



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating Instructions

WirelessHART Fieldgate SWG70

Intelligent WirelessHART gateway
with Ethernet and RS-485 interfaces

WirelessHART

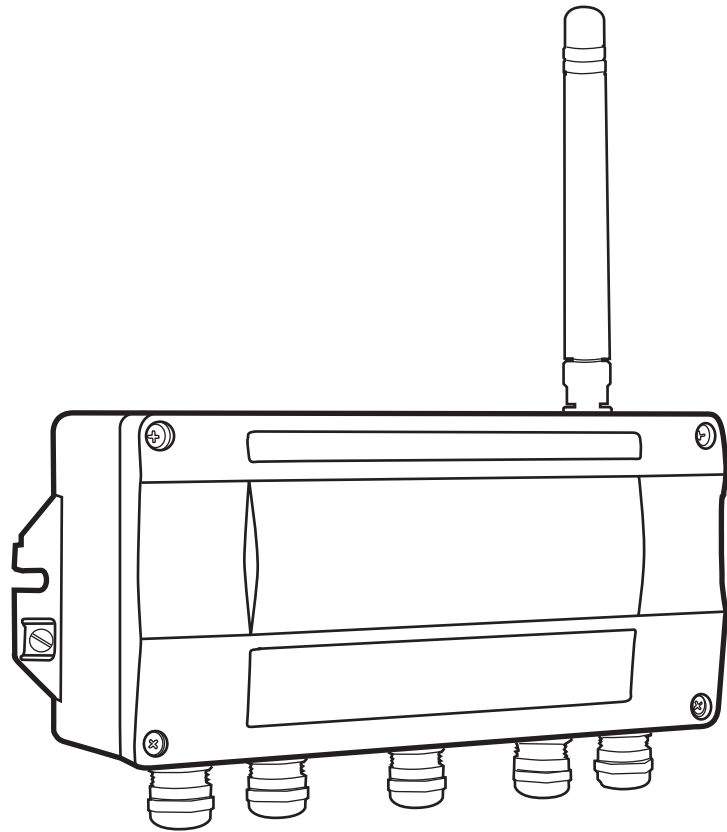


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Revision History

Package version	Manual	Changes	Remarks
1.00.xx	BA064S/04/en/06.10	–	Original manual
1.01.xx	BA00064S/04/en/13.13	New Functions	Navigation changed, see Chapter 7.6 Channel Blacklisting possible, Chapter 8.2.2 Topology with signal strength; Chapter 9.2.4/10.3 Network tables revised, e.g. Chapter 8.2.3
		Manual Restructuring	Chapter 8 Fieldgate Configuration => Chapters 8-12 Chapter 10 Modbus => Appendix A Chapter 9 HART OPC Server => Appendix B

Registered Trademarks

HART[®], WirelessHART[®]

Registered trademark of the HART Communication Foundation, Austen/TX, USA

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1 Safety

1.1 Designated use

Fieldgate SWG70 serves as a gateway device for WirelessHART networks. It enables WirelessHART devices to communicate with each other and manages security and connectivity. The Fieldgate converts wireless device data to a format that is compatible with host systems.

1.2 Installation, commissioning and operation

Fieldgate SWG70 has been designed to operate safely in accordance with current technical safety and EU directives.

If the fieldgate is installed incorrectly or used for applications for which it is not intended, or if the fieldgate is not configured correctly, it is possible that dangers may arise. For this reason, the system must be transported, stored, installed, connected, configured, operated and maintained according to the instructions in this and the associated manuals: personnel must be authorised and suitably qualified.

1.3 Operational safety

Location

Fieldgate SWG70 fulfils the requirements of EU Guidelines for a number of applications. The associated environmental conditions described in Chapter 15, Technical Data, must be upheld.

The device must not be installed at locations where corrosive vapors may be present.

Hazardous areas

Fieldgate SWG70 is available in a version that can be mounted in an explosion hazardous area. In order to ensure the necessary degree of protection:

- All seals must be undamaged and have been correctly fitted
- All screws of the housing/housing cover must have been tightened with the appropriate torque
- Only cable of the appropriate size must be used in the cable glands
- All cable glands must have been tightened with the appropriate torque, see Chapter 5.5
- All empty cable glands must have been sealed with sealing plugs
- Once a Fieldgate SWG70 has been used in a non-Ex installation, it should never be used in an Ex installation, as there is a danger that the protective circuits have been inadvertently overloaded and no longer function correctly.

When installing components in explosion hazardous areas:

- Ensure that all installation and maintenance personnel are suitably qualified
- Check that all equipment has the appropriate safety certificates
- Observe the specifications in the device certificates as well as national and local regulations.

Maintenance

Fieldgate SWG70 may not be repaired, changed or manipulated. If there is a defect, the product must always be replaced with an original part.

Coexistence of wireless technologies

WirelessHART networks use the frequency spectrum between 2400 ... 2483.5 MHz according to IEEE 802.15.4. Various other wireless technologies also use this frequency spectrum, for example WLAN and Bluetooth. Depending upon the situation, it is possible that these different wireless technologies will affect each other.

When wireless technologies are used in an industrial environment, they must coexist without interfering with each other. If you find that systems are interfering with each other, take appropriate measures to ensure the operation of all wireless systems, e.g. by reconfiguring, enforcing a wireless compatibility policy, etc.

1.4 Conformance

All declarations of conformity are to be found on the accompanying CD ROM in the folder **Fieldgate SWG70=>Documentation=>Certificates.**

CE Mark

In attaching the CE Mark, Endress+Hauser confirms that Fieldgate SWG70 conforms to all relevant EU directives. Declarations of conformity are available for both Ex and Non-Ex versions.

EMC

All modules are suitable for industrial use and conform to the EU Electromagnetic Compatibility Directive 2004/108/EC:

- Interference emission
EN 61326-1: 2006, Class A apparatus
- Interference immunity
EN 61326-1: 2006, industrial environment

1.5 Radio Approvals



WARNING

Warning!


- When the device is in operation, a distance of at least 20 cm must be maintained at all times between the device antenna and the body of the user or any other person within the vicinity of the measuring point irrespective of application or use.



CAUTION

Caution!

- Changes or modifications to the Fieldgate not expressly approved by the Endress+Hauser will void the user's authority to operate the equipment.

Compliance	Statement/Conditions of Compliance
R&TTE	This device complies with the requirements of the EC Telecommunications Directive 1999/5/EC <ul style="list-style-type: none"> ■ ETSI EN 300 328: V1.7.1 (2006-10) ■ ETSI EN 301 489-17: V1.2.1 (2002-08) ■ EN 60950: 2001
FCC	This device complies with CFR 47, Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Chinese	This device has been granted a type approval by the SRRC (State Radio Regulatory Commission of P. R. China): CMIIT ID 2011DJ5310
Japanese 	This device has been granted a designation number by the Japanese Ministry of Internal Affairs and Communications according to the Ordinance concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment ((特定無線設備の技術基準適合証明等に関する規則)) <ul style="list-style-type: none"> ■ Article 2 clause 1 item 19 ■ Approval No.: 202WW09117712 This device should not be modified (otherwise the granted designation number will be invalid)
Mexican	La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada. <ul style="list-style-type: none"> ■ COFETEL Approval No.: RCPENSW12-0651
Brazilian	ANATEL 2759-11-7311 (EAN Number: 7898994191414) “Este produto está homologado pela ANATEL, de acordo com os procedimentos regulamentados pela Resolução 242/2000, e atende aos requisitos técnicos aplicados.” Para maiores informações, consulte o site da ANATEL www.anatel.gov.br





1.6 Technical improvement

Endress+Hauser reserves the right to make technical improvements to its software and equipment at any time and without prior notification. Where such improvements have no effect on the operation of the equipment, they are not documented. If the improvements effect operation, a new version of the operating instructions is normally issued.




1.7 Conventions and icons

In order to highlight safety relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.






Safety conventions

Icon	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.

Explosion protection

Icon	Meaning
	Device certified for use in explosion hazardous area If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area in accordance with the specifications in the certificate or in a safe area
	Explosion hazardous area Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation “explosion hazardous areas” must conform with the stated type of protection
	Safe area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas

Electrical symbols

Icon	Meaning
	Direct voltage A terminal to which or from which a direct current or voltage may be applied or supplied
	Alternating voltage A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied
	Grounded terminal A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system
	Protective grounding (earth) terminal A terminal which must be connected to earth ground prior to making any other connection to the equipment
	Equipotential connection (earth bonding) A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice

2 Identification

2.1 Unpacking

2.1.1 Visual inspection

During unpacking:

- Check the packing materials for signs of transportation damage
- Remove the packaging material with care, so as not to damage the Fieldgate
- Store the original packing material, in case the Fieldgate must be shipped again
- Keep the documentation supplied with the Fieldgate in a safe place

In the event of damage to the Fieldgate, contact your Endress+Hauser Sales Center, see Chapter 13.1.2. Where possible, return the fieldgate to us in its original packing.

2.1.2 Scope of delivery

Please check that the delivery is complete and free of defects before starting installation. The scope of delivery comprises the following parts:

- WirelessHART Fieldgate SWG70
- Antenna
- Short instructions and CD-ROM
- Depending upon order, FieldCare Device Setup DVD

2.1.3 Storage und transport

Always store and transport the device in the original packaging.

Always store the device in a clean, dry environment. Note the permitted storage temperature, see Chapter 15.4.

2.2 Device designation

The device designation together with other information is to be found on the nameplate affixed to the front of the Fieldgate, see Fig. 2-1.

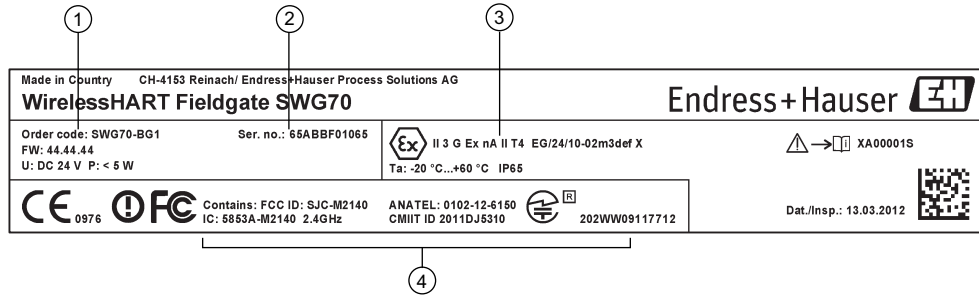


Fig. 2-1: Nameplate

- | | | | |
|---|---------------|---|------------------------------|
| 1 | Order code | 3 | Type of protection, if any |
| 2 | Serial number | 4 | Telecommunication compliance |

The device type can be derived from the order code as follows:

WirelessHART Fieldgate SWG70	
Approvals	
AA	Non-hazardous area
BG	ATEX II 3G Ex nA II T4
Output	
1	Ethernet + RS-485 + HART; OPC + Modbus
9	Special version
Service	
IK	Customized configuration
IW	Without tooling DVD (FieldCare Setup)
Marking	
Z1	Tagging (TAG)
	52006327: Self-adhesive paper label
	52006328: Supplied label/plate
SWG70-	Product designation

2.3 Licensing agreement

The Product CD-ROM and FieldCare Device Setup DVD supplied with the WirelessHART fieldgate contain a number of components that are required for its commissioning. These can be installed free-of-charge on the computer to be used with the Fieldgate.

Information on the various Windows versions supported is to be found in the folder System Requirements on the Product CD-ROM.

The full licensing agreement is also to be found on the CD-ROM. The software required for start-up and commissioning, i.e. the Internet browser, is either freely available or is subject to the licensing conditions of its manufacturer. Installation of this software on your computer implies that you accept the terms of the corresponding licensing agreement.

3 Function and System Design

3.1 WirelessHART protocol

The HART protocol has until now used the wired 4–20mA loop with a superimposed digital signal as physical layer. Although full digital communication is available in multidrop mode, the majority of transmitters are connected to analog I/O cards and digital communication is used only for parameterization, diagnosis and maintenance purposes.

WirelessHART now allows for the wireless transmission of HART data. To be employable worldwide, WirelessHART utilizes the 2.4 GHz Band (IEEE 802.15.4 wireless network) as physical layer. The WirelessHART devices form a mesh network in which every device is not just a measurement point, but also a repeater. This results in a wider range for the whole network as well as increased reliability through redundant communication paths.

The network may comprise three types of device:

- WirelessHART gateway (Fieldgate SWG70)
- WirelessHART field devices
- WirelessHART adapters (either connected to 4–20 mA/HART devices or acting as repeaters)

The WirelessHART network is built up, organized and maintained by the Fieldgate, which also takes care for connection to different HOST systems through different bus interfaces.

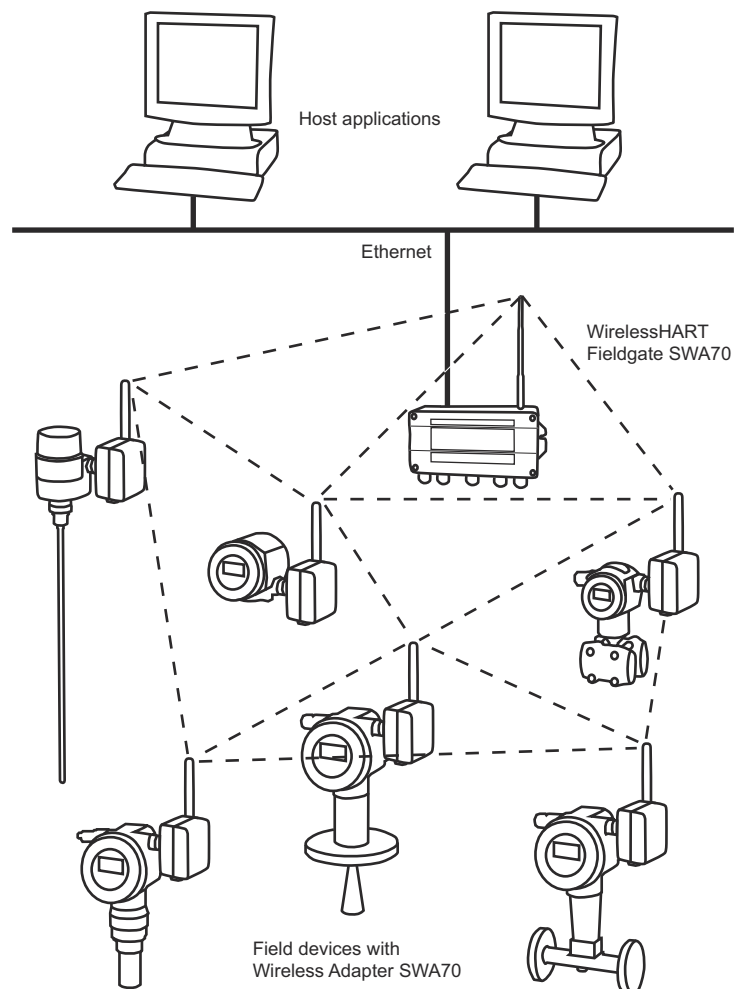


Fig. 3-1: WirelessHART network

3.2 WirelessHART network

Fieldgate SWG70 is the master device in the WirelessHART network. Acting as network manager, it recognizes other devices wanting to join the network. It makes contact with each in turn and initiates the procedures required for them to join. The network organizes itself without any intervention on the part of the user. Fieldgate SWG70 also acts as security manager and collects the data sent by the network participants, converting it into a form which can be used by other systems connected to it.

3.2.1 Network management

In its role as network manager, Fieldgate SWG70 organizes the wireless communication between the WirelessHART field devices.

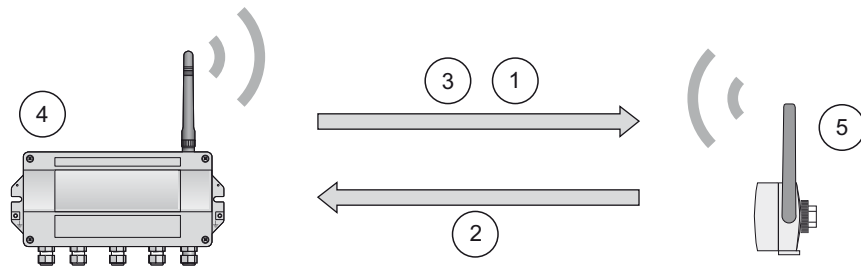


Fig. 3-2: Network management

- | | | | |
|---|---|---|--|
| 1 | Step 1: Advertising | 4 | WirelessHART gateway (Fieldgate SWG70) |
| 2 | Step 2: Join Request | 5 | WirelessHART device or adapter |
| 3 | Step 3: Authorization, Session & Network Keys, Scheduling and Routing | | |

After the Fieldgate has started up the network, devices can join. To this end, it first sends out a call for devices to join the network. Then, the device sends a join request to announce its wish to join the network. If the WirelessHART field device can identify itself with the same network ID and join key as stored in the WirelessHART gateway, the field device is authorized to join the network. Otherwise, the field device will be rejected.

In the next step, the WirelessHART gateway sends session and network keys as well as scheduling and routing information to the field device. The field device is told how to participate in the network and receives various information from the WirelessHART gateway:

- Number and identity of neighbouring WirelessHART field devices,
- When to send messages and which channels to use,
- When to repeat messages for other WirelessHART field devices,
- The optimal communication path for messages as well as alternative communication paths in case of failure.

During this process, the WirelessHART device or adapter may also apply to send messages in certain intervals and ask the network manager for the appropriate resources. The network manager then takes care that these resources are available. For example, the network manager informs other WirelessHART field devices when to repeat messages.

3.2.2 Security management

Fieldgate SWG70 also acts as security manager. To make communication safe, all messages are encrypted with industry-standard AES-128 block ciphers with symmetric keys. Therefore, messages are unreadable for external listeners. The encryption keys are distributed by the security manager.

The Join Key is used to join the network. Subsequently, the Join Key is automatically exchanged against the Session Key and the Network Key, i.e. two new additional keys.

3.3 Connection to host applications

Fieldgate SWG70 also makes wireless communication accessible to HART-capable host systems via its Ethernet or serial interfaces through the following functions.

3.3.1 Instrument List

WirelessHART devices in the network are made available to host systems via an instrument list. This list contains one or more I/O cards. Every I/O card has one or more channels. Up to 15 field devices (for WirelessHART Adapter SWA70 max. four) can be connected in multidrop mode to each channel, see Fig. 3-3. The list itself can be up and downloaded, see Chapter 10.1.

Fieldgate SWG70 assigns a virtual I/O card to each WirelessHART device. The I/O cards are assigned to the WirelessHART devices in the order in which they join the network. New WirelessHART devices in the network are assigned to the next available I/O card, which is added to the end of the instrument list (First-in-First-Out principle).

Within an I/O card, the WirelessHART device itself as well as status information is assigned to Channel 0. If the WirelessHART device is an adapter, all field devices connected to it are assigned to channel 1 (multi-drop mode). The list of the connected field devices is also called sub-device list.

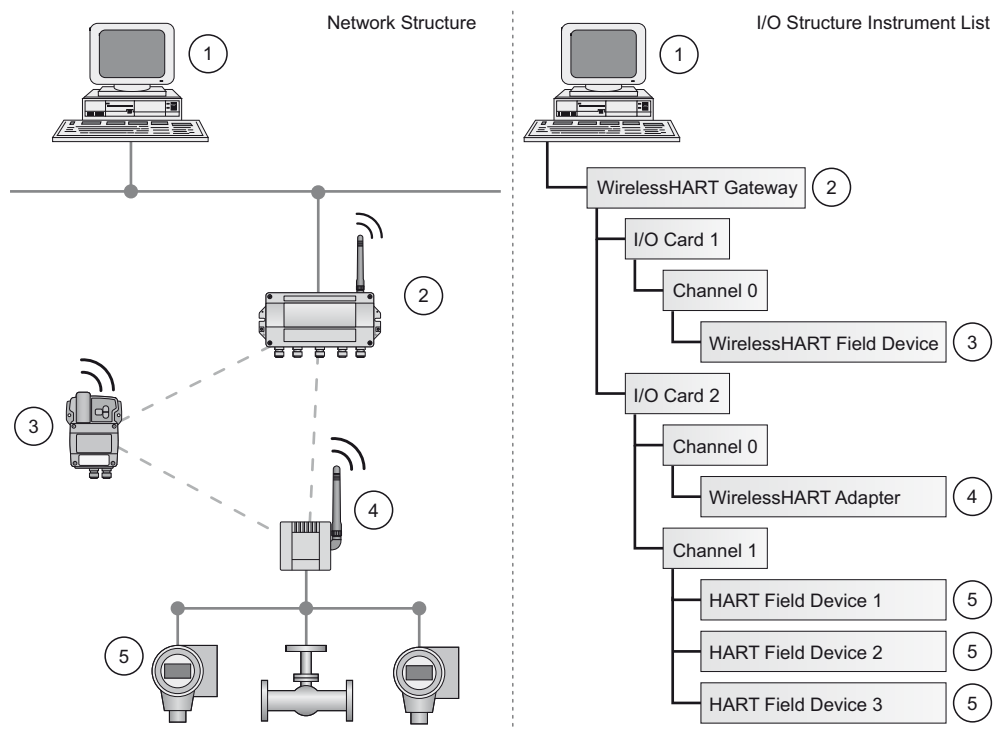


Fig. 3-3: Instrument list

If a WirelessHART device loses communication to the gateway, it stays assigned to the I/O card initially allocated to it. When communication is established again, the device thus has the same position in the instrument list that it had before.

The same principle applies to the field devices connected to the WirelessHART adapter. When communication to the gateway is lost, the long tags of the field devices are stored. After communication has been established again, the field devices regain their previous position in the instrument list.

3.3.2 Cache

The WirelessHART gateway stores information received over the WirelessHART network and makes it available to the host for further processing. This ensures that information is available immediately for the host system without having to send a request to the device and wait for the response. The following commands and answers to requests are cached in the gateway.

Information cached in the WirelessHART gateway

Cache	HART Command	Description
Static: cached upon read	0, 11, 21	Read unique identifier (associated with tag or long tag)
Static: cached upon read & write confirmation	12, (17)	Read (Write) Message
	13, (18)	Read (Write) Short Tag, Descriptor, Date
	20, (22)	Read (Write) Long Tag
	50 (51)	Read (Write) Dynamic Variable Assignments
Dynamic: cached on publication only	1	Read Primary Variable
	2	Read Current and Percentage
	3	Read All Variables
	9	Read Device Variables and Status
	33	Read Device Variables
	48	Read Additional Device Status
	38	Reset Configuration Change Counter
	93	Read Trend

Each listed command has its own cache memory. Static commands are stored in the cache upon the first request. These contain device parameters, e.g. tags, that do not normally change. Dynamic variables are stored each time a field device sends a burst message so that up-to-date values are available at all times.

With the exception of commands the Write commands 17, 18, 22 and 51, when the WirelessHART gateway receives a request from a host system which is embedded in Command 77, the response is sent immediately (provided that the response is available in the cache).

Long Tag Emulation

WirelessHART uses the long tag for addressing devices. Not every HART device supports long tags, for example, older HART devices with HART Protocol Version 5 or less, do not support long tag addressing.

If a HART 5.0 device is connected to a WirelessHART adapter, the WirelessHART gateway emulates the long tag using the "Message" field. When a host system addresses a HART 5 device, the emulation translates Command 20(22) directly into Command 12 (17) which the HART 5 understands. The response is stored in the gateway cache for CMD 12(17) and for CMD 20(22).

4 Mechanical Installation

NOTICE**NOTE!**

- It is recommended that Fieldgate SWG70, adapters and devices be setup on the test bench and the network be tested before the components are installed in the field.

4.1 Mounting considerations

4.1.1 Positioning the Fieldgate

Install the gateway first, before installing other WirelessHART devices. This way you can check for proper operation of new devices as they are installed. Nevertheless, consider the location of future WirelessHART devices that will be routed through the gateway to ensure good connectivity.

Guidelines for Planning a WirelessHART Network

- Mark the positions of the various measuring points on a scale overview of the plant. It is important that the overview shows likely obstacles to the propagation of the radio waves
- Make sure that a minimum of 2 other WirelessHART devices are well within the antenna range of the device. If necessary, consider using an adapter as an additional stand-alone repeater. For more information on the antenna characteristics please refer to Chapter 4.1.3.
- Where a lot of metal, grids or walls prevent a device from being in line-of-sight of its nearest neighbour, the maximum distance between two devices is 30 m. Install wireless devices at least 1m above the ground or the floor.
- Where there are fewer structural elements and one or more neighbours are in direct line-of-sight, the maximum distance between two devices for planning purposes is 200 m. In this case, install wireless devices at least 3m above the ground or the floor.
- Consider moving objects that could affect the device's antenna range.
- Make sure that the device's antenna is aligned vertically.
- If possible, position the Fieldgate at or near the centre of the network - it should be in contact with at least 20% of the devices in the network.
- Do not position WirelessHART devices directly below or above each other as they will be outside each other's antenna range, see Chapter 4.1.5.
- If possible, do not position the device next to metal surfaces, pipes or walls containing metal (minimum distance: 6 centimetres). There should be as little metal around the device as possible.
- Do not position other 2.4 GHz devices like cordless phone bases or WLAN routers near WirelessHART devices. Wireless technologies used in an industrial environment must be able to coexist without disrupting each other. If multiple networks operate in one facility, wireless frequency management may be required.

4.1.2 Positioning the antenna

Fieldgate FWG70 is supplied with an omnidirectional dipole antenna that must be screwed on during installation, see Chapter 4.2.1. The antenna characteristics and details of positioning are to be found in Chapters 4.1.3 to 4.1.5.

If the application requires that the Fieldgate be mounted in a protective enclosure, a remote antenna must be connected to the antenna terminal and mounted outdoors, see Chapter 4.2.2. This antenna must conform with the requirements described in 4.2.2 and be mounted according to the instructions in Chapter 4.2.3. The guidelines for positioning a WirelessHART device also apply to the positioning of a remote antenna, see Chapter 4.1.5.

4.1.3 Antenna characteristics

Fig. 4.1 shows the antenna gain in the vertical and horizontal planes.

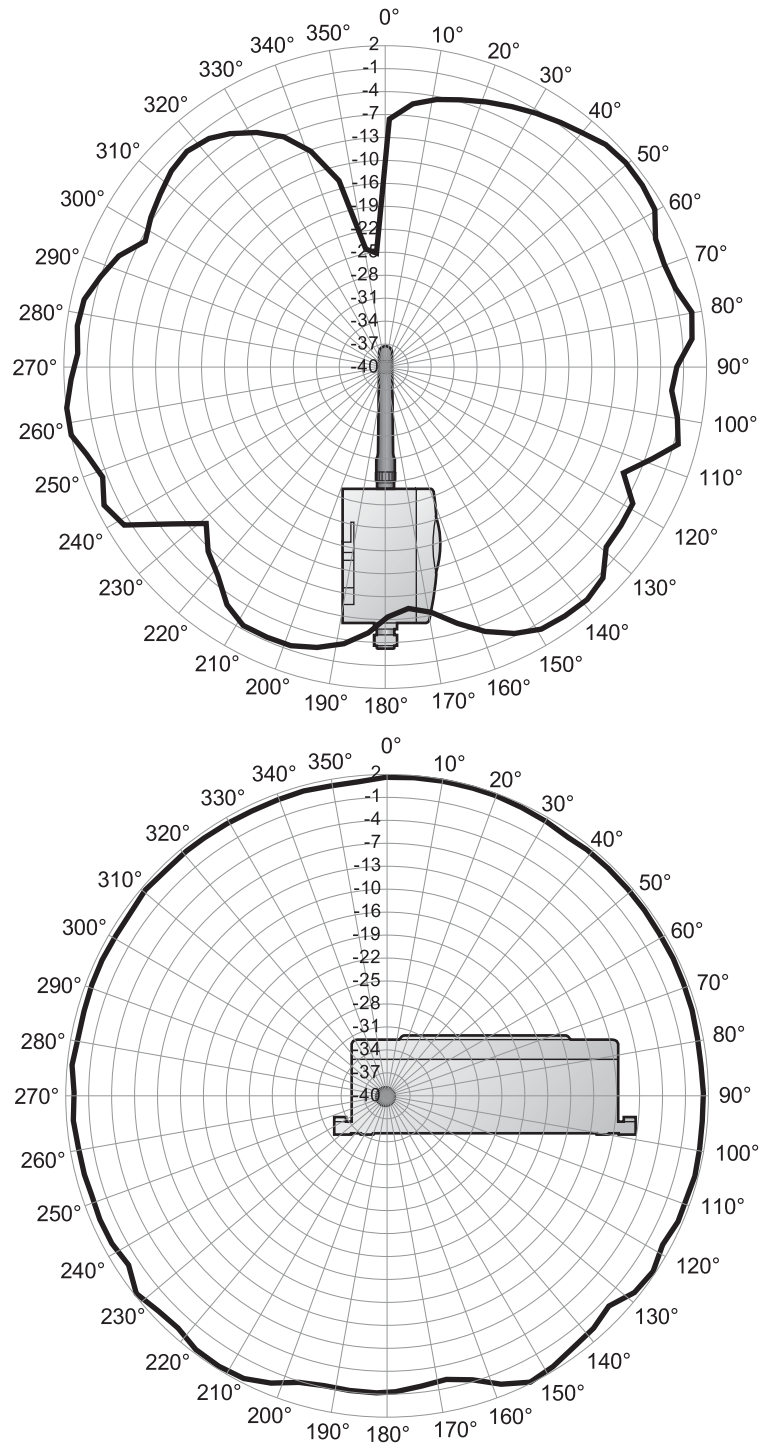


Fig. 4-1: Antenna gain in the vertical (above) and horizontal planes

4.1.4 Antenna range

Fig. 4.2 is a schematic representation of Fig. 4.1 and shows the wave propagation with the signal attenuation. The antenna is an omni-directional dipole antenna. If you point the antenna upwards, the signal radiates horizontally at an angle of approx. 39 degrees above and below the horizontal (donut shaped). The most power is in the horizontal plane, decreasing to 50% at an angle of 39°. Almost no signal will be radiated directly above and below the antenna. Consider this when planning a WirelessHART network.

The height differences between wireless devices in a network should not be too large.

The schematic is valid only for an antenna placed outdoors with no metal surfaces near. The radiation pattern changes significantly when metal surfaces are close to the antenna.

