User Manual

FG-200 HSE/FF Modbus

FOUNDATION fieldbus network integration via Modbus including redundancy

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1 Introduction

1.1 About FG-200 HSE/FF Modbus

The FG-200 HSE/FF Modbus allows integrating FOUNDATION fieldbus (FF) technology into legacy plants and Modbus control systems. It includes a Windows-based FOUNDATION Fieldbus configuration tool and can be used for implementing state-of-the-art information services.

1.2 System requirements

When using the FOUNDATION fieldbus Configuration Tool FF-CONF

- PC with operating system Windows 7 or Windows 8.1 (both 32 bit or 64 bit supported)

Browsers supported

- Microsoft Internet Explorer version 8.0 or higher
- Mozilla Firefox version version 35 or higher

1.3 Scope of delivery

The FG-200 HSE/FF Modbus comprises the following parts:

- the FG-200 HSE/FF Modbus device
- CD-ROM including drivers, firmware and manuals
- a Quick Startup Guide

Note

The FG-200 is available in two variants. They have identical technical specifications. Their only differentiating characteristic is their mount direction that is mirrored, i.e. rotated by 180°.

1.4 Safety precautions

CAUTION

During operation, the device's surface will be heated up. Avoid direct contact. When servicing, turn off the power supply and wait until surface has cooled down.

Note

Do not open the housing of the FG-200. It does not contain any parts that need to be maintained or repaired. In the event of a fault or defect, remove the device and return it to the vendor. Opening the device will void the warranty!

1.5 Intended use

Softing's FG-200 HSE/FF Modbus is used to integrate up to four FF H1 links into control systems supporting Modbus. The device can be used as a redundant link. It provides fast access to process data, while making use of FOUNDATION Fieldbus advantages such as reduced cabling, central field device parametrization, comprehensive diagnostics or intrinsically safe device segments. It is compatible with the R. STAHL bus-Carrier Series 9419 and Power Supply 9412 products for easy commissioning.

1.6 Document history

Document version	Modifications compared to previous version
1.00 - initial version	none

1.7 Conventions used

The following conventions are used throughout Softing customer documentation:

Keys, buttons, menu items, commands and other elements involving user interaction are set in bold font and menu sequences are separated by an arrow	Open **Start → Control Panel → Programs**
Buttons from the user interface are enclosed in brackets and set to bold typeface	Press **[Start]** to start the application
Coding samples, file extracts and screen output is set in Courier font type	`MaxDlsapAddressSupported=23`
Filenames and directories are written in italic	Device description files are located in *C:\<Application name>\delivery \software\Device Description files*

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Note

This symbol is used to call attention to notable information that should be followed during installation, use, or servicing of this device.

Hint

This symbol is used when providing you with helpful user hints.

2 Hardware installation

2.1 Installation in hazardous locations

The FG-200 HSE/FF Modbus can be used in hazardous locations and is certified according to ATEX and IEC. The approval process for North American Approval (cULus) is currently pending.

WARNING

Use only according to operating conditions from instructions!

Use the FG-200 in accordance with its designated use only! Otherwise, the manufacturer's liability and warranty will expire. The device is only to be used according to the operating conditions described in these instructions.

WARNING

Do not connect or disconnect energized conductors!

Be aware that energized conductors are not to be connected or disconnected! This can lead to danger of life if potentially explosive atmosphere is present there at that time!

General Requirements

Note

If the notes stated in this document are not observed or in case of inappropriate handling of the device, our liability is waived. In addition, the warranty on devices and spare parts does no longer apply.

Following general requirements must be observed while installing FG-200 on hazardous locations:

- The details of this document must be observed along with the conditions for use and the applicable details stated on the marking and type labels of each.
- Any selection and operation of the device must be done as per the technical rules.
- Adequate precautions must be taken to prevent unintended actuation or impairment of the device.
- Connectors must not be connected or disconnected when area is known to be hazardous. This can be life threatening in a potentially explosive atmosphere. Open or not securely closed sockets shall not be energized in the Ex-atmosphere!
- Ensure the installed equipment comply with the types of protection applicable to the corresponding zones.
- All connected electrical equipment must be suitable for the respective intended use.
- The operator must ensure protection against lightning in compliance with the locally applicable regulations.
- Electrostatic aspects must be considered when mounting the bus-modules. Electrostatic charges have to be prevented.

- In explosion group IIC and Zone 2 no protected plastic surfaces > 20 cm^2 are allowed; in IIB or dust-Ex, 100 cm^2 may be reached.
- The hazard of any objects falling onto the bus-module must be prevented.
- The FG-200 does not meet the requirements of impact protection and IP54 (according to IEC 60529). It must be installed in a protective enclosure which meets the requirements for resistance to impact and IP as stated in section 26.4 of IEC/EN 60079-0. This enclosure must be fully mounted and intact. If the enclosure is damaged, the operation is not permitted.
- The FG-200 is defined as instruments and apparatus of low energy according to clause 23 of IEC/EN 60079-15; thus the requirement stated in sub-clause C, limiting the transient characteristic to 40% above the rated voltage, has to be adhered to when erecting the equipment.
- When removing the packaging ensure that no dirt can enter the enclosure or the plugs.
- If any vibration during the operation may cause parts of the plugs to loosen, then the plugs have to be provided with a light firm varnish used for securing screws. An extraction force of 0.5 Nm has to be achieved at an equivalent thread.
- To circuits of Zone 2 only such equipment may be connected that is suitable for operation in this zone and has been certified accordingly.
- Components may only be replaced by original spare parts which are also approved for the use in Ex-atmospheres. Spare parts are ordered as complete units giving the material number stated on the device (marking, type label).
- Only such auxiliary components may be used in potentially explosive atmospheres which meet all requirements of European and national directives and legislation.
- The environmental conditions specified in the manual have to be followed strictly.
- The FG-200 is not to be used in systems where cathodic systems for corrosion protection are in place. Although special precautions may allow the use in such systems (additional earthing bridges), the manufacturer has to be consulted in each case.
- The operator has to provide measures for protection against lightning.
- According to the local conditions and in compliance with the environmental rules, the operator is responsible to visually inspect the system and to remove dust settlements in a regularly interval (every 6 months).
- The company installing the device has to ensure that the transient characteristic is limited to 40% above the service voltage.
- Additional precautions have to be taken, if the presence of hydrosulfide, ethylene oxide and/or carbon monoxide is to be expected: those substances are of a vary low ignition energy.
- Icing is not permitted.

Pair of values for fieldbus voltage and current for Intrinsic Safety Fieldbus (ic):

	Pair 1	Pair 2	Pair 3
Fieldbus Voltage	Ui = 14 Volt DC	Ui = 17.5 Volt DC	Ui = 32 Volt DC
Fieldbus Current	Ii = 570 mA	Ii = 319 mA	Ii = 100 mA

CAUTION

Make sure that the sum of power supply voltage and fieldbus supply voltage does not exceed 60 VDC!

Explosion hazard

Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

Observe relevant national regulations, standards and directives

This manual does not supersede the relevant national regulations, standards and directives. These must be observed and have to be applied according to the national conditions!

Hazardous Location - North American Approval (cULus)

Preliminary information only!

The information in this Chapter is preliminary only and not valid until the approval for hazardous locations according to North American Approval (cULus) has been successfully completed.

If indicated on the device label, the FG-200 is suitable for use in Class 1, Division 2, Groups A, B, C and D or non-hazardous locations.

The device must be installed in a protective enclosure which meets the requirements for resistance to impact and IP54 according to IEC 60529.

Marking for explosion protection: Class I Div.2 Groups A,B,C,D.

Hazardous Location - European and International Approval (ATEX, IECEx)

The equipment was assessed as based on the following standards and editions:

a) IEC 60079-0:2011 Ed. 6, modified Cor. 2012 + Cor. 2013 / EN 60079-0:2012 + A11:2013

b) IEC 60079-11:2011 Ed. 6 + Corr. 2012 / EN 60079-11:2012

c) IEC 60079-15:2010 Ed. 4 / EN 60079-15:2010

If indicated on the device label or by technical documentation, the FG-200 is suitable for use in gas-Ex atmospheres of Zone 2 in the explosion groups IIA, IIB and IIC in temperature class T4, if accommodated in a tested enclosure.

- IECEx marking for explosion protection: Ex nA [ic] IIC T4 Gc.
- ATEX marking for explosion protection: ⟨Ex⟩ II 3G nA [ic] IIC T4 Gc.

The Ex protection method [ic] corresponds only to the FF-H1 fieldbus interfaces.

The FG-200 HSE/FF Modbus complies with the applicable standards and regulations and meets the requirements of Directive 94/9/EC. The requirements for erecting the device as part of the system in potentially explosive atmospheres (e.g. IEC / EN 60079-14) must be strictly adhered.

Certificates

The EC type examination number for ATEX is: **BVS 15 ATEX E 063 X**
A copy of the certificate is available in section ATEX Type Examination Certificate in this document.

The type examination number for IECEx is: **IECEx: BVS 15.0055X**
The certificate can be downloaded from http://iecex.iec.ch

2.2 Mounting and dismounting

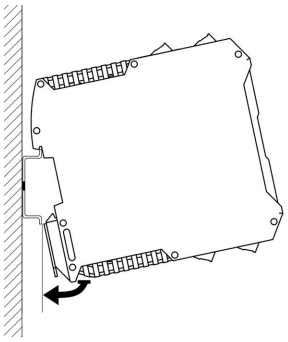
Note
Make sure the FG-200 is mounted in a manner that the power supply disconnecting device or interrupt facility can always be reached easily.

Note
Depending on the installation position, the maximum ambient operating temperature may differ. Refer to Technical Data 84 for detailed information.

Installation and inspection
Installation and inspection tasks are to be carried out by qualified personnel only, i.e. personnel qualified according to TRBS 1203 or similar! The definition of terms can be found in IEC 60079-17.

Mounting

1. For mounting the FG-200 on a DIN rail (35 mm), attach the two upper notches to the rail.
2. Press the device down towards the rail until it locks into place.



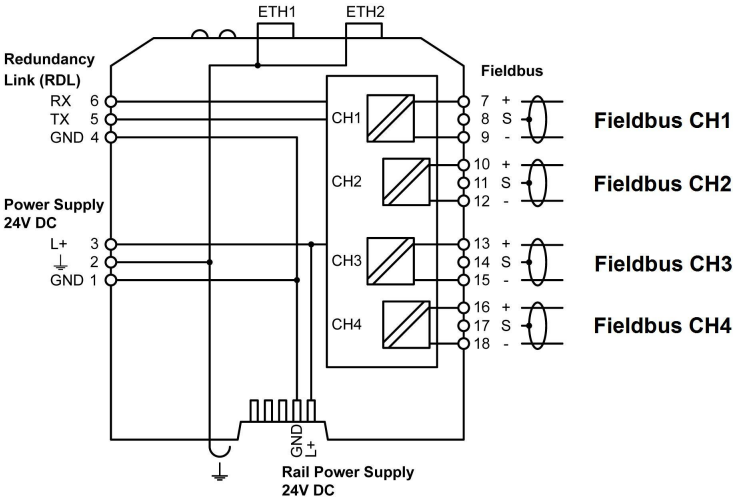
Note
Do not put stress on the system by bending or torsion.

Dismounting

To dismount the FG-200 from the DIN rail, slide a screw driver horizontally underneath the housing into the locking bar, slide the bar downwards – without tilting the screw driver - and fold the device upwards.

2.3 Connection diagram

The following connection diagram gives an overview about the different plugs and interfaces:



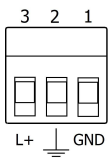
Note

If ambient temperatures exceed 55 °C at the place of installation, it may occur that the temperatures of connecting cables strongly rise if those cables have been put in place in an unfavorable condition. In such cases, either perform measurements to confirm that the service temperature of the cables is not exceeded (i.e. 80 °C), or use such variants that withstand temperatures of minimum 90 °C.

2.4 Connect the power supply

1. Connect the FG-200 to a 24 V DC power supply.
2. Use different or redundant power supplies for redundant FG-200s.
3. Turn on the power supply. The boot process takes approx. 50 seconds. For indication of proper operation of a FG-200 acting in non-redundant mode or as primary device in redundant mode refer to Status indicators - LEDs 65.

The supply voltage (18 VDC .... 32 VDC) is connected by a 3-pole terminal block. The power supply is connected to the plug connector via flexible wires with a cross section of 0.75 to 1.5 mm². The ground connection wire must have a cross section of 1.5 mm².



Pin	Signal	Description
3	L+	Positive supply voltage
2	⏚	Functional Earth
1	GND	Ground

CAUTION

The Functional Earth (FE) connection of the device has to be connected at low inductance with the Protective Earth (PE) of the system.

Note

As indicated in the connection diagram, the power can be applied alternatively by a special DIN rail connector (Rail Power Supply). For further information contact Softing Industrial Automation.

2.5 Connect to network

Connect the FG-200 to the network using the upper network connection.

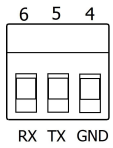
Note

The FG-200 is able to communicate with the HSE (High Speed Ethernet protocol of Fieldbus Foundation) and Modbus TCP over the same Ethernet port.

Refer also to Use two FG-200s as a redundant set 14.

2.6 Modbus serial connection

When connecting the FG-200 via serial connection use the connector from your delivery with the following pin assignment:



Pin No.	Signal	Connector symbol
6	RX	+
5	TX	S
4	GND	-

Note

If you are working with two FG-200 in redundant mode, the serial connection cannot be used, refer to Use two FG-200s as a redundant set 14.

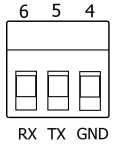
2.7 Use two FG-200s as a redundant set

When using two FG-200s as a redundant set, the redundancy link interfaces (RDL) of both FG-200s (primary and secondary) must be connected by a cable, thus forming a redundancy link. If the redundancy link is not installed during start-up (power-on), the FG-200 will operate in non-redundant mode.

Note

The interface is not galvanically isolated. Thus make sure that there is no potential difference between the two connected devices.

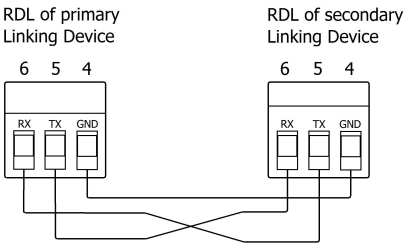
The maximum cable length is 0.5 m according to EMC requirements. The pin assignment is as follows:



Pin	Signal	Description
6	RX	Receives data from redundant device
5	TX	Transmits data to redundant device
4	GND	Ground

Note

The receive (RX) and transmit (TX) signals must be cross-linked.



Do not power up FG-200s while the serial link is missing

If the two FG-200s forming a redundant set are powered while the serial link is missing, both devices will behave like independent, non-redundant Primary Devices. If they operated in redundant mode before and therefore have identical configuration information, both will use the same H1 node addresses, which will cause problems on the H1 links. The ERR (error) LED will blink. In this case, remove the power, install the serial link and apply the power again.

First powered device operates as primary device

When using a redundant set of two FG-200s, the device which is powered first will operate as primary device. If both devices are powered at the same time, the one with the lower IP address will operate as primary device.

Before removing the power supply from primary device make sure the secondary device is operational

In a redundant set of FG-200s, removing the power supply, the Ethernet cable or the redundancy link interface cable from the primary device causes a redundancy change-over. Before doing so, make sure that the secondary device is operational (and not still booting due to a prior change-over). Otherwise the system breaks down or the configuration information might get lost. Therefore wait at least one minute between such checks.

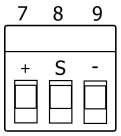
2.8 Connect FF-H1 interfaces

Connect the H1 links to the terminal blocks of the H1 interfaces. Since the FG-200 does not provide power to the H1 links, a power supply, a power conditioner and a bus termination is required for each H1 link. When using a redundant set of two FG-200s, make sure to connect each H1 link to the same channel (FF 1 .. FF 4) on both FG-200s.

The FG-200 provides four Foundation Fieldbus H1 interfaces. These interfaces are named CH1 to CH4 and are used to connect an FF-H1 bus to the FG-200.

FF H1 bus line channel 1

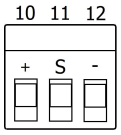
CH1



Pin	Signal	Description
7	+	Fieldbus +
8	S	Fieldbus shield
9	-	Fieldbus -

FF H1 bus line channel 2

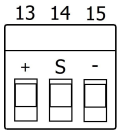
CH2



Pin	Signal	Description
10	+	Fieldbus +
11	S	Fieldbus shield
12	-	Fieldbus -

FF H1 bus line channel 3

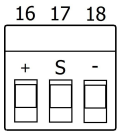
CH3



Pin	Signal	Description
13	+	Fieldbus +
14	S	Fieldbus shield
15	-	Fieldbus -

FF H1 bus line channel 4

CH4



Pin	Signal	Description
16	+	Fieldbus +
17	S	Fieldbus shield
18	-	Fieldbus -

Note

The fieldbus shield is not connected directly to functional earth. For EMC reasons, it is only connected via a capacitor. If a direct connection to functional earth or protective earth is required, you need to implement this separately.

2.9 Power up the device

Turn on the power supply. The boot process takes a few seconds. For indication of proper operation of a FG-200 refer to Status indicators - LEDs.

2.10 Add a second FG-200 to form a redundant set of FG-200

For adding a second FG-200 to an already commissioned FG-200 that is operating in the role "Primary, no backup", the following steps are required:

1. Set the IP configuration (IP address and subnet mask) of the second FG-200 in a way that it is in the same IP subnet as the primary device (refer to Settings - Internet Protocol [41]).
2. Connect the H1 links to the terminal blocks of the H1 interfaces. Make sure to connect each H1 link to the same channel (FF 1 .. FF 4) on both FG-200s.
3. Connect the second FG-200 to the Ethernet switch or hub.
4. Connect both serial ports by means of a redundancy link interface cable.
5. Connect the second FG-200 to a 24 V DC power supply. Use different or redundant power supplies for redundant FG-200s.
6. After turning on the power supply the boot process takes approx. 50 seconds.
7. The second FG-200 will take over the configuration data from the primary device and will start operation in the role "secondary". For indication of proper operation as a secondary device refer to Status indicators - LEDs [65].

Hint

Refer to Use FG-200 as a redundant set [14] and to Redundancy mode [71] for more information on the redundancy concept.

3 Commissioning the FG-200 HSE/FF Modbus

3.1 Install FF-CONF

New installation

1. Insert your FG-200 HSE/FF Modbus CD into your CD drive.
2. If Autorun is enabled on your system, the startup page is opened. Select FF-CONF from line "Install First".
3. If Autorun is disabled, open an Explorer window, select your CD drive and double-click the file *FFConfSetup.exe* located in *<CD drive>:\delivery\FF-CONF*.
4. Follow the instructions from the installation wizard.

Update installation

If you have already installed a previous version of FF-CONF (lower than version 1.3), perform the following steps:

1. Uninstall your existing version (**Start → Control Panel → Uninstall Program → Softing - FF-CONF → Uninstall**).
2. Switch to *..\ProgramData* and delete the subdirectories *\Softing\FF-CIT* and *Softing \FF-CONF* including their complete data content.
3. Then start your installation as described above.

3.2 Configure IP address and Modbus parameters

The FG-200 is delivered with the pre-configured IP address 192.168.0.10. Connect the FG-200 to the PC either directly or via an Ethernet switch.

Note

Before connecting the FG-200 to your LAN network, make sure that its IP address is not used by another network station.

