

MLX-PLC

Specifications

Models MLXP300/325-x



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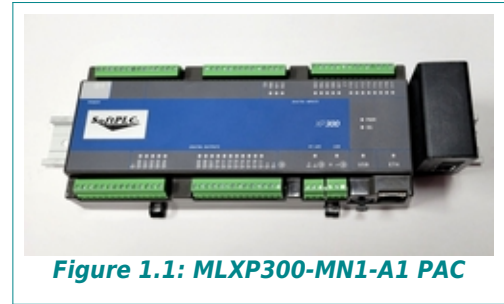
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CHAPTER 1 - PRODUCT DESCRIPTIONS

1.1 OVERVIEW

The MLX-PLC is a powerful family of compact Programmable Automation Controllers (PAC's). The MLX-PLC's deliver superior functionality, virtually unlimited memory, high-speed processing and rich communications in the CPU combined with a compact block of mixed I/O. There are several options to choose from, allowing the best solution for a range of small to mid-size applications.

This family targets small control systems, offering models containing up to 43 I/O points concentrated in a single system, including models with analog inputs and outputs, plus temperature inputs (RTD sensors). In case of additional I/O needs, the system can be easily expanded through remote and/or distributed I/O devices communicating via protocols such as EtherNet/IP, ModbusTCP and ModbusRTU.



The MLX-PLC CPU's offer the same functions and features of all SoftPLC controllers, and use the same programming and configuration software. This is a great advantage for OEMs and systems integrators with needs for a range of application sizes and serving multiple industries.

1.2 MAIN FEATURES

- Compact DIN rail mount design
- High-speed 64-bit ARM-based processor
- GB Ethernet interface with protocols like EtherNet/IP, ModbusTCP and A-B Ethernet (PCCC)
- (2) USB Host ports
- High density mix of I/O - up to 43 I/O points in a single block
- Optically isolated digital inputs (sinking) and transistor digital outputs (sourcing)
- Multi-purpose analog inputs (voltage and current), RTD analog inputs (*Models MLX325-x only*)
- Support for additional remote I/O expansion via Ethernet and/or serial networks, or via Allen-Bradley Remote I/O (RIO) (*Models MLX3xx-SN2-A1-x only*)
- LEDs for inputs/outputs state indication and diagnostics
- Optional embedded web server and firewall

1.3 MODELS AND ORDERING INFORMATION

There are (4) hardware models within the MLX-PLC family. For each model, a suffix indicating the firmware license size determines the I/O and communication connection capacity of the CPU.

Table 1.1: MLX-PLC Models

Model	CPU	I/O
MLXP300-MN1-A1-y	MN1-A1 Micro SoftPLC, 1 Ethernet, 2 USB ports, 5VDC powered	16 DI, 16 DO
MLXP325-MN1-A1-y		16 DI, 16 DO, 5 AI, 2 RTD, 4 AO
MLXP300-SN2-A1-y	SN2-A1 NeoPAC SoftPLC, 1 Ethernet, 2 USB ports, 2 option ports (RS-485 and/or A-B RIO/DH+), 24VDC powered	16 DI, 16 DO
MLXP325-SN2-A1-y		16 DI, 16 DO, 5 AI, 2 RTD, 4 AO

The “y” in the MLX-PLC model refers to the License Size which determines the CPU capacity. The table below describes the available License Sizes:

Table 1.2: MLX-PLC License Sizes (y value)

Attribute	LT	1K	2K	8K
ModbusTCP Servers (<i>I/O Block counts as 1 used</i>)	2	16	32	128
Ethernet/IP Connection Bytes	64	512	1024	4096
Max Digital I/O (<i>larger # of Inputs or Outputs</i>)	128	1024	2048	8192
A-B RIO Logical Racks (<i>SN2-A1 CPU only w/ SPO-BH option</i>)	1	8	16	64



HINT

EXAMPLE: A **MLXP325-SN2-A1-1K** is a NeoPAC SoftPLC CPU with a XP325 I/O block (*mixed digital & analog*) that has the capability for 15 additional ModbusTCP Servers and up to 512 Ethernet/IP Connection Bytes.

