SIEMENS

SIMATIC NET

IE/WSN-PA Link

Operating Instructions

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

Preface

<div style="text-align: right; font-size: 2em;">1</div>

Validity of this manual

This manual is valid for the following versions of the IE/WSN-PA Link:

- Hardware product version 0
- Firmware version 3.8

Device variants

The following variants of the IE/WSN-PA Link are available:

Device variant	Order number
IE/WSN-PA Link (with integrated antenna)	6GK1 411-6CA40-0AA0
IE/WSN-PA Link (with connection for integrated antenna [*)])	6GK1 411-6CA40-0BA0

[*)] An external antenna is available as an accessory, see section 2.2.3.

Product name used in the manual

Note

In this document, the name "Link" is also used in place of the full product name "IE/WSN-PA Link".

Purpose of the manual

This manual contains the information you require for commissioning, configuring and operating the Link.

Installation and connecting up the Link is described in the Operating Instructions (compact) that are supplied with the product.

Description of the product

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2.1 Basic functions of the link

Fig. 2-1   IE/WSN-PA Link (device variant with integrated antenna)

The IE/WSN-PA Link is a gateway between a WirelessHART™ network (wireless sensor network = WSN) and a wired local area network (LAN).
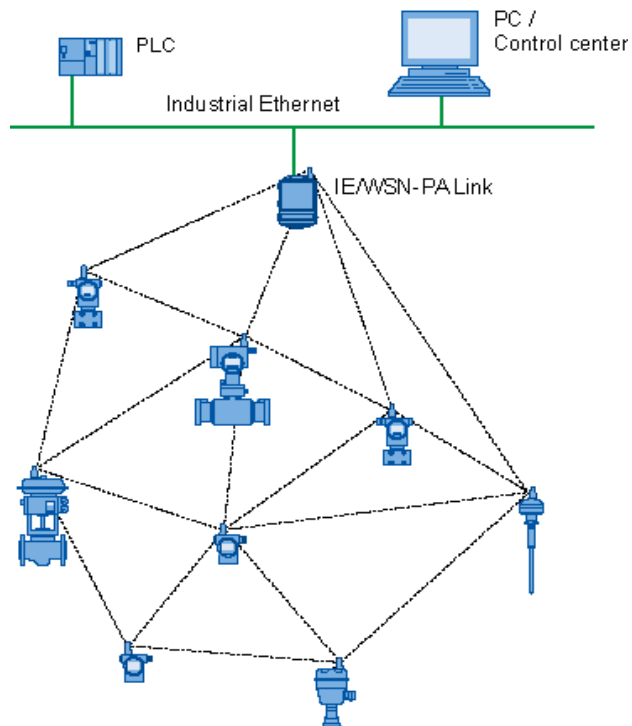
Fig. 2-2   Use of the IE/WSN-PA Link as a gateway between a WirelessHART network (WSN) and a wired network

The IE/WSN-PA Link allows a self-organizing WirelessHART network to be set up and manages security and connectivity. The Link is the input point for data from WirelessHART sensors. This data is converted to a format compatible with other systems. System integration can be achieved in conjunction with an HMI system: With TCP/IP via HTTPS browser, OPC server, Modbus TCP/IP via Ethernet or Modbus RTU via a serial connection.

The IE/WSN-PA Link provides industry leading security, scalability, and functionality. You can customize security levels to meet plant standards via a web-based interface. This interface also allows monitoring of points, simple trending, customized measuring point lists, basic configuration, and security management.

The network can be expanded easily with the IE/WSN-PA Link. Simply set the network ID and the Join key on the new device and this becomes part of the existing network.

2.2 Components of the product and accessories

2.2.1 Components of the product

What the package contains

The following components are supplied with the IE/WSN-PA Link:

- IE/WSN-PA Link
- Mast fittings comprising 2 mast clamps (78 mm) and screws
- Threaded blind plugs 1/2 inch NPT for unused cable feedthroughs
- LAN cable (1 meter) for connecting a PC/laptop (for direct connection to a non-Switch network component)
- Operating Instructions (compact) on paper
- CD with important documentation and software:
  - These operating instructions for the IE/WSN-PA Link (PDF)
  - Operating Instructions (compact) for the IE/WSN-PA Link (PDF)

2.2.2 Accessories for attachment to Industrial Ethernet

Accessories for the IE/WSN-PA Link

Suitable products are available for outdoor installation of the Ethernet cabling. The following products are not supplied with the IE/WSN-PA Link.

- Adapter cable M12 female NPT 1/2" to RJ-45 jack, length 11 cm

  Harting Electronics GmbH & Co KG

  Order number 21 03 683 6420

You will find information on ordering at the following Internet address

www.harting.com -> contact -> adresse

● Ethernet SIMATIC NET IE FC standard cable GP 2x2

Order no. 6XV1 840-2AH10

The cable is not suitable for underground installation.

● M12 male connector IE FC M12 Plug PRO for assembly in the field

Order no. 6GK1 901-0DB20-6AA0

2.2.3 Accessories for the device variant with external antenna

Optional accessories

The following accessories for the device variant 6GK1 411-6CA40-0BA0 are not supplied with the IE/WSN-PA Link:

● External antenna ANT792-6MN

Order number 6GK5 792-6MN00-0AA6

● Lightning protection element LP798-1N

Order number 6GK5 798-2LP00-2AA6

● Antenna cable (10 m) N-Connect male/male flexible connecting cable

Order number 6XV1 875-5AN10

● Antenna cable (1 m) N-Connect male/male flexible connecting cable

Order number 6XV1 875-5AH10

● 2.4 GHz IWLAN RCoax N-Connect male/male coupler

Order number 6GK5 798-0CP00-1AA0

2.3 Application

The Link is intended to link a WirelessHART network (WSN) to an Industrial Ethernet network.

Data transmission of the WirelessHART sensors can be configured via the Link and the data of the sensors can be transferred from the Link to the stations connected via Ethernet. The WirelessHART devices can be displayed and diagnostics functions run.

The following two diagrams are typical sample configurations showing how the IE/WSN-PA Link can be connected to a control system, an operator control and monitoring station or, for example, to a maintenance station.

2.3.1 Connection to a wired Industrial Ethernet network

The following schematic shows a configuration in which the IE/WSN-PA Link is connected via a wired Industrial Ethernet network.

Fig. 2-3   Example of a configuration of a Link with attachment to wired Industrial Ethernet

2.3.2 Connection to Industrial Ethernet via IWLAN

The following schematic shows a configuration in which the IE/WSN-PA Link is connected via IWLAN to an Industrial Ethernet network. This increases the flexibility in the location of the Link. By connecting the Link to an IWLAN node (client or access point), you can transfer data from the WSN via WLAN.

Fig. 2-4   Example of a configuration of a Link with attachment to Industrial Ethernet via IWLAN

2.4 Properties of the IE/WSN-PA Link

2.4.1 Hardware interfaces

Interfaces

- Wireless interface for connection to a WirelessHART network (WSN)

    – Radio frequencies
      2.4 - 2.5 GHz DSSS (Direct sequence spread spectrum technology) sliced into 16 radio-channels, based on standard IEEE 802.15.4
      Continually "hop" across channels to avoid interference and increase reliability

    – Antenna

      Integrated omnidirectional antenna (device variant 6GK1 411-6CA40-0AA0)

      Option: Remote omnidirectional antenna (installed via N-Connect female connector of device variant 6GK1 411-6CA40-0BA0)

- Ethernet

  2 LAN interfaces as RJ-45 jacks for connection to an Industrial Ethernet network

  10baseT/100baseT Ethernet communication port, supports Modbus TCP/IP.
  Some configuration of the field devices (communication parameters) and monitoring is performed using Web pages generated by the IE/WSN-PA LINK.

- RS 485

  2-wire communication link for Modbus multidrop connections
  Transmission speed: 57.600, 38.400, 19.200, or 9.600
  Protocol: Modbus RTU

2.4.2 Housing

Housing design

- Rugged industrial housing

  The rugged housing of the Link allows field installation in any Zone 2 / Division 2 and is NEMA 4X / IP 65 rated.

  The cast aluminum housing encloses the electronics and circuitry of the Link. The front of the enclosure has two covers:

    – The upper cover

      Normally the upper cover does not need to be opened.

    – The lower cover

      The lower cover provides access to the junction box which contains the terminals for the power supply, and Ethernet and serial Modbus connections.

2.5 System requirements

2.5.1 Configuration PC

System requirements for the configuration PC

For the initial configuration, a PC/laptop must meet or exceed the following criteria:

Operating system:

- Windows 2000, service pack 4
- Windows Server 2003
- Windows XP (Home or Professional), Service Pack 1 or higher.

Applications:

- A Web browser, for example
  - Internet Explorer 6.0 or higher (recommended)
  - Mozilla Firefox 1.5 or higher
- Adobe Acrobat 5.0 (or higher) for the Operating Instructions

Network structures

<div style="text-align: right; font-size: 3em;">3</div>

3.1 Setting up network structures

Note

To make optimum use of the WirelessHART network, a site survey of the WSN network under local conditions is a must.

Where possible, mount the Link or the external antenna of the Link at a location where a connection to several WirelessHART devices is possible.

To achieve ideal illumination, we recommend that each network node should have at least two neighbors.

Overview

This chapter discusses ways to ensure good performance and security in the WirelessHART network. After commissioning the network, the connections should be checked and choke points in the network eliminated. If expansions to the network become necessary, they increase the span and reliability of the network.

This chapter lays out guidelines to increase and ensure the security of the network.

Verify connections

A good connection should have the following characteristics:

- Data reliability > 99%
- Data latency < 3 times the update rate
- Battery life > desired life span at fastest update rate. Note the information from the field device vendor.
- The Radio Signal Strength Indication (RSSI) in the Link diagnostics is helpful. This check is listed last because it can be misleading on its own (weak signals can still get through if the path is stable), but it can help to identify a problems when they arise.

Choke points in the network

Next, identify choke points in the network. If messages from several devices all have to pass through a single device on their way to the Link, this may lead to a choke point in the available bandwidth.

This does not happen often because of the redundant communication paths in most self-organizing networks. The solution is simply to add additional devices near the device that represents the choke point to provide more communication paths.

Note

Identification of choke points in the network should be performed 24 hours after all the devices have joined the network. This will allow the network to stabilize and optimize itself.