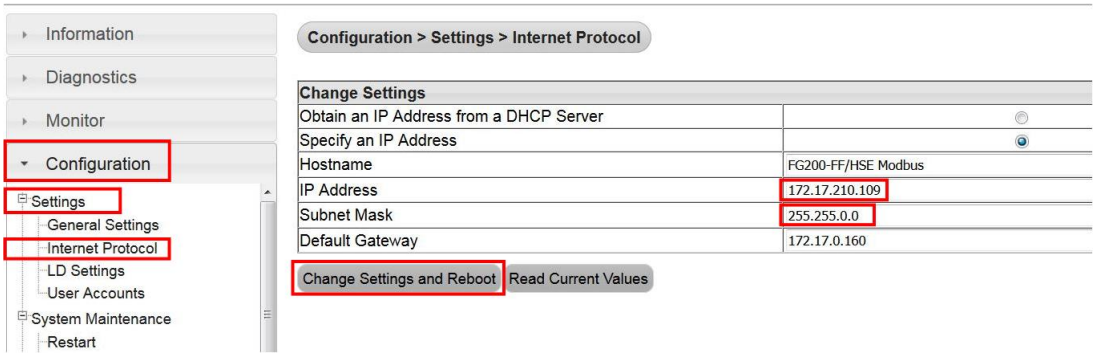
To assign a new IP address to your PC, you must have administrator rights.

1. Open a browser (e.g. Internet Explorer or Firefox).
2. Enter the URL address 192.168.0.10 and press **Enter**.
3. Login with the following data:

   login name: **administrator**

   login password: **fgadmin**

4. Select **Configuration → Settings → Internet Protocol**.
5. Change **IP Address** and **Subnet Mask**.
6. Click **[Change Settings and Reebot]**:



7. The FG-200 performs a reboot.

4 Working with the FG-200 HSE/FF Modbus

4.1 FG-200 acts as a Modbus / FF-H1 Gateway

Main purpose: PLC with Modbus interface accesses IO parameters of FF-H1 field devices

FG-200 supports access to IO parameters of FF-H1 field devices via client/server connections [70] (CLT/SRV connections) and via publisher/subscriber links [69] (PUB/SUB links).

When accessing device IO parameters it is not possible to mix CLT/SRV connections and PUB/SUB links. For the selection of the communication mode see below.

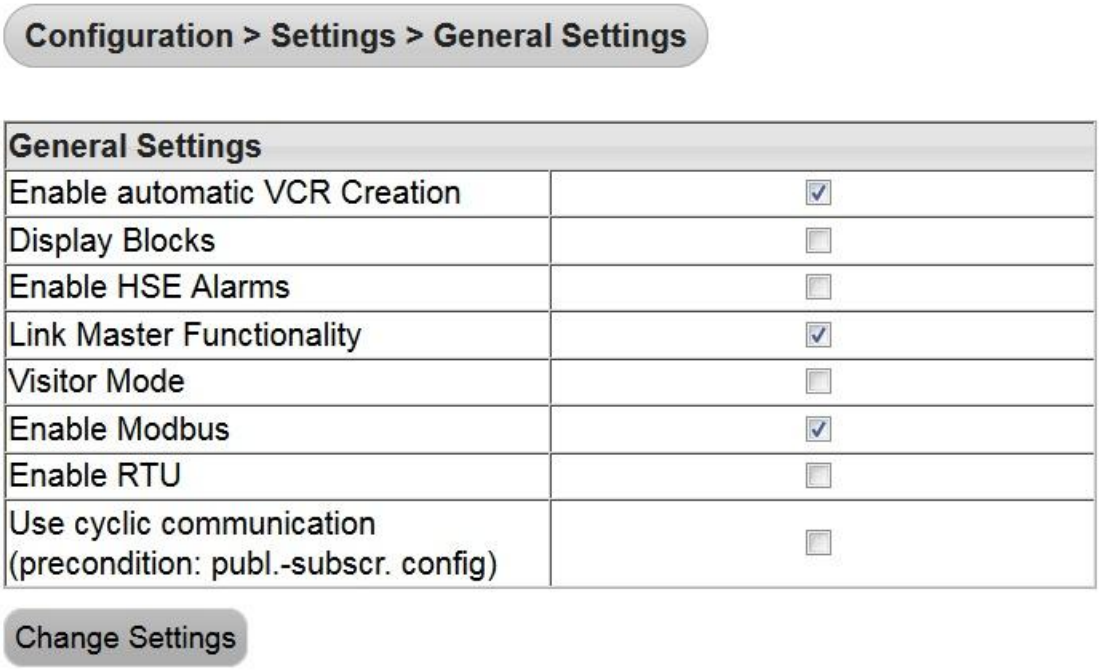
4.1.1 FG-200 acts as link active scheduler

If FG-200 acts as a link active scheduler [69], no other FF host system is connected to the H1 segment.

For accessing field device parameters CLT/SRV connections as well as PUB/SUB links can be used. PUB/SUB links are the standard way for accessing IO parameters in FF installations. If you want to use PUB/SUB links, you have to configure them using the configuration tool FF-CONF. For more information refer to Configuration with FF-CONF [21].

As there is no other FF host system you have to download the function block schedule into the field devices. You can generate the function block schedule and download it to the field devices by means of FF-CONF.

Before you go online with the FF-CONF update your general settings in the FG-200's web interface. Go to **Configuration → Settings → General Settings:**



If you have changed your settings click **[Change Settings]** to apply the new values.

4.1.1.1 Configuration with FF-CONF

The following sections describe two scenarios for use cases: setting up a project with pre-configured field devices and setting up a project with field devices that are not pre-configured or not available yet. For both use cases we use the configuration tool FF-CONF. Specific procedures and settings for FF-CONF are explained in this document.

4.1.1.1.1 The H1 field devices are pre-configured

Assumptions

- PD tags, node addresses and block tags have already been configured.
- Important function block parameters such as MODE, CHANNEL and SCALE have already been configured.
- The function blocks are not executed yet.
- The communication paths between function blocks as well as the communication paths between function blocks and FG-200 are not (fully) configured.

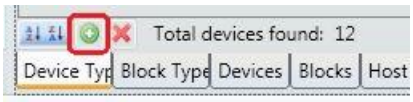
Import the device descriptions of the field devices into the FF-CONF device catalog

You can work in offline mode. It is not necessary that FF-CONF is connected to the H1 segment.

1. Start the FF-CONF application (**Start → All Programs → Softing → FF-CONF → FFCONF V1.3**).
2. Import the device description file. File types are *.cff*, *.ff5*, *.sy5* and for older devices *.ffo* and *.sym*. The file is either part of the delivery of the H1 device or can be downloaded from the Fieldbus Foundation page (http://www.fieldbus.org/index.php?option=com_mtree&Itemid=324).

Note
Make sure you use the correct device revision for your device.

3. In the lower right corner select **Device Type** and then click the **Import Device** icon:

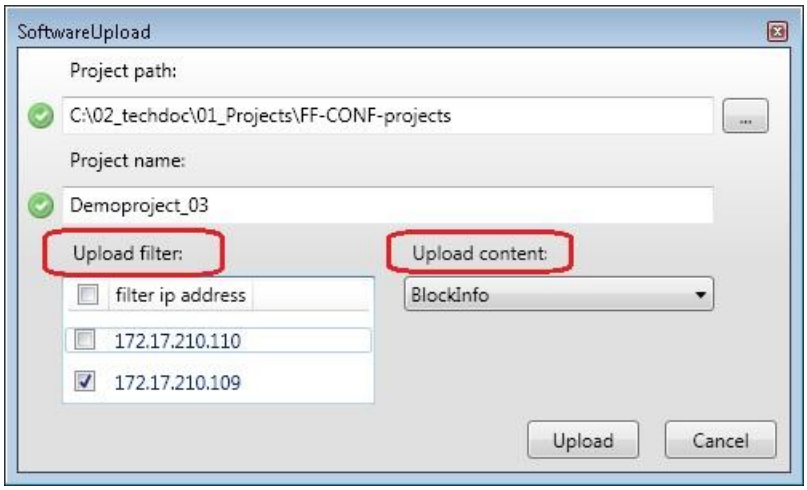


4. Select your device description file and confirm with **[Ok]**.

Upload date the BlockInfo of the pre-configured devices

1. Activate the online mode ( ) and open the network live list with **View → Network Livelist**.
2. Right-click the PC module in the livelist and select **Upload**:

3. In the following dialog enter (or select) the project path where you want to store the project, enter a project name, select in **Upload filter** the IP address of your device and select in **Upload content** the value **BlockInfo**:



4. Confirm with **[Upload]** and then save the project.

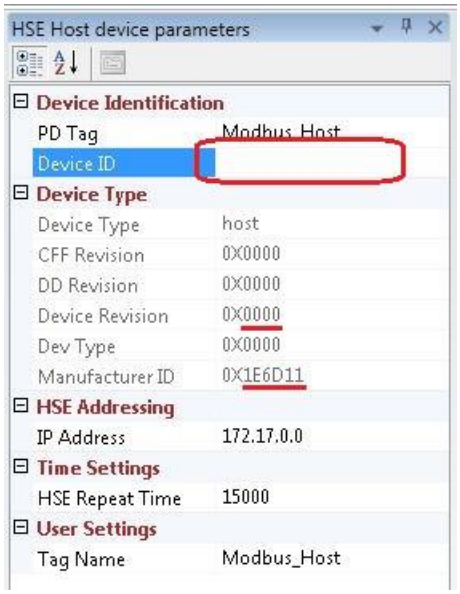
Create an HSE Host device

1. Go offline ( ) .
2. Create an HSE Host device. To do so, open **Network Configuration**, then select **Device Type** in the lower right corner and select the HSE Host device from the list.
3. Click the green icon in the upper left corner to add the device to the network configuration:

4. Go to **Network Configuration** and select the device you added. Click the green button to open the IP address field and enter the IP address depending on your subnet:

5. Click the lower green button to open the user tag name field. Rename the HSE Host (user tag). Do **not** enter spaces in the tag name:

6. Select the HSE Host and press **F4** to open the device properties. Enter the Device ID (six last digits from manufacturer ID and four last digits from the device type):



7. Confirm with **Enter**.

Add Function Blocks to your FF-CONF project

1. Switch to the **Function Block Application** View and select **Blocks** in the lower right corner.
2. Select the function blocks used by your control application to your FF_CONF project. Add it to the function block application view with **Add to function block application**:

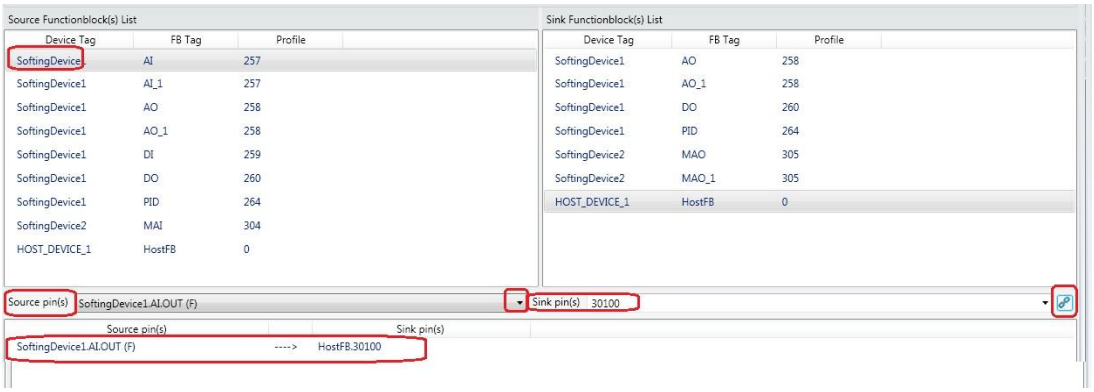
Note

Note that for configuring PUB/SUB links it is necessary to also add an Host function block which is provided by the HSE Host device.

Configure communication paths (PUB/SUB links)

1. Select the desired source device, then the related source pin.
2. Then select the sink device and enter the related sink pin, in our example 30100. Click the connect icon on the right.

3. The connected devices appear in the list:



Hint

For the Host Function Block (HostFB) you can enter any value in the field **Sink Pin(s)** but we recommend entering the Modbus register number to have a mapped relationship (in our example 30100).

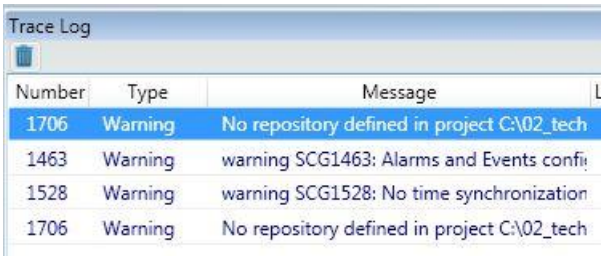
3. Continue with the next device. In our example we have mapped the sensor values that we want to process with the Modbus PLC (AI and MAI values) to the specific Modbus register number. Values being sent by the PLC are mapped to AO or MAO:

Source pin(s)		Sink pin(s)
SoftingDevice1.AI.OUT (F)	---->	HostFB.30100
SoftingDevice1.AI_1.OUT (F)	---->	HostFB.30102
SoftingDevice2.MAI.OUT_1 (F)	---->	HostFB.30104
SoftingDevice2.MAI.OUT_2 (F)	---->	HostFB.30106
HostFB.40100	---->	SoftingDevice1.AO.CAS_IN (F)
HostFB.40102	---->	SoftingDevice1.AO_1.CAS_IN (F)
HostFB.40104	---->	SoftingDevice2.MAO.IN_1 (F)
HostFB.40106	---->	SoftingDevice2.MAO.IN_2 (F)

4. Switch to the Trace Log in the lower window part. Deselect trace category **Information**. If you have trace messages, right click in the Trace Log table and select **Clear log**.
5. From the **Build** menu select the command **Build All** (or press **Alt+F8**).
6. Go online ( ). From the **Download** menu select **Download Project**.

Note

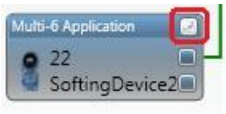
You can ignore the warnings with the following numbers: 1463, 1528 and 1706:



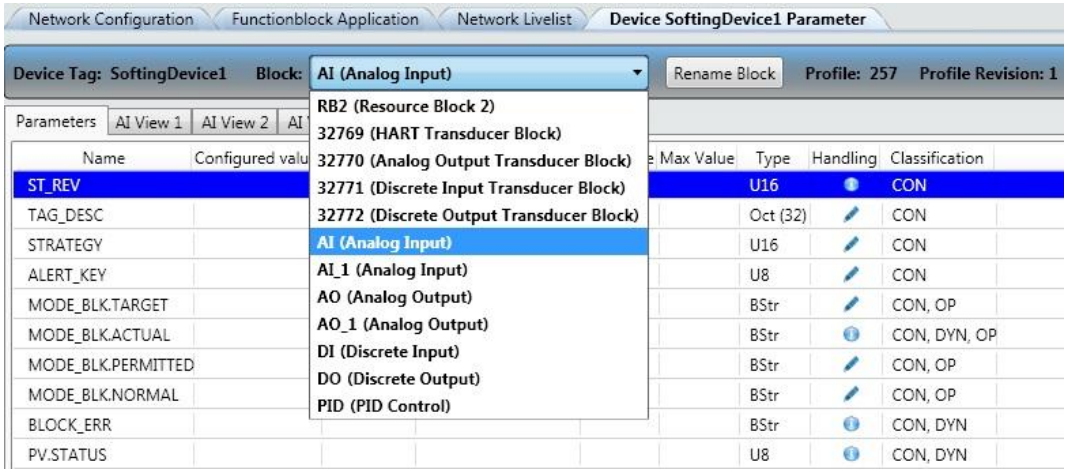
Make sure that all function blocks work as expected

FF-CONF is connected to the H1 segment (you are working in online mode).

1. Switch to **Network Configuration** view. Click the icon in the upper right corner to open the parameter view:



2. Select the required block from the list in the upper screen part:



3. Click **[Read All]** in the lower right part to read all parameters.

4. Check the parameters list to make sure that all function blocks work as expected. In our example for AI and MAI you can see the MODE_* parameters with value **AUTO** and the BLOCK_ERR parameter with value **None**:

Note

To get all H1 field devices fully operable it may be necessary to perform additional commissioning steps (e.g. sensor calibration). For details please refer to the respective user manuals of the device vendors.

5. Exit the FF-CONF application.

4.1.1.1.2 The H1 field devices are not configured/not available yet

Assumptions

- The H1 segment to be implemented is not available yet.
- All devices are still in the box.

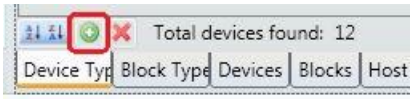
Import the device descriptions of the field devices into the FF-CONF device catalog

You can work in offline mode. It is not necessary that FF-CONF is connected to the H1 segment.

1. Start the FF-CONF application (**Start → All Programs → Softing → FF-CONF → FFCONF V1.3**).
2. Import the device description file. File types are *.cff*, *.ff5*, *.sy5* and for older devices *.ffo* and *.sym*. The file is either part of the delivery of the H1 device or can be downloaded from the Fieldbus Foundation page (http://www.fieldbus.org/index.php?option=com_mtree&Itemid=324).

Note
Make sure you use the correct device revision for your device.

3. In the lower right corner select **Device Type** and then click the **Import Device** icon:

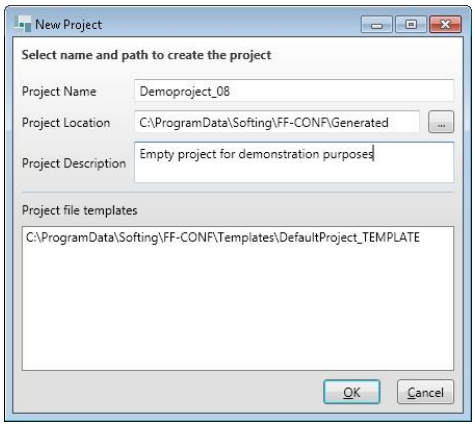


4. Select your device description file and confirm with **[Ok]**.

Create a new project

You can work in offline mode. It is not necessary that FF-CONF is connected to the H1 segment.

1. Select **Project → New** or press **Ctrl+N** to create a new project. Enter a project name, select the project location and confirm with **[OK]**:



Add a FG-200 to your project

1. In **Network Configuration** add a FG-200 HSE/FF Modbus. To do so, select **Device Type** in the lower right corner, select your FG-200 and click the green icon in the device's upper left corner:

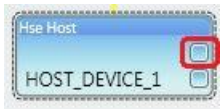
2. In **Network Configuration** right-click your FG-200 and select **Add H1 Link**:

3. Modify the H1 link port number (in our example to 4) and rename the devices (node id and user tag) according to your values.

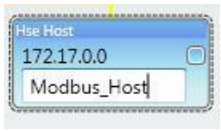
Create an HSE Host device

1. Go offline ( ) .
2. Create an HSE Host device. To do so, open **Network Configuration**, then select **Device Type** in the lower right corner and select the HSE Host device from the list.
3. Click the green icon in the upper left corner to add the device to the network configuration:

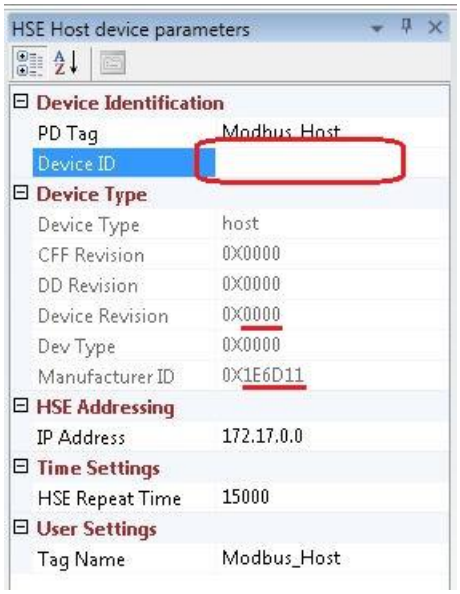
4. Go to **Network Configuration** and select the device you added. Click the green button to open the IP address field and enter the IP address depending on your subnet:



5. Click the lower green button to open the user tag name field. Rename the HSE Host (user tag). Do **not** enter spaces in the tag name:



6. Select the HSE Host and press **F4** to open the device properties. Enter the Device ID (six last digits from manufacturer ID and four last digits from the device type).



