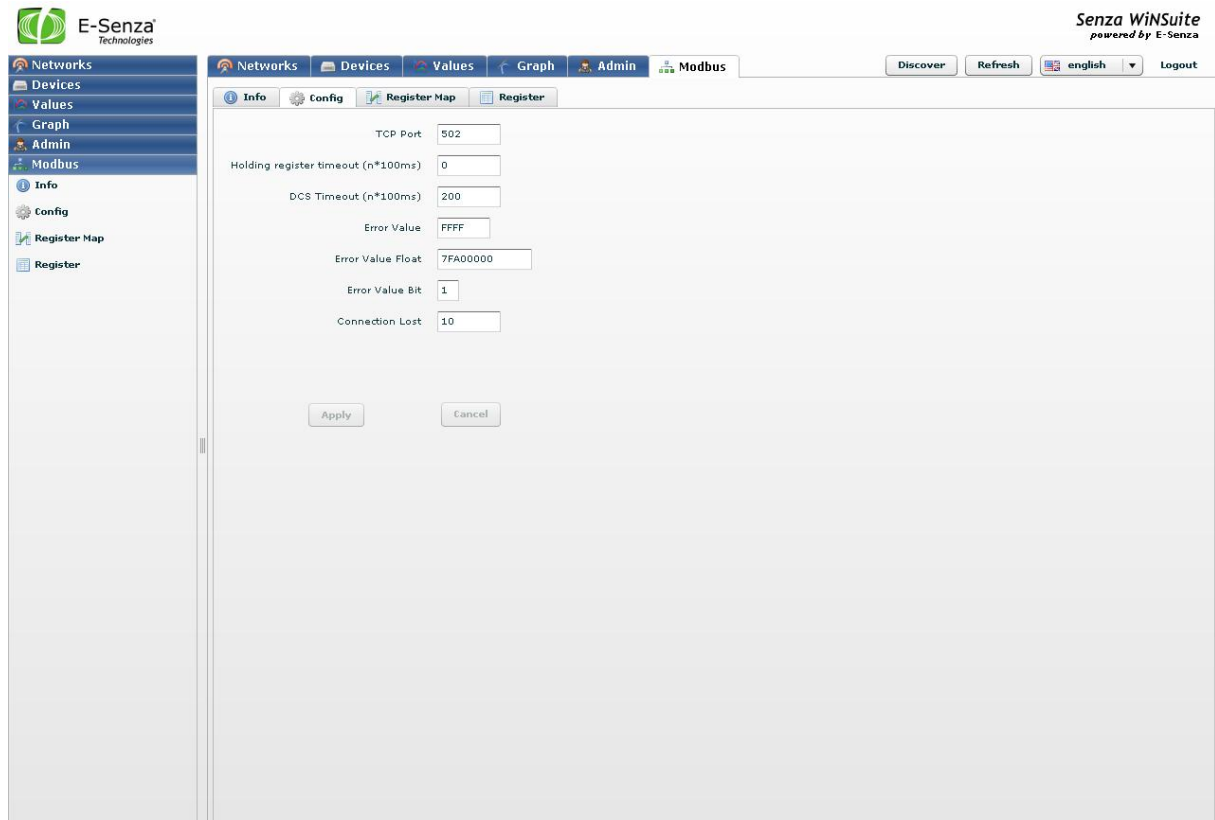


The Status register is the status register of the gateway and can be updated by pressing Refresh Button.



## 3.2 Config Panel

The Config Panel contains configuration parameters for the Modbus interface like:



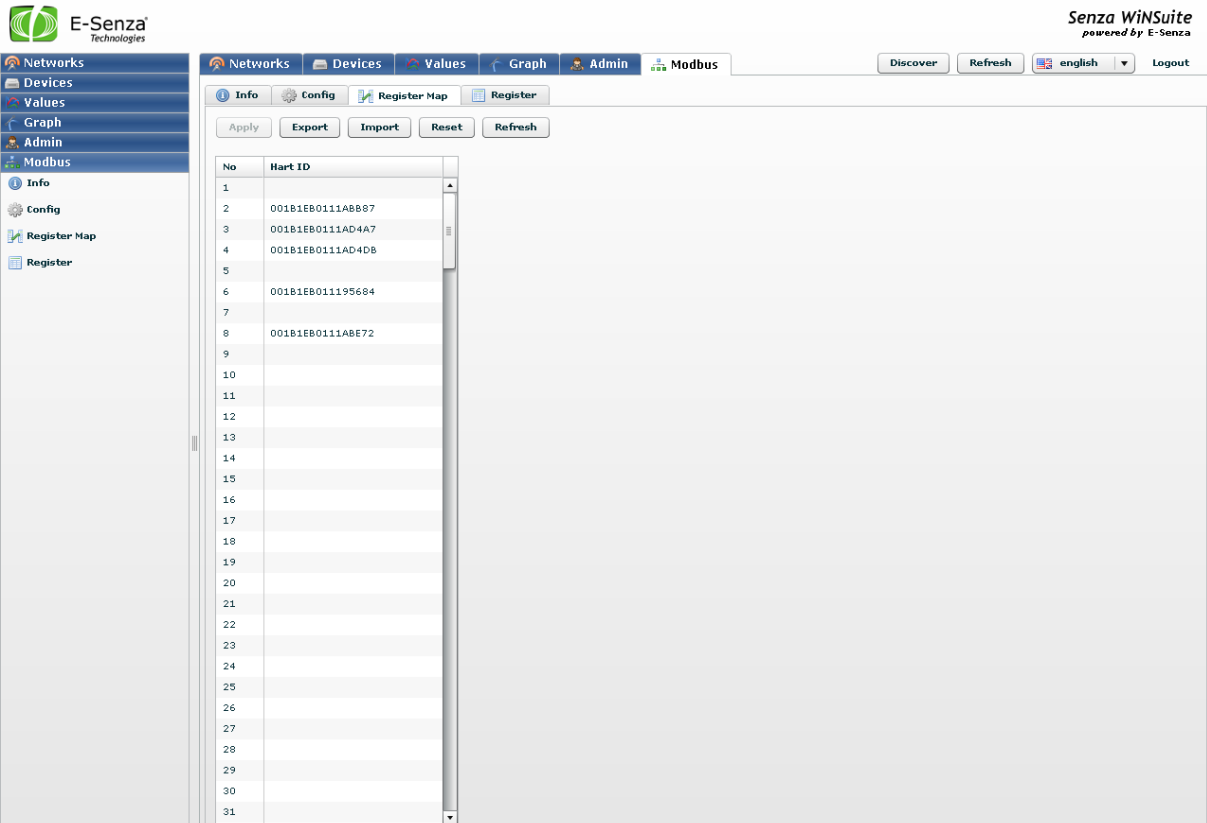
- TCP Port
  - This is the TCP Port of the Modbus connection. It can be changed by the user to some other value
- Holding Timeout
  - This value is the Holding Register Timeout represented here in 100 ms. If user sets it to 0, the holding register would never timeout, otherwise they would time out after the elapsed time in this register and all affected holding registers would be set to Error Value
- DCS Timeout
  - This value is the DCS Timeout represented here in 100ms. If use sets it to some value, if no communication happens on the DCS side, then the DCS connection would be interrupted.
- Error Value
  - This value is the error value of a holding data register so that user knows when the value in register is not correct. User can change it to desired value.

