MCU 500
Merging Unit and Circuit Breaker Controller

MCU 500

IEC 61131-3 flexible programming

IEC 61850 open design

Being part of Efacec portfolio for Digital Substation solutions, the **MCU 500** is a state-of-the-art IED for near-process applications and integration of smart power equipment in process bus architectures, including both stand-alone merging unit (SAMU) function for current and voltage signals acquisition and circuit breaker and switch controller functions (BIED) for interfacing switching devices.

The **MCU 500** enables several communication network architectures, including zero-time recovery protocols and accurate time synchronization from several sources and it is suitable for distinct applications, covering Transmission, Sub-Transmission and Distribution substations, supported on multiple product options that enable fit-for-purpose and cost-effective solutions.

Object orientation and state-of-the-art toolset, combined with pre-configured application templates, allow straightforward engineering throughout the system life-cycle without compromising user requirements. Designed with IEC 61850 and other open standards in mind the **MCU 500** is future-proof and can also be seamlessly integrated in multivendor distributed systems.

Key Features

- Stand-alone merging unit function
- Circuit breaker and switch controller
- IEC 61850-9-2LE publisher, prepared for IEC 61869-9
- IEC 61850-9-2LE subscriber
- IEC 61850 Server and GOOSE publisher/subscriber
- PRP/HSR communication redundancy options
- Accurate measurement and disturbance recording
- Event recorder
- CT, VT and trip circuit supervision
- Distributed Automation according to IEC 61850 and IEC 61131-3 programming
- Integrated webserver
- Watchdog and self-monitoring
- State-of-the-art configuration and management software

Costumer Benefits

- Single device hardware and software platform
- Multiple applications
- High application adaptability while being easy to specify, configure, test and maintain
- Extended range of operation for process-level applications
- High-availability and redundancy options
- Enhanced performance and accuracy
- Protection, control, monitoring, measurements and recording integrated in each device
- Web-based interface and advanced diagnostics
- Architecture supports the latest IEC 61850 edition including process bus
- Fully-integrated in the system engineering toolse

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EMPOWERING THE FUTURE

Functions

Stand-Alone Merging Unit

Enabling the integration of conventional current and voltage transformers in digital substation architectures, the **MCU 500** can be configured as Stand-Alone Merging Unit (SAMU) device. With its highly accurate analogue inputs and carefully designed time-response and low-pass filters, the SAMU can generate sampled values in its digital interface at both 80 samples/cycle (protection applications) and 256 samples/cycle (metering and power quality applications), according to IEC 61850-9-2LE. Indeed, the **MCU 500** is prepared for other sampling rates, enabling future applications according to the more generic IEC 61869-9 standard.

The analogue acquisition can be accurately synchronized by an external time source, either IRIG-B or PTP. CT and VT failure algorithms are built-in the device, allowing the detection of external circuit failures, and originating corresponding quality information in the IEC 61850-9-2 interface.

Circuit Breaker and Switch Controller

The application of the **MCU 500** can be extended to circuit breaker controller applications, enabling the integration of digital primary switching devices in process bus architectures. High-speed tripping for transmission protection is provides, as all other typical supervision and control associated with circuit breakers. Additional supervision and control of bay circuit switches is also possible, taking advantage of the I/O expansion capabilities.

The option for subscription of analogue signals from other SAMU in the same communication network and the high-processing capacity of the **MCU 500** provide future configuration extensions including the implementation of other protection or control functions at process level.

Measurement, Monitoring and Recording

The **MCU 500** provides additional built-in measurement and monitoring functions. Three-phase measurements (voltage, current, power, energy, etc.) are available and can be used for diagnosis and commissioning purposes or made available through the IEC 61850 server.