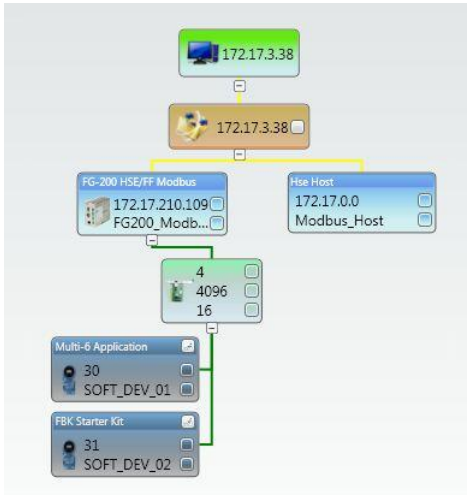
7. Confirm with **Enter**.

Add field devices to your project

From the **Device Type** list select your H1 devices and add them as described above.

Configure device tags, node addresses and block tags of the selected components

1. Modify the H1 link port number (in our example to 4) and rename the devices (node id and user tag) according to your values. Your topology may look as follows:



2. Switch to the **Function Block Application** View and select **Blocks** in the lower right corner.

Add Function Blocks to your FF-CONF project

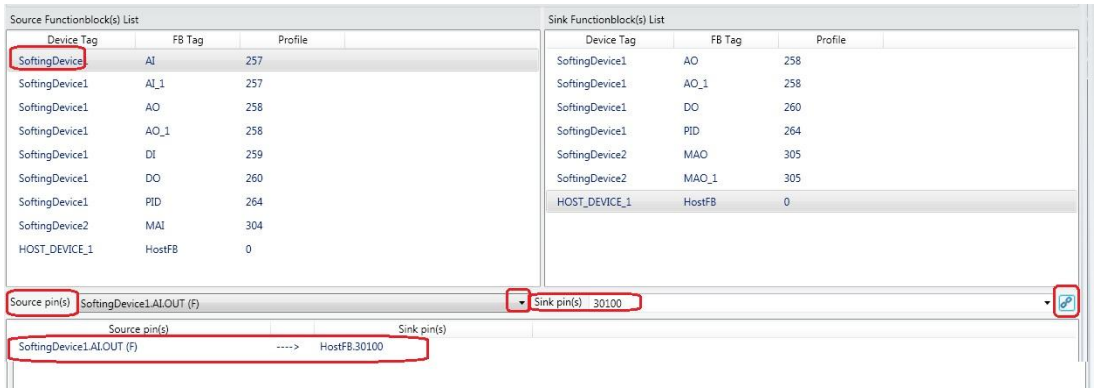
1. Switch to the **Function Block Application** View and select **Blocks** in the lower right corner.
2. Select the function blocks used by your control application to your FF_CONF project. Add it to the function block application view with **Add to function block application**:

Note

Note that for configuring PUB/SUB links it is necessary to also add an Host function block which is provided by the HSE Host device.

Configure communication paths (PUB/SUB links)

1. Select the desired source device, then the related source pin.
2. Then select the sink device and enter the related sink pin, in our example 30100. Click the connect icon on the right. The connected devices appear in the list:



Hint

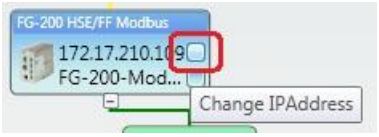
For the Host Function Block (HostFB) you can enter any value in the field **Sink Pin(s)** but we recommend entering the Modbus register number to have a mapped relationship (in our example 30100).

3. Continue with the next device. In our example we have mapped the sensor values that we want to process with the Modbus PLC (AI and MAI values) to the specific Modbus register number. Values being sent by the PLC are mapped to AO or MAO:

Source pin(s)		Sink pin(s)
SoftingDevice1.AI.OUT (F)	---->	HostFB.30100
SoftingDevice1.AI_1.OUT (F)	---->	HostFB.30102
SoftingDevice2.MAI.OUT_1 (F)	---->	HostFB.30104
SoftingDevice2.MAI.OUT_2 (F)	---->	HostFB.30106
HostFB.40100	---->	SoftingDevice1.AO.CAS_IN (F)
HostFB.40102	---->	SoftingDevice1.AO_1.CAS_IN (F)
HostFB.40104	---->	SoftingDevice2.MAO.IN_1 (F)
HostFB.40106	---->	SoftingDevice2.MAO.IN_2 (F)

Adapt IP addresses of FG-200

1. Go to **View → Network Live List**. Select your FG-200 and press **F4** to open the **Properties** view. Copy the IP address from the IP address field into the clipboard.
2. Go to **Network Configuration** and select the FG-200 you added. Click the green button to open the IP address field and paste the IP address from the clipboard:



Adapt PD tag of FG-200

1. Go to **View → Network Live List**. Select your FG-200 and press **F4** to open the **Properties** view. Copy the PD tag from the **PD Tag** field into the clipboard.
2. Go to **Network Configuration** and select the FG-200 you added. Click the green button to open the PD Tag field and paste the PD tag from the clipboard:

Assign device tags, node addresses, block tags configured in your FF-CONF project to the device in the H1 segment

1. Switch back to the **Network Live List** and select your HSE device (dotted frame around device name, see above).
2. Go to the **Network Configuration**, right-click the HSE device and select **Assign** from the context menu.
3. Repeat this step for the H1 devices as well.

Download the project

1. Go online ( ).
2. From the **Download** menu select **Download Project**.

Make sure that all function blocks work as expected

Refer to Make sure that all function blocks work as expected 25 for a detailed description.

4.1.2 FG-200 acts as visitor host

In this case the FG-200 is connected to an H1 segment that is controlled by another FF host system. The links between the FF field devices and the FF host system are working. The FG-200 is not allowed to disturb the operation by reconfiguring working communication paths.

The FG-200 is just allowed to use CLT/SRV connections for reading contained parameters 71 and function block output parameters. The parameters to be read have to be configured in the Modbus mapping table (refer to Mapping submenu) 57.

Important Note

If the FG-200 acts as a visitor host, no FF-CONF project must be downloaded into the FG-200 and the field devices.

Parameter settings

- Make sure **Enable automatic VCR Creation** is activated.
- Activate or deactivate **Link Master Functionality** depending on the following presumptions:

  For this scenario we recommend configuring the Node Address within the range from 252 to 255 for the FG-200. If you want prevent the FG-200 to take an active role in the H1 segments, deactivate **Link Master Functionality**. Usually this is not required if the H1 bus parameters used in the control system are not too slow.

  If **Link Master Functionality** is activated make sure that all activated H1 links of the FG-200 are connected to H1 segments with an active host system interface. Otherwise the FG-200 would wait for a 6 minute period for activity on the H1 segments and would then disable the segments without activity i.e. the segments without an active host interface.

4.1.3 Configure the Modbus mapping table

The FG-200 supports the mapping of a set of function block parameters to Modbus registers. The set of available parameters depends on the type of communication (PUB/SUB links or CLT/SRV connections) used for transferring IO data.

The FG-200 selects PUB/SUB links or CLT/SRV connections depending on the downloaded FF-CONF project. If the downloaded FF-CONF project configures at least one link between the HSE host device and a function block IO parameter, then the FG-200 will use PUB/SUB links for accessing IO parameters. If in the downloaded FF-CONF project there are no links between the HSE host device and IO parameters, then the FG-200 will use CLT/SRV connections for accessing IO parameters.

If the FG-200 uses PUB/SUB links for accessing IO parameters than in the Modbus mapping only the IO parameters linked with the HSE host device are available for the Modbus mapping. If you link in your FF-CONF project one single IO parameter to the HSE host device, then exactly this single parameter will be available for the Modbus mapping.

The FG-200 supports the mapping of the following block parameters. For parameter type see Contained parameters [71] in the Appendix:

Resource block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
FD_FAIL	Contained parameter (read only)
FD_OFFSPEC	Contained parameter (read only)
FD_MAINT	Contained parameter (read only)
FD_CHECK	Contained parameter (read only)

The parameters FD_FAIL, FD_OFFSPEC, FD_MAINT and FD_CHECK provide access to the field diagnostic parameters of the field device. Old devices do not support these diagnostic parameters. For old devices only MODE_BLK and BLOCK_ERR can be mapped to Modbus registers.

Analog input (AI) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
CHANNEL	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
OUT	IO parameter

Analog output (AO) function block

Parameter name	Parameter type	Comment
MODE_BLK	Contained parameter (read/write)	
CHANNEL	Contained parameter (read/write)	
BLOCK_ERR	Contained parameter (read only)	
CAS_IN	IO parameter	available if PUB/SUB links are used
SP	Contained parameter (read/write)	available if CLT/SRV connections are used
BKCAL_OUT	IO parameter	

Discrete input (DI) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
CHANNEL	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
OUT_D	IO parameter

Discrete output (DO) function block

Parameter name	Parameter type	Comment
MODE_BLK	Contained parameter (read/write)	
CHANNEL	Contained parameter (read/write)	
BLOCK_ERR	Contained parameter (read only)	
CAS_IN	IO parameter	available if PUB/SUB links are used
SP_D	Contained parameter (read/write)	available if CLT/SRV connections are used
BKCAL_OUT_D	IO parameter	

Multiple analog input (MAI) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
CHANNEL	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
OUT_1	IO parameter
OUT_2	IO parameter
OUT_3	IO parameter
OUT_4	IO parameter
OUT_5	IO parameter
OUT_6	IO parameter
OUT_7	IO parameter
OUT_8	IO parameter

Multiple discrete input (MDI) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
CHANNEL	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
OUT_D_1	IO parameter
OUT_D_2	IO parameter
OUT_D_3	IO parameter
OUT_D_4	IO parameter
OUT_D_5	IO parameter
OUT_D_6	IO parameter
OUT_D_7	IO parameter
OUT_D_8	IO parameter

Multiple analog output (MAO) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
CHANNEL	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
IN_1	IO parameter
IN_2	IO parameter
IN_3	IO parameter
IN_4	IO parameter
IN_5	IO parameter
IN_6	IO parameter
IN_7	IO parameter
IN_8	IO parameter

Multiple discrete input (MDO) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
CHANNEL	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
IN_D_1	IO parameter
IN_D_2	IO parameter
IN_D_3	IO parameter
IN_D_4	IO parameter
IN_D_5	IO parameter
IN_D_6	IO parameter
IN_D_7	IO parameter
IN_D_8	IO parameter

PID function block

Parameter name	Parameter type	Comment
MODE_BLK	Contained parameter (read/write)	
CHANNEL	Contained parameter (read/write)	
BLOCK_ERR	Contained parameter (read only)	
IN	IO parameter	
CAS_IN	IO parameter	available if PUB/SUB links are used
SP	Contained parameter (read/write)	available if CLT/SRV connections are used
BKCAL_OUT_D	IO parameter	
OUT	IO parameter	

Output splitter (OS) function block

Parameter name	Parameter type	Comment
MODE_BLK	Contained parameter (read/write)	
BLOCK_ERR	Contained parameter (read only)	
CAS_IN	IO parameter	Available if PUB/SUB links are used
SP	Contained parameter (read/write)	Available if CLT/SRV connections are used
BKCAL_IN_1	IO parameter	
BKCAL_IN_2	IO parameter	
OUT_1	IO parameter	
OUT_2	IO parameter	

Integrator (IT) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
IN_1	IO parameter
IN_2	IO parameter
OUT	IO parameter

Input selector (IS) function block

Parameter name	Parameter type
MODE_BLK	Contained parameter (read/write)
BLOCK_ERR	Contained parameter (read only)
IN_1	IO parameter
IN_2	IO parameter
IN_3	IO parameter
IN_4	IO parameter
OUT	IO parameter

For more information on data items used for Modbus mapping table and coding of bit fields refer to Data items used for Modbus mapping table [80] and Coding of bit fields [81].

Perform mapping on the webserver application

Precondition: You have downloaded [24] the FF-CONF project.

1. Open the web browser and login.
2. Go to **Configuration → Fieldbus → Blocks** and click **[Reload Live List]**.
3. To update the page select **Configuration → Fieldbus → Devices**, then go back to **Configuration → Fieldbus → Blocks.**

4. Now go to **Configuration → Modbus → Mapping**.

Note
Assumption is: Modbus addresses is **base 1**.

5. Click **[New Entry]**. Enter the register number, then select the device, the block and the parameter.
6. Repeat these steps for each register with a new entry.
7. Then click **[Change Mapping]**. The table is loaded into the FG-200.
8. Save the mapping by exporting the table into a *.csv file. To do so, select **Configuration → Modbus → Mapping → Import/Export**. Click **[Export]** and save the file to your backup location.
9. Mapped values are now accessible in the configured Modbus registers and can be accessed by a Modbus control.

4.1.4 Modbus statistics counter

You can get additional statistic information concerning the Modbus communication state by reading the Modbus registers:

Modbus Holding Register (addresses base 0)	Modbus Holding Register (addresses base 1)	Meaning
9000	9001	Redundancy Role: 0: Primary 1: Secondary
9001	9002	Number of received Modbus TCP requests
9002	9003	Number of sent Modbus TCP responses
9003	9004	Number of received Modbus TCP requests with encoding errors
9004	9005	Number of received Modbus RTU requests
9005	9006	Number of sent Modbus RTU responses
9006	9007	Number of received Modbus RTU requets with encoding or CRC errors
9007	9008	Number of current open Modbus TCP sessions
9008	9009	Total number of Modbus TCP sessions
9009	9010	Timestamp for starting Modbus TCP statistic collection
9010	9011	Time stamp for starting Modbus TCP statistic collections

Note
Statistic values from Modbus registers 9001 – 9010 are identical to information available on web pages **Diagnostics → Advanced → Modbus Statistics → TCP** and
Diagnostics → Advanced → Modbus Statistics → Serial.

Statistic counter values can be reset via web pages.

4.2 FG-200 acts as a FF-HSE/ FF-H1 gateway

4.2.1 FG-200 acts as an H1 interface used by Emerson AMS System

Emerson provides its AMS Device Manager for calibration, diagnostics and device configuration for various fieldbus technologies. Using the FG-200 enables AMS Device Manager to access FF-H1 devices. As a precondition it is necessary to enable FF-HSE interface in the AMS Device Manager and integrate the FF device descriptions of the FG-200 (CFH-File) and the H1 Devices that have to be accessed.

In order to use the FG-200 the following general settings have to be done via the webserver interface:

Configuration > Settings > General Settings

General Settings	
Enable automatic VCR Creation	☑
Display Blocks	☐
Enable HSE Alarms	☐
Link Master Functionality	☑
Visitor Mode	☐
Enable Modbus	☐
Enable RTU	☐

Configuration > Settings > LD Settings

Linking Device Settings	
PD Tag	FG200_For_AMS_Interface
Link ID 1 (Range 0,1000-FFFF)	1000
Link ID 2 (Range 0,1000-FFFF)	1001
Link ID 3 (Range 0,1000-FFFF)	1002
Link ID 4 (Range 0,1000-FFFF)	1003
Node Address (Range 16-247,252-255)	16

Make sure **Enable automatic VCR Creation** is activated. Otherwise no access to H1 device parameters would be necessary.

Additional settings depend on the user scenario:

Offline access (Standalone network FG-200 and H1 devices)

In this scenario the FG-200 would be the primary host device and **Link Master Functionality** is activated. In addition we recommend disabling the **Visitor Mode** and setting Node Address to 16 or 17. Make sure all required H1 Links are activated i.e. a Link ID >= 0x1000 is assigned for those links.

Access in field (H1 devices are used as part of a control system)

For this scenario we recommend configuring the Node Address within the range from 252 to 255 for the FG-200. If you want prevent the FG-200 to take an active role in the H1 segments, deactivate **Link Master Functionality**. Usually this is not required if the H1 bus parameters used in the control system are not too slow.

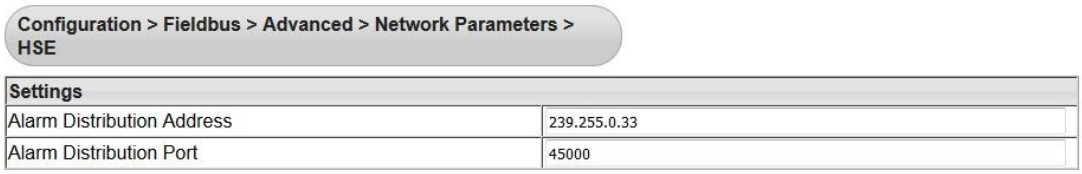
If **Link Master Functionality** is activated make sure that all activated H1 links of the FG-200 are connected to H1 segments with an active host system interface. Otherwise the FG-200 would wait for a 6 minute period for activity on the H1 segments and would then disable the segments without activity i.e. the segments without an active host interface.

H1 Device Alarms

AMS Device Manager supports monitoring a subset of H1 device alarms. To make use of this functionality you need to enable this feature in the AMS Device Manager and to configure the FG-200 and the attached H1 devices accordingly. Note that within AMS Device Manager alarms are designated as "Alerts". Activate this setting with **Enable HSE Alarms** in the General Settings web page of the FG-200.

We recommend activating **Visitor Mode** in the **General settings** web page. Thus you disable the alarm configuration of H1 devices. This would prevent an impact on an existing device configuration but could lead to situations where it is not possible to receive alarms from some H1 devices. To display which devices are affected go to **Configuration → Fieldbus →Device** and search in column "Alarm configured" for the respective device.

AMS Device Manager is supporting standard Fieldbus Foundation alarm messaging using the UDP protocol, but it has an preconfigured UDP multicast address (239.255.0.33) and UDP port (45000) for the reception of the alarm messages. This is used as default in the FG-200 but could be altered if a future AMS Device Manager version would expect a different multicast address or UDP port by changing the settings in the following web page.



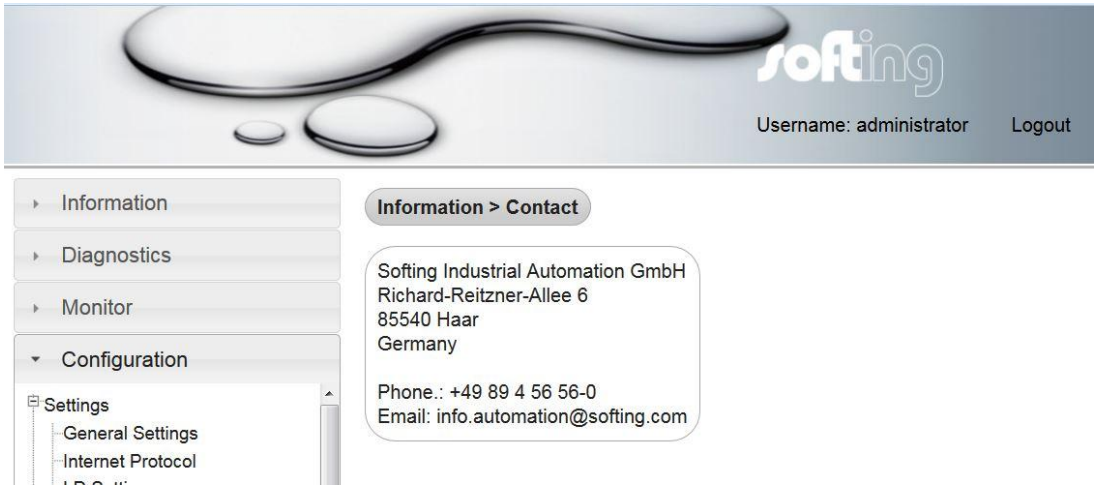
5 Using the internal webserver interface

After an IP connection between PC and FG-200 has been set up as described in Configure IP address and Modbus parameters 18, you may access the FG-200 from your PC by means of a web browser that supports JavaScript (e.g. Microsoft Internet Explorer).