1.3.1 NEOPAC MODELS SN2-A1 CPU PORT OPTIONS

SoftPLC NeoPAC model SN2-A1 CPU’s have (2) communication ports that are factory-only installed options. At the time of order you can specify any combination of either or both of these options for each port. The communication driver(s) available on the ports are user configurable via software.

Order (1) or (2) of these port options as separate items. They will be installed/tested by the factory prior to shipment.

Cat No	Description
SPO-485	Isolated RS-485, 2 wire
SPO-BH	Allen-Bradley DH+ or Remote I/O (RIO) “blue-hose”

1.4 RELATED PRODUCTS

The following products can be purchased separately when desired or necessary for your application:

Table 1.3: Related Hardware Products / Options

Cat No	Description
SPO-WIFIMOD	WiFi Antenna Extension, Case Modification for SoftPLC CPU's
SPO-USB232KIT	SoftPLC USB to RS-232 Support Kit (USB-serial cable, null modem, firmware)
SPO-USB485KIT	SoftPLC USB to RS-485 Support Kit (USB-serial cable, firmware)
SPO-UCONCBL	SoftPLC Serial Console Access Cable (USB2.0 to Micro-USB cable)
ICO-MSDF	64GB Industrial MicroSD Flash Card
MLXP101	I/O Expansion, 16 DI (<i>connected to MLXP3xx via CANopen bus</i>)
MLXP106	I/O Expansion, 8 DI, 6 Relay Outputs (<i>connected to MLXP3xx via CANopen bus</i>)
MLXP-AL2306	Cable from MLXP3xx to MLXP1xx
ICO-PSH1524	DinRail Power Supply, 24VDC out, 15W, 85-264VAC in (<i>for MLXPxxx and/or SN2-A1</i>)
ICO-PSH1505	DinRail Power Supply, 5VDC out, 15W, 85-264VAC in (<i>for MN1-A1</i>)
SPO-CKIT	Spare Port Connectors Kit for SoftPLC CPUs

Table 1.4: Related Firmware Products / Options

Cat No	Description
SPZ-EML	Send Email/Text Message Package
SPZ-WEB	Embedded Web Server Package
SSR-xL	Web Studio Embedded Runtime (<i>x is # of tags</i>)
TW-x	TagWell Cloud Interface products

CHAPTER 2 - CPU SPECIFICATIONS

2.1 CPU OVERVIEW

There are 2 CPU hardware options for the MLX-PLC family - the NeoPAC (models SN2-A1) and the Micro (models MN1-A1). These models differ in hardware features only, the firmware is the same.

All CPU's use TOPDOC NexGen for system configuration, programming, documentation, and troubleshooting. Configuration of the firmware and use of TOPDOC NexGen is in the TOPDOC/SoftPLC User's Guide that can be found on the USB drive for the TOPDOC NexGen software (and at <http://softplc.com>).

2.2 NEOPAC SOFTPLC SPECIFICATIONS

The NeoPAC SoftPLC CPU (*Models MLX3xx-SN2-A1-y*) is an assembly that consists of a base unit, 2 configurable communication ports, and a selected SoftPLC runtime license size. These components are assembled at the factory and undergo a system test prior to shipment. Other options are available for field installation.

Specifications are in the table below.



Figure 2.1:
NeoPAC SoftPLC

Table 2.1: NeoPAC SoftPLC Hardware Specifications

NeoPAC SoftPLC (<i>Models SN2-A1-y</i>) Hardware Specifications	
User Memory	512MB RAM, 8GB on-board eMMC flash
Removable Memory	MicroSD (optional-no card included)
Processor	64-bit, quad-core ARM processor
Operating Temperature	0 to 60°C, (storage -40~85°C) Extended Temp option (Cat No SPO-EXTEMP) -20~70°C
Humidity	0-95%, non-condensing
Input Voltage Range	6~72 VDC, terminal block connector (alternatively 12-48VAC)
Power Requirements	2-5W based on options selected
Communication Ports	(1) GB Ethernet port (10/100/1000 BaseT) via RJ-45 connection (2) USB 2.0 host ports, (1) w/ OTG (1) Micro-USB serial console port (for troubleshooting only)
	(2) Option Ports, any mix of choices below (must be factory installed): RS-485, isolated 2 wire (Cat No SPO-485) A-B RIO Master, A-B RIO Adapter or Data Hwy Plus (Cat No SPO-BH)
Wireless	802.11 b/g/h WiFi, requires Cat No SPO-WIFI antenna extension kit
	Bluetooth 4.0 dual mode
Remote I/O	Serial and Ethernet connections, A-B RIO w/ SPO-BH option

