

EFM[®] 9000

Power Monitoring Device and
Power Quality Recorder



Description

Introduction

The most important prerequisite for continuously improving the power supply and its use is previous knowledge of local network conditions. Today there is also a greater awareness of energy efficiency and the need to monitor power and log supply quality – after all, one cannot improve what is not known. That's why monitoring of currents, voltages, harmonics and power is more urgently needed than ever. These parameters for network performance help plan networks and improve availability, efficiency and reliability. Highly accurate local monitoring is a crucial feature of current and future monitoring systems, as is open communications with the ability to integrate systems.

The EFM9000 multifunctional device are used to collect, display and transmit measured electrical variables such as AC current, AC voltage, power types, harmonics, etc. The measurands and events are collected and processed according to the Power Quality Standard IEC 61000-4-30. The communications interfaces can be used to output the measurands to a PC and the control center or display them on a display.

Applications

EFM9000 device are used in single-phase systems, three-phase systems and four-phase systems (with neutral conductors). They are used primarily in power utilities but also in other industrial and commercial applications.

The web server integrated into the device is used to configure the parameters and output measured values via HTML pages on a connected PC / laptop. The output variables can also be transmitted to control or other systems via the communications interfaces in the form of digital data.

The Perfect Monitoring Choice for Critical Applications

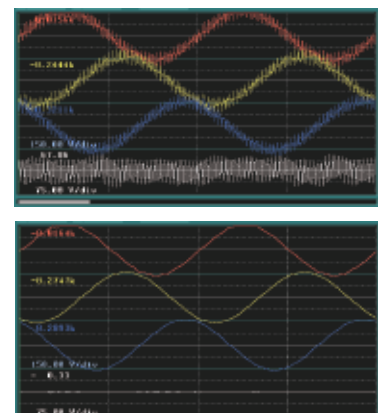
- Utility transmission line substations
- Power generation
- Highly critical industrials
- Hospitals / medical