The internal web server of the FG-200 offers the possibilities to configure the device (such as IP address settings or Modbus mapping), to get diagnostic information on the fieldbus or Modbus as well as to monitor process values of the connected field devices.

5.1 Login to webserver

1. Start your web browser with the URL http://192.168.0.10. You are prompted to log in with username and password.
2. Enter **administrator** in the field **Username**. Enter **fgadmin** in the **Password** field (default setting - refer also to Settings - User Accounts 47).
3. Your specified start page is opened - in our example the Information page (refer to Homepage submenu) 53. Depending on the web browser you are using the information presentation may vary slightly:



The menu bar on the left side offers three main menus and several submenus:

- Information menu 40
- Diagnostics menu 41
- Monitor menu 43
- Configuration menu 44

Note

If you erase the FG-200 configuration, the password is reset to its default value.

5.2 Information menu

The **Information** menu offers the following menu items:

Menu item	Functionality
Contact	shows you Softing's contact information in case ▪ you require general information about the product or ▪ you need technical support or ▪ you like to provide feedback about the product. **Softing Industrial Automation GmbH** Richard-Reitzner-Allee 6 85540 Haar / Germany Tel: + 49 89 4 56 56-0 Fax: + 49 89 4 56 56-488 Internet: http://industrial.softing.com Email: info.automation@softing.com Support: support.automation@softing.com
Version	gives you detailed information about the device/system, the base module (mother board) and the H1 module (daughter bard) with the four H1 channels. Both modules as well as the entire device are identified by hardware version numbers and serial numbers. The firmware version and the system id, a manufacturer-specific identifier for the system, are also indicated.
Manual	provides access to information on how to use the web server. Click **[Device Manual]** to open the FG-200 HSE/FF Modbus User Manual.
Notices	informs you about the open Source Declaration and the open source software packages used in conjunction with FG-200 HSE/FF Modbus. **Open Source Declaration:** The FG-200 HSE/FF Modbus uses the following open source software packages: ▪ - eCosPro V3.1.41 ▪ - jQuery V1.7.2 The license declarations and links to source codes for these components are available on the following webpage: http://opensource.softing.com/IA/FG-200FF/V1/

5.3 Diagnostics menu

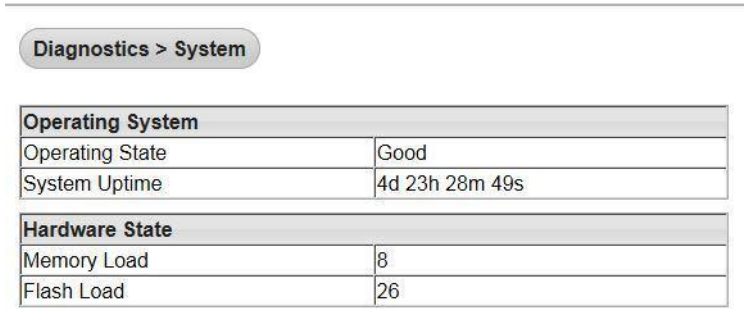
Click **Diagnostics** to open the following menus:

- System [41]
- Internet Protocol [41]
- Fieldbus [42]
- Advanced [42]

5.3.1 System

Click **System** to display system information about the operating system and the hardware status:

- Operating State: operational, good, ...
- System Uptime: Time since the FG-200 has been booted
- Memory load: Percentage of memory used
- Flash Load: Percentage of flash used



5.3.2 Internet Protocol

Click **Internet Protocol** to display detailed information about the addresses used:

MAC Address: number that acts like a name for the network adapter
IP Address: IP address of the FG-200
IP Address (redundant device):
IP address of the redundant FG-200. Empty if the FG-200 operates in non-redundant mode.
Subnet Mask: IP subnet mask
Default Gateway: Address of the IP gateway to other subnets
Redundancy State: Current role in a redundant set of FG-200; the following values are possible

- Primary, no backup
- Primary
- Secondary

Diagnostics > Internet Protocol

Internet Protocol	
MAC	00:06:71:2d:00:1a
IP Address	172.17.11.26
IP Address(redundant Device)	Not detected
Subnet Mask	255.255.0.0
Default Gateway	0.0.0.0
Redundancy State	Primary, no backup

5.3.3 Fieldbus

Fieldbus segment diagnostics are provided to give you a quick view of what is attached to the FG-200. It shows how many segments are active. Two tables are displayed: The first table shows the information about the FG-200, the PD Tag as well as the Device ID. The PD Tag can be modified in the LD Settings submenu 47 page. The second table shows which segment (H1 Link) of the FG-200 is occupied and how many FF-H1 devices are connected to each segment. Additionally, for each available FF-H1 device the tag name is shown. This table provides a simple live list of the FF-H1 network. To update this list click the **Fieldbus** menu again.

System and Segment status in detail:

- PD Tag (Physical Device Tag): a unique, configurable and system-dependent name for the device.
- Device ID is set to a unique value for each individual device by the device manufacturer.
- Online: indicates whether a device is online or not.
- Devices: shows number of devices online (including the FG-200).

For each FG-200 up to four H1 Links (segments) are available. And under each H1 Link up to 16 H1 devices are possible.

The following example shows that in segment 1 the FG-200 plus four field devices are online and in segment 3 the FG-200 plus five field devices are online. In the segments 2 and 4 only the FG-200 is online.

Diagnostics > Fieldbus

PD Tag	FG200_Modbus108
Device ID	1E6D114210-00-FG200-000150400108

Description	Segment 1	Segment 2	Segment 3	Segment 4
Online	✓	✓	✓	✓
Devices	5	1	6	1

5.3.4 Advanced

The Advanced submenu contains additional statistics information. Refer to Diagnostics - Advanced submenus 76 in the Appendix for a detailed description of the different web pages.

5.4 Monitor menu

The **Monitor** menu offers the following menu items:

- Point Pages submenu [43] and
- Point Data submenu [43]

5.4.1 Point Pages submenu

Point Pages displays the output of FF function blocks (value and status) on one or more web pages. Multiple pages can be configured to fit the application and to keep track of the different parts of the plant.

Click **Point Pages** to select the desired part of data. It may be displayed in one or more rows or sites.

pointpage_0

Segment	Device	Block	Block Desc	Parameter	Point	Name	Description	Value	StatusDescription	Status	StatusIcon
4	SoftingDevice2	MAI		MAI .OUT_1	MAI .OUT_1			892.109985	GoodNonCascadeNonSpecific	Good	
4	SoftingDevice1	AI		AI .OUT	AI .OUT			87.000000	GoodNonCascadeUnacknowledgedAdvisoryAlarm	Good	
4	SoftingDevice1	DI		DI .OUT	DI .OUT			0x00	GoodNonCascadeNonSpecific	Good	

Hint

The initial value in column "StatusDescription" is shown offline until a value has been received after the first call-up of this point page.

If a device to which this point page value has been assigned is not online, the text "Unknown Device" in column "Device" is displayed and in "StatusDescription" appears "Offline" for this specific point.

In this case check whether the H1 devices configuration has been changed. Perform a Reload Live List as described in Blocks submenu [54].

5.4.2 Point Data submenu

Click **Point Data** to display all data items from all point pages.

Segment	Device	Block	Block Desc	Parameter	Point	Name	Description	Value	StatusDescription	Status	StatusIcon
4	SoftingDevice2	MAI		MAI .OUT_1	MAI .OUT_1			814.109985	GoodNonCascadeNonSpecific	Good	
4	SoftingDevice1	AI		AI .OUT	AI .OUT			9.000000	GoodNonCascadeUnacknowledgedAdvisoryAlarm	Good	
4	SoftingDevice1	DI		DI .OUT	DI .OUT			0x00	GoodNonCascadeNonSpecific	Good	

5.5 Configuration menu

The **Configuration** menu offers the following menu items:

- Settings [44]
- System Maintenance [48]
- Page Options [51]
- Fieldbus [53]
- Modbus [56]

Note

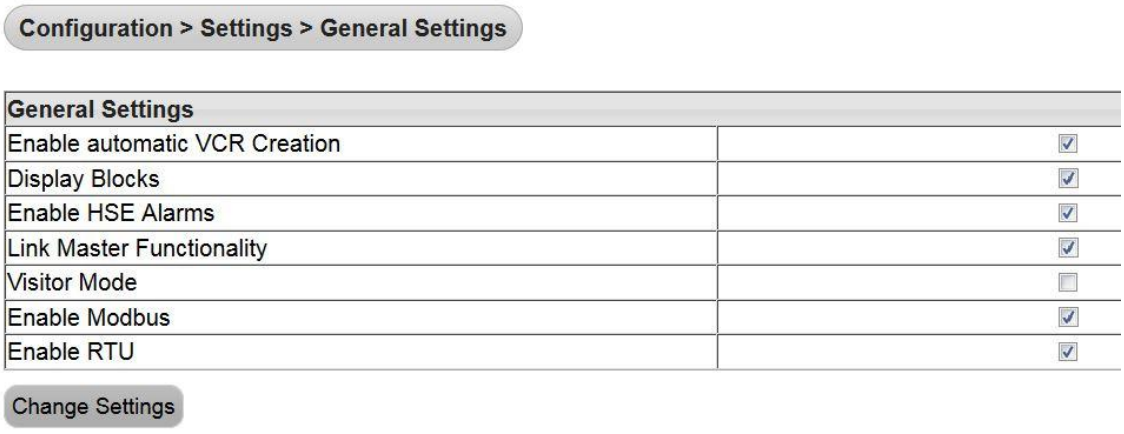
Settings performed on the web interface are not automatically transferred from the primary to the secondary FG-200. The secondary FG-200 must also be configured separately.

5.5.1 Settings

The **Settings** menu offers the following submenus:

- General Settings submenu [44]
- Internet Protocol submenu [46]
- LD Settings submenu [47]
- User Accounts submenu [47]

5.5.1.1 General Settings submenu



Enable automatic VCR Creation

If this feature is activated, the FG-200 establishes the VCR connection by itself. Examples are

- Softing FOUNDATION Fieldbus Configuration Tool (FF-CONF): activate
- Emerson AMS™ Software: activate
- NI-FBUS Configuration Tool: deactivate

Note

The feature **Enable automatic VCR Creation** has to be activated when the tool FF-CONF is to be used for the Foundation fieldbus configuration.

Display Blocks

This feature enables or disables the point page [43] functionality.

Hint

The use of the point pages creates a lot of traffic of the FF-H1 network. If you do not use this Monitor feature then you can save more H1 bandwidth and faster reaction time over Modbus.

Enable HSE Alarms

The FG-200 is able to use the already configured alarm VCRs in the FF-H1 devices or can established new ones. Or it will configure the FF-H1 devices accordingly. The behavior depends whether the Visitor Mode is enabled or not.

Link Master Functionality

In case of visitor mode it can make sense to disable the Link Master functionality. If no Link Master is available on a segment connected to an activated H1 Link of the FG-200, a timeout will occur after 6 minutes to indicate this. The FG-200 will not be visible in the HSE live list during this period. To avoid this assure that a Link Master is present for all activated H1 Links or deactivate H1 Links of the FG-200.

Visitor Mode

When the FG-200 is in visitor mode it can be connected to a running FF-H1 network with the FF-Host system without affecting the established communication.

Enable Modbus

This button enables or disables Modbus TCP.

Enable RTU (Modbus RTU)

Modbus RTU runs over the same serial interface (RS232) which is necessary to establish an application with HSE device redundancy. To use redundancy together with Modbus TCP the feature "Modbus RTU" has to be disabled.

Note

If you are using Modbus TCP, activate the option **Enable Modbus** only.

If you are using Modbus RTU, activate both options **Enable Modbus** and **Enable RTU**.

The button **[Change Settings]** allows you to update the settings. To see the updated values click **General Settings** again.

5.5.1.2 Internet Protocol submenu

The FG-200 is delivered in a default configuration. To change the default internet protocol settings to assigned values of the chosen subnet in which the installation is running, select **Configuration**, then **Internet Protocol**.

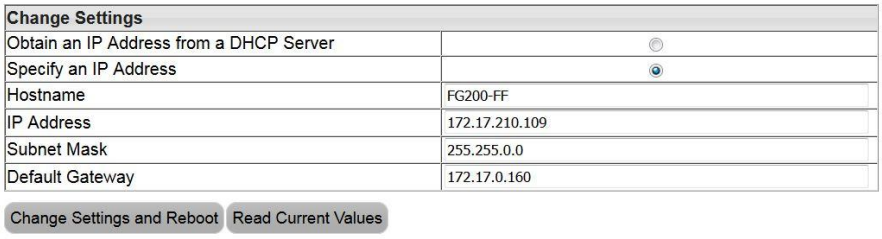
A table enabling you to change settings appears. You can click

- **Obtain an IP address from a DHCP server** to obtain a random address chosen from the DHCP server.

  To find out the IP address of the FG-200 you can use the function **Network Livelist** in the FF-CONF tool. The tool is available on your delivery CD-ROM or can be downloaded from the Softing download area.

  or

- **Specify an IP Address** to activate the fields in the table below:
  - Host name: configurable name for the host
  - IP Address: must be compatible with the subnet you choose for the PC setting, must be present in any case.
  - Subnet mask: default with 255.255.0.0, no change needed, must be present in any case.
  - Default Gateway: It is not necessary to configure a Default Gateway if the host and FG-200 share the same network.



[Change Settings and Reboot]

When you click this button, the web site shuts down and the system reboots. The input values are checked for consistency. In case of problems the following error may be displayed: Failure: Wrong IP Settings.

The FG-200 reboots after a few seconds and the new values are accepted.

If you change the IP address of the FG-200, the IP connection between PC and FG-200 are lost. You have to use the new IP address to re-establish web access to the FG-200.

If all parameters are correct, the new values are accepted and displayed.

[Read Current Values]

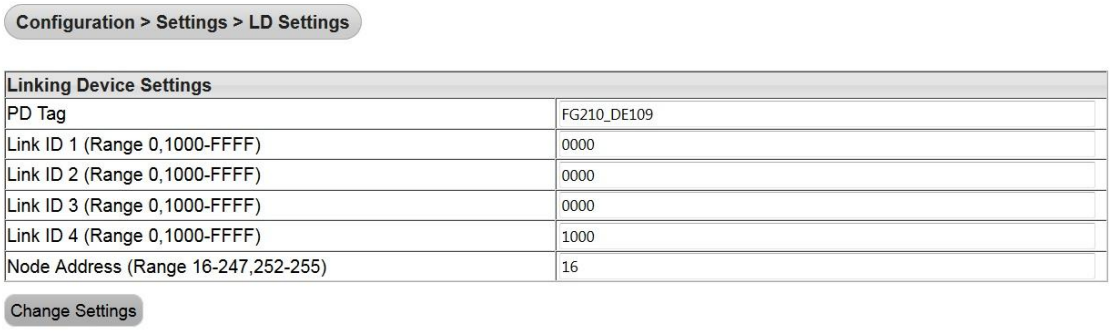
If you changed some of the parameters and you are not sure of your changes, click the button **[Read Current Values]**. Input fields which are already filled are shown again.

5.5.1.3 LD Settings submenu

The LD Settings submenu allows to change

- the PD-Tag of the FG-200
- the Link ID as well as
- the Node Address of the H1 links.

Each FG-200 uses a default PD tag that includes the serial number. The default PD Tag is also used if the configuration is erased via the web server interface or during firmware download.

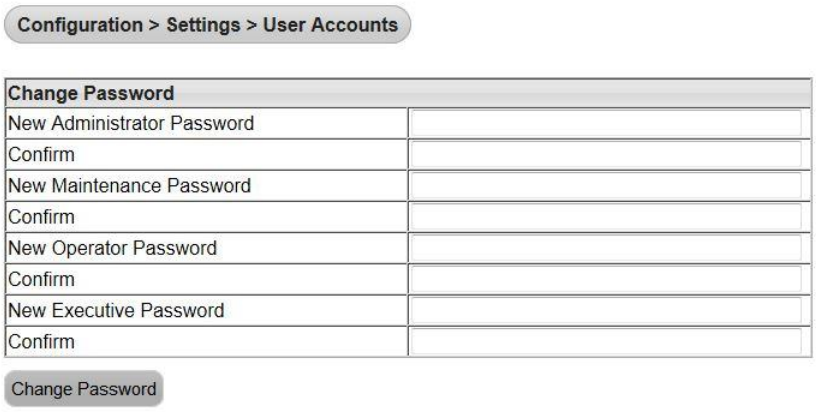


5.5.1.4 User Accounts submenu

This menu allows you to change and confirm account passwords depending on the role. Due to the tasks a user executes in this web site there are several graduations for admission control. The following standard logins and passwords are available.

Role	Login name	Password
Administrator	administrator	fgadmin
Service or maintenance engineer	maintenance	keepitgoing
User or operator	operator	runit
Executive	executive	showme

These passwords can be configured with administrator rights in the following window:



Enter the password into the corresponding field(s), confirm your entry and click **[Change Password]** to confirm the modified password(s).

The following tasks can be executed by the specified role:

Task	Administrator	Maintenance	Operator	Executive
Configure network settings	☑			
Set passwords	☑			
Set time settings and home page options	☑			
Restart applications	☑			
Monitor process values	☑	☑	☑	☑
Monitor diagnostic values	☑	☑	☑	☑

Note
Be careful when changing the administrator password. If you lose your changed administrator password, you cannot perform any configuration or set up task.

5.5.2 System Maintenance

The **System Maintenace** menu offers the following submenus:

- Restart submenu 48
- Firmware submenu 48
- Configuration Backup submenu 49
- Time submenu 50

5.5.2.1 Restart submenu

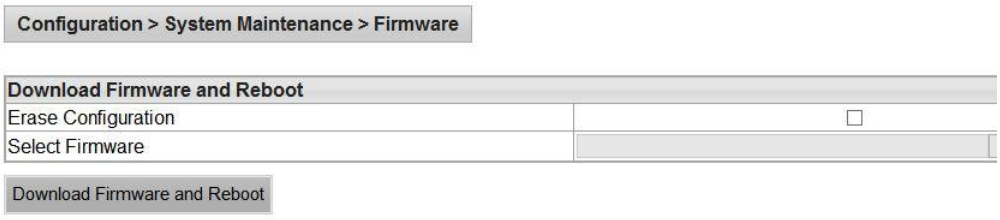
Allows you to restart the system:

- Click **[Restart Now]** to restart the system.

5.5.2.2 Firmware submenu

Allows you to

- erase an existing firmware configuration and to
- select new firmware file(s):



Do not activate the check box **Erase Configuration** unless you want to set up the complete plant configuration using the FF-CONF tool. When activating, the PD tag is set to an empty string and all passwords are reset to standard passwords (refer to Login to webserver 39 for more information).