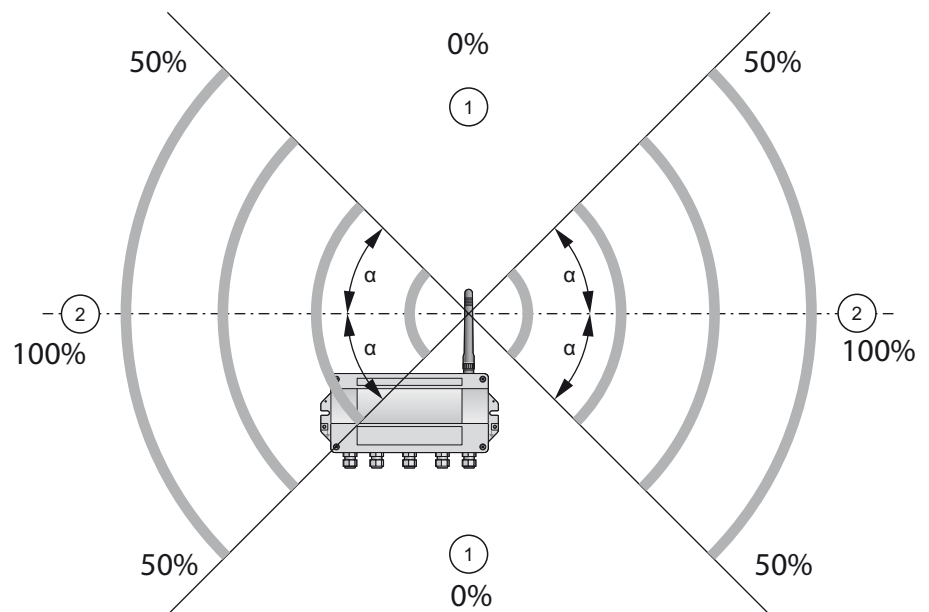


Fig. 4-2: Wave propagation, schematic representation ($\alpha = \text{approx. } 39^\circ$)

1: No signal above and below

2: Stronger signal sideways

4.1.5 Examples for good and poor positioning

The positioning is good when the network participants are within the antenna range:

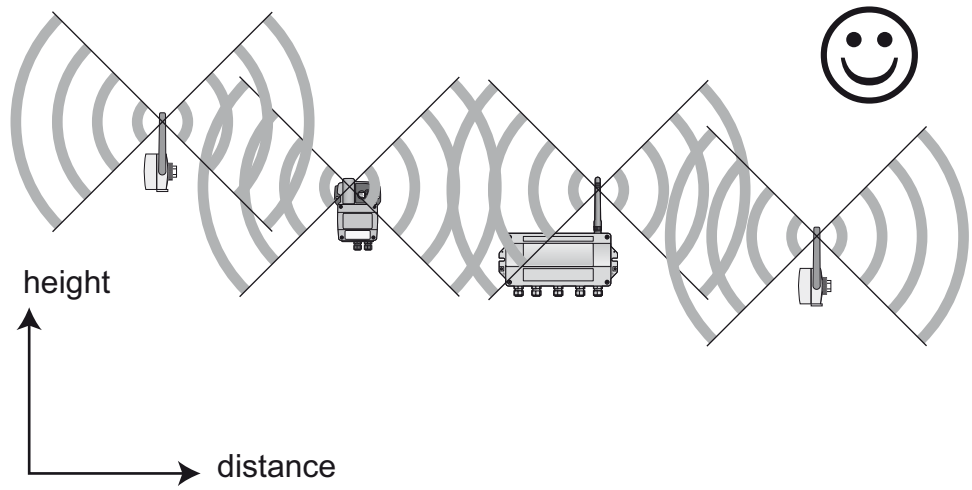


Fig. 4-3: Example of good positioning

The positioning is poor when neighbours are not in the antenna range or within the weaker signal zone of the antenna:

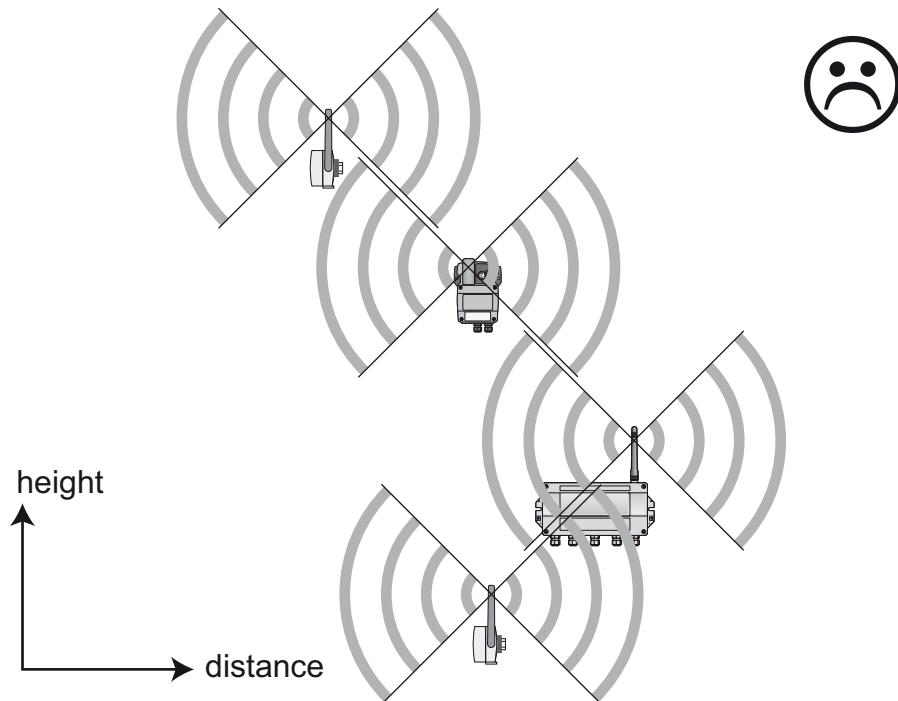


Fig. 4-4: Example of poor positioning

4.2 Mounting the antenna

WARNING

WARNING!

- When Fieldgate SWG70 is installed in Ex-Zone 2, the connection/disconnection of cables is permitted only in the absence of any potentially explosive atmosphere or when the Fieldgate is not connected to the power supply.

NOTICE

NOTE!

- Use only the antenna supplied or a remote antenna that conforms to the requirements in Chapter 4.2.2.
- A failure to do this will void the radio approval and/or the Ex-certificate and the Fieldgate may no longer be operated.

4.2.1 Mounting the antenna supplied

- Before mounting the antenna supplied, make sure that the Fieldgate has been disconnected from line power.
- Firmly screw the antenna to the device's antenna terminal (see Item 6 in Fig. 5.1 in Chapter 5.1).

4.2.2 Requirements for a remote antenna

WARNING

WARNING!

- If Fieldgate SWG70 is to be operated in with a remote antenna installed in an explosion hazardous area, then the antenna must possess the appropriate Ex-certification.

NOTICE

NOTE!

- The use of a remote antenna of a different type or that operates at a higher gain than specified in the requirements below is subject to legal restrictions.

Only remote antennas that conform with the following requirements may be connected to the Fieldgate.

- The antenna must comply with the laws for usage of 2.4 GHz equipment valid in the country of installation
- Radio frequency energy $\leq 50 \mu\text{J}$
- Radio frequency power $\leq 2 \text{ W}$
- Antenna gain $\leq 20 \text{ dBi}$
- Maximum gain (EU) $\leq 4 \text{ dBi}$; Maximum gain (US & Canada) $\leq 2 \text{ dBi}$

The maximum gain must be less than or equal to the sum of the antenna gain and the losses of the individual components. Note that the permitted maximum gain is dependent on the country of installation.

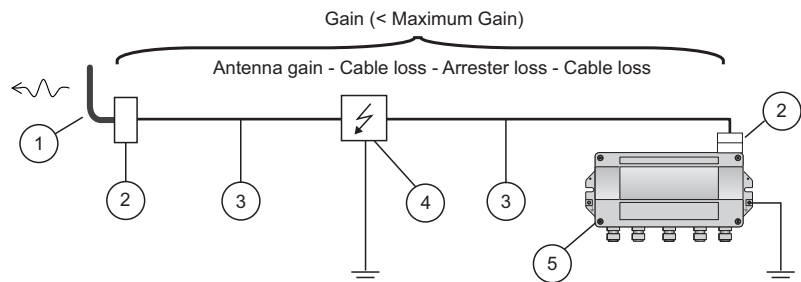


Fig. 4-5: Calculating the maximum gain of a remote antenna

- | | | | |
|---|----------------------------------|---|--|
| 1 | Antenna | 4 | Surge protector, $\lambda/4$, without mechanical fixing |
| 2 | Coaxial adaptor | 5 | Fieldgate SWG70 |
| 3 | RF coaxial cable with connectors | | |

4.2.3 Connecting a remote antenna

⚠ WARNING

WARNING!

- Outdoor installations can be subject to lightning strikes. Install a surge arrester, to protect the installation against transients or damage caused by lightning strikes.

NOTICE

NOTE!

- Tension relief and bending radii:** Ensure sufficient relief of tension on the cables during installation and note the minimum bending radii of the cables.

The antenna must be connected to the Fieldgate SWG70 by means of coaxial cable. A surge arrester provides protection against lightening strikes. The surge arrester must be installed directly on the Fieldgate SWA70 antenna connection. Install the components according to Fig. 4-6.

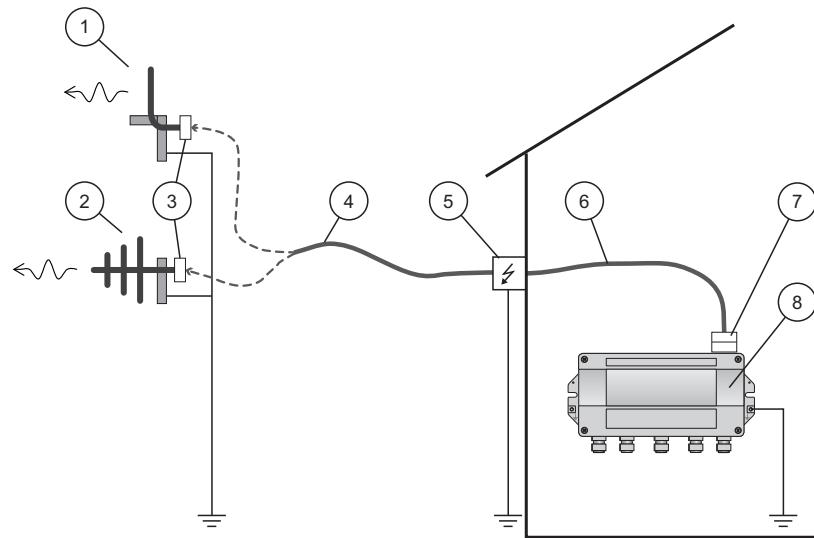


Fig. 4-6: Installation of an remote antenna

1	Omnidirectional antenna	5	Surge arrester, $\lambda/4$, without mechanical fixing
2	Directional antenna	6	RF coaxial cable with connectors
3	Coaxial adaptor	7	Coaxial adaptor
4	RF coaxial cable with connectors	8	Fieldgate SWG70

- Before installing the remote antenna, make sure that the Fieldgate has been disconnected from line power
- Install the components according to Fig. 4-6
- Install the surge arrester in a way that all indoor connections are protected
- Connect the surge arrester to protective grounding
- Install the remote antenna where it is within the antenna range of other WirelessHART devices, see Chapter 4.1.5

4.3 Mounting the Fieldgate

In addition to fulfilling the conditions for good wireless communication, the mounting location should be well accessible for mounting and electrical installation. Make sure that there is enough space to open the housing cover and to access the terminals, switches, and cable glands. Choose a mounting location that meets the climatic limits specified and radio requirements in the technical data.

The housing has a degree of protection of IP65 and is designed for wall mounting (mounting accessories not included).

Required tools:

- 2 screws (M6)
- Drill
- Screwdriver

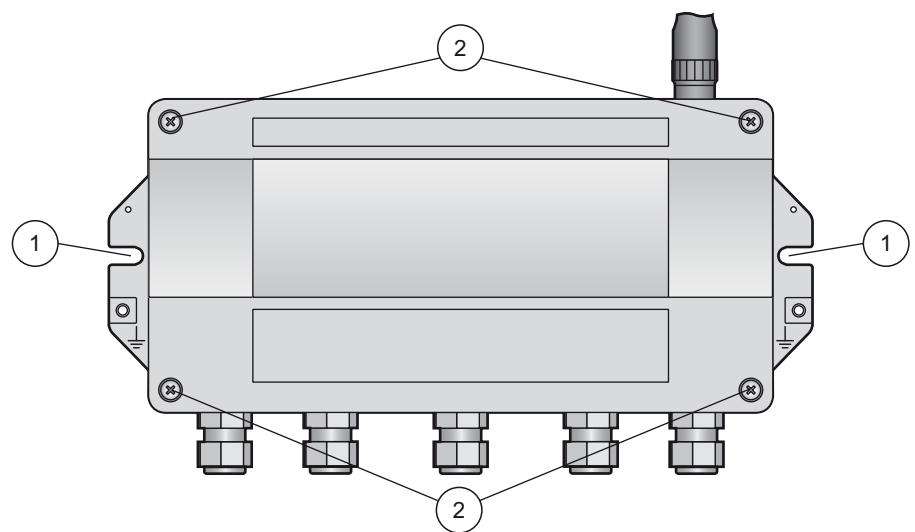


Fig. 4-7: Mounting holes and housing screws

1 Mounting holes

2 Housing screws

Mounting the Gateway

- 1 Drill 2 holes in the mounting surface so that they match the holes of the housing (centres 240 mm to 250 mm apart). See Chapter 15.5 for dimensioned drawing.
- 2 Screw the device to the mounting surface.

5 Electrical Installation

5.1 Connections and interfaces

The connections and interfaces are only accessible with an open enclosure. In the case of the DIP switches, the user has the choice of using the switch settings, or overriding the settings by software, see Chapter 8.

WARNING

Warning!

- When Fieldgate SWG70 is installed in Ex-Ex-Zone 2, the connection/disconnection of cables is permitted only in the absence of any potentially explosive atmosphere or when the fieldgate is not connected to the power supply.

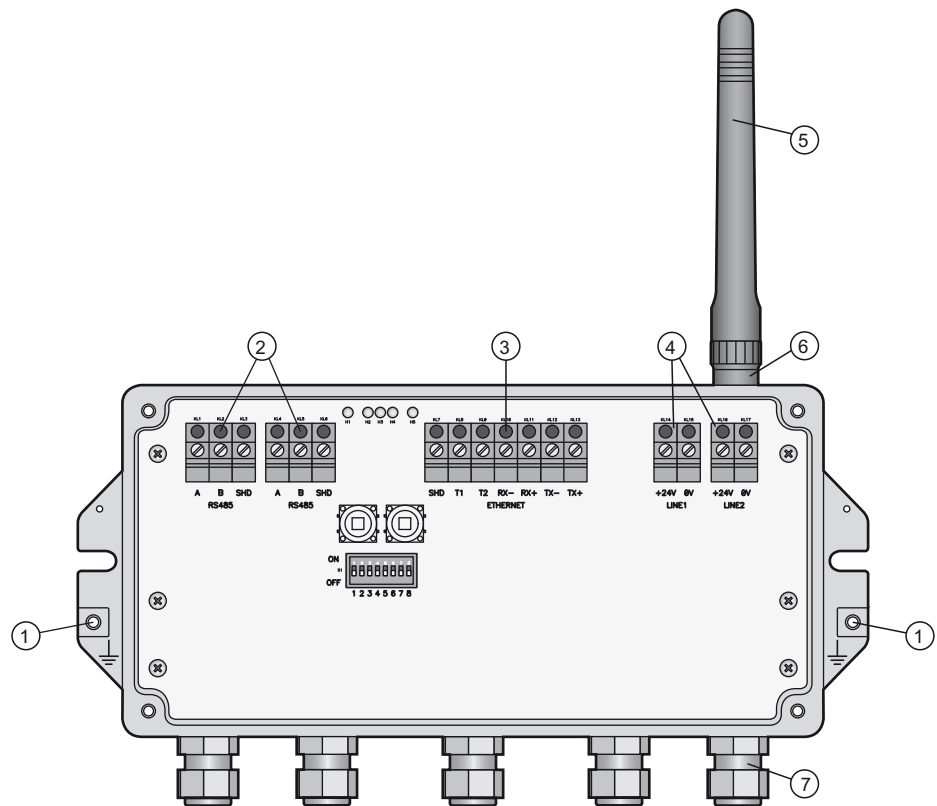


Fig. 5-1: Connections and interfaces

- | | | | |
|---|---|---|------------------|
| 1 | Grounding terminal | 5 | Antenna |
| 2 | RS-485 interfaces, duplicated terminal block for daisy-chain capability | 6 | Antenna terminal |
| 3 | Ethernet interface | 7 | Cable glands |
| 4 | Power supply connections (redundant) | | |

5.2 Connecting to power supply and grounding

There are two 24 VDC power supply terminal blocks located inside Fieldgate SWG70, allowing for redundant power supply. Open the housing cover to access the terminal blocks.

NOTICE

NOTE!

- **Tension relief and bending radii:** Ensure sufficient relief of tension on the cables during installation and note the minimum bending radii of the cables.

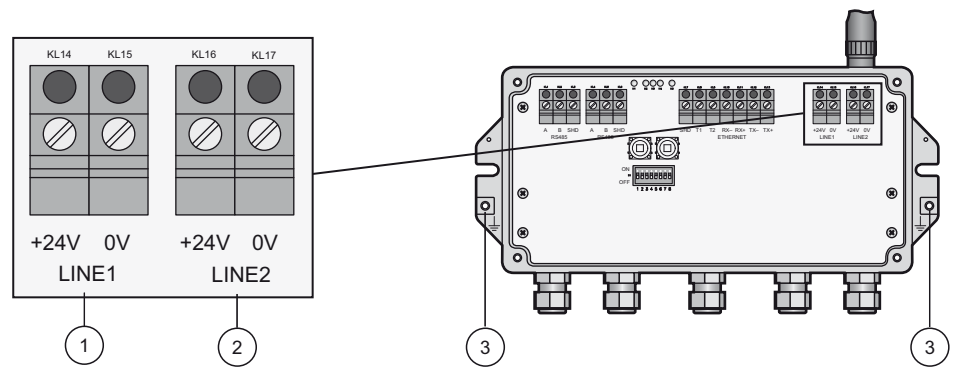


Fig. 5-2: Power supply

- | | | | |
|---|--|---|---------------------|
| 1 | First power supply connection | 3 | Grounding terminals |
| 2 | Second (redundant) power supply connection | | |

Connecting to 24 VDC power supply and grounding

Fieldgate SWG70 must be connected to a 24 VDC (20 VDC – 30 VDC) power supply

- 1 Connect the grounding terminal to a ground wire.
- 2 Unscrew the 4 screws of the housing cover (see Fig. 4-5 in Chapter 4.2) and remove the housing cover.
- 3 Route the 24 VDC power cable through the second cable gland from right
 - The permissible cable diameter lies between 6 mm and 10 mm.
- 4 Connect the 24 VDC power cable to the first power supply connection "Line 1" observing polarity (see Fig. 5-1 above).
- 5 If you want to connect a redundant power supply (optional), route the second 24 VDC power cable through the cable gland on the far right of the housing.
- 6 Connect the second power cable to the second power supply connection "Line 2" observing polarity .
- 7 Switch on the power: the green power LED should light immediately.
- 8 Tighten the cable gland with appropriate torque, see Chapter 5.5.
- 9 Switch off the power before making any more connections.

5.3 Connecting to Ethernet

Fieldgate SWG70 is equipped with a fully galvanic isolated 10 Base-T/100 Base-TX Ethernet interface. You may connect it to an existing Ethernet Hub, Switch or Router.

NOTICE

NOTE!

- Keep in mind that an access point of the Ethernet network has to be available. The maximum length of the cable running from the gateway to the access point is 100 m, depending on cable type and communication speed.
- **Tension relief and bending radii:** Ensure sufficient relief of tension on the cables during installation and note the minimum bending radii of the cables.

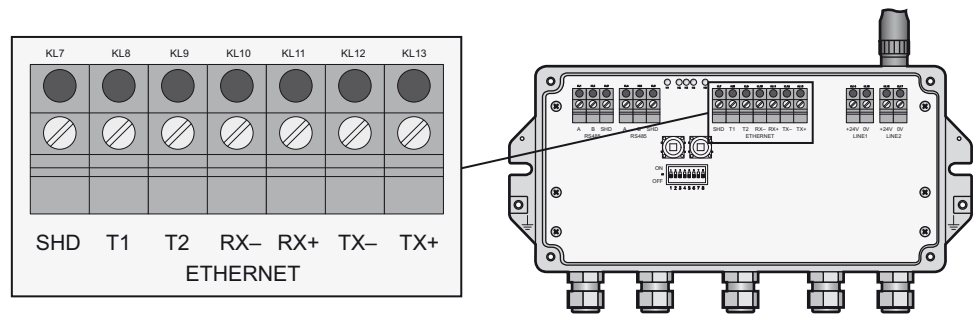


Fig. 5-3: Ethernet interface

The wiring of the Ethernet interface depends on the cable used, see table below.

- A crossover cable is required if the gateway is connected directly to a computer
- A straight through cable is used in connection with a hub, switch or router

The other end of the cable is fitted with a standard RJ-45 connector.

Connecting to Ethernet Network

- 1 Check that the power is switched off
- 2 If applicable, unscrew the four screws of the housing cover (see Fig. 4-5 in Chapter 4.2) and remove the housing cover.
- 3 Route the Ethernet cable through the cable gland in the middle of the gateway housing.
 - The permissible cable diameter lies between 6 mm and 10 mm.
- 4 Connect the Ethernet cable to the terminal block labelled "Ethernet" (see above) according to the following table:

Computer		Gateway	
Pin Numbering	Connector	Crossover cable	Straight through
	Pin 1	TX+	RX+
	Pin 2	TX-	RX-
	Pin 3	RX+	TX+
	Pin 4	T2	T2
	Pin 5	T2	T2
	Pin 6	RX-	TX-
	Pin 7	T1	T1
	Pin 8	T1	T1

- 5 Screw the housing cover to the housing again.
- 6 Tighten the cable gland with appropriate torque, see Chapter 5.5.

5.4 Connecting to RS-485

Fieldgate SWG70 is equipped with a fully galvanic isolated RS-485 interface. A second RS-485 terminal block allows several gateways to be connected through a daisy chain.

A terminating resistor is required at each end of the RS-485 cable. If the RS-485 is not routed to other devices (no daisy-chain connection), activate the terminating resistor integrated in the fieldgate.

NOTICE

NOTE!

- Keep in mind the location of the Modbus PLC or DCS. The maximum length of the cable running from the gateway to the PLC/DCS is 1200m (at reduced communication speed).
- Use shielded twisted pair (STP) cables only.
- If the cable shield is grounded, the grounding should only be connected to one end of the cable, in order to avoid equipotential bonding currents.
- **Tension relief and bending radii:** Ensure sufficient relief of tension on the cables during installation and note the minimum bending radii of the cables.

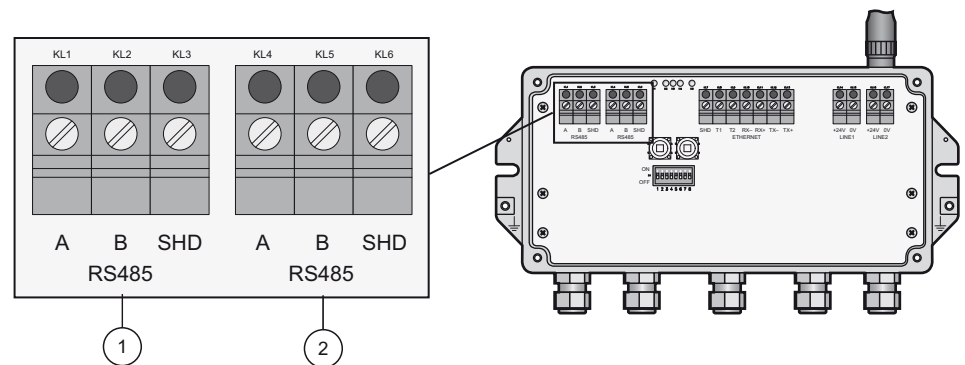


Fig. 5-4: RS-485 interface

1 First RS-485 connection

2 Second RS-485 connection for daisy chaining

Connecting to RS-485

- 1 Check that the power is switched off
- 2 If applicable, unscrew the four screws of the housing cover (see Fig. 4-5 in Chapter 4.2) and remove the housing cover.
- 3 Route the RS-485 cable through the first cable gland from left
 - The permissible cable diameter lies between 6 mm and 10 mm.
- 4 Connect the RS-485 cable to the left terminal block labelled "RS485" (see Figure 5-4) as follows:

Wire RS-485 cable	Fieldgate terminal	Remarks
RxD/TxD- (RS-485 A)	A	RS-485 differential signal
RxD/TxD+ (RS-485 B)	B	
Shield	SHD	Cable shielding

- 5 For a daisy-chain connection, route the second RS-485 cable through the second cable gland from left and connect it to the right terminal block labelled "RS485", see table above.
- 6 To activate the RS-485 termination, set DIP switch number 7 to "ON" (see Chapter 6.1.3).
- 7 Screw the housing cover to the housing again.
- 8 Tighten the cable gland with appropriate torque, see Chapter 5.5.

5.5 Cable glands and housing cover

The degree of protection IP 65 (NEMA Type 4) cannot be achieved if the cables and cable glands are not fitted correctly.

To ensure the IP degree of protection

- all screws of the housing / housing cover must have been tightened with the appropriate torque,
- only cables of the appropriate size must be used in the cable glands,
- all cable glands must be tightened with the appropriate torque,
- all seals must be undamaged and fitted correctly,
- all empty cable glands must be sealed with appropriate plugs.

The tightening torques of cable glands depend on what type of cable is used and must therefore be determined by the user. The cap nuts must be securely tightened. Tightening the cap nuts too tight can have a negative effect on the protection class. The following figures can be taken as rough guides.

Type of cable gland	Approx. installation torque
Plastic	2.5 Nm
Nickel-plated brass	4.1 Nm
Stainless steel	4.1 Nm

The housing cover must be installed with a torque of 24.1 Nm.

6 Operation

6.1 Operating and display elements

Inside the fieldgate housing there are LED indicators, DIP switches and reset buttons. The controls and indicators are accessible with open enclosure.

WARNING

Warning!

- When Fieldgate SWG70 is installed in Ex-Zone 2 and the power is switched on, the operation of DIP switches and buttons as well as the connection/disconnection of cables is permitted only in the absence of any potentially explosive atmosphere
- The operation of DIP switches and the connection/disconnection of cables in Ex-Zone 2 is permitted, however, when the power to Fieldgate SWG70 is switched off

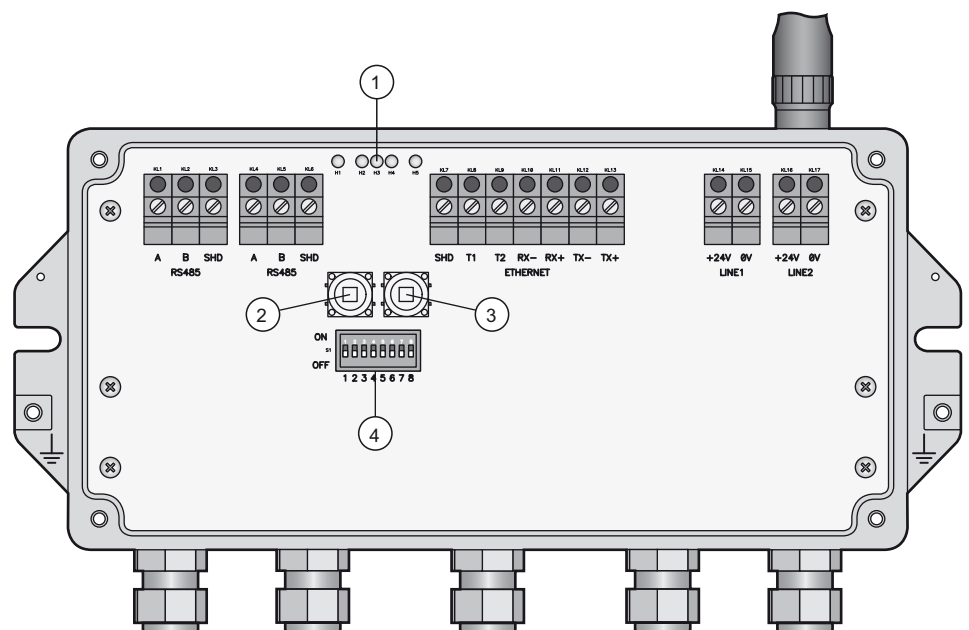


Fig. 6-1: Operating and display elements

- | | | | |
|---|-----------|---|--------------|
| 1 | LEDs | 3 | Button P2 |
| 2 | Button P1 | 4 | DIP switches |

6.1.1 LEDs

Five leds indicate the status of Fieldgate SWG70:

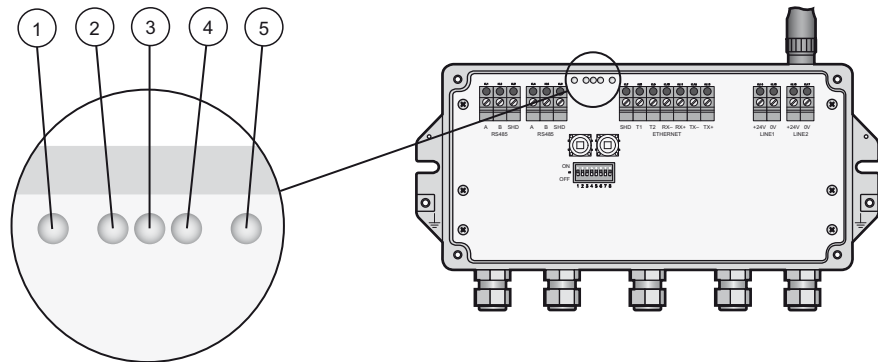


Fig. 6-2: LED indicators

- | | | | |
|---|---|---|---|
| 1 | Yellow LED: RS-485 communication status | 4 | Red LED: Fault |
| 2 | Green LED: Power supply | 5 | Yellow LED: Ethernet communication status |
| 3 | Yellow LED: WirelessHART communication status | | |

The significance of the LEDs is as follows:

Yellow LED: RS-485 communication status

Mode	Status	Significance
Flashes	–	Flashes shortly whenever a valid HART or Modbus message is received by the Gateway on the RS-485 communication line – The LED does not flash if the message is not addressed to the gateway or if a communication error was detected within the message
Off	–	Currently no communication on the RS-485 line

Green LED: Power supply and operation status

Mode	Status	Significance
On	OK	Fieldgate SWG70 is powered up and running
Flashes	Not ready	On power-up, indicates that the Fieldgate application is running but the Fieldgate is not yet ready to answer HART commands
Off	No power	The power supply is not connected/Fieldgate is not ready

Yellow LED: WirelessHART communication status

Mode	Status	Significance
Flashes	–	Flashes shortly whenever a valid WirelessHART message is received by the Gateway on the WirelessHART communication interface – Messages include simple commands but not published bursts and event notifications
Off	–	Currently no communication on the WirelessHART interface

Red LED: Device status

Mode	Status	Significance
On	Hardware fault	Fieldgate has detected a hardware fault that makes normal operation impossible.
Flashes	Recovering from hardware fault	The Fieldgate application is trying to recover from the fault (not possible for all faults)
Off	No hardware fault	–

Yellow LED: Ethernet communication status

Mode	Status	Significance
Flashes	–	Flashes shortly whenever a valid HART or Modbus message is received by the Gateway on the Ethernet communication line – The LED does not flash if the message is not addressed to the gateway or if a communication error was detected within the message
Off	–	Currently no HART/Modbus communication on the Ethernet line

6.1.2 Buttons

Fieldgate has two pushbuttons.



Warning!

- When Fieldgate SWG70 is installed in Ex-Zone 2 and the power is switched on, the operation of the pushbuttons is permitted only in the absence of any potentially explosive atmosphere.

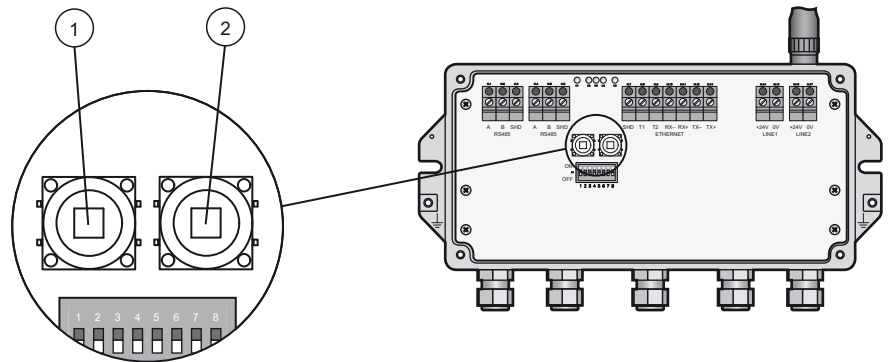


Fig. 6-3: Pushbuttons

1 Button A

2 Button B

The function of the buttons is as follows:

Buttons

Button	Function	Procedure
Button P1	Configuration reset	Press the button for more than 3 seconds – All Fieldgate SWG70 configuration parameters are reset to factory settings with exception of the parameters set by button P2 and button P1 + P2. – After approx. 3 seconds, all LEDs light up to confirm the reset
Button P2	Communication reset	Press the button for more than 3 seconds – All Fieldgate SWG70 configuration parameters related to the wired communication channels are reset to factory settings – After approx. 3 seconds, all LEDs light up to confirm the reset
Button P1 + P2 DIP Switch 8 OFF	Password reset	Press buttons P1 and P2 simultaneously for more than 3 seconds – All Fieldgate SWG70 passwords are reset to the factory settings – Passwords are used for access to the Command Line Interface and the Web Server (HTTPS) – For Web Server User name: admin; Password: admin – After approx. 3 seconds, all LEDs light up to confirm the reset
Button P1 + P2 DIP Switch 8 ON	Network manager reset	Press buttons P1 and P2 simultaneously for more than 3 seconds – The Fieldgate SWG70 join key, network ID, radio power and access mode are reset to factory settings. – After approx. 3 seconds, all LEDs light up to confirm the reset

6.1.3 DIP switches



WARNING

Warning!

- When Fieldgate SWG70 is installed in Ex-Zone 2 and connected to the power supply, the operation of DIP switches is permitted only in the absence of any potentially explosive atmosphere.



NOTICE

NOTE!

- The same functions can be initiated from the Fieldgate SWG70 Web interface and DTM, see Chapter 8.4, Wired Communication

Fieldgate SWG70 has one 8-gang DIP switch. Fieldgate SWG70 is delivered with all DIP switches set to ON and with all DIP switch functions set by software controls.

