Operating Instructions
FieldGate SWG50

Functional WirelessHART Gateway

Endress+Hauser **EH**

People for Process Automation

Table of contents

1   About this document

1.1   Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2   Symbols

1.2.1   Safety symbols

⚠ 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.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2   Symbols for certain types of information

Symbol	Meaning
☑	**Permitted** Procedures, processes or actions that are permitted.
☑☑	**Preferred** Procedures, processes or actions that are preferred.
✖	**Forbidden** Procedures, processes or actions that are forbidden.
🛈	**Tip** Indicates additional information.
📖	Reference to documentation
📄	Reference to page
🖼	Reference to graphic

Symbol	Meaning
▶	Notice or individual step to be observed
1. , 2. , 3.…	Series of steps
∟▶	Result of a step
❓	Help in the event of a problem
👁	Visual inspection

1.3   Documentation

FieldGate SWG50 Technical Information TI01677S/04/EN

1.4   Registered trademarks

HART®, WirelessHART® is the registered trademark of the FieldComm Group, Austin, TX 78759, USA.

All other brand and product names are trademarks or registered trademarks of the companies and organizations in question.

2   Basic safety instructions

2.1   Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
▶ Are authorized by the plant owner/operator.
▶ Are familiar with federal/national regulations.
▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
▶ Follow the instructions in this manual.

2.2   Designated use

FieldGate SWG50 is a gateway for WirelessHART networks. It enables WirelessHART field devices to communicate with each another and manages network security and connectivity. The FieldGate SWG50 converts and stores data from wireless field devices in a format that is

compatible with other systems. It has Ethernet interfaces for connecting to host applications such as SCADA tools.

Incorrect use

Non-designated use can compromise safety. The manufacturer is not liable for damage caused by using the device incorrectly or for purposes for which it was not intended.

2.3 Workplace safety

For work on and with the device:
▶ Wear the required personal protective equipment according to federal/national regulations.

If working on and with the device with wet hands:
▶ Due to the increased risk of electric shock, gloves must be worn.

2.4 Operational safety

Risk of injury.
▶ Operate the device in proper technical condition and fail-safe condition only.
▶ The operator is responsible for interference-free operation of the device.

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.
▶ If, despite this, modifications are required, consult with Endress+Hauser.

Repair

To ensure continued operational safety and reliability,
▶ Carry out repairs on the device only if they are expressly permitted.
▶ Observe federal/national regulations pertaining to repair of an electrical device.
▶ Use original spare parts and accessories from Endress+Hauser only.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. The manufacturer confirms this by affixing the CE mark.

2.6 IT security

Our warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product and associated data transfer, must be implemented by the operators themselves in line with their security standards.

3   Product description

The FieldGate SWG50 is a functional WirelessHART gateway. It comprises a network manager application, a WirelessHART (access point) interface module and a gateway application. Up to 100 wireless or wired devices with WirelesssHART adapter can be connected to the FieldGate SWG50. The application supplies data from the WirelessHART network via Modbus TCP or HART-IP. A CommDTM makes it possible to configure the field devices or adapters connected to the WirelessHART network via their device DTMs.
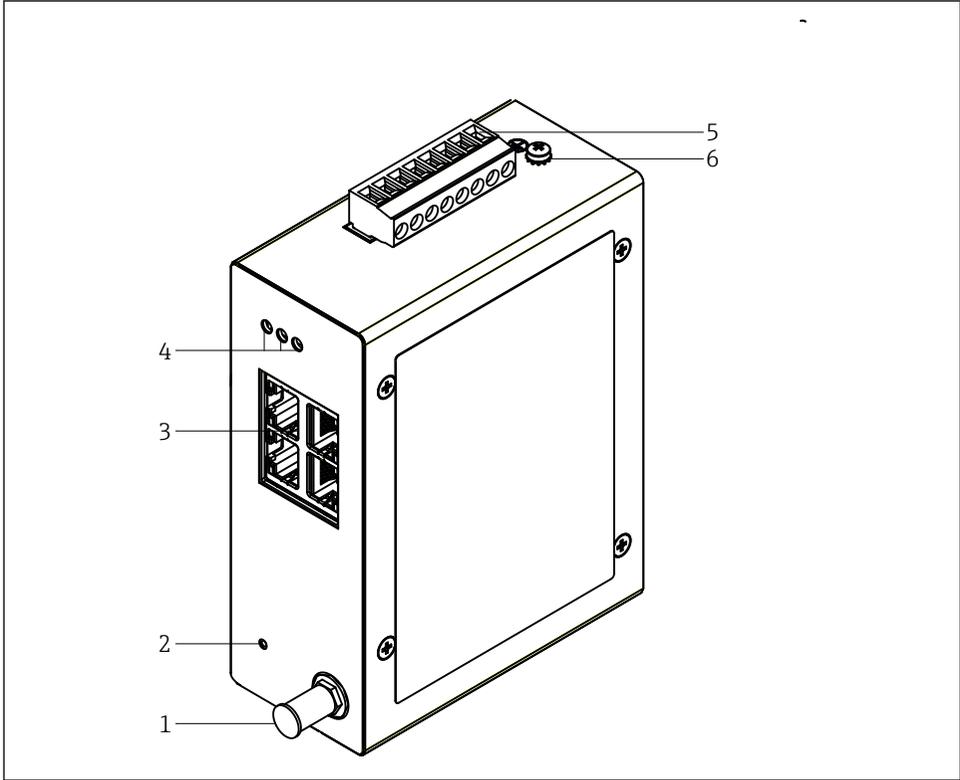
A0048889

🖼 *1   FieldGate SWG50*

1   Antenna connection
2   Reset button
3   4-port Ethernet switch (RJ45)
4   LEDs
5   Connector for power supply
6   Ground connection

3.1   Product design
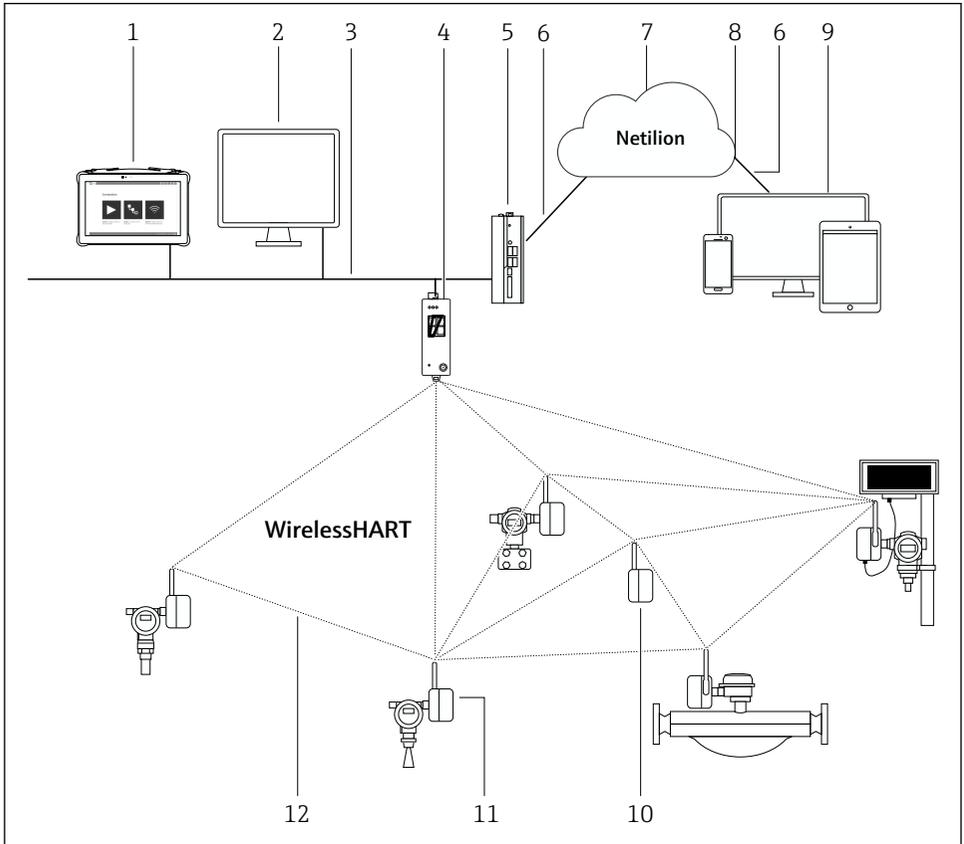
⊞ *2   Example of WirelessHART network architecture with FieldGate SWG50*

