FC1

High performance flow computer

elster
Instromet

FC1:

Total solution

The FC1 flow computer with its technical concept sets innovative standards as a basis for flexible customer-orientated solutions. A modular system design for both hardware and software, combined with a modern full graphic touch screen display, makes the a forward-looking, next-generation flow computer.

Brief information

The Elster FC1 flow computer is designed for gas and/or liquids measurement applications and the corresponding calculation algorithms. A multi-stream functionality and advanced logging features with a wide range of security and communication features are available. enCore, which means Elster new Core, is the 'base plate' of the FC1. This backbone of the new flow computer contains the basic functionalities.

A modular software system consisting of independent application function blocks (AFBs) turns the FC1 into a reliable, secure and high performance flow computer. By using cryptographic mechanisms, it can be securely updated and upgraded even in a fiscal way. Since this scalable software system is also modular in terms of hardware, the widest range of applications is possible. Two different housing sizes can effectively accommodate the required number of I/O boards, so no space is wasted. In combination with input boards with integrated EX barriers, small stations will also be able to be equipped with a high-end flow computer.

The widest range of calculation algorithms pursuant to AGA, ISO and API are implemented to fulfill all requested flow conversion requirements. The user definable logging feature can use any desired amount of flash memory, thus causing no more restrictions in logging depth. A multiple user functionality and complex audit trails simplify the security management and enable the service staff to retrieve the history of the unit whenever it is required.

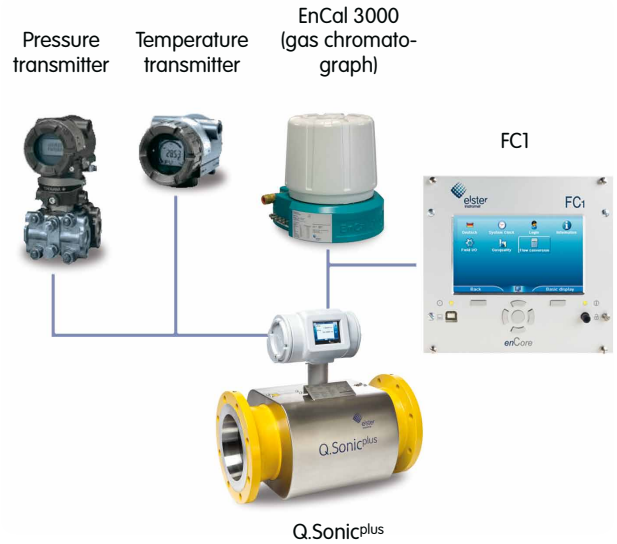
The user-friendly and operating system-independent configuration software enSuite simplifies the parameterization and configuration process as much as possible.

Main features

- Modular hardware architecture (one interface board for one stream)
- Partial software upgrade/update via USB or TCP/IP
- Enhanced data logging functionality
- Calculations according to AGA/ISO/API
- Ethernet: HTTP/FTP/MMS/Modbus protocols
- USB front panel interface
- enSuite configuration software
- Full graphic display, touch screen
- Configurable layout of user defined displays
- Multiple language system (selectable online)
- Optionally integrated EX barriers
- Low power consumption

Applications

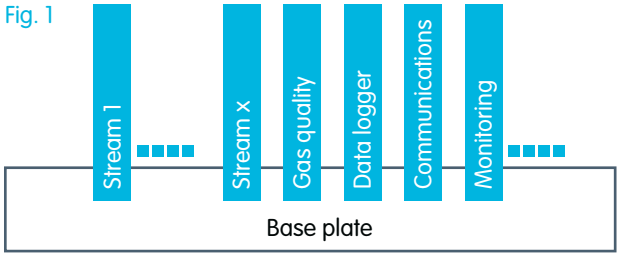
The Elster FC1 is a new modular flow computer approach based on future-proof hardware and software concepts.



Application function blocks

The enCore software system is divided into different application function blocks (AFBs). All AFBs are connected to each other via the base plate (as illustrated in figure 1). This base plate provides the basic functions such as I/O inputs, basic protocols, security mechanisms, update function,... All AFBs can be loaded separately via the configuration tool enSuite. For every target application, it is now possible to have a dedicated setup of different AFBs which make the enCore FC1 flow computer the best adapted solution for the requested task.

Fig. 1



For example, for a single stream application there is only the need for one flow conversion AFB and one gas quality AFB. With these two function blocks flow conversion can be carried out. There is then the need for data communication (e.g. Modbus) and data logging. For this, the modular flow computer is equipped with four AFBs (flow conversion, gas quality, Modbus and logging). The advantage is that the user only has to configure the desired functions and has a slim, well fitted flow computer system. Whenever there is the need for extended functionality (e.g. monitoring), an additional AFB can be loaded and the required functions are made available.

