System Integrators’ Guide
To
FOUNDATION fieldbus
System Integrator’s Guide to FOUNDATION fieldbus

Intention of this Document:

FOUNDATION fieldbus is an interesting and emerging technology in the field of Process Automation. SOFTING is well known in this business and has got a lot of experience in this technology:

- 11 out of 19 FF hosts (controllers) use Softing FF-stacks
- app. 60 % of all certified FF devices use Softing FF-stacks
- with our FF gateways (to HSE, Modbus/TCP or simply to USB) you can connect a large variety of data clients (e.g. asset management tools, controllers, SCADA, PLC etc....) to FOUNDATION fieldbus.

Our FF-gateways offer you following benefits:

- You can use a standard PLC to control FF networks (especially for smaller networks this is a nice alternative to an expensive DCS)
- You can connect any OPC-Client to FF networks (e.g. for SCADA, data collection in database etc....) in parallel to an existing DCS system. This way you do not need to touch the existing system. Just get your data via our gateways without any impact on the existing system
- Easy remote or local access for all sorts of asset management tasks

This makes Softing a strong partner for System Integrators in process industry.

In addition to the previous document V1-3 this new version V2-0 comprises also our new gateway FG-200 HSE/FF Modbus featuring an improved redundancy concept.

This document is meant to give you a quick overview on the many different application scenarios of our FF products and to make you solve your connectivity tasks in your FF projects more easily.

Softing – Haar, May 2016

Sincerely yours,
Table of Contents:

1. Where FOUNDATION fieldbus Networks are used?

2. Softing´s FF products
   2.1 NEW: FG-200 HSE/FF Modbus
   2.2 FG-110 FF
   2.3 FG-110 FF and FIM-110 FF: what is the difference?
   2.4 FFusb

3. Possible Applications of FG-200 HSE/FF and FG-110 FF
   3.1 Configuration and Asset Management Systems
   3.2 Linking Device between different H1 devices
   3.3 Connection to PLC or DCS
   3.4 Connection of SCADA, ERP, MES as OPC-Client to H1 devices

4. Possible Applications of FFusb
   4.1 Connecting a FDT Frame Application via H1-CommDTM to H1
   4.2 Connecting Softing’s FF-configurator to H1-devices (Dec 2014)
   4.3 FFusb with FieldMate from Yokogawa
   4.4 Use FFusb as Mini-Host
1. Where FOUNDATION fieldbus Networks are used?

FOUNDATION fieldbus (FF) networks are mainly used in applications with hazardous (explosive) environmental conditions:

- Gas
- Oil
- Vapors
- Dust

Thus the most common industries are

- Oil & Gas Industry
- Petrochemical industry
- Chemical industry

But in the past FF has also become more and more used in

- Pharmaceutical industry
- Grain mills, grain storage (dust !)
- Mining (dust !)
2. Softing´s FF Products

2.1 New FG-200 HSE/FF Modbus:
FG-200 HSE/FF Modbus is Softing´s new standard gateway for connecting both Modbus/TCP and HSE systems to 4 FF-H1 channels. The FG-200 provides redundancy and is suitable for the use in hazardous areas. It features fast access to process data, while making use of FF-advantages like reduced cabling, central field device parameterization, comprehensive diagnostics or intrinsically safe device segments. It is compatible with the R. STAHL bus-Carrier Series 9419 and Fieldbus Power Supply Series 9412 products for easy commissioning.

![Diagram of FG-200 HSE/FF Modbus connection]

The difference in the redundancy concepts between FG-200 HSE/FF Modbus and its predecessor FG-110 FF are as follows:

**Redundancy Concept of FG-200 HSE/FF Modbus:**
FG-200 uses a cyclic publisher-subscriber connection to the FF devices. If gateway A fails the redundant gateway B can immediately take over the job. Therefore the swap over is much faster with FG-200 HSE/FF than with FG-110 FF.

**Redundancy Concept of FG-110 FF:**
The gateway uses a server-client connection to the FF devices. In case this connection breaks down with gateway A the redundant gateway B at first needs to build up this server-client connection again to continue the job. This needs some time.
Easy Mounting with R. STAHL bus-Carrier Series 9419 and Fieldbus Power Supply Series 9412 products for easy commissioning:

You can easily click one or two FG-200 HSE/FF Modbus and the respective number of power conditioners into the bus carrier 9419. You do not need any internal cabling between these components since this is done by the back panel of the carrier. This makes assembly, commissioning and replacement of components a really easy task.

2.2 FG-110 FF:
FG-110 FF is still available.
Like FG-200 HSE/FF Modbus it can connect Modbus/TCP and RTU and HSE to 4 FF-H1 channels.
But since its capabilities for redundancy are limited its main purpose today is to connect asset management systems to FF-H1 as a visitor in parallel to a DCS system.
2.3 FG-110 FF and FIM-110 FF: what is the difference?

**FIM-110 FF: (GLA-YK-020121)**

**FG-110 FF (GLA-YK-020110):**

**FG-110 FF** is a gateway from Modbus/TCP or Modbus/RTU and HSE to four H1 channels. It is the central part of FIM-110 FF.

**FIM-110 FF** comprises
- FG-110 FF
- Power conditioners
- Conduit adapters
- IP 65 housing

**When to use which device?**
This is quite simple: If a customer has got an IP 65 cabinet with power conditioners and conduit adapters he only needs to purchase the “naked” FG-110 FF. This is mostly the case.

If he does not have all this he may purchase the FIM-110 FF as a complete package from Softing.

**By the way:**
FIM-110 FF is used to replace the Rosemount 3420 gateway which was discontinued by Emerson. Emerson officially approved FIM-110 FF for this.
2.4 **FFusb (DUA-KK-020300):**

The FFusb Interface provides direct access in the plant or lab to FOUNDATION fieldbus H1 segments and FOUNDATION fieldbus H1 field devices.