Impenetrables

A typical plant includes plenty of potential impenetrables, such as buildings, dense piping, concrete walls and long distances. The diagram below shows how impenetrables affect signal strength.
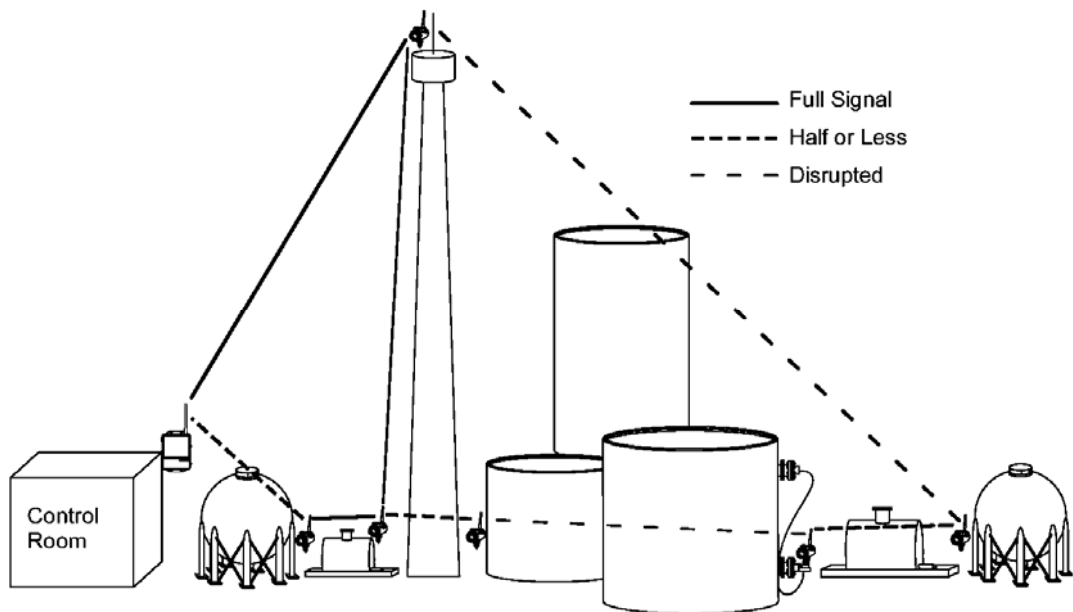
Fig. 3-1

At any layer, increasing distance can also weaken signals. In general, if impenetrables disrupt direct transmission between WirelessHART sensors, simply add additional devices to provide alternative communication paths around the obstacle.

Expanding the network

The network itself senses that a device has joined the network and routing algorithms in the devices and Link automatically find the best path to the destination. The only limitation is the amount of traffic that can be handled by each Link and by the devices.

This capability makes not only large-scale additions easy, but also allows the addition of single devices to meet short-term needs. You can even install a device temporarily to find out whether a permanent installation would make an improvement.

Note

Depending on the size of the network and the number of nodes, adding a node may take several minutes.

Commissioning, configuration and diagnostics

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4.1   Security settings and user roles

User roles

Before configuring and commissioning the Link, decide who should be assigned which user role.

Role (login)	HTML access
Executive (exec)	Read access to configuration pages
Operator (oper)	Read access to configuration pages
Maintenance (maint)	• Can set device tags • Can configure Modbus communications • Can configure Modbus register map
Administrator (admin)	• Can configure network settings (address, default) • Can set passwords • Can set time settings • Can set home page options • Can restart applications

These passwords should be changed periodically once the network is installed. Consult your local IT personnel or your network administrator for guidance on changing passwords.

Note

The factory-set password for all user roles is: default

Network ID and join key

The network ID and the join key must be identical on the Link and on the field devices to allow a connection to be established between them. The IE/WSN-PA Link can generate a random join key, or you can create your own custom join key made up of hexadecimal characters.

4.2 Commissioning the Link

Note

Order of powering up

The power supply of the WirelessHART field devices should not be turned on before the IE/WSN-PA Link is installed and working correctly. WirelessHART field devices should be powered up in the order of their distance to the IE/WSN-PA Link starting with the nearest device to the Link. This strategy will allow the wireless sensor network to form faster.

4.2.1 The configuration PC

Connecting the configuration PC

The PC/laptop must be connected to the LAN connector P1 of the IE/WSN-PA Link using a crossover cable.

You will find the other requirements in section 2.5.1.

CAUTION
Under no circumstances, use the covered "POE" connector on the Link, this can cause damage to the PC/laptop.

4.2.2 Procedure for commissioning

Follow the steps below to commission the IE/WSN-PA Link:

CAUTION
If you use a PC/laptop from a different network, you should note the current IP address and other settings carefully so that the PC/laptop can be assigned to its original network again after configuring the IE/WSN-PA Link.

Note

When commissioning the Link, remember that other wireless systems in the 2.4 gigahertz band be affected by interference or may cause interference.

You will find a list of WHART and WLAN channels in section 4.3.6.

To be able to reach the IE/WSN-PA Link using the standard IP address, you will first need to adapt the network address of the PC/laptop.

1. Select the menu command Start > Settings (> Control Panel) > Network and Dial-up Connections.

   The "Network connections" dialog opens.

2. Select the "Local Area Connection" entry.

3. Select "Properties" in the shortcut menu.

   The "Properties of Local Area Network" dialog opens at the "General" tab.

4. In the "This connection uses the following items" box, select the entry "Internet Protocol (TCP/IP)".

5. Click the "Properties" button.

   The "Properties of Internet protocol (TCP/IP)" dialog opens.

6. Select the "Use following IP address" option.

7. In the "IP address" input box, enter an IP address for your configuration PC that differs from the factory-set IP address of the Link, for example 192.168.1.12.

8. Enter the value 255.255.255.0 in the "Subnet mask" input box.

9. Click the "OK" button.

10. Close the "Network and Dial-up Connections" dialog.

Your PC/laptop can now be reached using the IP address set above.

4.2.3 Establishing a connection to the Link

1. Start your Web browser.

2. Select the "Tools" > "Internet Options..." menu command.

   The "Internet Options" dialog opens.

3. Select the "Connections" tab.

4. In the "Local Area Network (LAN) Settings" area, click the "LAN Settings...) button.

   The "Local Area Network (LAN) Settings" dialog opens.

5. If selected, deselect the following options:

   – "Automatically detect settings"

   – "Use automatic configuration script"

   – "Use a proxy server for your LAN"

These settings will not apply to dial-up of VPN connections.

6. Click the "OK" button.

7. To start the Web interface of your IE/WSN-PA Link, enter the following in the address line:

   https://192.168.1.10 (IP address set in the factory for the P1 LAN interface of the Link)

   or

   https://192.168.2.10 (IP address set in the factory for the P2 LAN interface of the Link)

8. Enter the following in the "Connect to IE/WSN-PA Link" dialog:

   – User name (login): admin

   – Password: default

   See also section 4.2.5 "Security settings".

9. Click the "Yes" button in the "Security Alert" dialog.

   The start page of the Link opens (for screenshot, see section 4.3.1).

4.2.4 Setting an IP address

1. Select the "Setup" > "Internet Protocol" menu command.

   The "Internet Protocol Address" dialog opens.
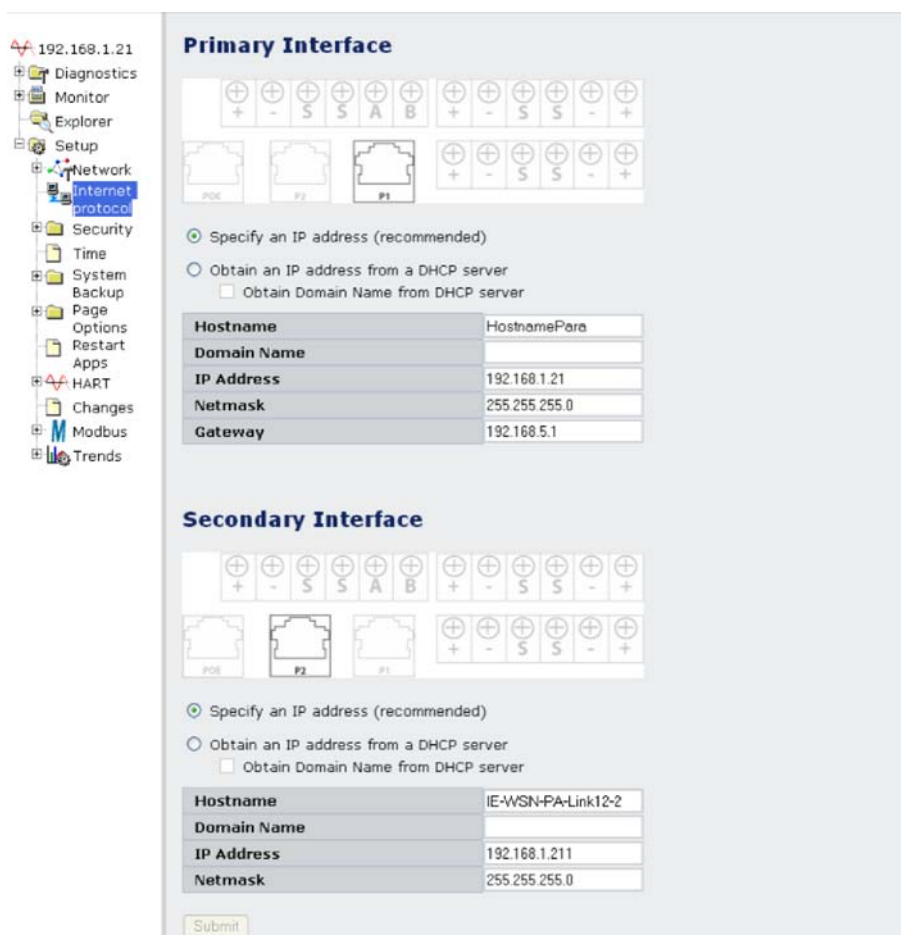
2. Enter the required IP address in the "IP Address" box or if you use a DHCP server , enable the option "Obtain an IP address from a DHCP server" and enter a host name in the "Host name" box.

3. Click the "Submit" button to save the changes.

4.2.5   Security settings

1. Select the "Setup" > "Security" > "User Accounts" menu command.

    The "User Accounts" dialog opens.
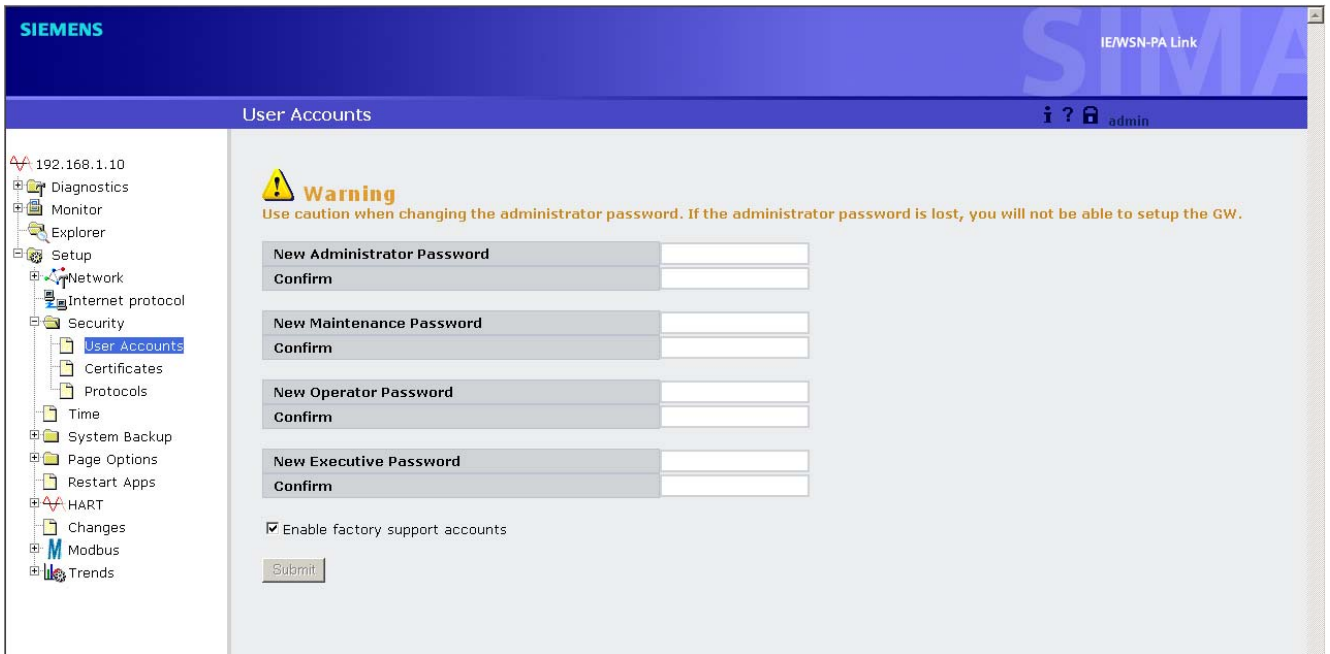
2. Modify the administrator password

    Enter a new password in the "New Administrator Password" and "Confirm" input boxes.