1   Endress+Hauser Field Xpert, e.g. SMTxx
2   Host application / FieldCare SFE500
3   Ethernet communication
4   FieldGate SWG50
5   FieldEdge SGC500
6   https Internet connection
7   Netilion Cloud
8   Application Programming Interface (API)
9   Browser-based Netilion Service app or user application
10   WirelessHART adapter SWA70 used as a repeater
11   HART field device with WirelessHART adapter SWA70
12   Encrypted wireless connection via WirelessHART

4   Incoming acceptance and product identification

4.1   Incoming acceptance

Visual inspection
- Check the packaging for visible damage arising from transportation
- Open the packaging carefully
- Check the contents for visible damage
- Check that the delivery is complete and nothing is missing
- Retain all the accompanying documents

ℹ️   The device may not be put into operation if the contents are found to be damaged
     beforehand. In this case, please contact your Endress+Hauser Sales Center:
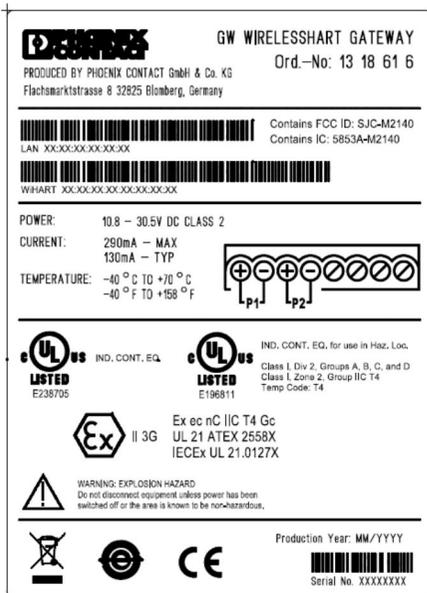   www.addresses.endress.com

     Return the device to Endress+Hauser in the original packaging where possible.

Scope of delivery
- FieldGate SWG50
- Operating Instructions with Safety Instructions