The product includes

- a free Communication DTM to connect to FDT frame applications
- a programming interface for integration into proprietary systems.
- a free FF-configurator for configuration of small FF networks
3. Possible Applications of FG-200 / FG-110 FF / FIM-110 FF

3.1 Configuration and Asset Management Systems:

- **Connect a HSE Configuration Tool to H1 Devices via HSE**
  
  FF-configuration tools mainly are connected via HSE (i.e. Ethernet based protocol of the FIELDBUS FOUNDATION). This allows you to remotely access FF devices for configuration from your office without the need to go down to the device in the plant.

  You need this configurator for the configuration of the FF part (function blocks etc...) of the FF-field devices. It is mostly integrated into a DCS system (e.g. DeltaVi) or exists as a separate application in parallel to a DCS.

  Typical separate HSE FF-configuration tools are e.g.
  
  - National Instruments
  - FF-CNF from Softing (comes for free with FG-110 FF / FIM-110 FF)

  You can use FG-200 HSE/FF, FG-110 FF or FIM-110 FF for connecting the configurator to the device
  
  - For online configuration of a FF-plant
  - For offline configuration of a device in the repair shop

  Softing’s FF-HSE configurator (FF-CNF) is included for free if you order a FG-200 HSE/FF, FG-110 FF or FIM-110 FF gateway.
Connect the Asset Management System (AMS) from Emerson via HSE:

AMS is the asset management system from Emerson. It connects directly via HSE to the FF network. In this case FG-200 HSE/FF or FG-110 FF acts as the visitor gateway between HSE and the H1 devices in the field.

FG-110 FF is officially approved by Emerson for connection to AMS. Please refer to following link on Emerson’s homepage:
• **Connect other Asset Management Systems via FDT/DTM:**

Most asset management systems are FDT frame applications. They can connect to the H1 networks via Softing’s HSE-CommDTM and the FG-200 HSE/FF or FG-110 FF.

Typical systems of this kind are
- FieldCare of Endress & Hauser
- FieldMate of Yokogawa
- PACTWARE (free of charge)

The HSE-CommDTM comes for free with the FG-200 HSE/FF, FG-110 FF or FIM-110 FF.

3.2 **Linking Device between different H1 devices:**

Skid modules become more and more popular in process automation because you can build up your plant out of preconfigured modules which can easily be added or replaced for maintenance.

With FG-200 HSE/FF, FG-110 FF or FIM-110 FF you can interconnect them easily.
3.3 Connection to PLC or DCS:

- **Connection of PLCs via Modbus/TCP to H1 devices:**

With FG-200 / FG-110 FF / FIM-110 FF you can connect any Modbus/TCP controller to H1 devices for cyclic data exchange of process data. In “Visitor Mode” you can do this also in parallel to an existing DCS system in the network. If redundancy is required we recommend to choose FG-200.

You can do this:

- to control H1 devices with a PLC instead of an expensive DCS system.
- to integrate single H1 devices to a Modbus/TCP network because there are no equivalent devices for Modbus/TCP on the market (ATEX..).
- to control a separate Modbus/TCP network depending on data input from the H1 networks

There are many PLCs with Modbus/TCP interface in the market like

- Schneider Electric M240, M580 etc..
- Siemens S7 with CP343-1 with function block for Modbus/TCP

- **Connection of older PLCs or DCS systems via Modbus/RTU to H1 devices:**

  FG-200 / FG-110 FF / FIM-110 FF is equipped with a RS232 interface. You can connect this RS232 port to a RS485/RS232 converter and from there to a controller with a Modbus/RTU interface.

  This applies to older PLCs from Schneider Electric and to older DCS systems from Honeywell.

  This application makes sense if you need to add modern FF-H1 devices to your existing DCS or PLC network.
• **Connection of DCS systems via HSE to H1 devices:**

So far following DCS controllers use the FF-HSE stack from Softing and therefore have got a HSE interface:

- ABB
- Metso
- GE

These DCS manufactures use brandlabled FF-Linking Devices from SOFTING to connect directly to H1 networks. They are based on FG-110 FF. They are in direct contact with Softing and will not buy from distributors.

### 3.4 Connection of SCADA, ERP, MES as OPC-Client to H1 devices:

Via FG-200 / FG-110 FF / FIM-110 FF and Softing´s OPC-Modbus/TCP-Server on a separate PC you can connect any OPC-Client to H1 networks for cyclic data exchange of process data. This also works in parallel to a DCS system in your H1 network.
4. Possible Applications of FFusb

**FFusb can be used for following tasks:**

**4.1 Connecting a FDT Frame Application via H1-CommDTM to H1:**
Typical Asset Management Systems use FDT technology for
  - Pre-Commissioning of field devices in the lab
  - Calibration and parameterization of field devices on site or in the lab
  - Field device diagnostics on site

With Softing’s FFusb + FF-H1 CommDTM (included in delivery scope) you can easily connect any FDT frame application on your laptop to your H1 devices.

**4.2 Connecting Softing’s free FF-configurator to H1-devices:**
FF-Configuration of field devices in the field

**4.3 Connecting to Yokogawa FieldMate:**
FFusb is ready to go with Yokogawa FieldMate for use with DDs - no CommDTM required in this case. Therefore FFusb is a perfect alternative to replace the expensive NI-interface.

**4.4 Use FFusb as Mini-Host:**
You can use FFusb as Mini-Host during commissioning phase for setting the individual Node-ID and PD-tag in a device.
More information on www.Softing.com

**FG-200 HSE/FF Modbus:**

**FG-110 FF:**

**FIM-110 FF:**

**FFusb:**