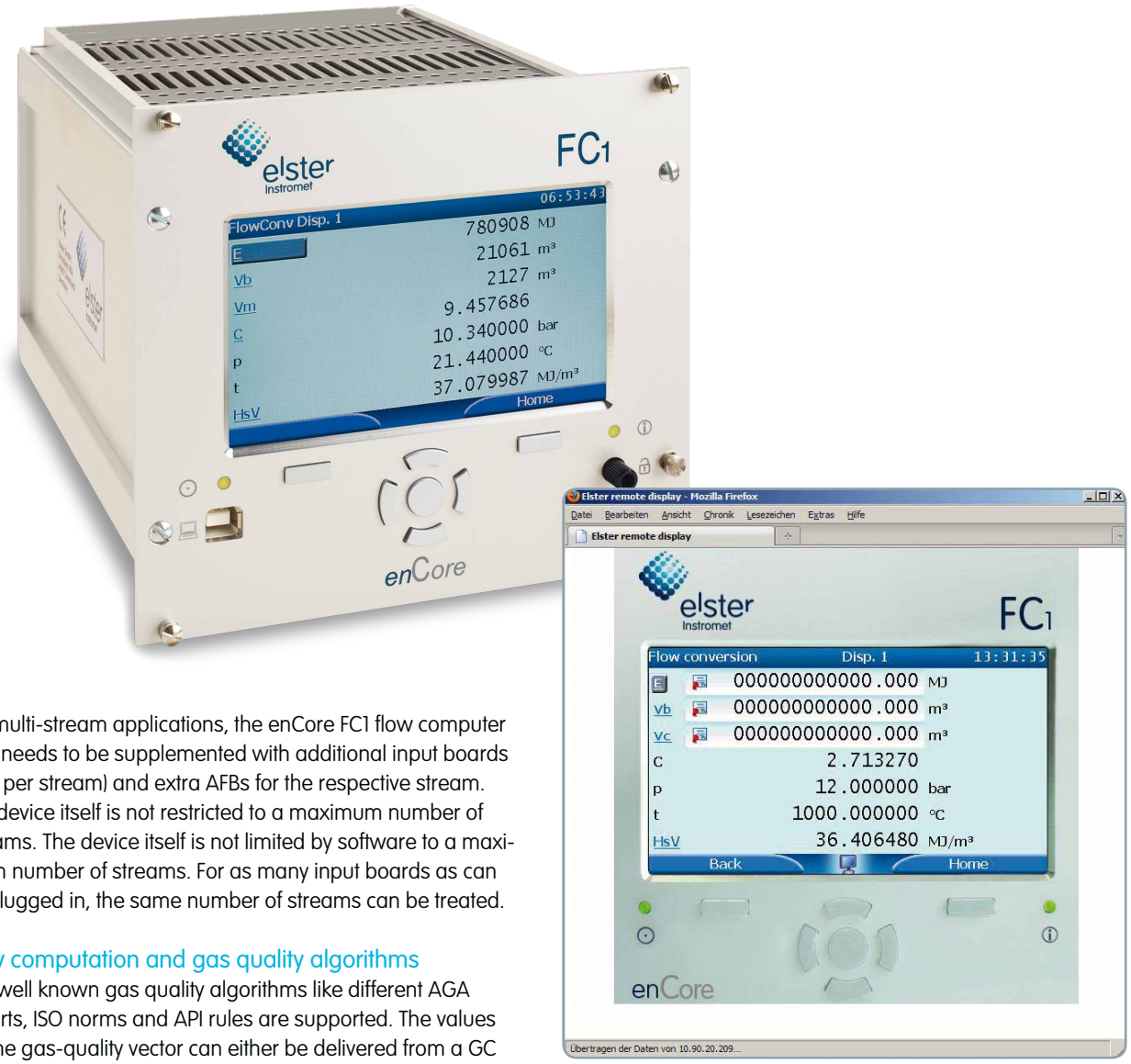
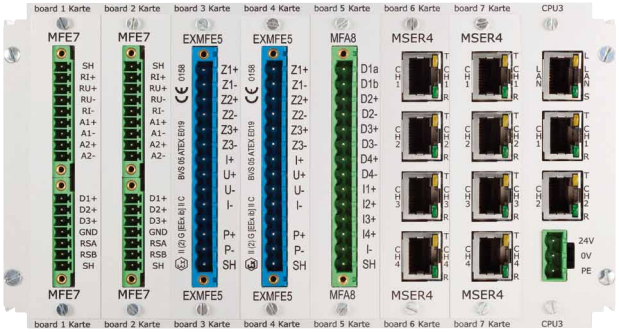


Fig. 2



For multi-stream applications, the enCore FC1 flow computer only needs to be supplemented with additional input boards (one per stream) and extra AFBs for the respective stream. The device itself is not restricted to a maximum number of streams. The device itself is not limited by software to a maximum number of streams. For as many input boards as can be plugged in, the same number of streams can be treated.