4.2   Product identification

4.2.1   Nameplate

🔲 *3*   *Phoenix Contact nameplate*

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Manufactured by PHOENIX CONTACT for
                          Endress+Hauser [EH]
FieldGate SWG50
Ser. no.:     T30001245A0
Order code:   SWG50-BB1
```
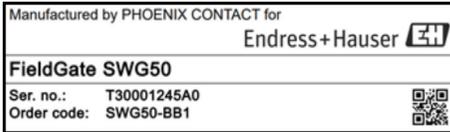
  🔲 *4   Endress+Hauser nameplate*

4.2.2   Manufacturer's address

PHOENIX CONTACT GmbH & Co. KG

Flachsmarktstraße 8

32825 Blomberg

Germany

www.phoenixcontact.com

4.3   Storage and transport

Always use the original packaging when transporting the product.

4.3.1   Storage temperature

−40 to 85 ℃

5   Mounting

5.1   Mounting requirements

The device must be installed in a housing that has a minimum protection rating of IP54 as per EN/IEC 60079-15. The device must be used only in areas with a maximum pollution degree of 2, as defined in EN/IEC 60664-1. The device can be installed in Zone 2 hazardous areas. Routing and remote installation of the antenna must comply with the relevant site regulations when installed in unclassified Zone 2 or Class I, Division 2 hazardous areas. Otherwise, the antenna must be installed within the end-use housing.

A remote antenna can be mounted outside a cabinet. If there is a risk of lightning, install lightning/EMP protection between the gateway and the remote antenna.

5.2   Mounting the device

The FieldGate SWG50 is mounted on an NS 35 mounting rail. To prevent the device from slipping, end clamps must be mounted on both sides. The device can be mounted either horizontally or vertically. The modules are mounted on the mounting rail from left to right.
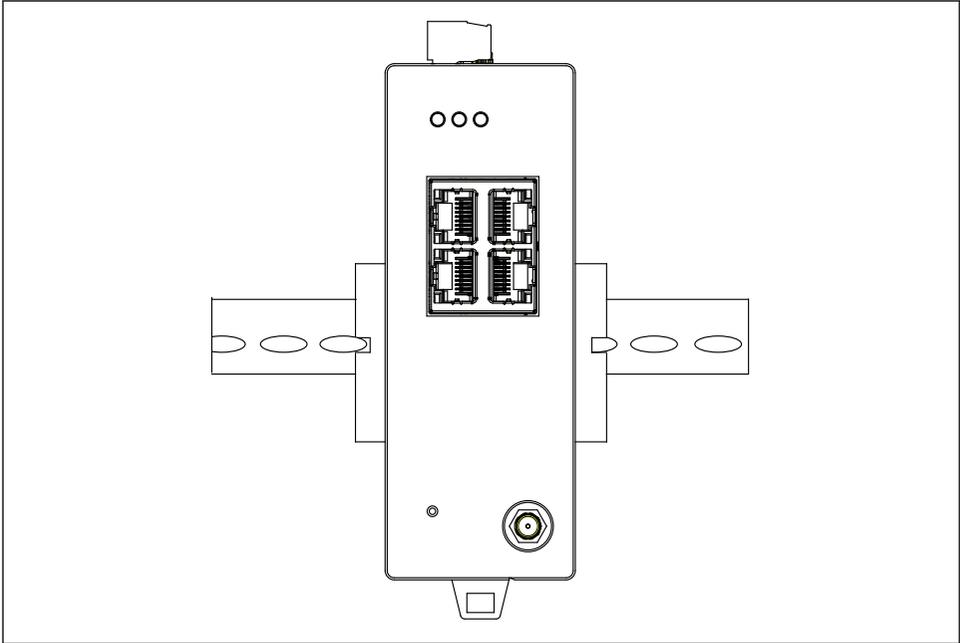
A0048928

⊡ *5   Mounting on a standard DIN rail*

Mounting the device

1.
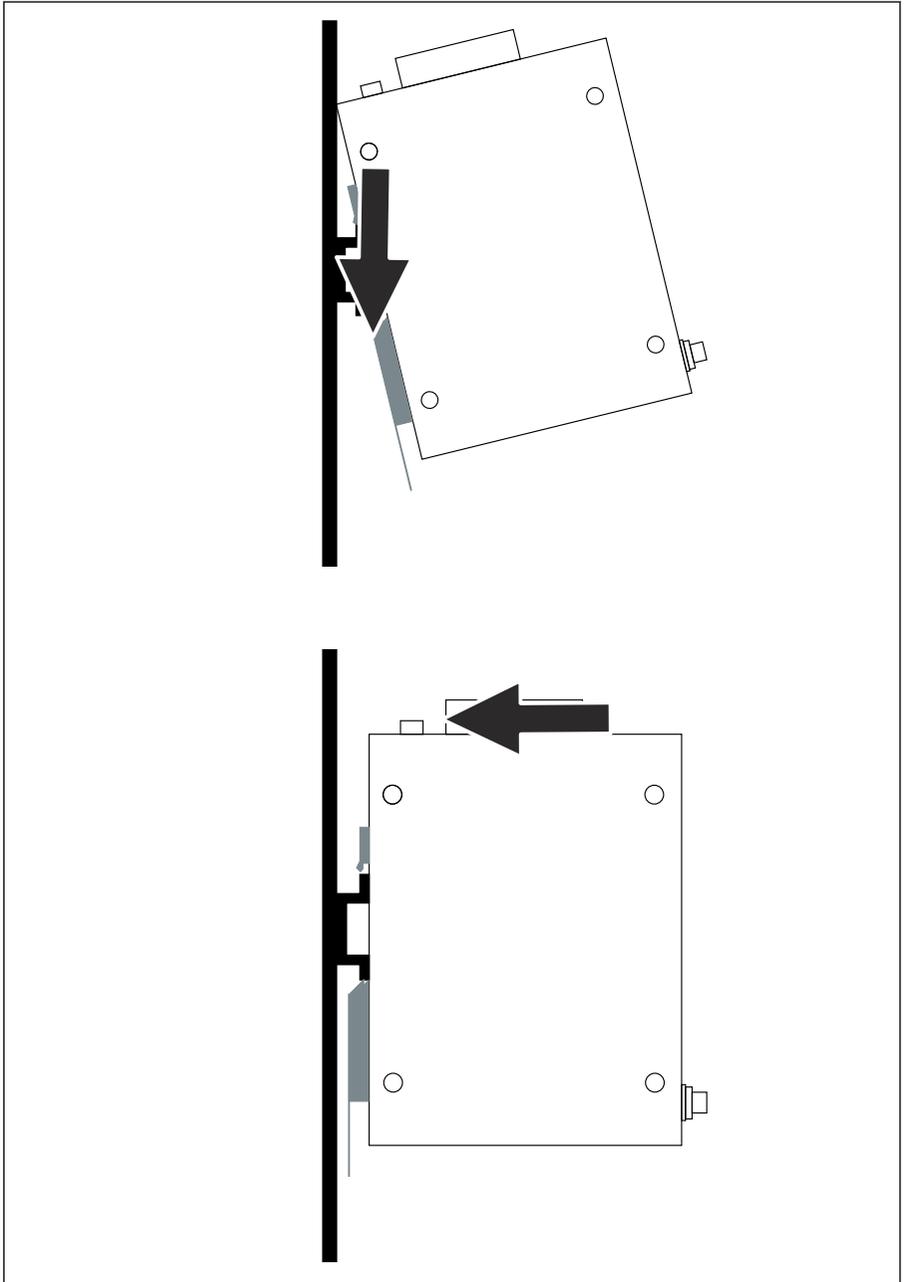
A0048933

Position the keyway on the mounting rail.

2. Push the device back until it locks into place.

3. Ground the mounting rail.

5.3   Post-mounting check

Is the device properly attached to the mounting rail?

6   Electrical connection

6.1   Connecting requirements

6.1.1   Power supply

Connect a regulated class 2 DC power source to the gateway. The supply voltage can be from 10.8 to 30 V_{DC}, with a recommended nominal voltage of either 12 V_{DC} or 24 V_{DC}. The power supply must be able to supply 290 mA current at 24 V_{DC}. External connecting cables must be used in accordance with NEC, ANSI/NFPA70 (for US applications) and Canadian Electrical Code, Part 1, CSA C22.1 (for Canadian applications) or in accordance with local country codes for all other countries.

The control cabinet or switch box must meet the specifications of EN 60950-1: 2001 for fire enclosures.

The power supply to the device must meet the following requirements:
- Class 2 circuit in accordance with National Electrical Code, NFPA-70 and Canadian Electrical
- Limited Power Supply (LPS) as per EN/IEC 60950-1 or EN/IEC 62368-1
- Limited-energy circuits EN/IEC 61010-1

6.1.2   Ethernet

The FieldGate SWG50 has an Ethernet interface (RJ45) on the front for connecting a twisted-pair cable with an impedance of 100 Ω. Data transmission is 10, 100 or 1 000 Mbit/s. Slide the Ethernet cable with the RJ45 connector into the device until it locks into place. When two, three or four Ethernet ports are used, the FieldGate SWG50 is classified as a switch. If only one port is used, it is a straightforward end-node device. The maximum number of linked gateways and the maximum distance between the units are based on the Ethernet standards and are determined by the environment and the compliance of the network with the standard.

6.2   Connecting the device
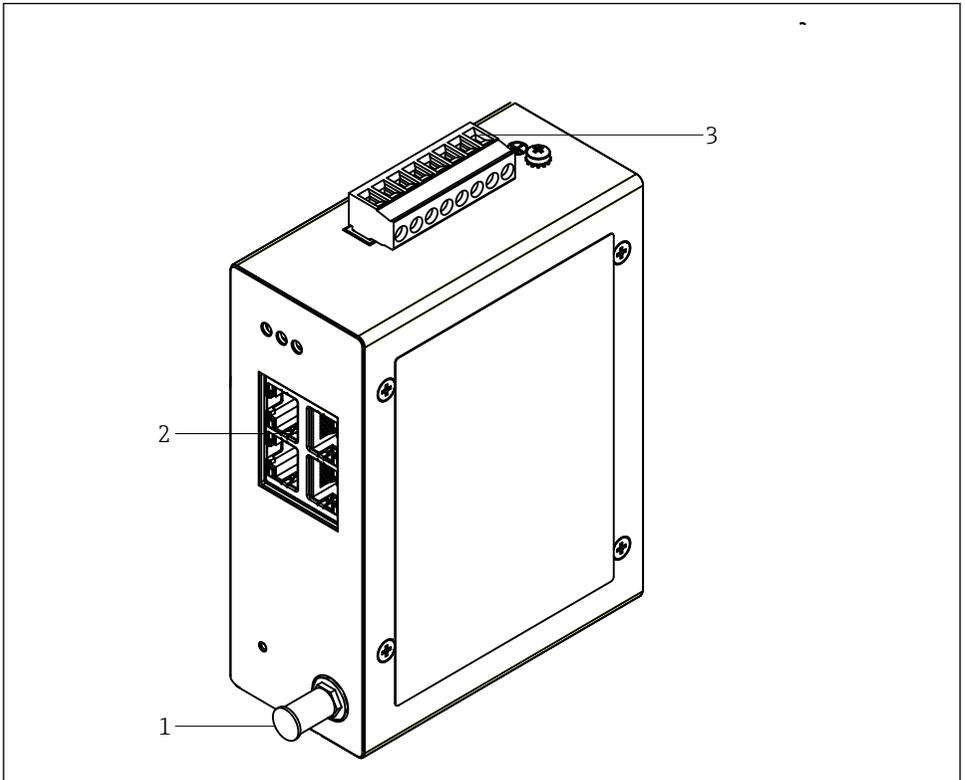
A0050154

1   Antenna
2   Ethernet
3   Power supply

Power supply
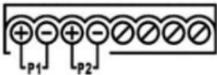
P1   10.8 to 30 V$_{DC}$
P2   10.8 to 30 V$_{DC}$

6.3   Special connection instructions

6.3.1   Antenna

The device is equipped with an RSMA antenna socket for connecting an external antenna. Install the antenna outside the cabinet or building. The maximum permitted HF line as per federal, state and local regulations must be observed. Use antenna and cables that are recommended by the manufacturer.

6.4   Post-connection check

- Are the device and cable undamaged (visual check)?
- Do the cables used comply with the requirements?
- Is the terminal assignment correct?
- Have the cables been connected in such a way that no wires, insulation and / or cable shields are jammed?
- Is the supply voltage correct?
- Is the FieldPort SWG50 grounded, if necessary?

7   Operation options

The FieldGate SWG50 has an integrated web server with which the WirelessHART network is configured.
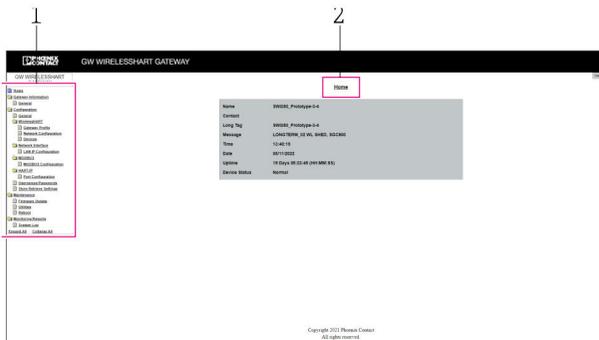
🖻 *6   Start screen*

1   Navigation bar
2   Page name

7.1   Overview of operation options

7.1.1   Overview of start screen

After login, the start screen appears with basic information about the FieldGate SWG50.

☑ 7 *Gateway information*

Field	Description
Name	Information about the gateway and location.
Contact	Person responsible for operating the device.
Long Tag	Identification of device in the WirelessHART network, can be identical to the **Name** field.
Message	Notification about the device or network.
Time	Internal device time.
Data	Internal device date.
Uptime	Length of time device is in operation since last power-up.
Device Status	Current operating status of device and error messages.

7.1.2 Overview of general information

▶ In the Navigation menu, click **Gateway Information -> General**.
  ↳ The **General Information** dialog box appears.

Field	Description
LAN IP Address	IP address uniquely identifies this device with the LAN.
LAN Subnet Mask	IP subnet mask for this device in the LAN.
LAN Default Gateway	IP address of default gateway.
LAN MAC Adresse	Media Access Control (MAC) address of LAN network card.

Field	Description
WirelessHART AP MAC-Address	Media Access Control (MAC) address of WirelessHART interface module.
Firmware Version	Software version in device
Hardware Version	Device version

7.1.3   Overview of basic configuration

Changing the data displayed on the home screen

1. In the Navigation menu, click **Configuration -> General**.
   ↳ The **General Configuration** dialog box appears.

2. Make any necessary changes.
3. Click **Submit**.

The changes are accepted.

> - Long Tag: maximum 32 characters (excess characters will be truncated following restart).
> - Message: maximum 32, only capital letters, numbers and certain special characters

Configuring the time manually

1. Make any necessary changes.
2. Click **Update System Time**.

7.1.4   Configuring the WirelessHART profile

1. In the Navigation menu, click **Configuration -> WirelessHART -> Gateway Profil**.
    ↳ The **WirelessHART Gateway Profile Configuration** dialog box appears.
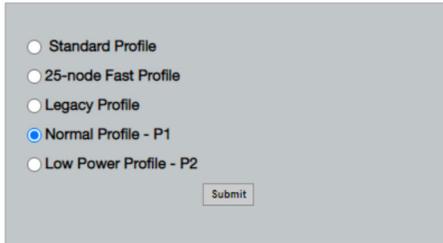
2. Make changes and click **Submit**.
    ↳ The changes are accepted automatically.

Profile	Description	Upload	Download	Commercial traffic