NeoPAC SoftPLC (Models SN2-A1-y) Hardware Specifications		
Protocols	Serial	Modbus Master/Slave, DF1, ASCII
	Ethernet	Ethernet/IP, ModbusTCP, DF1 Ethernet (PCCC)
Real Time Clock		Via Internet/Local LAN NTP Server
Dimensions (HxWxD)		3.945 x 1.349 x 3.823 in (100.2 x 34.26 x 97.1 mm)
Packaging		Fanless/Diskless system, aluminum enclosure, DIN-rail mount
LED's		(2) System Status, (2) Option Port Status, (2) Ethernet Port Status

The interfaces currently available and the required wiring are shown below.

Table 2.2: NeoPAC Configurable Port Wiring by Protocol

Catalog No	Communication Protocol	Wiring (Bottom to Top)
SPO-BH	Data Highway Plus	Clear - Shield - Blue
SPO-BH	Allen-Bradley Remote I/O (RIO)	Blue - Shield - Clear
SPO-485	RS-485, 2 wire, isolated	Neg - Ground - Positive

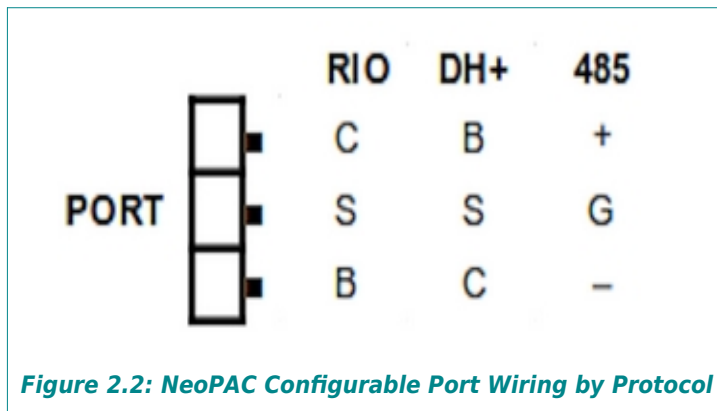


Figure 2.2: NeoPAC Configurable Port Wiring by Protocol

Correct power wiring is Negative on the top, Positive on the bottom, as shown in Figure 3.1.

2.3 MICRO MN1-A1 SOFTPLC SPECIFICATIONS

The Micro SoftPLC CPU (Models MLX3xx-MN1-A1-y) is an assembly that consists of a base unit and a selected SoftPLC runtime license size. Options are available for field installation.

Specifications are in the following table:



Figure 2.3: Micro SoftPLC Model MN1-A1

Table 2.3: Micro SoftPLC Hardware Specifications

Micro SoftPLC (Models MN1-A1-y) Hardware Specifications		
User Memory	512MB RAM, 8GB on-board eMMC flash	
Removable Memory	MicroSD (optional-no card included)	
Processor	64-bit, quad-core ARM processor	
Operating Temperature	0 to 60°C, (storage -40~85°C) Extended Temp option (Cat No SPO-EXTEMP) -20~70°C	
Humidity	0-95%, non-condensing	
Input Voltage Range	5 VDC, terminal block connector	
Power Requirements	2-5W based on options selected	
Communication Ports	(1) GB Ethernet port (10/100/1000 BaseT) RJ-45 connection (2) USB 2.0 host ports, (1) w/ OTG (1) Micro-USB serial console port (for troubleshooting only)	
Wireless	802.11 b/g/h WiFi, requires Cat No SPO-WIFI antenna extension kit Bluetooth 4.0 dual mode	
Remote I/O	Ethernet and Serial (via USB converter)	
Protocols	Serial	Modbus Master/Slave, DF1, ASCII (via USB converter)
	Ethernet	Ethernet/IP, ModbusTCP, DF1 Ethernet (PCCC)
Real Time Clock	Via Internet/Local LAN NTP Server	
Dimensions (HxWxD)	57.5 x 30 x 55 mm	
Packaging	Fanless/Diskless system, aluminum enclosure, DIN-rail mount	
LED's	(2) Ethernet Port Status	