- Error Value Float
  - This value is the error value of a holding status register for analog devices so that user knows when the value in register is not correct. User can change it to desired value.
- Error Value Bit
  - This value is the error value of a holding status register for Digital devices so that user knows when the value in register is not correct. User can change it to desired value.
- Connection Lost
  - This value is a counter after how many lost messages the Modbus should consider a device as not connected anymore

All changes become active and are communicated to the gateway only after pressing the Apply button.

### 3.3 Register Map Panel

The Register Map Panel contains the mapping configuration of devices for specific Modbus registers. You can configure your registered devices in the mapping table as the user desires.



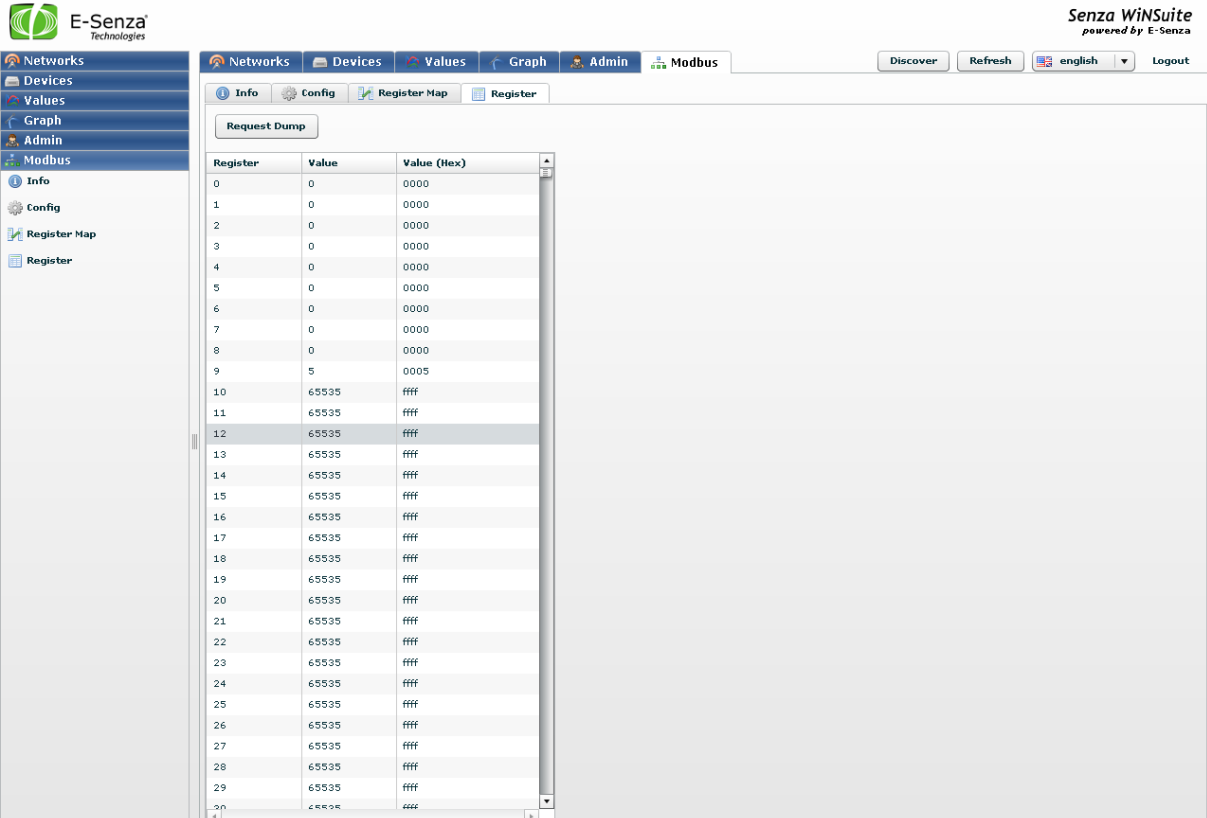
No	Hart ID
1	
2	001B1EB0111A8B07
3	001B1EB0111AD4A7
4	001B1EB0111AD4D8
5	
6	001B1EB011195684
7	
8	001B1EB0111ABE72
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	

Following buttons are available:

- Apply
  - With this user changes are communicated to the gateway and the new mapping table becomes active
- Export
  - With this button you can export your configuration to a separate file
- Import
  - With this button you can import your configuration from a separate file
- Reset
  - Resets the configuration to all empty registers
- Refresh
  - Loads the mapping configuration from the Modbus gateway again

### 3.4 Register Panel

The register panel shows the last complete data in all the registers. By request dump you can request the latest register structure from the Modbus gateway.



The screenshot shows the Senza WiNSuite interface. The top navigation bar includes 'Networks', 'Devices', 'Values', 'Graph', 'Admin', and 'Modbus'. The left sidebar has 'Info', 'Config', 'Register Map', and 'Register' options. The main content area has tabs for 'Info', 'Config', 'Register Map', and 'Register'. The 'Register' tab is active, showing a table of registers. A 'Request Dump' button is located above the table.