Default	Standard WirelessHART frame	Standard	Standard	Standard
25-note Fast Profile	Faster update, recommended for time-critical applications.	128	128	128
Legacy Profile	For networks consisting of loop-powered WirelessHART adapters, to reduce power consumption.	1024	256	128
Normal Profile - P1	Enables the supply of approx. 4.5 pkt/s through the gateway into the network.	1024	256	128
Low Power Profile - P2	Reduces the FieldGate SWG50 to one eighth of downstream capacity. Battery power may be saved but the network setup takes longer and significantly reduces application bandwidth downstream.	1024	2048	128

7.1.5 Configuring the WirelessHART network

▶ In the Navigation menu, click **Configuration -> WirelessHART -> Network Configuration**.
  ↳ The **Network Configuration** dialog box appears.
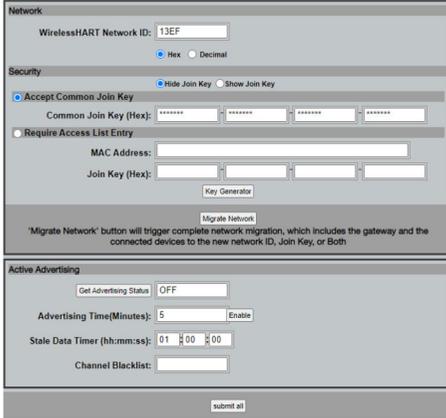
Field	Field	Description
Network	WirelessHART Network ID	In hexadecimal or decimal format, depending on setting.
Security	Hide/Show Join Key	Displays or hides the password.
	Accept Common Join Key Common Join Key (Hex)	Activates general network password. General network password in hexadecimal format (32 characters).
	Required Access List Entry MAC Address Join Key (Hex)	Enables access via an external join list in addition to a network password. List of MAC addresses of all permitted devices. Key in hexadecimal format (32 characters).
	Key generator	Automatically generates a random network password.
	Migrate Network	Migration of entire device network. The network ID and/or network password of all connected WirelessHART network subscribers is migrated.

Field	Field	Description
Active Advertising	Get Advertising Status	Status, whether Active Advertising is enabled or not.
	Advertising Time	The time period for which Active Advertising is to be enabled. Enabled via the **Enable** key.
	Stale Data Timer	Data from WirelessHart field devices is cached in the gateway. This allows the gateway to respond quickly to host requests without having to constantly query new device data. To ensure the validity of the cached data, each data point is time-stamped. If the cached data is not updated within the **Stale Data Timer** interval, a request is sent to the relevant field device (HART IP request) or a Modbus exception is generated and the saved data is deleted (Modbus). → 🕮 22 Recommended setting for **Stale Data Timer** is three times the burst rate of the field devices. If no bursts are active, it is advisable to set it to three times the desired update time.
	Channel Blacklist	Manages blocked WirelessHART channels.

Channel blacklist

The blacklist can be used to limit the number of channels used in a network. Any channels included in the blacklist are not used. The respective frequency of the channel must be entered in the blacklist. The channels must be blacklisted in pairs.

Channel	Frequency
1	2405
2	2410
3	2415
4	2420
5	2425

Channel	Frequency
6	2430
7	2435
8	2440
9	2445
10	2450
11	2455
12	2460
13	2465
14	2470
15	2475

7.1.6 Caching commands

The FieldGate SWG50 stores a number of commands in the cache. The validity of the stored data depends on the **Stale Data Timer**. → 🗎 20

Command	Description
3, 778	These commands are used to fill the **Devices** page in the web server and in the Modbus register. It is expected that most field devices will burst these commands. The gateway generates a request to update this cached data if it is older than 1/3 of the **Stale Data Timer** interval. For this reason, the "Stale Data Timer" interval should be set to three times the burst rate of the field devices. ℹ️ If the burst rate of the field devices is one minute, the "Stale Data Timer" interval should be set to three minutes.
1, 2, 9, 42, 48, 76, 89, 93, 95, 512, 769, 779, 781, 796, 798, 804, 808, 810, 817, 822, 833, 1793, 1794	These commands are cached by the gateway. If this data is older than the **Stale Data Timer** interval, the gateway forwards a request to the field device and renews the cached data.
0, 7, 8, 11, 12, 13, 14, 15, 16, 20, 21, 35, 74, 75, 84, 101, 105, 774, 776, 778	These commands are cached by the gateway and regarded as "static". They are updated only if an update is triggered by a HART command. ℹ️ The receipt of a CMD 22 (Write Long Tag) response generates a CMD 20 (Read Long Tag) request.
0, 48	If these commands are sent from a HART IP client to a field device, the cached value is bypassed and a request is sent directly to the field device.

7.1.7   Device view

The device information page displays all data and the status of the devices in the WirelessHART network and is constantly updated.

Color	Description
Green	The WirelessHART device is functioning correctly, is connected to the network and has at least three neighbors.
Yellow	The WirelessHART device is functioning correctly, is connected to the network and has less than three neighbors.
Orange	The HART device is connected to the WirelessHART adapter shown above it.
Red	The device is no longer communicating with the WirelessHART network.

▶ In the Navigation menu, click **Configuration -> WirelessHART -> Devices**.
  ↳ The **Device Information** dialog box appears.

ℹ️ For improved performance, web page caching must be disabled in the browser. The following description applies to Internet Explorer 11.

Disabling web page caching

1. In the Internet Explorer, click the **Settings** symbol.
2. In the menu, click **Internet options**.
3. Under **Browsing history** in the **General** tab, click **Settings**.
4. In the **Temporary Internet Files** tab, select **Every time I visit the webpage**.
5. In the **Caches and databases** tab, do not enable **Allow website caches and databases**.
6. Click **OK**.

ℹ️ When using Chrome or Firefox browsers, disable the web page cache here too.
It advisable to use Chrome or Firefox browsers with the web page cache disabled.

Field	Description
Device ID	Identification number of the WirelessHART device
Device Tag	Long tag of HART device.
	ℹ️ Long tags are supported only from HART 6. Older devices, such as HART 5 devices, must be labeled via the **Message** field. For a HART 5 device connected in a WirelessHART network, the WirelessHART gateway emulates the long tag with the **Message** field.
MAC Address	MAC address of WirelessHART device or adapter.
Status	Device status
PV/SV/TV/QV	Displays the process variables of the HART device.
Battery Life	Displays the expected remaining life of the battery that powers the devices.
	ℹ️ 65535 indicates that the device is receiving power from a mains supply or is waiting for the device to provide information regarding the battery life.
Neighbours	Number of neighbors with which a WirelessHART device can communicate in the mesh.
Timestamp	Time at which data was last updated. Format: hh:mm
Latency	Time required to respond to all data requests or to update the data (measured in seconds).
Bandwidth	Available bandwidth for the device in question.
Joins	The frequency with which a device was connected to the gateway (since the gateway was restarted)