CHAPTER 3 - I/O SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS

Table 3.1: General Specifications all I/O Blocks

Common Specifications for all MLXP3xx I/O Models	
Communication Ports	(1) Ethernet, (1) RS-485, (1) CANopen, (1) USB Host
Status / Diagnostic indication	LEDs & Memory Registers
Isolation	1,500 Vdc / 1 minute (1,000 Vac / 1 minute)
Maximum power dissipation	5 Watts
Input voltage	24 Vdc nominal, 19.2 to 30 Vdc
Maximum input inrush current	50 A / 300 us
Maximum input current	300 mA
Maximum Wire size	0.5 mm ² (20 AWG) with ferrule 1.5 mm ² (16 AWG) without ferrule
Wire material	Copper only
IP level	IP 20, Conformal Coating
Temperature	-20 to 60 °C Operating, -25 to 75 °C Storage
Relative humidity	5% to 96%, non-condensing
Vibration resistance	7mm from 5 to 8.4 Hz, 2G from 8.4 to 500 Hz 10 sweeps/axis, 1 octave/minute (IEC60068-2-6, sinus)
Shock resistance	15G for 11ms, 6 shocks in each of 3 axis (IEC60068-2-27, half-sine)
Standards	IEC 61131-2 CE - 2011/65/EU (RoHS), 2014/35/EU (LVD) and 2014/30/EU (EMC) UL/cUL Listed - UL 61010-1 (file E473496) DNV Type Approval - DNV-CG-0339 (TAA000034G)
Dimensions (W x H x D)	215.5 x 98.8 x 34.0 mm
Weight	370 g

3.2 ETHERNET INTERFACE

Table 3.2: MLXP3xx I/O Ethernet Interface Specifications

MLXP3xx I/O Block Ethernet Port	
Connector	Shielded female RJ45
Auto crossover	Yes
Maximum cable length	100m
Cable type	UTP or ScTP, category 5/6
Physical layer	10/100 BASE-TX
Protocols (See Note Below)	MODBUS TCP MODBUS RTU EtherNet/IP
Diagnostics	LED (Link/Activity)



NOTE

The factory default configured connection from the SoftPLC CPU to the MLXP3xx I/O block is via Ethernet using ModbusTCP protocol. Users can request other connection protocols, contact info@softplc.com.

3.3 I/O POINTS/CHANNELS SPECIFICATIONS



NOTE

The performance specifications given for MLXxxx I/O is from the terminal block connection to the memory in the I/O block. The total I/O performance time for data refresh to the SoftPLC CPU will be increased by the time to transfer the data over the connection between the I/O block and the CPU (*default is ModbusTCP network*).

Table 3.3: I/O Count per Model

I/O Type	MLXP300-	MLXP325-
Digital Inputs	12	12
Fast Inputs	4	4
Digital Outputs	12	12
Fast Outputs	4	4
Max. number of high-speed counters	1	1
Max. number of external interruptions	2	2
Max. number of PTO outputs	2	2
Max number of VFO/PWM outputs	4	4
V/I analog inputs (AI)	-	5
RTD analog inputs (AI)	-	2
V/I analog outputs (AO)	-	4

3.3.1 DIGITAL INPUTS

Table 3.4: Digital Inputs Specifications

MLXPxxx Digital Inputs	
Input Type	Optically isolated sink type 1 Two isolated groups of 8 inputs each
Connector Points	I04 to I17
Input Voltage	24 Vdc 15 to 30 Vdc for logic level 1 0 to 5 Vdc for logic level 0
Input Impedance	4.95 k Ω
Maximum Input Current	6.2 mA @ 30 Vdc
Input State Indication	Yes, LED
Response Time	0.1 ms
Input Filter (see Hint)	Disabled, or 2 to 255 ms by software



HINT

If enabled, the input filter sampling is performed on MainTask or by a Refresh function. In this case, it is recommended to use multiple values of the task interval.

