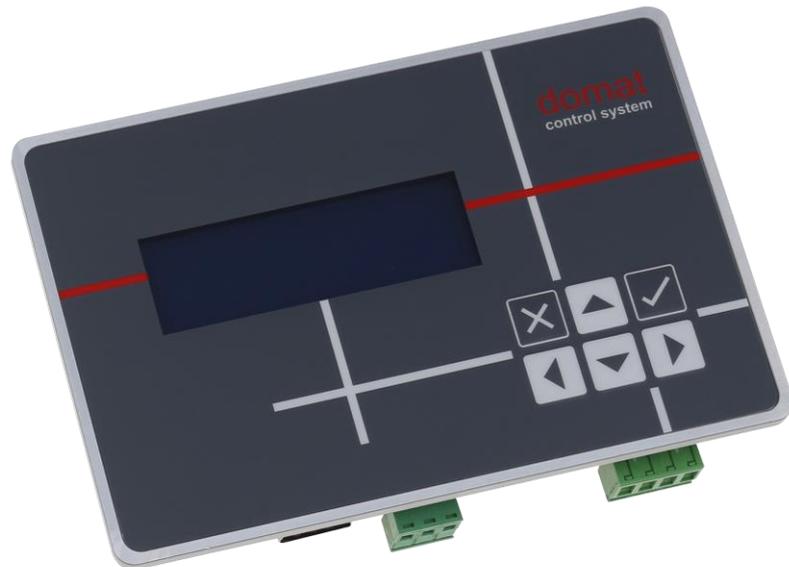


mark120
mark125

DDC controllers



Summary

DDC (Direct digital control) controllers mark120 and mark125 are free programmable process stations with ARM Cortex M4 processor and OS FreeRTOS. They are suitable for control of small installation or use like control panel for other mark process station with Merbon runtime. Mark 120 contains 1x Ethernet port. Mark125 contains 1x Ethernet port, 1x RS485 interface, 1x RS232 interface and external 8 MB RAM.

Application

- Control panel for mark process station with Merbon runtime for HVAC systems or other technologies
- Free programmable control units for small HVAC systems and other applications

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, mark120 contains 1x Ethernet port. The mark125 contains 1x Ethernet port, 1x a RS485 interface and 1x a RS232 interface.

The process station contains a web server for remote connection and user intervention. The web pages are created in Merbon HMI editor, which is included in the package of development programs. The exported web definition is uploaded to the process station through Merbon IDE (see Web definition in PLC properties).

The process station can be operated through a 4 x 20 characters backlit LCD display and 6 pushbuttons. Users move in the menu using buttons – the **active row is the second row** from the top, which is enhanced by the red line on the printed cover. Objects such as Value setting, Alarm, and Time schedule have predefined functionality, and thus for the configuration it is only necessary to set addresses, assign data points, and complete user texts.

The user menu structure is configured in Merbon HMI editor. The menu is uploaded to the process station through Merbon IDE (see LCD menu definition in PLC properties).

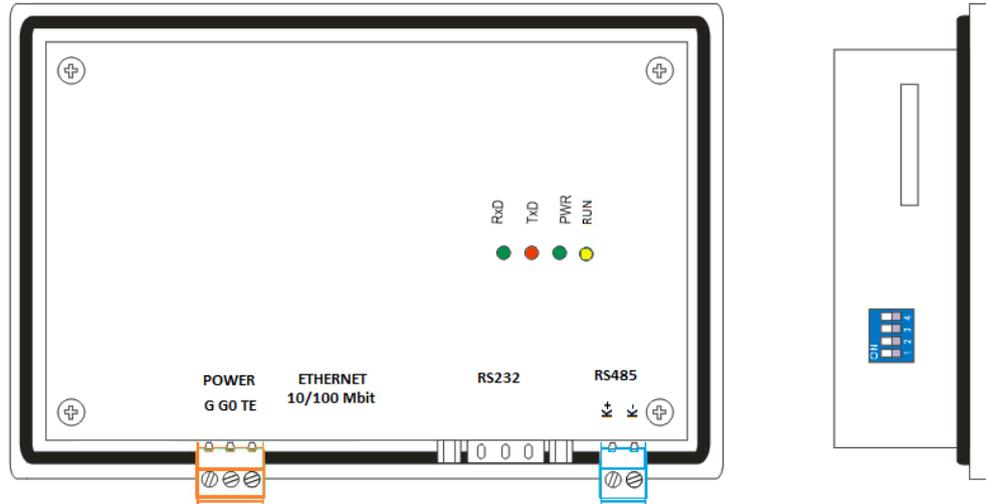
The device is installed using four metal clamps into an aperture in panel door or any suitable box. The aperture dimensions are 95 x 145 mm, with tolerance +2 mm.

