

Obstacle-free data transport

Simple integration of Foundation Fieldbus H1 devices in Modbus/TCP systems

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In addition to pure process plants such as refineries, there are many chemical/pharmaceutical production plants which represent hybrids of manufacturing and process technology. It is usually not worth using expensive process control systems to realize simple control applications in such plants. The flexibility of the FG-100 FF/M gateway makes it an economical alternative for small to medium-sized plants.

Process plants usually operate over the course of several decades. The very high investment costs for such plants are generally not amortized for many years. It is often not worth using expensive process control systems in hybrid plants which mix manufacturing and process technology. Furthermore, when moving gradually from 4-20 mA point-to-point wiring to a fieldbus, it is reasonable to gain experience with smaller units first. This can take place using inexpensive controllers from the field of manufacturing technology. Even when new plants are planned with process control technology and the corresponding bus systems in mind, it makes sense to move into the world of PLCs so that third-party components for visualization, servicing, etc. can be connected. Ongoing engineering costs are another factor to take into consideration. Unlike the one-off costs for procurement, these ongoing costs are often difficult to estimate.

Foundation Fieldbus H1

Foundation Fieldbus H1 (FF) is one of the solutions used in the field of process technology, particularly in the petrochemical industry. It offers extensive device parameterization and diagnostic capabilities. It thereby eliminates not only the need for a special parameterization interface at the sensor, but also the arduous - and possibly time-consuming - way to the sensor, depending on where the sensor is installed. Process peripherals are typically connected to what are known as H1 segments, which can also

be intrinsically safe. Many manufacturers offer a wide range of sensors and actuators for FF. As of yet, however, relatively few control technology manufacturers have adapted their systems to FF. For this reason, FF is usually integrated in a proprietary way, which has made it nearly impossible to use control technology components from different manufacturers. In light of this, users are generally tied to the first provider they choose.



In order to make it easier for users to implement FF and achieve investment security, manufacturers must improve the compatibility and interoperability of their components – particularly for control technology – and create transitions to established control architectures. One example of this is Softing's FG-100 FF/M gateway from FF to Modbus/TCP (Image 1).

Modbus/TCP

Alongside solutions like Profinet, Modbus/TCP has developed into a standard for communication via Ethernet-TCP/IP in automation technology. This is the result of a stable specification, widely available technology and a variety of industrial serial devices, like controllers, in nearly every performance class. Unlike Profinet, which is a distributed automation solution, fieldbus-on-Ethernet solutions like Modbus/TCP are characterized by the fact that Ethernet-TCP/IP is used as a new transmission technology while the respective fieldbus protocol remains largely unchanged. The

major advantages of these systems are that their specifications have been stable for several years and no fundamental rethinking is required on the part of users. These systems are not intended for distributed automation, but rather for the fast, reliable transmission of data over Ethernet.

Image 1: The FG-100 FF/M is well-equipped for the future since it also makes process data available via Web services in accordance with the OPC XML DA specification. This open standard is increasingly found in commercially available SCADA systems.

In accordance with this, Ethernet-TCP/IP was simply approved as an additional transmission technology for the Modbus protocol which has existed since. Simple Modbus services like the reading and writing of address spaces, which have been part of Modbus since the original

taneous access to the process data which is transmitted using the individual and combined read and write functions defined by Modbus. In order to optimize bandwidth and prevent Modbus/TCP devices from only being able to cyclically read and write data from the gateway, the FG-100 FF/M itself can also act as a Modbus client. To this end, it is possible to define which device should receive which data at which time. This enables the realization of event-driven behavior in which selected data is reported to a previously specified Modbus device only in the event of a change, like an error message. The gateway can naturally be used as a

client and server in parallel. using the FG-100 FF/HSE Linking Device from Softing, for example. The gateway has an integrated Web server for integrating the device on the Modbus/TCP side. This provides clear, user-friendly HTML pages for the respective services (Image 3). Online help is also available, so there is little need for an instruction manual. The Web pages can be accessed by entering their IP address in any standard Web browser. The gateway's Modbus server requires no configuration other than setting the IP port, since the mapping of the local FF function blocks to the Modbus register is fixed. The Modbus client function is also configured using the Web interface. Source data in the form of the register address, data triggers (value changes or time constraints) and target devices (IP and register address) is individually specified here. The Web interface can additionally be used for network administration and carrying out extensive diagnostic and commissioning functions. It is possible to access a comprehensive self-test, status and version information, and process data and status information from the connected field devices. The Web interface offers an upload and download function which allows all of the configuration data in the gateway to be saved and transferred back to the device, so no reconfiguration is necessary if devices are exchanged.

