MIDAM
CONTROL SYSTEM

MIDAM D00201

Free programmable controller

Cloud bow

PLC / HMI

Free programmable process station equipped with ARM Cortex M4 processor and FreeRTOS operating system. It is suitable for control of small installations or data acquisition. It features Ethernet and RS485 ports, M-Bus port for up to 60 metering devices, three pulse counter inputs as well as integrated web interface.

Application

- Free programmable control of HVAC systems
- Web access and visualisation of HVAC systems
- Data acquisition, processing, and presentation
- Protocol converters with web data presentation
- Common application with advanced networking features
- Water, heat, gas, and electrical energy meter readout for meters with M-Bus communication or pulse output

Function

The D00201 controller possesses an embedded FreeRTOS operating system which boots up the runtime with the application. There are three pulse inputs and an M-Bus interface according to EN 1434-3, EN 13757-2 (maximum 60 metering devices) available for data acquisition from various energy meters. There is a RTC backed up with battery, flash memory containing OS, runtime, application, and other necessary data like time programs, setpoints etc., as well as a watchdog. It is also possible to use NVRAM as a backup for key parameters in case of unexpected system shutdown or connectivity drop. The application is created and uploaded in the integrated development environment (IDE). The complexity of application program size depends on number of physical and software data points, amount of function blocks which require more memory (e.g. time schedulers), level of code optimisation, and number of connections the controller is supposed to maintain. It contains Ethernet (RJ45) port and RS485 port for seamless communication with other control devices. The PLC features an integrated web server for remote connection and direct user intervention. The web pages are created in HMI editor, which is included in the package of development programs supplied by the manufacturer. The exported web definition components are uploaded to the PLC through IDE (refer to Web definition in PLC properties).

SCADA system integration

Direct integration into various SCADA systems through wired Modbus TCP, OPC UA, or BACnet/IP (RJ45) protocols is possible.

Programming

The main programming tool is the IDE package which contains I/O editor, graphical editor of the function plan (FBD), structure text editor (according to IEC 61131-3) and compiler. The application program consists of function blocks which are stored in libraries. Those contain analogue and digital functions, mathematical blocks including goniometric functions, time schedulers, alarm blocks, and HVAC specific blocks (heat recovery, dewpoint calculation, enthalpy, pump switch etc.). The program can be set up also as structured text (ST) or with combination of both types of programming languages. The IDE package contains LCD menu editor as well as web editor (HMI).

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Technical data

Power supply	24 V AC/DC ± 20 %
Consumption	6 W
Communication	**Ethernet** 1x Ethernet 10/100 BaseT; galvanically insulated, insulating voltage 1 kV RJ45, 2x LED (link, data) integrated in the connector **RS485, Modbus RTU (K+, K-)** baud rates 300 ... 115 200 bit/s, parity and bits are set over Modbus RTU, default 9600/8/N/1 maximal bus length 1200 m, maximum number of modules depends on requested response time, for common HVAC applications 255 addresses are supported, galvanic isolation 1 kV **M-Bus (MBus+, Mbus-)** resistant to permanent short-circuit, electronic fuse with indication and auto-recovery, 300 to 9600 bps, maximal bus length 1200 m, maximum number of meters 60, galvanic isolation 1 kV
Protocol	Modbus RTU master/slave; 256 nodes (RS485), Modbus TCP client/server; 128 nodes, OPC UA, BACnet/IP
Indication	PWR (green, power supply), STAT (yellow, system cycle), Tx485 (red, RS485 transmitting data), TxD (red, MBus transmitting data), RxD (green, M-bus, receiving data), ALR (yellow, M-Bus alarm indication), LINK/DATA (yellow/green, Ethernet receiving/transmitting data)
SW	IDE 2.4+ (IEC61131-3, FUPLA, ST language)
HW	ARM Cortex M4 168 MHz, 10 MB FLASH, 256 KB + 8 MB SRAM, 4 KB + 64 KB NVRAM
CI	3x Digital counter, max. input frequency 50 Hz, min. "low" level time 10 ms, voltage at CNTx +12 VDC, CNTx to COM current 5 mA, signal contact type is reed relay or open collector
Mechanical and dimensions	98.7 x 70.4 x 64 mm (l x w x h) Polycarbonate enclosure (UL94V0), IP20 3x DIP switch blocks - BUS END , INIT (default configuration), USR (runtime, program execution)
Terminals	7 x M3 screw terminals (RS485, MBus, Power), 4x M2 screw terminals (CNT1 - 3, COM) Recommended wire diameter 0.35 to 1.5 mm^2
Ambient conditions	+5 to +40 °C, 5 % to 85 % rH non-condensation (EN 60721-3-3. Class 3K3)
RoHS notice	The device contains a non-rechargeable battery which backups the real-time clock and part of the memory. After the device is not operable, please return it to the manufacturer or dispose of it in compliance with local regulations.
Safety note	The device is designed for monitoring and control of heating, ventilation, and air conditioning systems. It must not be used for protection of persons against health risks or death, as a safety element, or in applications where its failure could lead to physical or property damage or environmental damage. All risks related to device operation must be considered together with design, installation, and operation of the entire control system which the device is part of.