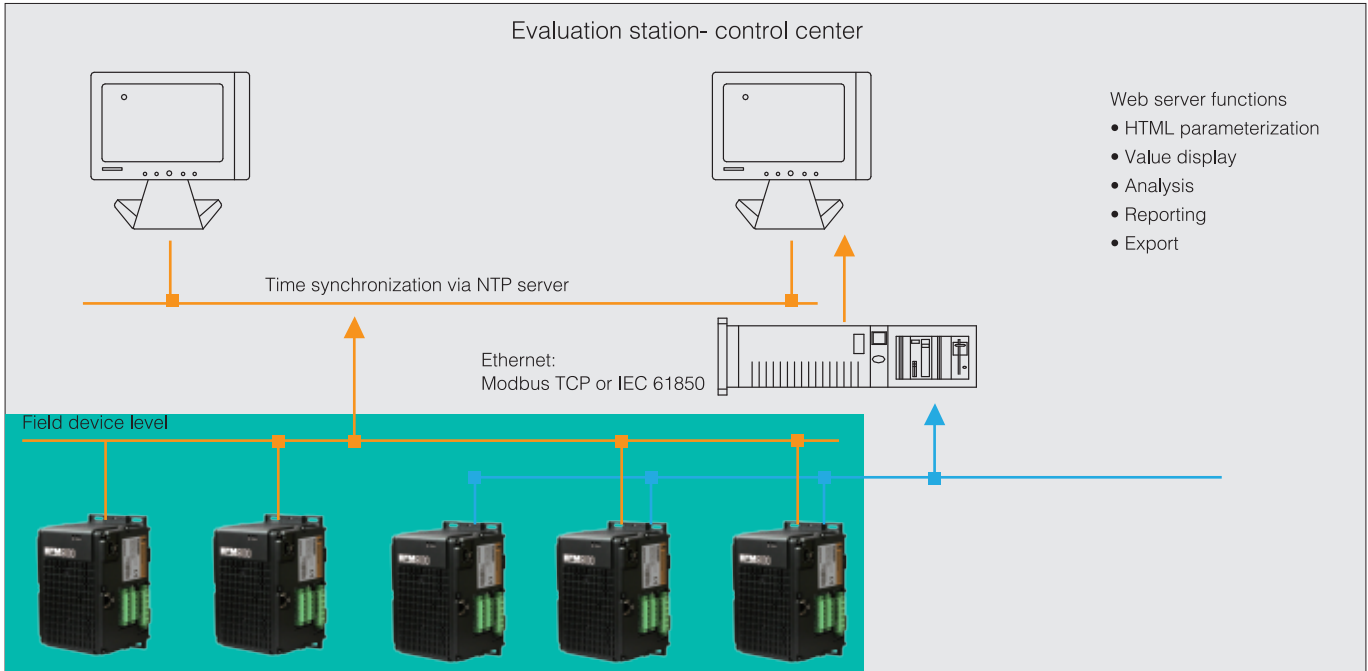
Key features

- Robust and compact design according to IEC 62586-1, Class S (leading standard)
- Use of EFM9000 device in the IT, TT and TN power systems
- Ethernet communication via the Modbus TCP or IEC 61850 Edition 2 protocol; serial communication via Modbus RTU and IEC 60870-5-103 via the RS485 interface is an option.
- External time synchronization via the Network Time Protocol (NTP)
- The measurands and events are detected according to the Power Quality Standard IEC 61000-4-30.
- Additional measurands: Minimum/mean/maximum values, flicker, event detection, voltage dips (U dip), voltage interruptions and over voltages (swells)
- Events are evaluated directly in HTML via the integrated web server
- 2 Gigabyte+ of Storage Capability Providing Years of Data Recording
- Evaluations: Power quality reports and online viewer output directly on the HTML page
- Data export: PQDIF data

system view

EFM9000 device can communicate flexibly with automation systems and evaluation stations via open protocols such as IEC 61850 and Modbus TCP. power quality and event recordings can be exported in open data formats such as PQDIF in the form of error recordings. They are available directly from the device in the form of HTML pages on a connected PC.





Sample application

Function

Hardware design

- EFM9000 device contains the following electrical modules, Digital signal processor
- 3 inputs for AC voltage measurements
- 4 inputs for AC current measurements
- 1 binary output
- 4 Digital outputs
- 4 Digital inputs
- Power supply
- 1 Ethernet interface
- 1 Ethernet or Fiber optic interface (Optional)
- 4 RS485 interfaces

Measurands

EFM9000 device contains the following measurands:

- True RMS AC voltage and AC current
- Effective value measurement (TRMS) up to 127th harmonic
- Line frequency
- Active, reactive and apparent power
- Active, reactive and apparent energy
- Power factor
- AC voltage and AC current unbalance

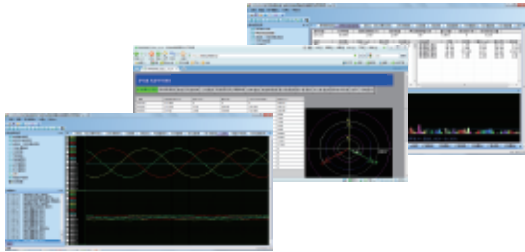
- Harmonics of AC voltage and AC current are stored up to the 40th order for evaluation
- THD (Total Harmonic Distortion) of AC voltage and AC current
- Phase angle
- Flicker

recorder functionality

- Measurand recorder
Records PQ measurands (voltage values, frequency, harmonics, flicker) and non-PQ measurands (e.g., current or power);
- Trend recorder
Long-term recording and monitoring of effective values (1/2 periods) of voltage and optionally current
- Fault recorder
Records voltage or current dips, swells and interruptions over a parameterized time segment within programmable tolerance ranges
- Event recorder
Records voltage, frequency and voltage unbalance events according to a selectable standard. EFM9000 device utilizes uploadable flash memory technology on all processors and

DSPs located in the unit. This insures that the unit can be upgraded from service.