3.3.2 FAST INPUTS

Table 3.5: Fast Inputs Specifications

MLXP3xx Fast Inputs	
Number of Fast Inputs	(4) Can be used for high-speed counter, external interrupts or normal inputs (1) High Speed Counter Maximum (2) External Interrupts Maximum
Connector Points	I00, I01, I02 and I03
Input voltage	24 Vdc 15 to 30 Vdc for logic level 1 0 to 5 Vdc for logic level 0
Input impedance	1.85 k Ω
Input maximum current	16.2 mA @ 30 Vdc
Input Configuration modes	Normal digital input External interrupt Up/Down (A count, B direction) with zero (uses I00, I01, I02) Quadrature 2x (uses I00, I01) Quadrature 2x with zero (uses I00, I01, I02) Quadrature 4x (uses I00, I01) Quadrature 4x with zero (uses I00, I01, I02)
Counting direction	Control by software or hardware
Counting input detection edge	Rising edge, active at logic level 1 (except for quadrature 4x where it counts on both edges)
Counting Data Format	Signed 32-bit integer (- 2,147,483,648 to 2,147,483,647)
Input frequency	100 kHz maximum
Minimum pulse width	2 μ s @ 24 Vdc

3.3.3 DIGITAL OUTPUTS

Table 3.6: Digital Outputs Specifications

MLXP3xx Digital Outputs	
Output type	Optically isolated transistor source type (PNP)
Connector Points	Q00 to Q13
Maximum output current	1.5A per output, 12A total
Leakage current	35 μ A
On state resistance	105 m Ω
External power supply	19.2 to 30 Vdc
Switching time (see note)	20 μ s - off-to-on transition @ 24 Vdc 500 μ s - on-to-off transition @ 24 Vdc
Maximum switching frequency	250 Hz
Configurable parameters	Yes
Output state indication	Yes, LEDs
Output protections	Yes, protection against surge voltages



NOTE

Switching time: The required time to turn off one specific output depends on the load.

3.3.4 FAST OUTPUTS

Table 3.7: Fast Outputs Specifications

Xpress I/O Fast Outputs		
Number of outputs	(4) Can be used as VFO/PWM, PTO or normal outputs (2) PTO Outputs Maximum	
Max number of VFO/PWM outputs	(4) when using no PTO (2) when using 1 PTO (0) when using 2 PTO	
Connector Points	Q14, Q15, Q16 and Q17	
Maximum current	0.5A @ 30 Vdc by output 2A @ 30 Vdc total	
Output type	Transistor source	
Pulse generation frequency	200 kHz @ 60 mA Maximum	
Minimum pulse width @ 24 Vdc	MINIMUM LOAD	MINIMUM PULSE TIME
	400 Ω	320 ns
State indication	Through static reserved operands	
Protections	TVS diode at all transistor outputs	
Operation voltage	19.2 to 30 Vdc	
Output impedance	700 mΩ	
Output modes	Normal digital output VFO/PWM PTO (Q14 & Q16 only. Adjacent output is forced to normal DO)	
Functions executed by software	PTO	VFO/PWM
	Writing number of pulses to be generated	Writing of frequency value to be generated (1 Hz ~ 200 kHz).
	Writing of acceleration and deceleration number of pulses	Writing of outputs duty cycle (1% to 100%)
	Start/end outputs operation	Start/end of outputs operations
	Output diagnostics	Output diagnostics
	Output current state monitoring	

3.3.5 ANALOG INPUTS

Table 3.8: Analog Inputs Specifications

MLX325 Analog Inputs	
Input type	Voltage or current input, single ended, individually configured
Data format	16 bits in two's complement, justified to the left
Converter resolution	12 bits monotonicity guaranteed, no missing codes
Conversion time	400 μ s (all V/I and RTD channels enabled)
Input state indication	Yes
Module protections	Yes, protection against surge voltages and polarity inversion