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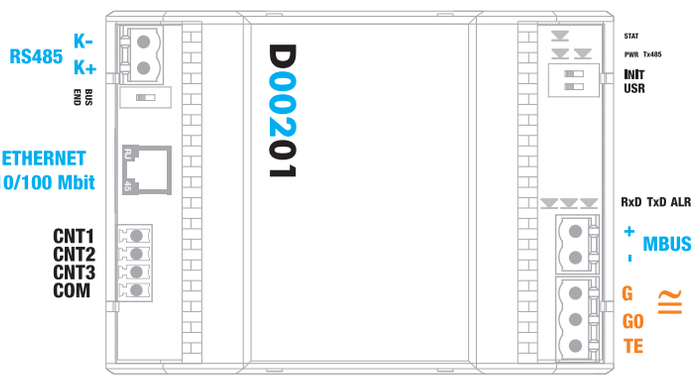
Terminals and connection

K -	Serial line RS485 -
K +	Serial line RS485 +
Ethernet	Network interface (RJ45)
CNT1	Counting input 1 (for dry contact, to be shortcircuited to COM)
CNT2	Counting input 2 (for dry contact, to be shortcircuited to COM)
CNT3	Counting input 3 (for dry contact, to be shortcircuited to COM)
COM	Common terminal for counting inputs
MBUS +	Serial line MBus +
MBUS –	Serial line MBus –
G	Power
G0	Power
TE	Technical ground (TE with DIN rail is connected together at the DIN rail mounting point at the back of the controller)



LED indication and DIP switches

BUS END	Bus end RS485, the first and last devices on the bus should have bus end in ON position.
STAT	Yellow LED, system cycle; see table "Runtime status indication".
PWR	Green LED – power (ON: power OK; OFF: no power applied, weak or damaged power supply).
Tx485	Red LED – RS485 transmitting data (flashing: transmitting data; OFF: no data traffic).
INIT	In ON position at power-up - configuration parameters are brought to defaults (refer to Configuration parameters in IDE; for example IP address, user and password, database settings, proxy, ...).
USR	In ON position - runtime is running, program execution is stopped.
RxD	Green LED – M-Bus receiving data (flashing: receiving data; OFF: no data traffic).
TxD	Red LED – M-Bus transmitting data (flashing: transmitting data; OFF: no data traffic).
ALR	Yellow LED – M-Bus error (short circuit at bus, collision).

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Runtime status indication

STAT LED indicates the runtime status using a sequence of short flashes.
The error code persists the power off / on cycle. Reset is effective upon project upload.

Normal state: LED flashes periodically 1 s ON, 1 s OFF – no errors

Error state: LED flashes in a pattern of:

M short flashes (300 ms ON / 300 ms OFF), where M is the upper code error order 1 s OFF

N short flashes (300 ms ON / 300 ms OFF), where N is the lower code error order 2.5 s OFF

Error codes indication:

11 memory low for OS
12 memory low for runtime
13 stack overflow *
21 corrupted / bad RT image
31 HardFault *
4X watchdog of client X expired
51 system file error
52 web file system error
53 file system error - reset of IP address, saved variables were erased
54 user file system error - WEB files need to be uploaded again
6X - file system full
* at these errors the PLC stops and the LED starts to flash when bringing the device back to power.

Communication settings

Default network settings

IP address 192.168.1.10

Subnet mask 255.255.255.0

Default gateway 192.168.1.1

SSCP user: admin

Password: rw

Note the changed network settings for future reference!

As soon as these values have been changed, it is possible to bring the PLC into default settings by the INIT DIP switch. Set INIT to ON and restart the PLC. All values in the PLC configuration are set to defaults. The PLC will respond at the default IP address and it is possible to change the old address through IDE. The PLC controllers can share variables over the Ethernet network (outside temperature, heat demands etc.) together with other PLC platforms. The runtime provides drivers for communication with subsystems. Runtime contains e.g. Modbus TCP / RTU (server/client), M-Bus, IEC62056-21, SSCP. The complete list of drivers can be found in the Channel configuration dialog in the most recent IDE release available. Please consult the required protocol features and functions with the list of implemented features in the IDE help. It is also possible to program own communication drivers using the I/O library functions in ST language.

Number of communication channels (on the serial lines and Ethernet) to I/O modules and subsystems is not directly restricted and relates to available RAM PLC memory. Maximum five SSCP client connections are available. Number of connections from Modbus TCP clients on Modbus TCP server is also limited to five. Other client channels (web interface, etc.) are not directly restricted.

Changes in versions

05/2019	New datasheet version (v19/05).
10/2019	RS232 port deleted from HW specification (v19/10).
01/2021	Layout/scheme changed, STAT LED, Protocol description extended (v21/01).