Active Pipe	Indicates the status of the pipe for a device
Fast Pipe Control	This function can be used to enable or disable the fast pipe function for a device.

Deleting the device

ℹ️ Only devices that are not connected can be removed from the list of devices. To delete an active device, switch off the device and wait until the status column indicates that the device is no longer connected.

1. Click the device with the right mouse button.
2. Confirm the delete option.

Editing the Slave ID

1. Click the **Edit Slave IDs** button.
2. Enter the new ID number.
3. Click **OK**.
   ↳ Changes are saved; this may take several minutes.

7.1.8   Adding a device

If a device is added to the network, the FieldGate SWG50 issues several commands.

The commands are processed in the following order:
- Command 0
- Command 74
- Command 84
- Command 20
- Command 27
- Command 7
- Command 13
- Command 105

ℹ️ While the commands are executed, the web server reports the device as "Handshaking". Once command 105 has been executed, the device switches to the "connected" status. The device is updated once per second.

7.1.9 IP configuration

▶ In the Navigation menu, click **Configuration -> Network Interface -> LAN IP Configuration**.
    ↳ The **LAN IP Configuration** dialog box appears.

Field	Description
Link Speed and Duplex	Determines the speed of the communication channel. ℹ️ If the connection speed is not known, leave the setting as **AUTO**. If a manual option is selected, the connected device must be set to the same speed.
Ethernet IP Configuration	Indicates the method by which the network retrieves addresses. ℹ️ If static IP addresses are used, the IP address assigned to the device must be entered. Each device in the network must have a different IP address.

There is a DHCP server present in the network that assigns the IP addresses.

▶ Select **Use DHCP to get an IP address**.
    ↳ The option field for the IP address appears.

Changing the IP address

1. Select **Specify a static IP address**.

2. Enter the desired IP address and subnet mask.

3. Enter the LAN default gateway and DNS1 and DNS2 if necessary.

4. Click **Submit**.
   - ↳ The amended IP address will be applied following an automatic restart.

> ℹ️ If the IP address has been amended, it must be noted down so that it can be used when reconnecting to the web server.

7.1.10 Modbus configuration

1. In the Navigation menu, click **Configuration -> MODBUS -> MODBUS Configuration**.
   - ↳ The **MODBUS Configuration** dialog box appears.

2. In the **TCP port** field, enter the Ethernet port number.

3. Click **Submit**.
   - ↳ The changes are applied following a restart.

4. Click **Reboot**.
   - ↳ The device restarts.

7.1.11 HART IP configuration

▸ In the Navigation menu, click **Configuration -> HART-IP -> Port Configuration**.
   - ↳ The **Protocol Configuration** dialog box appears.

Gateway polling address

1. Make any necessary changes.
2. Click **Update**.

HART IP

1. Make any necessary changes.
2. Click **Submit**.

A restart notification appears. The changes are applied following a restart.

8 System integration

8.1 Modbus TCP

8.1.1 Condensed Modbus mapping

Condensed Modbus mapping is available when using Modbus device ID 254 in conjunction with the IP address of the FieldGate SWG50.

Modbus address	Variable	Read/Write	Type
49996	Gateway status register [1]	Read	Integer
49997	WirelessHART device count (includes any disconnected)	Read	Integer
49998	Total Device Count (includes wired sub-devices)	Read	Integer
49999	Live Device Count (anything currently connected)	Read	Integer
4xxx0 [2]	PV for Device ID xxx (Float) (MSW)	Read	Float
4xxx12	PV for Device ID xxx (Float) (LSW)	Read	Float
4xxx2	SV for Device ID xxx (Float) (MSW)	Read	Float
4xxx3	SV for Device ID xxx (Float) (LSW)	Read	Float
4xxx4	TV for Device ID xxx (Float) (MSW)	Read	Float
4xxx5	TV for Device ID xxx (Float) (LSW)	Read	Float
4xxx6	QV for Device ID xxx (Float) (MSW)	Read	Float
4xxx7	QV for Device ID xxx (Float) (LSW)	Read	Float
4xxx8	Battery life for Device ID xxx	Read	Integer
4xxx9	Number of WirelessHART neighbors	Read	Integer

1) A value of 0 indicates a "good" status
2) xxx stands for the device ID from the web server device table

8.1.2 Expanded Modbus mapping

HART command	Type	Memory address	Device variable	Register count
0	Read	4000 (2 bytes)	Expanded device type code	17
		40001	Number of preambles required for request message from client to device	
		40002	HART protocol major revision number	
		40003	Device revision level	
		40004	Software revision level	
		40005	Hardware revision level	
		40006	Physical signaling code	
		40007	Flags	
		40008 - 40009 (3 bytes)	Device ID	
		40010	Minimum number of preambles to be sent with response message from device to client	
		40011	Maximum number of device variables	
		40012 (2 bytes)	Configuration change counter	
		40013	Extended field device status	
		40014 (2 bytes)	Manufacturing identity code	
		40015 (2 bytes)	Private label distributor code	
		40016 (2 bytes)	Device profile	
1	Read	40017	Primary variable units	3
		40018 - 40019 (float)	Primary variable	
2	Read	40020 - 40021 (float)	Primary variable loop current	4
		40022 - 40023 (float)	Primary variable percent of range	
3	Read	40024	Secondary variable unit code	9
		40025 - 40026 (float)	Secondary variable	
		40027	Tertiary variable unit code	
		40028 - 40029 (float)	Tertiary variable	
		40030	Quaternary variable unit code	
		40031 - 40032 (float)	Quaternary variable	
6	Write	40036	Polling address	2
		40037	Loop current mode	
8	Read	40038	Primary variable classification	4

HART command	Type	Memory address	Device variable	Register count
		40039	Secondary variable classification	
		40040	Tertiary variable classification	
		40041	Quaternary variable classification	
34	Write	40042 - 40043 (float)	Primary variable damping value	2
38	Write	40012 (2 bytes)	Configuration change counter	1
44	Write	40026	Primary variable damping value	1
71	Write	40044	Lock code	1
76	Read	40045	Read lock device state	1
95	Read	40046 (2 bytes)	Count of STX messages received	3
		40047 (2 bytes)	Count of ACK messages received	
		40048 (2 bytes)	Count of BACK messages received	
103	Write	40049	Burst message	9
		40050 - 40053 (time)	Update period	
		40054 - 40057 (time)	Maximum update period	
104	Write	40058	Burst message	6
		40059	Burst trigger mode selection code	
		40060	Device variable classification for trigger level	
		40061	Units code	
		40062 - 40063 (float)	Trigger level	
107	Write	40064	Device variable code assigned to slot 0	9
		40065	Device variable code assigned to slot 1	
		40066	Device variable code assigned to slot 2	
		40067	Device variable code assigned to slot 3	
		40068	Device variable code assigned to slot 4	
		40069	Device variable code assigned to slot 5	
		40070	Device variable code assigned to slot 6	
		40071	Device variable code assigned to slot 7	
		40072	Burst message	
108	Write	40073	Command number of response message to be initiated	2
		40074	Burst message	
109	Write	40075	Burst mode control code	2