    For the factory-set passwords, refer to section 4.1.

CAUTION
Use caution when changing the administrator password. If the administrator password is lost, you will not be able to operate the IE/WSN-PA Link from the administrator role.

3. Click the "Submit" button.

4.2.6 Network data

1. Select the "Setup" > "Network" > "Settings" menu command.

   The "Network Settings" dialog opens.
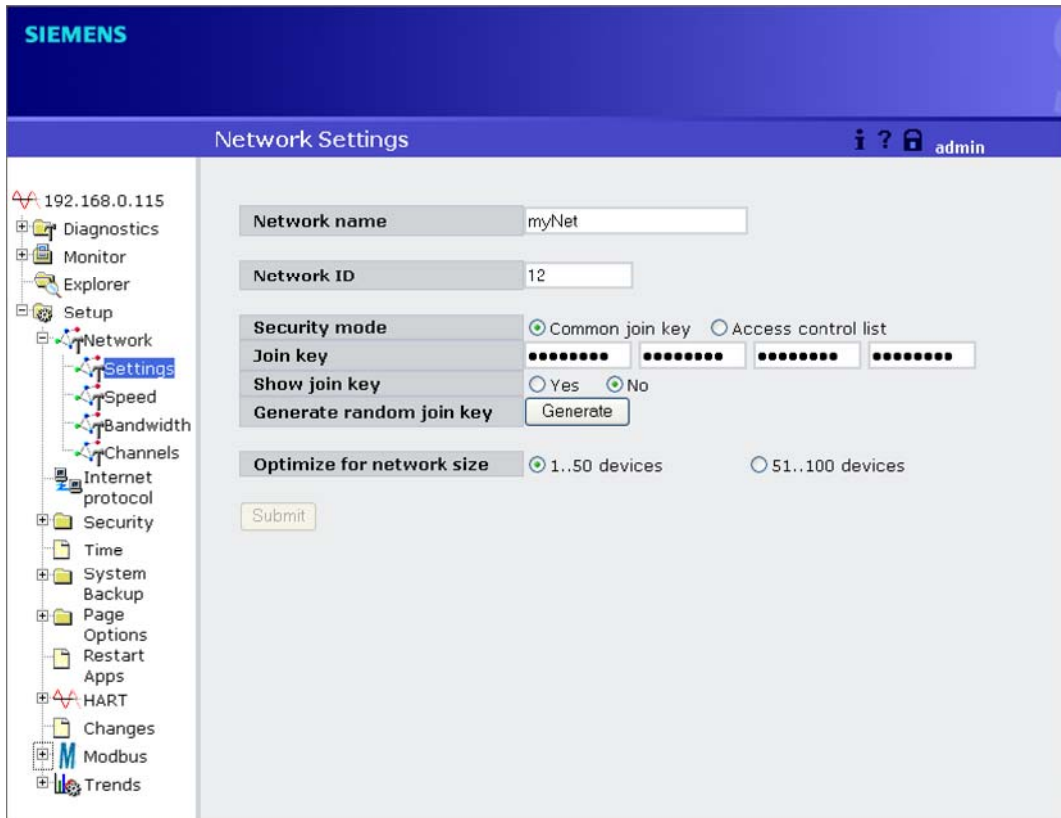
2. Enter the network ID of your WirelessHART network in the "Network ID" input box. Numbers in the range 0…65 535 are permitted.

3. Enter the join key of your WirelessHART network in the "Join key" input box as a hexadecimal number.

4. Click the "Submit" button.

5. Select the "Setup" > "Restart Apps" menu command.

This completes the initial commissioning of the IE/WSN-PA Link. You can remove the PC/laptop and restore the original settings on the PC/laptop.

Note

You will find a detailed description of all the configuration functions of the Link in section 4.3.

4.3 Configuration of the Link

4.3.1 Start page
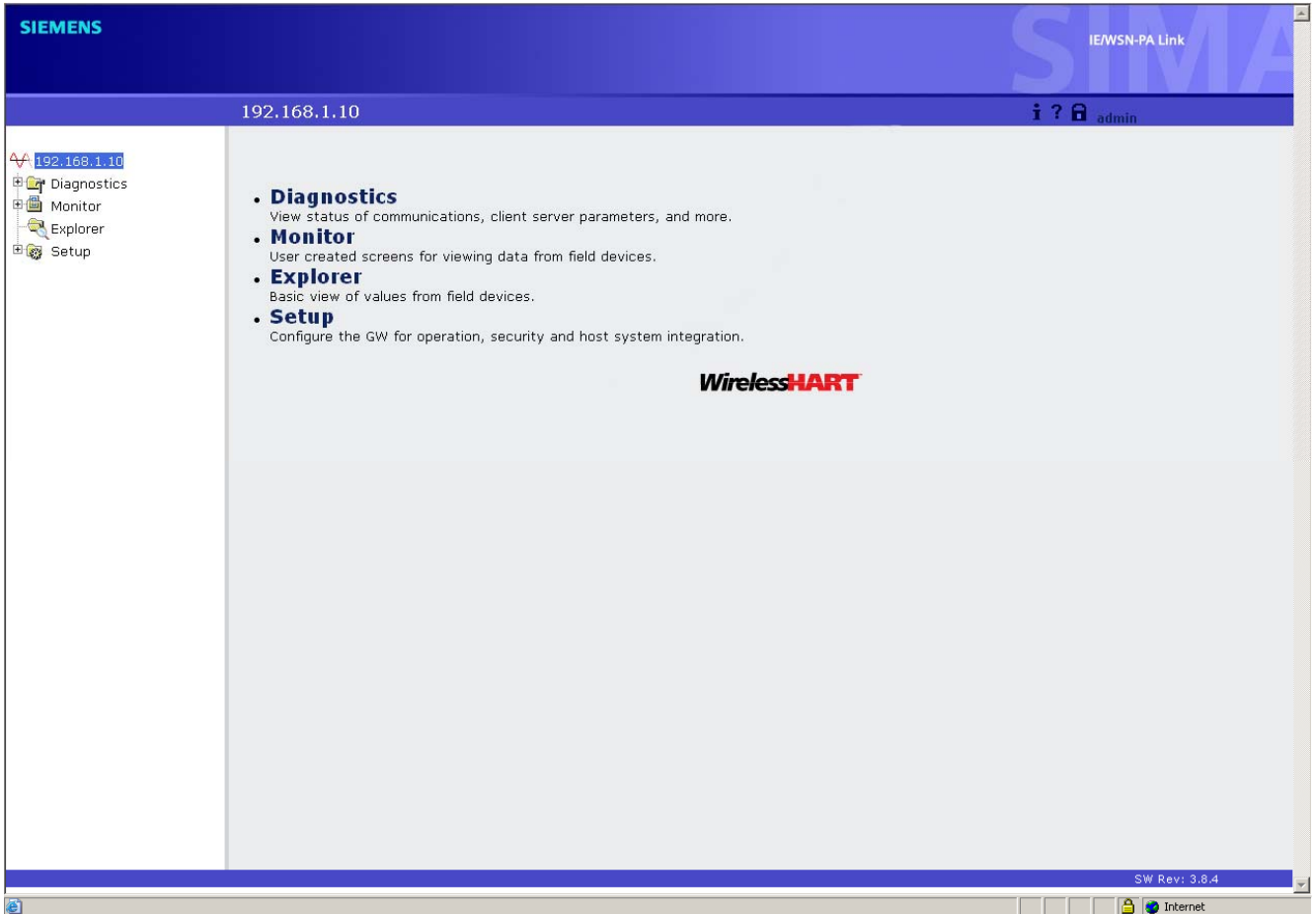
Fig. 4-1   Start page of the Web-based configuration tool of the Link

The HTML pages of the Link have the following basic structure:

Entry	Description
Diagnostics	Check the communication status, client/server parameters etc.
Monitor	Customized Web pages for monitoring the data of the field devices
Explorer	View of the values of the field devices
Setup	Configure the Link for operation, security and host system integration.

From the navigation area on the left, you can expand the structure of the HTML pages and jump to specific pages by clicking with the mouse.

4.3.2 Setup > Network > Settings

You will find a screenshot of the page in section 4.2.6.

CAUTION
It is not advisable to change the network ID while a network is in operation. This will reset the network and cause it to need to reform.

Entry	Description
Network name	Network name (plain text)
Network ID	Network ID
Security mode	Select either a common join key for all network nodes or individual join keys that you can specify in the access control list. If you select the "Access control list" option, the next page, "Access control list" opens in which individual join keys will be applied to each device (see below).
Common join key	With this security mode, all the devices in the WirelessHART network use the same join key
Access control list	Under this security mode, the Link maintains an access control list and each device has a separate and unique join key
Show join key	Allows the user to see the current common join key for the WirelessHART network
Generate random join key	Causes the Link to generate a new common join key. Any change is passed on to all WirelessHART devices currently connected to the WirelessHART network.
Optimize for network size	Optimizes the Link for communicating with smaller (1-50 devices) networks or larger (51-100 devices) networks.
Submit	Accepts all changes (highlighted in yellow).

4.3.3 Setup > Network > Settings > Access Control List

Parameter settings for the access control list

On this page, you make the parameter settings for the access control list with which you allow individual WSN devices access to your WirelessHART network.

Entry	Description
Device ID	The unique device ID of the device
Device name	The long HART tag of the device
Generate new join key	Generates a new unique join key for the device
Online	Indicates the device is communicating on the WirelessHART network.
Common join key	Indicates the device is using a common join key.
Default join key	Indicates the device is using the default join key.
<<First	Navigates to the first page of this table.

