domat
MEMBER OF CEZ ESCO

IPLC201
IPLC301

MiniPLC process station

Summary

The IPLC range is a family of digital process stations – communicative DDC controllers with processor ARM i.MX6UL. All types contain one RS485 interface for connecting of I/O modules and one Ethernet port for communication with a management station or a web browser for remote management, extended types provide two more RS232 ports and one more RS485 port.

Applications

- **Free programmable control units for HVAC systems and other applications with local HMI and web access**
- **Optional customized firmware – protocol converters with data presentation**
- **Data acquisition, processing, and presentation systems with advanced networking features**
- **Communicative home automation etc.**

Functions

The controller contains an embedded operating system which boots up the runtime with the application. On the board there is a real time clock with battery backup, alarm buzzer, flash memory containing OS, runtime, application, and other data (time programs, setpoints etc.), and a watchdog. The controller also includes one Ethernet port, 2× RS232, and 2× RS485 serial interfaces. The RS485 communication is indicated by two LEDs at the bus end switch, another LED is software-controlled from the application. The SW1 – if set to ON – disables runtime start after power up and thus opens safe service access to the OS in case of corrupted application.

The application is downloaded either in the Integrated Development Environment (IDE) or over a FTP connection in the file system of the controller.

IPLC201 and IPLC301 provide a HMI: backlit 16 × 3 characters display and 6 pushbuttons. The user menu structure is configured in the LCD Menu Editor and contains actual values, setpoints, alarms, time schedules etc. in a tree structure.

The branches are either freely accessible or protected by a PIN.

The module is 105 mm wide and mounts on a standard DIN rail.

Application examples: see *domat – Design and application guide*.

Technical data	Power	24 V AC/DC ± 20 %, 6 W
	Communication	
	Ethernet	1× Ethernet 10/100BaseT
		RJ45, 2 LED (link, data) integrated in the connector
	RS232	COM1, COM2
		2× CANNON 9 male; pin 2=TX, 3=RX, 5=GND
		galvanic insolation 1 kV
		300…115 200 bit/s, parity and bits are set in SW
	RS485	COM3, COM4 RS485 (K+, K-)
		2 separated buses galvanically insulated from each other,
		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	3 rows × 16 characters, blue backlight
		manually adjustable backlight intensity
		backlight can be turned off with application software
	Buttons	6 buttons with backlight
	4x LED	PWR, RUN, RS485 TxD/RxD
	HW	ARM i.MX6UL 528 MHz, 128 MB FLASH, 128 MB SRAM
	SW	SoftPLC IDE
	Housing	Polycarbonate box (certification UL94V0)
	Dimensions	105.6 × 98.7 × 61.4 mm
	Aperture dimensions	102(width) × 45 (high) mm; tolerance +1 mm
		(**notice:** the previous type of housing of IPLC201 has different dimensions)
	Protection degree	IP20 (EN 60529)
	Terminals	screw terminals M3, recommended wire diameter 0.35…1.5 mm^2
	Ambient temperature	From -20…50 °C; 5…85% relative humidity; non-condensing gases, chemically non-aggressive conditions, fog, ice and frost (according EN IEC 60721-3-3 ed. 2:2019 climatic class 3K22, 1K21, 3M11)
		For installation at high altitude, it is necessary to consider the reduction of dielectric strength and a limited cooling air (EN IEC 60664-1 ed.3: 2020)
	Standards of conformity	EMC EN IEC 61000-6-2 ed. 4:2019, EN IEC 61000-6-4 ed. 3:2019 (industrial environment)
		Electrical safety EN IEC 62368-1 ed. 2:2020+A11:2020
		Hazardous substances reduction EN IEC 63000:2019

Accessories

Optional - *markPLCkit* – frame for mounting into an aperture in panel door or any suitable box (notice: the previous type of housing has different dimensions)