Register	Value	Value (Hex)
0	0	0000
1	0	0000
2	0	0000
3	0	0000
4	0	0000
5	0	0000
6	0	0000
7	0	0000
8	0	0000
9	5	0005
10	65535	ffff
11	65535	ffff
12	65535	ffff
13	65535	ffff
14	65535	ffff
15	65535	ffff
16	65535	ffff
17	65535	ffff
18	65535	ffff
19	65535	ffff
20	65535	ffff
21	65535	ffff
22	65535	ffff
23	65535	ffff
24	65535	ffff
25	65535	ffff
26	65535	ffff
27	65535	ffff
28	65535	ffff
29	65535	ffff
30	65535	ffff

### 3.4.1 Register Structure

The Register structure of the Modbus master is fixed, no optimization required. The registers are split into different segments. The segments are organized as followed:

Register	Content	Size (registers)	Comment
0	Reserved	9	
9	Status register	1	Gateway status
10	Status register	500	Signal status
510	Reserved	90	
600	Segment 1 - 250 x 1 Float	500	Mapping for 1. Variable
1100	Segment 2 - 250 x 4 Float	2000	Mapping for 4. Variables
3100	Segment 3 - 250 x 8 Float	4000	Mapping for 8. Variables
7100	Segment 4 - 250 x 1 Float	500	Mapping for Analog Output
7600	Segment 5 - 250 x 2 bytes	250	Mapping for Binary input
7850	Segment 6 - 250 x 2 bytes	250	Mapping for Binary ouput

This means that the Primary Variable is 3 times noted down in the registers for an Analog Input.

Segment 1	$600+(i-1)*2$
Segment 2	$1100+(i-1)*8$
Segment 3	$3100+(i-1)*16$
Segment 4	$7100+(i-1)*2$
Segment 5	$7600+(i-1)$
Segment 6	$7850+(i-1)$

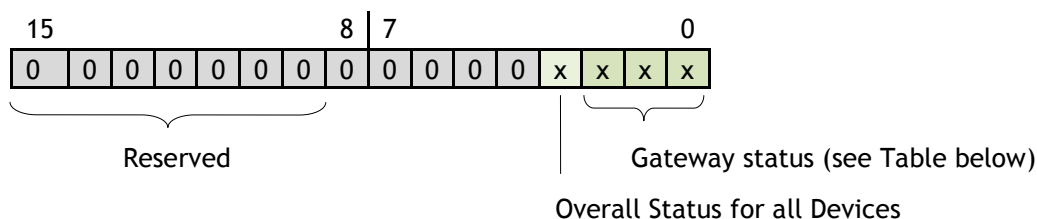
i is the ID of the device (1 to 250)

Access to addresses below 9 or higher than 8099 are not allowed and are answered with error code 0x02 (Illegal Data Address)

All reserved bits are set to 0. Not to ErrorValue.

#### 3.4.1.1 Status Register Gateway

The Gateway status is specified in register 9.





0 (000)	Reserved
1 (001)	Hardware error if NAP is not accessible
2 (010)	Data Exchange
3 (011)	No Data Exchange (after Power On without configuration)
4 (100)	configuration or parameter error
5 (101)	No Data Exchange (after power on)
6 (110)	Loss of connection between GW and NM

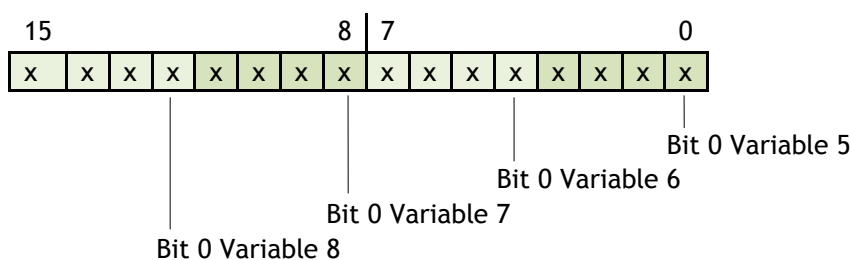
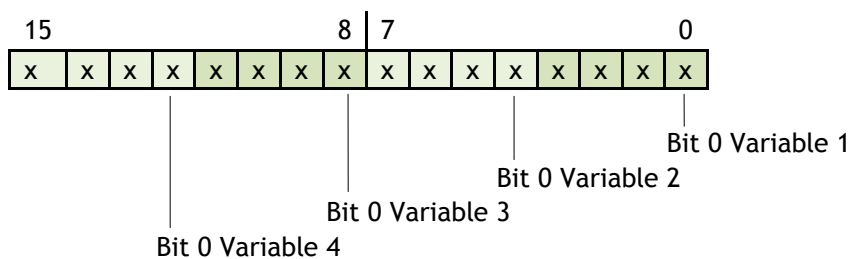
### 3.4.1.2 Signal Status

Each wireless device, WiHART Field Device or WiHART Adapter, has two register for indicate the signal status for all variables. For each of the possible 8 values of a device are 4 bits specified. The 4 bits defines 5 states

Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	no Warning
1	0	0	0	Maintains required
0	1	0	0	Out of specification
1	1	0	0	Check function
1	1	1	1	Failure
Any other bit set				Not in use

The signal status of the first device is specified at register 10.

Status of any device(i) can be found at register  $10+(i-1)*2$  and followed one.

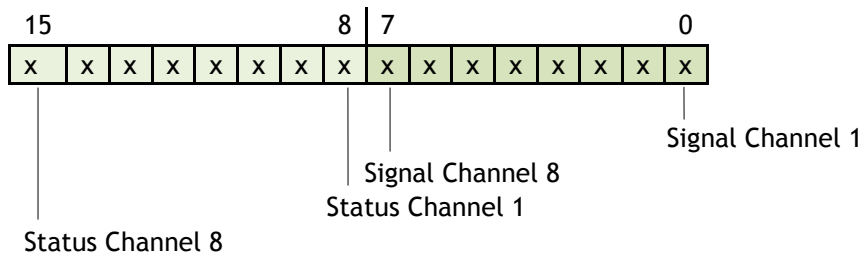


Status changes are triggered by the following events and reflected in the specific status bit.

Event	Status bit	Limit
Battery status low	Maintenance required	< 30 days
Sign in failed	Failure	3 -retries on Application layer
Burst mode mismatch	Failure	
No Communication between end device and GW	Failure	n missing burst messages
Loss of connection between NM and GW	Maintenance required for all signal states	Tbd.
Loss of connection between GW and DCS	Failure (just for initialization)	
Device in Join process	out of specification	

### 3.4.1.3 Digital Input / Output

The Registers for Digital in- and outputs is split into status and signal byte. The low byte contains the signals of all 8 channels, and the high byte contains the associated stats.



Signal is the written or read value from the FieldDevice

Status1 indicates no error

0 indicates a communication error, shorted or broken sensor

The status bit is logical and for the Signal status register.

