M+F Technologies GmbH

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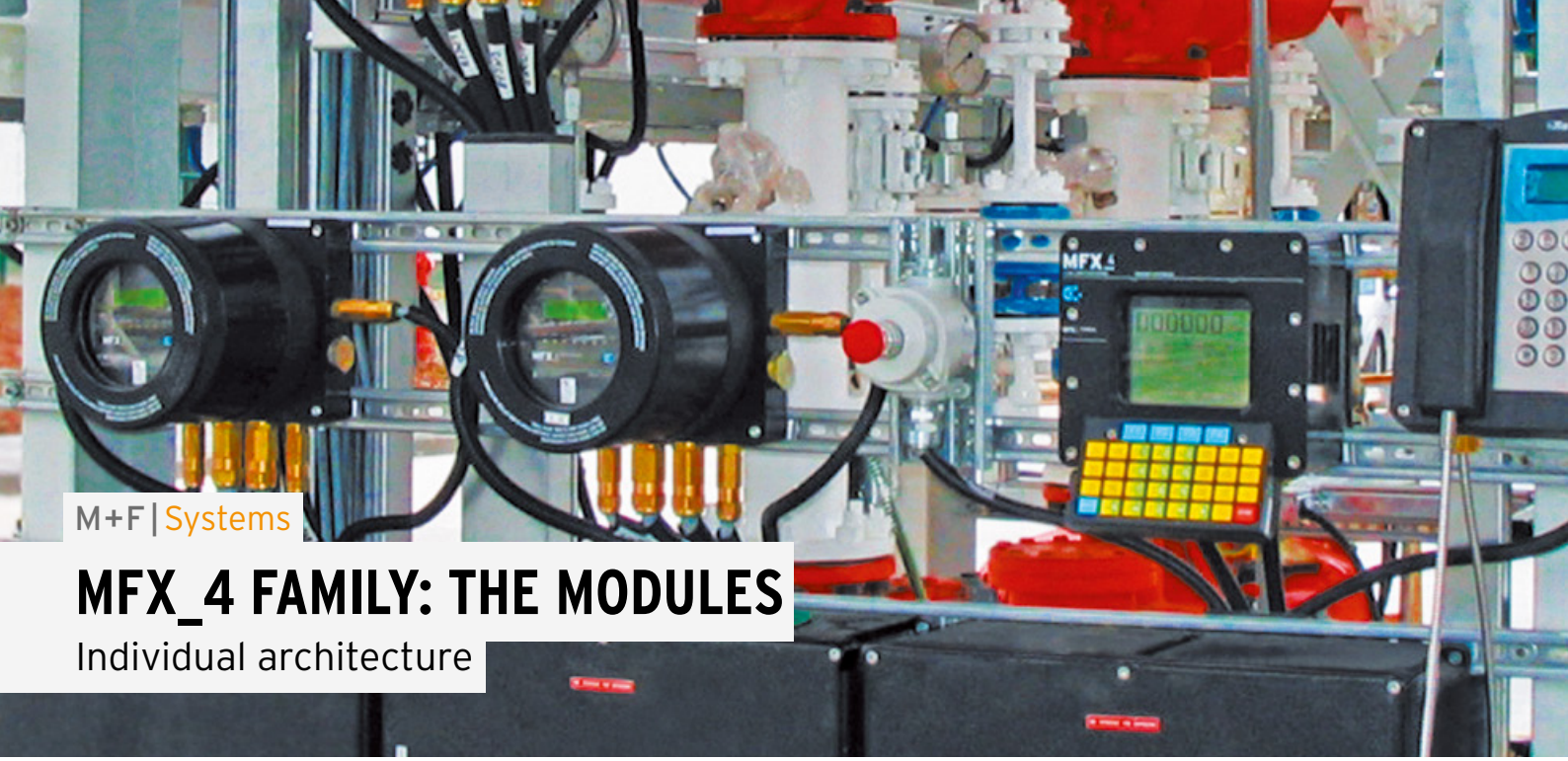
MFX_4: MODULAR FLOW COMPUTER SYSTEM

For a comprehensive overview of all processes

J.H.K.
Member of the J.H.K. Group



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MFX_4 FAMILY: THE MODULES

Individual architecture

The high-performance **MFX_4** flow computer complies with the highest standards, allowing for flexible and reliable custody transfer measurement and blending as well as the management of processes for the handling of liquids and, in particular, oil. With more than 30 years of operating experience and in excess of 15,000 installations, the fourth generation combines long-standing industry know-how with state-of-the-art technologies.

