

## mark100 DDC controller



**Summary** DDC (Direct digital control) controller mark100 is free programmable process station with ARM Cortex M4 processor and OS FreeRTOS. It is suitable for control of small installations (up to about 30 physical data points). They contain 1× Ethernet port and 1× RS485 interface. This type is successor of  $\mu$ PLC100. Mark100 dispose with higher RAM memory than  $\mu$ PLC100.

**Application**

- Free programmable control units for HVAC systems and other applications with web access
- Data acquisition, processing, and presentation systems with advanced networking features
- Protocol converters with web data presentation (must be programmed by user)

**Function** The controller hosts an embedded FreeRTOS operating system which boots up the Merbon runtime with the application. The board contains real time clock with battery backup, flash memory containing OS, runtime, application, and other data (time programs, setpoints etc.), and a watchdog. It is also possible to use NVRAM to backup parameters in case of unexpected system shutdown.

The application is created and uploaded in the Merbon IDE development environment. The maximum application program size depends on number of physical and software data points, amount of function blocks which require more memory (e.g. time schedulers), degree of code optimisation, and number of connections the PLC has to handle.

For communication with other devices, mark100 contains 1× Ethernet port and 1× RS485 interface.

The process station contains a web server for remote connection and user intervention. The web pages are created in Merbon IDE which is also used for

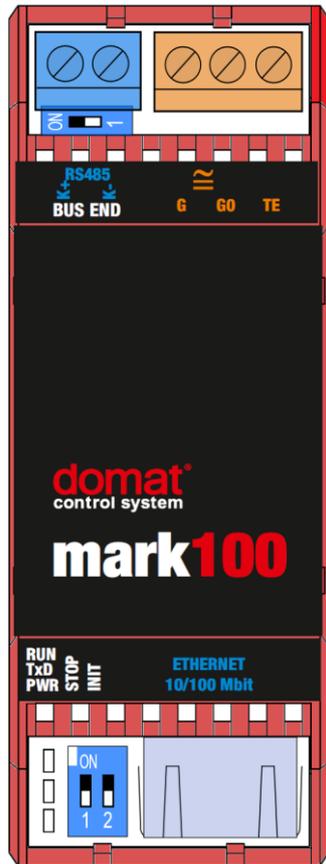
uploading the exported web definition to the process station. From the security point of view, the website is not recommended for use in the public network, it is intended for operation in a local network. Therefore it is necessary to integrate the configured router or other element that ensures network security during the design of the network topology.

The module is 36 mm wide and mounts on a standard DIN rail.

## Technical data

Power	24 V AC/DC $\pm$ 20 %; max. 3 VA
<b>Communication</b>	
Ethernet	1× Ethernet 10/100BaseT RJ45, 2 LED (link, data) integrated in the connector
RS485	COM1 RS485 (K+, K-) galvanically insulated, insulating voltage 1 kV 300...115 200 bit/s, parity and bits are set in SW maximal bus length 1200 m maximum number of modules depends on requested response time – up to 255 addresses, for common HVAC applications use about 300...400 physical data points on the bus
3x LED	RUN, TxD, PWR
HW	ARM M4 STMF427 168 MHz, 256 kB RAM, 3 MB Flash, 4 kB NVRAM
SW	Merbon IDE
Housing	polycarbonate box (certification UL94V0) elbox 2
Dimensions	36.2 (l) × 98.7 (w) × 64 (h) mm
Protection degree	IP10 (EN 60529)
Recommended wire diameter	screw terminals M3, maximum wire cross-section 2,5 mm <sup>2</sup>
Ambient temperature	5...40 °C; 5...85 % relative humidity; non-condensing gases and chemically non-aggressive conditions (according EN 60721-3-3 climatic class 3K3)
Standards conformity	EMC EN 61000-6-2 ed.3:2005, EN 55022 ed.3:2010 EN 60950-1 ed.2:2006 + A11:2009 + A12:2011 + A1:2010 + A2:2014 EN 50581:2012

## Terminals



### Terminals and connectors

<b>RS485</b>	port COM1 - serial link RS485, terminals K+, K-
<b>G</b>	G power
<b>GO</b>	GO power
<b>TE</b>	optional connection for shielding
<b>Ethernet</b>	network interface