### 3.5 Modbus Functions

The Modbus functions which are supported are:

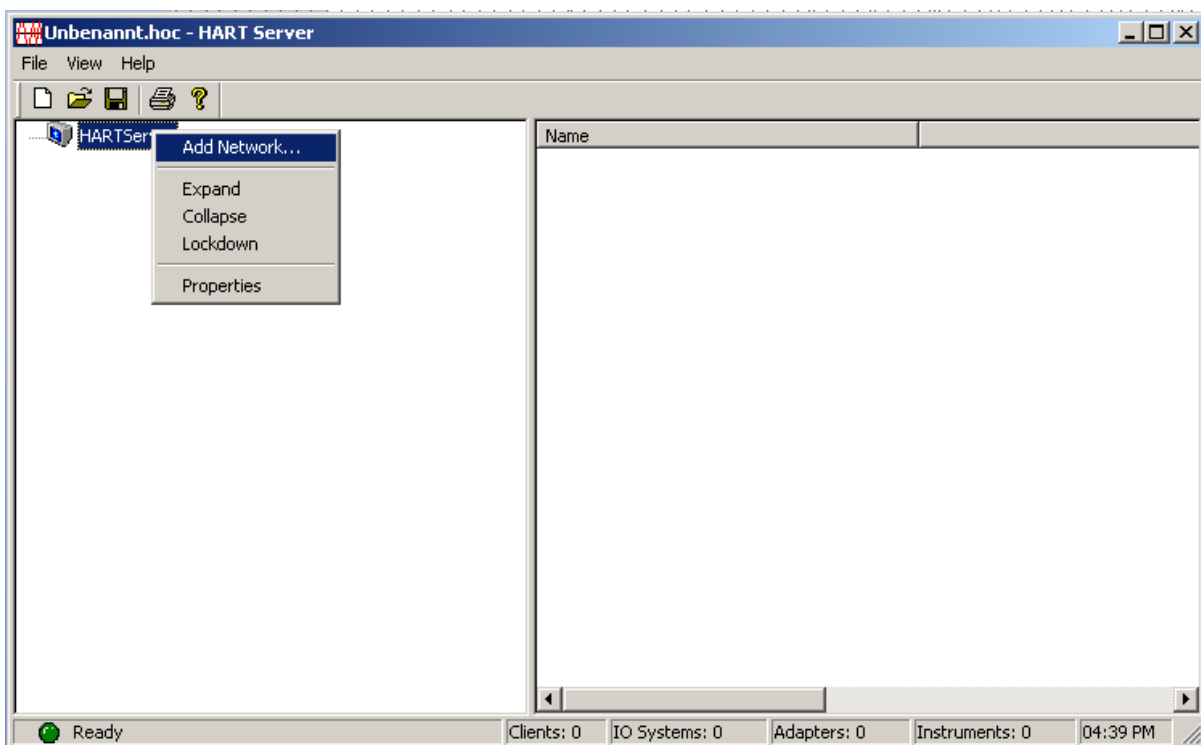
Modbus Function		Gateway functionality
03 (0x03)	Read Holding Registers	Output Register read 1register
06 (0x06)	Write Single Register	Write 1 register
08 (0x08)	Diagnostics Subfunction 0x00 Return-Query Data	Connection test
16 (0x10)	Write Multiple Registers	Write Register
43 (0x2B)	Read Device Identification Read Device ID code = 01 / 02 / 04	Read device information

## 4. HART Server

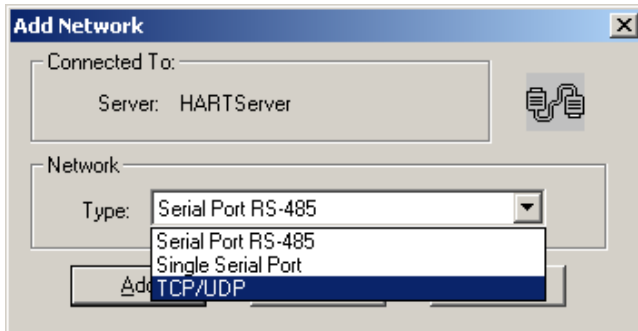
The Gateway is accessible over the HCF HART Server version 3.1.0 as a TCP client.

To add a Gateway from the HART Server please follow these steps

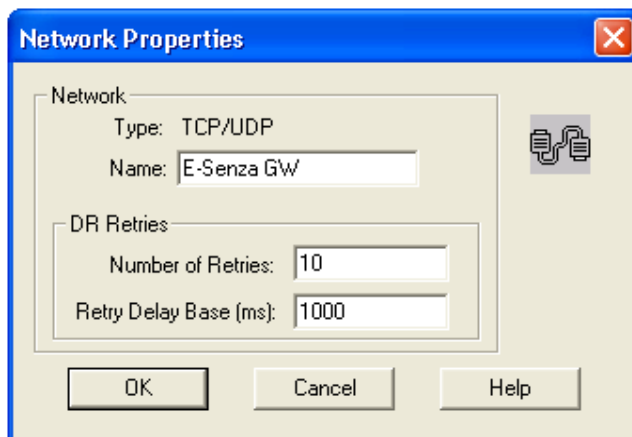
Step 1: Right Click on the HARTServer and select 'Add Network'



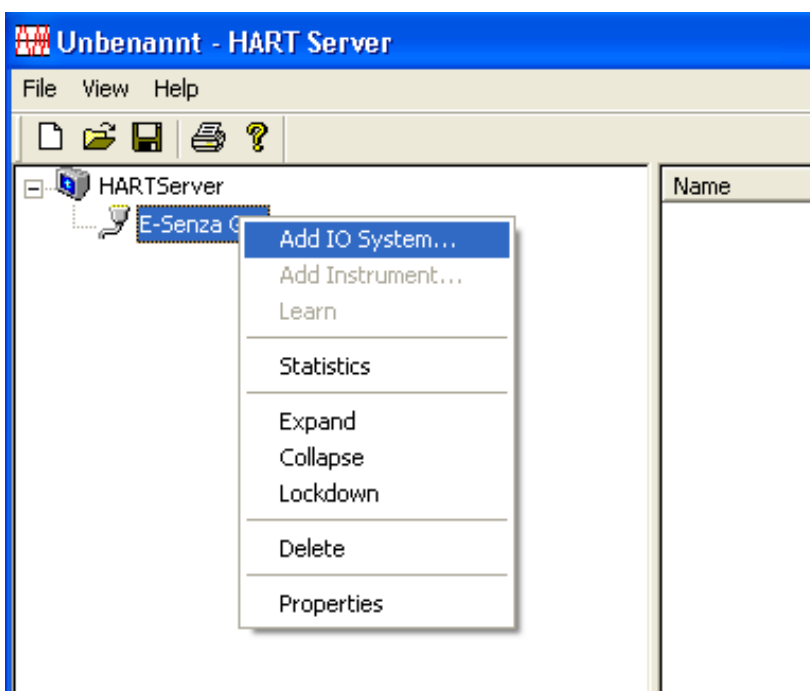
Step 2: In the Add Network pop-up menu select the Network type as TCP/UDP