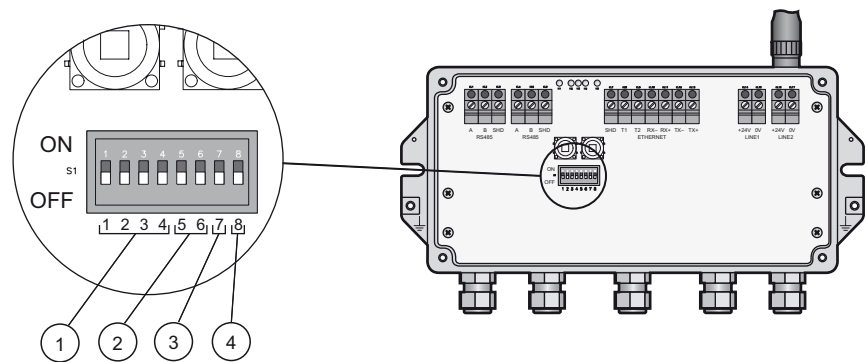


Fig. 6-4: DIP switches

- | | | | |
|---|---------------------------------|---|------------------------------|
| 1 | Switches 1 – 4: Polling address | 3 | Switch 7: RS-485 termination |
| 2 | Switches 5 – 6: Baudrate | 4 | Switch 8: Security mode |

DIP switch positions

Switch	Function	SW1	SW2	SW3	SW4	Value	SW1	SW2	SW3	SW4	Value
SW1 – SW4	Bus address 1)	OFF	OFF	OFF	OFF	0	OFF	OFF	OFF	ON	8
		ON	OFF	OFF	OFF	1	ON	OFF	OFF	ON	9
		OFF	ON	OFF	OFF	2	OFF	ON	OFF	ON	10
		ON	ON	OFF	OFF	3	ON	ON	OFF	ON	11
		OFF	OFF	ON	OFF	4	OFF	OFF	ON	ON	12
		ON	OFF	ON	OFF	5	ON	OFF	ON	ON	13
		OFF	ON	ON	OFF	6	OFF	ON	ON	ON	14
		ON	ON	ON	OFF	7	ON	ON	ON	ON	15
		SW5	SW6	Value			SW5	SW6	Value		
SW5– SW6	Baudrate 2)	OFF	OFF	9600			OFF	ON	38400		
		ON	OFF	19200			ON	ON	57600		
SW7	RS-485 termination	■ OFF = disconnected					■ ON = connected				
SW8	Download Join Key/Network ID	■ OFF = disabled					■ ON = enabled				
1) Addresses from 0 to 63 can be set by software 2) If the DIP switches are used, the baudrate applies to both HART and MODBUS protocols. Software configuration allows additional baudrates to be set for HART and MODBUS protocols (Chapter 8.4.3/8.4.4)											

Security mode

When DIP Switch 8 is OFF, it is not possible to download the Network ID and the Join Key to the gateway, see Chapter 8.3.1. Fieldgate SWG70 is delivered with the the download enabled by default, i.e. DIP Switch 8 is ON.

7 Commissioning

NOTICE**NOTE!**

- It is recommended that Fieldgate SWG70, adapters and devices be setup on the test bench and the network be tested before the components are installed in the field.

7.1 Preliminaries

7.1.1 Software package

The CD ROM delivered with Fieldgate SWG70 contains the following components which must be installed on your computer prior to configuration as described in Chapter 7.4.

- FieldCare Device Setup
- Any DTMs supplied to be found on the CD, e.g. Fieldgate DTM and HART IP CommDTM

NOTICE**NOTE!**

- You need to be logged on to Windows with administrator privileges during installation
- If one of the software components is already installed on your system its installation may be omitted

7.1.2 Setup

There are two possibilities to set up Fieldgate SWG70

- via Web Server
- via FieldCare

Web Server

Fieldgate SWG70 has a integral Web Server which can be used to set up and monitor both the device and the network. The structure of the parameter blocks and parameters is identical with that of the Fieldgate SWG70 DTM. Connection to the Web Server is made by an Internet browser, e.g. Windows Explorer.

To connect to and set up via Web Server, follow the preliminary procedures in Chapter 7.2.

FieldCare

Setup via FieldCare differs from the Web Server in that it is also possible to parameterize the WirelessHART Adapter SWA70 as well as any connected HART devices. A prerequisite is that the field devices already have the same join key and network identifier as Fieldgate SWG70 and have joined the network. Attached devices can be configured via their DTMs.

NOTICE**NOTE!**

- We recommend that the adapters and connected HART devices are parameterized by a direct connection as described in Operating Instructions BA00061S/04/en. If FieldCare accesses the devices via the Fieldgate SWG70 DTM, the response times may be considerably longer than for a direct connection.

To setup via FieldCare, follow the preliminary procedures in Chapters 7.2. to 7.5.

7.2 Ethernet connection

The Ethernet connection of Fieldgate SWG70 allows communication with a computer via the integral Web Server or via FieldCare. Before starting, check the following:

- Internet Protocol TCP/IP is installed on your computer and is active
- You have administration rights for your computer and network
- You have an set of IP addresses that have been authorized by your IT department
- Any proxy server for your Internet Browser is disabled
- Firewalls allow communication on Port 502 and 5094

The procedures described in this chapter are for Windows XP. For other Windows systems consult your system administrator.

Fieldgate SWG70 is delivered with the default IP address:

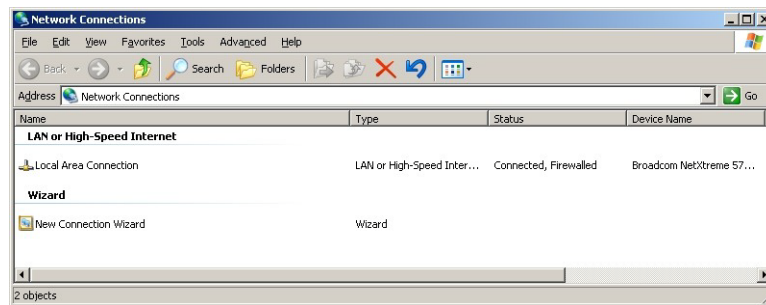
- 192.168.1.1

In order that the host computer can communicate with the Fieldgate Web Server

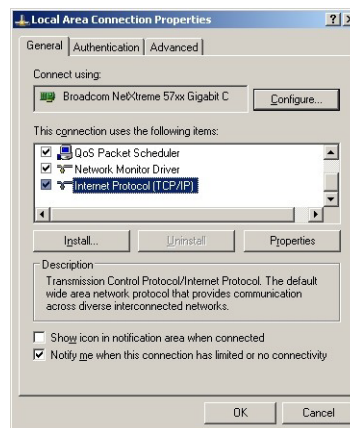
- Check that the computer can reach the Fieldgate via ports 80, 443, 502 and 5094.
If you are not sure how to do this, consult your network administrator.
- For the initial commissioning, set your computer's address to e.g. 192.168.1.200 or similar

7.2.1 Changing the IP address

Procedure for Windows XP 1 Right-click **Start =>Settings =>Control Panel =>Network Connections**



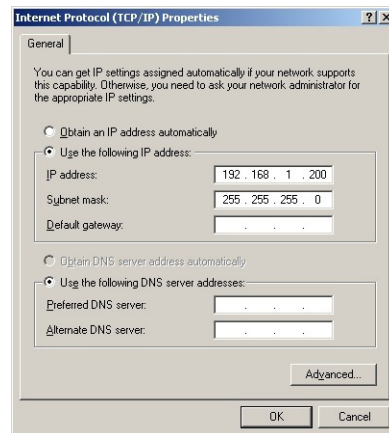
2 Right-click **Local Area Connection => Properties**



3 Using the left mouse button, double-click **Internet Protocol (TCP/IP)** or click once, then click **Properties**.

4 Note the original values of IP address and Subnet Mask of the computer to restore them if necessary at end of the operation.

- 5 Change the IP address and the Subnet Mask of the host computer to match the IP address of the Fieldgate.
 - IP Address 192.168.1.XXX and network mask (Subnet Mask) 255.255.255.0.



- 6 Click on the **OK** button to complete the procedure, close the other dialogs with **OK** and **Close**.

7.2.2 Check the connection

The simplest way to check the connection is to call up the Fieldgate SWG70 Web Server:

- 1 In your Internet browser enter the address of Fieldgate SWG70: 192.168.1.1 and press **Enter**:



- 2 Accept the site certificate in the dialog which now appears.
- 3 Now the Login of the Web page appears. To open the Fieldgate SWG70 Web pages
 - Enter **User name** (default: admin) and **Password** (default: admin) and press **OK**



- 4 If you are not able to connect to the Fieldgate:
 - Ping the Fieldgate using the Command prompt
 - Check that any proxy server is switched off or not used for this address range
 - Check ports 80, 443, 502 and 5094 in all firewalls are open
 - Check that you have the correct Ethernet cable (crossover for direct PC connection)
 - Check that the Ethernet cable has been correctly connected, Chapter 5.3
 - Check your IP address setting again

7.3 RS-485 connection

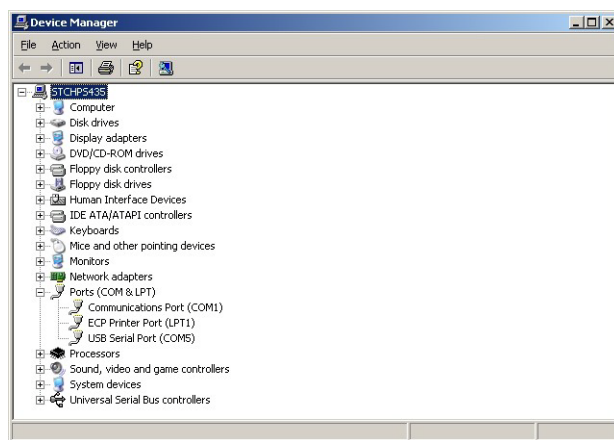
Once the gateway has been connected to the RS-485 bus (see Chapter 5.4), you may connect the RS485 bus to your PC. This can be done by using a RS485–RS232 converter or a RS485–USB converter.

Procedure

- 1 Connect the RS-485–RS-232 converter or the RS-485–USB converter to your PC.
- 2 In the case of the RS-485-USB converter install any driver that is delivered with the device.
- 3 To find out to which COM port the converter is connected, open the Windows device manager. e.g. for Windows XP:

Start > Settings > Control Panel > System > Hardware > Device Manager.

- 4 Under "Ports (COM & LPT)" you should see the converter and the COM port assigned to it



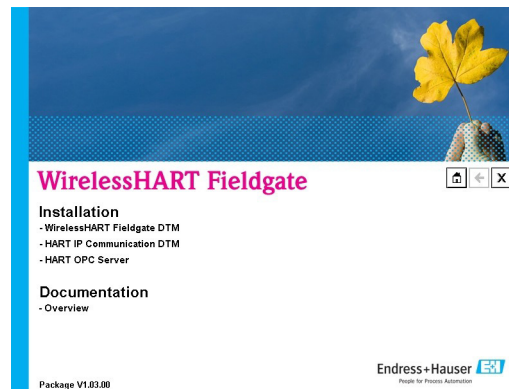
- 5 Note the COM port (in this case USB Serial Port (COM5)) and the baudrate etc. as you will need them to set up communication

7.4 Installing FieldCare

If you do not already have FieldCare running on your computer, you can install FieldCare Device Setup from the corresponding DVD: will normally start automatically, otherwise via setup.exe.

7.4.1 Installing the Fieldgate DTM and HART IP CommDTM

- 1 Insert the Fieldgate CD ROM into the CD ROM drive: the setup program starts:
 - If this is not the case, double click on **Setup.exe** to be found in the Fieldgate SWG70 folder



- 2 Click on **WirelessHART Fieldgate DTM**: the **DTM Setup Wizard** starts:



- Press **Next** to continue
- 3 The **Licence Agreement** dialog appears: read and accept it, then press **Next** to continue
 - If you do not accept the licence agreement, the wizard closes
 - 4 In the **Customer Information** dialog, enter details of the user, then press **Next** to continue
 - 5 In the **Choose Setup Type** dialog, select **Complete**
 - If the wizard has found an earlier version of the DTM, press **Upgrade**
 - 6 DTM Setup Wizard now locates the FieldCare HART DTM folder and displays it in the **Ready to Install** dialog: press **Install** to start installation
 - A progress bar indicates the state of installation
 - 7 When installation is complete the successfully installed dialog appears:
 - Press **Finish** to close the dialog and finish the installation
 - 8 Repeat the procedure for the **HART IP Communication DTM**
 - 9 If you intend to use the HART OPC server you can also install it in approximately the same manner from the **HART OPC Server** menu item
 - 10 Press "**X**" in the Setup Welcome dialog to close the setup program

7.4.2 Update the FieldCare DTM catalog

Before they can be used, the new DTMs must be integrated in the FieldCare DTM Catalog.

NOTICE

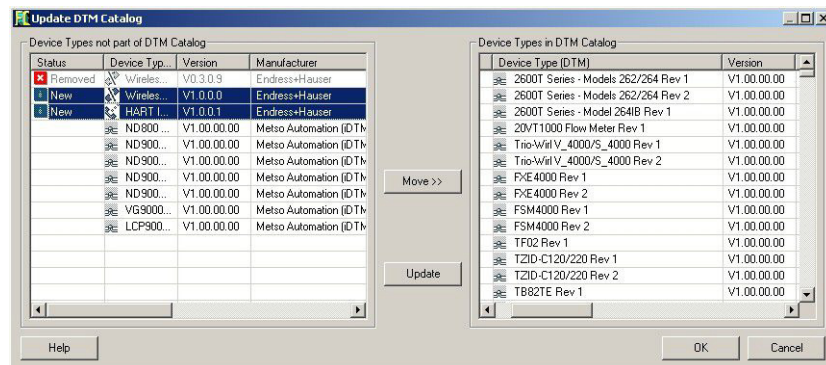
NOTE!

- For FieldCare Standard and Professional, administrator rights are required to update the DTM catalog
- For new FieldCare installations, follow the instructions in the FieldCare Getting Started booklet

- 1 Start FieldCare and log on as administrator (not necessary for FieldCare Device Setup)



- 2 In the **Start-Up Screen** dialog, press **Continue** and in the **FieldCare** dialog press **Open**
 - An empty Project workspace appears
- 3 Right-click on the **DTM Catalog** menu and select **Update...**
 - The **Update DTM Catalog** dialog appears
 - Press **Update** to start the search for new DTMs (make take several minutes)
- 4 When the search is complete, the new DTM will be shown in the left-hand pane:



- Select the Wireless Fieldgate and HART IP DTMs and press **Move >>**
- Press **OK** to close the dialog and register the changes
- You are now ready to start configuration, see Chapter 8

NOTICE

NOTE!

- If a WirelessHART Fieldgate DTM or HART IP Communication DTM was already in the catalog, it is automatically updated and appears as "Changed" in the right-hand panel

7.5 Create a FieldCare Project

Creating a FieldCare project will allow you to configure Fieldgate SWG70 and any HART device (field device or adapter) in the wireless network via its DTM. The configuration of a field device can be taken from the manufacturer's operating manual, the configuration of the adapter is described in Operating Instructions BA061S/04/en, SWA70 Wireless Adapter.

7.5.1 Add the HART IP CommDTM

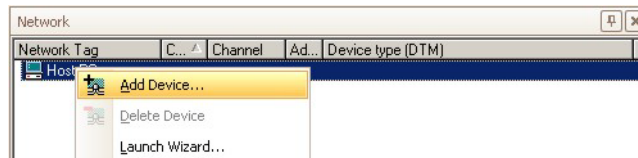
The HART IP CommDTM is required for communication via Ethernet with FieldCare.

NOTICE

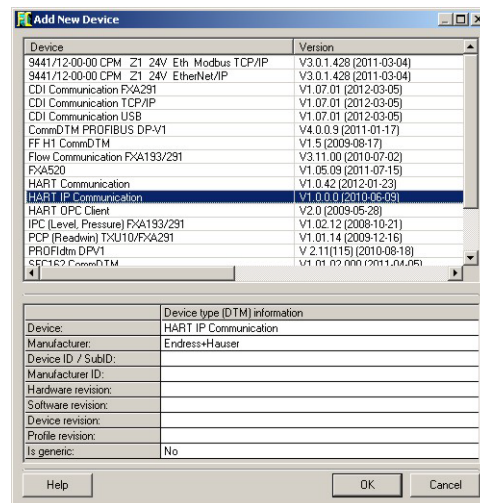
NOTE!

- If you wish to connect to FieldCare via the RS-485 interface, the HART Communication CommDTM must be added and configured instead of the HART IP CommDTM.
- The procedure is similar to that described here, whereby the configuration involves other parameters such as selection of multiplexer option, COM port and baudrate.

- 1 In the FieldCare project workspace, right-click on the **Host** node and select **Add Device...**:



- 2 The **Add New Device** dialog opens:



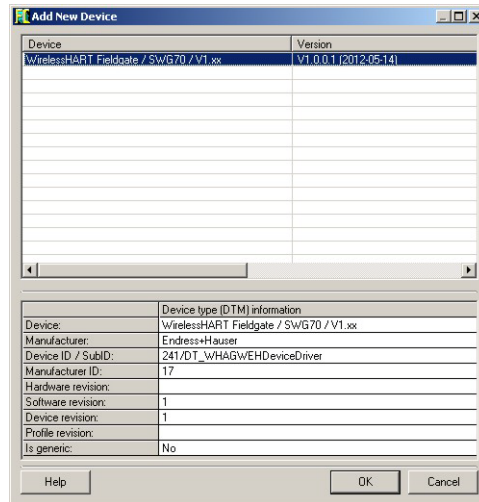
- Select **HART IP Communication** and press **OK**
 - The dialog closes and the HART IP Communication DTM is added below the Host node
- 3 If desired, the HART IP Communication DTM can be now configured offline
 - Right-click on the node and select **Configuration**.
 - The node name and timeout (default 10000 ms) can be changed
 - The changes are accepted when the **Apply** button is pressed.

7.5.2 Add the Fieldgate SWG70

- 1 Right-click on the **HART IP Communication** node and select **Add Device**:



- 2 The **Add New Device** dialog opens:



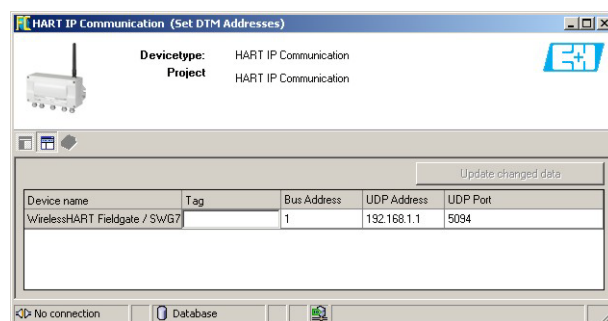
- Select **WirelessHART Fieldgate SWG70** and press **OK**

- 3 The dialog closes and the Fieldgate SWG70 DTM is added below the HART IP node



- 4 If the factory IP address (192.168.1.1) or Ethernet Port (5094) of the Fieldgate SWG70 has been changed, right click on the **HART IP Communication node** and select **Additional Functions => Set DTM Addresses**

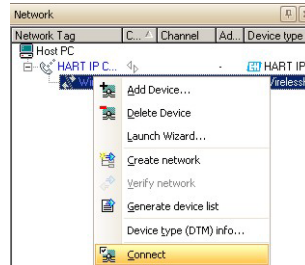
- The **Set DTM Addresses Dialog** opens:



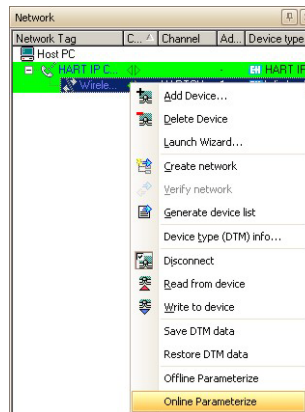
- 5 Enter the new IP address and/or Ethernet UDP Port number and press **Update Changed Data**
- 6 Close the dialog – the Fieldgate SWG70 can now be put online

7.5.3 Parameterize Fieldgate SWG70

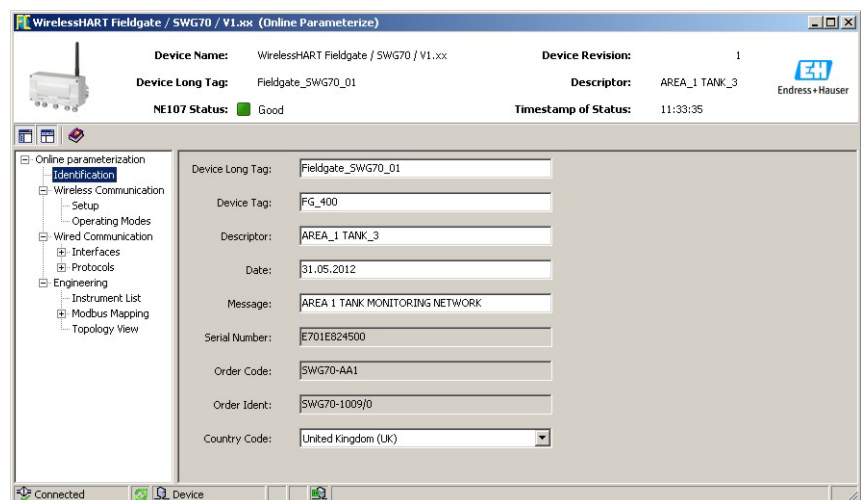
- 1 Right-click on the **HART IP Communication** node and select **Connect**
 - The HART IP CommDTM is put on-line and the two arrows turn green



- 2 Right-click on the **Fieldgate SWG70** node and select **Connect**:
 - The Fieldgate SWG70 DTM is put on-line and the two arrows turn green
- 3 Right-click on the **Fieldgate SWG70** node and select **Online Parameterize**:



- The DTM of Fieldgate SWG70 opens
- 4 Expand the navigation tree to reveal the parameter blocks (here shown with the Identification page open):

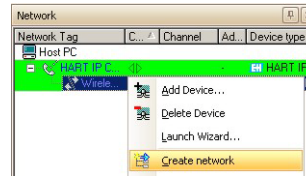


- You are now ready to configure the device, see Chapter 8

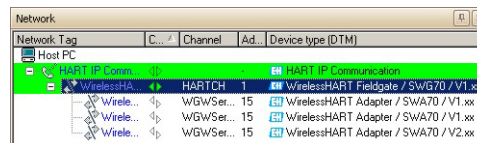
7.5.4 Scan for wireless devices in the network

After Fieldgate SWG70 has been configured, see Chapter 8.2 onwards, you may want to scan for other devices in the network

- 1 Right-click on the **Fieldgate SWG70** node and select **Create Network...**
 - You can also click on the Create Network icon to do this
 - The Fieldgate SWG70 is put on-line and the two arrows turn green



- 2 The Fieldgate CommDTM now scans the wireless network and automatically adds all WirelessHART devices found to the network (in our case the SWA70 adapters):



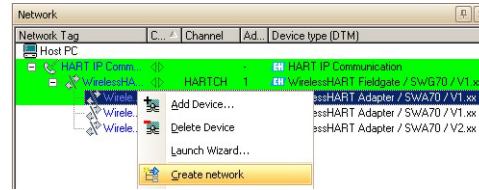
Note!

- If no device is found although communication has been established, check that the adapters have been configured with the correct network identification and join key
- It may take up to ten minutes for a wireless device to join the network after download of the Network ID and Join Key
- To increase the performance of a connection to an adapter it is possible to open a fast pipe, see Chapter 8.2.3.

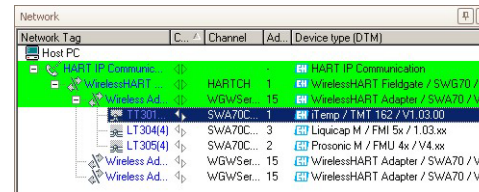
7.5.5 Scan for devices connected to adapters

It is also possible to scan for the devices connected to the adapters. Depending on the size of the network and the connected field devices, however, it is possible that time out problems occur. In this case, FieldCare issues a warning and the user can choose to cut the connection, wait for connection or retry the connection.

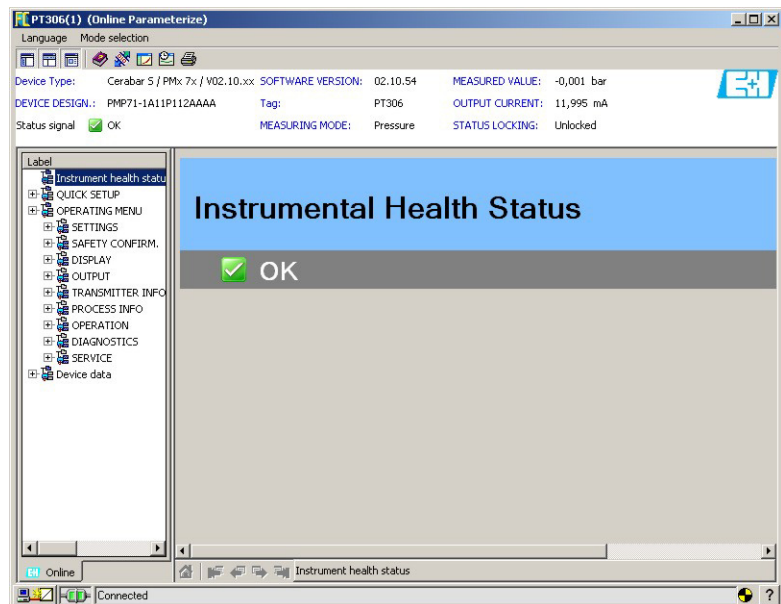
- 1 Open a fast pipe to the corresponding adapter, see Chapter 8.2.3
- 2 Right-click on the **Adapter** node and select **Create Network...**
 - You can also click on the Create Network icon to do this
 - The adapter is put on-line and the two arrows turn green



- 3 The adapter DTM now scans the wired interface and automatically adds all HART devices found to the network:
 - Depending upon FieldCare configuration and number of devices, this may occur automatically or after confirmation with **OK** in the Scanning Result dialog.
 - Depending upon FieldCare configuration, if only one device is found, the corresponding Device DTM will open, see below.



- 4 Repeat the process for all adapters in the network
- 5 To open the Device DTM of an unconnected transmitter right-click on the **Transmitter** node and select **Connect**, then right-click again and select **Online Parameterization**



7.6 User interface

The Web Server and DTM of the Fieldgate SWG70 are structured in the same manner, so that the configuration is identical. Before starting, the **Web Server** must be open, see Chapter 7.2.2 or the **Online parameterization** dialog of the DTM must be open, see Chapter 7.5.3. The user interface is structured as follows:

Parameters (DTM dialog: Online Parameterization)		Chapter 8
	Identification	Chapter 8.1
	Wireless Communication	Chapter 8.2
	Setup (Basic/Advanced)	Chapter 8.2.1/2
	Operating modes	Chapter 8.2.3
	Wired Communication	Chapter 8.3
	Interfaces	–
	Serial	Chapter 8.3.1
	Ethernet	Chapter 8.3.2
	Protocols	–
	HART	Chapter 8.3.3
	Modbus	Chapter 8.3.4
	AMS	Chapter 8.3.5
Diagnosis (DTM dialog: Diagnostics)		Chapter 9
	Identification	Chapter 9.1
	Wireless Communication	Chapter 9.2
	Overview	Chapter 9.2.1
	Details	Chapter 9.2.2
	Burst Lists	Chapter 9.2.3
	Topology View	Chapter 9.2.4
	Wired Communication	Chapter 9.3
	Overview	Chapter 9.3.1
	HART	Chapter 9.3.2
Engineering		Chapter 10
	Instrument List	Chapter 10.1
	General	Chapter 10.1.1
	Creation and editing of an instrument list	Chapter 10.1.2
	Modbus Mapping	Chapter 10.2
	Modbus Settings	Chapter 10.2.1
	Input Status	Chapter 10.2.2
	Input Register	Chapter 10.2.3
	Topology View	Chapter 10.3
Additional Functions (DTM dialog: Additional Functions => Function)		Chapter 11
	Reset	Chapter 11.1
	Self Test (DTM only)	Chapter 11.2
	About	Chapter 11.3
	Firmware Update	Chapter 11.4
	Change Password	Chapter 11.5
	Set DTM Addresses (DTM only)	Chapter 11.6
	Set Device Addresses (DTM only)	Chapter 11.7
	Upload Certificate (Web server only)	Chapter 11.8
Measurement		Chapter 12

The Web interface differs from the DTM only in the presentation of the parameters. In the case of the Web interface, the parameters are presented in a single tree. For the DTM, the Parameterization, Diagnostics and Additional Functions are contained in separate DTM dialogs, which must be called by a right-click on the Fieldgate SWG70 node and selection from the context menu. The DTM offers addition functions which are FDT-frame specific, e.g. Set Device Addresses. In both cases parameters are registered by pressing **Enter**. In some cases, in which more than one parameter is registered, an additional button must be pressed for the changes to take effect.

8 Fieldgate Configuration

Parameter contains all parameters related to the set-up of Fieldgate SWG70. In FieldCare the corresponding function is called by right-clicking on the Fieldgate SWG70 node and selecting **Online Parameterization**.

8.1 Identification

The parameters to be found in this leaf pertain to the identification of Fieldgate SWG70. The default parameters of Fieldgate SWG70 will appear in the appropriate input fields.

- 1 Click on the **Parameter => Identification** leaf to display the associated parameters:

- The significance of the parameters can be taken from the table below, whereby mandatory parameters are highlighted by bold type

- 2 Enter at least a **Device Long Tag** and **Device Tag**, pressing **Enter** to register the change.

Identification parameters

Parameter	Meaning	Example	Default
Device Long Tag	Identifies Fieldgate within the plant network – Max. 32 character ASCII "Latin 1" string	Fieldgate_ SWG70_01	–
Device Tag	Identifies Fieldgate within the plant network – Max. 8 character HART Packed ASCII string*	FG_100	–
Descriptor	User text describing, e.g. function or location of Fieldgate SWG70 – Max. 16 character HART Packed ASCII string*	AREA1, TANKS	–
Date	Date, dd.mm.yyyy, indicating the date of the last parameter change	11.07.2012	01.04.2009
Message	User message, to be transmitted with information from the adapter – Max. 32 character HART Packed ASCII string*	–	–
Serial number	Indicates serial number of connected Fieldgate SWG70	–	–
Ext. Order Code	Indicates order code of connected Fieldgate SWG70	–	–
Order Code	Indicate order identification of the connected Fieldgate SWG70	–	–
Country Code	Country in which the Fieldgate is to be used - select from list – Governs the signal strength that can be set for the device	United Kingdom	Germany
* Valid character set: @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\] ^ _ blank ! " # \$ % & ' () * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?			

8.2 Wireless Communication

8.2.1 Basic Setup

This leaf contains the parameters required to set up the WirelessHART communication offered by the Fieldgate SWG70.

- 1 Click on the **Parameter => Wireless Communication => Setup** leaf to display the associated parameters:

The screenshot displays a configuration form for the WirelessHART Fieldgate SWG70. The parameters and their values are as follows:

- Network Tag: Area_1_FG_400
- Network ID: 2012
- Join Key part 1 of 4 (HEX): *****
- Join Key part 2 of 4 (HEX): *****
- Join Key part 3 of 4 (HEX): *****
- Join Key part 4 of 4 (HEX): *****
- Write Join Information: >>
- Real Time Clock Date: 5/31/2012
- Real Time Clock Time: 14:57:21.829
- Network start date: 5/31/2012
- Network start time: 11:34:18
- Allow new Devices: all
- Radio Power: 10dBm
- Bandwidth Profile: Normal Bandwidth Profile
- Global Advertising Timeout: (empty field)
- Activate Global Advertising: >>

- The significance of the parameters can be taken from the table below, whereby mandatory parameters are highlighted by bold type

Basic Setup parameters

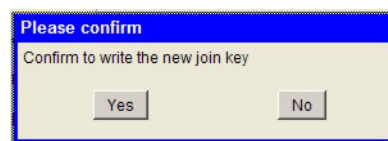
Parameter	Meaning	Example	Default
Network Tag	32-character network identification tag of Fieldgate SWG70	Area_1_FG_400	–
Network ID	Unique identification number of the network – Valid range 0 - 99999	2010	1447
Join Key Part 1 of 4	User network password, 8 hexadecimal characters, Part 1 of 4	33333333	456E6472
Join Key Part 2 of 4	User network password, 8 hexadecimal characters, Part 2 of 4	33333333	65737320
Join Key Part 3 of 4	User network password, 8 hexadecimal characters, Part 3 of 4	33333333	2B204861
Join Key Part 4 of 4	User network password, 8 hexadecimal characters, Part 4 of 4	33333333	75736572
Write Join Information	Press the button to download your changes and restart the network	–	–
RTC Date	Indicates date setting for the network	–	–
RTC Time	Indicates time setting for the network	–	–
Network start date	Indicates the date on which the network was created	–	–
Network start time	Indicates the time at which the network was created	–	–
Allow New Devices	Determines whether new devices are allowed to join the network <ul style="list-style-type: none"> ■ All: any device can join the network ■ None: no device can join the network 	All	All
Radio Power	Determines power of the radio signal emitted by the device. <ul style="list-style-type: none"> – Selection and default value depend on the Country Code – Observe local restrictions for 2.4 GHz equipment 	10 dBm	10 dBm
Bandwidth Profile	Determines Fieldgate's bandwidth profile	Normal	Normal
Global Advertising Timeout	Determines the period for global advertising on network start-up	–	–
Activate Global Advertising	Press the button to activate global advertising	–	–

NOTICE**NOTE!**

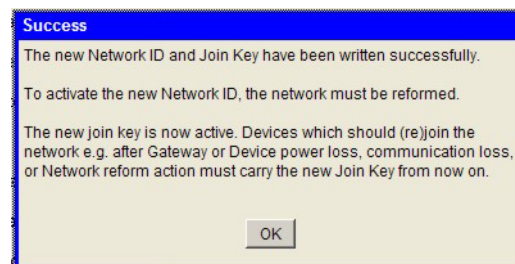
- The Join Key parameters, can only be entered when DIP Switch 8 (inside the gateway housing) is set to ON (factory default), see Chapter 6.1.3.