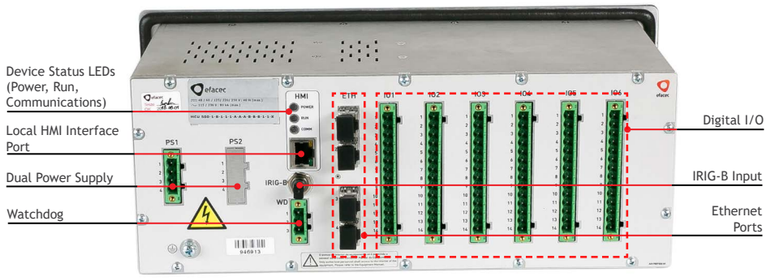
Disturbance records are stored in native COMTRADE format including both analogue and digital information. Up to 100 records can be stored. A general-purpose event recorder that can store up to 25 000 events of any data source is also included.

Hardware

The **MCU 500** provides a compact design and light case, suitable for installation in small cabinets in the switchyard near primary assets. Both wall and rack-mounted options are available, for further flexibility.

Extended I/O capability allows up to 12 AC inputs, 48 digital inputs or 36 digital outputs, including high-speed tripping options. Both rated values of analogue inputs and threshold levels of binary inputs are configurable by software.

Besides the more typical configuration of 4 current and 4 voltage signals, additional flexibility is allowed by supporting other configurations. For example, two sets of 4 current module enable separate inputs for protection and control/measurement applications (different CT cores). The fourth current in each module can be provided with higher sensitivity option, for high impedance earth-fault detection.



MCU 500 Hardware Interfaces

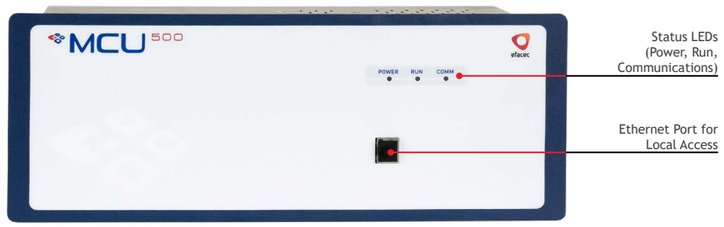
The **MCU 500** was designed according to European and US international standards and tested by independent labs. It is fully prepared for extreme environmental conditions and tested against the most demanding climatic, mechanical and EMC emission and immunity tests. This product is also CE Marked according to the applicable European Directives, namely the Low-Voltage (LVD) Directive 2006/95/EC, as well as the EMC Directive 2004/108/EC.

The **MCU 500** devices also support power supply redundancy as an option.

Interfaces

Built-in and Web-based User Interface

The local user interface includes operation status indication and a front Ethernet port for configuration, diagnostic and test.



MCU 500 User Interface Front Panel

Complementary to the local interface the **MCU 500** provides IP connectivity options for the engineering toolset as well as an embedded webserver where all local operations are available as well as access to status, SOE and disturbance records. This allows straightforward device operation and management either locally or remotely.

Communication Interfaces and Protocols

The **MCU 500** supports multiple communication options, enabling the simultaneous integration in both process and station communication buses. Two dual-Ethernet interfaces are provided, with 100 Mbit/s and 1 Gbit/s options available, and integration in either point-to-point, PRP or HSR architectures is possible.

All communication interfaces include extensive self-monitoring, including online data and statistics.

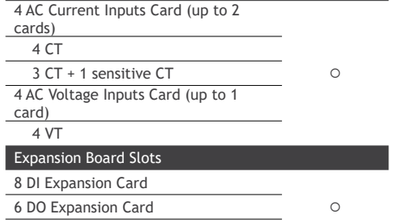
Cyber security features such as software and firmware protection, authentication and encrypted communication between IED and external access (systems, tools, web browsers) for selected protocols are included.