HART command	Type	Memory address	Device variable	Register count
		40076	Burst message	
512/513	Read/Write	40077 (2 bytes)	Country code	2
		40078	SI units	
1024	Read	40079	Device variable code	3
		40080	Temperature family device variable status	
		40081	Temperature family status 0	
1152	Write	40082	Device variable code	3
		40083	Probe type	
		40084	Number of wires	
1792	Read	40085	Device variable code	4
		40086	PID control device variable status	
		40087	PID control family status 0	
		40088	PID control family status 1	
1793	Read	40089	Device variable code	4
		40090	Set point device variable code	
		40091	Measurement device variable code	
		40092	Manipulated variable code	
1794	Read	40093	Device variable code	15
		40094	PID input units	
		40095 - 40096 (float)	Set point value	
		40097	Set point status	
		40098 - 40099 (float)	Measurement value	
		40100	Measurement status	
		40101 - 40102 (float)	Error	
		40103	Error status	
		40104	PiD output units	
		40105 - 40106 (float)	PID output units	
		40107	MV status	
1921	Write	40108	Device variable code	4
		40109	Proportional band units	
		40110 - 40111 (float)	Proportional band	
1922	Write	40112	Device variable code	3
		40113 - 40114	Integral time in repeats/min	

HART command	Type	Memory address	Device variable	Register count
1923	Write	40115	Device variable code	4
		40116	Manipulated variable unit	
		40117 - 40118 (float)	Manipulated variable rate of change of limit	
1924	Write	40119	Device variable code	4
		40120	Set point units	
		40121 - 40122 (float)	Set point rate of change limit	
1925	Write	40123	Device variable code	4
		40124	Fail safe unit	
		40125 - 40126 (float)	Fail safe output level	
1926	Write	40127	Device variable code	3
		40128 - 40129 (float)	Derivative time in minutes	
1927	Write	40130	Device variable code	4
		40131	Shed timing enabled	
		40132 - 40133 (float)	Shed time in second	
768	Write	40134 - 40141 (15 bytes)	Join key value	8
769	Read	40142	Wireless mode	9
		40143 (2 bytes)	Join status	
		40144	Number of available neighbor	
		40145	Number of advertising packet received	
		40146	Number of join attempts	
		40174 - 40148	Join retry timer	
		40149 - 40150	Network search time	
773/774	Write/Read	40155 (2 bytes)	Network ID	1
778	Read	40156 (2 bytes)	Battery life	1
779	Read	40157 (2 bytes)	Number of packets generated by this device since last report	5
		40158 (2 bytes)	Number of packets terminated since last report	
		40159	Number of MAC MIC failures	
		40160	Number of network MIC failures	
		40161	Power status	
781	Read	40194	Nickname	1

HART command	Type	Memory address	Device variable	Register count
795/796	Write/Read	40162	Timer type	3
		40163 - 40164 (4 bytes)	Timer interval	
797/798	Write/Read	40165	Output power in dbm	1
804/805	Read/Write	40166	CCA mode	1
808/809	Read/Write	40167	Currently configured time-to-live	1
810/811	Read/Write	40168	Join priority	1
817	Read	40169	Number of bits in new channel map array	3
		40170	Current channel map array	
		40171	Pending channel map array	
818	Write	40169	Number of bits in new channel map array	2
		40170	Current channel map array	
821/822	Write/Read	40174	Network access mode code	1
840	Read	40390 - 4392 (5 bytes)	Unique ID of device	30
		40393 (2 bytes)	Number of graphics active	
		40394 (2 bytes)	Number of frames active	
		40395 (2 bytes)	Number of links active	
		40396	Number of neighbors	
		40397 - 40398	Average communication latency	
		40399 (2 bytes)	Number of joins	
		40400 - 40401	Date of most recent join	
		40402 - 40403	Time of date when the device most recently join	
		40404 - 40405	Number of packets generated by this device	
		40406 - 40407	Number of packets terminated by this device	
		40408 - 40409	Number of data-link layer MIC failures detected	
		40410 - 40411	Number of network layer (session) MIC failures detected	
		40412 - 40413	Number of CRC errors detected	
		40414 - 40415	Number of nonce counter values not received by this device	
		40416 - 40417	Number of nonce counter values not received from the device	

HART command	Type	Memory address	Device variable	Register count
		40418 - 40419	Standard deviation of latency	
960	Write	40193	Reason	1
962	Write	40194	Nickname	1
972	Write	40195 - 40197	Time at which to suspend network	6
		40198 - 40200	Time at which to resume network	
20	Read	40201 - 40216	Long tag	16
12	Read	40217 - 40228	Message	12
42	Read	40229	Device reset	1
48	Read	40230 - 40232 (6 bytes)	Device specific status	17
		40233	Extended device status	
		40234	Device operating mode	
		40235	Standardized status 0	
		40236	Standardized status 1	
		40237	Analog channel saturated	
		40238	Standardized status 2	
		40239	Standardized status 3	
		40240	Analog channel fixed	
		40241 - 40246 (11 bytes)	Device specific status	
74	Read	40309	Maximum no. of I/O cards	7
		40310	Maximum no. of channels per I/O cards	
		40311	Maximum no. of sub-devices per channel	
		40312	Number of devices detected	
		40313	Maximum number of delayed responses	
		40314	Master mode for communication on channels	
		40315	Retry count to use when sending commands to a sub-device	
17	Write	40317 - 40328 (24 bytes)	Message string	12
22	Write	40330 - 40345 (32 bytes)	Long tag	16
75	Read	40347	Same as command 0	17
105	Write	40359	Burst message	1

HART command	Type	Memory address	Device variable	Register count
105	Read	40361	Burst mode control code	22
		40362	Command number expansion flag	
		40363	Device variable code assigned to slot 0	
		40364	Device variable code assigned to slot 1	
		40365	Device variable code assigned to slot 2	
		40366	Device variable code assigned to slot 3	
		40367	Device variable code assigned to slot 4	
		40368	Device variable code assigned to slot 5	
		40369	Device variable code assigned to slot 6	
		40370	Device variable code assigned to slot 7	
		40371	Burst message	
		40372	Maximum number of burst messages supported by the device	
		40373 (2 bytes)	Extended command number	
		40374 - 40375	Update time in 1/32 of a millisecond	
		40376 - 40377	Maximum update time in 1/32 of a millisecond	
		40378	Burst trigger mode code	
		40379	Device variable classification for trigger value	
		40380	Units code	
		40381 - 40382	Trigger value	

8.1.3   Modbus exception codes

Code	Meaning
0x01	No request bytes present (expanded mapping only). Invalid read request for "Number of neighbors" register from sub-device (condensed mapping only).
0x02	Starting address does not exist in mapping.
0x03	Starting register valid, but length of requests spans at least one unmapped register WirelessHART device disconnected (condensed mapping only).
0x06	WirelessHART field device is engaged in processing another command. Retry later.
0x0b	Indicates that no response was obtained from the target device.

To avoid Modbus exception notifications, read each individual device data independently. In case of device disconnection, reading data from multiple devices in one block read will result in complete Modbus block read error.

8.2   HART IP

8.2.1   Gateway terminated commands

The FieldGate SWG50 provides information on the following HART commands:

Command	Function
Universal commands	
0	Read Unique Identifier
12	Read Message
13	Read Tag, Descriptor, Date
17	Write Message
18	Write Tag, Descriptor, Date
20	Read Long Tag
22	Write Long Tag
38	Reset Configuration Changed Flag
Common practice commands	
74	Read I/O system capabilities
77	Send command to sub-device
84	Read sub-device identity summary
89	Set real time clock
106	Flushed delayed responses
Wireless commands	
773	Read Network ID
774	Write Network ID
836	Flush cached response for a device
Diagnostics	
CMD 833	Diagnostics

8.2.2 Special commands

The FieldGate SWG50 supports the activation of Fast Pipes for block data transfer using the following commands:

CMD 146 (Write Device Fast Pipe Status)	Byte(s) Value
Request	0-4 5-byte Device Unique ID

5 Pipe Status (OFF, ON_BI, ON_UP, ON_DOWN)	Byte(s) Value
Response	0-4 5-byte Device Unique ID 5 Pipe Status (OFF, ON_BI, ON_UP, ON_DOWN)

CMD 147 (Get Device ID of Active Pipe)	Byte(s) Value
Request None Response	0-4 5-byte Device Unique ID

CMD 147 (Get Device ID of Active Pipe)	Byte(s) Value
Request None Response	0-4 5-byte Device Unique ID

CMD 148 (Write Device Routing Status)	Byte(s) Value
Request	0-4 5-byte Device Unique ID 5 Routing Status (Enable/Disable) Response
	0-4 5-byte Device Unique ID 5 Routing Status (Enable/Disable)

9 Commissioning

9.1 Function check

- Post-mounting check → 🕮 14
- Post-connection check

9.2 Configuring the device

1. Connect the device to the network.

2. Adjust the IP address of the connected PC to the IP range of the SWG50 as follows.
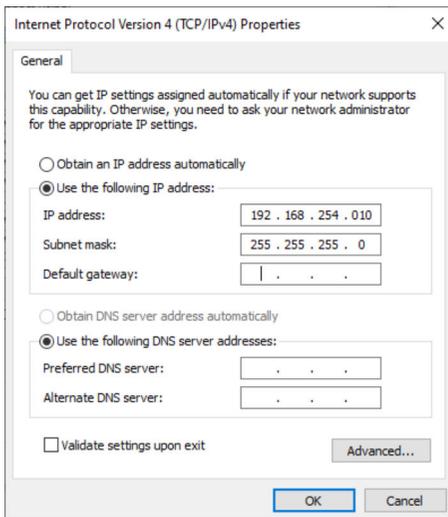
ℹ️ **Default IP of FieldGate SWG50:**

IP address: 192.168.254.254

Subnet mask 255.255.255.0

3. Open network connections.

4. Select **Properties** by clicking the right mouse button.
   ↳ The **General** dialog box opens.

5. Click **Use the following IP address** and enter IP address.

6. Enter "255.255.255.0" in the **Subnet mask** field and click **OK**.

ℹ️ The IP address assigned to the PC must be different to that of the FieldGate SWG50.

9.3   Login

1. Ensure that the connected PC is in the IP range of the FieldGate SWG50.

2. Open the web browser and enter the IP address of the FieldGate SWG50.
   ↳ The web server with the login window opens.

3.   Enter "admin" login information.
     ↳   The web server opens.

ℹ   The default password must be changed when logging in for the first time. → 🖺 38

ℹ   Operating multiple devices with factory-preset IP addresses will cause a network conflict,
    and incorrect parameters may be configured in the FieldGate SWG50 modules. When
    programming modules for the first time, it is important to switch on only one at a time
    and to change the IP address of each module to a unique IP address. Once all devices
    have a unique IP address, they can be switched on together in the same network.

9.3.1   Changing the username and password

1.   In the Navigation menu, click **Configuration -> Usernames/Passwords**.
     ↳   The **Configuration - Usernames/Passwords Modification** dialog box appears.
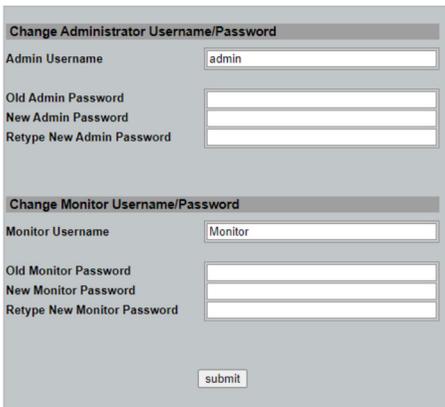
2.   Make changes and click **Submit**.

The changes are accepted.

10 Diagnostics and troubleshooting

10.1 General troubleshooting

Problem	Solution
Access to web server is not possible.	Check power supply to device (ST-LED on ERR-LED off). Check cable connection between PC and device. Check network settings of PC and device. Check IP addresses and subnet mask.
Connection to WirelessHART devices is taking too long or they are not communicating with each other.	"Active Advertising" must be enabled. Check wiring of the devices. Check power supply. Check network ID and network password. Check correct hexadecimal representation of network ID and network password. Check communication range of the device and the WirelessHART devices in the same network.
Error LED is lit	Check status notifications Configuration file is corrupted or missing: problem reading/parsing the XML configuration file of the device One or more systems could not start properly or an application could not be initialized: If the errors are not deleted after a few minutes, the device must be restarted. Important system components could not be initialized correctly: Check applications and tools. Network manager queue full: Reduce scan rate. Up to 100 notifications can be stored.
Modbus	Check Modbus addresses. Check support for commands from WirelessHART device, adapter and HART device.
WirelessHART device connects and disconnects	Check stability and number of joins. If joins increase, add repeater.
No connection from new device	Check network ID and connection key. Check access control list. Ensure that the new device is switched on.
Low battery life	Replace battery.
Wireless signal too weak	Make sure the antenna is not blocked.
Weak network	Check communication. Each device must be able to communicate with at least three devices.

10.2 Diagnostic information via light emitting diodes

ST	flashing green	Voltage applied, device is active
	flashing red	Device is initializing
	off	Device off
MESH	lit green	WirelessHART device connected
	off	No WirelessHART device connected

ERR	lit red	Internal error
	off	Normal operation

10.3   Diagnostic information in web browser

Advanced diagnostics are possible via the integrated web server.

10.4   Event logbook

This page shows the system protocol. It may take several seconds for the page to load.

▸ In the Navigation menu, click **Monitoring/Reports -> System Log**.
  ↳ The **Monitoring - System Log** dialog box appears.

10.5   Resetting the device

▸ In the Navigation menu, click **Configuration -> Store Retrieve Settings**.
  ↳ The **Configuration - Store Retrieve Settings** dialog box appears.
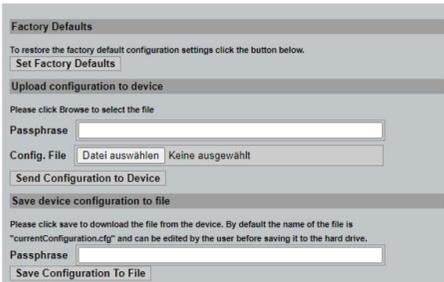
Resetting the device:

▶ Click the **Set Factory Defaults** button.
   ↳ All settings, including the IP address, are reset to the factory settings.

Uploading the configuration to the device:

1. Click the **Select file** button.
2. Navigate to the desired file. The **Passphrase** field must be completed.
3. Click the **Send Configuration to Device** button.
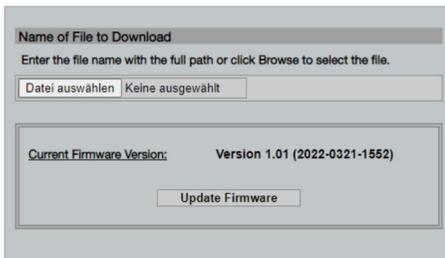   ↳ The upload starts.

ℹ️ The FieldGate SWG50 can export an existing configuration to the hard drive of a PC. Please note that a passphrase is required. A 10-digit passphrase is necessary to protect and then validate the file before it is saved or can be retrieved from a PC. It prevents unauthorized users from applying the system configuration file to an unauthorized access point to gain access to the network. Make a note of this passphrase whenever you save a configuration file. It must be re-entered each time the configuration file is uploaded to the gateway.

11   Maintenance

11.1   Firmware update

On this page the current firmware can be displayed or a version installed.

1. In the Navigation menu, click **Maintenance -> Firmware Update**.
   ↳ The **Software Updates** dialog box appears.