Terminals
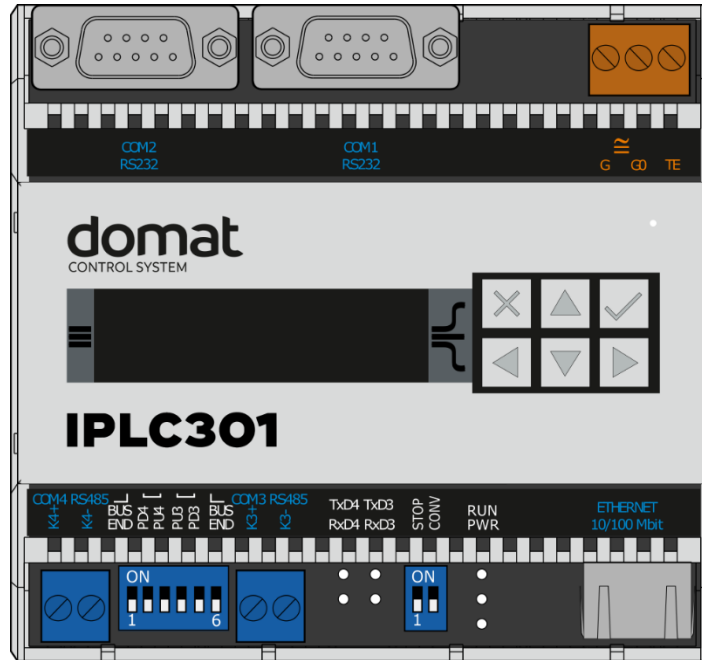
Terminals and connectors

COM1	port COM1 - serial link RS232; CANNON 9 male
COM2	port COM2 - serial link RS232; CANNON 9 male
COM3	port COM3 - serial link RS485, terminals K+, K-
COM4	port COM4 - serial link RS485, terminals K+, K-
Ethernet	network interface
G	power
G0	power
TE	optional connection for shielding (on the back side in the DIN rail groove there is a metal strip which connects TE to DIN rail after the device is snapped on the rail)

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)
PWR	green LED – power (ON: power OK; OFF: no power applied, weak or damaged power supply, …)
RxD3	green LED – RS485 receiving data at COM3 (flashing: receiving data; OFF: no data traffic)(**mark320 only**)
TxD3	red LED – RS485 transmitting data at COM3 (flashing: transmitting data; OFF: no data traffic)(**mark320 only**)
RxD4	green LED – RS485 receiving data at COM4 (flashing: receiving data; OFF: no data traffic)
TxD4	red LED – RS485 transmitting data at COM4 (flashing: transmitting data; OFF: no data traffic)

DIP switches

STOP	if ON runtime is running, program execution is stopped
CONV	active (at ON) at start switches to converter mode Ethernet-RS485 (support in IDE)
BUS END	(DIP6 next to COM3 RS485) bus end COM3; the first and last devices on bus should have bus end ON
BUS END	(DIP1 next to COM4 RS485) bus end COM4; the first and last devices on bus should have bus end ON
PU3	pull-up resistor for COM3
PD3	pull-down resistor for COM3
PU4	pull-up resistor for COM4
PD4	pull-down resistor for COM4

When powered by DC voltage the polarity is not relevant.

LED RUN – PLC state indication:
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

Meaning of the error codes:

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 system error
52 web file system error
53 system FS error - reset of IP address, saved variables were erased
54 cusers FS error - WEB files need to be uploaded again
6X - file system full
* at these errors the PLC stops and the LED starts to flash after power off and on.

Bus End and pull up / pull down switches:
Three switches on the left belong to COM4, three switches on the right belong to COM3.
Unlike for the other modules and controllers, the bus is terminated (BUS END) with one switch only (SW1 and SW6).
The inner switches (2 and 3 for COM4, 4 and 5 for COM3) are pull-up and pull-down switches for K+, and K- wires:
The K- signal is bound over a resistor to RS485 ground (switch marked PD), the K+ links over a resistor to +5V power of the bus driver (switch marked PU).
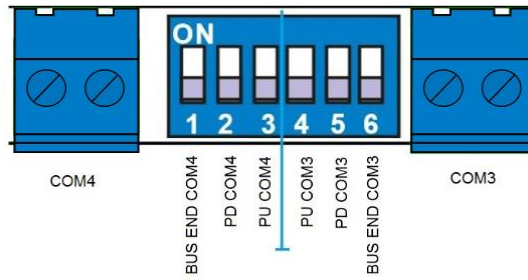
NB:

In case it is necessary to use the pull-up and pull-down resistors because of strong EMC interference or extremely long wiring, the resistors may be activated for one line only – either COM3 or COM4, never both at the same time! The RS485 lines are mutually galvanically separated. When the PU and PD switches are activated at different buses at the same time, mutual interference of the signals may appear which results in communication errors.