Step 3: Give an appropriate name for the Network and maintain the default DR Retries values



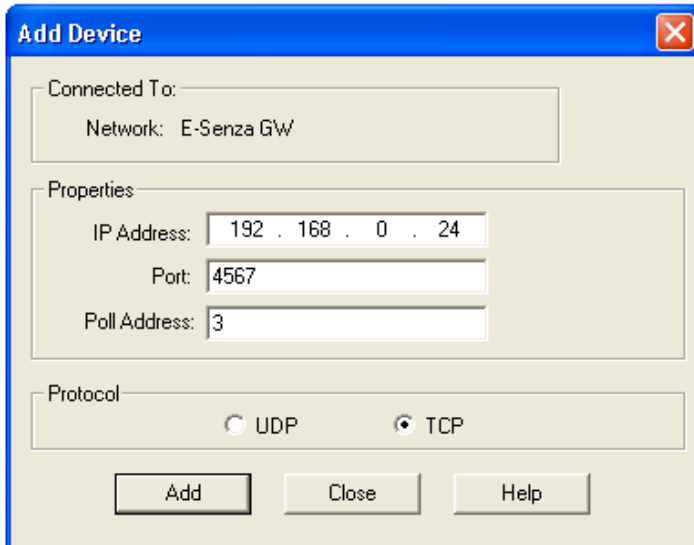
Step 4: Right Click on the Network 'E-Senza GW 1' and select the option Add IO System



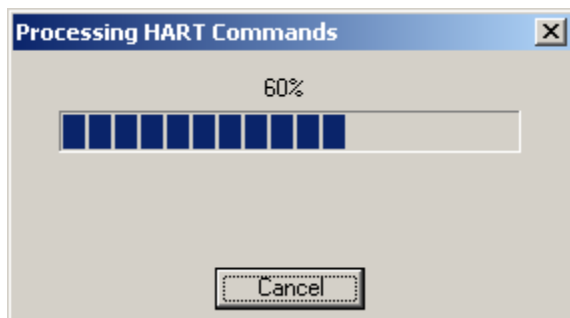


Step 5: Enter the IO System properties as shown in the next figure. The IP Address of the Gateway can be obtained from the WiNSuite User Interface (see Figure 6: WiNSuite - Ethernet Settings).

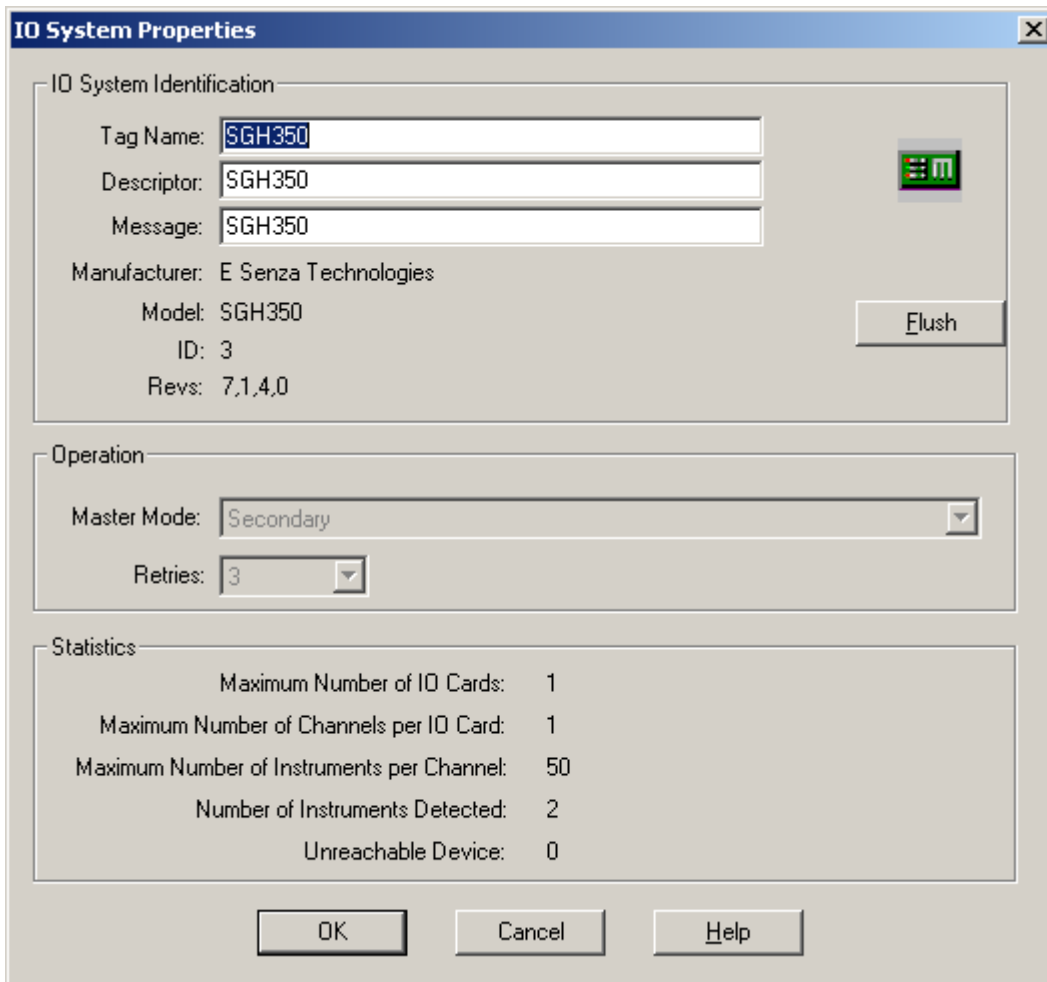
The Port should always be '4567' and the polling address is always '3'. The protocol should be 'TCP'. Now left click on 'Add'.