```
Name of File to Download
Enter the file name with the full path or click Browse to select the file.

[ Datei auswählen ] Keine ausgewählt

Current Firmware Version:      Version 1.01 (2022-0321-1552)

              [ Update Firmware ]
```

2. Click the **Select file** button and navigate to the required file.
3. Click Update Firmware.
   ↳ The new firmware version is installed.

11.2 Utilities

▶ In the Navigation menu, click **Maintenance -> Utilities**.
   ↳ The **Utilities** dialog box appears.

Ping

1. Enter the **IP address** or **host name**.
2. Click **Ping**.

The display indicates if the device is connected and operational.

Auto Logout Timer

1. Select the relevant option.
2. Click **Submit**.

The changes are accepted.

Reform WirelessHART Network

▶ Click **Reform Now**.

The WirelessHART network is reorganized.

11.3 Reboot

The FieldGate SWG50 can be restarted on this page.

1. In the Navigation menu, click **Maintenance -> Reboot**.
   ↳ The **Reboot Device** dialog box appears.

2. Click the **Reboot** button.
3. Confirm **Reboot**.
   ↳ The FieldGate SWG50 restarts.

12   Repair

12.1   General information

Repairs may only be performed by Endress+Hauser staff or by individuals authorized and trained by Endress+Hauser.

12.2   Spare parts

Accessories currently available for the product can be selected via the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

12.3   Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information:
    http://www.endress.com/support/return-material
    ↳ Select the region.
2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

12.4   Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

13   Accessories

Accessories currently available for the product can be selected via the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

14   Technical data

For detailed information on the "technical data", see the Technical Information.

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