1. Click **[Browse]** right beside the **Select Firmware** field and browse to your firmware file. Confirm with **[Open]**.
2. Then click **[Download Firmware and Reboot]** to download the firmware file and to reboot the system.

   The system performs a firmware file check. The download is started. Messages indicate the current download status. A complete download is indicated as successful and the FG-200 reboots:

Starting FW download, please don't power off the Linking Device.

Decoding Firmware File... OK, decoded 1897284 bytes
Firmware: "FG-200 Firmware VX.XX.0.00.socevatest"
Erasing Flash... OK, programming Flash... OK
Now Updating Backup Image
Erasing Flash... OK, programming Flash... OK
Erasing Configuration... OK
Success: Update Complete!
Rebooting... OK

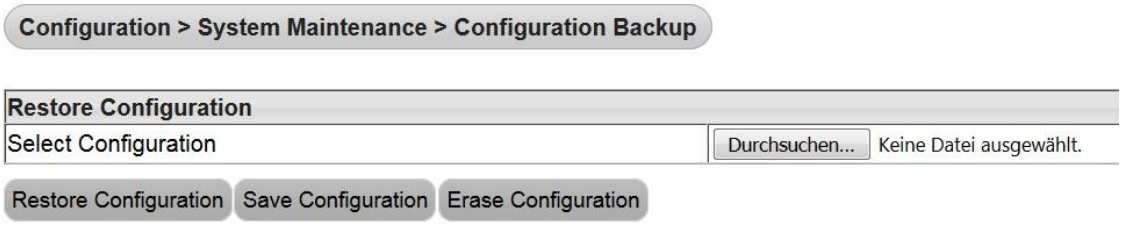
Note
Do not access the web server of the FG-200 before the "Success" message is displayed in the browser window. If you do so, you will have to clear the cache of your web browser after the boot process has finished, and then re-establish a connection to the web server of the FG-200.

The end of the boot process is indicated by a continuously lit RUN LED for a FG-200 acting in non-redundant mode or for a primary device in redundant mode. For a secondary device it is indicated by a flashing (1 Hz) RUN LED.

5.5.2.3 Configuration Backup submenu

Allows you to

- restore a selected system configuration,
- save a selected configuration or to
- erase the current configuration:



Restore Configuration

To restore a previously saved configuration click **[Browse]**, select the desired configuration file and confirm with **[Open]**.

Save Configuration

1. To save your current configuration, click **[Save Configuration]**. An additional window is opened asking you to save the file.
2. Click **Save file** and confirm with **[OK]**. The configuration file is saved to your standard download directory.

Erase Configuration

To erase an existing configuration and to reset the FG-200 back to factory default settings click **[Erase Configuration]**. This action causes

- the deletion of the current configuration (whereby the IP configuration is not changed),
- passwords to be deleted and to be reset to their default value.

Important Note

When clicking **[Erase Configuration]** the configuration is immediately deleted.

5.5.2.4 Time submenu

Allows you to

- synchronize date and time between PC and device(s) or
- to set a specific date and time for your device:

Configuration > System Maintenance > Time

Current Time	
Your PC´s Time	Fri Aug 28 2015 13:43:52 GMT+0200
FG-200 FF Time	Sat Jan 01 1972 01:11:21 GMT+0100
Difference	-1377689551 seconds

Set Time	
Time Synchronized by HSE SNTP Server	Not configured
Set with PC	◉
Manual Entry	○
Date (mm/dd/yyyy)	
Time (hh:mm:ss)	

Set Time

Note
If an SNTP server is configured, you cannot modify date and time due to automatic time synchronization.

Current Time displays

- the current time on your PC,
- the time on the Softing FG-200 and
- the difference between the current PC time and the time on the FG-200.

Set Time allows you to

- synchronize the current PC time and the time of the FG-200. Activate **Set with PC** and then click **[Set Time]**. The synchronized time will appear in the table.
  If the FG-200 is connected to a network and if you want to use this feature, you can select a timeserver at your facility or one near you geographically to ensure accurate time adjustments. The device will function properly with this feature disabled but data time stamps are less accurate and time updates must be entered for each FG-200

  or

- set the time manually. To do so, activate **Manual Entry**, then click into the corresponding field **Date** and **Time** and enter the desired values. Confirm your changes by clicking **[Set Time]**. Your entries are then activated.

5.5.3 Page Options

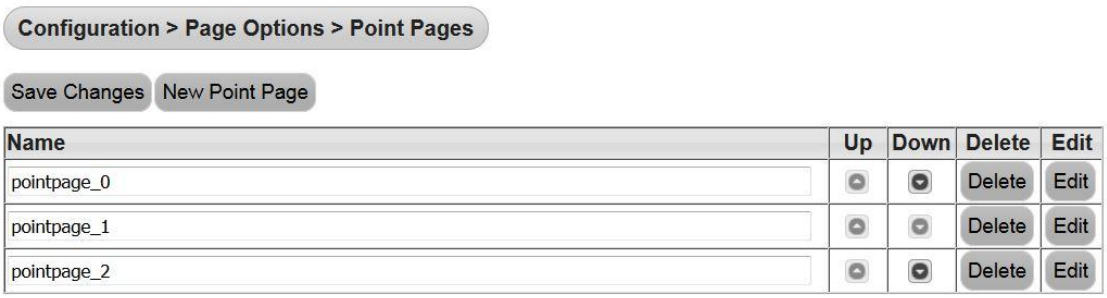
The **Page Options** menu offers the following submenus:

- Point Pages submenu 51
- Point Columns submenu 53
- Home Page submenu 53

5.5.3.1 Point Pages submenu

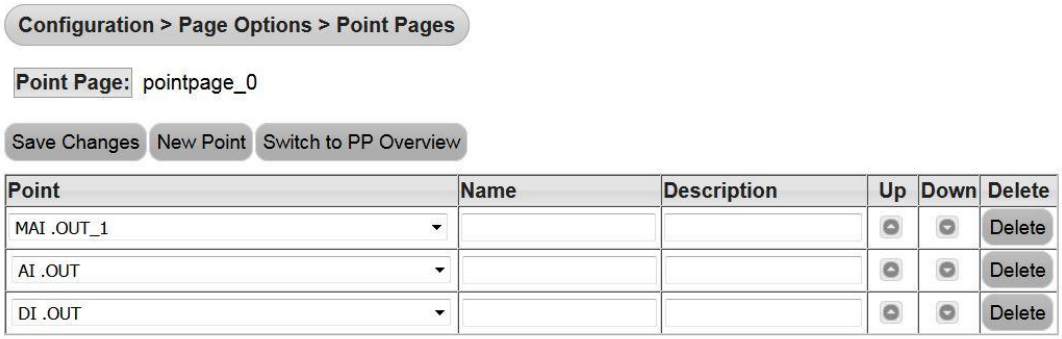
Point Pages provide a means to view the Output of a Function Block and its status on one or more web pages. It allows to create pages to select information of your whole plant. Multiple pages can be configured to fit the application.

Click **Point Pages** to display the current list of Point Pages.



[Save Changes] saves your changes.

[New Point Page]	inserts a new point page line (ascending number, maximum of 20 pages).
Up and **Down**	sort the selected page int the order you desire (up or downwards).
[Delete]	deletes the selected page.
[Edit]	allows to edit the selected point page content. A new windows is opened:



You can insert a new point with **[New Point]**, edit the selected point, sort the list and delete the point.

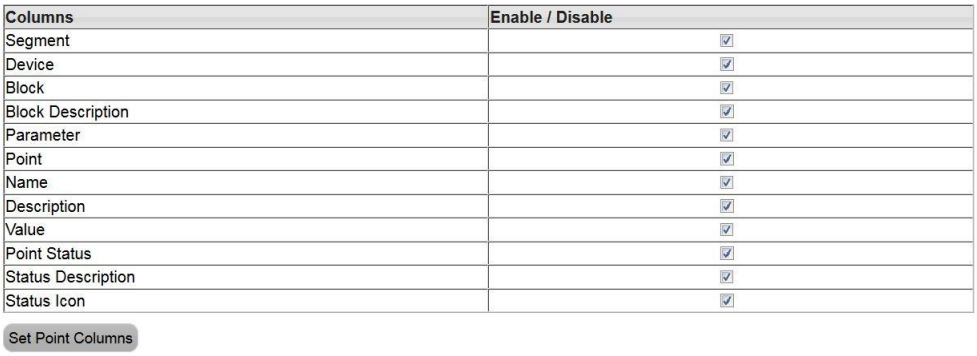
Columns and their meaning

Point	lists the Blocks with OUTPUT parameters (e.g. AI, DI, PID, AO.BKCAL_OUT, AO.BKCAL_OUT). To open the list of configured points click on the arrow right beside the point. Depending on the selection for usage of cyclic communication (in **Configuration → General Settings**) the list will contain only those parameters that are configured to be published cyclically. Maximum number of new points is 20.
Name	contains the parameter name. You can enter any name such as a plant or system tag name for an I/O parameter. Maximum length is 32 characters.
Description	contains the user description of the parameter name.
[Save Changes]	saves your changes. To display the new or modified values click **[Switch to PP Overview]**.
[Switch to PP Overview]	switches back to the main point pages overview window.

5.5.3.2 Point Columns submenu

The point columns submenu opens a table allowing you to enable or disable various point columns. Thus you are able to build the specific point page format you need.

Activate the desired column to make it appear in the point page:



Columns	Enable / Disable
Segment	☑
Device	☑
Block	☑
Block Description	☑
Parameter	☑
Point	☑
Name	☑
Description	☑
Value	☑
Point Status	☑
Status Description	☑
Status Icon	☑

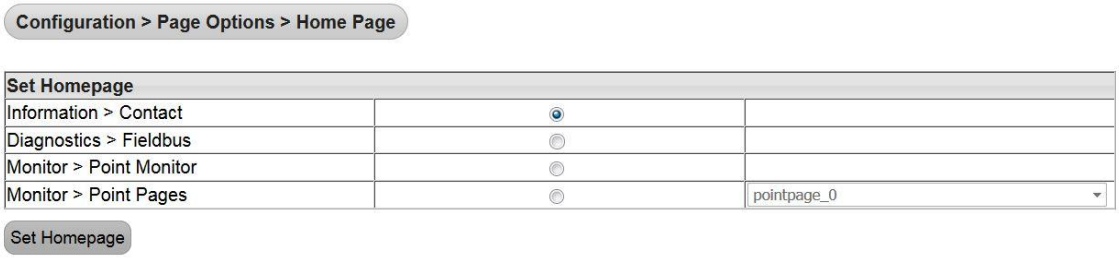
Set Point Columns

Any deselected point column is disabled and does not appear in the point page (refer also to Point Pages submenu 43 in the **Monitor** menu).

5.5.3.3 Homepage submenu

The homepage submenu opens a table allowing you to set the start page of the FG-200 HSE/FF Modbus web interface to one of the following four pages:

- Information - Contact
- Diagnostics - Fieldbus
- Monitor - Point Monitor
- Monitor - Point Pages



Configuration > Page Options > Home Page

Set Homepage		
Information > Contact	◉	
Diagnostics > Fieldbus	○	
Monitor > Point Monitor	○	
Monitor > Point Pages	○	pointpage_0

Set Homepage

Select the desired homepage and confirm your selection with **[Set Homepage]**. The next time you log in into your web interface it is opened with the new start page.

If you select **Monitor > Point Pages** you need to select the specific point page you want to be opened from a list.

5.5.4 Fieldbus

The **Fieldbus** menu offers the following submenus:

- Devices submenu 54
- Blocks submenu 54
- H1 Parameter submenu 55
- HSE submenu 56

5.5.4.1 Devices submenu

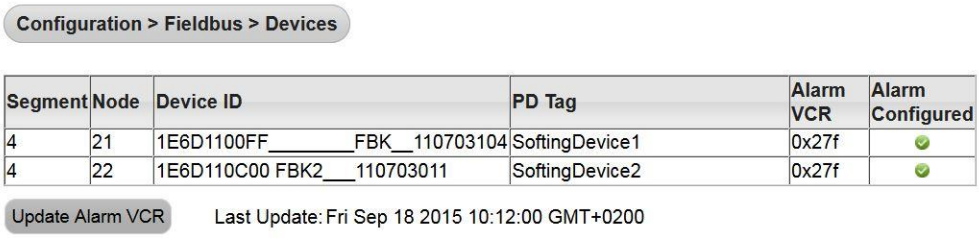
The devices submenu opens a table displaying the devices that are connected to the FG-200. The table shows which segment from the FG-200 is connected to how many devices. The devices are displayed with their H1 Node Address, their Device ID and their PD Tag.

Precondition: You have activated **Enable HSE Alarms** in **Configuration → Settings → General Settings**.

Additionally there is information about the alarm VCR (VCR address) and the status of the alarm (alarm sending in the H1 device and transferring the alarm from the FG-200 to HSE).

The column Alarm VCR displays the configured H1 endpoint address used for the reception of the alarms.

- indicates that alarm sending is configured.
- indicates that no alarm could be configured or - in Visitor mode only - a different endpoint is configured already to the device which must not be overwritten.



The fields **Node** and **PD Tag** are display fields and cannot be modified.

Click **[Update Alarm VCR]** to update the list, e.g. after a configuration download. Thus, modified node addresses, PD tags or the communication configuration list will reflect the current H1 segment configuration status. Alternatively you can restart the FG-200 to update settings.

5.5.4.2 Blocks submenu

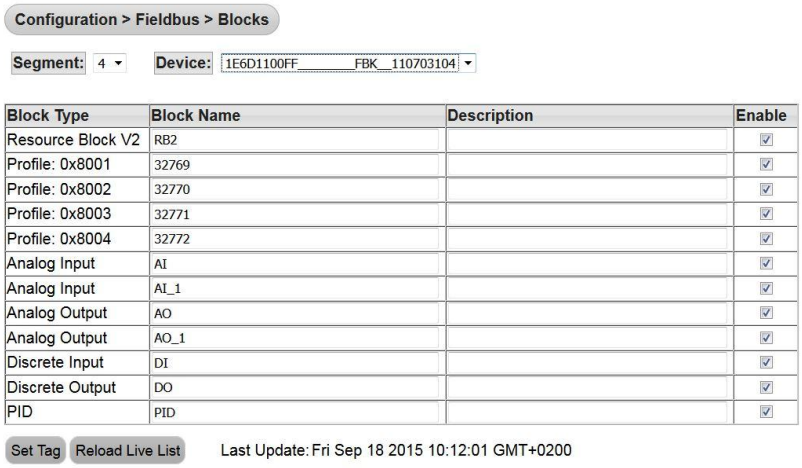
The Block submenu displays the block information of all FF-H1 field devices that are connected to the FG-200. Two filters allow for selecting

Segment the list of configured segments.

Device list of devices connected.

The table shows the corresponding Block Type, Block Name, Description and whether it is enabled or not. Enabled block types are displayed in the point page in the Monitor menu 43. By default only those blocks are enabled that have a block name. For vendor-specific blocks the profile number is displayed instead of the name.

When naming blocks (up to 32 ASCII-characters) we recommend assigning self-explanatory names that contain information about the location or type (e.g. analog output, digital input).



[Set Tag] will change the block tag in the device according to the modifications performed.

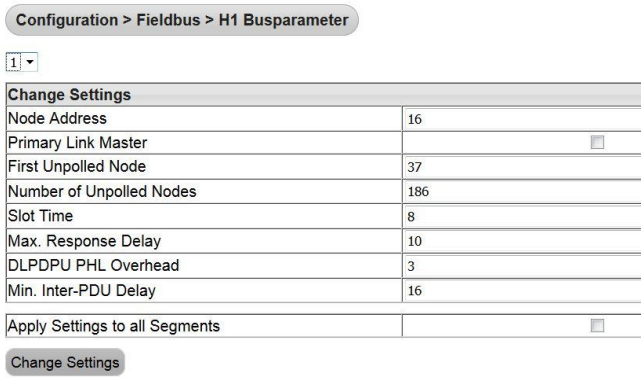
Note

if you are working with the Configuration tool FF-CONF we recommend **not** to modify tags.

[Reload Live List] updates information on the blocks and reloads the live list in the FF-CONF with updated information, e.g. after a configuration download. Thus, modified block tags will reflect the current configuration status. Alternatively you can restart the FG-200 to update information on the blocks.

5.5.4.3 H1 Busparameter submenu

The H1 Busparameter submenu allows to define parameters for the chosen segment (H1 Link). Click **[Change Settings]** to apply your modifications and download it to the FG-200. If the selected H1 segment is active, the settings would also be downloaded to a secondary FG-200 if the FG-200 is acting as primary in a redundant set.



Note

The FF-CONF can calculate optimized busparameters derived from the *.cff file information. Thus you need not to modify any parameter here.

5.5.4.4 HSE submenu

The HSE submenu allows to specify the **Alarm Distribution Address** and the **Alarm Distribution Port**. These parameters are the Multicast Address and the UDP Port that are used by the FG-200 to forward alarms from H1 devices.

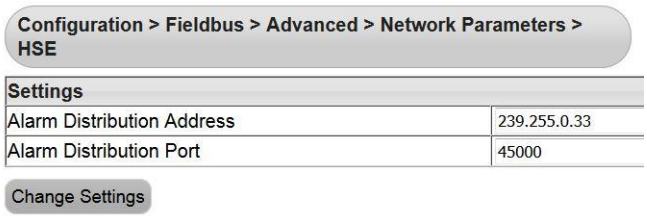
Note

The default settings "Address = 239.255.0.33" and "Port = 45000" are required for interoperability with Emerson AMS tool.

Changing these parameters would disable the display of alarm conditions in AMS alert monitoring.

If a different HSE host tool should be used, the parameter could be adapted to the values required by that tool.

Click **[Change Settings]** to apply your modifications.



5.5.5 Modbus

The FG-200 allows traditional control systems access to H1 fieldbus devices as well as over the serial port RS485 and using TCP/IP. These control systems normally include support for the Modbus communication protocol.

The **Modbus** menu offers the following submenus:

- Communication submenu 56
- Mapping submenu 57
- Import/Export submenu 58

5.5.5.1 Communication submenu

The Communication submenu allows to configure the Modbus Communication settings.

Hint

Before you modify settings make sure that the Modbus function is enabled and all parameters are set to a valid value. Therefore consult the manual of your particular Modbus client and adjust the Modbus configuration accordingly.

Most of the settings are self-explanatory and are related to configuring the serial port to match the settings used by the Modbus Master.

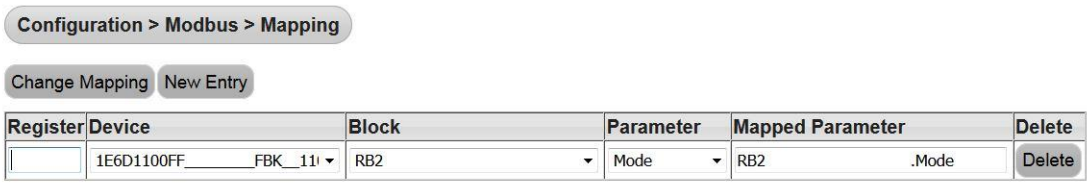
If you are using Modbus TCP/IP over the Ethernet, then the communication settings (baud rate, parity, stop bits) can be ignored.

Click **[Change Settings]** to apply your modifications.