Table 3.9: Analog Input Voltage Mode Specifications

	Range	Engineering Scale	Resolution
Input ranges	0 to 10 Vdc	0 to 30,000	2.5 mV
Precision	$\pm 0.3\%$ of full scale @ 25 °C $\pm 0.010\%$ of full scale / °C		
Over scale	3% of full scale		
Maximum input voltage	12 Vdc		
Input impedance	21 k Ω		
Configurable parameters	Signal type per input Filters		
Low pass filter time constant	100 ms, 1sec, 10sec or disabled		

Table 3.10: Analog Input Current Mode Specifications

	Range	Engineering Scale	Resolution
Input ranges (<i>see note</i>)	0 to 20 mA 4 to 20 mA	0 to 30,000 0 to 30,000	5.12 μ A 5.12 μ A
Precision	$\pm 0.3\%$ of full scale @ 25 °C $\pm 0.015\%$ of full scale / °C		
Over scale	3% of full scale		
Maximum input current	30 mA		
Input impedance	119 Ω		
Configurable parameters	Signal type per input Filters Open Loop Value		
Low pass filter time constant	100 ms, 1 s, 10 s or disabled		



NOTE

Input ranges: When configured as 4 to 20mA, input signals lower than 4mA will result in negative values (-7,500 for 0mA). A software parameter called Open Loop Value allows user selection of the behavior in this situation. The default value is Disabled (which provides a linear reading as described above), or you can provide a fixed reading equal to the lower and upper limits ("0" or "30000").

3.3.6 RTD INPUTS

Table 3.11: RTD Inputs Specifications

MLXP325 RTD Inputs	
Supported RTDs	Pt100, Pt10000, 0 to 400 Ω, 0 to 4000 Ω
Connection Type	3 wire
Excitation current	1 mA
Resistance range (scale)	0 to 400 Ω (used for PT100) 0 to 4000 Ω (used for PT1000)
Precision	±0.5% of full scale @ 25 °C
Over Scale	5% of full scale
Configurable parameters	Signal type per input Filters
Low pass filter time constant	100 ms, 1 sec, 10 sec or disabled
Sensor cable impedance (<i>see note</i>)	20 Ω maximum



NOTE

Sensor cable impedance: Maximum total resistance added by the two wires of the sensor.

Table 3.12: RTD Input Types

Input type	Temperature Coefficient (α)	Measurement Band	Count	Resolution
400 Ω	-	0 to 400 Ω	0 to 4000	0.1 Ω
4000 Ω	-	0 to 4000 Ω	0 to 4000	1 Ω
Pt100E, Pt1000E	0,00385	-200 to 850 °C -328 to 1562 °F	-2000 to 8500 -3280 to 15620	0.3 °C 0.6 °F
Pt100A, Pt1000A	0,003916	-200 to 630 °C -328 to 1166 °F	-2000 to 6300 -3280 to 11660	0.3 °C 0.6 °F

3.4 ANALOG OUTPUTS

Table 3.13: Analog Outputs Specifications

MLXP325 Analog Outputs	
Output type	Voltage or current outputs, individually configured
Data format	16 bits in two's complement, justified to the left
Converter resolution	12 bits monotonicity guaranteed, no missing codes
Update time	450 μ s (all outputs enabled)
Output state indication	Yes
Module protections	Yes, protection against surge voltages and polarity inversion

Table 3.14: Analog Output Voltage Mode Specifications

	Range	Engineering Scale	Resolution
Output ranges	0 to 10 V	0 to 30,000	2.5 mV
Precision	$\pm 0.3\%$ of full scale @ 25 $^{\circ}$ C, $\pm 0.025\%$ of full scale / $^{\circ}$ C		
Stabilization time	4 ms		
Maximum output value	+10.3 Vdc		
Load impedance	> 1 k Ω		
Configurable parameters	Signal type per output		

Table 3.15: Analog Output Current Mode Specifications

	Range	Engineering Scale	Resolution
Output ranges (see note)	0 to 20 mA 4 to 20 mA	0 to 30,000 0 to 30,000	5.18 μ A 5.18 μ A
Precision	$\pm 0.3\%$ of full scale @ 25 $^{\circ}$ C, $\pm 0.020\%$ of full scale / $^{\circ}$ C		
Stabilization time	4 ms		
Maximum output value	+ 20.6 mA		
Load impedance	< 600 Ω		
Configurable parameters	Signal type per output		



NOTE

Output ranges: When configured as 4 to 20 mA, the output can be set to values lower than 4 mA by assigning negative values to the output variable (-7,500 for 0 mA).