Flow computation and gas quality algorithms

The well known gas quality algorithms like different AGA reports, ISO norms and API rules are supported. The values for the gas-quality vector can either be delivered from a GC (e.g. EnCal 3000) or fix values. Other input values as pressure and temperature can be connected via digital protocols or galvanic inputs. With an enhanced and failsafe input strategy more than one value can be used for the flow computation. If the first preferred value is not available anymore a next one out of a list is used for a most failsafe operation.

Digital communication protocols

The basic communication mechanism of the enCore FC1 will be via Ethernet TCP/IP protocol. This currently up-to-date way of communication is used for several issues. Since many field connections (e.g. to PLCs, to transmitters,…) are still serial connections the FC1 has also the possibility to be equipped with up to 16 serial interfaces.

The Modbus protocol is available in different modes (RTU, ASCII, TCP). As a new way of communication the MMS protocol (Manufacturing Message Specification ISO 9506) is implemented. It is used for parameterization purposes archive readouts and SCADA communication. An http:// web server is implemented with which a remote operation panel can be transmitted all over the world (figure 2) for maintenance reasons.

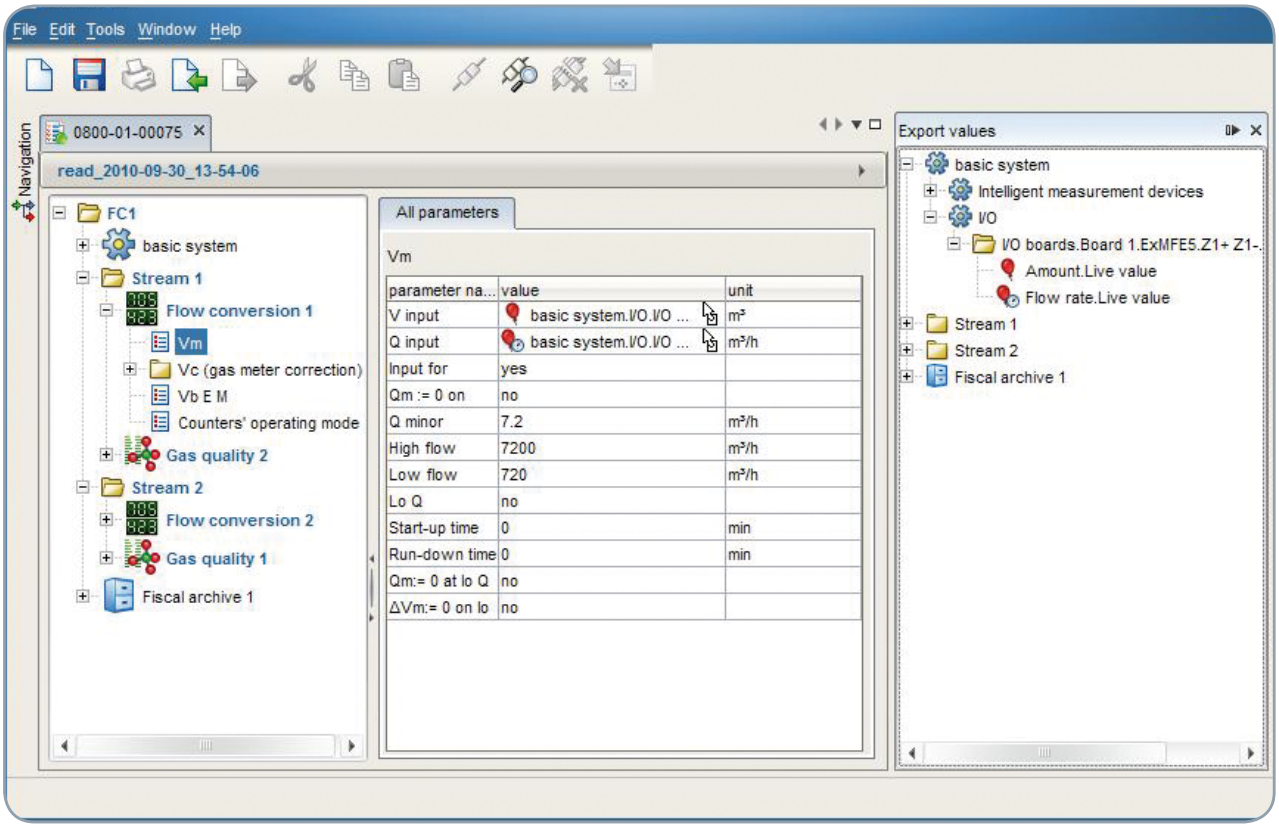
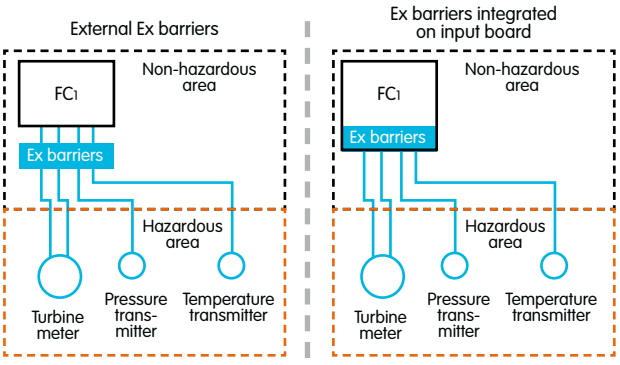