Types and their properties

The IPLC201 and IPLC301 can host up to appr. 400 physical data points (I/Os)

Type	LCD	COM1 RS232	COM2 RS232	COM3 RS485	COM4 RS485
IPLC201	✓				✓
IPLC301	✓	✓	✓	✓	✓

The IPLC301 is suitable for more complex applications or where integration of 3rd party systems or serial communication with other devices than domat I/O modules is required. The most used type is IPLC201.

Dimensions
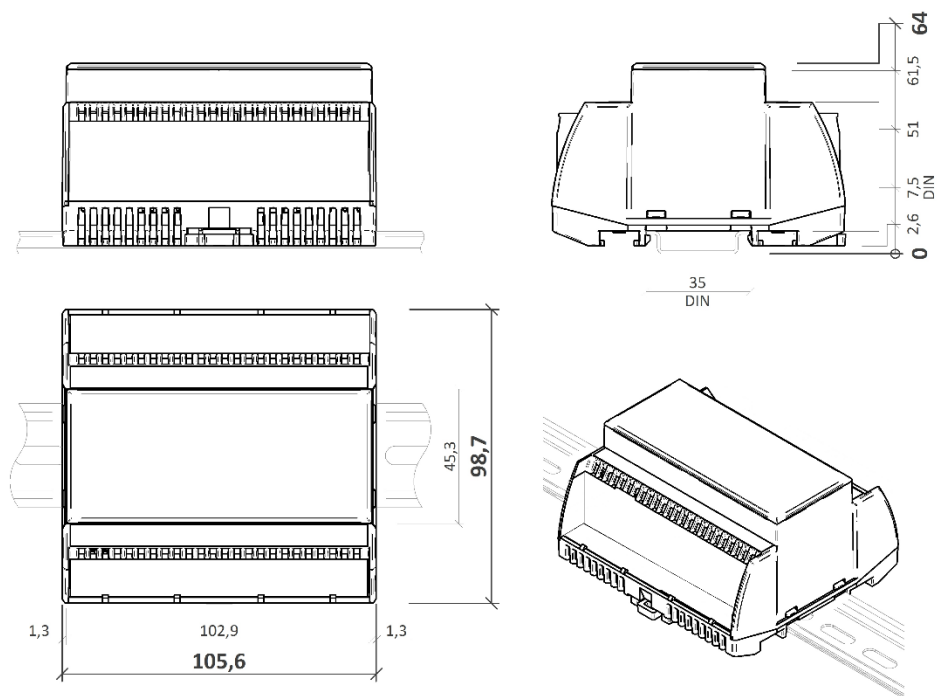
Dimensions are in v *mm*.

Programming

The main programming tool is the **RcWare SoftPLC** package which contains I/O editor, graphical editor of the function plan, compiler (**RcWare SoftPLC IDE)**, and LCD menu editor as well as touchscreen and web interface editor (**RcWare SoftPLC HMI Editor**).