Thanks to its support of various protocols and communication standards, all **MFX_4** systems are easy to integrate, can be configured quickly and can be serviced remotely during ongoing operations. The **MFX-4** flow computer sets itself apart with its distributed architecture made up of centralised processing units and decentralised operating units, thus substantially expanding the range of possible applications,

- → **Flexibility:** a wide-ranging system family with modules for use in control rooms and external use in explosive environments, even under extreme weather conditions
- → **Scalability:** use in various applications, ranging from systems with single loading stations to large, complex transfer systems
- → **Security:** rigorously secure parameter access through structured system admission as part of a multi-level security approach with the archiving of all changes

AN EXCEPTIONAL SYSTEM IN DETAIL

The **MFX_4 Controller** is the centralised control unit of the MFX_4 system. It is available in two housing variants as an explosion-proof (Ex) as well as an unprotected device, whereby the functionality of the electronics is identical. Depending on the model, it can be used both in the control room and under extreme weather conditions in explosive external areas.

- → **MFX_4 Controller:** configurable for individual applications for blending or additivation and including an integrated PLC control system via scripting

The **MFX_4 Terminal** is the human-machine interface (HMI) via which communication with the Controller, other suitable terminals or a SCADA system takes place. To ensure optimum operability, it is equipped with a configurable graphic display and is able to display all process data in various sizes and languages.

- → **MFX_4 Terminal:** interface between the measurement device (e.g. MFX_4 Controller) and the user in the field

The **MFX_4 Compact** combines all functionalities of the MFX_4 Controller and MFX_4 Terminal in a single explosion-proof (Ex) housing. Thanks to its compact size, the MFX_4 Compact is also suitable for use in small systems.

- → **MFX_4 Compact:** especially suitable for smaller systems in which a single housing is advantageous

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DESIGNED FOR MANY CHALLENGES

The MFX_4 applications

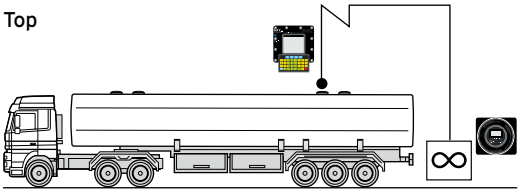
MFX_4 is the fourth generation of the flow-computer product line of **M+F Technologies**. More than 15,000 MFX flow computers are in use worldwide.

The **MFX_4** system covers a broad range of applications: from tank truck, rail car and ship loading systems to pipeline measurement systems and multi-component blending systems.

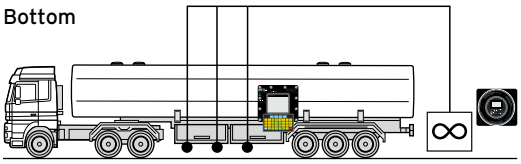
OVERVIEW OF APPLICATIONS

Tank truck loading

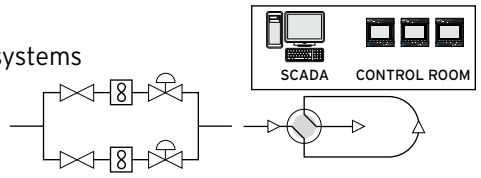
Top



Bottom

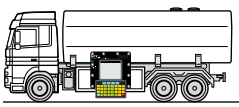


Pipelines
Measurement systems



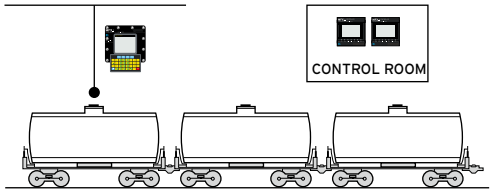
Tank truck applications

heating oil

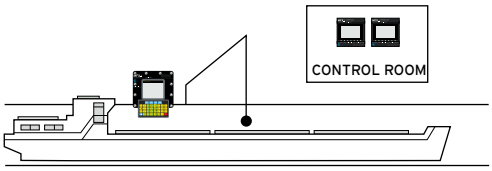


COMPACT

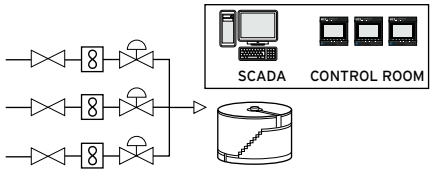
Rail car loading



Ship loading



Blending



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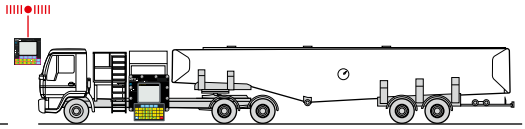
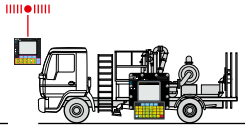
Refueller



COMPACT

Dispenser



COMPACT

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MFX_4: THE FUNCTIONS

Outstanding capabilities

The **MFX_4** has a modular system architecture: Its functions are distributed between individual modules, which communicate with one another via the CANopen fieldbus.

These modules are available in [Ex] and non-[Ex] versions and can be precisely positioned and configured for the required application.