Basic Setup Procedure

- 1 Click on **Parameter => Wireless Communication => Setup**
- 2 Enter the following parameters, pressing **Enter** after each change:
 - **Network Tag**
 - **Network ID**
 - **Join Key Part 1 to Part 4**
- 3 If your national regulations require it, set the radio power to 0dBm (most allow 10 dBm)
- 4 Leave all other parameters at their default values, unless you want to activate global advertising and/or change the bandwidth profile, see below.
- 5 Press the **Write Join Information** button to download the join key
 - Confirm the download with **Yes**



- A successful download message should now appear (clear the message with **OK**)



- 6 To activate the new network, select **Reform Network** in **Additional Functions > Reset** (see Chapter 11.1)
- 7 The wireless network is now up and running

Bandwidth Profile

This option allows you to increase network performance by reducing network latency. If battery power is being used, this option increases energy consumption and reduces battery life. If a faster response time is more important than battery life, set the profile to medium or high.

To activate the new profile, **always** choose **Reform Network** in **Additional Functions > Reset** (see Chapter 11.1)

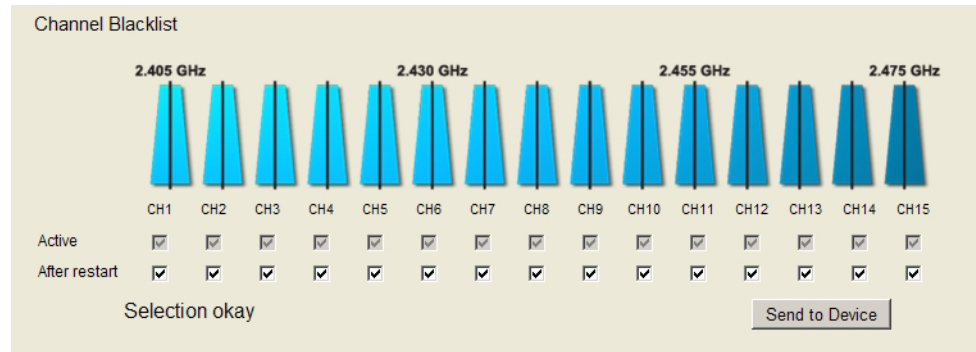
Global Advertising

If Global Advertising is activated, the gateway and the network devices issue a series of identification messages at a rate higher than normal to identify new wireless devices and to reduce the network join time. The messages are sent until the **Global Advertising Timeout** is reached.

As Global Advertising increases energy consumption of the network devices it is recommended that it is activated only when needed, e.g. during the set up of the network.

- 1 Enter a **Global Advertising Timeout** (1 ... 255 minutes)
- 2 Press the **Activate Global Advertising** button; advertising starts immediately.

8.2.2 Advanced Setup



Channel Blacklist

Where several wireless networks are in operation on a site and all are critical for plant operation, it is advisable to set up them up such a way that mutual interference is avoided. This is done by restricting the channels on which a particular network can broadcast.

In general, a WirelessHART network dynamically adapts channel usage to new situations, for example if a new wireless network is installed in the area where the WirelessHART network is located. If WLAN and WirelessHART are used together in a production environment, it is necessary to set up channel usage manually in the Channel Blacklist.

It should be noted that a WLAN channel based on the IEEE 802.11 standard is wider than a WirelessHART channel based on the IEEE 802.15.4 standard. If a WirelessHART network is to be run parallel to a IEEE 802.11 network, several WirelessHART channels must be disabled. Also note that the channel numbering differs for each type of network:

Channel numbering											
Wifi	Wireless HART	IEEE	Wifi	Wireless HART	IEEE	Wifi	Wireless HART	IEEE	Wifi	Wireless HART	IEEE
1	1 – 4	11 – 14	5	5 – 8	15 – 18	8	8 – 11	18 – 21	11	11 – 14	21 – 24
2	2 – 5	12 – 15	6	6 – 9	16 – 19	9	9 – 12	19 – 22	12	12 – 15	22 – 25
3	3 – 6	13 – 16	7	7 – 10	17 – 20	10	10 – 13	20 – 23	13	13 – 15	23 – 25
4	4 – 7	14 – 17									


For example: If the WLAN uses channel number 5, channels 5 to 8 in the WirelessHART network must be disabled.

Disabling channels




































- 1 Disable a channel by deactivating its check box in the Channel Blacklist
 - The number of remaining active channels must be odd
 - At least 5 channels must remain active.
- 2 Click **Send to Device** to transfer the updated blacklist settings to the Fieldgate
 - Fieldgate stores the updated blacklist but does not apply the updated settings until the network is reformed.
- 3 Go to **Additional Functions > Reset** and click **Reform Network** to apply the updated channel blacklist.

8.2.3 Operating Modes










Operating Modes contains a table listing all devices in the WirelessHART network together with their operation modes.

Whenever a wireless device joins the network, it is automatically inserted into the list, provided it is not already listed. Wired HART devices connected to a WirelessHART adapter are also inserted. The list retains all the devices Fieldgate has detected over the lifetime of the network, i.e. if a device is completely removed from the network, it will still be seen in the list. Such devices can be removed from the Operating Modes list clicking on the Delete button  which appears next to them.

- 1 Click on **Parameter => Wireless Communication => Operating Modes** to display the table

Operating Modes											Refresh
Long Tag	IO-Card	Channe...	Device Type	Com. Stat...	Dev. Status	Routing Device...	Fast Pipe	Force Identification	Flush Cache	Delete	
Fieldgate_SWG70_01	251	1	SWG70								
Wireless Adapter WA...	1	0	SWA70			<input checked="" type="checkbox"/>	<input type="checkbox"/>				
TT301	1	1	TMT162								
LT304	1	1	FMSx								
LT305	1	1	FMU4x								
Wireless Adapter WA...	2	0	SWA70			<input checked="" type="checkbox"/>	<input type="checkbox"/>				
TT303	2	1	TMT182								
Wireless Adapter WA...	3	0	SWA70			<input checked="" type="checkbox"/>	<input type="checkbox"/>				
PT306	3	1	CerabarS								

- The significance of the parameters can be taken from the table below

Parameter	Meaning
Long Tag	Identifies Fieldgate within the plant network – For HART 5.0 or less, this is the text in the Message parameter
I/O Card	Indicates the virtual I/O card number to which the device is mapped
Channel	Indicates the channel of the virtual I/O card to which the device is mapped
Device Type	Displays the device type as registered at the HART Communication Foundation
Status	Displays the communication status –  Connected –  Flashing: Device connected, being identified –  Continuous: Device connected but not identified –  Communication failure
Dev. Status	Displays the device status –  Good –  Out of specification –  Failure Note that the device status that is displayed in the list may differ from the actual device status because the HART status bits may be interpreted differently.
Routing Device	Indicates whether the device is allowed to act a routing device. ■ To deactivate the routing functionality, deactivate the corresponding check box in the Routing Device column. ■ This option enables you to set up a star network
Fast Pipe	Establishes a direct connection to a selected device. The fast pipe connection is about 4 times faster than a regular connection, which enables you to perform fast updates. ■ Click on the check box to activate the Fast Pipe. – Note that you can activate the Fast Pipe option for only one device at a time.
Enforce Identification	Forces a device to resend its identification, for example if a communication failure occurred.
Flush Cache	Deletes the transmitted values.
Refresh	Press this button to reload the operational mode parameters of all network devices
Delete button 	Devices with no connection can be deleted by pressing the delete button 

8.3 Wired Communication

8.3.1 Serial

The parameters contained in this leaf pertain to the set up of the serial interface offered by Fieldgate SWG70.

- 1 Click on the **Wired Communication => Interfaces => Serial** to display the associated parameter:



Termination Resistor Selection:

Termination Resistor:

Protocol Selection:

- The significance of the parameters can be taken from the table below
- 2 Configure the serial interface for HART or MODBUS RTU as required
 - 3 After configuration, set up the interface protocol parameters in the appropriate "Protocol" leaf, see Chapters 8.3.3 and 8.3.4
 - Modbus serial allows access for one master
 - HART serial allows access for one primary master and one secondary master

Serial parameters

Parameter	Meaning	Example	Default
Terminal Resistor Selection	Specifies whether hardware (DIP switch 6) or software termination settings are to be used	DIP-Switch	Software
Terminal Resistor	Sets the termination of the wireless fieldgate when Terminal Resistor Selection is set to Software <ul style="list-style-type: none"> – When DIP-Switch is selected, displays the setting 	Connected	Dis-connected
Protocol Selection	Sets the protocol to be used over the serial port	HART	MODBUS RTU

8.3.2 Ethernet

The parameters contained in this leaf pertain to the set up of the communication to the host via Ethernet interface offered by Fieldgate SWG70.

- 1 Click on the **Wired Communication => Interfaces => Ethernet** to display the associated parameters:

The screenshot shows a configuration window for Ethernet parameters. At the top, 'IP configuration mode (DHCP, DNS):' is set to 'Manually'. Below are input fields for 'IP Address: 192.168.1.1', 'Netmask: 255.255.0.0', 'Gateway address: 0.0.0.0', 'DNS 1: 0.0.0.0', 'DNS 2: 0.0.0.0', and 'MAC Address: 50:2d:f4:01:c8:47'. A 'Write Ethernet Information:' button with a '>>' symbol is at the bottom.

- The significance of the parameters can be taken from the table overleaf, whereby mandatory parameters are highlighted by bold type
- 2 Enter the parameters, pressing **Enter** after each change
 - Note: Automatic IP address assignment requires that there is a DHCP server in the Ethernet network
 - 3 Press the **Write Ethernet Information** button when all parameters have been changed
 - The gateway will restart with the new parameters
 - If the IP address was changed, communication will be lost
 - If necessary, change your computer address and re-establish communication with the new IP address as described in Chapter 7.2
 - If you are using the HART IP CommDTM, reconfigure the communication parameters, see Chapter 7.5.2 Step 4, before making connection again

Ethernet parameters

Parameter	Meaning	Example	Default
IP Address Assignment (DHCP, DNS)	Specifies whether Fieldgate SWG70 IP network and DNS address is to be assigned manually or automatically <ul style="list-style-type: none"> ■ Manually: The settings in the dialogue are used ■ Automatically: The IP address of the DNS is assigned by a DHCP server 	Manually	Manually
IP Address	Sets fixed fieldgate IP network address for manual assignment mode	192.168.1.1	192.168.1.1
Netmask	Sets subnet mask IP network address for manual assignment mode	255.255.0.0	255.255.0.0
Gateway Address	Sets default gateway TCP/IP network address <ul style="list-style-type: none"> – This setting is currently not actively used by Fieldgate 	–	0.0.0.0
DNS 1	Sets preferred DNS server IP address for manual assignment mode <ul style="list-style-type: none"> – This setting is currently not actively used by Fieldgate 	–	0.0.0.0
DNS 2	Sets alternative DNS server IP address for manual assignment mode <ul style="list-style-type: none"> – This setting is currently not actively used by Fieldgate 	–	0.0.0.0
MAC Address	Displays the MAC address of the WirelessHART gateway. <ul style="list-style-type: none"> – Note that the MAC address is a characteristic of the device itself and cannot be changed. Each device has its own MAC address. 	–	–
Write Ethernet Information	Downloads the changed parameters to the gateway <ul style="list-style-type: none"> – If the IP address was changed, communication will be lost – If the other addresses were changed, communication will be interrupted for a short period 	–	–

8.3.3 HART

The parameters contained in this leaf pertain to the set up of the HART communication to the host on the interfaces offered by Fieldgate SWG70.

- 1 Click on the **Wired Communication => Protocols => HART** to display the associated parameters:

The screenshot shows a configuration window for HART communication. It is divided into two sections: 'Serial' and 'Ethernet'. Under 'Serial', there are four settings: 'Bus Address Selection' (dropdown menu set to 'Software'), 'Bus Address' (text input field containing '1'), 'Baud Rate Selection' (dropdown menu set to 'Software'), and 'Baud Rate' (dropdown menu set to '19200'). Under 'Ethernet', there is one setting: 'Port Number' (text input field containing '5094').

- The significance of the parameters can be taken from the table overleaf, whereby mandatory parameters are highlighted by bold type
- 2 If the default port number is changed, and FieldCare is in use, communication will be lost
 - Reconfigure the HART IP CommDTM communication parameters, see Chapter 7.5.2 Step 4, before making connection again

HART parameters

Parameter	Meaning	Example	Default
Bus Address Selection	Specifies whether hardware (DIP switch 0-3) or software bus address settings are to be used <ul style="list-style-type: none"> ■ DIP Switch: 0 - 15 ■ Software: 0 - 63 	Software	Software
Bus Address	Sets the HART address of the wireless fieldgate when Bus Address Selection is set to Software <ul style="list-style-type: none"> – When DIP-Switch is selected, displays the setting 	63	1
Baud Rate Selection	Specifies whether hardware (DIP switch 4-5) or software baudrate settings are to be used <ul style="list-style-type: none"> ■ DIP Switch: 9600 Bit/s - 57600 Bit/s ■ Software: 1200 Bit/s - 115200 Bit/s 	Software	Software
Baud Rate	Sets the baudrate of the wireless fieldgate when Baud Rate Selection is set to Software <ul style="list-style-type: none"> – When DIP-Switch is selected, displays the setting 	19200	19200
Port Number	Sets the Fieldgate SWG70 Ethernet port number for HART via UDP/TCP transmission <ul style="list-style-type: none"> – If the port number is changed, the default port remains open – HART UDP allows access for two primary masters and two secondary masters – HART TCP allows access for one primary masters and one secondary master 		5094

8.3.4 Modbus

The parameters contained in this leaf pertain to the set up of the Modbus communication to the host on the interfaces offered by Fieldgate SWG70.

- 1 Click on the **Wired Communication => Protocols => Modbus** to display the associated parameters:

The screenshot shows a configuration window for Modbus. It is divided into two sections: 'Serial' and 'Ethernet'.
Serial Section:
 - Bus Address Selection: Software (dropdown)
 - Bus Address: 1 (text input)
 - Baud Rate Selection: Software (dropdown)
 - Baud Rate: 19200 (dropdown)
 - Parity Bit: none (dropdown)
 - Stop Bit: 1 (dropdown)
Ethernet Section:
 - Port Number: 502 (text input)

- The significance of the parameters can be taken from the table overleaf, whereby mandatory parameters are highlighted by bold type

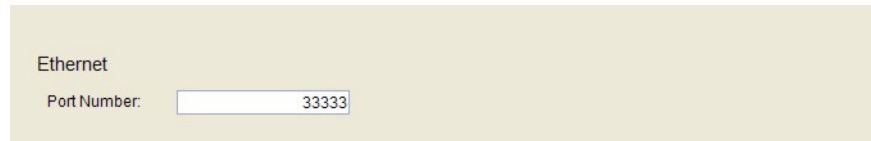
Modbus parameters

Parameter	Meaning	Example	Default
Bus Address Selection	Specifies whether hardware (DIP switch 0-3) or software polling address settings are to be used	DIP-Switch	Software
Bus Address	Sets the HART address of the wireless fieldgate when Bus Address Selection is set to Software – When DIP-Switch is selected, displays the setting	63	1
Baud Rate Selection	Specifies whether hardware (DIP switch 4-5) or software baudrate settings are to be used ■ DIP Switch Setting: 9600 Bit/s - 57600 Bit/s ■ Software Setting: 1200 Bit/s - 115200 Bit/s	Software	Software
Baud Rate	Sets the baudrate of the wireless fieldgate when Baud Rate Selection is set to Software – When DIP-Switch is selected, displays the setting	38400	38400
Parity Bit	Sets the number of parity bits in the MODBUS RTU telegram ■ Odd, Even or None		Odd
Stop Bit	Sets the number of stop bits in the MODBUS RTU telegram ■ 1, 1.5 or 2	1	1
Port Number (Ethernet)	Sets Fieldgate SWG70 port number for MODBUS TCP transmission – If the port number is changed, the default port remains open – MODBUS TCP allows access for up to five masters		502

8.3.5 AMS

If Fieldgate SWG70 is to be integrated into Emerson's Asset Management System (AMS), this must be done via an Ethernet port. The port number is set in this leaf.

- 1 Click on the **Wired Communication => Protocols => AMS** to display the associated parameter:



Ethernet

Port Number:

- The significance of the parameters can be taken from the table, whereby mandatory parameters are highlighted by bold type

AMS Ethernet Port

Parameter	Meaning	Example	Default
Port Number (Ethernet)	Sets Fieldgate SWG70 port number for AMS integration – AMS XML allows access for one primary master and one secondary master		33333

9 Diagnostics

Diagnosis contains all health and related information on Fieldgate SWG70. In FieldCare the corresponding function is called by right-clicking on the Fieldgate SWG70 node and selecting **Diagnostics**.

9.1 Identification

The **Identification** leaf contains information on the hardware and software of Fieldgate SWG70. The significance of the parameters is described in the table below.

- 1 Click on the **Diagnostics => Identification** to display the associated parameter:

Device Long Tag:	Fieldgate_SWG70_01
Device Tag:	FG_400
Descriptor:	AREA_1 TANK_3
Date:	5/31/2012
Message:	AREA 1 TANK MONITORING NETWORK
Universal Command Revision:	7
Device Revision:	2
Software Revision:	25
Gateway Software Version:	01.05.00-rc4
Serial Number:	E701E824500
Ext. Order Code:	SWG70-AA1
Order Code:	SWG70-1009/0
Country Code:	Germany
Assembly Number:	0

- The significance of the parameters can be taken from the table below

Identification parameters

Parameter	Meaning
Device Long Tag	Identifies Fieldgate within the plant network
Device Tag	Identifies Fieldgate within the plant network
Descriptor	User text describing, e.g. function or location of Fieldgate
Date	Indicates a date
Message	User message, transmitted with information from Fieldgate SWG70
Universal Command Revision	Revision of the HART protocol supported by Fieldgate SWG70
Device Revision	HART Revision of device specific commands supported by Fieldgate SWG70
Software Revision	HART Software revision of Fieldgate SWG70
Gateway Software Versions	Indicates the firmware version installed in Fieldgate SWG70
Serial number	Indicates serial number of connected Fieldgate SWG70
Order Code	Indicates order code of connected Fieldgate SWG70
Order Ident	Indicate order identification of the connected Fieldgate SWG70
Country Code	Country Code to which Fieldgate SWG70 is set
Assembly Number	The assembly number of Fieldgate SWG70

9.2 Wireless Communication

The **Wireless Communication** leaf contains information on the operation of Fieldgate SWG70 within the wireless network.

9.2.1 Overview

Overview provides information about the I/O interfaces of the wireless network as well as network statistics.

- 1 Click on the **Diagnostics => Wireless Communication => Overview** leaf to display the associated parameters:

The screenshot displays two sections of configuration and statistics:

- I/O System Capabilities:**
 - Max. Card Number: 250
 - Max. Channel Number: 2
 - Max. Sub Dev. Number: 6
 - Number of Devices: 8
- Lifetime Network Statistics:**
 - Reliability: 100.000000 %
 - Stability: 96.760986 %
 - Latency: 140 ms
 - Lost upstream packages: 0

- The significance of the parameters can be taken from the table below.

Parameter	Meaning
I/O System Capabilities	
Max. Card Number	Indicates the maximum number of cards in the I/O system. This corresponds to the maximum number of wireless devices that can be connected to the gateway.
Max. Channel Number	Indicates the maximum number of channels.
Max. Sub Dev. Number	Indicates the maximum number of sub devices that can be connected to a specific channel.
Number of Devices	Indicates the current number of subdevices. Every device counts as a subdevice, no matter if it is a wireless device or a wired device connected to a WirelessHART adapter.
Lifetime Network Statistics	
Reliability	Ratio of the number of successful packet transmissions to the sum of the successful and permanently lost packet transmissions taken across the entire network
Stability	Ratio of the number of successful packet transmissions to the sum of the successful and unsuccessful packet transmissions taken across the entire network <ul style="list-style-type: none"> – Unsuccessful transmissions are repeated for as many time as necessary using all communication paths available. If the repeat process is interrupted, e.g. by removing the device from the network, then the corresponding packets are counted as lost.
Latency	Average time taken for packets generated by the wireless devices to reach the gateway
Lost Upstream Packages	Total number of packets generated by the wireless devices that were lost when transferred over the network.

9.2.2 Details

NOTICE

NOTE!

- Diagnostic information is available only after the applicable statistics period has been completed (15 minutes). During this time, some information is set to 0 or replaced by wildcard characters.

Details shows all devices in the WirelessHART network together with their diagnostic information.

Whenever a wireless device joins the network, it is automatically inserted into the list if it is not already there. Wired devices connected to a WirelessHART adapter are also be inserted. To remove a device from the list, use the Instrument List. For more information, see Chapter 10.1.

- Click on the **Diagnostics => Wireless Communication => Details** leaf to display the associated parameters:

Details													
<input checked="" type="checkbox"/> Tree-View Export Refresh													
Long Tag	IO-Card	Channel	Device Type	Com. Status	Dev. Status	Number of Joins	Join Time	Reliability	Latency	+	Neighbors	RSSI	Stability
Fieldgate_SWG70_01	251	1	SWG70										
Wireless Adapter WAD...	1	0	SWA70	✔	✔	1	2012:10:5 13:25...	100 %	0.022 s		Fieldgate_SWG70...	-55 dBm	96.9688941...
				✔	✔						Wireless Adapter...	-25 dBm	100
				✔	✔						Wireless Adapter...	-55 dBm	91.1759948...
TT301	1	1	TMT162	✔	✔								
LT304	1	1	FM5x	✔	✔								
LT305	1	1	FMU4x	✔	✔								
Wireless Adapter WAD...	2	0	SWA70	✔	✔	1	2012:10:5 13:28...	100 %	0.051 s				

- The significance of the parameters can be taken from the table below.

Wireless Communication Details parameters

Parameter	Meaning
Tree-View	<ul style="list-style-type: none"> Checked: Table displayed according to wireless and wired connections, see above Unchecked: Table displayed according to adapter and device join time
Instrument Identification	Displays information identifying the device: <ul style="list-style-type: none"> Long Tag: Long Tag of connected device (= Message for devices < HART 6.0) IO card: Identifier of fieldgate card used by the device Channel: Identifier of card channel used by the device Device Type: Designation of connected device Status: Communication status of the associated device <ul style="list-style-type: none"> ✔ Connected ⚠ Flashing: Device connected, being identified ⚠ Continuous: Device connected but not identified ✖ Communication failure Dev. Status: Device status of the associated device <ul style="list-style-type: none"> ✔ Good ⚠ Out of specification ✖ Failure The device status displayed in the Operating Modes list may differ from the actual device status because the HART status bits may be interpreted differently.
Number of Joins	Number of times the device has joined the network
Join Time	Date of the last time the device joined the network
Reliability	Percentage of the packets generated by the wireless devices that were correctly received by the gateway
Latency	Average time taken for packets generated by the wireless devices to reach the gateway
+/-	Show/hide the list of neighbouring devices
Neighbors	Neighbouring WirelessHART devices in reach of the selected device
RSSI	Indicates the power of the signal received from the selected device by the named neighboring device
Stability	Ratio of successful packet transmissions to the total number of packet transmissions on all wireless paths in the network
Refresh	Updates the instrument list
Export	Exports the details list to an Excel file

9.2.3 Burst Lists

Burst mode is a special mode of a HART slave device which allows it to periodically send the response to a selected HART command without the being polled by the master. For a WirelessHART slave device, it is the main operating mode and can be used, for instance, to send the process values from an adapter or connected HART device to Fieldgate SWG70 at regular intervals.

The burst lists, contain information on the devices operating in this mode. The measured values sent by the devices can be viewed in the Measurement List, see Chapter 12.

- 1 Click on the **Diagnostics => Wireless Communication=> Burst Lists** leaf to display the associated parameters:

Burst Lists								Refresh
Long Tag	IO-Card	Channel	Device Type	Com. Status	Dev. Status	+	Burst command	Num.Packets
Fieldgate_SWG70_01	251	1	SWG70					
Wireless Adapter WAD_301	1	0	SWA70	✓	✓	-	Cmd 77	16
				✓	✓		Cmd 33 Read Device Variables	2
• TT301	1	1	TMT162	✓	✓		Cmd 3 Read Dynamic Variables and Loop...	2
• LT304	1	1	FMI5x	✓	✓		Cmd 3 Read Dynamic Variables and Loop...	6
• LT305	1	1	FMU4x	✓	✓		Cmd 3 Read Dynamic Variables and Loop...	7
Wireless Adapter WAD_302	2	0	SWA70	✓	✓	-	Cmd 3 Read Dynamic Variables and Loop...	35
				✓	✓		Cmd 77	33
• TT303	2	1	TMT162	✓	✓		Cmd 3 Read Dynamic Variables and Loop...	32
Wireless Adapter WAD_303	3	0	SWA70	✓	✓	-	Cmd 3 Read Dynamic Variables and Loop...	3
				✓	✓		Cmd 77	7
• PT306	3	1	CerabarS	✓	✓		Cmd 3 Read Dynamic Variables and Loop...	6

- The significance of the parameters can be taken from the table below

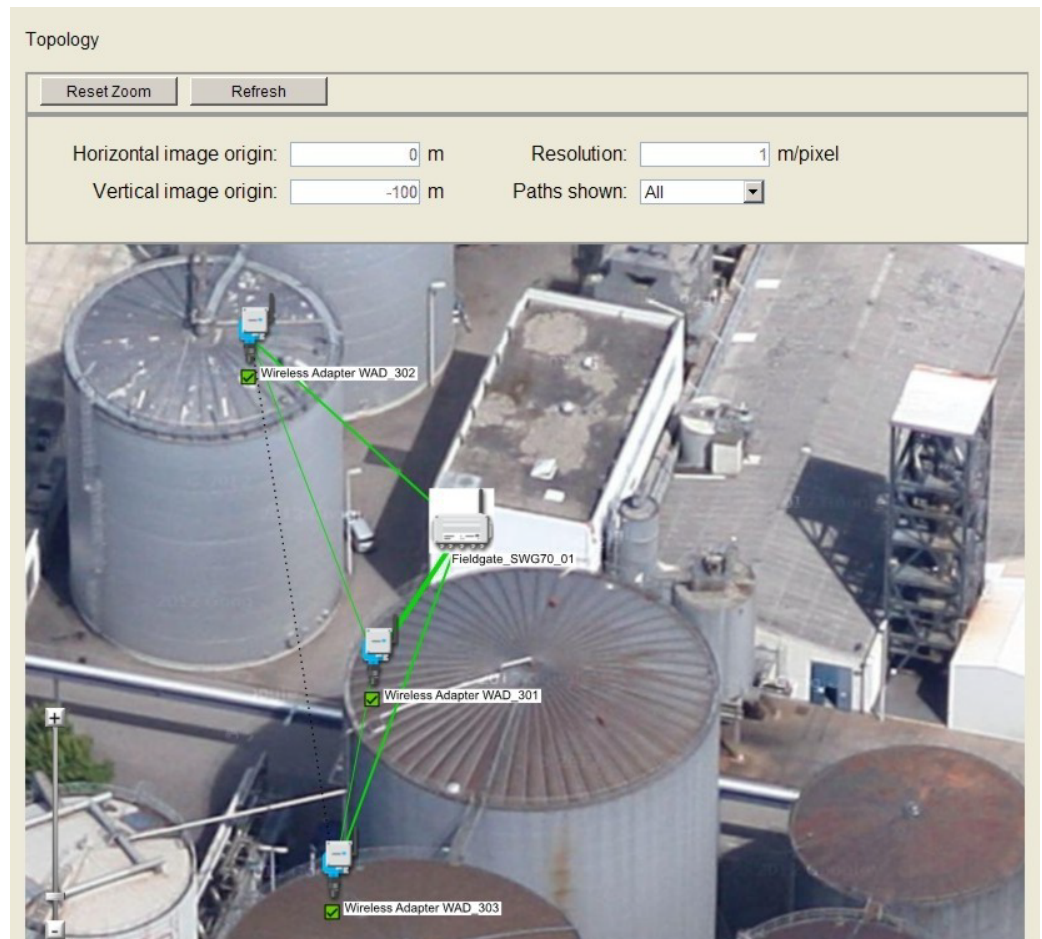
Burst List parameters

Parameter	Meaning	Example	Default
Instrument Identification	Displays information identifying the device: <ul style="list-style-type: none"> ▪ Long Tag: Long Tag of connected device ▪ IO card: Identifier of fieldgate card used by the device ▪ Channel: Identifier of card channel used by the device ▪ Device Type: Designation of connected device ▪ Status: Communication status of the associated device <ul style="list-style-type: none"> - ✓ Connected - ⚠ Flashing: Device connected, being identified - ⚠ Continuous: Device connected but not identified - ⚠ Communication failure ▪ Dev. Status: Device status of the associated device <ul style="list-style-type: none"> - ✓ Good - ⚠ Out of specification - ⚠ Failure 	-	-
+/-	Show/hide the burst list details		
Burst Command	Command number of selected burst commands with explanation: <ul style="list-style-type: none"> ▪ 1: Returns the primary value and units ▪ 2: Returns the loop current and its associated percent of range. ▪ 3: Returns the loop current and up to four predefined dynamic variables and units (PV, SV, TV, QV) ▪ 9: Returns the value and status of up to eight device or dynamic variables with units ▪ 48:Returns the complete device status information ▪ 77: Embeds the commands of a connected wired device so that they can be transmitted by wireless 	-	-
Num. Packets	Number of burst messages sent by the network device since the last network restart	-	-
Refresh	Updates the burst list	-	-

9.2.4 Topology View (Diagnostics)

Topology view is a graphical overview of all wireless devices within your network, including their connection status and connection paths. It is set up in **Engineering => Topology View**, see Chapter 10.3.









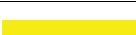





- 1 Click on the **Diagnostics => Wireless Communication => Topology View** leaf to open the view:



- The lines between the devices represent the connection paths.
 - The color and thickness indicate the connection quality respectively traffic for each connection path.
 - The significance of the colours, line thicknesses and other functions are to be found in the table which follows
- 2 In the example above:
 - The most traffic flows between the Adapter WAD_301 and Fieldgate SWG70_01
 - Less traffic flows between Adapter WAD_302 and WAD_303 respectively and Fieldgate SWG70_01 as well as between Adapter WAD_302 and WAD 303 respectively and Adapter WAD_301
 - There is no traffic between Adapter WAD_302 and Adapter WAD_303, but the path is managed as a backup path in the event of one of the other paths failing.
 - The stability of all connections is good
 - 3 Right-click on an adapter to display its network statistics

Wireless Adapter WAD_302	
Reliability	100%
Latency	361ms
Number of Joins	2

Topology parameters

Parameter	Meaning
Traffic	
	Dotted line: Path is unused at the moment
	Thin line: Path used by one third of connections
	Medium lines: Path used by two thirds of connections
	Thick line: Path used by all connections
Connection Quality	
	Signal Red: Signal stability 0 - 10% of maximum possible
	Red: Signal stability 10 - 20% of maximum possible
	Orange: Signal stability 20 - 30% of maximum possible
	Gold: Signal stability 30 - 40% of maximum possible
	Yellow: Signal stability 40 - 50% of maximum possible
	Lime: Signal stability 50 - 60% of maximum possible
	Light Green: Signal stability 60 - 70% of maximum possible
	Lawn Green: Signal stability 70 - 80% of maximum possible
	Bright Green: Signal stability 80 - 90% of maximum possible
	Green: Signal stability 90 - 100% of maximum possible
Controls	
Reset Zoom	Resets the zoom to show everything
Refresh	Updates the information on signal quality and traffic
Zoom rider - ——— +	Increases (+) or decreases (-) the magnification of the topology view
Horizontal image origin	Indicates the position of the horizontal origin of the image
Vertical image origin	Indicates the position of the vertical origin of the image
Resolution	Indicates the resolution of the image
Paths shown	Selects the paths to be shown in the topology view <ul style="list-style-type: none"> - All: all paths are shown - In use: only those paths used by the network are shown - Selected: the paths associated with a device are shown when the cursor is moved to the said device - None: No paths are shown

9.3 Wired Communication

The **Wired Communication** leaf contains information on the communication interface used to connect to a supervisory system. It contains two sub menus: **Overview** and **HART**.