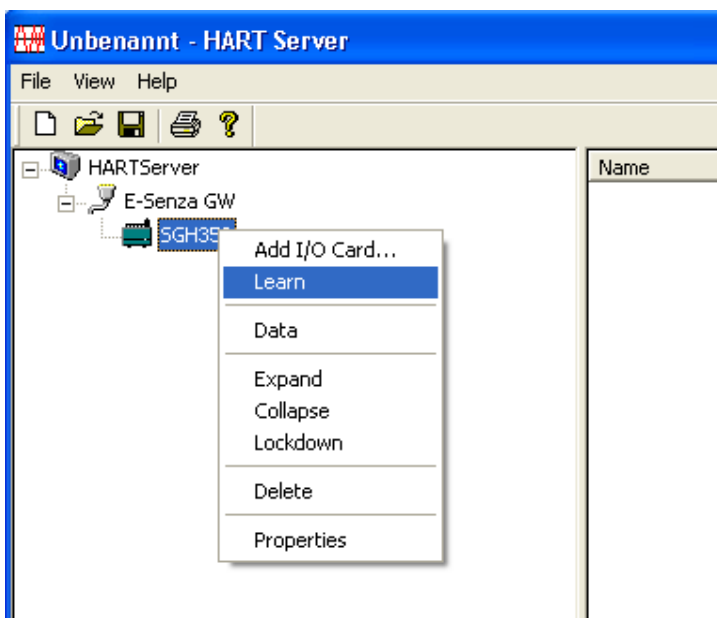
Step 6: The following progress bar will briefly appear on the screen.



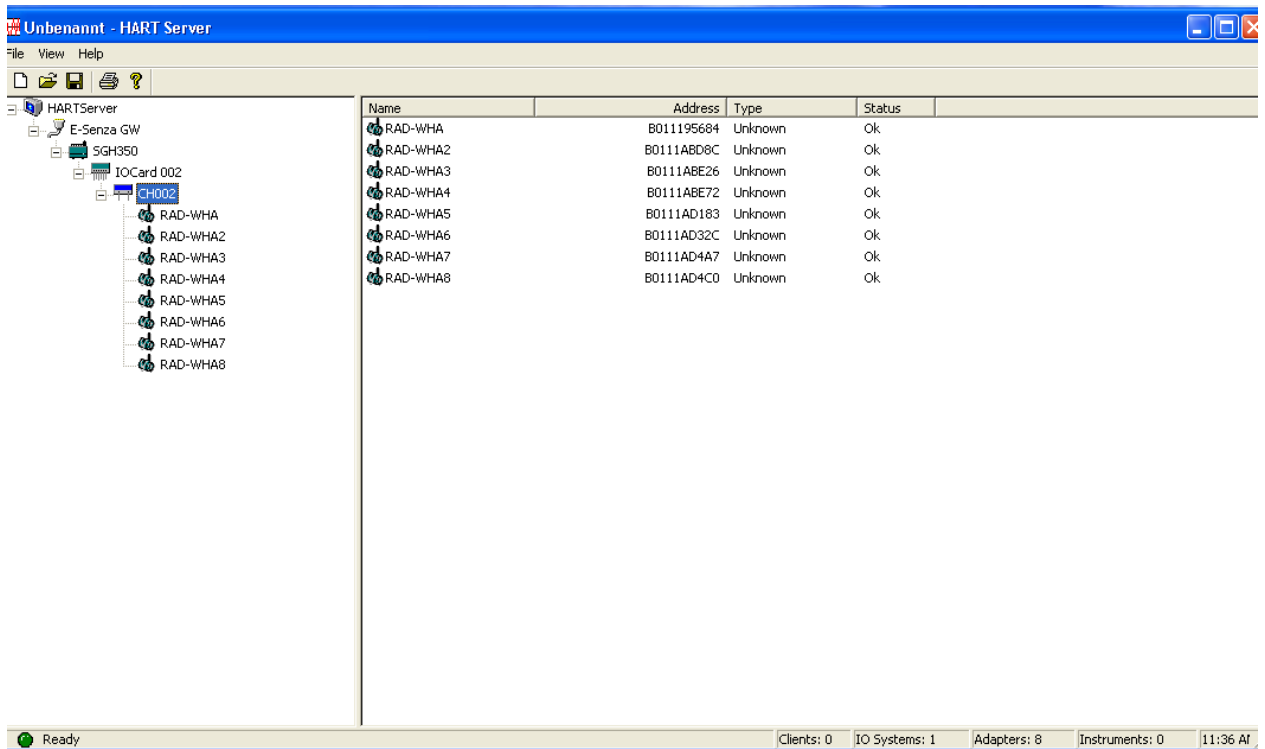
Once it is completed i.e. it reaches 100%, the following screen will appear. From this screen, you can verify the Tag name, descriptor and message settings of the Gateway. If you have no field devices connected to your network you will see that the number of instruments detected will appear as '0'. In this example there are '2' field devices detected. Left Click on 'OK' to continue.



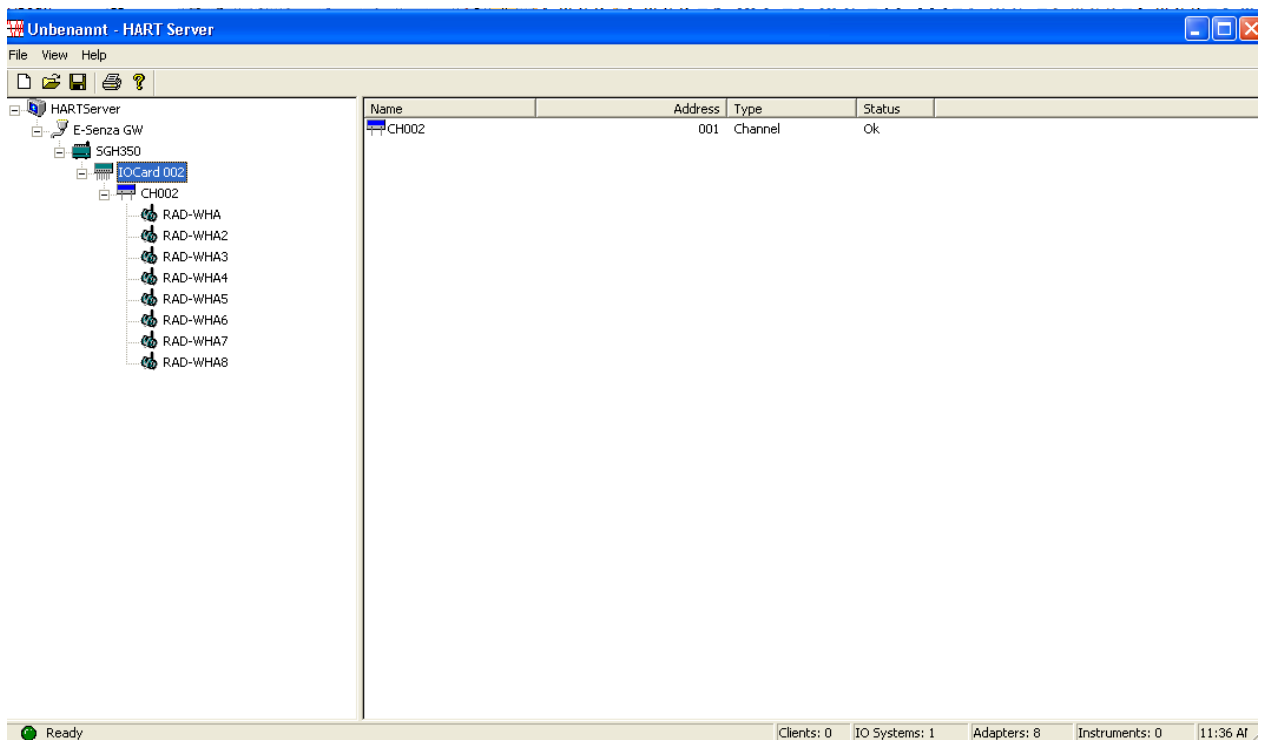
Step 7: At the main screen now right click on SGH350 and select the 'Learn' Option to add the detected instruments to the Network. This operation may take a few minutes to execute, so please be patient.



