

μPLC100

DDC controller



Summary

DDC (Direct digital control) controller μPLC100 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 1x Ethernet port and 1x RS485 interface.

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, μPLC100 contains 1x Ethernet port and 1x RS485 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 module is 36 mm wide and mounts on a standard DIN rail.

Technical data

Power	10 V ÷ 35 V DC, 14 V ÷ 24 V AC; max 3 VA
Communication	
Ethernet	1x 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 STM32F407 168 MHz, 192 kB RAM, 3 MB Flash, 4 kB NVRAM
SW	Merbon IDE Merbon HMI
Housing	Polyphenylene oxid box; gray
Dimensions	36 (l) x 90 (w) x 58 (h) mm
Protection degree	IP10 (EN 60529)
Recommended wire diameter	Screw terminals M3, maximum wire cross-section 2,5 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)
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:

RS485	port COM1 - serial link RS485, terminals K+, K-
1	G power
2	G0 power
TE	optional connection for shielding
Ethernet	network interface

LED indication:

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

DIP switches:

SW1	STOP - if ON at power-up, program execution stopped, runtime is running
SW2	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, ...)
BUS END	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

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. External release 1 Merbon runtime contains: Modbus TCP / RTU (server/client), M-Bus, SSCP, and SoftPLC link. The complete list of drivers can be found in the Channel configuration dialogue in the most recent Merbon release. It is also possible to program own communication drivers using the I/O library functions in structure text language.

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.

**Changes in
versions**

09/2015 – Changed information in section technical data, function, terminals, communication and programming.