EFM9000 is one of the industry's premier fault and voltage disturbance recorders. This instrument captures a comprehensive picture history of voltage reliability and power quality events within mass memory for detailed and extensive forensic engineering analysis.



Communication

An Ethernet interface and an RS485 interface are available for communicating with the control center and other process automation systems. The RS485 interface supports the transmission of operating measured values, counts and messages.

The device parameterization, transmission of measured data, counts and messages / events as well as time synchronization with the Network Time Protocol (NTP) are supported over Ethernet.

The devices support the transmission of operating measured values with the two Ethernet proto-

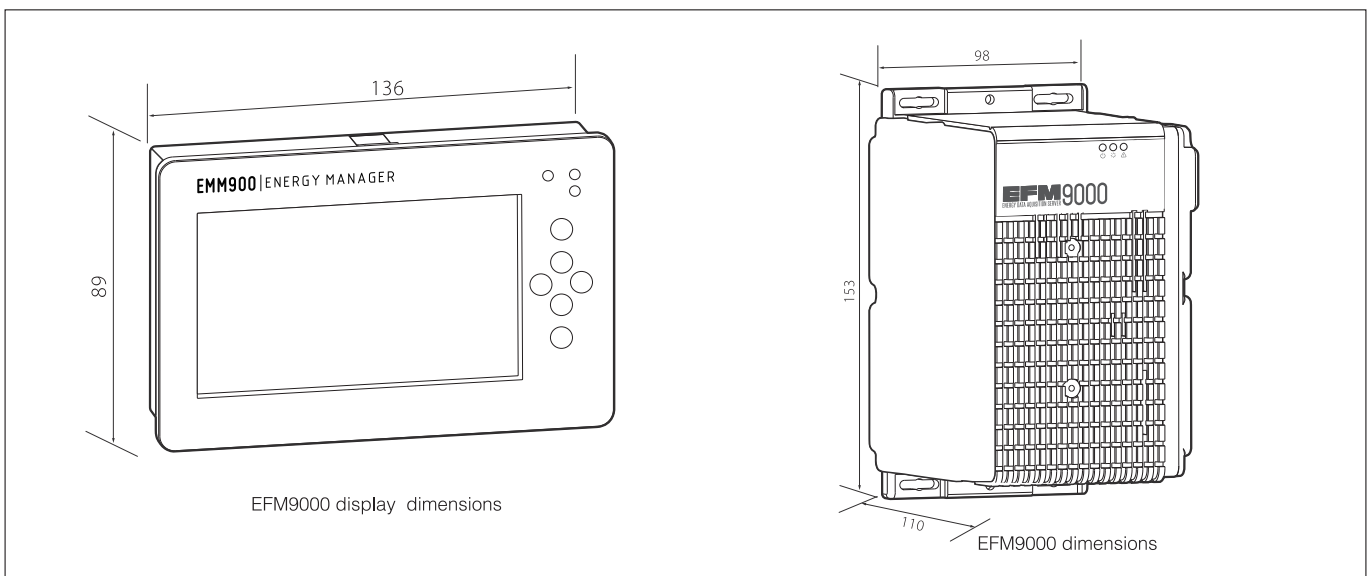
col options – via both Modbus TCP and IEC 61850.