→ **MFX_4 Controller:** the centralised control unit for custody transfer measurement

→ **MFX_4 Terminal:** the human-machine interface

→ **EDI module:** intelligent TCP/IP gateway

MFX_4 CONTROLLER

Flow computer, custody transfer

Field

Controller
[Ex]

Control room

hat rail mounted non explosion proof Controller for installation in control cabinets

→ MFX_4 Controller

Flow computer for one or two meters
Digital and analogue inputs and outputs
Densimeter frequency input
Multi-component blending
Additivation
Bio-ethanol blending
Preset

→ Interfaces

CANopen
RS232/485

MFX_4 TERMINAL

Human-machine-interface [HMI]

Field

Terminal
[Ex]

→ MFX_4 Terminal

Large graphical display
Alphanumeric keypad
Configurable menus
Multi-lingual capability
Proximity card reader
Wiegand card reader

→ Interfaces

CANopen
RS232
RS485 4 Draht
TCP/IP mit 5 Kanälen

MFX_4 COMPACT

Flow computer and HMI combined in one [Ex] housing

Field

Compact
[front view]

Compact
[rear view]

→ MFX_4 Compact

combines a controller module with a terminal module in an [Ex]-proof housing.

This device is specially designed for smaller systems for which a single housing is appropriate.

UPC OR LEGAL PRINTER

The UPC is a PC database application approved by the Office of Weights and Measures and replaces the conventional legal printer. Its database queries allow the simple retrieval of historical data.

The UPC communicates with the MFX_4 via TCP/IP [see example 3 on page 7].
Alternatively, a conventional legal printer can be connected.

MFX_4 TERMINAL AS AN ACCESS CONTROLER

Due to the integrated card reader and its TCP/IP connection, the MFX_4 Terminal can also be used as a separate access control device, e.g. for entrance and exit of loading terminals.

↑ Proximity card reader

↑ Wiegand card reader

→ **[Ex] and non-[Ex] versions**

→ **Wiegand/Proximity** card reader integrated

→ **Local customer database** integrated

→ **Stand-alone** with pre-defined dialogues and/or external dialogue control

MFX_4 EDI

Communication gateways

Control room
EDI

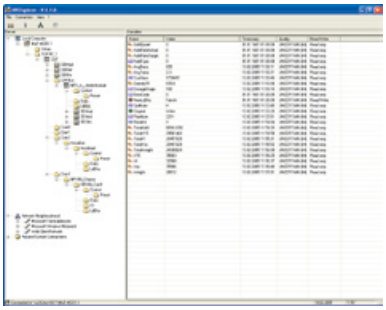
→ MFX_4 EDI
The MFX_4 EDI is a gateway between the MFX_4 modules [CANopen] and a local area network [TCP/IP].

→ EDI versions:
CANopen to Ethernet
CANopen to the serial printer
CANopen to Modbus RTU
CANopen to Modbus TCP

MFX_4 OPC SERVER

Communication gateways

OPC-Server



→ MFX_4 OPC Server
The MFX_4 OPC Server is a PC program [MS Windows], which can run on the same computer as the terminal automation system [TAS]. It offers full access to all process data of the MFX_4 in tabular form. The TAS reads and writes in the OPC Server tables without being directly connected to the MFX_4.

This standard system communication is supported by a large number of device manufacturers and significantly simplifies the integration of SCADA and TAS systems into the system environment.

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CONNECTION TO THE FIELD AND THE INTERNET

The communication

CONNECTION TO A LOCAL AREA NETWORK

In addition to a peer-to-peer connection with a SCADA or TAS system, the **MFX_4** system can also communicate via TCP/IP on a local area network [LAN].

The SCADA or TAS system does not need to know the internal protocol of the **MFX_4**. It communicates with the OPC Server (and can read and write in its register) on the LAN or directly via Modbus TCP.

The OPC Server can be installed on the same PC as the automation system; it can, however, also be accessed via the LAN from a different PC.

