MIDAM CONTROL SYSTEM

MIDAM DMIDI02

Free programmable controller with multiple I/O

Cloud bow

Free programmable process station equipped with i.MX RT processor and FreeRTOS operating system. It is suitable for control of medium-scale HVAC or industrial installations, home automation and data acquisition. It features two Ethernet and two RS485 ports, 8AIs (universal/configurable), 6AOs, 8DIs, 8DOs, LED display, 6 user intervention buttons as well as integrated web interface.

PLC / HMI

Application

- Free programmable control of common HVAC systems
- Web access and visualisation of HVAC systems
- Direct control through multiple inputs /outputs
- Data acquisition, processing, and presentation
- Protocol converters with web data presentation

Function

The DMIDI02 controller possesses an embedded FreeRTOS operating system which boots up the runtime with the application. It features 8 AI, 8 DI, 6 AO and 8 DO. There is a RTC backed up by battery, flash memory containing OS, runtime, application, and other necessary data like time programs, set points 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 two Ethernet (RJ45) and two RS485 ports for seamless communication with other control devices. It features a 3x16 character LED display with backlit function, six user buttons and an integrated web server for remote connection and direct user intervention. The web pages can be created in embedded editor.

The user menu structure as well as 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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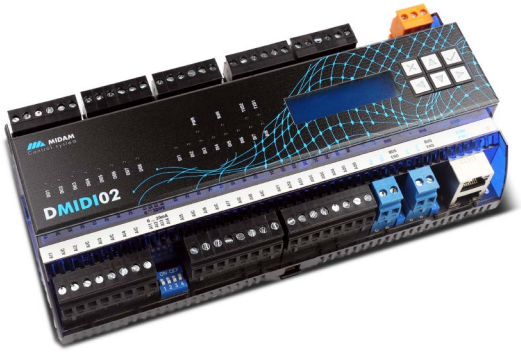

Technical data

Power supply	24V AC/DC ± 20%
Consumption	0,4 A
Communication	**Ethernet** Dual Ethernet port 10/100 BaseT; RJ45, 2x LED (link, data) integrated in the connector, galvanic isolation 1 kV **RS485, Modbus RTU (K1+, K1-, K2+, K2-)** baud rates 300 ... 115 200 bit/s, parity and bits are set over Modbus RTU, default 9600, N, 8, 1 maximal bus length 1200 m, 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), RUN (yellow, device active), TxD1, TxD2 (red, RS485 communication), LINK/DATA (Ethernet) or LCD (see below).
SW	IDE 2.5+ (IEC61131-3, FUPLA, ST language)
CPU	CPU i.MX RT (1x Cortex M7, 600 MHz), RAM 32MB, NAND Flash 32MB, Power fail detection (50 ms ISO16750-2)
Inputs	**Analog inputs** AI1 - AI8, all configurable via SW and AI1 - AI4 via switches S1 - S4 located between the AI terminals (refer to description further in this document), resistance 0..1600 Ohm, 0...5000 Ohm, 0..10V DC, 16-bit resolution, accuracy 0.25% absolute, current sensing 0..20 mA, galvanic isolation 1 kV **Digital inputs** 8x 24V AC/DC – voltage must be applied (no dry contact), e.g. from G and G0, input current 4 mA. Max. peak voltage 60V DC, 40V AC, galvanic isolation 1 kV
Outputs	**Analog outputs** 6x 0-10V DC. Typical load 10 kOhm, max. current 10mA, permanent short circuit protection – 20 mA limit, 8-bit resolution, galvanic isolation 1 kV **Digital outputs** 6x relay, normally open (NO, SPST): 5A/250V AC 1250 VA, 5A/30V DC, 150W, galvanic isolation 1 kV. EN 60947-4-1 ed. 3 general usage, AC1, non-inductive load 2x relay, (changeover, SPDT): 5A/250V AC 1250 VA, 5A/30V DC, 150W, galvanic isolation 1 kV. EN 60947-4-1 ed. 3 general usage, AC1, non-inductive load
Mechanical and dimensions	210 x 98 x 64 mm (l x w x h) Polycarbonate enclosure (UL94V0), IP20, 4x DIP switch blocks - stop, runtime, program execution, S1-S4), INIT (default configuration), 2x BUS END LCD display - 3 rows x 16 characters with backlight (light blue), 6x push buttons
Terminals	61 x M3 screw terminals, Recommended wire diameter 0.35 to 1.5 mm^2

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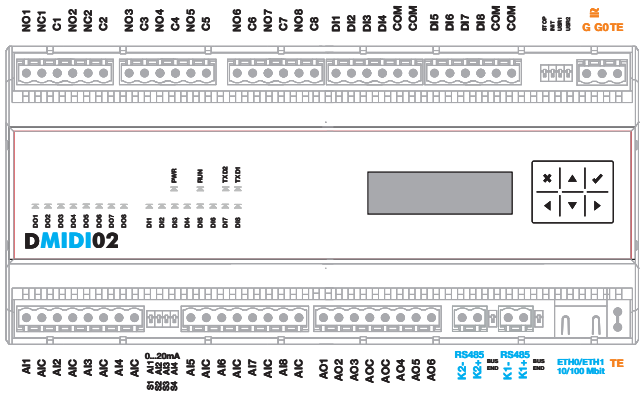
Ambient conditions	+5 to +40 °C, 5 % to 85 % rH non-condensation (EN 60721-3-3. Class 3K3).
RoHS notice	The device contains a non-rechargeable battery which backups the real-time clock and part of the memory. After the device is not operable, please return it to the manufacturer or dispose of it in compliance 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.

Terminals and connection

NO1 - 2	Relay output 1 - 2, normally open against C1- 2
NC1 - 2	Relay output 1 - 2, normally closed against C1- 2
C1 - C2	Relay output 1 - 2, ground (common)
NO3 - 8	Relay outputs 3 - 8, normally open against C3 - 8
C3 - C8	Relay output 3 - 8, ground (common)
DI1 - 8	Digital inputs 1 - 8
COM	Digital input ground (common)
G	Power
G0	Power
TE	Technical ground
AI1 - 8	Analog input 1 - 8
AIC	Analog input ground (common)
AO1 - 6	Analog outputs 1 - 6
AOC	Analog output ground (common)
K2-	Serial line RS485 (2) –
K2+	Serial line RS485 (2)+
K1-	Serial line RS485 (1) –
K1+	Serial line RS485 (1)+
Eth1, Eth2	Network interface (RJ45)



LED indication and DIP switches

STOP	In ON position runtime is running, program execution is stopped.
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, ...).
STOP + INIT	Both switched in ON position - factory default RT (i.e. the upgraded RT is not loaded).
USR1	Not used.
USR2	Not used.
PWR	Green LED: Power supply indicator (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).
TXD1	RS485 transmitting data to the field bus at COM1 (flashing: transmitting data; OFF: no data traffic).
TXD2	RS485 transmitting data to the field bus at COM2 (flashing: transmitting data; OFF: no data traffic).
S1 - S4	In ON position for AI1 - AI4 (adds 125 Ohm resistors in parallel to AIC and selected input). In order to measure current on AI5 - AI8 terminals, installation of external 125 Ohm resistors is necessary.
BUS END	Bus end RS485, the first and last devices on the bus should have bus end in ON position.

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Runtime status indication

RUN 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

04/2024	New datasheet version (v24/04).