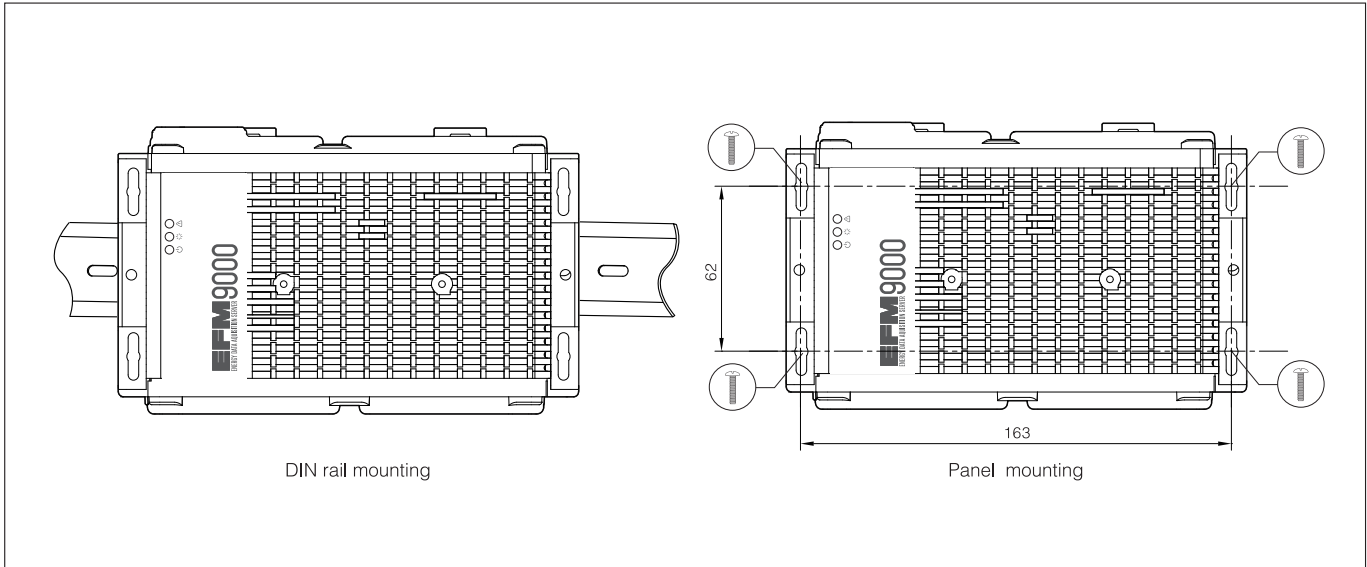
Time synchronization

The devices need to have the date and time during operation for all time-relevant processes. EFM9000 device therefore uses time synchronization while communicating with peripheral devices to guarantee a common time basis and to permit time stamping of the process data. The following types of time synchronization can be carried out:

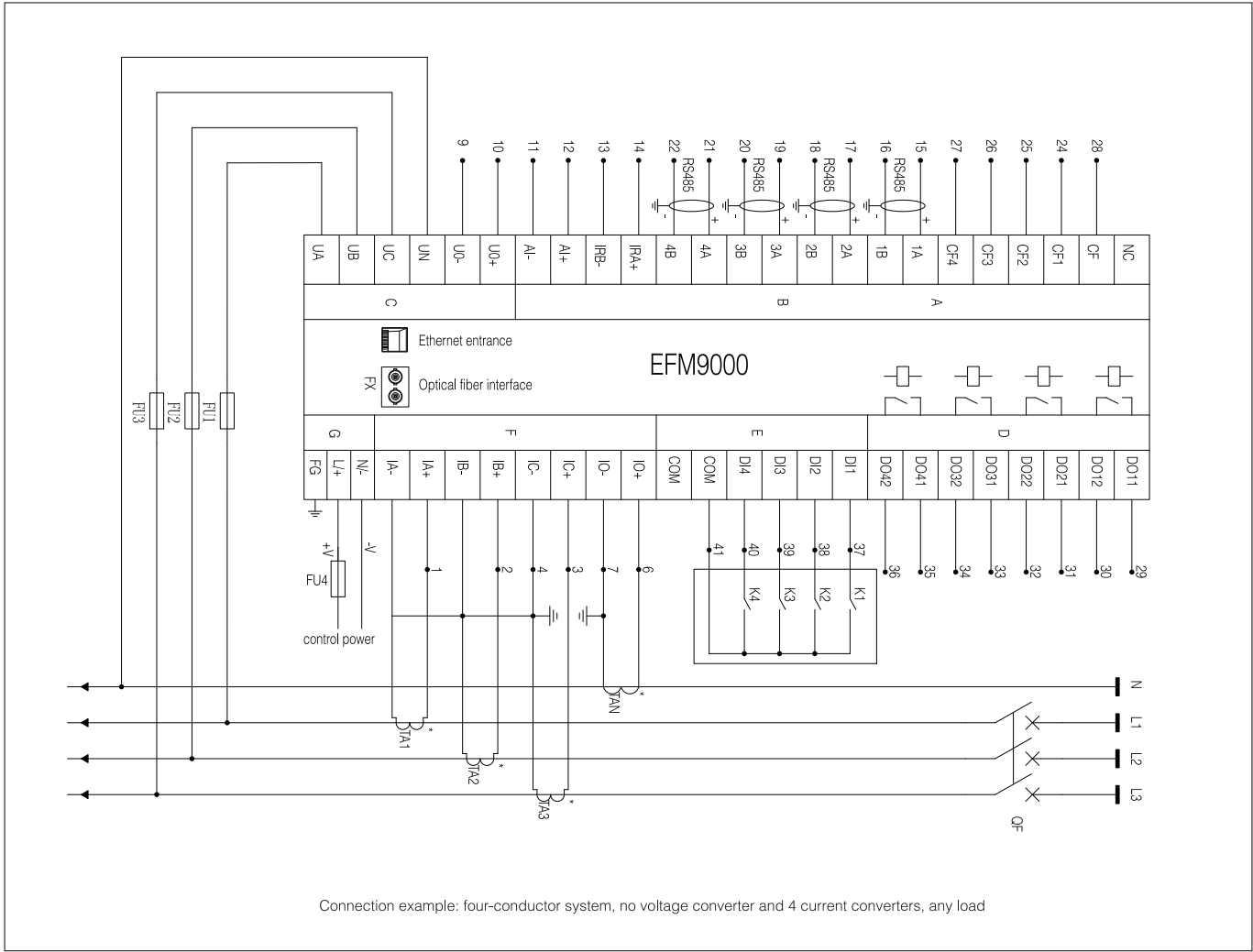
- Time synchronization via Ethernet NTP (preferred)
EFM9000 has an SNTP client (Simple Network Time Protocol) that can be connected to two NTP servers (Network Time Protocol) for external time synchronization: the primary and secondary (redundant) NTP servers.
- External time synchronization via the field bus using the Modbus RTU or IEC 60870-5-103 communication protocol
- Real Time Clock (RTC)
If external time synchronization is not possible, data can be synchronized with the time pulse of an internal clock.