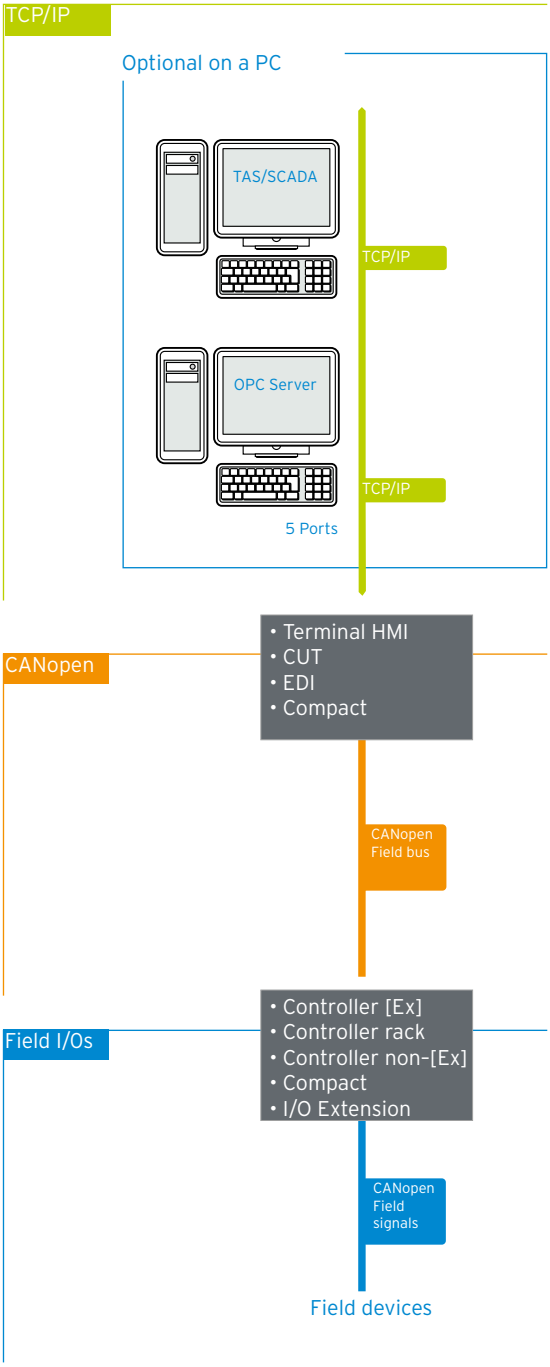
Alternatively, the **MFX_4** can communicate serially with other systems in a conventional manner via RS232 or RS485, for example with Modbus RTU.

COMMUNICATION WITH CANOPEN FIELDBUS

The **MFX_4** modules communicate via the CANopen fieldbus. This very fast and highly secure bus system has proven its quality in practice over many years and is frequently used where rapid data transfer is required [e.g. car technology].
The CANopen controllers are already integrated in the **MFX_4** modules.

CONNECTION TO DEVICES IN THE FIELD

The devices used in the field are directly connected to the **MFX_4** Controller.
The design of the **MFX_4** system allows for an optimal connection of the field in- and outputs: e.g. densimeter frequency signals can be connected directly without the need for a converter.



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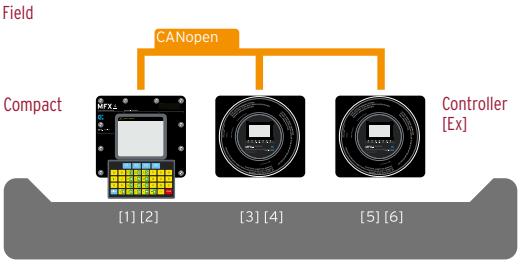
FLEXIBLE MODULAR CONCEPT

Configuration examples

In simple systems, all modules can be arranged on the loading platform. An automation system has not (yet) been installed: the system runs semi-automatically with the **MFX_4** Terminal.

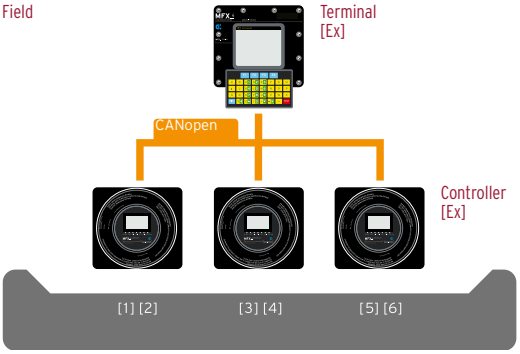
EX. 1: ALL MODULES ON THE LOADING PLATFORM

The **MFX_4** Compact is used together with two **MFX_4** Controllers. As the **MFX_4** Controllers, the **MFX_4** Compact can supply up to two metering points. The operator uses the HMI of the Compact for all metering points on the loading platform.



EX. 2: ALL MODULES ON THE LOADING PLATFORM

The **MFX_4** Terminal is used with three **MFX_4** Controllers. It serves as a HMI for all metering points.