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 application (project) is uploaded into the process stations using RcWare SoftPLC IDE. The installation package RcWare SoftPLC, manual and videotutorials are available at www.domat.cz.
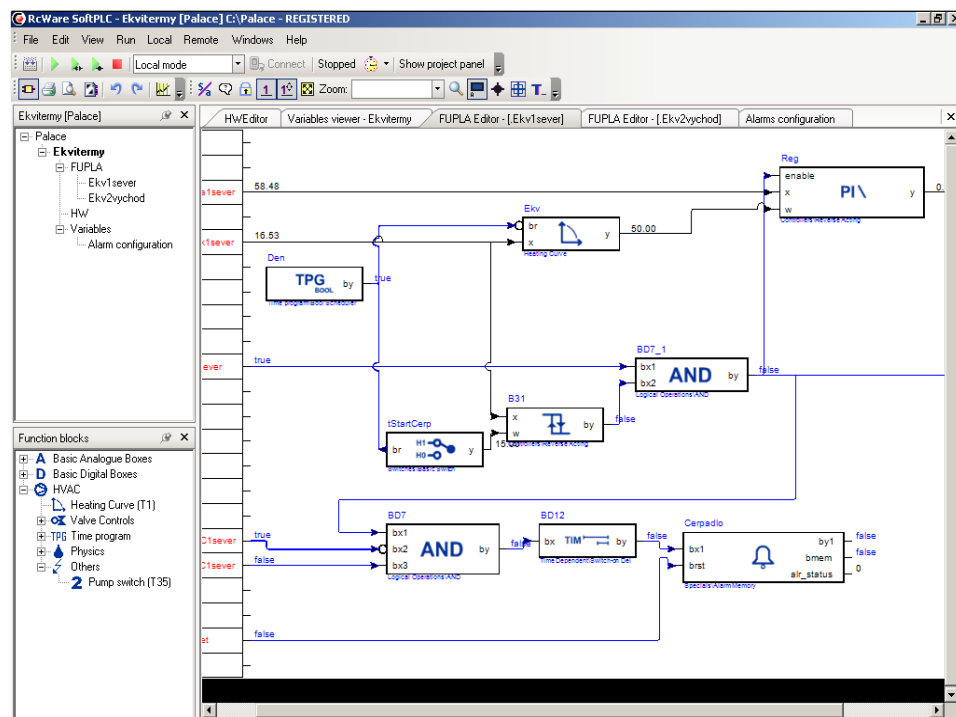
RcWare SoftPLC IDE

Communication

Default network settings are:

IP address	192.168.1.37
subnet mask	255.255.255.0
default gateway	192.168.1.1

Default login to PLC by the SoftPLC Link protocol is: admin / rw.

Remember to note the new IP address after readdressing!

The controllers can share variables over the Ethernet network (outside temperature, heat demands etc.). For integration into foreign systems, the Modbus RTU server serves through a serial interface that can work with any port. Integration is also possible via Ethernet, via http POST - for details, contact Technical Support at support@domat.cz.

Web access HMI is configured in the **web interface** editor. Texts, images, actual values, setpoints, time schedulers, online graphs, and multistate animations are inserted in different screens – panels. This web graphics is available over the network at the IP address of the controller, protected by username and password. According to the user rights, parameters and time schedules can be changed, alarms acknowledged and reset etc.

In case of integration into a 3rd party SCADA system the controller links over TCP/IP (default TCP port number is 12345) to an OPC server (**RcWare SoftPLC OPC server**). The server can communicate with more than one controller.

A simple HMI interface can be created with the **Touchscreen** application which is contrrollable over a touch screen or a mouse or another pointing device.

To integrate the MiniPLC data into third party systems, the serial Modbus RTU server working on any COM port can be used, or http POST communication over the Ethernet – ask for details at support@domat.cz.

Limitations

Number of communication channels (on the serial lines and Ethernet) to I/O modules and subsystems: max. 5, from this max. 3 of the same type (e.g. 3 × Modbus RTU / serial, 1 × M-Bus).

Number of connections from clients: max. 5. This includes connections from RcWare Vision, IDE, Touchscreen application, LCD menu, browser to internal web server, connection from other PLCs over SoftPLC Link etc.

Communication drivers: find the updated list at https://www.domat-int.com/en/technical-documentation - List of supported protocols.

Program upload is only possible in a local network (LAN). If a remote program upload over the Internet is required, security rules must be observed to prevent the building control system from network attacks. A VPN or similar technology is recommended to access the PLC from the Internet.

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.

Cyber security note
The product may influence the information and cyber security (ICS) of the control system. It is supplied in default settings. Implementation and continuous compliance with the ICS rules (e.g. creating and upload of certificates and keys, their updates and management, protection against misuse, etc.) are fully the responsibility of the control system operator. The manufacturer is not responsible for damages which originated or may originate due of wrong or insufficient implementation of ICS rules when using the device. In case of questions, please contact Domat Control System technical support.

Changes in versions

07/2021 – First version.
08/2022 – Stylistic adjustments, added info about network connection.
08/2023 – Safety note added
07/2024 – Removed NVRAM information