Fig. 4

I/O Boards

For measurement inputs two different input boards are available. The main difference is the handling of the connection into the hazardous area. With the MFE7 input board external barriers are needed. This is shown in figure 3 left hand side. The MFE7 board can handle all signals which are needed for a one stream flow computation including a serial connection of the ultrasonic meter.

Fig. 3



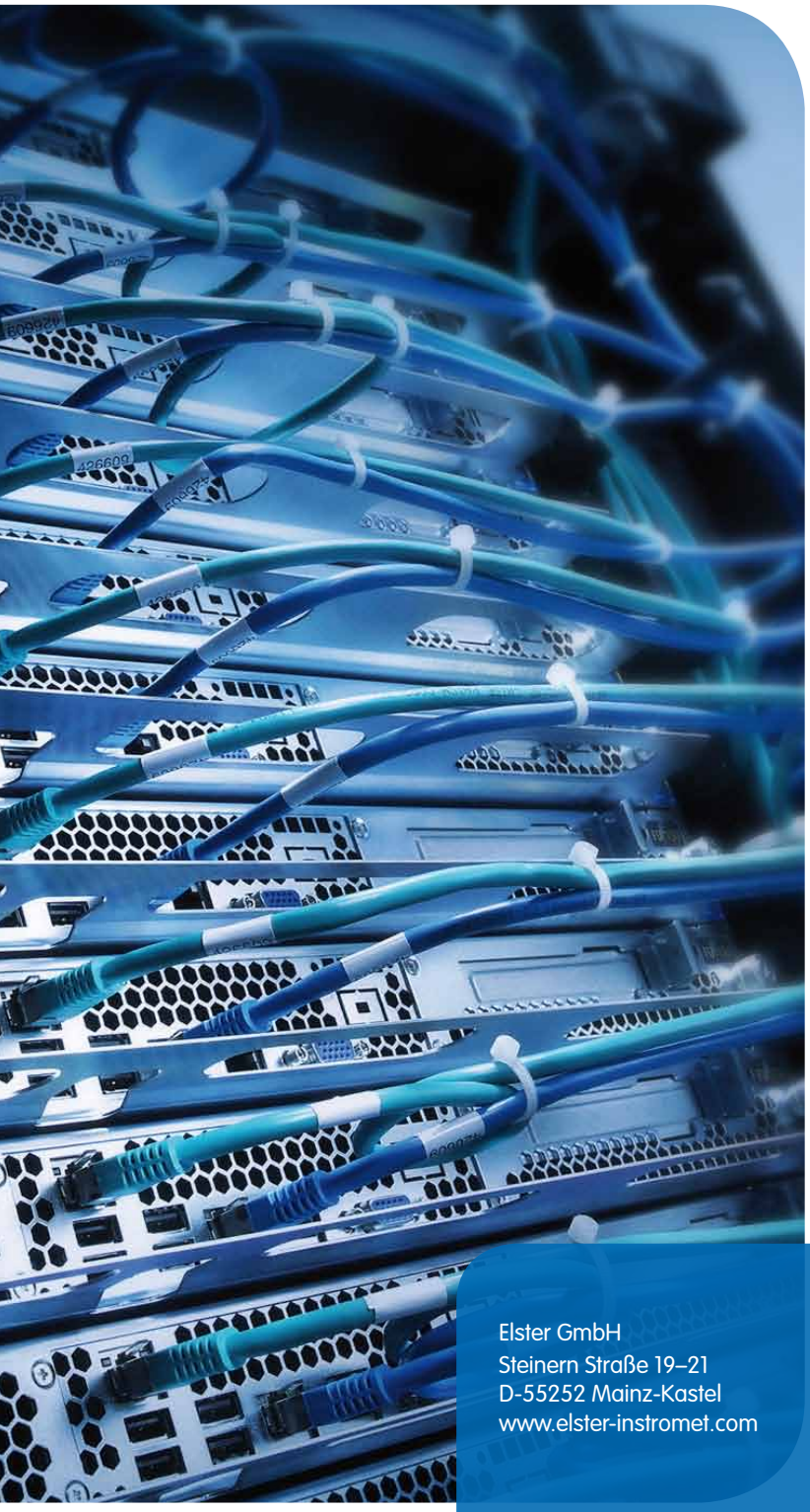
The ExMFE5 input board has integrated barriers (figure 3 right hand side). The advantage of this board is that the transmitters and e.g. the turbine meters can be connected directly to the board without any peripheral devices. This saves costs and space within the cabinet.