Entry	Description
<<Previous	Navigates to the previous page of this table.
Search	Finds the next occurrence of the characters entered into this field.
Next>>	Navigates to the next page of this table.
Last>>	Navigates to the last page of this table.
New entry	Creates a new entry in this table.
Show join failure	Go to the page "Diagnostics" > "Network" > "Join failures".
Add entries for join failure	Creates new entries in this table and populates them with the current join failures.
Delete selected	Removes the selected entry from this table.
Check generate key for selected	Checks the Generate New Join Key box for all selected entries.
Select all	Selects all table entries.
Select none	Deselects all table entries.
Select online	Selects all online devices in this table.
Select new join key recommended	Selects all devices with a common join key or a default join key.
Submit	Accepts all changes (highlighted in yellow).

4.3.4 Setup > Network > Speed

Entry	Description
Active advertising	Shows whether active advertising is enabled or disabled. If active advertising is enabled, the WirelessHART network increases the sending of advertising frames to accelerate the joining of field devices in the network. Active advertising is automatically activated for 30 minutes when the Link is powered up.
Duration (minutes)	Determines how long (in minutes) active advertising will be enabled.
Activate	Causes the WirelessHART network to enter active advertising mode
Fast pipe	Shows whether fast pipe is activated or deactivated. Fast pipe creates a dedicated channel for communication to the selected device. Used for large data transfers.
Device selector	Selects a device to establish fast pipe.
Activate	Causes the Link to establish a fast pipe connection with the selected device.

4.3.5 Setup > Network > Bandwidth

Entry	Description
Analyze again	Analyzes the WirelessHART network to determine if any devices require more bandwidth.

4.3.6 Setup > Network > Channels

Channel activation

On this page, you can enable or disable the individual wireless channels.

Entry	Description
Enable	Select the option (check mark) to enable the channel.
Channel	Number of the channel
Frequency (GHz)	Frequency of the channel in GHz
Clear channel access assessment (CCA)	WirelessHART function that automatically enables/disables individual channels depending on the wireless load on channels. It is recommended that this option is set to "no".

It may be useful to disable channels if there are other wireless nodes in your plant that do not belong to your WirelessHART network (for example IWLAN nodes) and with which overlaps or interference may occur on certain channels.

Overlapping frequency range in WLAN and WHART systems in the 2.4 GHz band:

WLAN channel 802.11b/g	WHART channel 802.15.4
1	11-16
6	15-20
7	16-21
11	20-25
13	21-25

4.3.7 Setup > Internet Protocol

Ethernet network configuration

Note

The best protection against accidental errors during assignment of the IP address is not to change the IP addresses of Ethernet port P1 and P2 at the same time. If P1 has the wrong setting, you can still access the device via P2.

You will find a screenshot of the page in section 4.2.4.

Entry	Description
Primary interface	Refers to Ethernet port P1
Secondary interface	Refers to Ethernet port P2
Specify an IP address	The interface is assigned a fixed IP address.
Obtain an IP address from a DHCP server	The interface obtains an IP address assigned by a DHCP server.
Obtain domain name from DHCP server	The interface obtains a domain name assigned by a DHCP server.
Hostname	Hostname for the Link.
Domain name	Domain name
IP Address	IP address set by the user for the associated interface.
Netmask	Netmask set by the user for the associated interface.
Gateway	Gateway set by the user for the associated interface (not to be confused with the IE/WSN-PA Link)
Submit	Accepts all changes (highlighted in yellow).

4.3.8 Setup > Security > User Accounts

The basic security settings and user roles are described in section 4.1. Below, you will find additional information.

Note

It is recommended that passwords be changed for security purposes. Consult your network administrator for guidelines on setting passwords.

Entry	Description
New administrator password	Box for entering a new administrator password
New maintenance password	Box for entering a new maintenance password
New operator password	Box for entering a new operator password
New executive password	Box for entering a new executive password
Confirm	Box to confirm the new password for each user role.
Enable factory support accounts	Enabling this option allows trained service personnel to upgrade firmware and run extra diagnostics functions. Note the following information.
Submit	Accepts all changes (highlighted in yellow).

Note

The "Enable factory support accounts" option is not enabled as default. A new firmware version can only loaded if the option was enabled previously.

Note that changing the setting of "Enable factory support accounts" only takes effect after restarting the application and that the option is automatically disabled again after a cold restart on the Link (cycling power OFF → ON).

4.3.9   Setup > Security > Certificates

Entry	Description
Import GW certificate into webrowser	Sends security certificates of the Link to the Web browser.
Rebuild GW certificates	Rebuilds the security certificates for the Link.

4.3.10   Setup > Security > Protocols

Entry	Description
Enable	Enables associated communication protocol and opens the specified TCP / UDP port.
Protocol	Type of Ethernet communication protocol
TCP port	The TCP port used by the associated communication protocol
UDP port	The UDP port used by the associated communication protocol
HTTP	Ethernet communication protocol used for the Link's Web-based user interface.
HTTPS	SSL-compliant Ethernet communication protocol used for the Link's Web-based user interface.
Modbus TCP	Ethernet communication protocol used for communication with Modbus TCP-compliant hosts.
Modbus TCP secure	SSL-compliant Ethernet communication protocol used for communication with Modbus TCP-compliant hosts.
Submit	Accepts all changes (highlighted in yellow).
Defaults	Restores the default protocols and port numbers.

4.3.11   Setup > Time

⚠WARNING
Note that setting the date or time causes a restart on the Link and therefore a temporary loss of communication.

Entry	Description
Your PC's time	The time used by the PC client
GW time	The time currently used by the Link.
Difference	The difference between the PC client time and the Link time
Method used to set time	Selects what method to use when setting the Link time.
Network Time Protocol (NTP)	Uses NTP time.
Set with PC time	Uses the current PC client time.
Manual entry	Uses the Date and Time fields.
Date (mm/dd/yy)	Manually enter the date (mm/dd/yy)
Time (hh:mm:ss)	Manually enter the time (hh:mm:ss)
Submit	Accepts all changes (highlighted in yellow). Take note of the following warning notice.

4.3.12   Setup > System Backup > Save

Entry	Description
Include diagnostic information in system backup	Saves Link diagnostic log information with the system backup file.
Save Configuration	Collects the Link configuration data and creates a system backup file. This system backup file is saved on the PC client as a zip file (*.zip).

4.3.13   Setup > System Backup > Restore

CAUTION
Note that resetting to factory defaults deletes the entire configuration of the Link.

Entry	Description
Browse…	Opens a navigation window to locate a system backup file (zip file) on the PC client.
Upload configuration	Uploads the configuration of the selected system backup file to the Link.
Reset defaults	Returns the Link to default factory configuration. See also section 5.3.

4.3.14   Setup > Page Options > Point Pages

Entry	Description
Name	Name of the custom point page (user specified)
Order	Order in which custom point pages appear in the "Monitor" section of the navigation menu
UP	Moves the associated point page up in the navigation order.
Down	Moves the associated point page down in the navigation order.
Actions	The actions you can perform on the associated point page.
Edit	Navigates to the configuration of the associated page and allows the user to make changes.
Delete	Deletes the associated page.
Go to	Navigates to the associated point page in the web interface.
New	Starts a new custom point page.
Submit	Accepts all changes (highlighted in yellow).

4.3.15   Setup > Page Options > Point Pages > Editing Custom Page

Entry	Description
Page name	Name of this custom point page as it will appear in the "Monitor" navigation menu.
Point name	Identifies the data point to display. Data point names have the following syntax: (longHARTTag.parameter).
Name	Name set by the user for the data point.
Description	Description of the data point entered by the user.
Order	The order in which the associated data point appears on the custom point page.
Up	Moves the associated data point up in the order.
Down	Moves the associated data point down in the order.
<<First	Navigates to the first page of this table.
<<Previous	Navigates to the previous page of this table.
Search	Finds the next occurrence of the characters entered into this field.
Next>>	Navigates to the next page of this table.
Last>>	Navigates to the last page of this table.
Delete selected	Removes the selected entry from this table.
Select all	Selects all table entries.
Select none	Deselects all table entries.
Select errors	Selects all table entries with error messages.
Submit	Accepts all changes (highlighted in yellow).

4.3.16 Setup > Page Options > Point Columns

Entry	Description
Device	Indicates whether or not the "Device" column appears as default in the point pages.
Device desc	Indicates whether or not the "Device desc" column appears as default in the point pages.
Parameter	Indicates whether or not the "Parameter" column appears as default in the point pages.
Point	Indicates whether or not the "Point" column appears as default in the point pages.
Name	Indicates whether or not the "Name" column appears as default in the point pages.
Description	Indicates whether or not the "Description" column appears as default in the point pages.
Value	Indicates whether or not the "Value" column appears as default in the point pages.
Units	Indicates whether or not the "Units" column appears as default in the point pages.
Status description	Indicates whether or not the "Status description" column appears as default in the point pages.
Status icon	Indicates whether or not the "Status icon" column appears as default in the point pages.
Submit	Accepts all changes (highlighted in yellow).

4.3.17 Setup > Page Options > Home Pages

Entry	Description
GW menu overview	Indicates that the Link menu overview is the default home page when logging into the Link Web-based user interface.
Custom page	Indicates that the Custom Point page is the default home page when logging into the Link Web-based user interface.
Point monitor	Indicates that the "Point Monitor" page is the default home page when logging into the Link Web-based user interface.
HART status	Indicates that the HART Status page is the default home page when logging into the Link Web-based user interface.
Quick point data	Indicates that the Quick Point Data page is the default home page when logging into the Link Web-based user interface.
Network status	Indicates that the "Network status" page is the default home page when logging into the Link Web-based user interface.
Submit	Accepts all changes (highlighted in yellow).

4.3.18   Setup > Restart Apps

Entry	Description
Restart	Software reset. This is required for some configuration changes to take affect. A physical power cycle may erase configuration changes before they take affect.
Yes	The application is restarted immediately.
No	Delays the restart. Configuration changes are first saved.

- Application software:

  Software for the web user interface, program manager, operating system, etc.

- Suspend Gateway operations:

  The Link will temporarily be inaccessible via the Web-based user interface. It will stop reporting Modbus or OPC values or collecting trend data.

4.3.19   Setup > HART > Gateway

Entry	Description
Use Internet protocol host name for gateway name	Uses the hostname field under the Internet protocol page to replace the Link name. This is a one time action that happens when the box is checked. Further hostname changes will not be reflected on this page.
Gateway name	Long HART tag for the Link
HART master type	Indicates whether the Link is communicating as the HART primary or secondary master. Most host systems operate as a secondary master and leave primary master status to a handheld device.
Primary	The Link will have priority over a secondary master when outputting commands to WirelessHART field devices.
Secondary	Commands from the Link to a WirelessHART device have lower priority than those of a primary master.
Network retry count	Number of times the Link will attempt to resend a message when it does not get a confirmation.
Submit	Accepts all changes (highlighted in yellow).

4.3.20   Setup > HART > Device

Note

If there is a change, in particular a reduction, in the Burst Rate, you will need to analyze the bandwidth, see "Setup > Network > Bandwidth" in section 4.3.5.

Note the information from the field device vendor when you set the burst rate.