9.3.1 Overview

Overview contains the performance parameters of the wired communication interface

- 1 Click on the **Diagnostics => Wired Communication=> Overview** leaf to open the overview:



- The significance of the parameters is described in the table below.

Overview parameters

Parameter	Meaning
Messages received through HOST	Total number of messages received from the host since the start-up or last reset of Fieldgate SWG70
Messages returned to HOST	Total number of messages returned to the host since the start-up or last reset of Fieldgate SWG70
Number of requests forwarded to IO system	Total number of messages from the host forwarded to the devices in the wireless network since the start-up or last reset of Fieldgate SWG70
Number of responses returned from IO system	Total number of messages for the host received from the devices in the wireless network since the start-up or last reset of Fieldgate SWG70

9.3.2 HART

The HART page shows the possible statuses that may exist for HART devices in the network. A tick box beside each parameter indicates whether the described condition is currently valid.

- 1 Click on the **Diagnostics => Wired Communication => HART** leaf to open the list:

The screenshot displays a list of diagnostic parameters for HART devices, each with a green status icon and a set of checkboxes. The parameters and their current states are as follows:

- Extended Device Malfunction:**
 - Manager fault
 - Non-Volatile Memory Defect
 - Volatile Memory Defect
 - Ethernet communication fault
 - Electronic defect
 - RS-485 communication fault
- Gateway Operation in Progress:**
 - Block transfer
 - Delayed answer
 - Self-test
 - File update
 - Start-up phase
- Extended List changes:**
 - Instrument List Changed
 - Active Device List changed
- Cumulative Device Status:**
 - Primary Variable Out of Limits
 - Non-Primary Variable Out of Limits
 - Loop Current Saturated
 - Loop Current Fixed
 - More Status Available
 - Cold Start
 - Configuration Changed
 - Device malfunction
- Cumulative Extended Device Status:**
 - Maintenance Required
 - Device Variable Alert
 - Critical Power Failure
- Device Operation in Progress:**
 - "Configuration Changed bit reset" procedure
 - "Sub-Device update" procedure
 - "Device update" procedure

- The significance of the parameters is described in the table which follows.
- In the case of the Cumulative Extended Device Status, the user must turn to the Wireless Communication Details list to get more information on individual device status, see Chapter 9.2.2.

HART parameters

Parameter	Parameter	Meaning
Extended Device Malfunction	Manager fault	Non-recoverable hardware fault: Fieldgate manager
	Non-Volatile Memory Defect	Non-recoverable hardware fault: Non-volatile memory
	Volatile Memory Defect	Non-recoverable hardware fault: Volatile memory
	Ethernet communication fault	Non-recoverable hardware fault: Ethernet controller
	Electronic defect	Non-recoverable hardware fault: Other case
	RS-485 communication fault	Non-recoverable hardware fault: RS-485 controller
Gateway Operation in Progress	Block transfer	Fieldgate transferring block
	Delayed answer	Fieldgate awaiting answer from device (buffer)
	Self test	Fieldgate is in self test mode, see Chapter 8.6.5
	File update	Fieldgate writing to non-volatile memory file
	Start-up phase	Fieldgate is starting up and building the network
Extended List changes	Instrument List Changed	Instrument list has changed since last refresh
	Active Device List Changed	Device list has changed since last refresh
Cumulative Device Status	Primary Variable Out of Limits	PV of a device in the network is out of limits
	Non-Primary Variable Out of Limits	SV, TV, QV of a device in the network is out of limits
	Loop Current Saturated	Loop current of a device in the network above 20 mA
	Loop Current Fixed	Loop current of a device in the network is fixed to 4 mA (multidrop mode)
	More Status Available	Device in the network has more status available flagged
	Cold Start	Device in the network has cold start flagged
	Configuration Changed	Configuration of a device in the network has changed
	Device Malfunction	Device in the network has malfunctioned
Cumulative Extended Device Status	Maintenance required	The status "Maintenance required" has been set for a device in the network
	Device Variable Alert	The status "Device Variable Alert" has been set for a device in the network
	Critical Power Failure	The status "Critical Power Failure" has been set for a device in the network
Device Operation in Progress	"Configuration Changed bit reset" procedure	Fieldgate has reset the "Configuration Changes" bit of one of the devices
	"Sub-Device update" procedure	Fieldgate is carrying out the identification of a device connected to an adapter
	"Device update" procedure	Fieldgate is carrying out the identification of an adapter

10 Engineering

10.1 Instrument List

10.1.1 General

This leaf contains a list of instruments in the network. It is also possible to add individual devices that are still to be connected.

- 1 Click on the **Engineering => Instrument List** leaf to display the associated parameters:

Instrument List							
Export		Import		Refresh		Apply	
Index	Long Tag	IO-Card	Channel	Device ID	Extended Device Type Co...		
0	Wireless Adapter WAD_301	1	0	588011	11F0		✗
1	Wireless Adapter WAD_302	2	0	5C8009	11F0		✗
2	Wireless Adapter WAD_303	3	0	6E0072	11F0		✗
3	TT303	2	1	60822B	11C8		✗
4	TT301	1	1	31812C	11CA		✗
5	LT304	1	1	56028B	111D		✗
6	LT305	1	1	001A8B	1111		✗
7	PT306	3	1	6438AC	1118		✗

- The significance of the parameters is described in the table below

Instrument List parameters

Parameter/Field	Meaning
Instrument List	Displays tabular information identifying the device: <ul style="list-style-type: none"> ■ Index: Order of the device determined according its type and the time at which it joined the network ■ Long Tag: Long Tag of connected device (= Message <HART 5) ■ IO card: Identifier of Fieldgate card used by the device ■ Channel: Identifier of card channel used by the device ■ Device ID: HART serial number that is assigned at manufacturing time and that differs for each HART device of a given type ■ Extended Device Type Code: Unique code identifying the HART product family
Delete button ✗	Deletes a device from the instrument list <ul style="list-style-type: none"> – Press Apply to register the change in Fieldgate SWG70 – If the device is still communicating with the network, it will automatically reappear in the list at the next refresh – Caution! Deleting a device from the instrument list can change the Modbus register address if the Modbus addresses have been automatically generated.
Export/Export CSV	Exports the current instrument list as a CSV file
Import/Import CSV	Imports an instrument list that has been stored as a CSV file
Import Project Tree (DTM)	In Offline Parameterize dialog, imports the network view to the Instrument List
Refresh	Updates the instrument list <ul style="list-style-type: none"> – After switching on or resetting the device, wait at least one minute before pressing the Reset button.
Apply	Stores the current instrument list in Fieldgate SWG70

10.1.2 Creation and editing of an Instrument List

Normally the Instrument List will be generated by refreshing after the network is up and running. It is possible, however, to create a list from scratch before any WirelessHART devices join the network. This allows the order in which the devices are displayed in the both the Instrument List and Operating Modes - and hence in the Modbus mapping - to be predetermined. The individual entries can also be edited.

NOTICE

NOTE!

- When editing the instrument list, incomplete entries are highlighted in red. These data must be entered or corrected before the instrument list can be downloaded to Fieldgate SWG70
- Entries marked with yellow already exist: the copies must be removed.

Procedure for Web Server

- 1 Click on the **Engineering => Instrument List** leaf to display the instrument list
- 2 To add a device, click into the last row of the instrument list and enter the Long Tag of the device:

Index	Long Tag	I/O-Card	Channel	Device ID	Extended Device Type Co...	Delete
0	WirelessHART Adapter WAD_001	1	0	000000	1000	✘
1	PT101	1	1	000000	1000	✘
2	TT102	1	1	000000	1000	✘
3	WirelessHART Adapter WAD_002	2	0	000000	1000	✘
4	PT201	2	1	000000	1000	✘
5	WirelessHART Adapter WAD_003	3	0	000000	1000	✘
6	PT301	3	1	000000	1000	✘

- 3 Enter the following optional additional parameters by clicking on the appropriate field:
 - I/O Card to which the device should be attached
 - Channel: adapters are assigned to Channel 0, devices to Channel 1
 - Device ID: unique HART serial number assigned on manufacture of the device
 - Extended Device Type Code: unique code identifying the HART family type
 Press **Enter** to confirm your entries.

NOTICE

NOTE!

If the values of the fields "Device ID" and "Extended Device Type Code" are unknown, "0" must be entered.

- 4 When the instrument list is complete, press **Apply** to download it to Fieldgate SWG70
- 5 When the devices join the network at a later time, they will be assigned to their allotted positions in the **Operating Modes** list
- 6 When all devices have joined the network, return to the **Instrument List** and press **Refresh** to import the latest list
- 7 Press **Export** to store a copy of the list on your computer as a CSV file
 - The file can be re-imported into the Instrument List by pressing **Import** and navigating to the folder containing the file.

Procedure for FieldCare

In addition to the previous method, in FieldCare the instrument list can also be generated by importing a network tree created in off-line mode.

- 1 Create a FieldCare project as described in Chapters 7.5.1 and 7.5.2
 - Put the **HART Communication IP CommDTM** and **Fieldgate SWG70 CommDTM** on line
- 2 Instead of scanning for devices use the **Add Device** context menu to add first an adapter, then the device or devices attached to it.
 - For WirelessHART devices without an adapter, just add the device
- 3 Continue until the network tree is complete
 - Edit the long tags so that they correspond to those stored in your devices

Network Tag	Cor...	Channel	A...	Device type (DTM)	Physical Device
HART IP Communication				HART IP Communication	
WirelessHART Fieldgate FG100		HARTCH	1	WirelessHART Fieldgate / SWG70 / V2.xx	
WirelessHART Adapter WAD_001		WGWSerialC...	15	WirelessHART Adapter / SWA70 / V2.xx	
PT101		SWA70Chan...	0	Cerabar S / PMx x3x / V7.1	
WirelessHART Adapter WAD_002		WGWSerialC...	15	WirelessHART Adapter / SWA70 / V2.xx	
FT202		SWA70Chan...	0	Promass / 83 / V3.01.0x	
LT203		SWA70Chan...	0	Microplot S / FMR 53x / V3.00	
PT201		SWA70Chan...	0	Dellabar S / xMD x3x / V7.1	
WirelessHART Adapter WAD_003		WGWSerialC...	15	WirelessHART Adapter / SWA70 / V2.xx	
TT301		SWA70Chan...	0	iTemp / TMT 162 / V1.03.00	

- 4 Click on **Offline Parameterize=> Engineering => Instrument List** to display the empty instrument list
 - You may have to enable the Engineering menu first
- 5 Press **Import Project Tree** to import the network tree

Index	Long Tag	IO-Card	Channel	Device ID	Extended Device Type Code	Delete
1	WirelessHART Adapter WAD_001	1	0	000000	0101	<input type="checkbox"/>
2	PT101	1	1	000000	0000	<input type="checkbox"/>
3	WirelessHART Adapter WAD_002	2	0	000000	0101	<input type="checkbox"/>
4	PT201	2	1	000000	0000	<input type="checkbox"/>
5	FT202	2	1	000000	0000	<input type="checkbox"/>
6	LT203	2	1	000000	0000	<input type="checkbox"/>
7	WirelessHART Adapter WAD_003	3	0	000000	0101	<input type="checkbox"/>
8	TT301	3	1	000000	0000	<input type="checkbox"/>

- 6 Press **Export CSV** to store the instrument list on your computer
- 7 Close the **Offline Parameterize** dialogue and open the **Online Parameterize** dialog
 - Select **Engineering => Instrument List** to display the empty instrument list
- 8 Press **Import CSV** and import the file you have just created
- 9 Press **Apply** to download the instrument list to the Fieldgate
- 10 When the devices join the network at a later time, they will be assigned to their allotted positions in the **Operating Modes** list
- 11 When all devices have joined the network, return to the **Instrument List** and press **Refresh** to import the latest list
- 12 Press **Export CSV** to store a copy of the list on your computer
 - The file can be re-imported into the Instrument List by pressing **Import** and navigating to the folder containing the file.

10.2 Modbus Mapping

10.2.1 Modbus Settings

Modbus Settings determines how the Modbus information is to be transmitted by Fieldgate SWG70 and where the information is to be found. It also allows the selection of automatic or manual mapping. The set-up of the Modbus communication parameters (address, baudrate etc.) is described in Chapter 8.3.4.

More details on the Modbus Interface itself and the way in which the HART parameters are mapped to the Modbus registers is to be found in Appendix A.

- 1 Click on the **Engineering =>Modbus Mapping =>Modbus Settings** leaf to display the associated parameters:



Swap option:

Addressing Method:

Read Modbus Registers Mode:

- The significance of the parameters is described in the table below

Modbus Settings parameters

Parameter	Meaning	Example	Default												
Swap Option	<p>Selects frame format swap option for Modbus data transmission (see also Appendix A.1.3)</p> <ul style="list-style-type: none"> ■ Big Endian: no swap <table border="0" style="margin-left: 20px;"> <tr> <td>Register 0</td> <td>Register 1</td> </tr> <tr> <td>Source bytes: [0xABCD]</td> <td>[0xEFGH]</td> </tr> <tr> <td>Target bytes: [0xABCD]</td> <td>[0xEFGH]</td> </tr> </table> ■ Little Endian: Register swap; <table border="0" style="margin-left: 20px;"> <tr> <td>Register 0</td> <td>Register 1</td> </tr> <tr> <td>Source bytes: [0xABCD]</td> <td>[0xEFGH]</td> </tr> <tr> <td>Target bytes: [0xEFGH]</td> <td>[0xABCD]</td> </tr> </table> <p>The Swap Option does not apply to the Input Status registers</p>	Register 0	Register 1	Source bytes: [0xABCD]	[0xEFGH]	Target bytes: [0xABCD]	[0xEFGH]	Register 0	Register 1	Source bytes: [0xABCD]	[0xEFGH]	Target bytes: [0xEFGH]	[0xABCD]	Big Endian	Big Endian
Register 0	Register 1														
Source bytes: [0xABCD]	[0xEFGH]														
Target bytes: [0xABCD]	[0xEFGH]														
Register 0	Register 1														
Source bytes: [0xABCD]	[0xEFGH]														
Target bytes: [0xEFGH]	[0xABCD]														
Addressing Method	<p>Selects whether the mapping is to be done automatically or manually</p> <ul style="list-style-type: none"> ■ Auto: Mapping is done automatically according to the rules described in Appendix A.2 <ul style="list-style-type: none"> – There is no automatic mapping of Input Status – The dialogues Input Status and Input Registers are deactivated ■ Manual: Mapping is done manually or semi-automatically in the Input Status and/or Input Register dialogues 	Manual	Auto												
Read Modbus Registers Mode	<p>Determines in which registers the mapping is to be done</p> <ul style="list-style-type: none"> ■ Input Registers only: Values mapped to Input Registers 300001...365536 ■ Input and Holding: Values mapped to Input Registers 300001...365536 and Holding Registers 400001...465536 	Inactive	Inactive												

10.2.2 Input Status

Input Status allows the Modbus mapping of a device with single or multiple binary output. As Fieldgate SWG70 supports extended registers, values are normally assigned to the registers with the reference addresses 100001 to 165536. The reference addresses are obtained by adding the register number to 100,000. The dialogue checks for completeness of entries (line turns red if not correctly filled out) as well as double assignment to the registers (line turns yellow).

The algorithm assumes that the discrete device delivers a maximum of 256 packed discrete values, each of comprising 16 bits of an unsigned Integer16 (UINT16). Each bit represents a unique input status. Fieldgate SWG70 first splits the data into two bytes and reserves 8 registers for each byte, i.e. one for each bit contained.

- Least significant byte (Bits 0 – 7) maps e.g. to registers 100001 – 100008
- Most significant byte (Bits 8 – 15) maps e.g. to registers 100009 – 100016

The value entered after the byte selection determines which of the packed discrete values is to be mapped, e.g. 0 will map the first set of packed discrete values and 15 the sixteenth set of packed discrete values. More information is to be found in Appendix A.2.2.

NOTICE

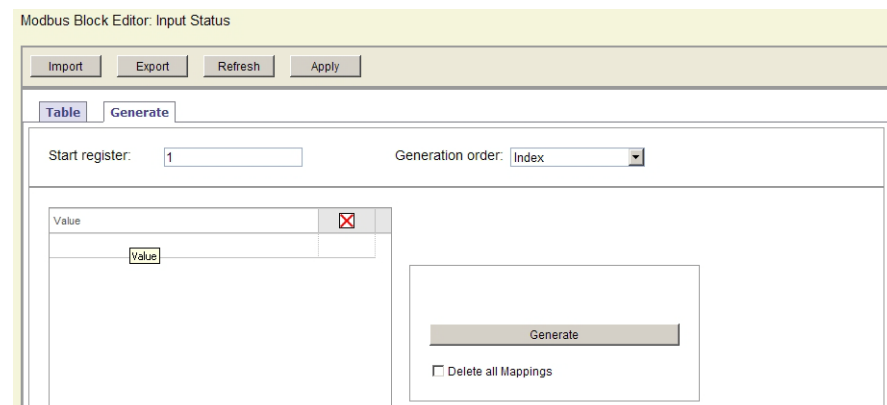
NOTE!

- Some HART devices map their discrete value and status as PV in HART CMD 3. In this case the value and status information will be found in the appropriate Input or Holding Register, see Chapter 10.2.3.
- If a device status is mapped as a UINT8 to the Input Status registers, the status will be found in only one of the bit registers, e.g. in Bit 0. The UINT8 is stored as a 16-bit value, the MSB being filled with "0"s, see Chapter A.1.3.

- 1 Click on the **Engineering =>Modbus Mapping =>Input Status** leaf to display the associated parameters:



- 2 Click on **Generate** to open the Generate tab



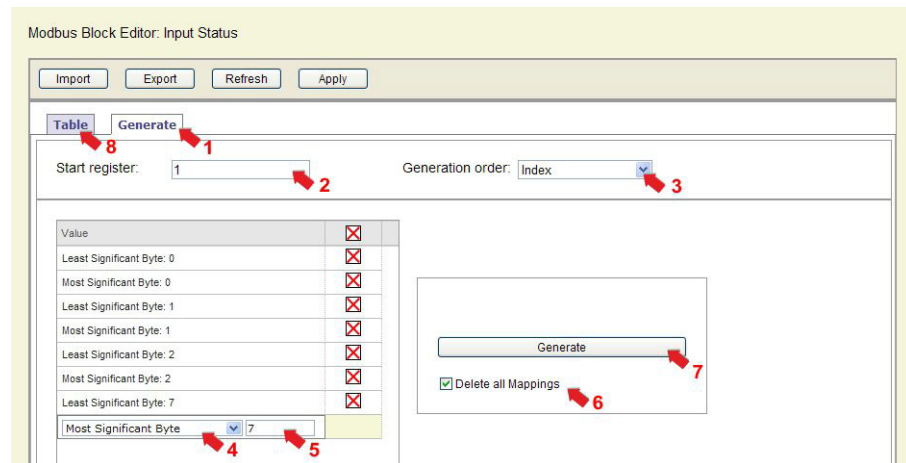
- The significance of the parameters is described in the table overleaf

Input Status parameters

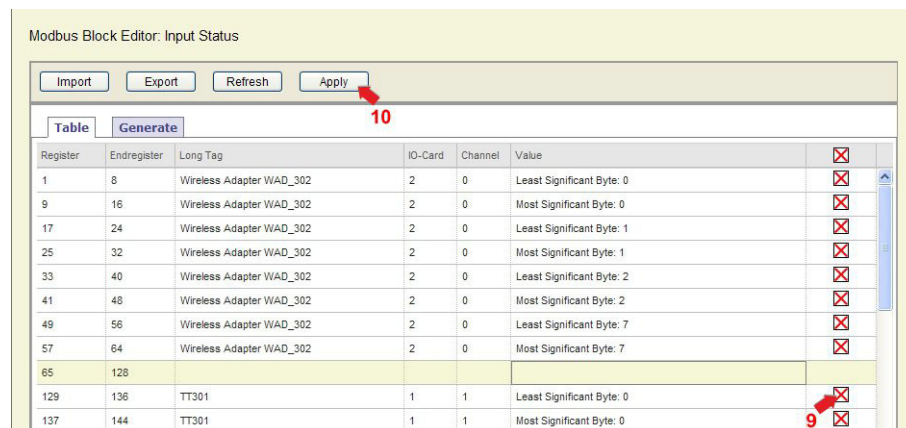
Parameter	Meaning	Example	Default
Table			
Register	Defines the start register for the Digital I/O device values – For Input Status the first value is normally 1 – The initial value can be overwritten only after a device has been selected in the Long Tag drop-down menu – Subsequent start registers are automatically generated	1	1
End Register	End register for Digital I/O device values (generated automatically)	8	65536
Long Tag	Click to open a drop-down list of connected network devices	–	–
IO-Card	Identifier of fieldgate card used by the device	–	–
Channel	Identifier of card channel used by the device	–	–
Value	Click to open a drop-down list of values for the selected device – Least Significant Byte: maps bits 0 - 7 of a UINT16 to one register each – Most Significant Byte: maps bits 8 - 15 of a UINT16 to one register each	–	–
Value field	Enter an appropriate value into the field which opens when a value is selected – 0: the 1st discrete value of a device is mapped ... 255: the 256th discrete value of a device is mapped	0	0
Delete button <input checked="" type="checkbox"/>	Depending upon position, deletes the table or the table line	–	–
Generate			
Start Register	Defines the start register for the first Digital I/O device – For Input Status this is normally 1	1	1
Generation Order	Order in which the devices are mapped to the Modbus registers. ■ Index: According to the index number, see Instrument List, Chapter 10.1, for example ■ Alphabetical: In alphabetical order according to the Long Tag ■ Alphabetical (sub-device): In alphabetical order according to the Long Tag of the sub-device. ■ IO card & channel: According to the IO card & channel number of the wireless device. ■ IO card & channel (sub-device): According to the IO card & channel number of the sub-device.	–	–
Value	Click to open a drop-down list of values for the selected device – Least Significant Byte: maps bits 0 - 7 of a UINT16 to one register each – Most Significant Byte: maps bits 8 - 15 of a UINT16 to one register each	–	–
Value field	Enter an appropriate value into the field which opens when a value is selected – 0: the 1st discrete value of a device is mapped ... 255: the 256th discrete value of a device is mapped	0	0
Delete button <input checked="" type="checkbox"/>	Depending upon position, deletes the table or the table line	–	–
Generate	Writes mapping table to table in Table tab	–	–
Delete all mappings	■ Checked: Overwrites any table already in Table tab ■ Unchecked: Adds any new devices found to existing table	–	–
Controls			
Import	Imports a mapping table in CSV format	–	–
Export	Exports the current mapping table in CSV format	–	–
Refresh	Loads the mapping table currently stored in Fieldgate SWG70	–	–
Apply	Stores the current mapping table to Fieldgate SWG70	–	–

Semi-automatic generation of Input Status mapping table

- 1 Click on the **Generate** tab to open the Generate dialogue:



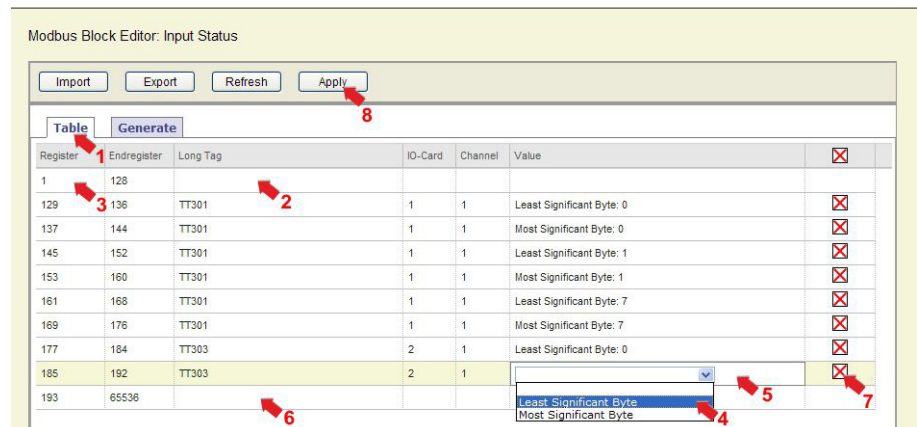
- 2 Enter an offset value in the **Start register** field.
 - For a typical application the Start value is normally 1
- 3 Select the order in which the devices are to be mapped to the Modbus registers in the **Generation order** drop-down list
- 4 Select the values you want to read for each device in the **Value** column
 - Least Significant Byte will map Bits 0 - 7 of an UINT16
 - Most Significant Byte will map Bits 8 - 15 of an UINT16
- 5 Enter a the index of the UINT16 to be mapped (0 to 255) into the value field which now opens
- 6 Repeat Steps 4 and 5 for all UINT16s
- 7 If required, check the **Delete all Mappings** checkbox to overwrite any existing mappings
 - If the box is unchecked, any new devices found will be added an existing table
- 8 Click **Generate** to write the mapping to the table on the Table tab.
- 9 Click the **Table** tab to view the generated mapping table



- 10 Manually edit the generated mapping table by deleting unwanted entries with the delete button , e.g. all analog devices
 - The registers occupied by the deleted entries remain free
- 11 After the mapping table is complete, click **Apply** to store it in Fieldgate SWG70.

Manual entry of an Input Status mapping table

- 1 Click on the **Table** tab to open the Table dialogue:



- 2 Select a device from the drop-down menu that appears when the **Long Tag** field is clicked
- 3 Enter an offset value in the **Register** field.
 - For a typical application the start value is normally 1
 - Offset values > 1: only values (n + 1) are allowed, where n is divisible by 8
For the first device entered, an extra field will be added for the registers 0 to e.g. 200 that lie before the entered value
 - The line turns red indicating missing entries and remains so until all entries are made
 - For subsequent entries, missing values are outlined in red.
- 4 Select the value you want to read for the device in the **Value** column
 - Least Significant Byte will map Bits 0 - 7 of an UINT16
 - Most Significant Byte will map Bits 8 - 15 of an UINT16
- 5 Enter a the index of the UINT16 to be mapped (0 to 255) into the value field which now opens
- 6 Repeat Steps 2, 4 and 5 for all other devices
- 7 If required, manually edit the mapping table by deleting unwanted entries with the delete button
- 8 After the mapping table is complete, click **Apply** to store it in Fieldgate SWG70.

Import and Export of mapping tables

The export/import functionality can be useful if you want to create the mapping table using a spreadsheet program, or if you want to import a backup of an existing mapping table.

- 1 To export the current mapping table to a CSV file, click **Export**.
- 2 To load the mapping table from a CSV file, click **Import**
 - Click **Apply** to store the imported mapping table in Fieldgate SWG70
- 3 To reload the mapping table currently used by Fieldgate SWG70, click **Refresh**

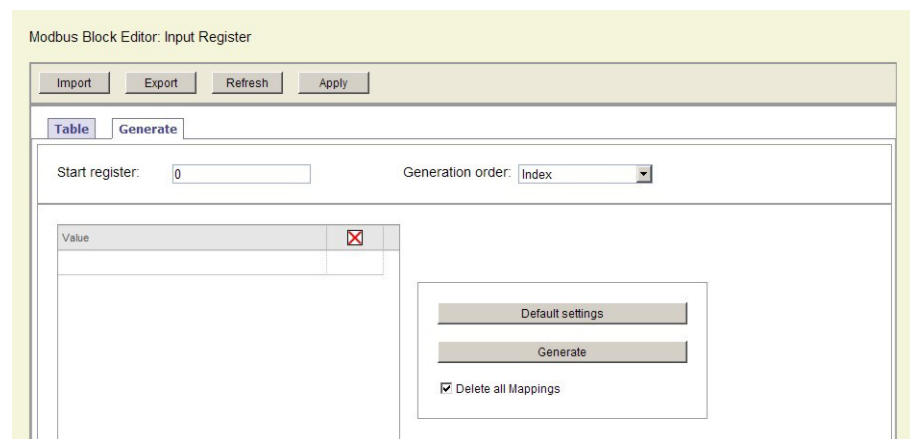
10.2.3 Input Register

Input Register allows the Modbus mapping of Fieldgate SWG70 and the connected HART devices. As Fieldgate SWG70 supports extended registers, values are normally assigned the Input Registers with the reference addresses 300001 to 365536 but for some Modbus systems the mapping must be made to the Holding Registers with the reference addresses 400001 to 465536, see **Read Modbus Registers Mode** in Chapter 10.2.1. The reference addresses are obtained by adding the register number to 300,000 or 400,000 respectively. The dialogue checks for completeness of entries (line turns red if not correctly filled out) as well as double assignment to the registers.

- 1 Click on the **Engineering =>Modbus Mapping =>Input Register** leaf to display the associated parameters:



- 2 Click on **Generate** to open the Generate tab



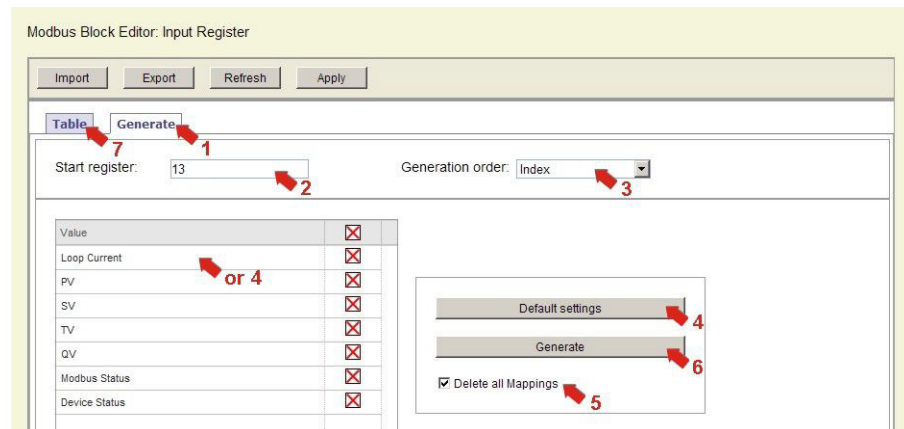
- The significance of the parameters is described in the table overleaf

Input Register parameters

Parameter	Meaning	Example	Default
Table			
Register	Defines the start register for the HART device values <ul style="list-style-type: none"> – For Input Register the first value is normally 30000; some systems work only with Holding Registers starting at 40000 – The initial value can be overwritten only after a device has been selected in the Long Tag drop-down menu – Subsequent start registers are automatically generated 	13	1
End Register	End register for HART device values (generated automatically)	14	65531
Long Tag	Click to open a drop-down list of connected network devices	–	–
IO-Card	Identifier of fieldgate card used by the device	–	–
Channel	Identifier of card channel used by the device	–	–
Value	Click to open a drop-down list of values for the selected device	–	–
Delete button <input checked="" type="checkbox"/>	Depending upon position, deletes the table or the table line		
Generate			
Start Register	Defines the start register for the first HART device <ul style="list-style-type: none"> – For Input Registers this is normally 1, depending on the Modbus system in use 	13	1
Generation Order	Order in which the devices are mapped to the Modbus registers. <ul style="list-style-type: none"> ■ Index: According to the index number, see Instrument List, Chapter 10.1, for example ■ Alphabetical: In alphabetical order according to the Long Tag ■ Alphabetical (sub-device): In alphabetical order according to the Long Tag of the sub-device. ■ IO card & channel: According to the IO card & channel number of the wireless device. ■ IO card & channel (sub-device): According to the IO card & channel number of the sub-device. 		
Value	Click to open a drop-down list of values for the selected device		
Delete button <input checked="" type="checkbox"/>	Depending upon position, deletes the table or the table line		
Default Settings	Adds all HART Command 3 values to the value list, see Appendix A		
Generate	Writes mapping table to table in Table tab		
Delete all mappings	<ul style="list-style-type: none"> ■ Checked: Overwrites any table already in Table tab ■ Unchecked: Adds any new devices found to existing table 		
Controls			
Import	Imports a mapping table in CSV format		
Export	Exports the current mapping table in CSV format		
Refresh	Loads the mapping table currently stored in Fieldgate SWG70		
Apply	Stores the current mapping table to Fieldgate SWG70		

Semi-automatic generation of Input Register mapping table

- 1 Click on the **Generate** tab to open the Generate dialogue:



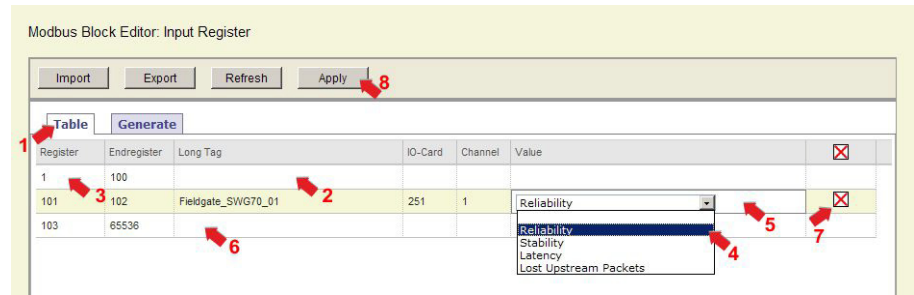
- 2 Enter an offset value in the **Start Register** field.
 - For a typical application, e.g. monitoring of device values only, the Start value is normally 1
 - If you intend to monitor Fieldgate SWG70 values, enter 13, in order to leave space for the Fieldgate values
- 3 Select the order in which the devices are to be mapped to the Modbus registers in the **Generation order** drop-down list
- 4 Click **Default Settings** to automatically load HART CMD 3 values as well as device and status information into the value list
 - Alternatively click in the value field and choose the values you require
 - Note that the list will be replicated for all devices, so some editing may be required later
- 5 If required, check the **Delete all Mappings** checkbox to overwrite any existing mappings
 - If the box is unchecked, any new devices found will be added to an existing table
- 6 Click **Generate** to write the mapping to the table on the Table tab.
- 7 Click the **Table** tab to view the generated mapping table

Register	Endregister	Long Tag	IO-Card	Channel	Value	
1	12					<input type="checkbox"/>
13	14	Wireless Adapter WAD_301	1	0	Loop Current	<input type="checkbox"/>
15	16	Wireless Adapter WAD_301	1	0	PV	<input type="checkbox"/>
17	18	Wireless Adapter WAD_301	1	0	SV	<input type="checkbox"/>
19	20	Wireless Adapter WAD_301	1	0	TV	<input type="checkbox"/>
21	22	Wireless Adapter WAD_301	1	0	QV	<input type="checkbox"/>
23	23	Wireless Adapter WAD_301	1	0	Modbus Status	<input type="checkbox"/>
24	24	Wireless Adapter WAD_301	1	0	Device Status	<input type="checkbox"/>
25	26	Wireless Adapter WAD_302	2	0	Loop Current	<input type="checkbox"/>
27	28	Wireless Adapter WAD_302	2	0	PV	<input type="checkbox"/>
29	30	Wireless Adapter WAD_302	2	0	SV	<input type="checkbox"/>
31	32	Wireless Adapter WAD_302	2	0	TV	<input type="checkbox"/>
33	34	Wireless Adapter WAD_302	2	0	QV	<input type="checkbox"/>
35	35	Wireless Adapter WAD_302	2	0	Modbus Status	<input type="checkbox"/>

- 8 If you want to add Fieldgate SWG70 to the mapping table
 - Select Fieldgate SWG70 in the Long Tag drop down menu
 - Select a value from the value list
 - Repeat the selection for as many Fieldgate SWG70 values as you wish to map
- 9 If required, manually edit the generated mapping table by deleting unwanted entries with the delete button
- 10 After the mapping table is complete, click **Apply** to store it in Fieldgate SWG70.