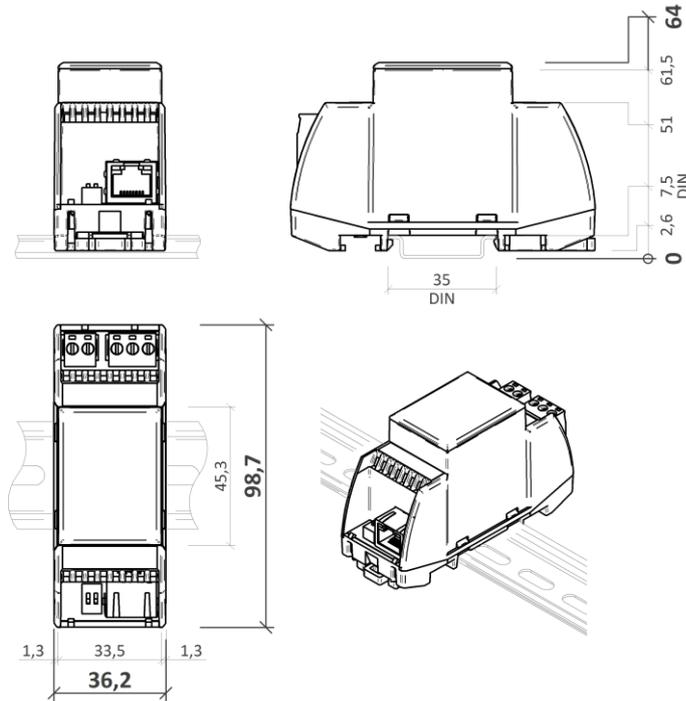
### LED indication:

<b>RUN</b>	green LED – system cycle (OK: LED flashes periodically 1 s ON, 1 s OFF; ERROR: LED flashes in other pattern, LED is still ON or OFF)
<b>TxD</b>	red LED – RS485 transmitting data at COM1 (flashing: transmitting data; OFF: no data traffic)
<b>PWR</b>	green LED – power (ON: power OK; OFF: no power applied, weak or damaged power supply, ...)

### DIP switches:

<b>STOP</b>	if ON runtime is running, program execution is stopped
<b>INIT</b>	INIT – if ON at power-up, configuration parameters are brought to defaults (see Configuration parameters in Merbon IDE; for example IP address, user and password, database settings, proxy, ... )
<b>BUS END</b>	micro DIP switches next to terminals RS485 (direction to the device); both ON = bus end COM1; the first and last devices on bus should have bus end ON

## Dimensions



Dimensions are in *mm*.

## Programming Merbon IDE

Programming tool Merbon IDE contains I/O editor, graphical editor of the function plan (FBD), structure text editor, web page editor and LCD menu editor (HMI) for PLC 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.). In addition to function blocks, the application program can also be compiled from structured text, or a combination of both languages can be used.

The minimum guaranteed number of records for history on the PLC is 3 500, but the actual number of stored samples may be larger depending on the data types that are stored in the history.

## Communication Default network settings are:

IP address: 192.168.1.10  
subnet mask: 255.255.255.0  
default gateway: 192.168.1.1

SSCP user: admin  
Password: rw

Notice: Do not forget to note the new network settings after change!

After these values have been changed, it is possible to bring the process station into default settings by the INIT DIP switch: set INIT to ON and restart the station. 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 Merbon IDE.

The 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 I/O modules and other subsystems which communicates e.g. through Modbus TCP/RTU (server/client), M-Bus, IEC62056-21, SSCP, SoftPLC link and BACnet IP server/client (see PICS). The complete list of drivers can be found in the Channel configuration dialogue in the most recent Merbon release. Please check the required protocol features and functions with the list of implemented features in the Merbon IDE help. It is also possible to program own communication drivers using the I/O library functions in structure text language.

**Number of communication channels** (on the serial lines and Ethernet) to I/O modules and subsystems is not directly restricted. It depends on available RAM PLC memory.

**Number of connections from SSCP clients is max. 20.** This includes connections from Merbon IDE, Merbon SCADA, HT104/200, mobile application Merbon Visual, connection from other PLCs over SSCP etc.

Uploading a project from the Merbon IDE reserves two SSCP TCP connections.

**Number of connections from Modbus TCP clients on Modbus TCP server is max. 5.**

In case of implementation of your own ST driver, there is limitation of max. 10 clients connected simultaneously

Other clients channels (web, ...) are not directly restricted.

**WEEE 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.

**Changes in versions**

11/2018 – First datasheet version.

07/2020 – Added information about min. number of records in history, new logo.

07/2021 – Stylistic adjustments, logo change, sw adjustments

02/2022 – Added sentence about max. number of clients in case of implementation of own ST driver.

03/2022 – Modified paragraph with the number of simultaneously connected clients using the SSCP protocol.