Entry	Description
Device ID	Device ID of the field device
HART tag	Configures the long HART tag (32 characters).
Short tag	Configures the HART tag (8 characters).
Descriptor	Configures the description.
Units	Configures the units.
Burst rate	Configures the interval in which the WirelessHART field device transmits its measurement data to the Link. Some devices burst multiple messages and at different rates. Setting options: • In the seconds range: 4, 8, 16, 32 • In the minutes range: In the format "hh:mm:ss" up to a maximum of 60 minutes • Note the information from the field device vendor when you set the burst rate.
Delete	Removes the WirelessHART field device from the WirelessHART network.
% Range	Percentage of user-defined range assigned to the HART primary variable.
Edit	Configures the lower range limit and upper range limit.
<<First	Navigates to the first page of this table.
<<Previous	Navigates to the previous page of this table.
Search	Finds the next occurrence of the characters entered into this field.
Next>>	Navigates to the next page of this table.
Last>>	Navigates to the last page of this table.
Submit	Accepts all changes (highlighted in yellow).

4.3.21   Setup > Changes

Entry	Description
Description	Description of the changes adopted.
From	Initial value
To	Final value
Requested	Time stamp of the implementation of the change
Status	Indicates if the change has been successful, is in process, or has failed.

4.3.22   Setup > Modbus > Communications

Make the settings for IE/WSN-PA Link Modbus communication suitable for the Modbus settings of the host.

Note

Modbus connections will fail if they are not configured identically on the host and the IE/WSN-PA Link.

Default register addressing

The Link saves data in four separate tables. Two tables are for discrete parameters and two are for numeric parameters. Each table contains up to 9 999 values. The discrete parameters are saved in one-bit registers and numeric parameters are saved in 16-bit registers.

Register description	Register type	Register number	Address area of the internal data table
Discrete output values - coils	Read - write	1 – 9999	0x0000 to 0x270E
Discrete input values - contact	Read only	10 001 – 19 999	0x0000 to 0x270E
Analog input	Read only	30 001 – 39 999	0x0000 to 0x270E
Analog output - hold	Read - write	40 001 – 49 999	0x0000 to 0x270E

Access to data types

Discrete data is stored in one-bit registers. If the read or write request does not contain 16 registers, the response is returned as a 16-bit value left justified.

Analog data is returned either as an integer in 16-bit registers or as a floating-point value depending on the configuration of the Link. If floating-point representation is selected, each floating-point value is returned as 2 linked registers that together produce a floating-point value with single accuracy.

The following example shows the values in the client display when the holding register 40001 has the following value:

Analog value = -100.234
IEEE equivalent = 0xC2 0xC8 0x77 0xCF

Register values: (40 001) C2C8
                     (40 002) 77CF

Setting options

Entry	Description
One Modbus address	Selects a single Modbus RTU slave address to be used.
Multiple Modbus address	Allows multiple Modbus RTU slave addresses to be used. These addresses are configured per point in the Modbus mapping page.
Modbus TCP port	The TCP port used to access Modbus TCP data directly from the Link.
Baud rate	Communication speed for Modbus RTU.
Parity	Selects the parity bits for Modbus RTU messages.
Stop bits	Sets the number of stop bits for Modbus RTU messages.
Response delay time (ms)	After receiving a request, the Link will wait this long before it sends a response.
Unmapped register read response?	The response the Link returns if no data points are mapped to the requested register.
Floating point representation	Modbus data format
Float	Floating point number in two 16 bit Modbus registers.
Round	Rounded integer in one 16 bit Modbus register. If measured value = 2711.97, the rounded value = 2712.
Scale	Scaled integer in one 16 bit Modbus register. The Link uses the equation $y = Ax - (B - 32768)$. y = scaled integer returned by the Link, A = gain, x = measured value, B = offset.
Use swapped floating point format?	Reverses which significant register is used in a floating point representation.
Incorporate value's associated status as error?	If the HART variable status indicates a critical failure, it will be reported through the Modbus register.
Value reported for error (floating point)	Chooses what value is reported if the value's associated status indicates a critical failure. Only used if the Link is using floating-point representation.
NaN	Not a number is reported if the value's associated status indicates a critical failure.
+Inf	Positive infinity is reported if the value's associated status indicates a critical failure.
-Inf	Negative infinity is reported if the value's associated status indicates a critical failure.
Other	User-defined value is reported if the value's associated status indicates a critical failure.
Value reported for error (rounded or native integer)	User-defined value is reported if the value's associated status indicates a critical failure. Only used if the Link is using rounded or scaled representation.
Scaled floating point maximum integer value	Highest integer proportional to the measured value. Default = 65534. This is generally the highest integer value accepted by the host system.
Use global scale gain and offset	Determines whether scaled integers use the global scale gain and offset or unique gain and offsets for each measured value.

Entry	Description
Global scale gain	Gain used by all measured values for scaled integers. The Link uses the equation y = Ax - (B - 32768). y = scaled integer returned by the Link, A = global scale gain, x = measured value, B = global scale offset.
Global scale offset	Offset used by all measured values for scaled integers. The Link uses the equation y = Ax - (B - 32768). y = scaled integer returned by the Link, A = global scale gain, x = measured value, B = global scale offset.

4.3.23 Setup > Modbus > Mapping

Configuring the Modbus mapping of status and process values

The following paragraphs explain the mapping of parameters to Modbus registers. Examples illustrate the mapping of device status values as integer registers or as discrete registers and the mapping of process and status values is described.

Device tags for Modbus mapping

The Link provides numerous parameters for mapping to Modbus RTU/TCP and OPC. Both the OPC interface used for mapping and the Modbus interface contain only some of the data points used most frequently to accelerate the user interface.

Mapping the additional device status and standardized status to Modbus registers

The additional and the standardized status of a device can be mapped to Modbus registers in two ways. On the one hand, you can map to standard integer analog input registers. On the other, you can map the individual bits to the relevant bytes of registers for discrete inputs.

The parameter tags for these bits are ADDITIONAL_STATUS_0 – ADDITIONAL_STATUS_N, where N depends on the number of status bytes supported by the device and on STANDARDIZED_STATUS_0 – STANDARDIZED_STATUS_3.

Other status tags such as EXTENDED_STATUS (Maintenance required, Device variable alert) and STATUS_CODE (Device malfunction, Cold start) are also available.

The bit masks required to map individual status bits to discrete Modbus registers can be found in the "HART Common Tables" specification or in the documentation of the particular field device.

The standard parameter mapping "DEVICE_TAG.PARAMETER" is used for the Link. For this reason, the device tag must first be specified before correct register mapping is possible. When mapping discrete registers, the "State" field (see Fig. 4-2) is also used to enter the bit mask that is applied to the parameter and that generates the discrete value. The "Invert" field (see Fig. 4-2) is used to invert the bit (conversion 0 → 1 and 1 → 0), as may be required by the logic of the user program.
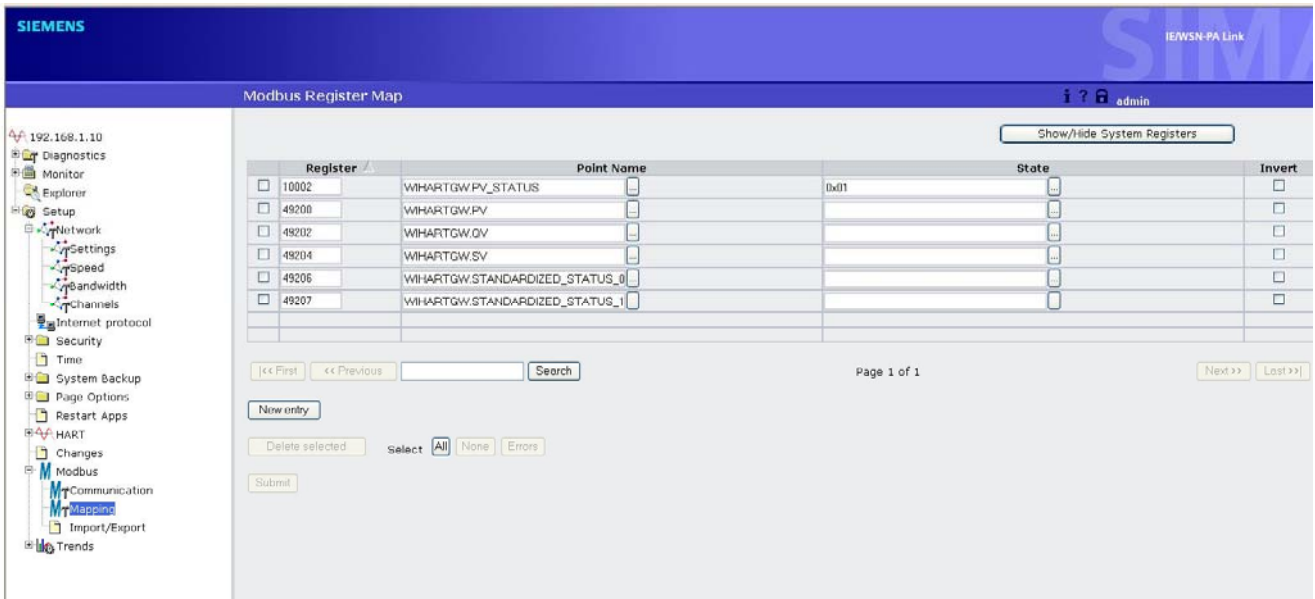
Fig. 4-2   Status mapped to an analog input

In the example of Fig. 4-2, bit 0 of STANDARDIZED_STATUS_0 is mapped to a discrete register. This corresponds to the bit for "simulation active" of STANDARDIZED_STATUS_0. Other single status bits can be mapped to registers for discrete inputs in the same way. Fig. 4-3 shows an example of a Modbus client that reads the discrete inputs of the "STANDARDIZED_STATUS_0" status (simulation active).
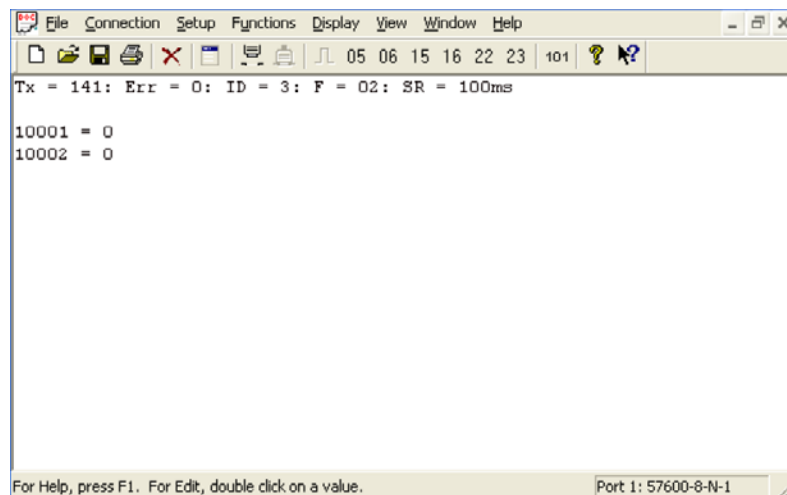
Fig. 4-3   Example of a Modbus client that reads a discrete input

Dynamic device variables and device status

The dynamic variables and the status of a device can also be mapped to Modbus registers. Here, the status of the dynamic variables can be mapped to an analog input register or to an analog holding register. The floating-point value of the dynamic variables can either be mapped as a floating-point value to two analog holding registers at the same time or using

scaling of the register to a single analog holding register. There is also an option of mapping the variable status mixed with the floating-point values or separate from them to another register section such as the registers for analog inputs.