Settings	
One Modbus Address	○
Single Address	0
Multiple Modbus Address	◉
Modbus TCP Port	502
Baud Rate	19200
Parity None	Even
Stop Bits	1
Response Delay Time	0
Unmapped Register Read Response	Illegal Data Address
Unmapped Register Write Response	Illegal Data Address
Write Behaviour	Queued
Floating Point Representation	Float
Use Swapped Floating Point Format	No
Incorporate Values Associated Status As Error	Yes
Value Reported For Error (Floating Point)	NaN
	0
Value Reported For Error (Rounded and Native Integer)	0
Stale count limit	4
Scaled Floating Point Maximum Integer Value	65534
Gain value used for scaled representation	1
Offset value used for scaled representation	0

Change Settings

5.5.5.2 Mapping submenu



The functions of the Modbus mapping in the FG-200 are flexible enough to accommodate most traditional control systems. The Modbus mapping table allows a user to associate the output or input value of an AI or an AO Function Block with any traditional or extended Modbus register.

1. Click **[New Entry]** to add a new entry.
2. Then type the required Modbus register and assign the relevant process value (the out or in value of the function block).
3. Then click **[Change Mapping]** to apply the configuration. After a reload of the page you will see the new mapping entry.

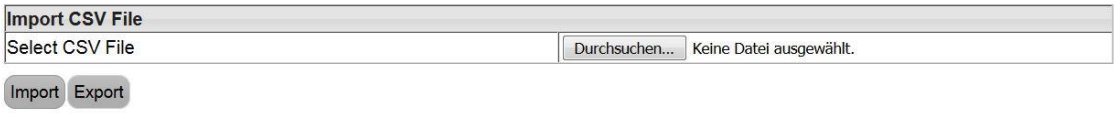
Note

On FF H1 side the 1 bit data length does not exist. Thus on Modbus side the Gateway does not support Discrete Inputs and Coils.

5.5.5.3 Import/Export submenu

[Export] saves the properties you have specified in the Modbus Mapping table.

[Import] imports an existing Modbus Mapping table in csv format.



6 Redundancy mode

Redundancy mode is possible in all environments/use cases where the FG-200 acts as link active scheduler.

Redundancy mode is not possible when FG-200 acts as a visitor host or when the serial RS232 interface of the FG-200 is used for Modbus communication.

6.1 Redundancy concept

FOUNDATION fieldbus is a distributed control architecture that provides increased availability compared to centralized control architectures.

To improve the availability of the FG-200 HSE/FF Modbus, it is possible to combine two FG-200s which then form a redundant Linking Device:

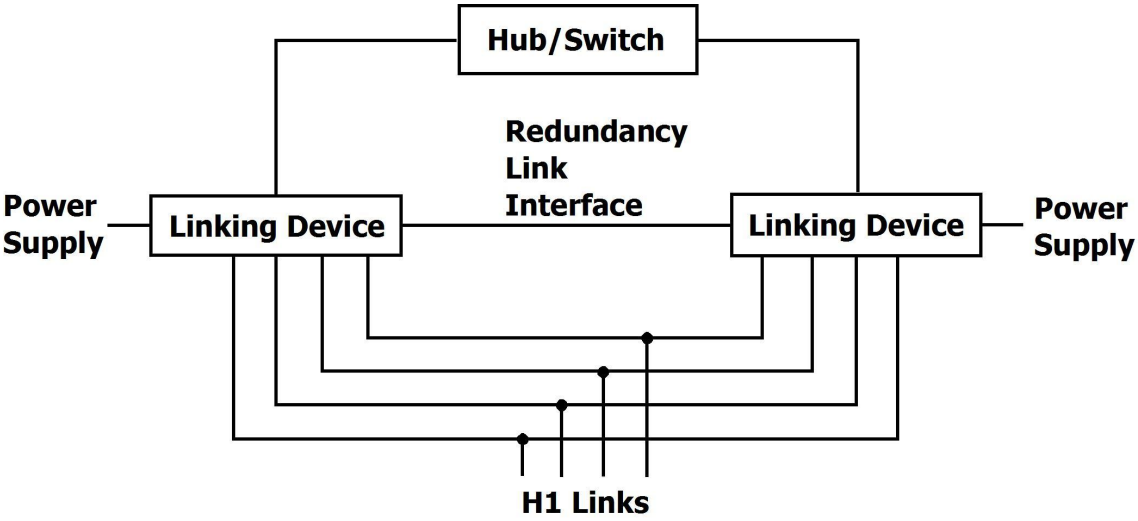


Figure 1: System Topology

A redundant Linking Device (also called "a redundant set of devices") consists of two physical Linking Devices that are connected to the same HSE subnet and to the same H1 links. The redundant set of devices behaves like one logical Linking Device. By duplicating the physical Linking Device, it is possible to tolerate one fault in one of the two devices.

In a redundant set of devices one Linking Device acts as primary device and performs actively all communication functions, including the Link Active Scheduler (LAS) function on the H1 links. In a redundant set it is the primary device that has to be addressed by Hosts and configuration tools.

The second Linking Device, named secondary device, acts as backup device. It receives automatically the same configuration as the primary device, but uses different node addresses on the H1 links and a different IP address on HSE.

The secondary device is able to take over the function of the primary device if the primary device fails. In that case the Linking Device is reduced to a non-redundant system that is not able to tolerate any further failure. Therefore it is necessary to replace the defective device as soon as possible to recover redundancy.

The secondary device acts as Backup Link Master on each H1 link attempting to take over the LAS role if required. Additional Link Master Devices may be configured to act as Backup Link Master on the H1 links.

The two devices forming a redundant set communicate via a redundancy link interface and via Ethernet. The serial line is used to establish a redundant set of devices, to exchange signs of life, and to control redundancy switch-over, while the Ethernet is used to transfer configuration information from the primary device to the secondary device. Therefore an operational serial communication path and an operational Ethernet path between both devices are required for proper operation.

The two physical Linking Devices forming a redundant set of devices are determined by the serial link between them. Without that serial link, both devices operate like independent, non-redundant Primary Devices.

6.2 Fault domain

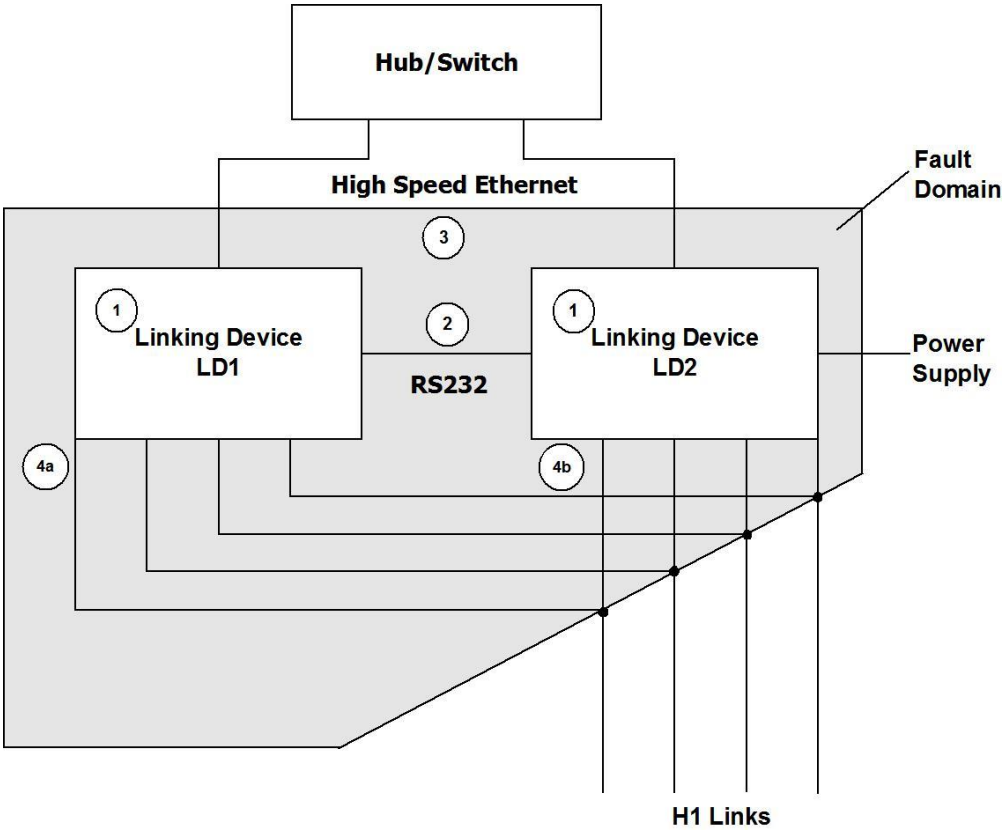


Figure 2: Fault Domain

The shaded area in the figure above shows the fault domain. Faults within the fault domain can be detected and covered by the redundancy features. Those are:

- permanent faults within the Linking Device - (1)
- transient faults within a Linking Device that lead to loss of functions - (1)
- a loss of the serial connection between the two Linking Devices - (2)
- a failure in the Ethernet communication between the two Linking Devices - (3)
- a loss of an H1 connection between the primary device and the entire H1 link; this may be caused by disconnecting an H1 cable from the primary device - (4a) if LD1 acts as primary device; (4b) if LD2 acts as primary device).

Detecting a loss of an H1 connection between the primary device and the entire H1 link requires that at least two H1 devices have been connected to that H1 channel of the Linking Device and have appeared in the H1 Live List before the loss of the connection occurs.

Only one of the listed faults may be present at a time. Another fault cannot be tolerated until the redundant set has been repaired and a fully operational secondary device is available.

The following fault conditions cannot be detected and covered:

- A loss of an H1 connection between the primary device and a subset of devices on an H1 link
- A loss of an H1 connection between the secondary device and the entire H1 link or a subset of devices on an H1 link.

The conditions for a switch-over from the primary device to the secondary device are listed below.

Transfer from primary device to secondary device

The primary device transfers its role to the secondary device

if Host system or configuration tool request to transfer the role

or the primary device detects a failure of its own Ethernet port

or the primary device detects a failure on at least one H1 interface

or the primary device detects a loss of the connection to all devices on an H1 link.[1]

[1] This requires that at least two devices have been connected to that H1 channel of the Linking Device and have appeared in the H1 Live List before the loss of the connection occurs.

The secondary device accepts the transfer

if its H1 interfaces are operational and faultless

and its Ethernet port is operational

and it has a valid configuration.

Take over of primary role

The secondary device takes over the primary role

if the serial connection to the primary device is lost

and it acts as Link Active Scheduler on all configured H1 links

and its Ethernet port is operational.

Restoring redundancy

Only one of the listed faults may be present at a time. Another fault cannot be tolerated until the redundant set has been repaired and a fully operational secondary device is available.

The required measures for repairing the redundant set of devices depend on the present fault. For an overview refer to Table 15.

Fault	Measure of repair
Permanent fault within the FG-200	Replacement of the detective FG-200.
Transient fault within the FG-200	Restart of the FG-200 (performed automatically).
Loss of the serial connection between the two FG-200s	Re-establishment of the serial connection.
Loss of the Ethernet connection between the two FG-200s.	Re-establishment of the Ethernet connection.
Loss of an H1 connection between the Primary Devices and the entire H1 link	Re-establishment of the H1 connection.

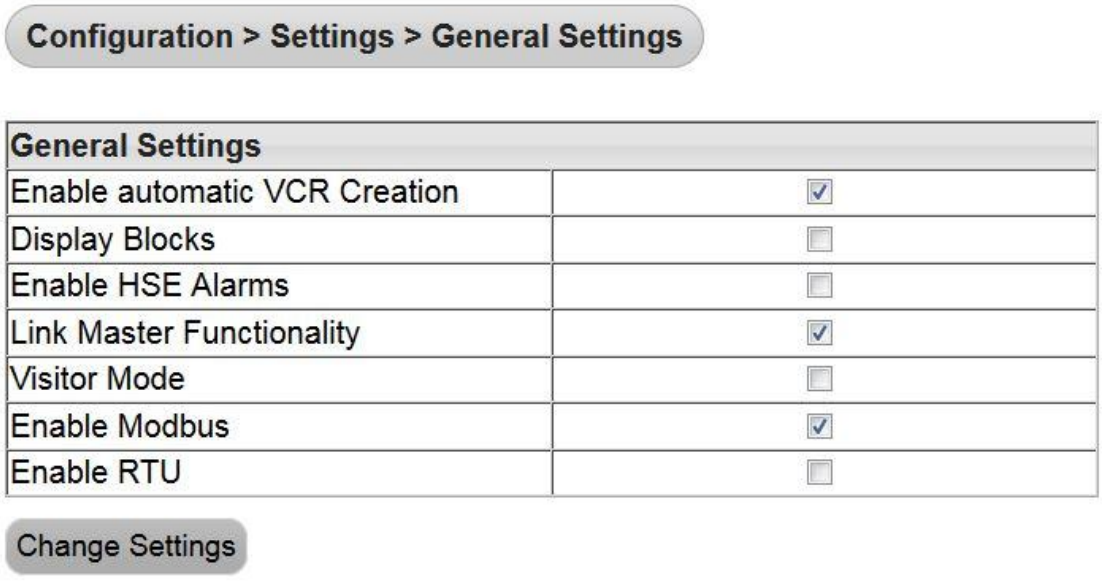
Table 1: Measures for repairing a redundant set of devices

6.3 Configuration for a redundant pair of FG-200

Webserver interface

Make sure that both FG-200s have a different IP address. Refer to Configure IP address and Modbus parameters [18] for a detailed description.

To realize a redundant pair of FG-200s a serial link between both devices is necessary. Deactivate **Enable RTU**. To do so, go to **Configuration → Settings → General Settings** in the webserver interface and deselect the option **Enable RTU**.



After modifying the configuration settings click **[Change Settings]** to apply the new settings and to reboot the FG-200. Make sure to apply these configuration settings on **both** FG-200s.

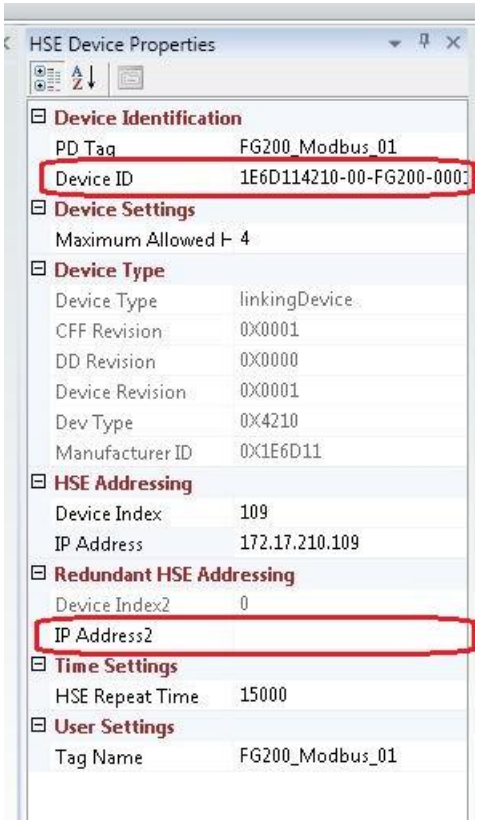
Detect primary and secondary FG-200

To detect primary and secondary FG-200 go to **Diagnostics** →Internet Protocol[41]. In the respective entry in line **Redundancy State** you will see **Primary, no backup** for the primary device and **Secondary** for the secondary device.

Then go to **Diagnostics** → Fieldbus[42] and note down the **Device ID** for the respective FG-200.

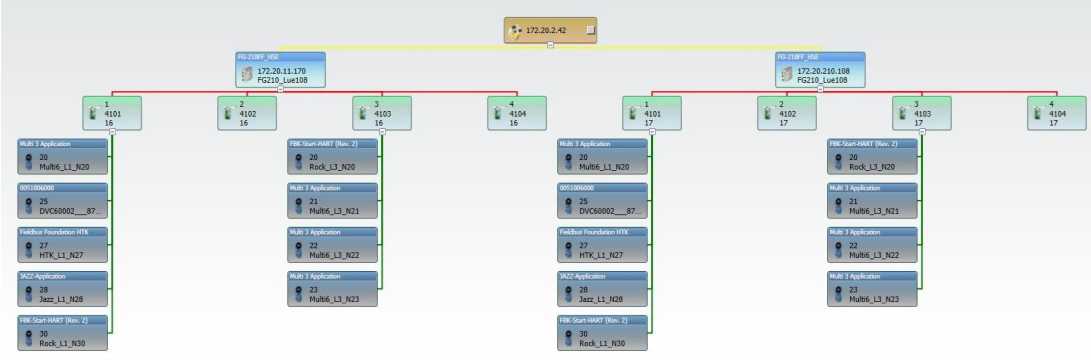
FF-CONF

1. To configure a redundant FG-200 with FF-CONF switch to **Network Configuration**, select the FG-200 and press **F4** or select **Properties** from the **View** menu to display the properties:



2. Enter the Device ID and the IP address in the corresponding fields of the secondary FG-200.
3. Save the values with Ctrl+S.
4. Then and Type the IP address and the Device ID of the secondary Linking Device
5. From the **Build** menu select the command **Build All** (or press **Alt+F8**).
6. Go online ( ). From the **Download** menu select **Download Project**.

7. Then switch to **Network Livelist** to display both FG-200 instances with identical field devices:

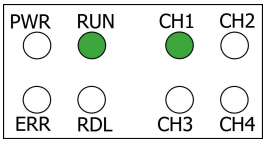


Synchronize Modbus mapping tables of primary and secondary device

1. Export the mapping table from the primary FG-200 (refer to Import/Export submenu 58 for a detailed description).
2. Then import the **.csv* file into the secondary FG-200 (refer to Import/Export submenu 58).

7 Status indicators - LEDs

The FG-200 is equipped with eight LEDs on its front side:



PWR stands for power supply - refer to PWR - power supply 65

RUN stands for running - refer to Device LED statuses (PWR, RUN, ERR and RDL) in stand-alone mode 65

ERR stands for error- refer to Device LED statuses (PWR, RUN, ERR and RDL) in stand-alone mode 65

RDL stands for redundancy link - refer to RUN / ERR / RDL - LED statuses in redundant mode 66

CH1 to **CH4** stands for H1 channel 1 to H1 channel 4 - refer to Status indications of the four H1 channels 68

The LEDs may be on permanently or flash in different colors and frequencies. We use the following symbols:

Symbol	Color	Lighting
⊗	none	off
●	red	permanent
●	green	permanent
⊗	red	flashing
⊗	green	flashing
◔	green	flashing slowly (0.5 Hz)
◔	green	flashing quickly (5 Hz)

7.1 PWR - power supply

●	permanent green	24V DC power supply is ok
⊗	off	no power supply

7.2 Device LED statuses (PWR, RUN, ERR and RDL) in stand-alone mode

The following table shows possible LED combinations in stand-alone mode:

LEDs	Meaning
PWR green **RUN** **ERR** **RDL**	**Start–up phase (approximately 7 seconds)** During this phase redundancy role is determined.