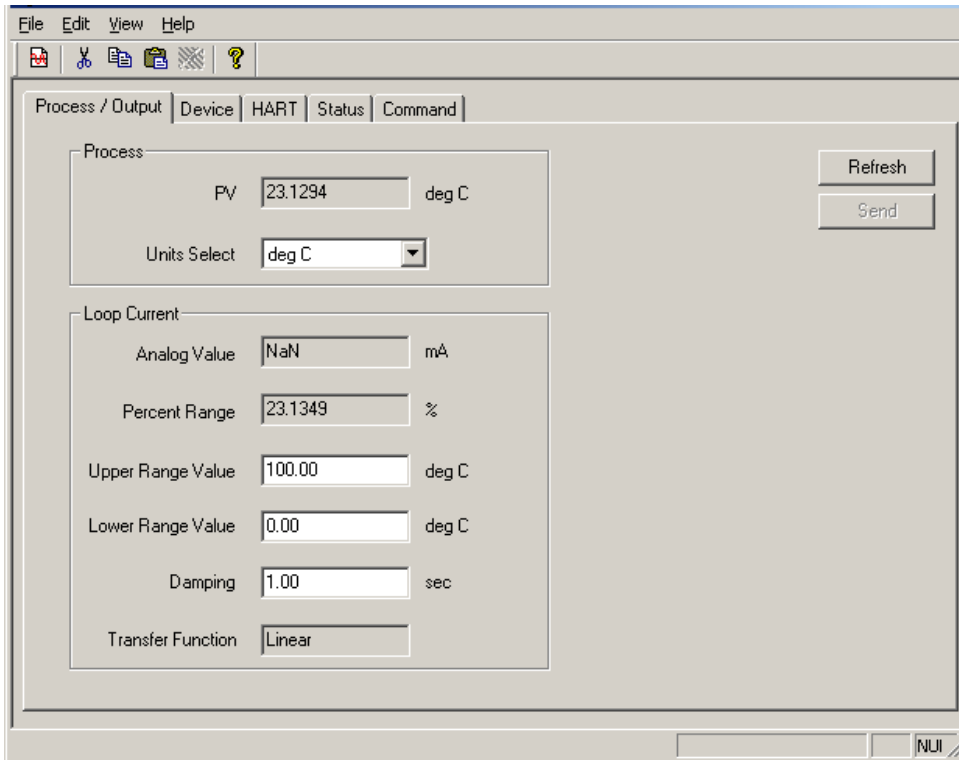
After the 'Learn' is complete, the Network may look like this:



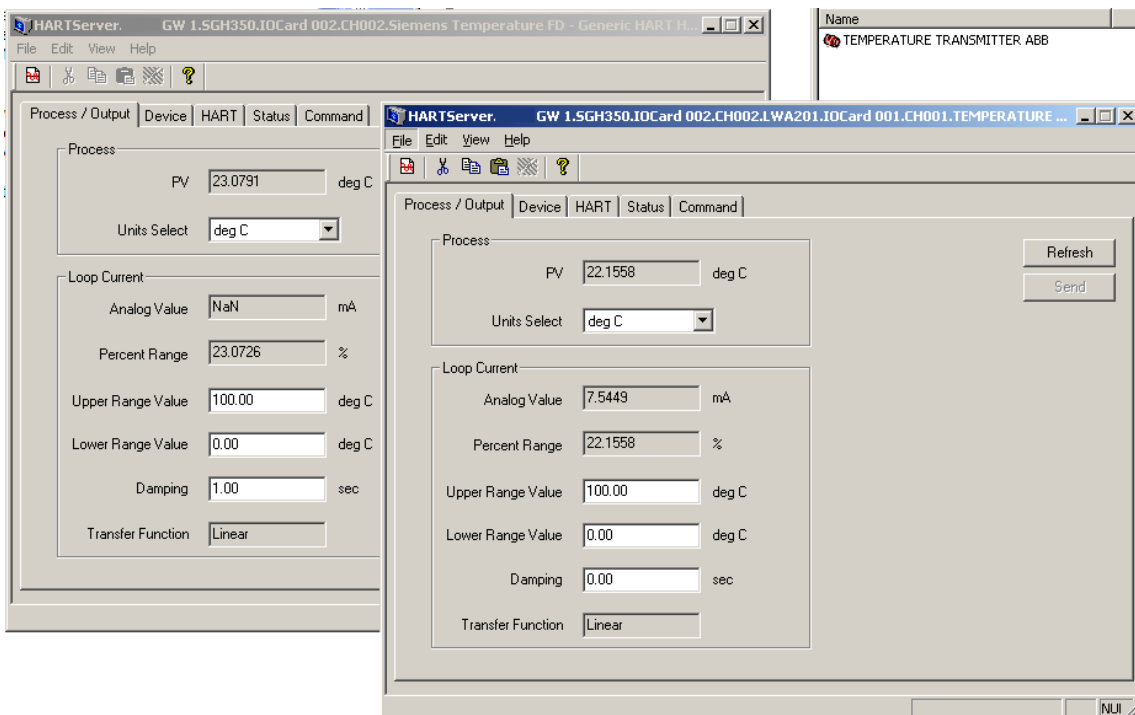
Field Devices will be available under the first IO Card/Channel under the Gateway as shown below:



Double clicking on a field device will show this window:



Such windows can also be opened for the HART Field devices connected to WirelessHART Adapters. Opening a window for a HART Field Device connected to a WirelessHART Adapter may take a few minutes, due to communication latencies and Delayed Responses from the legacy HART devices, so please be patient. You can observe multiple Field Devices from the HART Server at the same time as shown below.