You will find an example of this in Fig. 4-2. This option allows maximum flexibility for the different register mappings of host systems. Fig. 4-4 shows an example of a Modbus RTU client, that first reads out a mixed register map of floating-point values of a dynamic variable followed by the status value etc.

Fig. 4-4   Example of a Modbus client that reads the variables "PV" and "PV_STATUS"

Here, the standard parameter mapping "DEVICE_TAG.PARAMETER" of the Link is used. For this reason, the device tag must first be specified before correct register mapping is possible.

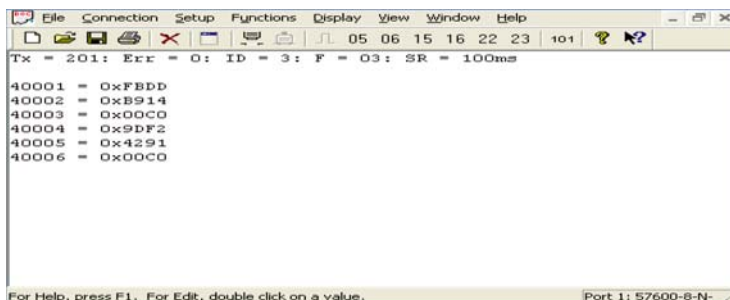The default dynamic variables for floating-point values are PV, SV, TV and QV. The device variables can, however, also be mapped according to the variable number. These are followed by the status values as PV_STATUS, SV_STATUS, TV_STATUS and QV_STATUS. These values are unsigned single byte values and they must be mapped to a single analog input register or a single analog holding register.

Setting options

On this page, Modbus Registers can be mapped to the measurement points.

To create a new entry, click the New Entry button. This will activate a row of text fields in the Modbus Register table. Begin by filling in the register number, then choose or type the point name. Be sure to click Submit to implement the changes.

Entry	Description
Show / hide system registers	Shows/hides predefined system registers.
	The predefined system registers follow in the form of a table.
Address Modbus RTU slave address	Only used if multiple Modbus addresses is selected on the "Modbus" > "Communications" page.
Register	Memory location used to reference point data via Modbus protocol. Modbus holding register.
Point name	Assigned data point in the format "LongHARTtag.parameter".
State	For Bool values, indicates which value is represented as 1.
	For integers, identifies a special bit that is represented as 1.
	Reserved for registers lower than 20 000.
Invert	Switches the 0 or 1 response for discrete measurement values.

Entry	Description
Gain	Unique register gain used for scaled integer format. Not used if global scale gain and offset is selected on the "Modbus" > "Communications" page.
Offset	Unique register offset used for scaled integer format. Not used if global scale gain and offset is selected on the "Modbus" > "Communications" page.
<<First	Navigates to the first page of this table.
<<Previous	Navigates to the previous page of this table.
Search	Finds the next occurrence of the characters entered into this field.
Submit	Accepts all changes (highlighted in yellow).

4.3.24 Setup > Modbus > Import/Export

Saving/loading a configuration file

On this page, you can save the current Modbus configuration of the Link in a file or load an existing Modbus configuration file.

Entry	Description
CSV file	Comma delimited or comma separated file format
Browse…	Opens a navigation window to locate a Modbus mapping backup file (CSV file) on the PC client.
Upload configuration	Restores the selected Modbus mapping backup file to the Link.
Download configuration	Collects the Link Modbus mapping data and creates a backup file. This Modbus mapping backup file is saved on the PC client as a CSV file (*.csv).

4.3.25 Setup > Trends > Collections

This page lists the configured trends. Existing trends can be edited ("Edit"), new trends can be created ("New Trend") and existing trends deleted ("Delete").

For information on monitoring trends and creating trend reports, see sections 4.5.5 and 4.5.6.

Entry	Description
Name	User-defined name of the trend
Edit	Navigates to the "Editing Custom Trend" page in the Web interface (see section 4.3.26).
Delete	Deletes the associated custom trend page.
	A confirmation window will pop up. Click "OK" to delete the trend or cancel to return to the Trend Collections page. Click "Return to form" to return to the Trend Collections page.
Last collection	The last sampling of data taken for trending purposes
Time	Time of the last data sampling

Entry	Description
Status	Status associated with the last data sampling
Next collection time	Date and time of the next data recording
New trend	Creates a new user-defined "Trend" page.
	Opens a new page where the Name, Collection interval and Data retention period are entered.
	Next, click the "New Entry" button to select a Point Name. Select the point name from the list, then add a label if desired. This can help identify the measurement separate from just the HART Point Name.
	Repeat the above steps to add more measurement points to the trend.
	Click "Submit" to complete the trend setup.

4.3.26 Setup > Trends > Collections > Editing Custom Trend

On this page, you can edit the properties of the new trends.

Entry	Description
Name	User-defined name of the trend
Collection interval	How often the Link samples for data.
	(Note: The value is not identical to the "burst rate", see also section 4.3.20.)
Data retention period	How long trend data is retained (moving window of time)
Point name	Assigned data point in the format "longHARTtag.parameter"
Label	User-defined label that appears in the legend for custom trend.
<<First	Navigates to the first page of this table.
<<Previous	Navigates to the previous page of this table.
Search	Finds the next occurrence of the characters entered into this field.
Next>>	Navigates to the next page of this table.
Last>>	Navigates to the last page of this table.
New entry	Addition of a further variable, whose trend will be displayed graphically.
	On the next page "Editing <Trend Name>", you enter the name of the new trend.
Delete selected	Removes the selected entry from this table.
Select …	Selects measuring points (check box on the left in the table selected)
	• All: Selects all table entries.
	• None: Deselects all table entries.
	• Errors: Selects all table entries that have an error message.
Submit	Accepts all changes (highlighted in yellow).

4.4 Explorer

Network overview

The "Explorer" page shows you an overview of your WirelessHART network.

Entry	Description
HART tag	Long HART tag or HART tag.
HART status	HART status parameter, this is the overall device status. Hover over the status icon for a more descriptive message.
Last update	Time stamp of the last measurement received by the WirelessHART field device.
PV	Value of the HART primary variable (1st variable)
SV	Value of the HART secondary variable (2nd variable)
TV	Value of the HART tertiary variable (3rd variable)
QV	Value of the HART quaternary variable (4th variable)
Burst rate	Interval in which the WirelessHART field device transmits its measurement data to the Link (see also section 4.3.20). Some devices burst multiple messages and at different rates.

4.5 Monitor

4.5.1 Monitoring data points

On the "Monitor" pages, you can monitor individual data points or group data points together and monitor them as a trend.

4.5.2 Monitor > Custom Page

Entry	Description
All columns / reduce columns	Shows all column categories or reduces columns to those configured in "Setup" > "Page Options" > "Point Columns" (default Point, Name, Desc, Value, Status)
Restore order	Clicking on the column header (Device, Device Desc, etc…) will sort data point entries in ascending/descending order based on the information of the associated column. Clicking "Restore order" will return the data points to the order specified by the user.
Edit	Navigates to the edit custom page in the web interface.
Device	Long HART tag or HART tag
Device desc	HART description. A common parameter in every HART device for descriptive information.
Parameter	HART parameter for the associated data point
Point	Data point in the format "longHARTtag.parameter"
Name	User-defined name
Desc	User-defined description
Value	Most recently registered value of the assigned data point
Units	Engineering unit of measure
Status	Status of the HART variables. Indicated by text and/or a status display symbol.

4.5.3 Monitor > Quick Point Data

Entry	Description
All columns / reduce columns	Shows all column categories or reduces columns to those configured in Setup>Page Options>Point Columns (default Point, Value, Status)
Variable selector	Selects whether PV, SV, TV, or QV is shown on this page.
Device	Long HART tag or HART tag
Device desc	HART description. A common parameter in every HART device for descriptive information.
Parameter	HART parameter for the associated data point
Point	Assigned data point in the format LongHARTtag.parameter.
Value	Most recently registered value of the assigned data point
Units	Engineering unit of measure
Status	Status of the HART variables. Indicated by text and/or a status display symbol.

4.5.4   Monitor > Point Data

Entry	Description
All columns / reduce columns	Shows all column categories or reduces columns to those configured in "Setup" > "Page Options" > "Point Columns" (default Point, Value, Status)
All points / filter points	Displays all HART parameters for all devices on the network or filters parameters to show only parameters mapped in Modbus mapping or the OPC browse tree (and Link PV).
Device	Long HART tag or HART tag
Device desc	HART description. A common parameter in every HART device for descriptive information.
Parameter	HART parameter for the associated data point
Point	Assigned data point in the format LongHARTtag.parameter
Value	Most recently registered value of the assigned data point
Units	Engineering units of measure.
Status	• Status of the HART variables. Indicated by text and/or a status display symbol.

4.5.5   Monitor > Trend > Graph > Custom Trend

Monitoring trends

To view the graph of a trend, click Monitor > Trend > Graph. The available trends are displayed. Click the name of the trend you wish to view.

Entry	Description
Separate Y axis / common Y axis	Separates the Y axis of each data point to give better resolution of the value or makes all data points share the same Y axis.
Print	Captures an image of this page and sends to PC client's default printer.
Time	Time stamp indicating the time the trend function sampled the associated data point. This is not the current value cached on the Link. It may not reflect the time in which the measurement was taken or received.
Legend	Legend for the trends

4.5.6 Monitor > Trend > Report

Trend reports

To view a report of a trend, click Monitor > Trend > Report. Choose the trend to report, then select local time or server time, the start and end times, and CSV, Excel, or XML format. To finish, click Generate Report.

Entry	Description
Trend	Selects the user-defined trend.
Start and end time in	Chooses between the time established by the Link (server time) or the PC client (local time).
Local time	Time of the PC client
Server time	Time of the Link
Start time	Time when the report will start gathering data. Input format: mm/dd/yy hh:mm:ss
End time	Time when the report will end gathering data. Input format: mm/dd/yy hh:mm:ss
Format	File format for the report. This can be either a comma separated file (CSV), Excel spreadsheet, or XML file.
Generate report	Causes the Link to generate a report using the selected file format. The report begins at the first data point after the start time and continues until the last data point before the end time.