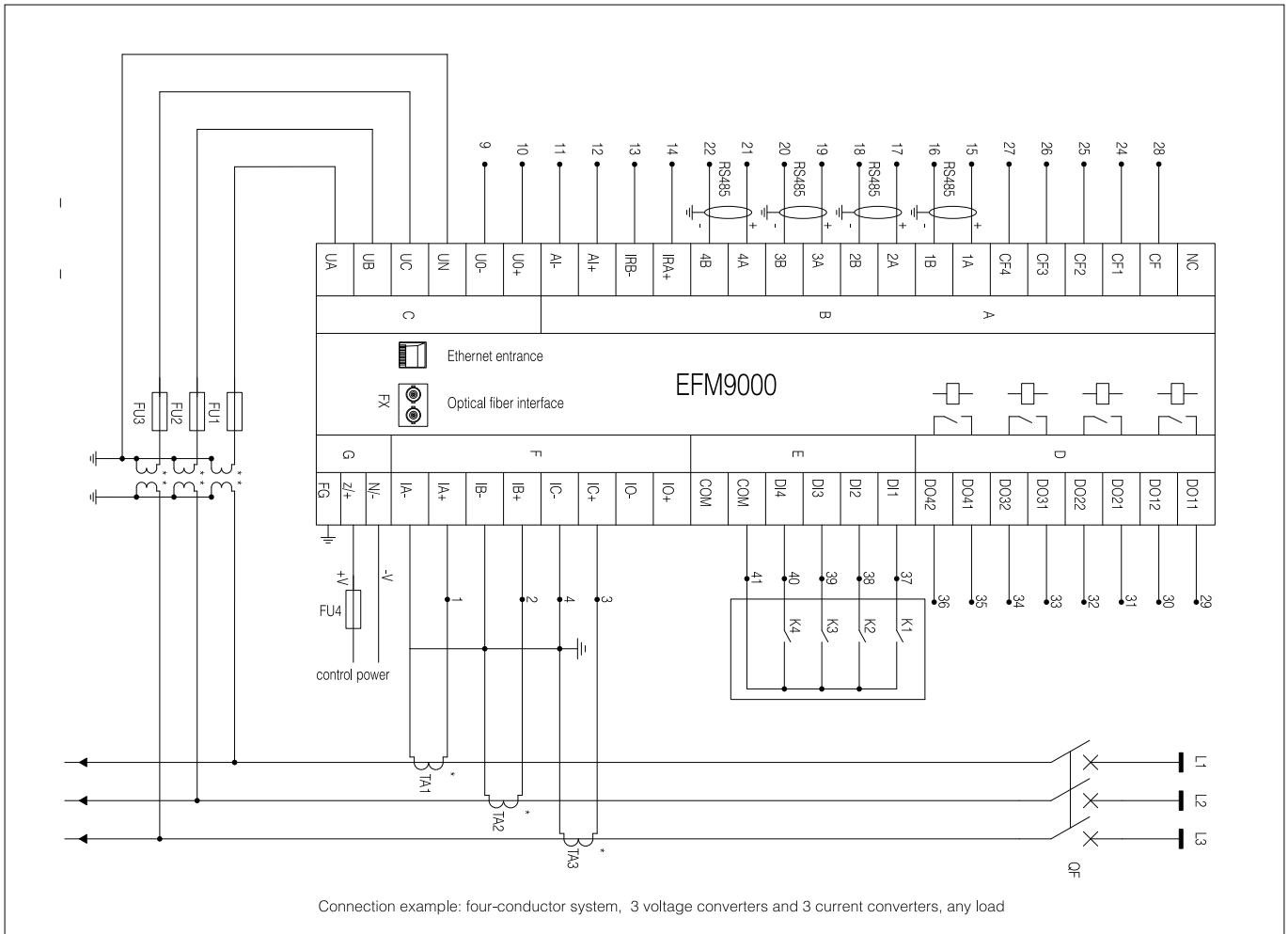
Dimension and Mountiong





Wiring Diagrams





Technical Specifications

Input Voltage Range:

- (5-400)VAC, Line to Neutral
- (10-690)VAC, Line to Line

Voltage Input Withstand Capability:

- Voltage Inputs isolated to 2500VAC
- Meets ANSI C37.90.1 (Surge Withstand Capability)

Input Current Range:

- 5 Amp Inputs 2x continuous
- Programmable to any CT range

Isolation:

All inputs to outputs are isolated to 2500 VAC.

Temperature Rating:

- Operating temperature: (-20 to +70)°C
- Humidity: Up to 95% RH non-condensing
- Storage temperature: (-30 to +80)°C

Sensing Method:

- Up to 1024 samples per cycle (programmable)
- 16 Bit A/D resolution – multiple converters
- True RMS

Control Power Requirements:

- D2 Option: (85–265)VAC @50/60Hz, (100-300)VDC

Frequency Range:

- 40Hz–70Hz