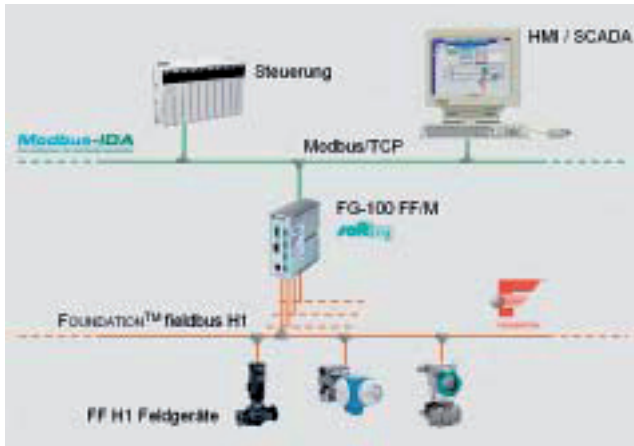


Image 2: Inserting the device into the plant architecture

version of the protocol, were retained unchanged and mapped to the transmission medium of TCP/IP.

Functionality of the gateway

The gateway is easy to commission. The two communication technologies have been coupled as a pure process data interface for easier handling. This means that no detailed knowledge is needed to integrate the gateway either in the FF application or the Modbus application (Image 2). From the H1 point of view, the gateway acts like an H1 field device with a number of I/O blocks which can be linked to other field devices using commercially available FF configuration tools. The gateway offers four H1 segments which are independent of one another. The measurement value of a sensor can be linked to one of the gateway's output blocks. The measurement value then becomes part of the process image held in the gateway, which can be read from the Modbus side. Conversely, a predetermined target value can also be written from a Modbus/TCP device to the gateway. This value, too, then becomes part of the internal process image and can be connected with an actuator in the field via one of the gateway's input blocks. On the Modbus side, the gateway implements the usual register interface. It acts as a server which gives several clients simul-

client and server in parallel.

Easy integration thanks to Web interface

The functionality of the device results in a clear distinction between the H1 side and the Modbus/TCP side. This means that each side can be configured independently without the need for specialist knowledge of the other side. For the H1 configuration, the FG-100 FF/M – like every H1 field device – provides a device description file which is read by the respective H1 configurator. It does not matter whether the configurator is part of a control system or whether it is a stand-alone application. The gateway can always be accessed for configuration via the corresponding H1 segment –

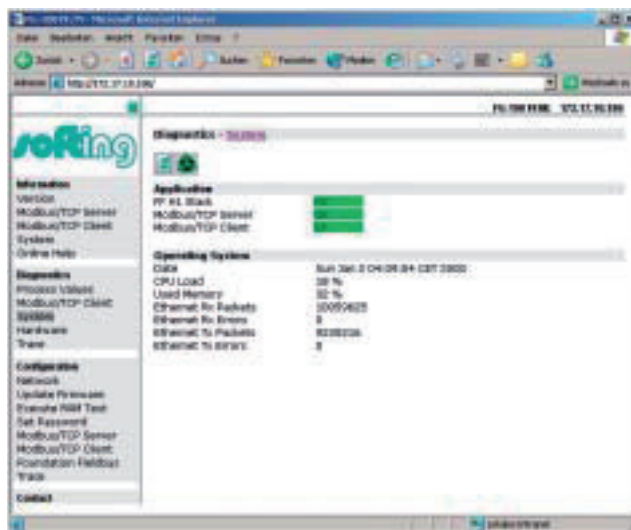


Image 3: Ergonomic operation through integrated Web interface