Technical data

Power	24 V AC/DC ± 20%; max. 5 VA
Communication - mark120	
Ethernet	1x Ethernet 10/100BaseT RJ45, 2 LED (link, data) integrated in the connector
Communication - mark125	
Ethernet	1x Ethernet 10/100BaseT RJ45, 2 LED (link, data) integrated in the connector
RS232	COM2 1x CANNON 9 male; pin 2=TX, 3=RX, 5=GND galvanically insulated, insulating voltage 1 kV 300 ... 115 200 bit/s, parity and bits are set in SW
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

LCD display	4 rows x 20 characters, blue backlight adjustable backlight intensity possibility to switch off the backlight through application software
Buttons	6 buttons on a membrane keyboard, water and dirt resistant
2x LED – mark120	RUN, PWR
4x LED – mark125	RUN, PWR, RS485 RxD/TxD
HW – mark120	ARM Cortex M4 168 MHz, 10 MB FLASH, 256 KB SRAM, 4 KB NVRAM
HW – mark125	ARM Cortex M4 168 MHz, 10 MB FLASH, 256 KB SRAM, 4 KB NVRAM, 8 MB external SDRAM
SW	Merbon IDE (supported from version ER2 2.2.0.0) Merbon HMI
Housing	stainless steel; front panel polyester membrane
Front panel dimensions	158(width) x 106(high) mm (device depth 38mm)
Aperture dimensions	145 x 95 mm (deviation +2 mm)
Front protection degree	IP65 (EN 60529)
Terminals	screw terminals M3, recommended wire diameter 0,35 - 1,5 mm ²
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) (from the front see Front protection degree)
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
EU legislation	Council Directive 2006/95/EC, health and low voltage equipment safety Council Directive 2004/108/EC, electromagnetic compatibility Council Directive 2011/65/EC, certain hazardous substances in electrical and electronic equipment

Terminals



Terminals and connectors:

G	power
G0	power
TE	optional connection for shielding
Ethernet	network interface
RS232	port COM2 - serial link RS232; CANNON 9 male (mark125 only)
RS485	port COM1 - serial link RS485, terminals K+, K- (mark125 only)

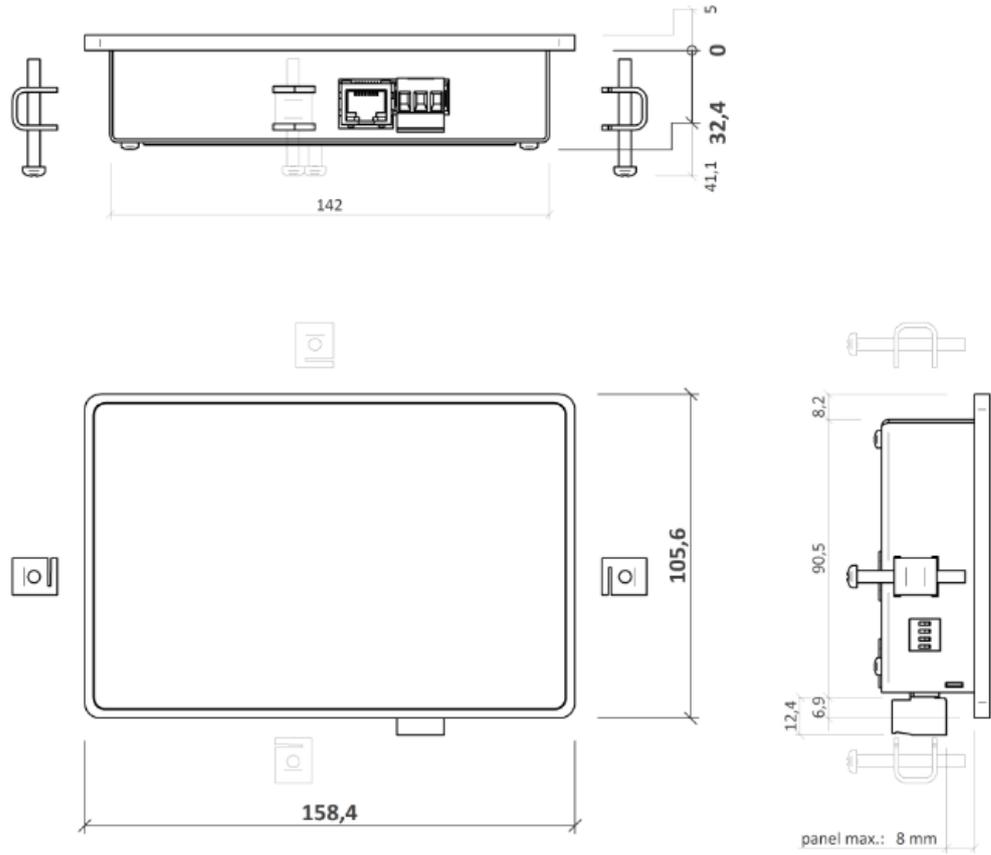
LED indication:

RxD	green LED – RS485 receiving data at COM1 (flashing: receiving data; OFF: no data traffic)(mark125 only)
TxD	red LED – RS485 transmitting data at COM1 (flashing: transmitting data; OFF: no data traffic)(mark125 only)
PWR	green LED – power (ON: power OK; OFF: no power applied, weak or damaged power supply, ...)
RUN	yellow 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)

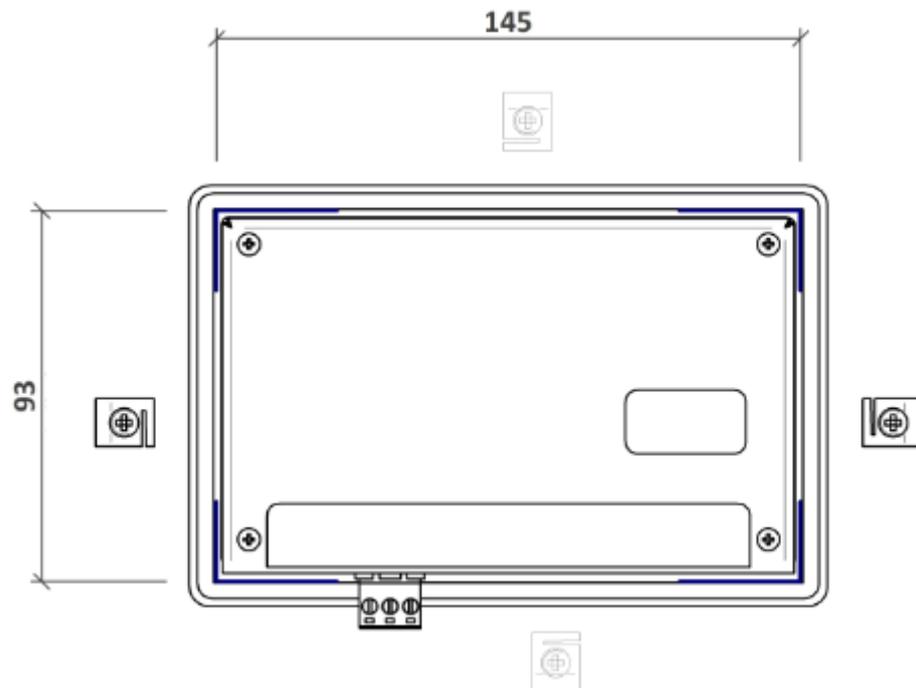
DIP switches:

BUS END	DIP1 and DIP2 (both ON) bus end COM1; the first and last devices on bus should have bus end ON
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, ...)
STOP	if ON runtime is running, program execution is stopped

Dimensions



Installation aperture:



Dimensions are in *mm*.

Programming **Merbon IDE**

The main programming tool is the Merbon package which contains I/O editor, graphical editor of the function plan (FBD), structure text editor and compiler (Merbon IDE). The Merbon package contains also LCD menu editor as well as web editor (Merbon HMI).

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 structure text (ST) or with combination of both types of programming languages.

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 subsystems. For example Merbon runtime contains: Modbus TCP / RTU (server/client), M-Bus, IEC62056-21, SSCP, and SoftPLC link. 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. 5. This includes connections from RcWare Vision, Merbon IDE, HT102/200, mobile application Merbon Menu Reader, connection from other PLCs over SSCP etc.

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

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

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.

Changes in versions

08/2015 – First version.

06/2016 – Added schema with dimensions and information about number of communication connections.

07/2016 – Added information about new communication drivers and communication limits. Corrected information about function of STOP DIP switch.

03/2017 – Added a new image mark125.

11/2017 – Added safety note and power tolerance.