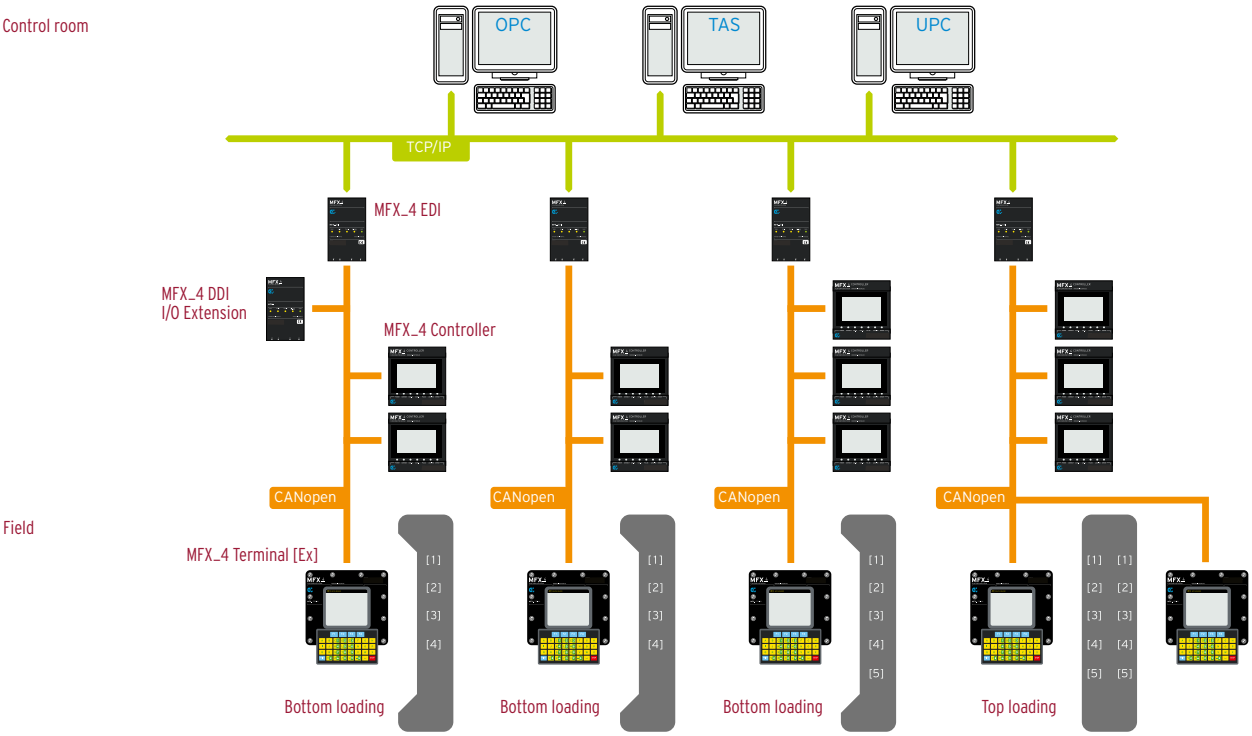


EXAMPLE 3: MFX_4 ON THE LOADING PLATFORM FOR TANK TRUCK LOADING

This example shows a tank truck terminal with four loading platforms. The respective **MFX_4** Terminals [Ex] are located on the loading platforms. [Note: platform 4 has a right and a left lane and uses two terminals.]
For additional I/O requirements on these loading platforms, a further I/O extension is installed on each loading platform. Each controller is responsible for one or two metering points.

The **MFX_4** EDI modules are gateways to the TCP/IP LAN network. The OPC server supplies the automation system with all writing/reading data of the **MFX_4**.

The UPC on the LAN is a legal data memory that replaces the legal printer.



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MFX_4: METER INTEGRITY AND SCALABILITY

The advantage of modularity

SCALABILITY

The **MFX_4** can be used for simple low-cost applications, as well as for highly complex high tech applications. The smallest system only requires a single controller in order to control up to two metering points. Highly complex applications can also be covered with the same **MFX_4** modules.

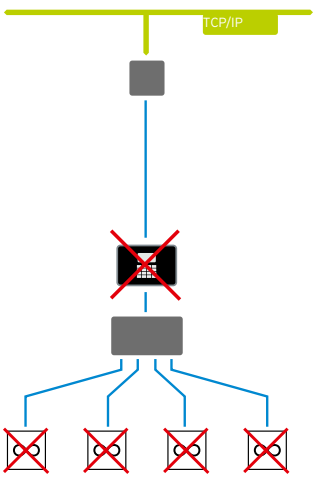
This scalability allows for high-performance system concepts to be realised over time with the same technology.

METER INTEGRITY

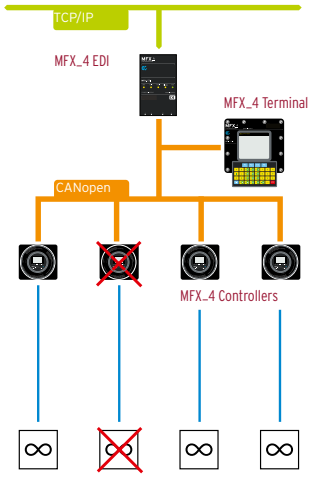
If other flow computers fail, a complete loading platform is no longer able to operate, so called "single island integrity".

With the "meter integrity" of the **MFX_4**, only one measuring point is affected in the event of an interruption.

→ **Higher performance,** maximum availability
→ **Simple configuration** and expansion
→ **Cost-efficient:** low costs for spare parts and maintenance
→ **Lower cabling costs:** no additional switch boxes



↑ Other flow computers



Single Island integrity and meter integrity

↑ MFX_4 system

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THE MFX_4 AS A BLENDING CONTROLLER

Application examples

The **MFX_4** offers full functionality as a blending controller for the blending of up to 12 different products. The result is a blended product comprising precisely defined blending proportions. The blending can take place on an in-line or sequential basis.