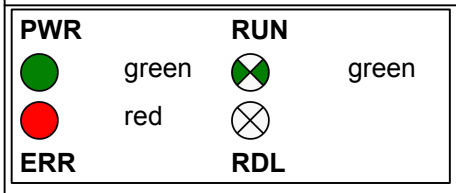
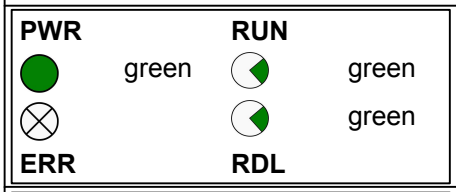
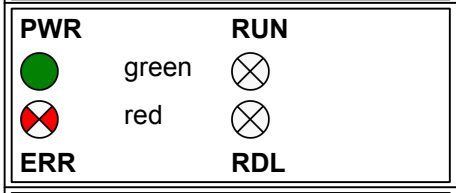
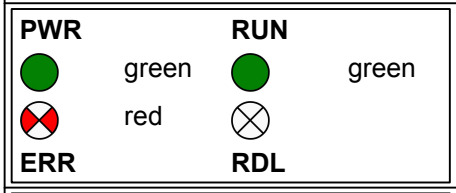
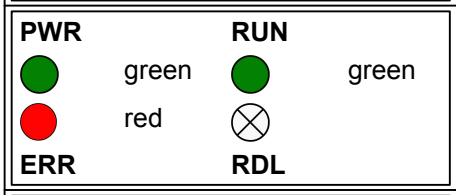
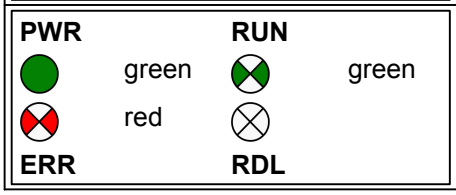
LEDs	Meaning
PWR green ERR RUN green RDL	**Non redundant device, ready.** The device is operational; it is not part of a redundant set.
PWR green ERR RUN green RDL	**Permanent hardware fault detection during startup.** A fatal error has been detected.

7.3 RUN / ERR / RDL - LED statuses in redundant mode

The redundancy link LED is used to indicate if traffic via the serial line is performed. It will flash green if a valid message is received. It will switch to red if serial communication is lost and it will be off if no serial response has been received after startup.

	flashing green	redundancy link communication is ok (triggered by redundancy link packets)
	red	link communication interrupted or aborted (broken down)
	off	no link communication at all

LEDs	Meaning
PWR green ERR RUN RDL	Start–up phase (approx. 7 seconds) During this phase redundancy role is determined.
PWR green ERR RUN green RDL	Non redundant device, ready. The device is operational; it is not part of a redundant set. Primary Device is redundant set. The device is operational, acting as Primary Device in a redundant set. The secondary device is ready
PWR green red ERR RUN green RDL	Permanent hardware fault detection during startup. A fatal error has been detected. Possible failure could be a missing Ethernet connection.
PWR green red ERR RUN green RDL	Primary device or non-redundant device, hardware failure. The device is acting as non-redundant device, but a minor hardware failure has been detected during start-up.

LEDs	Meaning
	In the case of a Primary Device on a redundant set, the secondary device is not ready
	Primary device or non-redundant device, failure. The device is acting as non-redundant device, but a failure has been detected. or Secondary device, not ready. The device is acting as secondary device in a redundant set, but it is not ready to take over the primary role due to e.g. not synchronized configuration information or a non-operational redundancy link. or Primary Device or non-redundant device, failure. The device is acting as Primary Device in a redundant set or as non-redundant device, but a failure has been detected. In the case of a Primary Device in a redundant set or as non redundant set, the secondary device is not ready.
	Secondary device, operational. The device is operational as secondary device in a redundant set. The configuration information has been successfully transferred from the Primary Device and the redundancy link is operational.
	Secondary device, hardware failure. The device is acting as secondary device in a redundant set, but a hardware failure has been detected. Details are available on the web page Diagnostics 41 of the device.
	Primary with H1 error state
	Primary not ready
	Secondary with H1 error

LEDs	Meaning
PWR **RUN** green red **ERR** **RDL**	Primary, configuration error

7.4 Status indications of the four H1 channels

The following table shows the channel LEDs and their meaning for all four channels (CH1 ... CH4):

Symbol	Meaning
green	Visitor address
flashing slowly (0.5 Hz)	not in LAS role
flashing quickly (5 Hz)	LAS role
red	no carrier or H1 link is disconnected
flashing red	no token received
off	H1 link unused

8 Appendix

8.1 FOUNDATION Fieldbus basics

8.1.1 Link active scheduler

The link active scheduler (LAS) is a deterministic, centralized bus scheduler that controls the communication in the H1 segment. It is responsible to maintain the live list.

8.1.2 Visitor host

A visitor host is a secondary on-process host typically used for asset management and device maintenance. The visitor host uses CLT/SRV connections only. It usually should be assigned to node addresses in the range from 252 to 255.

8.1.3 Live list

The Live list is a list of all currently active devices.

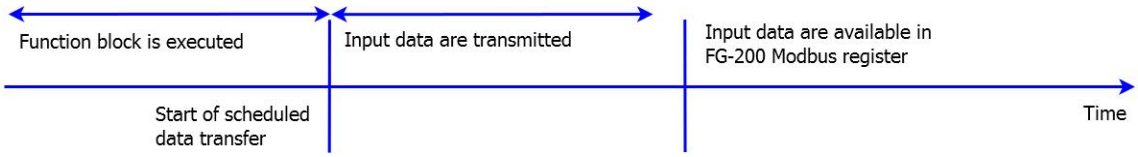
8.1.4 Publisher/subscriber links (PUB/SUB links)

Publisher/subscriber links is used for cyclic transfer of process values (input data and output data). The process value is send by a publisher. Multiple subscribers linked to the publisher are able to receive the process value.

The LAS coordinates the cyclic data transfer on base of a synchronized system time. The cyclic data transfer is synchronized with the execution of the function blocks in the field devices. The schedules for cyclic data transfer as well as for the execution of the function blocks are generated by FF-CONF.

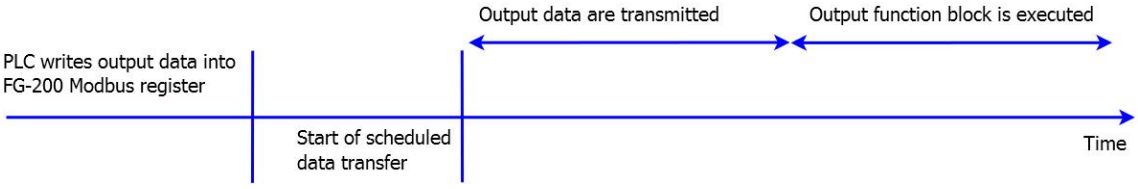
Input data

In case of input data the input function block executed and immediately after the function block execution the new data are transmitted over the line.



Output data

In case of output data the output function block is executed immediately after the transmission of the output data.



Output function blocks detect the absence of fresh PLC output data. If the PLC does not provide fresh output data then output function blocks will switch into a fault state mode. As the PLC write accesses to the FG-200 Modbus registers are not synchronized with the cyclic data transfer in the H1 segment it is necessary that the PLC writes "oversample" the H1 macrocycle. If, for example, the macrocycle time in the H1 link is one second then it is assumed that the PLC writes fresh output data every 500 milliseconds.

8.1.5 Client/server connections (CTL/SRV connections)

Client/server connections are used for acyclic transfer between FG-200 and field devices. Acyclic data transfer is performed in the gaps between cyclic data transfer.

For client/server connections the client (FG-200) establishes and server (H1 field device) is established. Once the connection is established the FG-200 can send read and write requests to the field device. After processing the request the field device sends a read or write response to the FG-200.

In case of client/server communication the FG-200 build internal read lists with all parameters configured in the Modbus mapping table or in the point pages. The FG-200 executes this read lists periodically. The time for executing the read lists depends on various factors. As a rule of thumb you can assume that a read request and the corresponding read response will take about 100 millisecond. Thus, if you have, for example, 25 parameters in your Modbus mapping and/or in your point pages each Modbus register and point page parameter will be updated every two and a half second.

The main time consuming factors in read request handling are the low baud rate in an H1 segment (31.25 kbit/sec) and the processing time of the read request in the H1 field device. The processing time within the FG-200 is negligible.

The FG-200 supports four H1 segments. If, enhancing the example above, 25 parameters are configured in each segment the update time of the 4 * 25 parameters will still be two and a half second.

Please consider that the execution of the FG-200 read lists is not synchronized with the periodic execution of the function blocks. Assuming the function blocks are executed one time per second and the execution of the read list takes two and a half seconds then you will get only each second or third value produced by the function block.

8.1.6 Macrocycle

Macrocycle is the period of the function block schedule and the cyclic data transfer schedule. Typical macrocycle times are 500 milliseconds, one second, two seconds and four seconds.

8.1.7 Input/output parameters (I/O parameters)

Input and output parameters are used for accessing process values (input data and output data). They are structured parameters composed of a status and a value.

IO parameters are typically transmitted via publisher/subscriber links. If no publisher/subscriber links are configured IO parameter can be read and written via client/server connection.

8.1.8 Contained parameters

Contained parameters are used for data that are not process values. Contained parameters contain status information and configuration data.

Contained parameters are read or written via client/server connections. It is not possible to transmit contained parameters via publisher/subscriber links.

8.2 Redundancy

8.2.1 Redundancy behavior

The following table provides detailed information on the redundancy behavior. This may be useful to get a correct understanding of what fault conditions can be covered and how the system recovers from those fault conditions.

In any case, the fully redundant state is obtained again when the secondary device indicates "operational" (RUN-LED flashing) and its H1 live lists are complete. In highly populated, tightly configured H1 links it may take several minutes to acquire the live lists. Before the live lists are completed, redundancy switching is possible but client server connections can only be established to H1 devices which are in the live list.

Any further error that occurs before the fully redundant state is reached may cause the system to fail.

8.2.1.1 Primary device fails due to permanent or transient hardware or software fault (1)

Fault detection	Device fails completely or software watchdog expires or hardware watchdog expires or exception occurs or failure in H1 interface detected.
Fault treatment	Primary role actively transferred to or taken by redundant system
Effect	Redundancy switch-over. System degrades to non–redundant system.
Repair measure	Transient fault: Automatic reboot Permanent fault: replace device Secondary service will reboot and receive configuration data from primary device.

8.2.1.2 Ethernet cable broken between primary device and Ethernet hub/switch (2)

Fault detection	Bad link status of Ethernet port detected. Detection time less than 500 ms.
Fault treatment	Primary role actively transferred to redundant device.
Effect	Redundancy switch-over. System degrades to non-redundant system.
Repair measure	Repair or reconnect Ethernet cable. Secondary device will reboot and receive configuration data from primary device.

8.2.1.3 H1 cable broken between primary device and H1 network (3)

Fault detection	Empty live list detected on one H1 port or primary device while secondary device still has non-empty live list. Due to the H1 protocol it may take some seconds. Until the live list becomes empty. Detection occurs only if in primary device and secondary device the number of active H1 devices in the live list has exceeded the threshold of one.
Fault treatment	Primary role actively transferred to redundant device, so that access to H1 is possible again.
Effect	Redundancy switch-over. No redundancy concerning the affected H1 link.
Repair measure	Repair or reconnect H1 cable.

8.2.1.4 Secondary device fails due to permanent or transient hardware or software fault (4)

Fault detection	Device fails completely or software watchdog expires or hardware watchdog expires or exception occurs or failure in H1 interface detected.
Fault treatment	Secondary device assumes and indicates non-operational state.
Effect	System degrades to non-redundant system.
Repair measure	Transient fault: Automatic reboot Permanent fault: replace device Secondary device will reboot and receive configuration data from primary device.

8.2.1.5 Ethernet cable broken between secondary device and Ethernet hub/switch (5)

Fault detection	Bad link status of Ethernet port detected. Detection time less than 500 ms.
Fault treatment	Secondary device assumes and indicates non-operational state.
Effect	System degrades to non-redundant system.
Repair measure	Repair or reconnect Ethernet cable. Secondary device will reboot and receive configuration data from primary device.

8.2.1.6 H1 cable broken between secondary device and H1 network (6)

Fault detection	No fault detection in secondary device. Empty live list has to be detected by any HSE client (e. g. asset monitor).
Fault treatment	None.
Effect	No redundancy concerning the affected H1 link.
Repair measure	Repair or reconnect H1 cable.

8.2.1.7 TCP connection lost between primary device and secondary device (7)

Fault detection	Time-out on TCP connection. Detection time less than 2 sec during activity and less than 7 sec during idle times.
Fault treatment	Secondary device assumes and indicates non operational state[1].
Effect	System degrades to non-redundant system. Secondary device clears configuration.
Repair measure	Repair Ethernet connection. Secondary device may reboot in some cases depending on prior state and will receive configuration data from primary device.

[1] If the secondary device reboots cyclically in this state, set the TCP acknowledge timeout (object 22223) to a smaller value.

8.2.1.8 Redundancy link broken or removed between primary device and secondary device (8)

Fault detection	Loss of serial communication. Detection time less than 800 ms.
Fault treatment	Secondary device assumes and indicates non operational state.
Effect	System degrades to non-redundant system.
Repair measure	Repair or reconnect redundancy link. Secondary device will reboot and receive configuration data from primary device.

8.2.1.9 State indication associated

The following table shows the state indications associated with the fault states described above. The numbers in the first column refer to the previous table. Line 0 describes the faultless state. "primary device" and "secondary device" denote the role after redundancy switching.

	Primary device			**Secondary device**		
	R-LED	**H1-LED**	**Web-Info**	**R-LED**	**H1-LEDs**	**Web-Info**
0	On	fast on configured links Off on unconfigured links.	Ok Primary	Flashing	Slow on configured links Off on not configured links	Ok Secondary
1	On	fast on configured links Off on not configured links	Failure no serial communication Primary, no backup	off	off	(no connection to web server)
2	On	fast on configured links Off on non configured links	Failure TCP link to redundant device is lost	Flashing	Slow on configured links Off on non configured links	(no connection to web server)

	Primary device			Secondary device		
	R-LED	**H1-LED**	**Web-Info**	**R-LED**	**H1-LEDs**	**Web-Info**
			Primary, no backup			
3	On	fast on configured links Off on not configured links	Ok Primary	Flashing	fast on missing links Slow on configured links Off on not configured links	Ok Secondary
4	On	fast on configured links Off on not configured links	Failure no serial communication Primary, no backup	off	off	(no connection to web server)
5	On	fast on configured links Off on not configured links	Failure TCP link to redundant device is lost Primary, no backup	Flashing	Slow on configured links Off on not configured links	(no connection to web server)
6	On	fast on configured links Off on not configured links	Ok Primary	Flashing	fast on missing links Slow on configured links Off on not configured links	Ok Secondary
7	On	fast on configured links Off on not configured links	Failure TCP link to redundant device is lost Primary, no backup (if connection to web server possible)	off	off	Failure TCP link to redundant device is lost Primary, no backup (if connection to web server possible)
8	On	fast on configured links Off on not configured links	Failure no serial communication Primary, no backup	off	Slow on configured links Off on not configured links	Failure no serial communication Primary, no backup

8.2.2 Duration of redundancy switch-over

Switch-over duration PUB/SUB links

During redundancy switch-over, the activity on H1 links is interrupted. From the perspective of a single H1 device, PUB/SUB links [69] are interrupted for a period of time that is composed of the following times:

- fault detection time t fd
- redundancy switching time t rs
- macro cycle duration t mc

The time of inactivity due to redundancy switch-over for a single process value is therefore:

- time of inactivity =t fd + t rs + t mc
- compared to t mc during regular operation.

The fault detection time is:

- t fd =800 ms if the primary device fails.
- t fd =1500 ms if the Ethernet connection on the primary device is removed.

The redundancy switching time is:

- t rs =500 ms.

The macrocycle duration depends on the configuration and is usually in the range of 500 ms to 2 seconds.

Switch-over duration for CLT/SRV connections

In case of CLT/SRV connections [70] the switch will take about one minute.

If contained parameters [71] such as BLOCK_ERR or channel are accessed, it will take about one minute until the registers in the secondary FG-200 show the current parameter values.

8.2.3 Replace a defective FG-200 in a redundant set

For replacing a defective FG-200 in a redundant set of FG-200s, perform the following steps:

1. Identify the defective FG-200. Refer to Status indicators - LEDs [65].
2. Remove the power terminal block from the FG-200.
3. Remove the redundancy link interface cable and the Ethernet cable.
4. If not indicated on the cable, make a note to which channel each H1 link is connected. Then remove the H1 terminal blocks.
5. Make sure that the new FG-200 has the same IP configuration (IP address and subnet mask) as the replaced defective device. See Internet Protocol submenu [46] for more information.
6. Replace the defective FG-200.
7. Plug in the H1 terminal blocks. Make sure to use the same allocation as before.

8. Connect the Ethernet cable and the redundancy link interface cable.
9. Make sure that the redundancy link interface cable is connected before plugging in the power terminal block.

   If the replaced FG-200 is powered while the serial link is missing, it will behave like an independent, non-redundant primary device. If in this case the FG-200 has a valid (possibly unknown) configuration, it might use H1 node addresses which are already in use on the H1 links. This will disturb or interrupt communication and application processing on the H1 links.
10. Plug in the power terminal block. The boot process and the download of the configuration information take about 1 minute. For indication of proper operation as a secondary device refer to Status indicators - LEDs 65.

8.3 Diagnostics - Advanced submenus

Click **Advanced** to open the following submenus:

8.3.1 Fieldbus Statistics submenu

This table shows you information about all four segments concerning

- Live List Changes - number of total live list changes
- Live List Pass Token Timeouts - number of pass token timeouts; under good conditions it should be "0"
- Total Retries - number of total retries for acyclic H1 requests. This could be an indication of noise on the H! segment or a H1 device problem.
- Messages Transmitted - number of messages transmitted by the FG-200.
- Good Messages Received - number of messages received from FG-200.

The button **[Reset Statistic Counter]** allows you to reset all segment values to zero and to restart counting. To see the new results, click **Fieldbus Statistics** again.

Diagnostics > Advanced > Fieldbus Statistics

Description	Segment 1	Segment 2	Segment 3	Segment 4
Live List Changes	0	0	0	4
Live List Pass Token Timeouts	0	0	0	0
Total Retries	0	0	0	0
Messages Transmitted	0	0	0	999566
Good Messages Received	0	0	0	395088

Reset Statistic Counter Last Reset: Fri Sep 18 2015 10:12:01 GMT+0200

8.3.2 HSE Statistics submenu

This table shows you the total number and number per second of HSE frames grouped into:

- Publisher / Subscriber
- Report Distribution
- Client / Server
- System Management
- Redundancy Synchronization

(This functionality is not supported by AssetMonitor Linking Devices.)

The button **[Reset Statistic Counter]** allows you to reset all segment values to zero and to restart counting. To see the new results, click **[Fieldbus Statistics]** again.

Diagnostics > Advanced > HSE Statistics

Description	Total	Per Second
Publisher / Subscriber	186837	3
Report Distribution	0	0
Client / Server	295	0
System Management	215	0
Redundancy Synchronization	0	0

Reset Statistic Counter Last Reset: Thu Sep 17 2015 15:38:49 GMT+0200

8.3.3 FPGA Error Statistics submenu

This table shows the values of the framing error counters per channel and checksum errors in received packets. High counter values may indicate a bad signal quality in the H1 channel and/or a device that is not operating properly.

In addition, the following information is displayed:

- Framing Errors (i.e. incomplete frames, might be an indication of noise on the H1 segment)
- Checksum Errors (might be an indication of noise on the H1 segment)

- Carrier Not Seen Errors
- Buffer Not Empty (might indicate that the H1 network is not connected or not powered)
- Receive Overrun
- Transmit Overrun
- Transmit Readback Error
- Collision Timeout Errors (might indicate that the H1 network is not connected or not powered).