Input/Outputs	
Expansion	
AC Analogue Inputs Slots	
4 AC Current Inputs Card (up to 2 cards)	
4 CT	
3 CT + 1 sensitive CT	○
4 AC Voltage Inputs Card (up to 1 card)	
4 VT	
Expansion Board Slots	
8 DI Expansion Card	
6 DO Expansion Card	○
4 High-Speed DO Expansion Card	

○ - Optional feature

Power Supply	
Single 48/60/110/125/220 V d.c. (38 V to 350 V) 115/230 V a.c. (80 V to 265 V)	○
Dual 48/60/110/125/220 V d.c. (38 V to 350 V) 115/230 V a.c. (80 V to 265 V)	

○ - Optional feature



Web interface

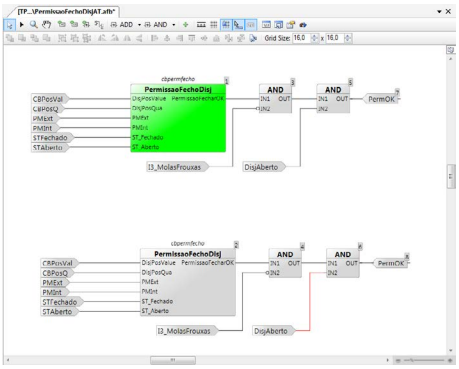
Communication Interfaces	
Communications *	
Dual Ethernet Port 100/1000BASE-FX	●
Dual Ethernet Port 100/1000BASE-FX	○
RTC Synchronization	
PTP (IEEE 1588-2008)	●
SNTP Client	●
IRIG-B Input	●

● - Core feature in product assembly
○ - Optional (Standard component)
* - Other communication hardware options available, please contact

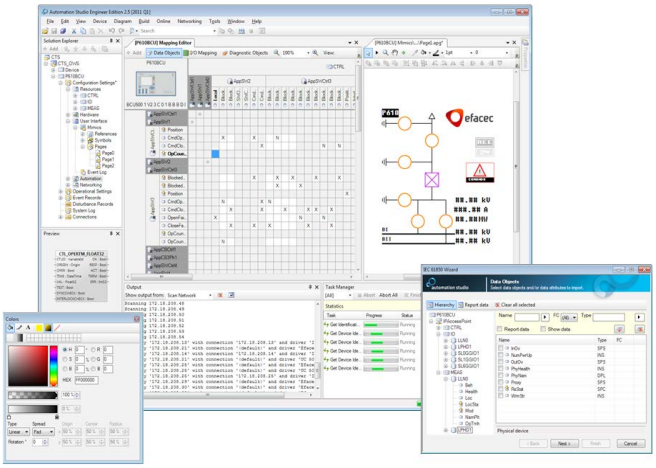
Unified Engineering and Handling

The **MCU 500** SAMU and circuit breaker controller shares a common user interface, installation and maintenance procedures with other Efacec IED families, and is delivered with pre-defined configuration templates for typical applications.

The user is still able to fully adapt **MCU 500** to any specific application with the use of the **Automation Studio** toolset, including the creation, type testing and deployment of user-defined configuration templates.



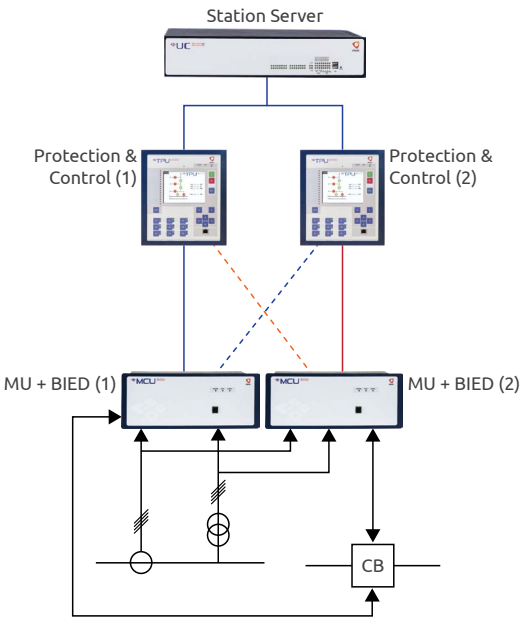
IEC 61131-3 function block diagram



Efacec Automation Studio

User-defined algorithms or control schemes can be designed through straightforward IEC 61131-3 programming together with full flexibility for user-defined IEC 61850 object models. With a state-of-the-art engineering environment, the **MCU 500** provides all the required flexibility and openness to support several distinct applications.

Applications



MCU 500 Application

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