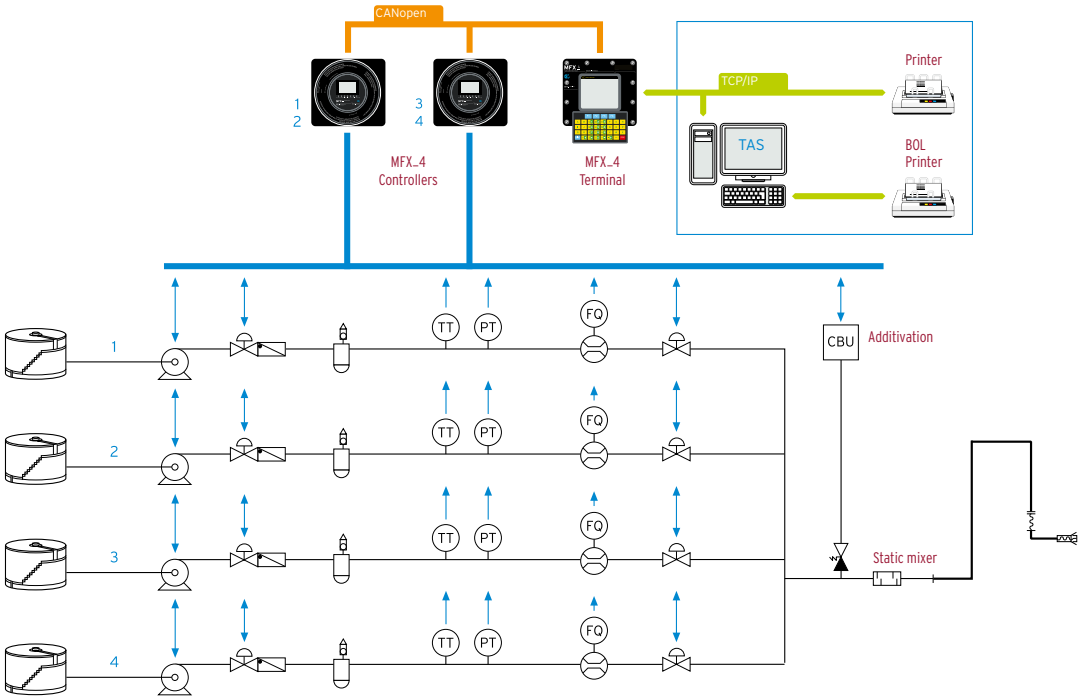
→ Typical areas of application

- Blending for tank truck loading
- Blending for ethanol and bio-diesel during loading
- Multi-product blending systems
- Bunker blending
- Additive blending
- Additivation of up to ten additives