Diagnostics > Advanced > FPGA Error Statistics

Description	Segment 1	Segment 2	Segment 3	Segment 4
Framing Errors	0	0	0	0
Checksum Errors	0	0	0	0
Carrier Not Seen Errors	0	0	0	0
Buffer Not Empty	0	0	0	0
Receive Overrun	0	0	0	0
Transmit Overrun	0	0	0	0
Transmit Readback Error	0	0	0	0
Collision Timeout Errors	0	0	0	0

8.3.4 FPGA Register Contents submenu

The content of the FPGA register contains data which is only relevant if you contact Softing's customer support for error analysis and troubleshooting.

If requested by Softing's support, take a screen shot and send your problem description together with the screen shot to support.automation@softing.com.

8.3.5 Device Temperature submenu

This table shows you information about current temperature values in degrees Celsius and Fahrenheit.

The button **[Reset Temperature Values]** allows you to reset all values to zero and to restart measuring. To see the new results, click **[Device Temperature]** again.

Diagnostics > Advanced > Device Temperature

Description	Celsius	Fahrenheit	Time
Current Temperature	47.500	117.500	2015/08/27 16:08:08
Min. Temperature (Lifetime)	21.500	70.700	1972/01/01 01:00:00
Max.Temperature (Lifetime)	54.500	130.100	1972/01/01 01:00:00
Min. Temperature	47.500	117.500	2015/08/27 16:08:05
Max. Temperature	47.500	117.500	2015/08/27 16:08:05

Reset Temperature Values

8.3.6 Modbus Statistics submenu

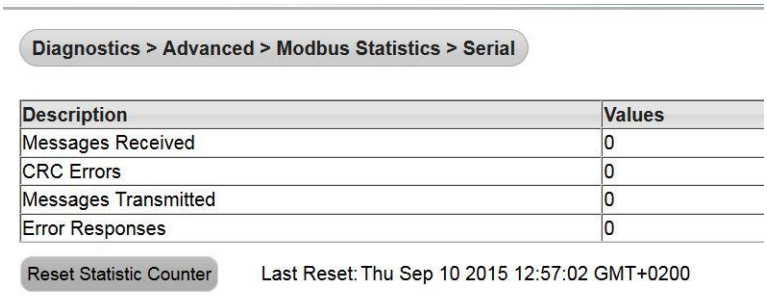
The Modbus communications statistics provide information on the data and packets received and transmitted by the Modbus slave interface. Select

- **[Serial]** if you want to monitor the Modbus RTU link or
- **[TCP]** if you are monitoring the Modbus TCP/IP communications.

Serial

The menu item **Serial** shows statistical data of a Modbus connected on a serial interface. First messages and CRC errors from received data are listed. Then messages and error responses from the transmitted data are listed.

The values specified apply to the time since the program has been started or the latest **[Reset Statistic Counter]**.

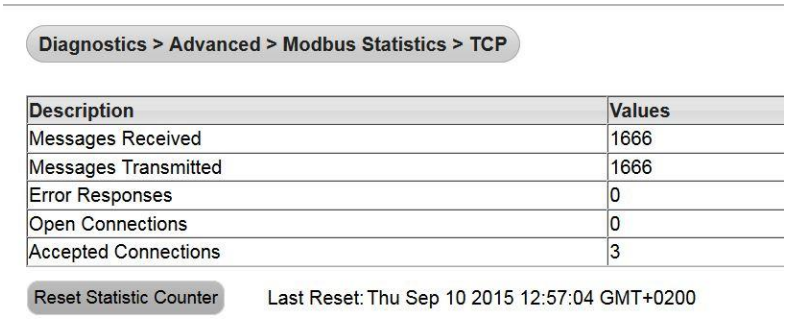


The button **[Reset Statistic Counter]** allows you to reset all values to zero and to restart counting. To see the new results, click **[Serial]** again.

TCP

The menu item **TCP** shows statistical data of a Modbus connected using TCP. First received and transmitted messages are listed. Then the error responses are counted. Finally open and accepted connections are listed.

The button **[Reset Counts]** allows you to reset all values to zero and to restart counting. To see the new results, click **[TCP]** again.



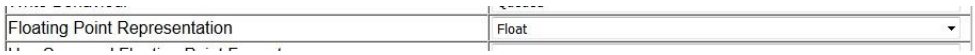
8.4 Data items used for Modbus mapping table

Parameter Name	Data Type	Number of Modbus Registers
BKCAL_OUT	FLOAT	2 or 1, see note below
BKCAL_OUT_D	USIGN8	1
BLOCK_ERR	BitString 16 Bit	1
CAS_IN	FLOAT	2 or 1, see note below
CAS_IN_D	USIGN8	1
CHANNEL	USIGN16	1
FD_FAIL	BitString 32 Bit	2
FD_OFFSPEC	BitString 32 Bit	2
FD_MAINT	BitString 32 Bit	2
FD_CHECK	BitString 32 Bit	2
IN	FLOAT	2 or 1, see note below
IN_1	FLOAT	2 or 1, see note below
IN_2	FLOAT	2 or 1, see note below
IN_3	FLOAT	2 or 1, see note below
IN_4	FLOAT	2 or 1, see note below
IN_5	FLOAT	2 or 1, see note below
IN_6	FLOAT	2 or 1, see note below
IN_7	FLOAT	2 or 1, see note below
IN_8	FLOAT	2 or 1, see note below
IN_D	USIGN8	1
IN_D_1	USIGN8	1
IN_D_2	USIGN8	1
IN_D_3	USIGN8	1
IN_D_4	USIGN8	1
IN_D_5	USIGN8	1
IN_D_6	USIGN8	1
IN_D_7	USIGN8	1
IN_D_8	USIGN8	1
MODE_BLK	4 * BitString 8 -> for Modbus Mapping only 2 * BitString 8 -> TargetMode (high byte) and Actual Mode (Low byte)	1
OUT	FLOAT	2 or 1, see note below
OUT_1	FLOAT	2 or 1, see note below
OUT_2	FLOAT	2 or 1, see note below
OUT_3	FLOAT	2 or 1, see note below
OUT_4	FLOAT	2 or 1, see note below
OUT_5	FLOAT	2 or 1, see note below
OUT_6	FLOAT	2 or 1, see note below
OUT_7	FLOAT	2 or 1, see note below
OUT_8	FLOAT	2 or 1, see note below

Parameter Name	Data Type	Number of Modbus Registers
OUT_D	USIGN8	1
OUT_D_1	USIGN8	1
OUT_D_2	USIGN8	1
OUT_D_3	USIGN8	1
OUT_D_4	USIGN8	1
OUT_D_5	USIGN8	1
OUT_D_6	USIGN8	1
OUT_D_7	USIGN8	1
OUT_D_8	USIGN8	1
SP	FLOAT	2 or 1, see note below
SP_D	USIGN8	1

Note

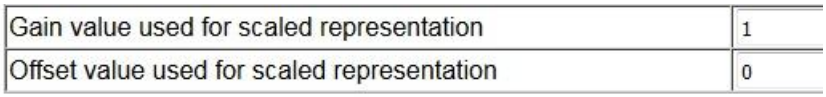
The number of Modbus registers used for Float value depends on the following settings on the web server page. Go to **Configuration → Modbus → Communication** and set the following values:



Float: Two (2) Modbus registers; their Word order depends on the following setting:

Round -> 1 Modbus register = float value rounded to Integer16
= Scaled -> 1 Modbus register = (Value_inFloat * Gain) – (Offset – 32768)

Gain, Offset can be set via:



8.5 Coding of bit fields

Parameter BLOCK_ERR

No error	0x0000
Out Of Service	0x0001
Power up	0x0002
Device needs maintenance	0x0004
Readback check failed	0x0008
Lost nv data	0x0010
Lost static data	0x0020
Memory failure	0x0040
Output failure	0x0080

Input failure	0x0100
Dev needs maint soon	0x0200
Dev fault state set	0x0400
Local override	0x0800
Simulate active	0x1000
Link config err	0x2000
Block config err	0x4000
Other	0x8000

Parameter MODE_BLK:

Out Of Service	0x01
Initialization Manual	0x02
Local Override	0x04
Manual	0x08
Auto	0x10
Cascade	0x20
Remote-Cascade	0x40
Remote-Output	0x80

Modbus Register 16 Bit register contains target mode in High Byte, actual mode in low byte.

Example: Modbus value 0x1001 means: target mode = Auto, actual mode = Out Of Service

Field Diagnostics (Parameter FD_FAIL, FD_OFFSPEC, FD_CHECK, FD_MAINT)

The bit fields are vendor specific and not specified by FIELDBUS Foundation except the least significant bit (LSB). The LSB indicates the check function to be active. The check function is typically mapped to the FD_CHECK parameter but may also be mapped to any of the other FD_xxx parameters.

The value for LSB is 0x80000000, the value for the most significant bit (MSB) is 0x00000001

8.6 Modbus exception responses

ExceptionCode = 02

The FG-200 will send an exception response with [ExceptionCode = 02] if [start address] or [start address + quantity of registers] is not OK.

ExceptionCode = 04

The FG-200 will send an exception response with [ExceptionCode = 04] if one of the requested registers does not contain valid data. Please note that after power-on the FG-200 responds with [ExceptionCode = 04] until all requested data are read from the connected H1 field devices.

8.7 Assign a second (local) IP address under Windows 8.1

1. Open the **Desktop**
2. Press the **Windows start key** and select **Control Panel**.
3. Select **Network and Internet**.
4. Open **Network and Sharing Center**.
5. Click **Connections**.
6. In the Connection Status window click **Properties**.
7. In the item connection list select **Internet Protocol Version 4 (TCP/IPv4)**.
8. Click **Properties**. In the **General** dialog, the regular (first) IP address, the subnet mask and the standard gateway are shown.
9. Click **Advanced** to add a second IP address. Then click **[Add]** in the IP Addresses dialog.
10. Enter the IP address and the subnet mask.
11. Click **[Add]**.
12. Then confirm all open dialogs with **[OK]**.

9 Technical data

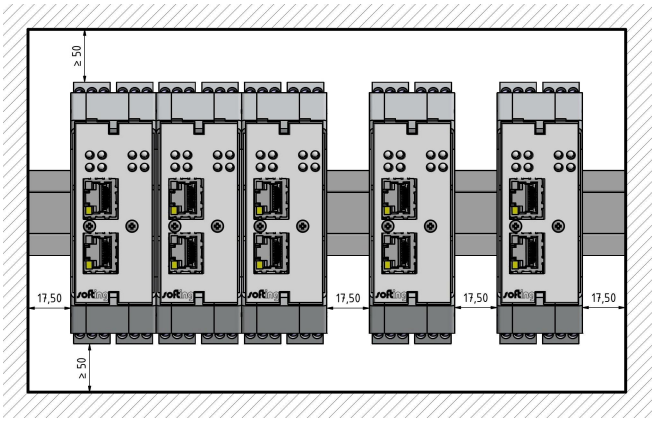
9.1 Specifications

Power supply	18 VDC...32 VDC; SELV/PELV supply mandatory Typical input current is 200 mA; maximum is 1 A (considering the rush-in current at switch-on).
FF-H1	Four FF-H1 channels, compliant with type 114 of the FF physical layer profile. The Fieldbus voltage range is from 9 VDC...32 VDC. Preferred value is 24 VDC.
Ethernet	IEEE 802.3 100BASE-TX/10BASE-T Only ETH 1 is supported. Do not use ETH 2 (reserved for further use).
Minimum ambient operating temperature	-40 °C
Storage temperature	-40 °C...+85 °C
Relative humidity	10 %...95 % (non-condensing)
Altitude	Must not exceed 2,000 m
Location	Indoor use only; no direct sunlight
Coating	Conformal Coating based on ANSI/ISA-S71.04 G3
Safety standard	IEC/EN/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC/EN/UL 61010-2-201 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment (both with CB scheme).
Ingress protection	IP20

9.2 Installation position and related ambient operating temperature

Depending on the installation position, different ambient operating temperatures (T_A) are allowed:

Horizontal installation position



Maximum number of fieldbus channels used	Maximum fieldbus voltage	Minimum distance	Maximum permissible ambient temperature T_a
4	32 VDC	0 mm	55 °C
2	24 VDC	0 mm	60 °C
4	32 VDC	17.5 mm	65 °C
2	24 VDC	17.5 mm	70 °C

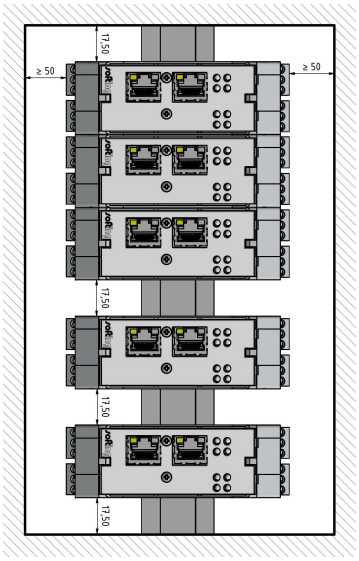
50 mm minimum distance to the air inlet and air outlet

Provide a minimum space of 50 mm to the air inlet and air outlet. Thus you ensure a natural convection.

Rotated installation position

The maximum permissible ambient temperature values are also valid for a 180° rotated installation position.

Vertical installation position



Maximum number of fieldbus channels used	Maximum fieldbus voltage	Minimum distance	Maximum permissible ambient temperature T_a
4	32 VDC	0 mm	40 °C
2	24 VDC	0 mm	50 °C
4	32 VDC	17.5 mm	55 °C
2	24 VDC	17.5 mm	60 °C

50 mm minimum distance to the air inlet and air outlet

Provide a minimum space of 50 mm to the air inlet and air outlet. Thus you ensure a natural convection.

Rotated installation position

The maximum permissible ambient temperature values are also valid for a 180° rotated installation position.

10 ATEX Type Examination Certificate

Translation

Type Examination Certificate

(1)

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC

(3) No. of Type Examination Certificate: **BVS 15 ATEX E 063 X**

(4) Equipment: **Linking Device type FG-200 HSE/FF**

(5) Manufacturer: **Softing Industrial Automation GmbH**

(6) Address: **Richard-Reitzner-Allee 6, 85540 Haar, Germany**

(7) The design and construction of this equipment and any acceptable variation thereto are specified in the appendix to this type examination certificate.

(8) The certification body of DEKRA EXAM GmbH certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design of Category 3 equipment intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in the Test and Assessment Report BVS PP 15.2105 EG.

(9) The Essential Health and Safety Requirements are assured by compliance with:

EN 60079-0:2012 + A11:2013	**General requirements**
EN 60079-11:2012	**Intrinsic Safety "i"**
EN 60079-15:2010	**Equipment protection by type of protection „n"**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the appendix to this certificate.

(11) This Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC.
Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 3G Ex nA IIC T4 Gc or
II 3G Ex nA [ic] IIC T4 Gc

DEKRA EXAM GmbH
Bochum, dated 2015-06-09

Signed: Simanski
Certification body

Signed: Dr. Eickhoff
Special services unit

Page 1 of 3 of BVS 15 ATEX E 063 X
This certificate may only be reproduced in its entirety and without any change.

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

(13) Appendix to

(14) **Type Examination Certificate**
BVS 15 ATEX E 063 X

(15) 15.1 Subject and type

Linking Device type FG-200 HSE/FF

15.2 Description

The linking device acts as a gateway between Ethernet-based host systems with foundation field-bus HSE and the foundation field-bus H1 bus system. It is suited for network configuration, device parametrization and the recording of production data. The data circuits are galvanically isolated. The Fieldbus circuits may operate as intrinsically safe circuits (level of protection Ex ic) or as non-intrinsically safe circuits; details see manual.

15.3 Parameters

15.3.1 Electrical parameters

15.3.1.1 Power supply circuit (terminals 1 – 3 or Rail Power Supply L+ and GND)

Nominal voltage		DC	18...32	V
Power consumption			< 5.6	W
Max. voltage	U_m	DC	40	V

15.3.1.2 Redundancy Link circuit (terminals 4,5,6)

Nominal voltage		DC	up to 32	V
Max. voltage	U_m	DC	40	V

15.3.1.3 Ethernet Ports (connectors ETH1, ETH2)

Nominal voltage		DC	up to 32	V
Max. voltage	U_m	DC	40	V

15.3.1.4 Fieldbus circuits (terminals 7,8,9 and 10,11,12 and 13,14,15 and 16,17,18)
(if operated as non-intrinsically safe circuits)

Nominal voltage		DC	24/32	V

(if operated as intrinsically safe circuits, each channel)

Voltage	U_i	DC	32	V
Current	I_i		570	mA

15.3.2 Ambient temperature range

-40 °C ≤ T_a ≤ see Manufacturer's instructions

15.3.2.1 Horizontal installation position

Minimum distance	Maximum number of fieldbus channels used per device	Maximum voltage of fieldbus circuits	Maximum permissible ambient temperature T_a
0 mm	4	32 VDC	55 °C
0 mm	2	24 VDC	60 °C
17.5 mm	4	32 VDC	65 °C
17.5 mm	2	24 VDC	70 °C

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telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

15.3.2.2 Vertical installation position

Minimum distance	Maximum number of fieldbus channels used per device	Maximum voltage of fieldbus circuits	Maximum permissible ambient temperature T_a
0 mm	4	32 VDC	40 °C
0 mm	2	24 VDC	50 °C
17.5 mm	4	32 VDC	55 °C
17.5 mm	2	24 VDC	60 °C

(16) Test and Assessment Report

BVS PP 15.2105 EG as of 09.06.2015

(17) Special conditions for safe use

17.1 The equipment is defined as "instruments and apparatus of low energy" according to clause 13 of EN 60079-15; thus the requirement stated in sub-clause c) (limiting the transient characteristic to 40% of the rated voltage) has to be adhered to when erecting the equipment.

17.2 The equipment has to be installed in a protective enclosure which meets the requirements for resistance to impact and IP54 defined in EN 60079-0 clause 26.4

17.3 Before the first use of the device one marking field (Ex nA IIC T4 Gc or Ex nA [ic] IIC T4 Gc) has to be selected and marked; once the device has operated at non-intrinsically safe fieldbus circuits it may not operate at intrinsically safe fieldbus circuits without reconsideration by the manufacturer.

17.4 The ambient temperature range depends on various installation conditions of the devices; see manufacturer's instructions.

We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

DEKRA EXAM GmbH
44809 Bochum, 2015-07-16
BVS-Pe/Wit/Ma A 20150664

Certification body

Special services unit

This certificate may only be reproduced in its entirety and without any change.

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

11 Declarations by the manufacturer

This device complies with the requirements of the EC directive 2004/108/EG, "Electromagnetic Compatibility" (EMC directive). It meets the following requirements:

- **Emission:**
  - EN 55011 Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment, group 1, class A
  - EN 55022 Information technology equipment; Radio disturbance characteristics; Limits and methods of measurement, class A
  - EN 61000-6-4 Electromagnetic compatibility (EMC); Part 6-4: Generic standard – Emission standard for industrial environments
- **Immunity:**
  - EN 61000-6-2 Electromagnetic compatibility (EMC); Part 6-2: Generic standard - Immunity for industrial environments

CE A Declaration of Conformity in compliance with the above standards has been made and can be requested from Softing Industrial Automation.

ROHS

The FG-200 HSE/FF Modbus device is ROHS compliant.

Note

To fulfill the EMC requirements, the other components of your installation (DC adapter, Industrial Ethernet devices, etc.) also have to meet the EMC requirements. A shielded cable must be used. In addition, the cable shield must be grounded properly.

CAUTION

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures!

FCC

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

WEEE

Electrical and electronic equipment must be disposed of separately from normal waste at the end of its operational lifetime. Packaging material and worn components shall be disposed of according to the regulations applicable in the country of installation.

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