4.6 Diagnostics

4.6.1 Diagnostics > Network > Overview

Entry	Description
Active advertising	Shows whether active advertising is activated or deactivated.
	Active advertising causes the WirelessHART network to send wireless messages looking for new or unreachable devices to join the network. Active advertising is automatically activated for 60 minutes when the Link is first powered up, a device becomes unreachable, or no devices are found.
	Click "Setup" to enable/disable the function. The "Setup" > "Network" > "Speed" menu opens.
Fast pipe	Shows whether fast pipe is activated or deactivated. Fast pipe creates a dedicated channel for communication to the selected device. Used for large data transfers.
Wireless device count	Total number of expected field devices
Live	Number of field devices that are currently communicating on the WirelessHART network.
Late	Number of field devices that have missed at least 1 update, but are not yet classified as stale.
Stale	Number of field devices that have missed several updates, but are not yet classified as unreachable.
Unreachable	Number of field devices that have not communicated for 10 minutes or more (also considered as offline).
Unknown	Number of field devices with an unknown state (i.e. not live, late, stale, etc…).
Conventional HART device count	Number of wired conventional HART field devices that are communicating via a WirelessHART adapter.
	Conventional HART field devices support the HART protocol up to and including HART version V6.
Devices with service denied	Number of field devices that have been denied bandwidth because a) too many devices are on the WirelessHART network or b) the device has asked for an update rate not currently supported by the Link.
Devices with critical power failure	Number of field devices that have indicated a critical power failure and have stopped sending updates.
Devices with unknown names	Number of field devices whose long HART tag or HART tag is not currently known (typical during the join process).
Devices with undefined names	Number of field devices whose long HART tag or HART tag has been left blank.
Devices with duplicated names	Number of field devices with duplicate long HART tags or HART tags.
Devices with invalid names	Number of field devices whose long HART tag or HART tag begins with a slash or contains either a dot or comma.
System up time	The total time the system has been operational without an interruption (power-cycle, restart, failure, etc…).

4.6.2 Diagnostics > Network > Devices

Entry	Description
HART tag	32 character long HART tag.
	If you click on a device in the "HART Tag" column, the "Network details", "Burst statistics" and "Service status" submenus for this device are called and display additional network information about the device.
Node state	The state of the device: live, late, stale, joining, unreachable, or unknown. • Green = live • Yellow = late • Red = stale, joining, unreachable, or unknown • Position the mouse pointer over the node status icons to display more detailed information.
Active neighbors	Number of other field devices with a connection to this field device.
Neighbors	Names of other neighboring field devices
Service denied	Indicates whether the field device has been denied bandwidth because: • Too many devices are on the WirelessHART network. or • The device has asked for an update rate not currently supported by the Link.
Missed updates	Total number of updates that have not been received by the Link. A…x…C…D… (x indicates a missed update where B should have been)
Discarded updates	Total number of updates that have been ignored because they where received out of order. A…C…B…D (update B will be discarded)
Reliability	Percentage of expected data packets that have been received by the Link. 100% reliability means that every expected data packet was received. Calculated in 15 minute cycles.
Path stability	Percentage of transmitted packets that have successfully reached their destination over a given path, averaged for all neighbor paths of this device and calculated in 15 minute cycles. Example: - Neighbor A path stability = 100 - Neighbor B path stability = 90 Resulting path stability = 95
RSSI	Average received signal strength indication (dBm) for the field device, as seen by all its neighbors. Calculated in 15 minute cycles.
Joins	Number of times the field device has joined the network within the last 15 minute cycle.
Join time	Time that the field device made its last successful join.

4.6.3 Diagnostics > Network > Join Failure

Entry	Description
Join failure	When a WirelessHART device fails to join the WirelessHART network. Most join failures are due to security reasons (missing or incorrect join key, not on access control list, etc…).

Entry	Description
Last failure time	Time the field device last attempted to join the WirelessHART network
Failure count	Number of total join failures for this device
Device ID	Unique device identification number
Name	Long HART tag or HART tag of the field device
In access control list	Indicates if the Device ID appears in the access control list (only when in access control mode).
Online	Indicates if the field device is communicating with the WirelessHART network.
Reset list	Clears all entries for the join failure table.
Edit access control list	Navigates to the access control list page in the Web-based user interface.

4.6.4 Diagnostics > Network > Invalid MICs

Entry	Description
Message integrity check	Diagnostic in each data packet that allows the Link to verify the packet source and contents ().
Invalid MIC	Packet received from field device is not valid. May indicate a security problem.

4.6.5 Diagnostics > Advanced > Network Stats

The values are the numbers since the commissioning of the Link, the last restart or the last counter reset.

Entry	Description
Tx requests	Number of HART messages sent / transmitted by the Link to the field devices
Tx request timeouts	Number of send requests from the Link without a response from the field devices
Rx response messages	Number of HART message responses received by the Link from the field devices. Equal to Tx requests - Tx request timeouts
Rx burst messages	Number of burst/published messages received by the Link from the field devices. These messages are pushed from the field devices and not requested/queried.
Requests received	Number of HART messages requested by a user application. These messages are forwarded to the radio to be transmitted. An example of user applications is the Web-based user interface of the Link.
Responses sent	Number of HART message responses received from field devices that are then forwarded on to the requesting user application.
Average latency	Time difference between when a message is time stamped in a field device and when it is received by the Link's WirelessHART radio. This value is the average latency for the entire WirelessHART network.

Entry	Description
Average reliability	Percentage of expected data packets that have been received by the Link. 100% reliability means that every expected data packet was received. This value is the average reliability for the entire WirelessHART network.
Reset counts	Resets all values for this table.

4.6.6 Diagnostics > Advanced > Modbus Stats > Serial Stats

Entry	Description
Messages receive	Number of messages received from the Modbus master device.
Crc errors	Number of cyclic redundancy check errors. Crc errors generally indicate noise in transmission or problems with data integrity.
Messages transmit	Number of response messages transmitted from the Link.
Error responses	Number of error response messages transmitted from the Link.
Reset counts	Resets all values for this table.

4.6.7 Diagnostics > Advanced > Modbus Stats > TCP Stats

Entry	Description
Messages received	Number of messages received from the Modbus TCP device.
Messages transmitted	Number of response messages transmitted from the Link.
Error responses	Number of error response messages transmitted from the Link.
Open connections	Number of connections in which the other Modbus TCP device is not communicating.
Accepted connections	Number of connections to other Modbus TCP devices.
Reset counts	Resets all values for this table.

4.6.8 Diagnostics > Advanced > System Stats

Entry	Description
CPU Usage	Central Processing Unit (CPU) utilization (time used by a process) by application or kernel.
User	Percentage of CPU utilization that occurred while executing at the user level (application).
System	Percentage of CPU utilization that occurred while executing at the system level (kernel).
Total	Total CPU utilization, user and system (as a percentage)

Entry	Description
Ram	Random Access Memory
Size	Total memory or disk space.
Used	Portion of memory or disk space that has been used
Main file system	Disk space reserved for Link operating system, user interface pages and configuration data
Temporary filesystem	Disk space reserved for log files, user-defined pages, and user-defined trends
Logs	Disk space taken by diagnostic log files

4.6.9 Diagnostics > Advanced > Client/Server

Entry	Description
Server	The WirelessHART Link web server application
Client	PC client that is currently logged onto the Link
HG version	IE/WSN-PA Link firmware version. Version 3.8.9 is the initial release version for the IE/WSNPA Link.
Name	Hostname assigned to the Link
Physical address	Hardware MAC address for the primary and secondary Ethernet ports
HG serial number	Link serial number (or final assembly number)
PM serial number	Program manager serial number
HG model number	Link model number
HG device ID	Link unique identification number
HG hardware revision	Hardware product version of the IE/WSN-PA Link
Network frequency	Radio frequency band for operating WirelessHART field network. WirelessHART networks operate at 2.4 GHz.
HART universal revision	The major revision of HART specification that applies to this Link.
Browser name	The Web browser application that is currently accessing the Link.
Browser version	The Web browser version
Operating system	Operating system of the PC client currently accessing the Link.
Screen width	Screen width resolution for the PC client
Screen height	Screen height resolution for the PC client
Color depth	Number of colors used by the PC client to display images.
User agent info	Information provided by Web browser for further identification
Java enabled	Indicates whether Java script is enabled.
IP Address	IP address of the PC client
Remote user	User role used to log into the Link

4.7 Connecting the Link to SIMATIC S7 and SIMATIC PCS 7

To connect the IE/WSN-PA Link to SIMATIC S7-300/400 or to integrate it in SIMATIC PCS 7, software blocks and technical support are available at the following addresses:

- SIMATIC S7

  Siemens AG
  Industrial Technologies
  IT4Industry Customer-Support
  Werner-von-Siemens-Straße 60
  91052 Erlangen
  Germany

  Phone: +49 9131 7-461 11

  Fax: +49 9131 7-447 57

  E-mail: it4.industry@siemens.com

- SIMATIC PCS 7

  Siemens AG
  I IS IN E&C OC A KHE
  Siemensallee 84
  76187 Karlsruhe
  Germany

  Phone: +49 721 595-6380

  E-mail: function.blocks.industry@siemens.com

Upkeep and maintenance

5

5.1 Replacing devices

Replacing a device

Follow the steps below to replace your Link with a new IE/WSN-PA Link:

1. Save the configuration of the Link you are replacing on a PC ("Setup" > "System Backup" > "Save").

2. Check to make sure the saved configuration file is valid and undamaged

   The configuration file is saved in CSV format as a ZIP file.

3. Disconnect the Link from the power supply.

4. Connect the new IE/WSN-PA Link to the power supply and turn on the power.

5. Wait until the device startup is complete.

6. Go to the Web pages of the Link (see section 4.3) and load the previously saved configuration file on the new Link ("Setup" > "System Backup" > "Restore" > "Upload Configuration").

7. Re-analyze the bandwidth ("Setup" > "Network" > "Bandwidth") as soon as all field devices are connected to the Link and are returning measured data. Update the bandwidth if necessary.

5.2 Loading a new firmware version

Loading firmware

Follow the steps below to load a new firmware version:

1. Save the *.exe file of the new firmware on a PC/laptop.

2. Connect the PC/laptop to the Link (see section 4.2).

3. Go to the Web page "Setup" > "Security" > "User Accounts" and enable the option "Enable factory support" (see section 4.3.8).

4. Then click "Submit".

   You will be prompted to restart the applications of the Link. This leads you automatically to the "Setup" > "Restart Apps" Web page.

5. Run the *.exe file on the connected PC.

   The *.exe file has a wizard that guides you through the update.

Once loading the firmware is completed, the Link automatically returns to productive operation.

5.3 Reset to factory settings

Restoring the default parameter settings

CAUTION
Note that resetting to factory defaults deletes the entire configuration of the Link.

To reset to factory settings, follow the steps outlined below:

1. Open the page "Setup" > "System Backup" > "Restore" in the Web pages for configuring the Link (section 4.3.13).

2. Click "Reset Defaults".

3. Click "OK".

4. To complete resetting the Link to default setting, select the "Restart Apps" button.

   The restart process takes a couple of minutes to complete. The Link then works with the default factory settings. It may be necessary to configure the network settings of the PC to restore communication with the Link.

   For network configuration, refer to section 4.2.