Configuration and parameterization

The delivered configuration tool for the enCore FC1 flow computer is called enSuite. This tool is free of charge and is used for all kind of configuration issues of the FC1 device. The connection to the device can be either via TCP/IP or USB. The enSuite is able to handle all configurations for certain devices. All configurations are stored with additional information in an internal database. The graphical user interface of the enSuite parameterization tool is shown in figure 4. The user is able to have a good overview of the different AFBs. Small icons help the user to see which values belong to each other.

Technical data

Calculations Gas	Compressibility: SGERG, AGA-NX19, AGA Report No. 8 (full gas composition), heating value & relative density: ISO 6976 (mass or volume based) Gas quality values: ISO 6976, AGA Report No 10 VOS comparison
Calculations Liquids	GPA-TP27 Table 59E/60E, API 12.2.5.3 Table 54, API 11.2.1, API 11.2.2 Densitometer algorithms Solartron/Micro Motion
Calculation Steam	ISO 5167 nozzles calculations
Prover	Master meter
Data logging	Measurement archives API21.1; fully flexible data logging structure with a very large database size
Data communication	1 USB interface on the front panel for parameterization and servicing purposes 1 TCP/IP interface on the CPU board Up to 16 serial interfaces (depending on board configuration)
Ethernet communication	NTP, Modbus TCP, MMS (Manufacturing Message Specification to ISO 9506), FTP, HTTP
Serial communication	Modbus (ASCII, RTU), Uniform
Inputs (per board)	EXMFE5: • 3 pulse or signal inputs (NAMUR), [EEx ib] IIC, one of which alternatively suitable for an ENCODER index • Process input for sensors with 4 – 20 mA interface [EEx ib] IIC, alternatively suitable for connection of up to 4 transmitters with HART interface (multi-drop) • Pt-100 temperature sensor incorporating 4-wire technology, [EEx ib] IIC MFE7 • 3 pulse or signal inputs (NAMUR), one of which alternatively for an ENCODER index or alternatively for frequency (densitometer) • Serial RS485 interface. This interface is intended to connect an ultrasonic meter • 2 process inputs for sensors with 4 – 20 mA interface, alternatively suitable for connection of up to 4 transmitters with HART interface (multi-drop or burst mode) • Pt-100 temperature sensor incorporating 4-wire technology
Outputs (per board)	MFA8 • 1 PhotoMos output (NC, max. 28.8 V, 120 mA) for alarm/message signalling • 3 PhotoMos outputs (NO, max. 28.8 V DC, 120 mA) for alarm/message or pulse output of up to 20 Hz • 4 0/4 - 20 mA analogue outputs for measurement readings
Display	4.3 inch full-colour wide screen display with 480 x 272 pixels with LED backlight Operation: touch screen display; 5 navigation keys and 2 special function keys; calibration switch
Hardware architecture	ARM9 processor 32 bit at 200 MHz; 128MB RAM; min. 2GB flash memory; 2MB NVRAM
Power supply	24 V DC +/-20%, power consumption up to 12 W (typ. 5 W). Optionally: 230 V via external power supply



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