Manual entry of an Input Register mapping table

- 1 Click on the **Table** tab to open the Table dialogue:



- 2 Select a device from the drop-down menu that appears when the **Long Tag** field is clicked
- 3 Enter an offset value in the **Register** field.
 - Offset value >1: For the first device entered, an extra field will be added for the registers 0 to e.g. 200 that lie before the entered value
 - The line turns red indication mission entries and remains so until all entries are made
 - For subsequent entries, missing entries are outlined in red.
- 4 Select the value you want to read for the device in the **Value** column
 - If you select **CMD 48 Device Status** enter a response byte as well
 - For more information, see CMD48 Read Additional Status Information, Chapter A.3.3
- 5 Repeat Steps 2, 4 and 5 for all other devices
- 6 If required, manually edit the mapping table by deleting unwanted entries with the delete button
- 7 After the mapping table is complete, click **Apply** to store the it in Fieldgate SWG70.

Import and Export of mapping tables

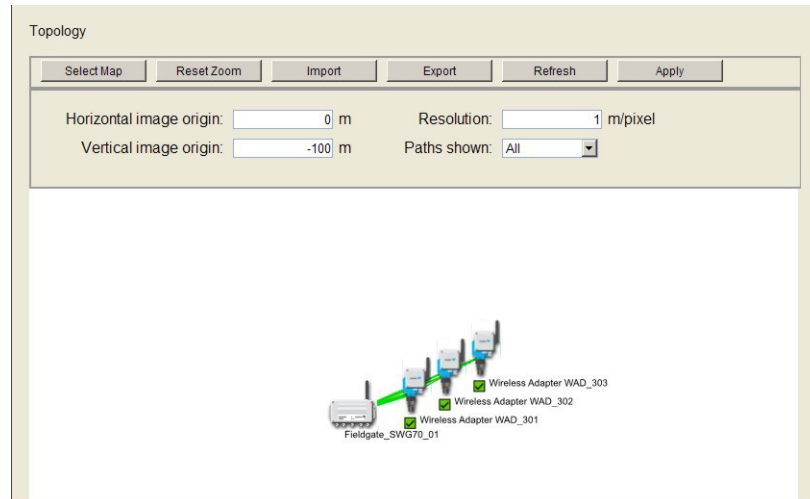
The export/import functionality can be useful if you want to create the mapping table using a spreadsheet program, or if you want to import a backup of an existing mapping table.

- 1 To export the current mapping table to a CSV file, click **Export**.
- 2 To load the mapping table from a CSV file, click **Import**
 - Click **Apply** to store the imported mapping table in Fieldgate SWG70
- 3 To reload the mapping table currently used by Fieldgate SWG70, click **Refresh**

10.3 Topology View (Engineering)

Topology view is a graphical overview of all wireless devices within your network, including their connection status and connection paths. The view set up in the dialog described here is shown in **Diagnosis => Wireless Communication=> Topology View**, see Chapter 9.2.4.

- 1 Click on the **Engineering > Topology View** leaf to open the dialogue:



- The dialog opens with icons and long tags for Fieldgate SWG70 and all WirelessHART devices connected to the network positioned in a blank workspace
- The significance of the parameters is described in the table below

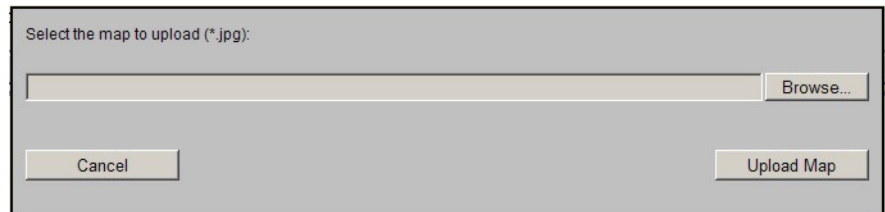
Topology View parameters

Parameter	Meaning
Select Map	Uploads a map in .jpg format
Reset Zoom	Resets the zoom to the minimum value
Import	Uploads the current devices and positions from a CSV file
Export	Stores the current devices and positions in a CSV file
Refresh	Updates the information on signal quality and traffic
Zoom rider – ———— +	Increases (+) or decreases (–) the magnification of the topology view
Horizontal image origin	Sets the position of the horizontal origin of the image
Vertical image origin	Sets the position of the vertical origin of the image
Resolution	Sets the resolution of the image
Paths shown	Selects the paths to be shown in the topology view <ul style="list-style-type: none"> – All: all paths are shown – In use: only those paths used by the network are shown – Selected: the paths associated with a device are shown when the cursor is moved to the said device – None: No paths are shown

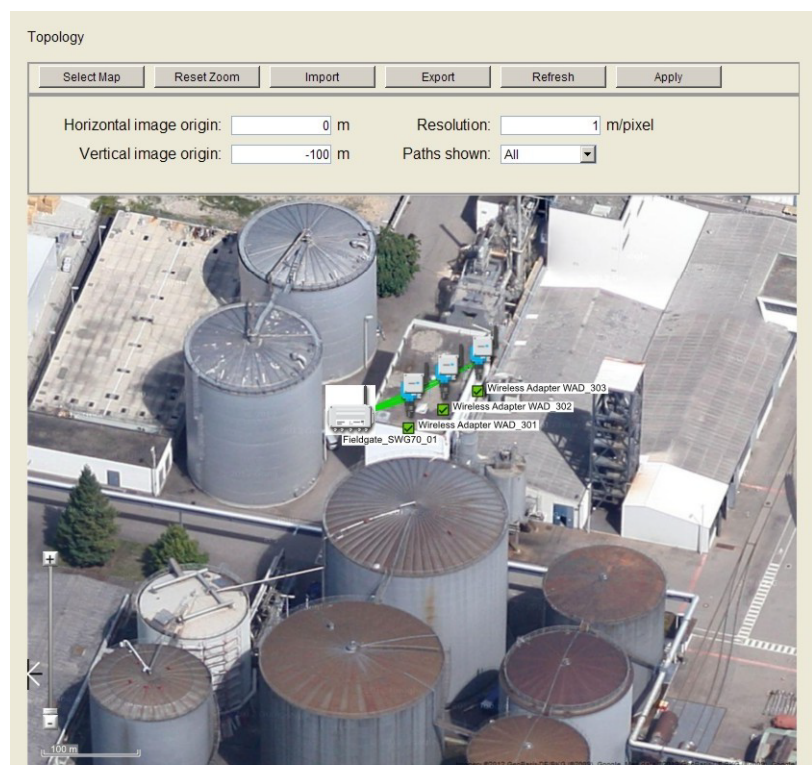
Topology View set-up

The WirelessHART devices are automatically added to the topology view. If required, click **Refresh** to reload the device information. Note that reloading the device information takes some time.

- 1 Click **Select Map** to select a background image for the topology view.
 - For example, a satellite photo, a floor plan or a diagram
 - The image must be in .jpg format
- 2 In the dialogue that now appears, click **Browse** to navigate to the background image.

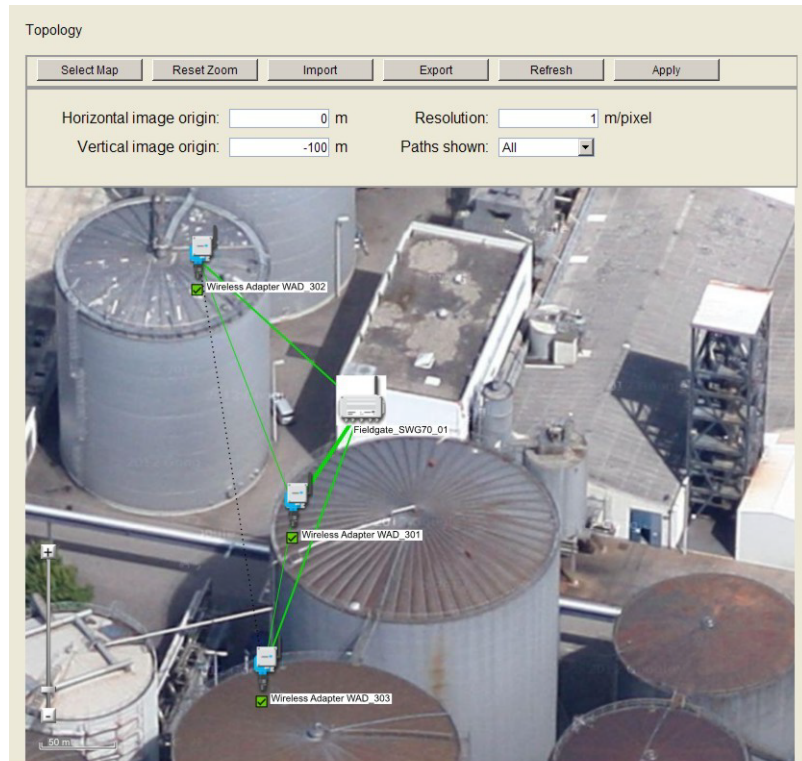


- 3 Click **Upload Map** to upload the background image.



- 4 If required, edit the coordinates of the image origin in the **Horizontal image origin** and **Vertical image origin** boxes.
- 5 Enter a value in the **Resolution** box to scale the background image, for example 0.4 m/pixel.

- 6 Arrange the WirelessHART devices in the topology view by dragging and dropping the icons to a selected position.
 - For more accurate positioning use the slider to zoom in or out of the topology view.
 - To reset the zoom to show all parts, click **Reset Zoom**



- 7 When the Topology View has been set up, click **Apply** to store it in Fieldgate SWG70

Export and Import

- 1 To export the current devices and their positions to a CSV file, click **Export**
- 2 To load a list of devices and their positions from a CSV file, click **Import**

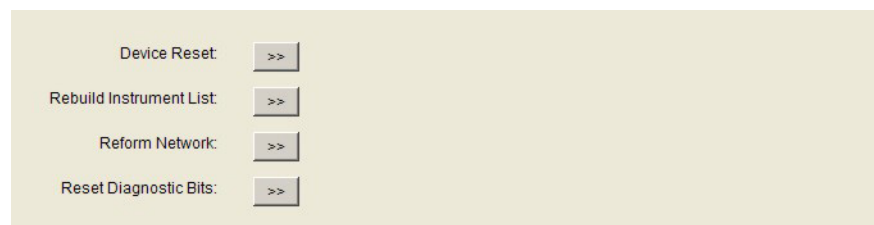
11 Additional Functions

Additional Functions contains a number of functions which maybe required during the Fieldgate life-cycle but not for everyday operation. The functions offered depend upon the parametrization tool. In FieldCare the corresponding function is called by right-clicking on the Fieldgate SWG70 node and selecting **Additional Functions**.

11.1 Reset

Reset allows the Fieldgate, the instrument list and the network to be reset, see table. The reset is initiated by pressing the appropriate button. During reset, communication with the network will be temporarily lost.

- 1 Click on the **Additional Functions> Reset** leaf to open the dialogue:



- The significance of the parameters is described in the table below

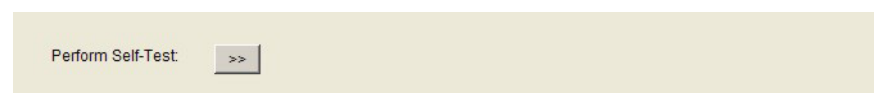
Reset options

Parameter group	Meaning
Device Reset	Press this button to restart Fieldgate without any impact on the established network. – Fieldgate SWG70 is restarted with all user settings intact
Rebuild Instrument List	Press this button to regenerate the instrument list – Create a backup of the existing instrument list before resetting, see Chapter 8.6.8 – The existing instrument list is overwritten. – The Modbus addresses of the devices in the network may change
Reform Network	Press this button to restart and reestablish the network. – The existing instrument list is overwritten. – The Modbus addresses of the devices in the network may change – Depending on the size of the network, this process may take some minutes
Reset Diagnosis Bits	Press this button to reset the diagnosis bits in Fieldgate SWG70

11.2 Self Test

Self test invokes a self testing procedure for Fieldgate SWG70.

- 1 Click on the **Additional Functions> Self Test** leaf to open the dialogue:

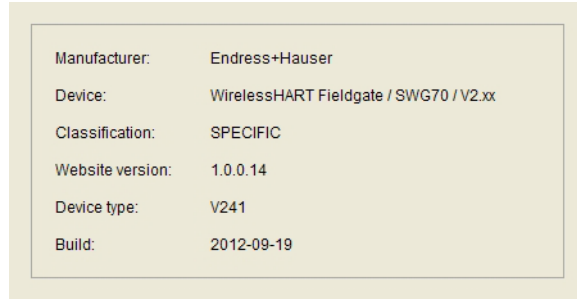


- 2 Press the **Perform Self Test** button to start the test
- 3 The results can be seen in the first two sections of the HART diagnosis dialogue: **Diagnostics =>Wired Communication =>HART** dialog, Chapter 9.3.2

11.3 About

About gives information about Fieldgate SWG70. If called from FieldCare, it also gives information about the DTM.

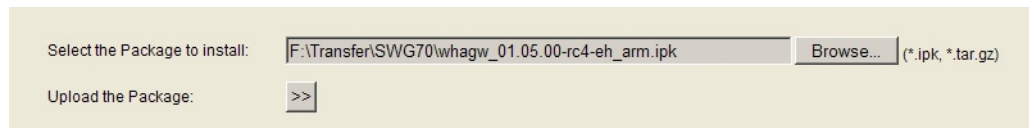
- 1 Click on the **Additional Functions> About** leaf to open the dialogue:



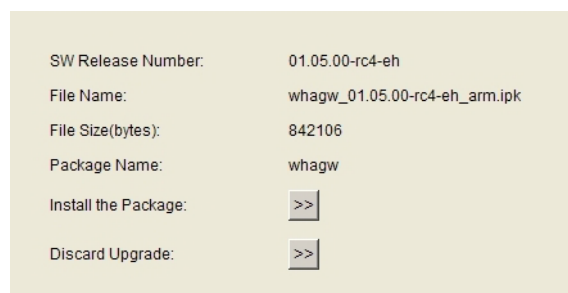
11.4 Firmware Upgrade (Web Server)

Firmware Upgrade allows new firmware to be downloaded to the gateway

- 1 Click on the **Additional Functions> Firmware Upgrade** leaf to open the dialogue:



- 2 **Browse** to the folder or location at which the firmware package is to be found (*.ipk, *.tar.gz)
- 3 Press to **Upload the Package >>**
 - The following page appears



- 4 Press the **Install the Package >>** button to install the firmware
 - To cancel the firmware upgrade, press **Discard Upgrade**
- 5 The package will now be installed.
 - The installation process may take a while.
 - When the installation is finished, **Installation Successfully Completed** together with a log is displayed on the screen.
- 6 After installation, Fieldgate SWG70 restarts with the new firmware
 - The network configuration of the old firmware is retained

11.5 Change Password (Web Server)

Change Password allows the password to the Web Server to be changed.

- 1 Click on the **Additional Functions => Change password** leaf to open the dialogue

Type a new password:

Type the new password again to confirm:

Change Password: >>

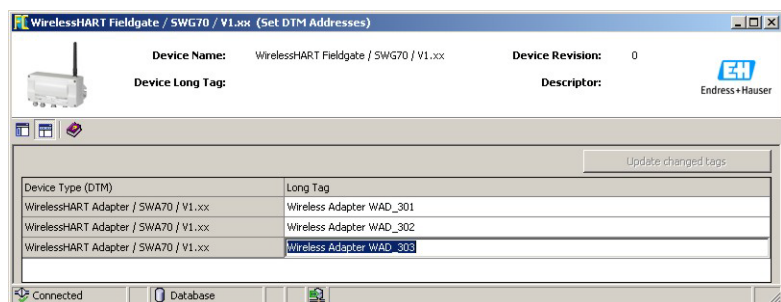
Discard Operation: >>

- 2 Enter the new password in the two fields provided
- 3 Press the **Change Password >>** button to download the new password
- 4 The action can be cancelled immediately after entering the new password if the **Discard Operation >>** button is pressed

11.6 Set DTM Addresses (DTM)

Set DTM Addresses allows the user to match the addressing in the DTM, i.e. the Long Tag in WirelessHART networks, to the physical devices. Any change must also be duplicated in the **Set Device Addresses** window (see Chapter 8.6.7), otherwise the DTM is not able to establish a connection to the adapter. Changes should be made only after all adapter DTMs have been closed. The function is not relevant to FieldCare but might be required for other FDT frames.

- 1 Right-click on Fieldgate SWG70 node and select **Additional Functions =>Set DTM Addresses**.



To change the DTM address:

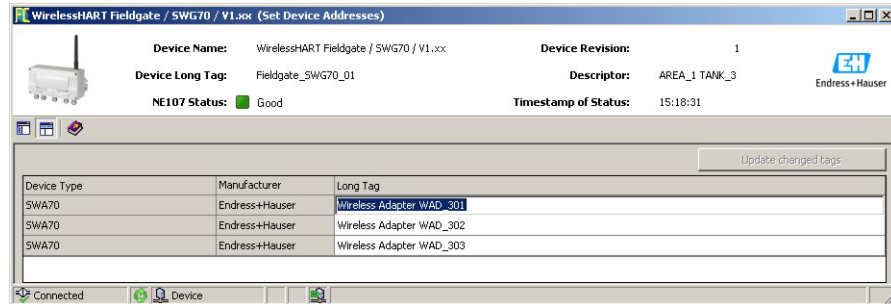
- 2 Place the cursor inside a cell of the **Long Tag** column
- 3 Change the device long tag as required. You may change the long tags of several devices at once, if needed
- 4 Close any DTM dialogs of the devices whose long tags are to be changed
- 5 To apply the new DTM address(es) press **Update Changed Tags**
- 6 The new DTM addresses are displayed in the project view of FieldCare

11.7 Set Device Addresses (DTM)

Set Device Addresses displays all adapters, together with their wired connections, that can be seen in the network. The device address is the device long tag stored in the device.

Set Device Addresses allows the user to match the addressing of a physical device, i.e. the Long Tag in WirelessHART networks, to the one stored in the DTM. The function is not relevant to FieldCare but might be required for other FDT frames.

- 1 Right-click on Fieldgate SWG70 node and select **Additional Functions =>Set Device Addresses**.



To change the device address:

- 2 Place the cursor inside a cell of the **Device Long Tag** column
- 3 Change the device long tag as required. You may change the long tags of several devices at once, if needed
- 4 To apply the new DTM address(es) press **Update Changed Tags**
 - The new DTM addresses are stored to the devices
 - **Refresh** updates the list

11.8 Upload Certificate (Web Server)

11.8.1 Self-signed security certificate

A digital certificate is an electronic document that binds a public key with an identity, for example, an organization or a user. The binding between a public key and the identity is done by a signature. This signature can be self-signed or authenticated by a certification authority.

Fieldgate SWG70 is delivered with a self-signed certificate for the HTTPS connection. If the web browser is unable to verify the authenticity of a self-signed certificate, a warning message appear:



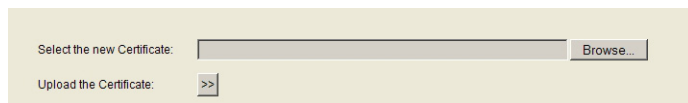
You can proceed to the web server by clicking the appropriate option below the message.

11.8.2 Trusted security certificate

If you wish to avoid the security message, a trusted certificate must be obtained from a certification authority. This is usually connected with a fee and applies to one Fieldgate only.

On registering the web server you will receive files containing a certificate and a private key. As your computer is probably not connected to the Internet, these should be available on its hard disk or a USB stick before the certificate is uploaded to Fieldgate SWG70. Now proceed as follows:

- 1 Click on the **Additional Functions => Upload Certificate** leaf to open the dialogue



- 2 Click **Browse** and select the certificate file on the hard disk or USB stick
- 3 Click >> to upload the certificate
- 4 The **Upload Private Key** option appears: Click **Browse** and select the private key on the hard disc or USB stick
- 5 Click >> to upload the private key
- 6 The **Change Certificate and Private Key** option appears: Click >> to install the trusted certificate.
- 7 Go to **Additional Functions => Device Reset** and perform a device reset for the changes to take effect.
- 8 If the trusted certificate has been installed successfully, the address bar in the web browser displays a padlock icon, which indicates that the web interface of the WirelessHART Gateway is a trusted site.

NOTICE

NOTE!

- In some cases, you must also install the certificate locally on your operating system.
 - If so, click the warning message in the address bar of the web browser and select more information on the certificate.
 - In the following window, click **Install Certificate** and follow the instructions of the installation wizard.

12 Measurement

The Measurement table provides a comprehensive overview of all cached parameters and values of all sub-devices.

- As the the list is stored in a non-volatile memory, the card and channel number assignment will remain the same after a restart of the gateway or software
- The dynamic values of each sub-device (analogue value, PV, SV, TV, QV) are cached by the gateway only if the sub-device publishes these values
- After a network restart, the instrument list needs time to rebuild. During this time, some information is set to 0 or replaced by wildcard characters
- To remove a device from the list, use the Instrument List, see Chapter 10.1

Whenever a new wireless device joins the network, it is automatically inserted into the list. Wired devices connected to a WirelessHART adapter are also inserted.

- 1 Click on the **Measurement** leaf to open the dialogue:
 - In FieldCare right click on the Fieldgate SWG70 node and select **Observe**

Measurement											Refresh
Long Tag	IO-Card	Channel	Device Type	Com. Status	Dev. Status	Loop Curr...	PV	SV	TV	QV	
Fieldgate_SWG70_01	251	1	SWG70								
Wireless Adapter WAD...	1	0	SWA70	☑	☑	-/-	0.000000...	22.79999...	6.970000 V	-/-	
• TT301	1	1	TMT162	☑	☑	4.000000...	22.39291...	22.28518...	22.39291...	-/-	
• LT304	1	1	FMI5x	☑	☑	4.000000...	224.5170...	45.55297...	23.00000...	-/-	
• LT305	1	1	FIMU4x	☑	☑	4.000000...	33.29723...	21.76443...	-/-	-/-	
Wireless Adapter WAD...	2	0	SWA70	☑	☑	0.000000...	0.000000...	27.29999...	-28.00000...	11185.0595...	
• TT303	2	1	TMT182	☑	☑	15.34105...	367.0527...	24.67886...	-/-	-/-	
Wireless Adapter WAD...	3	0	SWA70	☑	☑	11.98427...	11.98427...	25.60000...	-40.00000...	1405.938721 d	
• PT306	3	1	CerabarS	☑	☑	11.99462...	-0.000673...	-0.000676...	-0.002449...	21.570496 °C	

- The significance of the parameters is described in the table below

Parameter/Field	Meaning
Long Tag	Identifies Fieldgate within the plant network – For devices less than HART 6.0 the Message field is used as the long tag
IO card	Identifier of Fieldgate card used by the device
Channel	Identifier of card channel used by the device
Device Type	Designation of connected device
Status	Communication status of the associated device – ☑ Connected – ⚠ Flashing: Device connected, being identified – ⚠ Continuous: Device connected but not identified – 🚫 Communication failure
Dev. Status	Device status of the associated device – ☑ Good – ⚠ Out of specification – 🚫 Failure The device status displayed in the Operating Modes list may differ from the actual device status because the HART status bits may be interpreted differently.
Loop current	Current in mA (for HART Multidrop = 4 mA)
PV	Primary value of the device
SV	Secondary variable of the device
TV	Tertiary variable of the device
QV	Quaternary variable of the device
"+" , "-"	Expands or contracts the tree view
Refresh	Updates the instrument list

13 Maintenance and Repair

13.1 Maintenance

13.1.1 General

The national requirements apply to maintenance, servicing, and inspection of associated apparatus.

No maintenance is necessary if the devices are operated properly, observing the mounting instructions and ambient conditions.

The devices may not be repaired, changed or manipulated. If there is a defect, the product must always be replaced with an original part.

13.1.2 Return to Endress+Hauser.

Fieldgate SWG70 must be returned if repairs are required or if the wrong device has been ordered or delivered. According to legal regulations, Endress+Hauser, as an ISO-certified company, is required to follow certain procedures when handling returned products, especially those that have been in contact with medium.

To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website at www.services.endress.com/return-material

13.1.3 Disposal

Fieldgate SWG70 must be disposed of in accordance with national regulations.

13.1.4 Contact addresses

Contact addresses can be found on our homepage at www.endress.com/worldwide.

For enquiries, service etc. please contact your local Endress+Hauser Sales Center or Representative.

14 Trouble-Shooting

14.1 Network optimization

Once the WirelessHART network is running, there are some simple measures that will help to enhance network performance and reliability. These measures are described in the following.

NOTICE

NOTE!

- After installation and configuration of the network, give it a couple of hours to stabilize itself, before taking the following steps.

14.1.1 Verify Connections

Check that each device has joined the network and is communicating properly. If you cannot establish a connection to a device, the device is probably too far away or an obstacle blocks the radio waves. In this case, add an additional device to bridge the gap.

14.1.2 Eliminate Bottlenecks

If the messages of several devices all have to pass through one single device to get to the gateway, the network has a bottleneck. If the device at the bottleneck fails, whole parts of the network get cut off from communication because there are no alternative paths to route messages.

To eliminate bottlenecks in a wireless network, add at least one device near the bottleneck to provide redundant communication paths. There should always be at least two communication devices in each signal path.

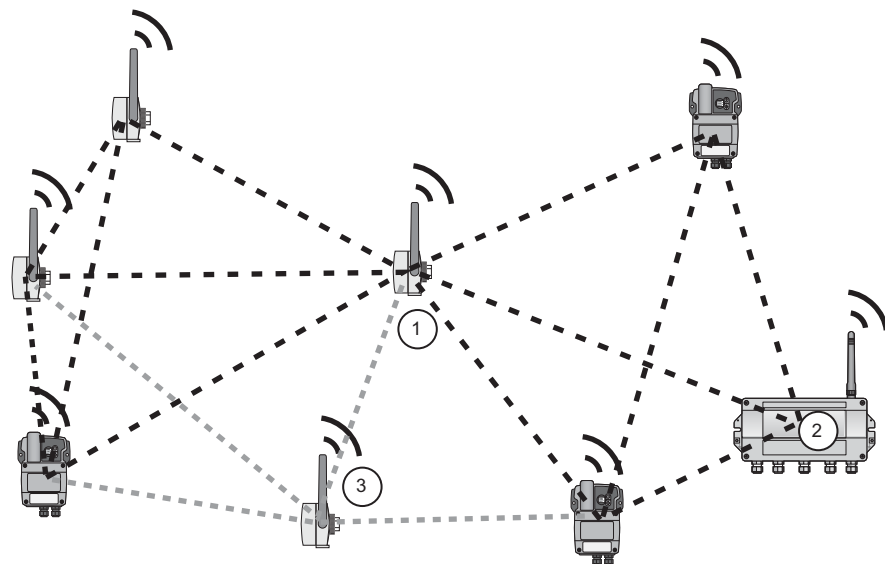


Fig. 14-1: Eliminating a bottleneck by the addition of a devices

- | | | | |
|---|---------------------------|---|--|
| 1 | Device causing bottleneck | 3 | Additional adapter adds alternative routes |
| 2 | Fieldgate | | |

14.1.3 Expand the Network

In an industrial environment, there are several potential obstacles for radio waves, for example buildings, walls, pipes, or even moving obstacles like trucks. Those obstacles can reflect, bend, diffuse or block radio waves. The effects of reflection, bending and diffusion create new waves which may interfere with the original ones and with each other. They can amplify or nullify each other. This effect is called fading.

Due to the interference of reflections, moving the antenna a few centimetres can help. If there are obstacles blocking transmission between wireless devices, add additional devices to provide alternative communication paths. The more devices exist in a WirelessHART network, the more reliable it becomes.

14.1.4 Optimize Coexistence with other Wireless Networks

WirelessHART networks (IEEE 802.15.4) use the frequency spectrum between 2400 ... 2483.5 MHz. Various other wireless technologies also use this frequency spectrum, for example WLAN (IEEE 802.11) and Bluetooth (IEEE 802.15.1). Measures must be taken to ensure that the various wireless technologies do not affect each other.

If there are problems with other wireless technologies disrupting the WirelessHART network, you should consider implementing a Coexistence Management policy. More information on this subject is to be found at the HART Communication Foundation site, www.hartcomm.org, and other sources on the Internet.

14.2 Diagnosis

14.2.1 Faults indicated by Fieldgate LEDs

	LED indication	Problem/Remedy
1	Red LED is lit	<ul style="list-style-type: none"> ■ Hardware fault which makes normal operation of the gateway impossible <ul style="list-style-type: none"> – Send Fieldgate back for repair
2	Red LED flashes	<ul style="list-style-type: none"> ■ Under certain conditions the LED flashes while the gateway application tries to eliminate the fault. <ul style="list-style-type: none"> – If this indication persists, even after a reboot, send the Fieldgate back for repair

14.2.2 Wired Communication Faults

Fieldgate error messages in plain text can be viewed in the **Diagnosis** leaf of the DTM, see Chapter 8.5.

The table below summarizes the more common problems which might occur during commissioning and operation of the WirelessHART Fieldgate SWG70.