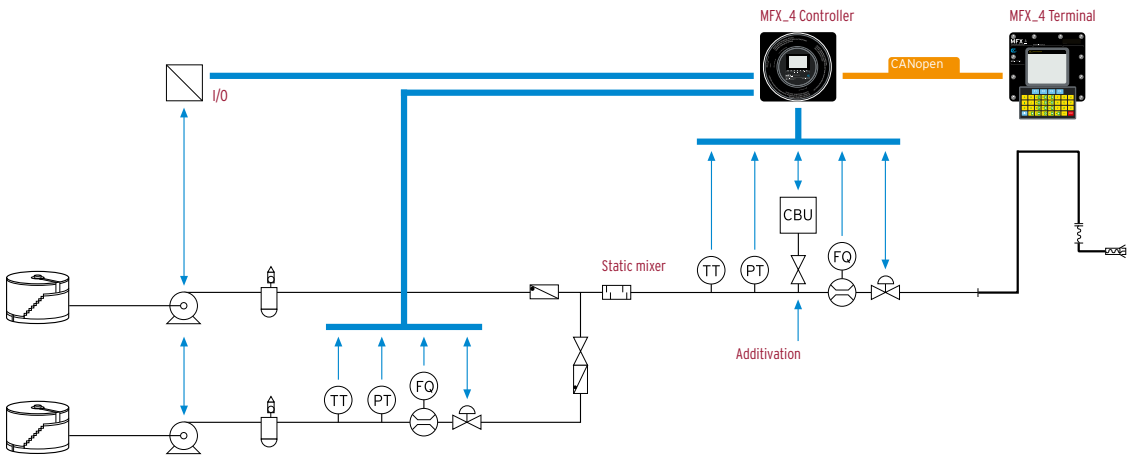
→ Main functions

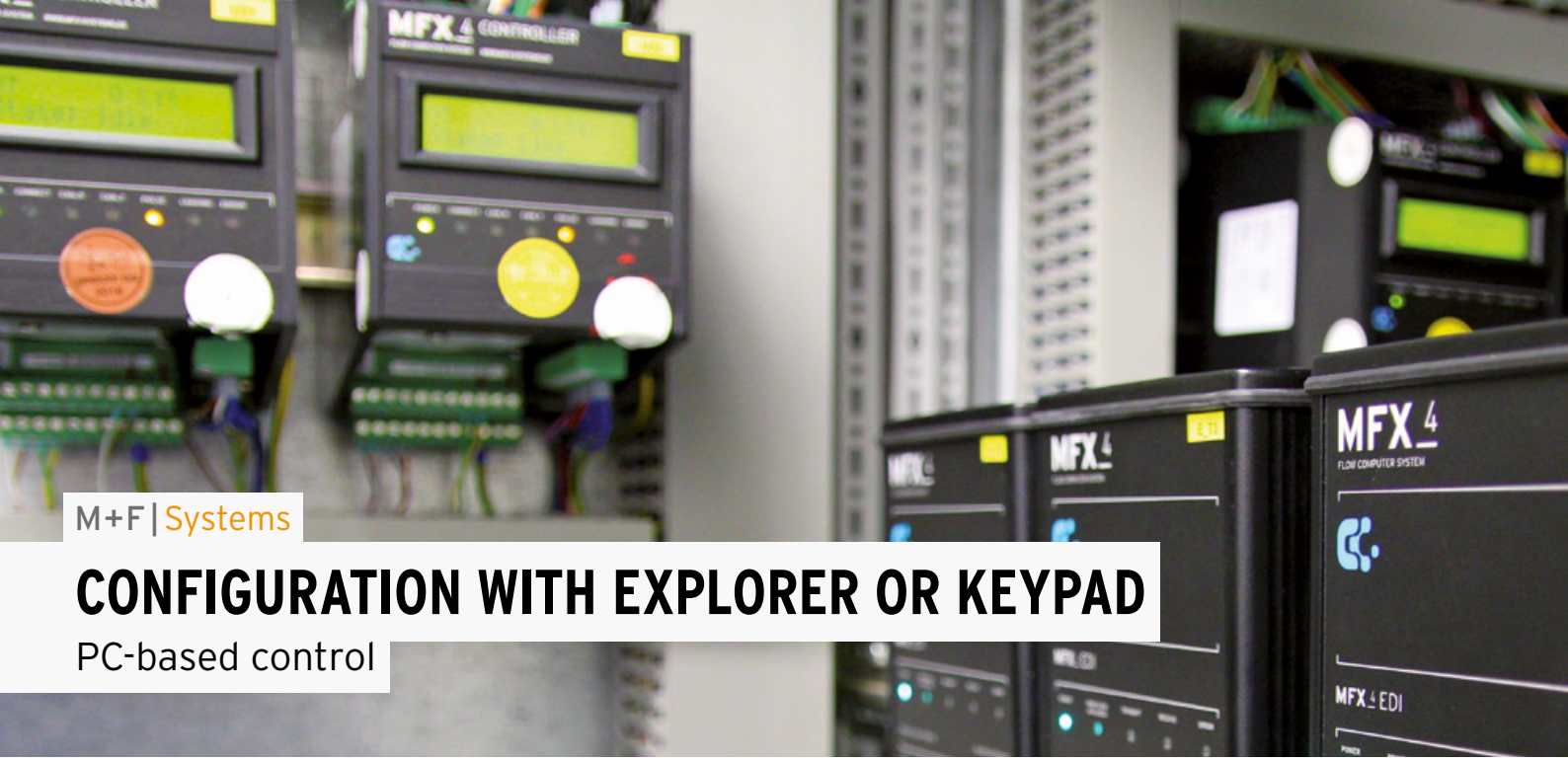
- Flushing after the loading process [optional]
- Controlled and wild stream blending
- Storage of recipes
- Meter and process data for each measuring point
- Total quantity determination for each batch
- Simultaneous additivation and blending with additive controller

EXAMPLE 1: RATIO IN-LINE BLENDING FOR UP TO 12 PRODUCTS



EXAMPLE 2: WILD STREAM BLENDING, E.G. FOR ETHANOL OR BIO-DIESEL BLENDING





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CONFIGURATION WITH EXPLORER OR KEYPAD

PC-based control

The **MFX_4** Explorer is a PC-based program which provides full access to all **MFX_4** process data. This software is the configuration tool for service personnel and operators. It also offers a large number of additional functions, making the handling of the **MFX_4** especially simple and flexible.

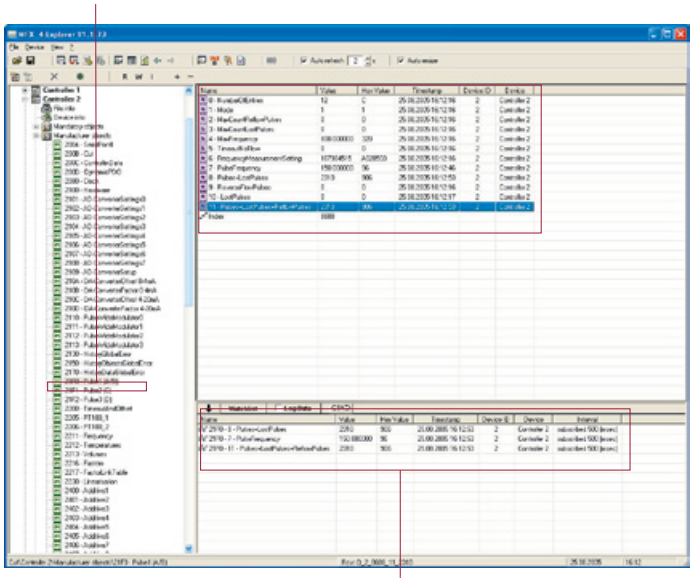
The easy-to-understand layout of the **MFX_4** Explorer allows users to familiarize themselves with it intuitively and quickly.