## 4.1 Backup & Restore Gateway Configuration

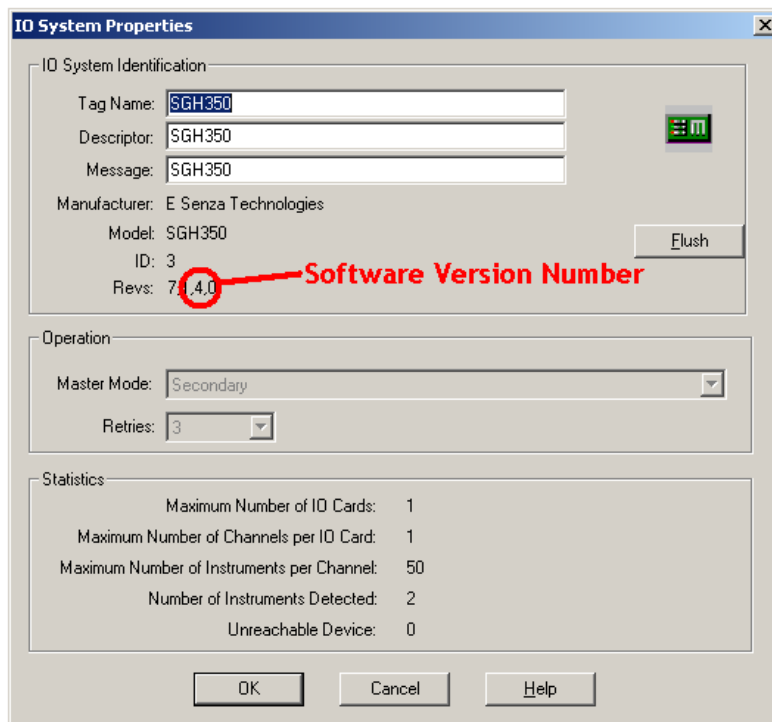
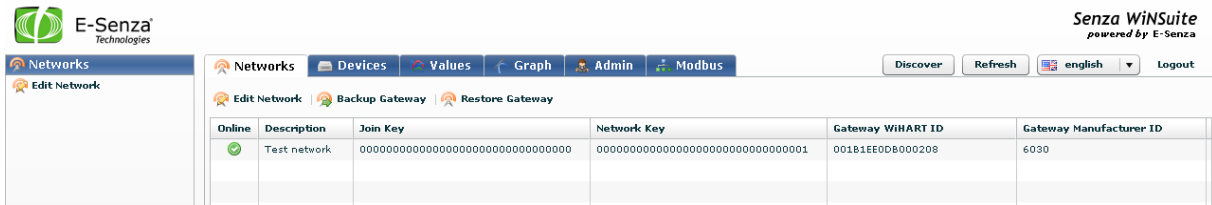
The Modbus register map, the Modbus configuration as well as the general Configuration of the gateway with its unique GatewayID can be stored locally and restored back. The file can be stored locally on the PC and comes in format of an XML.



## 4.2 Diagnostics

### 4.2.1 Version number

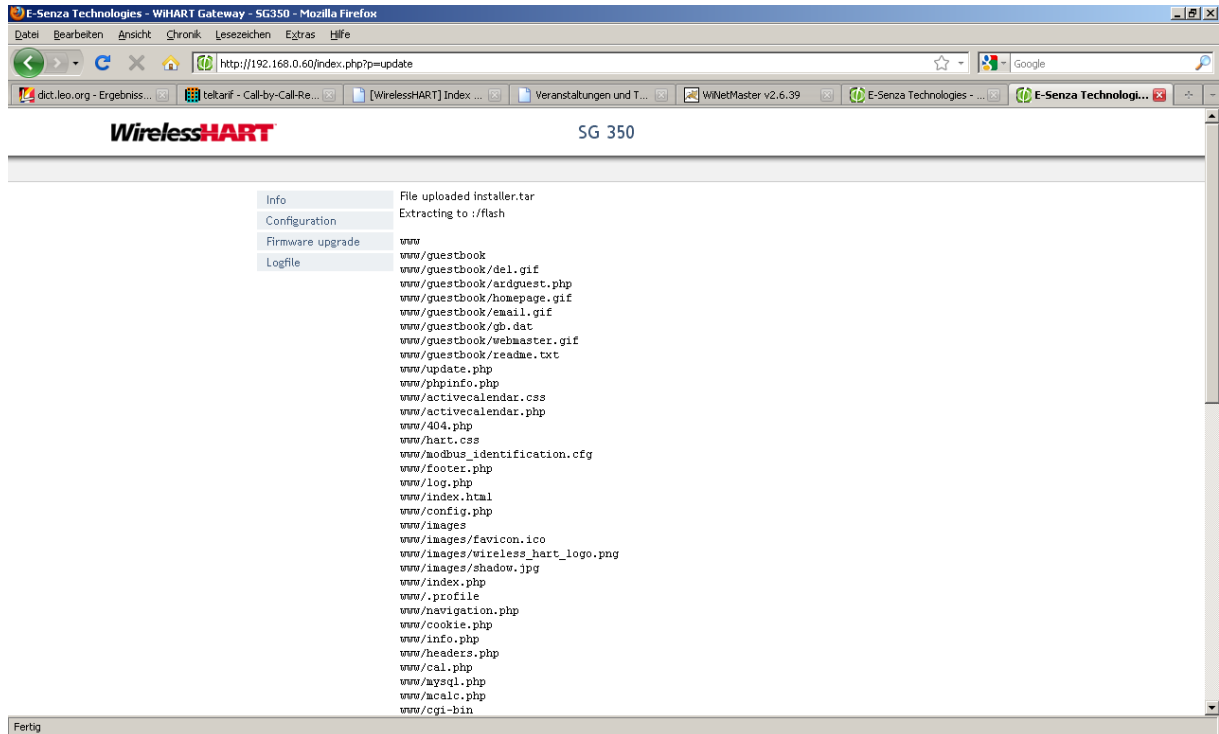
The Gateway version number can be observed either on the HART Server or on the network tab:



### 4.3 Firmware Updates

The Gateway firmware can be updated by uploading the new tar file via the webserver of the gateway and the power cycling the Gateway.

<http://IPaddressOfGateway> and then go to the Menu Firmware Upgrade



#### 4.3.1 Logs

The Gateway logs is located and visible also on the web server of the gateway.