Technical specifications

6

6.1 Technical specifications of the Link

IE/WSN-PA Link

The following technical specifications apply to the IE/WSN-PA Link:

Data transfer	
Transmission speed Ethernet	10/100 Mbps
Transmission speed Modbus RTU	57 600, 38 400, 19 200 or 9 600 bps
Update time (burst rate)	can be set (up to 60 minutes)
Maximum network size per IE/WSN-PA Link	100 field devices
Delay at a network size of: • 100 field devices • 50 field devices	 • max. 10 sec • max. 5 sec
Maximum distance from the IE/WSN-PA Link to the next WirelessHART field device	100 m
Reliability	> 99 %
Wireless technology and frequency range	WirelessHART™, 2.4 to 2.5 GHz DSSS

Interfaces	
Attachment to Ethernet	RJ-45 jack (two) 10BaseT/100BaseTx
Modbus	Terminals A + B

Power	
Power supply (external)	24 V DC (20…28 V)

Current consumption	
Current consumption	max. 500 mA

Permitted ambient conditions	
• Operating temperature without accessories • Operating temperature when using the Harting adapter cable	• -40°C to +60°C • -25°C to +60°C
Relative humidity (operation)	10 to 90 %

Construction	
Dimensions (W x H x D) in mm	229 x 306 x 89
Weight	4,54 kg
Housing	Low copper aluminum
Cable guides	4 cable feedthroughs 1/2" NPT
Seal	Silicon
Degree of protection	IP65 / NEMA 4X

EMC approval	
EMC	EN 61326-1 : 2006

Approvals

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7.1 Approvals of the Link

Telecommunication Compliance

All WirelessHART devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Siemens cooperates with government bodies worldwide. The aim is to supply fully compliant products and remove the risk of violating country directives or laws governing use of WirelessHart devices.

Note

The specified approvals apply only when the corresponding mark is printed on the IE/WSN-PA Link.

You will also find the approvals for this product on the Internet at the following address:

http://support.automation.siemens.com/WW/view/en/10805878

→ "Entry list" tab

Filter settings:

- Entry type: "Certificates"
- Certificate type: "all"
- Search item(s): IE/WSN-PA Link

FCC and IC approval

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions.

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

The FCC and IC approval is available only for the device variant with integrated antenna (6GK1 411-6CA40-0AA0)

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

North American Certifications

FM Division 2, Non-Incendive
Nonincendive for Class I, Division 2, Groups A, B, C, and D.
Dust Ignition-proof for Class II, III, Division 1,
Groups E, F, and G; Indoors/outdoor locations;
NEMA Type 4X
Temperature Code: T4 (-40°C < T_a < 60°C)

Canadian Standards Association (CSA)

CSA Division 2, Non-Incendive
Suitable for Class I, Division 2, Groups A, B, C, and D.
Dust Ignition-proof for Class II, Groups E, F, and G;
Suitable for Class III Hazardous Locations.;
Install per Siemens drawing A5E02467236A.
Temperature Code: T4 (-40°C < Ta < 60°C)
CSA Enclosure Type 4X

Information on directives of the European Union

$C\,\epsilon$

- ATEX Directive (94/9/EC)
  complies with the ATEX Directive.

- Electromagnetic Compatibility (EMC) (2004/108/EC)
  complies with the EMC directive:

- Directive (R&TTE)(1999/5/EC)
  complies with the R&TTE Directive

You will find the EC Declaration of Conformity for this product on the Internet at the following address:

http://support.automation.siemens.com/WW/view/en/10805878

→ "Entry list" tab

Filter settings:

- Entry type: "Certificates"

- Certificate type: "EC Declaration of Conformity"

- Search item(s): IE/WSN-PA Link

European certification

> ⚠**WARNING**
>
> Note that using the adapter cable affects the protection for hazardous areas and use in the hazardous zones listed in Chapter 7 is no longer permitted. If you use the Harting adapter cable to connect to Ethernet, the requirements for hazardous area approval are no longer met. In this case, if you want to use the device for an application in which the hazardous areas directive is relevant, you will need to obtain approval from the relevant test center.

- N1
  ATEX Typ n
  See notes below
  Certification Number: Baseefa10ATEX0044X
  ATEX-Kennzeichnung: ⟨Ex⟩ Ex II 3 G
  Ex nA nL IIC T4 (-40°C ≤ Ta ≤ 60°C)
  Rated voltage: 28 V

- ND
  ATEX Dust Ignition-proof
  See note below
  Certification Number: Baseefa10ATEX0045X
  ATEX-Kennzeichnung: ⟨Ex⟩ II 3 D
  Ex tD A22 IP66 T135 (-40°C ≤ Ta ≤ 60°C)
  Rated voltage: 28 V

- N7
  IECEx Typ n
  See notes below
  Certification Number: IECEx BAS 10.0014X
  Ex nA nL IIC T4 (-40°C ≤ Ta ≤ 60°C)
  Rated voltage: 28 V

- NF
  IECEx Dust Ignition-proof
  See note below
  Certification Number: IECEx BAS 10.0015X
  Ex tD A22 IP66 T135 (-40°C ≤ Ta ≤ 60°C)
  Rated voltage: 28 V

Conditions of safe use installing N1 and N7

The device is not capable of withstanding the 500 V insulation test required by Clause 6.8.1 of EN 6007915: 2005. This must be taken into account when installing the device.

Conditions of safe use installing N1, N7, ND and NF

⚠WARNING
The surface resistivity of the antenna is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or dry cloth.

Biological compatibility A

A.1 Biological compatibility of the Link

Electromagnetic fields and health

The independent German Commission on Radiological Protection was commissioned by the German Federal Ministry for the Environment to determine the possible thermal and non-thermal dangers posed by electromagnetic fields in the range from 0 Hz to 300 GHz according to current scientific knowledge and came to the following conclusion in issue 29 (see References):

"The German Commission on Radiological Protection concludes that according to the latest scientific literature no new scientific research is available with respect to proven health hazards which would throw doubt upon the scientific evaluation which serves as the basis for the ICNIRP safety concepts and the recommendations of the EU commission."

The SSK also concludes that below the current limit values, these is also no scientific suspicion of health risks.

This assessment agrees with those of other national and international scientific commissions and of the WHO (www.who.int/emf).

Accordingly and in view of the fact that WirelessHART devices are significantly below the scientifically established limit values, it can be assumed that there are no health risks from the electromagnetic fields of WirelessHART products.

For detailed information on this topic, refer to the references.

References

B

B.1 Sources of information and other documentation

Document	Further information
Limit values and precautionary measures for protecting the population from electromagnetic fields	German Commission on Radiological Protection, Bonn, Germany Issue 29, 2001, ISBN 3-437-21527-2 (German) Internet address: www.ssk.de Recommendation of the German Commission on Radiological Protection with scientific reasoning
Various information on the topic of electromagnetic fields and science	• World Health Organization (WHO): www.who.int/emf • International Commission of Non-ionizing Radiation Protection: www.icnirp.de • German Association for Information Technology, Telecommunications and New Media (BITKOM): www.bitkom.org/de/themen_gremien/38383.aspx

Training, Service & Support

<div style="text-align: right; font-size: 3em;">C</div>

C.1　　Training, Service & Support

Online support

In addition to our product documentation, the comprehensive online information platform supports you in all aspects of our Service & Support at any time and from any location in the world. You will find this on the Internet at the following address:

www.siemens.com/automation/service&support

Here, you will find the following information:

- Support news, newsletter
- Product information, Product Support, Applications & Tools
- Technical Forum
- Access to other features of our Service & Support offer:
  - Technical Consulting
  - Engineering Support
  - Field Service
  - Spare parts and repairs
  - Optimization and modernization
  - Technical Support

    Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

    www.siemens.de/automation/support-request

You will find contact addresses on the Internet at the following address:

www.automation.siemens.com/partner

SITRAIN - Siemens training for automation and industrial solutions

With over 300 different courses, SITRAIN covers the entire Siemens product and system spectrum in the field of automation and drive technology. Advanced training tailored to your needs is also available. In addition to our classic range of courses, we also offer a combination of various training media and sequences. You can, for example, use self-study programs on CD-ROM or on the Internet as preparation or to consolidate training.

You will find detailed information on our training curriculum and how to contact our customer consultants at the following Internet address:

www.siemens.com/sitrain

Glossary

Access Control List (ACL)

List with addresses of nodes that have the right to access a network. The access control list serves as access protection for a network.

The IE/WSN-PA Link manages an access control list in which the addresses of the WirelessHART sensors allowed to access the WSN are administered.

Bandwidth

Maximum throughput of a connecting cable (normally specified in bps).

Connectability

Typically refers to a combination of path statistics and link reliability. May also refer to the operability of the connection between the Link and the control center.

Device (field device)

Relates to a WirelessHART transducer.

DHCP

Dynamic Host Configuration Protocol

A protocol for automatic assignment of IP addresses.

Domain name

Domain name

A unique identifier used on the Internet. It consists of characters with dots as delimiters, for example: this.domain.com

HART

Highway Addressable Remote Transducer is a standardized and widely used communications system for setting up industrial fieldbuses. It allows digital communication of multiple nodes (field devices) over a common data bus. HART is based on the widespread 4-20 mA standard (for transmission of analog signals). Existing cables of older systems can be used directly and both systems operated parallel to each other. HART was developed in the 1980's by the Rosemount company for their field devices. In 1989, the HART standard was initiated by the HART Communication Foundation (HCF). HART Communication Foundation in Europe is based in Basle (Switzerland).

HART Version 7

> Specification of → HCF
> The main focus is on "WirelessHART" communication of HART devices.

HCF

> HART Communication Foundation

Host Name

> A unique designator in a domain associated with the IP address of a device such as: "device.this.domain.com". In that example the hostname is "device".

HTML

> Hyper Text Markup Language: The file format used to define pages viewed with a web browser.

HTTP

> Hyper Text Transfer Protocol

> Transfer protocol for Web pages in the Internet

HTTPS

> HyperText Transfer Protocol Secure

> Protocol for the encryption and authentication of communication between Web server and Web browser in the World Wide Web.

> Expansion of HTTP for secure transmission of confidential data with the aid of SSL.

ICNIRP

> International Council on Non-Ionizing Radiation Protection

IEEE

> Institute of Electrical and Electronics Engineers

IEEE 802.15.4

> Specification for a protocol for wireless data transmission of devices with a low power consumption and short range. It is used for all WirelessHART networks (WSN).

Industrial Ethernet

> A bus system complying with IEEE 802.3 (ISO 8802-2)

IP (TCP/IP)

Internet Protocol

The IP protocol alone is connectionless and not allowed. The most important information is the unique IP address. Blocks of data are sent to the target computer independent of each other. Putting them in the right order is responsibility of → TCP.

IP address

An IP address consists of a numeric code with four numbers between 0 and 255 (4 bytes), separated by a dot, for example 192.168.0.55. It is the numeric address of a particular computer in the network / Internet.

Join key

Hexadecimal code that connecting devices to the Link. This code must be identical in the device and the Link.

Network

The portion of the network that the device resides on.

Network ID

Numeric code that links devices to the Link. This code must be identical in the device and the Link.

Server

A server is a device or more generally an object, for example, a software program that can provide certain services. The service is provided at the request of a client.

Services

Services provided by a communication protocol.

SIMATIC

Siemens automation system

Subnet

A subnet is part of a network whose parameters must be matched up. It includes bus components and all the attached stations. Subnets can, for example, be connected together by gateways to form a network.

Subnet mask

The subnet mask specifies which part of an IP address is used as the subnet address. In a class B network(subnet mask 255.255.0.0), the first two fields of an IP address (for example 150.215 in the IP address 150.215.17.9) represent the subnet.

TCP/IP

TCP = Transport Connection Protocol
IP = Internet Protocol

WirelessHART

See HART Version 7

WSN

Wireless Sensor Network

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