	Problem	Cause/Remedy
1	The PC is not able to establish an Ethernet connection to the gateway, although the gateway and the PC are connected to the Ethernet.	<ul style="list-style-type: none"> ■ The gateway is connected to the Ethernet with a straight through connection although a crossover connection is necessary (or vice versa). <ul style="list-style-type: none"> – Wire in accordance with the table in Chapter 5.3 ■ The Ethernet parameters of the gateway are incorrect <ul style="list-style-type: none"> – Check the gateway's Ethernet parameters (see Chapter 8.3.2) ■ The Local Area Connection Properties of your PC are not configured correctly <ul style="list-style-type: none"> – Configure the Local Area Connection according to the instructions given (see chapter 7.2). ■ If you are parameterizing via the web interface: Maybe your web browser uses proxies <ul style="list-style-type: none"> – Deactivate proxies in your browser ■ Firewall blocking communication <ul style="list-style-type: none"> – Configure firewall to allow communication through ports 80, 443, 502 and 5094
2	The PC is not able to establish a serial connection to the gateway or the signal is of poor quality	<ul style="list-style-type: none"> ■ Wrong parameters, e.g. COM port, address range, have been set in the Wired Communication dialogues, (see Chapters 8.3.1 to 8.3.5) ■ The terminating resistor is not activated <ul style="list-style-type: none"> – If the RS-485 cable ends at the gateway (gateway is last device), activate the terminating resistor via the DIP switch inside the gateway housing (see Chapter 6.1.3) or via the dialogue (see Chapter 8.3.4) ■ Check cabling

14.2.3 Wireless Communication Faults

	Problem	Cause/Remedy
1	Fieldgate SWG70 cannot find a WirelessHART device in the network	<ul style="list-style-type: none"> ■ The device has not yet joined the network <ul style="list-style-type: none"> – The joining process may take a while – Check the join status in the gateway's Instrument List – Alternatively, check the wireless communication parameters (join status) of the device via a HART modem connected to the device ■ The device carries the wrong network ID and/or the wrong join key <ul style="list-style-type: none"> – Check the wireless communication parameters of the device via a HART modem connected to the device. The device and the gateway must have the same network ID and join key.
2	The wireless connection to a WirelessHART device is poor and disappears from time to time	<ul style="list-style-type: none"> ■ There are not enough neighboring WirelessHART devices within the device's antenna range <ul style="list-style-type: none"> – Check the number of neighbors – There should be at least 2 neighbors ■ Signal too weak <ul style="list-style-type: none"> – Check the signal level of next neighbour in the device diagnosis - this must be larger than -80 dBm if the network is to work properly – Improve signal strength by repositioning the antenna or adding adapters as repeaters ■ Walls or other static/moving objects block the radio signals, or the antenna is not aligned vertically <ul style="list-style-type: none"> – Reposition the gateway or use an external antenna.
3	The Network ID and the Join Key cannot be downloaded to Fieldgate SWG70	<ul style="list-style-type: none"> ■ The security DIP Switch 8 is OFF <ul style="list-style-type: none"> – Set DIP Switch 8 to ON (if Gateway installed in Ex-Zone 2, switch off power before doing this) – If you want to continue using security mode, set the DIP Switch 8 to OFF, after the Network ID and Join Key have been downloaded
4	A device appears with a yellow icon in the instrument list	<ul style="list-style-type: none"> ■ Either the device or the communication is faulty
5	A device appears with a red icon in the instrument list	<ul style="list-style-type: none"> ■ The device is faulty ■ The network was switched off for sometime, but the device has continued transmitting. <ul style="list-style-type: none"> – The device has gone into prolonged sleep mode – Either wait until the device reappears (waiting time depends on how long the network was not present) or press the adapter's push button for 5 seconds to force joining
6	A device is present in the network, but bursting is interrupted	<ul style="list-style-type: none"> ■ The field device is being configured locally by a modem <ul style="list-style-type: none"> – When a modem is communicating with the adapter, it is impossible to measure the loop current and bursting is disabled – Bursting will restart when the modem is disconnected

15 Technical Data

15.1 Input

Wireless interface	WirelessHART communication interface
Physical layer	IEEE 802.15.4; 2006
Transmission rate	Nominal 250 kBits/s
Operating frequency	2.4 GHz (ISM band)
Transmission range	Under reference conditions: Outdoor 250 m, indoor 50 m
RF power level	Configurable 0 dBm or 10 dBm, depending upon national regulations
Input variables	Process variables according to HART standard sent in burst mode by devices in network
Additional functions	<ul style="list-style-type: none"> ■ Security mode for join key and network ID download (enabled by DIP switch) ■ Buffering of process values for acquisition by host application

15.2 Output

15.2.1 Ethernet (100 BASE-T/100 BASE TX)

Protocol	Configurable for HART IP and MODBUS TCP communication
Transmission rate	100 Mbit/s (max. cable length 100 m at 25 °C ambient temperature)
Type of protection	None
Galvanic isolation	Fully isolated from all other circuits
Maximum bus length	100 m (110 yds) depending upon cable
Connection facilities	<ul style="list-style-type: none"> ■ 7-port terminal block ■ Screw terminals: 0.2 mm² to 4 mm² for solid wire, 0.2 mm² to 2.5 mm² for stranded wires

15.2.2 RS-485 serial interface

Protocol	Configurable for HART Version 7.0 or MODBUS RTU communication
Transmission rate	Hardware or software configurable between 1200 Bit/s to 115200 Bit/s
Type of protection	None
Galvanic isolation	Fully isolated from all other circuits
Maximum bus length	1200 m (1230 yds), depending upon cable and transmission rate
Terminal resistor	Integrated, settable by hardware (DIP-switch) or software
Connection facilities	<ul style="list-style-type: none"> ■ Two 3-port terminal blocks, allowing series connection of several Fieldgates ■ Screw terminals: 0.2 mm² to 4 mm² for solid wire, 0.2 mm² to 2.5 mm² for stranded wires

15.3 Power Supply

Supply voltage	20 VDC to 30 VDC
Power	<5 W
Connection facilities	<ul style="list-style-type: none">■ Two 2-port terminal blocks, 2nd port for redundant power supply■ Screw terminals: 0.2 mm² to 4 mm² for solid wire, 0.2 mm² to 2.5 mm² for stranded wires

15.4 Environment

Ambient temperature range	-20°C to +60°C, -4°F to 140°F
Storage temperature	-40°C to +85°C, -40°F to +185°F
Relative humidity	5% to 95%, non-condensing
Vibration resistance	EN 60068-2-6: 1 Hz ≤ f ≤ 150 Hz/1 g
Shock resistance	EN 60068-2-27: 15 g, 11 ms
Electromagnetic compatibility	<p>This device complies with the requirements of the EC Directive 2004/108/EG "Electromagnetic Compatibility".</p> <ul style="list-style-type: none">■ IEC 61326:<ul style="list-style-type: none">- Immunity: EN 61326-1: 2006, industrial environment- Emission: EN 61326-1: 2006, Class A
Telecommunication compliance	<p>Complies with the requirements of the EC Telecommunications Directive 99/5/EG</p> <ul style="list-style-type: none">■ ETSI EN 300 328: V1.7.1 (2006-10)■ ETSI EN 301 489-17: V1.2.1 (2002-08)■ EN 301 489-17: V2.1.1 (2009)

15.5 Mechanical Construction

Overall dimensions

W x H x D: 257 mm x 85 mm x 285 mm with cable glands and antenna
257 mm x 85 mm x 115 mm without cable glands and antenna

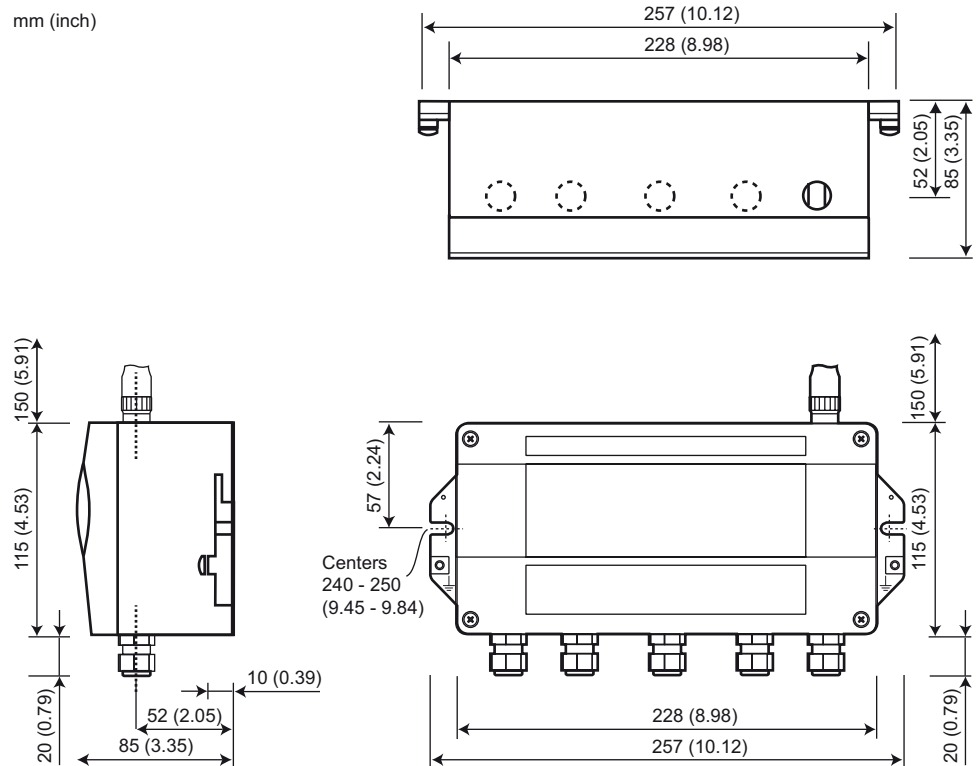


Fig. 15-1: Dimensions of Wireless Fieldgate SWG70

Weight

Approx. 1.6 kg

Housing

- Material: Painted aluminium
- Colour: Light grey, RAL 7035

Degree of protection

IP 65; NEMA Type 4

Type of protection

Complies with the requirements of the EC Directive 94/9/EG (ATEX)

- "nA", non-sparking to EN 60079-15:2005

Cable entry

5 separate M16x1.5 threaded entries

Antenna

- Omnidirectional dipole antenna
- Intrinsically safe antenna port
- Remote antenna available on request

15.6 Operability

Configuration	<ul style="list-style-type: none"> ■ Web browser via Ethernet ■ FieldCare via Ethernet (HART IP CommDTM) or RS-485 (serial CommDTM)
Operating elements	<ul style="list-style-type: none"> ■ 2x Pushbuttons within housing for selecting operating mode during local configuration ■ 5x LEDs within housing for indicating current operating mode during local configuration ■ 1x 8-gang DIP switch for Address (1 - 4), Baudrate (5-6), Termination (7) and security mode (8) <ul style="list-style-type: none"> – Hardware settings can be overridden by software settings
IP address	Configurable via Web browser or DTM, default 192.168.1.1

15.7 Certificates and Approvals

CE Mark In attaching the CE Mark, Endress+Hauser confirms that WirelessHART Fieldgate SWG70 conforms to all relevant EU directives.

Telecommunication compliance	<ul style="list-style-type: none"> ■ Brazil: ANATEL 2759-11-7311 (EAN Number: 7898994191414) ■ China: CMIIT ID (SRRC) ■ ETSI (R&TTE) ■ FCC Part 15.247 for wireless applications in the 2.4 GHz frequency band ■ Japan: Ministry of internal affairs and communication ■ Mexico: COFETEL RCEPNSW12-0651 ■ Other national certificates are available on request.
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Additional national guidelines to be observed:

Country	Guideline
Bulgaria	General authorization required for outdoor use and public service
Italy	If used outside of own premises, general authorization is required
Norway	May be restricted in the geographical area within a radius of 20 km from the center of Ny-Alesund
Rumania	Use on a secondary basis. Individual license required
Latvia	The outdoor usage of the 2,4 GHz band requires an authorization from the Electronic Communications Office

Hazardous area approvals See Chapter 2.2

A Appendix: Modbus Interface

A.1 Introduction

A.1.1 Modbus protocol

Modbus is a quasi-industrial standard developed some years ago by Gould-Modicon and provides a messaging service that may run on a variety of physical layers. For Fieldgate SWG70 there are two possibilities for connecting Modbus:

- Modbus RTU (also known as Serial) can be connected point-to-point to the RS-485C interface as described in Chapter 5.4.
- Modbus TCP (also known as Modbus TCP/IP) can be connected to an Ethernet Interface as described in Chapter 5.3.

The Modbus protocol exchanges data in a master-slave relationship. Each slave has a unique address, and the data are identified by their location in the slave address register. Certain characteristics of the Modbus protocol are fixed, such as the frame format, frame sequences, handling of communications errors, exception conditions and the functions performed. Other characteristics are user selectable; these include transmission medium, baudrate, character parity, number of stop bits, and transmission modes. Chapter 8.3 describes how both Ethernet and Serial interfaces can be set up. The contents of the data carried by the protocol are also freely selectable, i.e. nothing is said about strings, integers, floating-point numbers etc.

The Modbus protocol controls the query and response cycle between master and slave devices. Only the master can initiate a transaction. A query and response may involve only a single slave, or it may be in the form of a broadcast, in which case the slaves do not answer. The query is contained in a frame that includes the address of the intended receiver, what this slave is to do, data needed to perform the action, and a means of checking for errors. The slave checks if errors have occurred and performs the desired action. After the action is performed the slave builds the response and returns it to the master. The master can send another message to any slave as soon as it receives a valid response or after a user-selected time interval. This "timeout" period has to be selected on the master device and depends on the slave response time.

Data can be exchanged in two transmission modes: ASCII (American Standard Code for Information Interchange) and RTU (Remote Terminal Unit). The major differences between them are the type of error check performed on the message and the number of characters used. Fieldgate SWG70 supports RTU only. Modbus offers several read, write and test functions, each identified by a code number. They are designed as control commands for sensors and actuators, e.g. coils, inputs, input registers, holding or output registers, diagnosis and test reports, programs, polling control and reset. For Modbus TCP the serial frame is simply inserted into the Ethernet data frame. In addition, not all codes are implemented.

Modbus overview

	Modbus RTU	Modbus TCP
Standard compliance	"Modbus over Serial Line" V1	"Modbus over TCP" V1
Physical layer	RS-485	Ethernet
Transmission mode	RTU (binary mode)	TCP
Baudrates	1200 bit/s, 2400 bit/s, 4800 bit/s, 9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, 115200 bit/s	100 MBit/s
Parity	Odd, Even, None	–
Stop bits	1; 1.5; 2	–
Polling address	1...247	–
Port No.	–	502
Capabilities	<ul style="list-style-type: none"> ■ Input registers starting at Modbus address 30013 ■ HART Command 3 dynamic variables mapped into input registers ■ 2 input registers map a single HART dynamic variable ■ 32bit HART floating point format used ■ Status information mapped on dedicated input registers 	

A.1.2 Modbus in Fieldgate

Fieldgate SWG70 is equipped with both a Modbus serial and Ethernet interface. As a result, it can be operated in one of the following roles:

- Modbus Serial Slave
- Modbus TCP Slave

A serial or TCP slave can be accessed by one Modbus master only.

Establishing communication

As a TCP slave, Fieldgate SWG70 will normally communicate with the master via Port 502. If this port is unavailable, it is possible to specify a secondary TCP/IP port number.

Modbus commands

Fieldgate SWG70 support for Modbus functions is currently as follows

Function	Function Code	Hex	Function supported
Read discrete inputs	2	0x02	Yes
Read coils	1	0x01	No
Write single coil	5	0x05	No
Write multiple coils	15	0x0F	No
Read input register	4	0x04	Yes
Read holding register	3	0x03	Yes
Write single register	6	0x06	No
Write multiple registers	16	0x10	No
Read/Write multiple register	23	0x17	No

Registers

Modbus specifies four different types of register:

- Discrete input registers contain the discrete input values and possibly status
- Input registers contain analog input values and status
- Coil registers contain discrete output values and possibly status
- Holding registers contain analog output values and status

In addition, it is possible to "pack" discrete inputs and outputs into words, which are then stored as appropriate in the input or holding registers. Fig. A-1 overleaf gives an overview of the register and reference address ranges used for each register type.

For Fieldgate, the holding registers are a read only image of the input registers which can be accessed when the Read Modbus Registers Mode is set to "Input and Holding", see Chapter 10.2.1.

HART implementation

The Modbus implementation in Fieldgate SWG70 maps HART dynamic process variables over Modbus input registers and also uses input registers to provide device-related status information. The Modbus implementation is based on the following assumptions:

- The HART Command 3 dynamic variables are used for automatic Modbus mapping
- For Modbus access, publishing must be enabled for all relevant devices
- The gateway caches the relevant information. Modbus commands will therefore access the internal gateway memory
- Modbus input registers are only supported if they are associated with HART dynamic process variables
- A device can either be a WirelessHART device or a wired HART device connected to a WirelessHART adapter
- WirelessHART and wired HART devices are mapped independently within the Modbus input registers

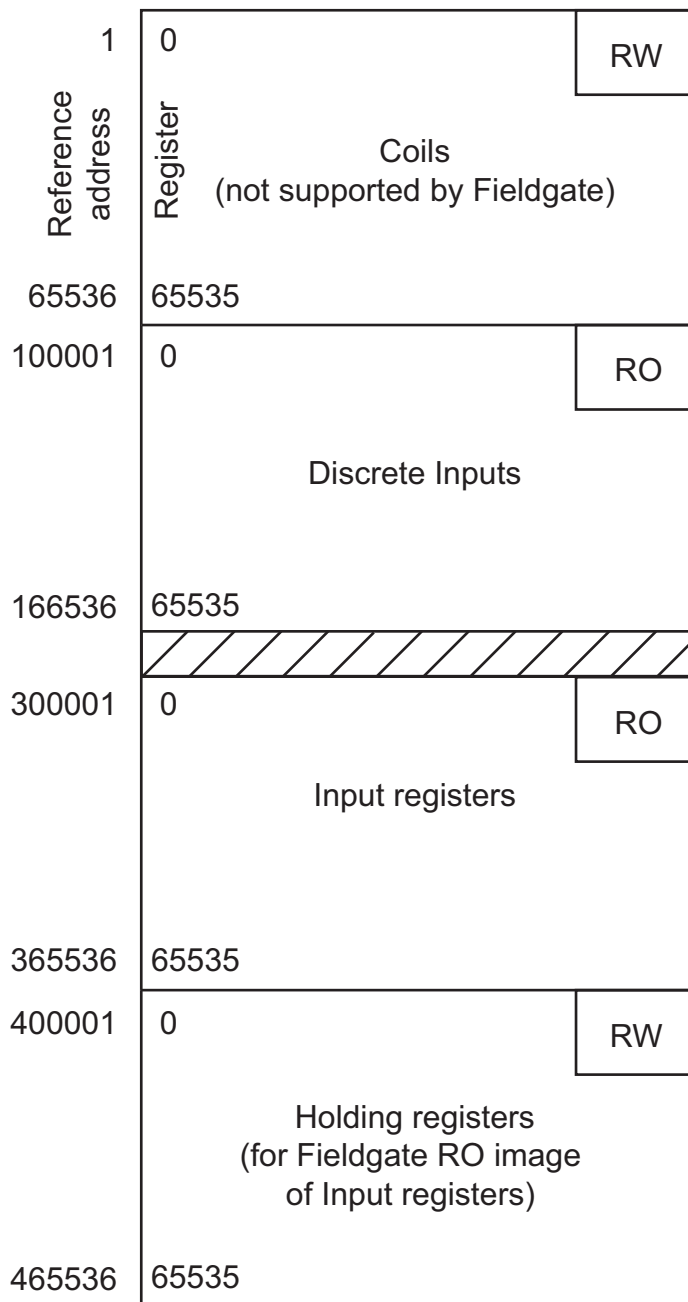


Fig. A-1: Mapping of Modbus registers Fieldgate SWG70

Refresh time

Fieldgate SWG70 refreshes Modbus discrete inputs and input registers once every macrocycle. The length of the macrocycle depends on the number of WirelessHART devices in the network, the response time of the devices and the number of parameters they transmit.

In general, shorter refresh times can be attained by restricting the traffic over the network to essential parameters only.

A.1.3 Data types

Fieldgate SWG70 supports three different data types, which are interpreted and stored as described below:

- Floating point, Unsigned Integer16, Unsigned Integer8

Floating point

Value range	$(\pm) 1.175 * 10^{-38}$ to $3.403 * 10^{38}$	
Byte Structure	<p>31 23 0 Sign Exponent (8 bit) Fraction (23 bit)</p>	
Storage	Float	Swapped Float
Modbus Register 1	<p>15 0</p>	<p>31 16</p>
Modbus Register 2	<p>31 16</p>	<p>15 0</p>

Unsigned16

Value range	0 to 65.535	
Byte Structure	<p>15 0 Value (16 bit)</p>	
Storage	Unsigned Integer16	Swapped Unsigned Integer16
Modbus Register 1	<p>15 0</p>	<p>15 0</p>

Unsigned8

Value range	0 to 255	
Byte Structure	<p>15 7 0 0 0 0 0 0 0 0 0 Value (8 bit)</p>	
Storage	Unsigned Integer8	Swapped Unsigned Integer8
Modbus Register 1	<p>15 7 0 0 0 0 0 0 0 0 0</p>	<p>15 7 0 0 0 0 0 0 0 0 0</p>

A.2 Rules for mapping

A.2.1 Automatic mapping of analog devices (HART CMD3)

Each HART device is mapped into 12 consecutive Modbus input registers. The order of HART device mapping starting from register 13 is the same as the order of the sub-device identity summary (returned by HART CMD84). For example, the HART device with the sub-device index=1 is mapped starting at register 13. The device with the sub-device index = 2 is mapped starting at register 25, and so on.

To find out the starting register reference address of a certain sub-device, use the following formula:

$$SMIR = 300013 + 12*(SDI-1),$$

whereby: "SMIR" is the starting Modbus input register of the associated HART device
"SDI" is the sub-device index value.

The following table shows an example of the mapping of the first two HART devices, i.e. the ones associated with SDI=1 and SDI=2.

The assigned Modbus registers can be viewed in the Input Status and Input Register dialogs, see Chapters 10.2.2 and 10.2.3

Example of Modbus mapping of HART CMD 3

Reference address			Modbus RTU	Format	Sub-device index
300013	300014	AI	Primary variable (loop current, mA unit)	32-bit floating point	1
300015	300016	PV	Primary variable (device-specific unit)		
300017	300018	SV	Secondary variable (device-specific unit)		
300019	300020	TV	Ternary variable (device-specific unit)		
300021	300022	QV	Quaternary variable (device-specific unit)		
300023	–	ModStat	Modbus Specific Status	16-bit unsigned integer	2
300024	–	DevStat	HART Device Status		
300025	300026	AI	Primary variable (loop current, mA unit)	32-bit floating point	
300027	300028	PV	Primary variable (device-specific unit)		
300029	300030	SV	Secondary variable (device-specific unit)		
300031	300032	TV	Ternary variable (device-specific unit)		
300033	300034	QV	Quaternary variable (device-specific unit)		
300035	–	ModStat	Modbus Specific Status	16-bit unsigned integer	
300036	–	DevStat	HART Device Status		

Modbus Specific Status

Bit	Parameter	Description
0x01 (LSB)	Cache validity	Set to 1 when the HART CMD 3 cache of the device is empty.
0x02 (LSB)	Identification ongoing	Set to 1 when the gateway is performing a device identification procedure.
0x04 (LSB)	Device off-line	Set to 1 when the device is off-line

HART Device Status

Bit	Parameter	Description
0x01	Primary variable out of limits	PV of a device in the network is out of limits
0x02	Non-primary variable out of limits	SV, TV, QV of a device in the network is out of limits
0x04	Loop current saturated	Loop current of a device in the network above 20 mA
0x08	Loop current fixed	Loop current of a device in the network is fixed to 4 mA (multidrop mode)
0x10	More status available	Device in the network has more status available flagged
0x20	Cold start	Device in the network has cold start flagged (power failure or device reset)
0x40	Configuration changed	Configuration of a device in the network has changed
0x80	Device malfunction	Device in the network has malfunctioned

A.2.2 Digital input/output devices

There is no automatic mapping of the Input Status registers: the user must generate the mapping table either semi-automatically or manually.

- A semi-automatic mapping will duplicate the values entered under the "Generate" tab for all devices in the network, irrespective of device type
- A manual mapping allows the table to be built up for each individual device (recommended)

Discrete devices publish their values by bursting HART CMD 64386. This tells Fieldgate SWG70 how many discrete values a device is publishing as well as the index of the first discrete value. A maximum of 256 discrete values can be mapped for each device. At the moment, Fieldgate SWG70 does not map the status of the device.

Each discrete value is published as a UNIT16. Fieldgate SWG70 first splits the data into two bytes then reserves 8 registers for each byte, i.e. one for each bit.

- The **Least Significant Byte** (x) maps Bits 0 - 7 of the value with Index x
- The **Most Significant Byte** (x) maps Bits 8 - 15 of the value with Index x

The Index "x" is not determined by the position of a discrete value in the device's burst list, but by its position in CMD 64385. For example, if the 1st and 4th discrete variables are selected in the device's burst list, the corresponding indices will be "0" and "3". Assuming that all bytes are of interest, the user must enter the following lines:

- Tag Device 1 Least Significant Byte 0
- Tag Device 1 Most Significant Byte 0
- Tag Device 1 Least Significant Byte 3
- Tag Device 1 Most Significant Byte 3

The following (manual) mapping table results:

Reference address	Device	Discrete Variable	Bit	Byte (Variable Index)
100001	Device 1	Variable 1	Bit 0	LSB (0)
100002	Device 1	Variable 1	Bit 1	LSB (0)
...				
100007	Device 1	Variable 1	Bit 6	LSB (0)
100008	Device 1	Variable 1	Bit 7	LSB (0)
100009	Device 1	Variable 1	Bit 8	MSB (0)
100010	Device 1	Variable 1	Bit 9	MSB (0)
...				
100015	Device 1	Variable 1	Bit 14	MSB (0)
100016	Device 1	Variable 1	Bit 15	MSB (0)
100017	Device 1	Variable 4	Bit 0	LSB (3)
...				
100025	Device 1	Variable 4	Bit 7	LSB (3)
100026	Device 1	Variable 4	Bit 8	MSB (3)
...				
100032	Device 1	Variable 4	Bit 15	MSB (3)
...				

When Fieldgate SWG70 receives CMD 64386, it checks whether the variables have been mapped, then enters the associated information. Any values that are not mapped are discarded.

A.3 Mapping formats

A.3.1 Dynamic process variables

For each HART device, the 5 possible Command 3 floating-point dynamic variables are sequentially mapped (units code values are not mapped). If a device does not support a specific dynamic value, a "NaN" (Not a Number) floating-point value is returned (namely, 0x7F, 0xA0, 0x00, 0x00).

The CMD3 dynamic variables follow the IEEE-754 (IEC559) single-precision floating-point format

1-bit Sign of Fraction	8-bit Exponent	23-bit Fraction
------------------------	----------------	-----------------

The same format is also used for the Modbus 32-bit floating point values.

The Modbus protocol does not explicitly specify any 32-bit data element. However, the usage of 2 consecutive 16-bit registers is the de-facto standard way to map a single-precision IEEE-754 floating-point value. The Modbus floating value will be transmitted in the "big-endian" or "little endian" style according to the swap selection in the Modbus dialog, see Chapter 8.4.4.

For example, the number 123456.00 as defined in the IEEE-754 standard appears as follows:

Byte 0	Byte 1	Byte 2	Byte 3
0x00	0x20	0xF1	0x47

This number will be transmitted from the Gateway to the Modbus master in the following sequence:

47 F1 20 00

in "big-endian" style where "00" – the less significant byte – is the first one to be transmitted. The sequence can be changed to "little-endian", see Chapter 10.2.1.

A.3.2 Status mapping

For each HART device, two 16-bit unsigned input registers are used to map the relevant status information. The status information is delivered as a series of independent flags. Within an input register, the unused bits are always returned as "0".

- ModStat: Modbus Specific Status
 - Bit 0: Cache validity (= 1 when cache empty). If the bit is set for a long period, this usually indicates that CMD 3 publishing is disabled for the device concerned-
 - Bit 1: Identification ongoing (=1 when Fieldgate is identifying a device)
 - Bit 3: Device off-line(= 1 when device is off-line).
- DevStat: The "Device Status" information according to the HART 7 specification
 - Bit 0: Primary variable out of limits
 - Bit 1: Non-primary variable out of limits
 - Bit 2: Loop current saturated
 - Bit 3: Loop current fixed
 - Bit 4: More status available
 - Bit 5: Cold start
 - Bit 6: Configuration changed
 - Bit 7: Device malfunction

For more information see the Modbus Specific Status and HART Device Status tables in Chapter A.2.1.

A.3.3 HART CMD48 Read Additional Status Information

Command 48 returns device status information not included in the response code or device status byte of Command 3. All field devices support at least bytes 0 ... 8. If a field device supports more than one analog channel, then bytes 9 ... 13 will be supported as well.

Response Data Bytes

Byte	Parameter	Description
0	Extended device malfunction (Device-specific status 0)	<ul style="list-style-type: none"> ■ 0x01 Manager fault ■ 0x02 Non-Volatile Memory Defect ■ 0x04 Volatile Memory Defect ■ 0x08 Ethernet communication fault ■ 0x10 Wired Device Duplicated ■ 0x20 Long Tag Duplicated ■ 0x40 Electronic defect ■ 0x80 RS-485 communication fault
1	Gateway Operation in Progress (Device-specific status 1)	<ul style="list-style-type: none"> ■ 0x02 Block transfer (not currently supported) ■ 0x04 Delayed answer ■ 0x08 Self-test (not currently supported) ■ 0x20 Device List update ■ 0x40 Network Manager Reset In Progress ■ 0x80 Start-up phase
2	Extended Lists Changes (Device-specific status 2)	<ul style="list-style-type: none"> ■ 0x01 Instrument List Changed ■ 0x04 Active Device List changed
3	Cumulative Device Status (Device-specific status 3)	<ul style="list-style-type: none"> ■ 0x01 Primary Variable Out of Limits ■ 0x02 Non-Primary Variable Out of Limits ■ 0x04 Loop Current Saturated ■ 0x08 Loop Current Fixed ■ 0x10 More Status Available ■ 0x20 Cold Start ■ 0x40 Configuration Changed ■ 0x80 Device malfunction
4	Cumulative Extended Device Status (Device-specific status 4)	<ul style="list-style-type: none"> ■ 0x01 Maintenance Required ■ 0x02 Device Variable Alert ■ 0x04 Critical Power Failure
5	Device Operation in Progress (Device-specific status 5)	<ul style="list-style-type: none"> ■ 0x02 "Configuration Changed bit reset" procedure ■ 0x04 "Sub-Device update" procedure ■ 0x08 "Device update" procedure
6	Extended device status	Not relevant for Gateway, always set to "0"
7	Device operating mode	For future expansions, always set to "0"
8	Standardized status 0	<ul style="list-style-type: none"> ■ 0x01 Simulation active The device is in simulation mode and one or more of its device variables are not representative of the process. ■ 0x02 Non-volatile memory defect The non-volatile memory check is invalid or maybe corrupt, or the battery of a battery-powered memory is defective ■ 0x04 Volatile memory defect The RAM memory check is invalid or maybe corrupt. ■ 0x08 Watchdog reset executed A watchdog reset has been executed. ■ 0x10 Power supply conditions out of range The power supply is outside its allowable range. ■ 0x20 Environmental conditions out of range An internal or environmental condition is beyond acceptable limits. ■ 0x40 Electronic defect A hardware problem not related to the sensor has been detected.
9	Standardized status 1	For future expansions, always set to "0"
10	Analog channel saturated	Not relevant for Gateway, always set to "0"
11	Standardized status 2	<ul style="list-style-type: none"> ■ 0x01 Sub-device list changed When set, the I/O system has lost communication with one of its sub-devices or discovered a new sub-device. This bit is reset if command 74 "Number of devices detected" is issued. The current sub-device list is read using command 84. ■ 0x02 Duplicate master detected The adapter has discovered another master with the same address connected to its token-passing interface.

A.3.4 Read Discrete Inputs

HART Specification 285 describes the requirements for discrete and hybrid field devices. A discrete device will return discrete values only. A hybrid device may return both analog and discrete values. Discrete inputs are read by means of HART Command 64,386, which returns a block of discrete variables (values and status). The length of the data string depends upon the device polled. For further details, please consult the device manual.