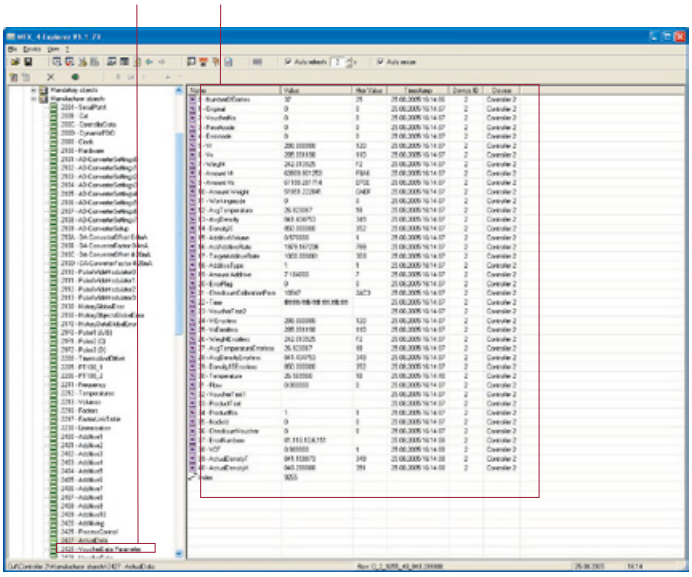
→ The program offers the following functions:

- Parameter setting
- Logging of communication
- Log book [data history]
- Parameter and configuration database
- Setting of prover variables
- Access to all variables of the OPC Server
- Firmware upload

For the service: analysis of current pulses during the loading process

Display of current loading data





Real-time update of all data

↑ Screenshots of the MFX_4 Explorer

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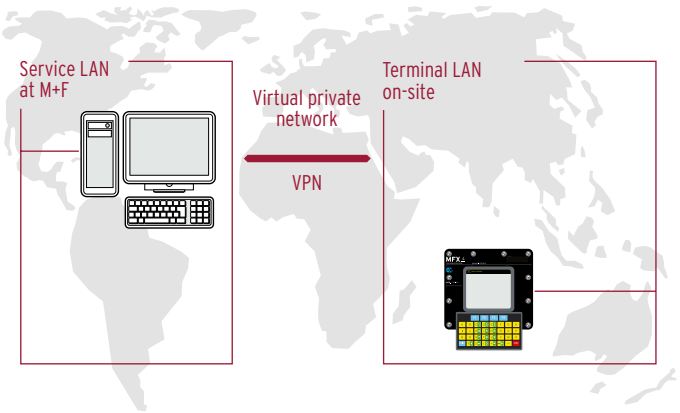
REMOTE MAINTENANCE WITH THE MFX_4 EXPLORER

All internal process data worldwide

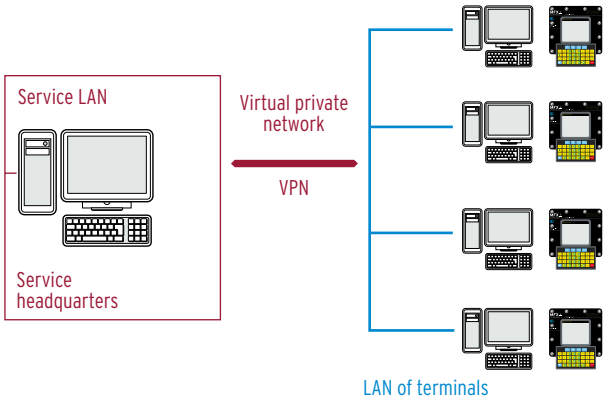
Due to the TCP/IP communication capabilities of the **MFX_4**, the system can also be supported and maintained via the internet over large distances, even internationally. As a service tool the **MFX_4** Explorer provides full access to all internal process data during the loading process, in order to analyse the process in real time.

Thus, it is also possible to review and change parameter settings and to perform firmware updates.
As firmware uploads are performed separately for the custody-transfer and non-custody-transfer areas, such updates are possible without breaking the calibration seal.

COMMUNICATION BETWEEN MFX_4 AND TAS VIA OPC SERVER



↑ International service support



↑ Central service of oil company

Helbingtwiete 5
22047 Hamburg | Germany

Phone +49 (0)40 72550 0
Fax +49 (0)40 72550 111

info@m-f.tech
www.m-f.tech

9175-0001-0044

J.H.K.
Member of the J.H.K. Group