Request Data Bytes		
Byte	Format	Description
0-1	Unsigned16	Index of First Discrete Variable to read
2	Unsigned8	Number of Discrete Variables to read (n)
Response Data Bytes		
Byte	Format	Description
0-1	Unsigned16	Index of first Discrete Variable Returned
2	Unsigned8	Number of Discrete Variables returned (n)
3	Bits-8	Extended Device Status
4-7	Time	Time stamp for most recent change to Actual Value of first Discrete Variable Value
8-9	Unsigned16	First Discrete Variable Value
10	Bits-8	First Discrete Variable Status <ul style="list-style-type: none"> ■ 0x01: 1 = Discrete Variable in Simulation or Local Override ■ 0x02: 1 = Discrete Variable in Fault Mode ■ 0x02-0x04: Reserved, bit set to zero
11-12	Unsigned16	Second Discrete Variable Value
13	Bits-8	Second Discrete Variable Status
....		
3n+8-3n+9	Unsigned16	Last Discrete Variable Value
3n+10	Bits-8	Last Discrete Variable Status
Command-Specific Response Codes		
Code	Class	Description
0	Success	No Command-Specific Errors
1	Undefined	
2	Error	Invalid Selection
3-4	Undefined	
5	Error	Too Few data Bytes Received
6	Error	Device-Specific Command Error
7	Undefined	
7	Undefined	
8	Warning	Set to nearest value
9-15	Undefined	
16	Error	Access Restricted
17-127	Undefined	

B Appendix: CSV File Formats

B.1 Structure of CSV Files

When creating or editing CSV files for import into Fieldgate SWG70, the following rules apply:

- Use a semicolon ";" as separator for the values in the CSV file. If a value already contains a semicolon you must put the value into quote signs. If the value already contains quote signs, put the entire value into quote signs and replace the original quote signs with double quote signs.

Example!

The value - this is a "long tag" that contains quote signs - must be entered like this:
"this is a ""long tag"" that contains quote signs"

- Avoid special characters. They can easily be corrupted or they can cause the whole data row to be skipped during the import of the CSV file.
- Avoid leading blanks, trailing blanks, and tabs, especially for integer or hexadecimal values.
- Respect the data type of each column.
- If a mandatory column is missing, the whole file is rejected and nothing is imported.
- If a mandatory value is missing, the corresponding data row is skipped.

B.2 Modbus Mapping CSV files

The files for the MODBUS mapping contain the following columns

Expanded Device Type Code	Device ID	IO-Card	Channel	Long Tag	Register	Register Type	Information Code	Mapping Code
4 digits hex	6 digits hex	integer	integer	string [32]	integer	integer	integer	integer
-	-	-	-	mandatory	mandatory	mandatory	mandatory	mandatory

The data in the RegisterType, InformationCode, and MappingCode columns is encoded as described in the tables below.

Register Type Codes

Value	Description
1	Discrete Input
3	Input Register

Information Code Codes

Value	Description
0	HART Status (RegisterType Code = 3)
1	CMD 48 Status (RegisterType Code = 3)
2	Device Variables (RegisterType Code = 3)
3	MODBUS Status (RegisterType Code = 3)
4	Discrete Variables LSB (RegisterType Code = 1)
5	Discrete Variables MSB (RegisterType Code = 1)
6	Network Statistic (RegisterType Code = 3)

Note that the Mapping Code codes depend on the Information Code code, see Table overleaf.

Information Codes

Information Code	Value	Description
0 (HART Status)	0	Device Status
	1	Extended Device Status
	2	Device Status & Extended Device Status
1 (CMD 48 Status)	0 ... 12	CMD 48 status word to be mapped
	0	maps CMD 48 bytes 0&1
	1	maps CMD 48 bytes 2&3
	...	and so on
	12	maps CMD 48 byte 24 only
2 (Device Variable)	0 ... 242	Device Variables For more information on what device-specific information is available and on the device specific unit codes, see the manual of the subdevice.
	243	Battery Life
	244	Percent Range
	245	Loop Current
	246	Primary Variable
	247	Secondary Variable
	248	Tertiary Variable
	249	Quaternary Variable
	255	Slot 0 data time stamp
3 (MODBUS Status)	0	"Mod Stat" information
4 (Discrete Variable - LSB)	0 ... 255	Discrete Variable Index The least significant byte of the variable is mapped.
5 (Discrete Variable - MSB)	0 ... 255	Discrete Variable Index The most significant byte of the variable is mapped.
6 (Network Statistic)	0	Reliability
	1	Stability
	2	Latency
	3	Lost Upstream Packets
LSB: least significant byte, MSB: most significant byte		

B.3 Instrument List CSV files

The files for the instrument list contain the following columns.

Type Code	Device ID	IO-Card	Channel	Long Tag
4 digits hex	6 digits hex	integer	integer	string[32]
				mandatory

B.4 Topology View CSV file

The files for the topology view contain the following columns.

Expanded Device Type Code	Device ID	IO-Card	Channel	Long Tag	Units Code	Range	X-Coordinate	Y-Coordinate	Z-Coordinate
4 digits hex	6 digits hex	integer	integer	string[32]	integer	float	float	float	float
-	-	-	-	mandatory	-	mandatory	mandatory	-	-

Note that the X- and Y-origins of the background image are not part of the CSV file, as these coordinates are related to the background image.

B.5 Details

The files you can export under **Diagnostics > Wireless Communication > Details** contain the following columns. There are no mandatory columns as there is no import function. Nevertheless, you can export the data in CSV format for documentation.

Expanded Device Type Code	Device ID	IO-Card	Channel	Long Tag	Status	Device Status	Number Of Joins	Recent Join Date	Reliability	Latency	Neighbors	RSSI	Stability
4 digits hex	6 digits hex	integer	integer	string[32]	2 digits hex	2 digits hex	integer	yyyy: mm:dd hh:mm:ss	float	float	string[32]	integer	float

C Appendix: HART OPC Connection

C.1 HART OPC server

The HART OPC server is software which runs under Microsoft Windows and provides a standard OPC communications interface with HART-capable instrumentation.

The HART OPC server acts as a transport mechanism for communicating with HART devices. The interface via the server to the device is the same whether the device is connected directly to the PC or connected via some intermediate I/O system. While the intermediate I/O systems may vary, the interface to applications using the OPC server remains the same. It is possible to read out primary variables, send commands and parameterize a device using the HART server.

A main advantage of the HART OPC server is that access to the field devices is shared. Many OPC client applications (see Chapter 10.4) can access HART data from the same device or several different devices simultaneously. The OPC client can subscribe to the data item of interest. In addition, it is possible for the client, for example to only get the data item when it changes.

The HART OPC server is delivered with the product CD, see Chapter 7.4.1.

C.2 Creating an Ethernet network

- 1 Start the HART Server application.
Start => Programs => HART Server => HART Server

The last used project of the HART Server software will be opened automatically.

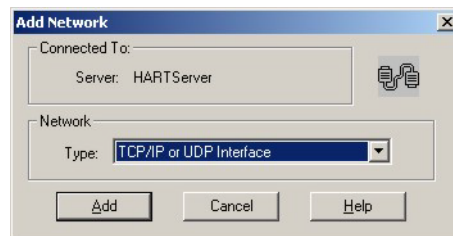
Alternatively, if an existing project opens, create a new project by selecting

File => New

- 2 Right-click on the HARTServer entry in the project window and select **Add Network**



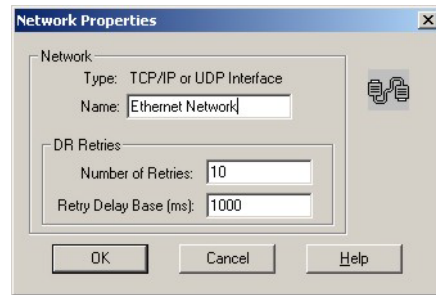
- 3 The **Add Network** window opens
 - Select the **TCP/UDP** from the drop-down menu



- Press **Add** to add the network to the project

NOTICE NOTE!

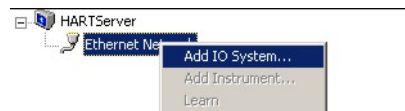
- Other choices are "Single port" (RS-232 to single or multidropped HART devices) or "Serial port RS-485" (RS-485 network to I/O system or multiplexer)
- The configuration of the "Single port" and "Serial port RS-485" options differs slightly from that of the Ethernet port

4 The **Network Properties** dialog opens

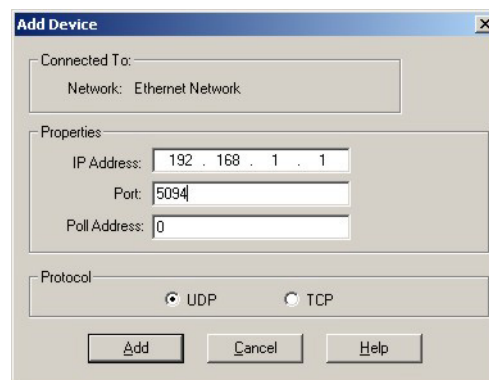
- Enter a network **Name**
- Enter the **Number of Retries**
- Enter the **Retry Delay Base** in ms
- Press **OK** to register the changes and add the network to your project

NOTICE**NOTE!**

- For "RS-485" you must enter a **Name**, **Address** (COM port), **Baudrate** and **Retries**.

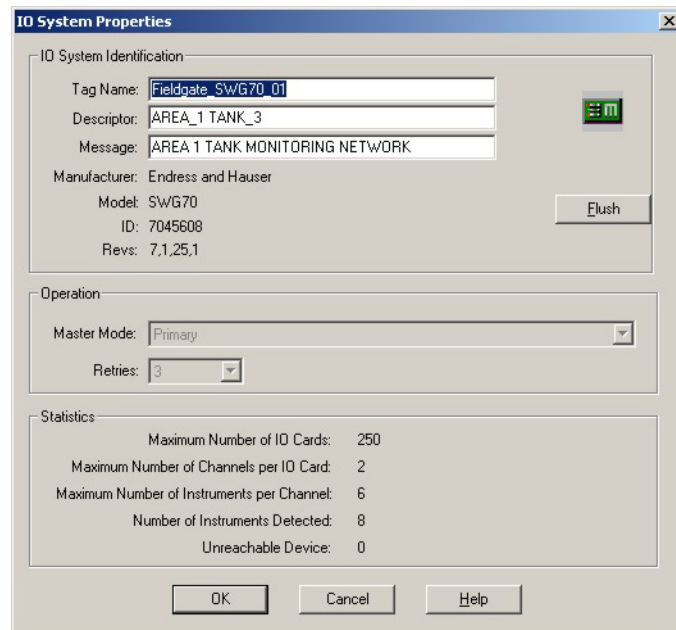
5 With Fieldgate SWG70 connected to the selected computer port, right click on the network and select **Add I/O system****NOTICE****NOTE!**

- For "RS-485" you can press **Add Multiplexer...** to invoke a similar procedure or **Learn** to automatically scan the network.

6 The **Add Device** dialog appears

- Enter the **IP Address** of Fieldgate SWG70 (default 192.168.1.1)
- Enter the **Port** (default 5094)
- Enter the **Poll Address** (= HART Polling Address, default 0)
- Select the **UDP** protocol
- Press **Add** to close the dialog and add the I/O system

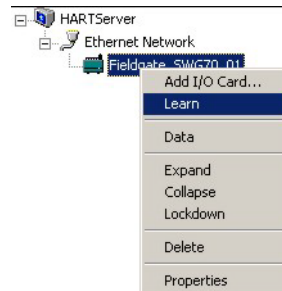
- 7 The **IO System Properties** dialog opens
 - Press **OK**



- 8 The I/O system is added to the project

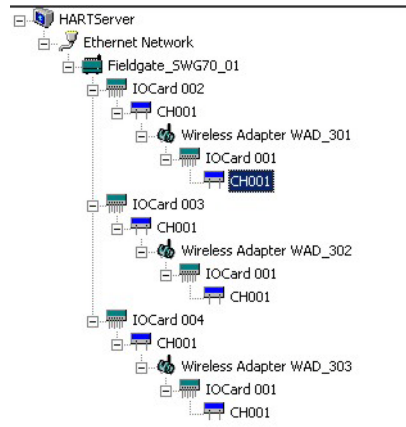


- 9 Now right-click on Fieldgate SWG70 node and select **Learn**



- The HART Server now scans the entire WirelessHART network
- Depending on how many devices are in the network, this may take some time

10 After scanning is complete, the network is added to Fieldgate SWG70 node:



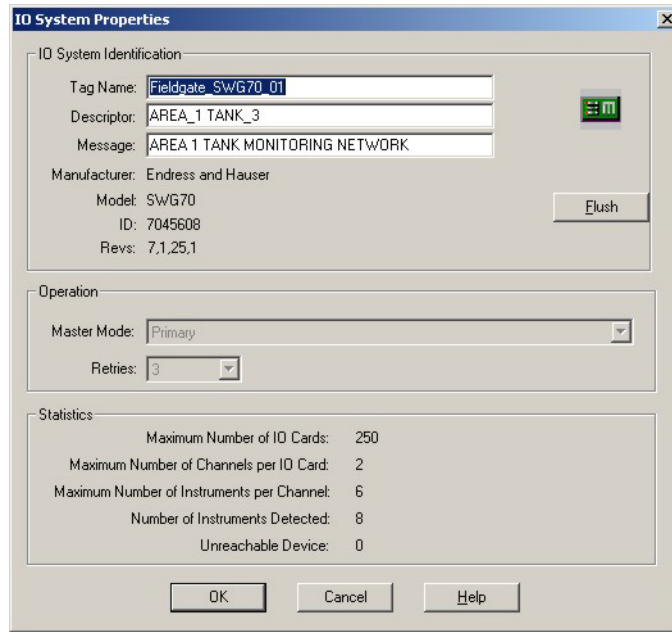
- The result should be similar to the screenshot above
- For more details on the structure, see Chapter 3.3.1.

C.3 Viewing and editing device properties

The HART server allows you to view and edit device properties at different levels of the network

C.3.1 Fieldgate properties

- 1 Right click on Fieldgate SWG70 node in the network and select properties
 - The **IO System Properties** dialog opens



- 2 Gray fields are parameters loaded from Fieldgate SWG70 memory
- 3 White fields can be edited
 - To store changes, press **Flush** followed by **OK**
 - **Cancel** closes the dialogue and discards any changes
 - The significance of the parameters can be taken from the table below

IO System Properties

Parameter	Meaning
IO System Identification	
Tag Name	A string identifying Fieldgate SWG70 - up to 32 characters.
Descriptor	Additional user text describing, e.g. function or location of adapter - up to 16 characters
Message	User message, transmitted with information from Fieldgate SWG70 up to 32 characters
Manufacturer	Indicates manufacturer of Fieldgate SWG70
Model	Indicates device type string name
ID	Indicates device identification
Revs	Indicates HART Universal, Device, Software and Hardware Revisions
Operation	
Master Mode	Indicates whether Fieldgate SWG70 is a primary or secondary HART host
Retries	Indicates number of retries for HART communication
Statistics	
Maximum Number of IO Cards	Maximum number of cards offered by Fieldgate SWG70
Maximum Number of IO Channels per IO Card	Maximum number of IO loops (channels) that can be connected to each card
Maximum Number of Instruments per Channel	Maximum number of instruments that fieldgate can store data for per channel
Number of Instruments Detected	Number of instruments currently connected to Fieldgate SWG70
Unreachable Device	Number of devices which were connected to Fieldgate SWG70 but are currently not available

C.3.2 Adapter properties

- 1 Click on the first **CH001** node in the first branch then right click on the **Adapter Long Tag** that appears in the right workspace and select **Properties**
- 2 The **Adapter Properties** dialog opens

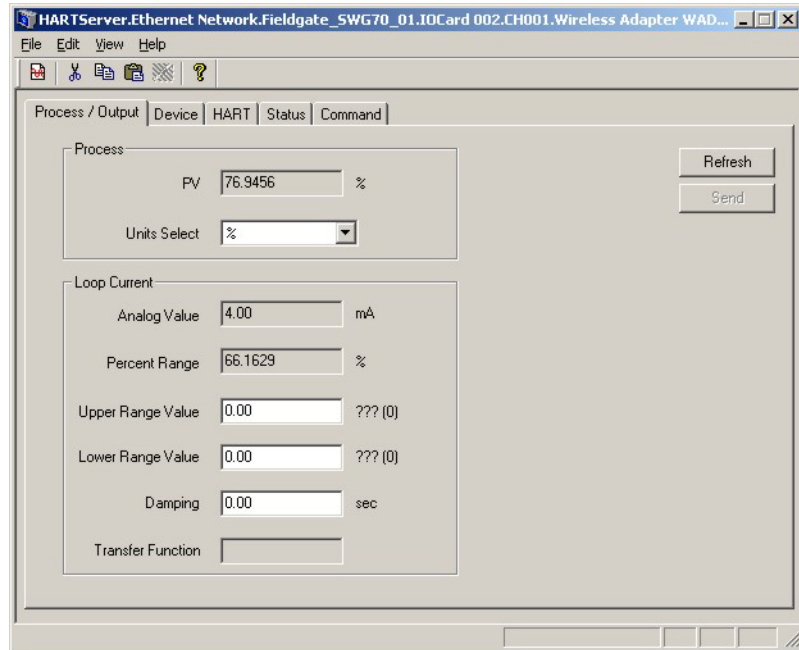
The significance of the parameters can be taken from the table below

IO System Properties

Parameter	Meaning
Adapter Identification	
Tag Name	A string identifying Fieldgate SWG70 - up to 32 characters.
Descriptor	Additional user text describing, e.g. function or location of adapter - up to 16 characters
Message	User message, transmitted with information from Fieldgate SWG70 up to 32 characters
Manufacturer	Indicates manufacturer of Fieldgate SWG70
Model	Indicates device type string name
ID	Indicates device identification
Revs	Indicates Universal Revision, Device Revision, Software Revision, Hardware Revision
Properties	
Poll Address	HART bus address
Date	Date on which the adapter was manufactured
Number of Preambles	Number of preambles for HART communication
Operation	
Master Mode	Indicates whether the adapter is a primary or secondary HART host
Retries	Indicates number of retries for HART communication
Statistics	
Maximum Number of IO Cards	Maximum number of cards offered by the adapter
Maximum Number of IO Channels per IO Card	Maximum number of IO loops (channels) that can be connected to each card
Maximum Number of Instruments per Channel	Maximum number of instruments that adapter can store data for per channel (in multidrop mode)
Number of Instruments Detected	Number of instruments currently connected to the adapter

C.3.3 Device properties

- 1 Click on the second **CH001** node in the first branch then right click on the **Device Long Tag** that appears in the right workspace and select **Properties**
 - For HART Multidrop, several devices may appear
- 2 The **Device Properties** dialog opens at the **Process/Output** tab
This contains information on the primary value and loop current



- Gray fields are parameters loaded from the device memory
- White fields can be edited, to store changes, press **Send**

- 3 The significance of the parameters can be taken from the table below

Process/Output parameters

Parameter	Meaning
Process	
PV	Indicates the current value of the primary variable
Unit select	Indicates/changes the unit of the primary variable
Loop Current	
Analog Value	Loop-current measured by adapter (always 4 mA for HART multidrop)
Percent Range	Primary value expressed as percentage of range
Upper Range Value	Indicates/changes upper range value of device
Lower Range Value	Indicates/changes lower range value of device
Damping	Indicates/changes output damping of device
Transfer Function	Indicates the type of characteristic used to convert current (mA) to engineering units

- 4 Press the **Device** tab to open the **Device** dialog
This contains information on the tagging and range of the device

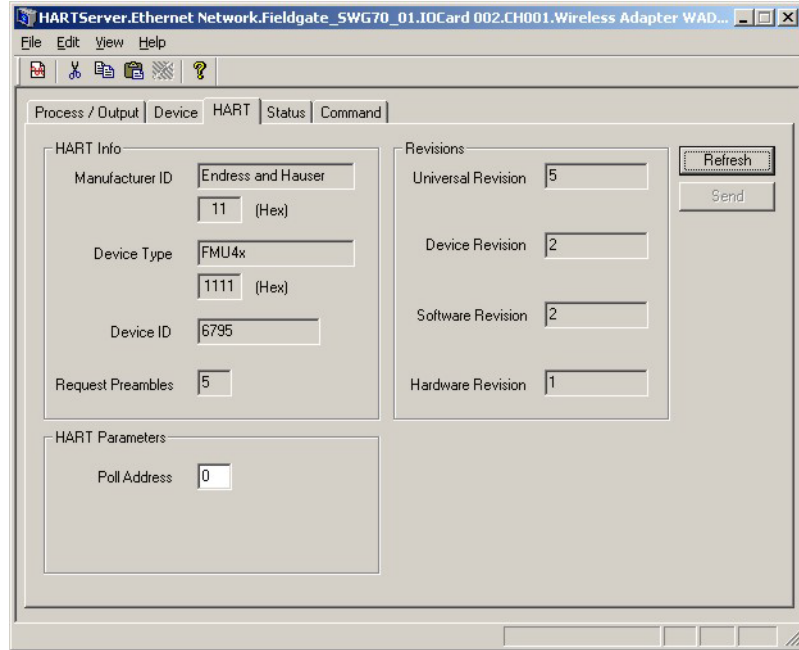
- Gray fields are parameters loaded from the device memory
- White fields can be edited, to store changes, press **Send**

- 5 The significance of the parameters can be taken from the table below

Device parameters

Parameter	Meaning
Device Info	
Message	User message, transmitted with information from the device – up to 32 characters
Tag	String identifying the device - up to 8 characters if "Use Start Tag" is ticked, otherwise 32
Descriptor	Additional user text describing, e.g. function or location of device – up to 16 characters
Date	Indicates the date
Final Assembly Number	Indicates assembly number of device
Write Protect	Indicates whether write protect is in operation
Private Label Distributer	Indicates label of a private distributor
Sensor Serial Number	Indicates sensor serial number
Sensor Info	
Upper Sensor Limit	Indicates maximum value of the process variable that can be measured by the device
Lower Sensor Limit	Indicates minimum value of the process variable that can be measured by the device
Minimum Span	Indicates minimum span that can be set at the device
Standard Procedures	
Self Test	Press to initiate self-test of device
Loop Test	Press to initiate test of loop to which the device is connected
Master Reset	Press to reset the device and restore all factory settings
DAC Trim	Trims the loop (DAC = Digital to Analog Converter)

- 6 Press the **HART** tab to open the **HART** dialog
This contains information on the device hardware and software



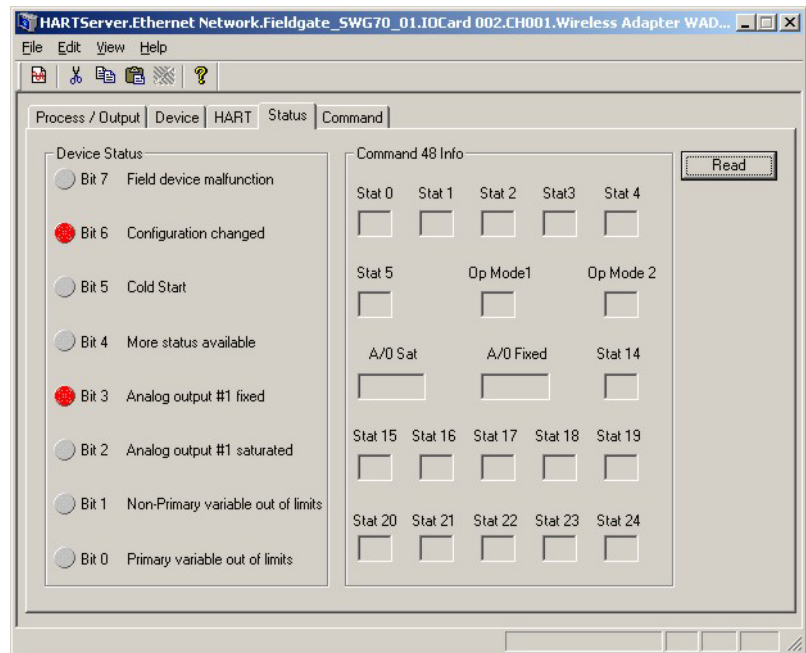
- Gray fields are parameters loaded from the device memory
- White fields can be edited, to store changes, press **Send**

- 7 The significance of the parameters can be taken from the table below

HART parameters

Parameter	Meaning
HART Info	
Manufacturer ID	Indicates manufacturer ID of the device in plain text and as a hexadecimal number
Device Type	Indicates type of the device in plain text and as a hexadecimal number
Device ID	Indicates device ID as a hexadecimal number
Request preambles	Indicates number of preambles for HART communication
HART Parameters	
Poll Address	HART bus address
Revisions	
Universal Revision	Indicates universal revision of the device
Device Revision	Indicates device revision of the device
Software Revision	Indicates software revision of the device
Hardware Revision	Indicates hardware revision of the device

- 8 Press the **Status** tab to open the **Status** dialog
This indicates the current status of the device



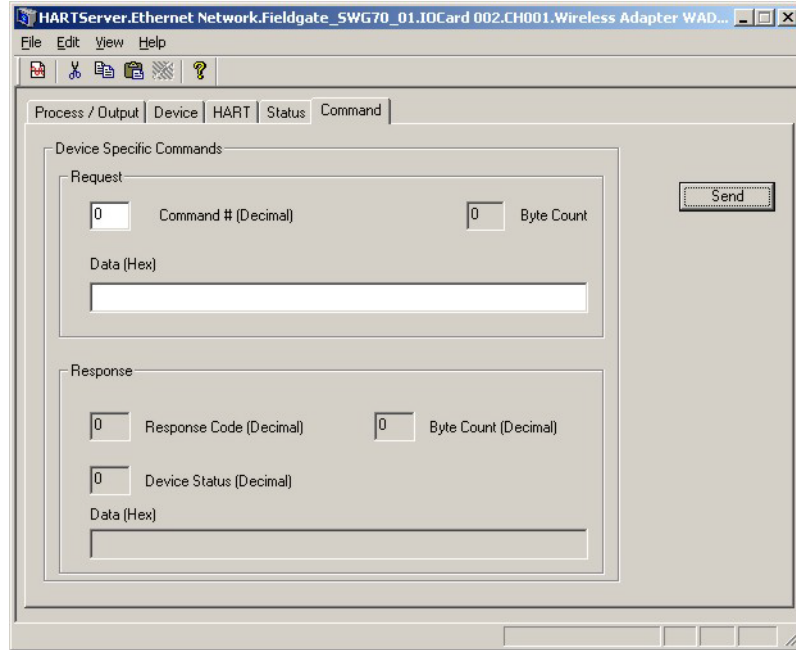
- Gray fields are parameters loaded from the device memory
- Press **Read** to refresh the display

- 9 The significance of the parameters can be taken from the table below

Status parameters

Parameter	Meaning
Device Status	
Bit 0 to Bit 7	Standard HART status information - A red dot indicates that the status is currently active
Command 48 Info	
...	Indicates information received by when Command 48 is sent to the device - More information is available in the device manual

- 10 Press the **Command** tab to open the **Command** dialog
 This allows a HART command to be sent to the device and the results to be displayed



- Gray fields are parameters received from the device
- White fields can be edited, send the command, press **Send**

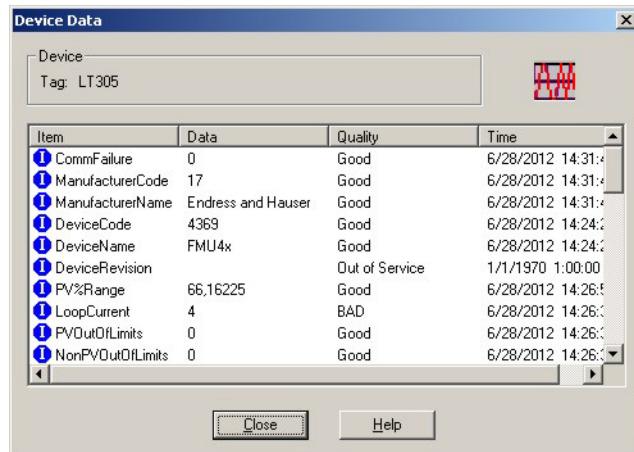
- 11 The significance of the parameters can be taken from the table below

Command parameters

Parameter	Meaning
Request	
Command # (decimal)	Enter the number of the command to be sent - The device must support this command
Byte Count	Indicates number of bytes sent with the command
Data (hex)	Data, if any, to be sent with the command
Response	
Response Code (decimal)	Indicates the command sent as a response to the request
Byte Count	Indicates number of bytes sent with the command
Device Staus (hex)	Indicates status of the device
Data (hex)	Data received as the response

C.3.4 Device data

- 1 Select a channel entry (CHx) beneath the gateway in the project window, Chapter B.3.1, Step 10
 - In the right part of the application window, you can see the device connected to the selected channel.
- 2 Right-click on the device
 - Select **Data** from the context menu.
- 3 The Device Data window opens and displays all OPC data items

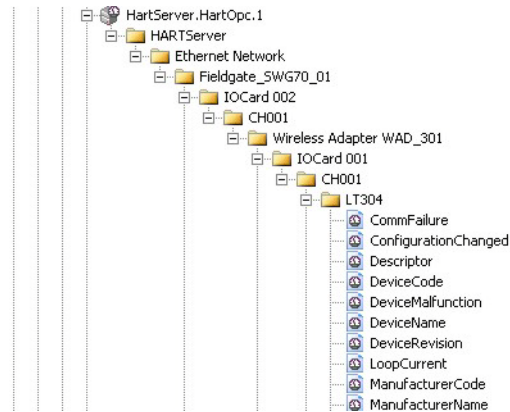


- 4 Close the window by pressing **Close**

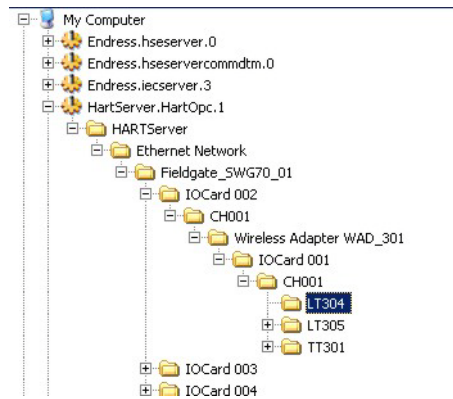
C.4 OPC client

The HART OPC Server can be used by any OPC Client Application to bring data into, e.g. a SCADA application. The example below uses the Data Spy client to view the data. This is supplied with ControlCare Application Designer and is part of ControlCare P View.

- 1 Open the client directly via **Start => Program => ...** or from the SCADA application
- 2 Expand the tree under **HartServer.HartOpc.1** down to the instrument tags



- 3 Select the Instrument Tag and click the "686" icon in the manu bar
– The **Select an OPC Item** dialog appears
- 4 Expand the tree down to the Instrument Tag again



5 Select the tag then press **OK**, the instrument data are displayed

Name	Full Item Id
<input type="checkbox"/> CommFailure	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.CommFailure
<input type="checkbox"/> ConfigurationChanged	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.ConfigurationChanged
<input type="checkbox"/> Descriptor	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.Descriptor
<input type="checkbox"/> DeviceCode	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.DeviceCode
<input type="checkbox"/> DeviceMalfunction	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.DeviceMalfunction
<input type="checkbox"/> DeviceName	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.DeviceName
<input type="checkbox"/> DeviceRevision	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.DeviceRevision
<input type="checkbox"/> LoopCurrent	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.LoopCurrent
<input type="checkbox"/> ManufacturerCode	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.ManufacturerCode
<input type="checkbox"/> ManufacturerName	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.ManufacturerName
<input type="checkbox"/> Message	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.Message
<input type="checkbox"/> MoreStatusAvailable	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.MoreStatusAvailable
<input type="checkbox"/> MoreStatusString	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.MoreStatusString
<input type="checkbox"/> NonPVOutOfLimits	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.NonPVOutOfLimits
<input type="checkbox"/> PV	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PV
<input type="checkbox"/> PV%Range	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PV%Range
<input type="checkbox"/> PVAnalogOutFixed	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVAnalogOutFixed
<input type="checkbox"/> PVAnalogOutSaturated	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVAnalogOutSaturated
<input type="checkbox"/> PVDamping	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVDamping
<input type="checkbox"/> PVHighRange	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVHighRange
<input type="checkbox"/> PVLowRange	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVLowRange
<input type="checkbox"/> PVLowerSensorLimit	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVLowerSensorLimit
<input type="checkbox"/> PVMinimumSpan	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVMinimumSpan
<input type="checkbox"/> PVOutOfLimits	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVOutOfLimits
<input type="checkbox"/> PVUnitString	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVUnitString
<input type="checkbox"/> PVUnits	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVUnits
<input type="checkbox"/> PVUpperSensorLimit	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.PVUpperSensorLimit
<input type="checkbox"/> QV	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.QV
<input type="checkbox"/> QVUnitString	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.QVUnitString
<input type="checkbox"/> QVUnits	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.QVUnits
<input type="checkbox"/> SV	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.SV
<input type="checkbox"/> SVUnitString	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.SVUnitString
<input type="checkbox"/> SVUnits	HARTServer.Ethernet.Network.Fieldgate_SWG70_01.IOCard 002.CH001.Wireless Adapter WAD_301.IOCard 001.CH001.LT304.SVUnits

For more information on using OPC data , see the P View operating manual.

D Appendix: ANATEL Approval

"Este produto está homologado pela ANATEL, de acordo com os procedimentos regulamentados pela Resolução 242/2000, e atende aos requisitos técnicos aplicados."

Para maiores informações, consulte o site da ANATEL www.anatel.gov.br



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