3.5 MLXP3XX I/O PHYSICAL DIMENSIONS

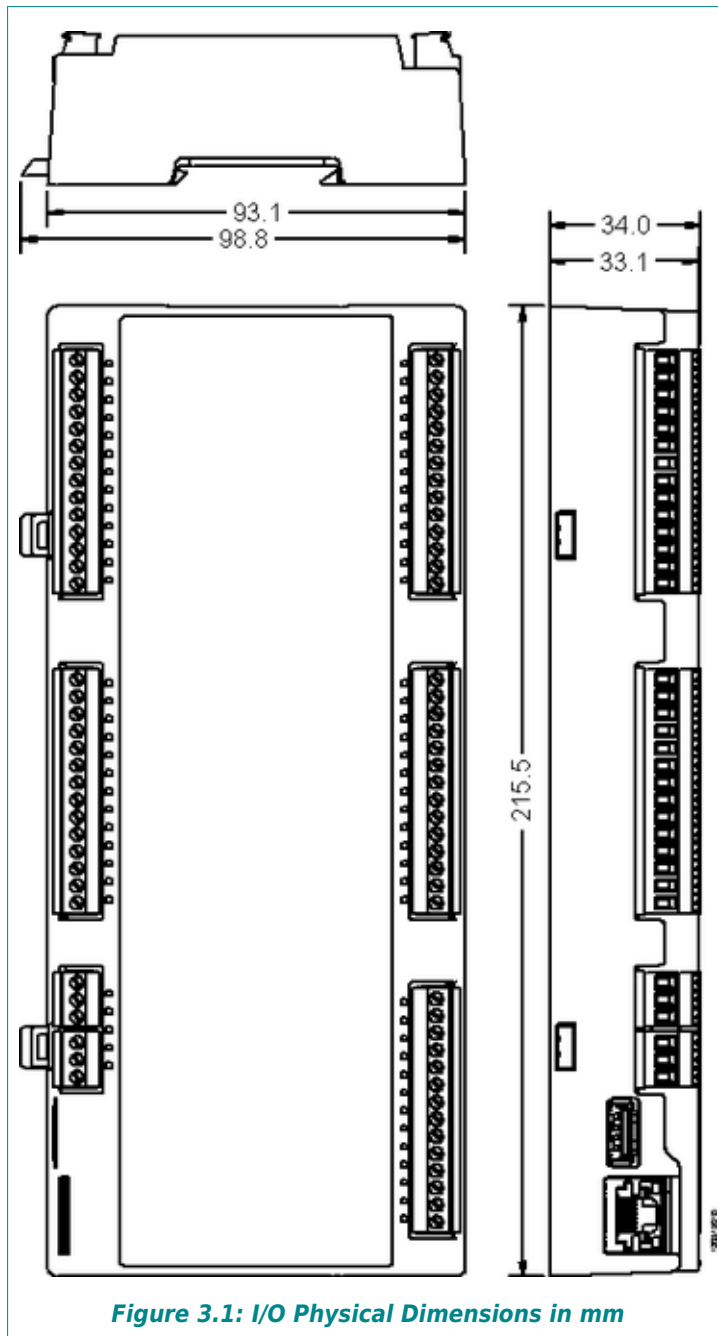


Figure 3.1: I/O Physical Dimensions in mm

3.6 WIRING DIAGRAM



CAUTION

When performing any installation in an electric panel, certify the main energy supply is OFF.

Refer to the following figure for the numbered references below:

1. Typical connection of analog output on voltage/current mode
2. Typical connection of digital output (source type)
3. External power supply to supply outputs Q00 to Q17, terminals Q + must be connected to +24 Vdc, and terminal Q- must be connected to 0 Vdc
4. Protective Earth terminals for power supply and communication ports - both should be externally connected to ground
5. Typical connection of RS-485 serial interface
6. Typical connection of CAN interface
7. USB port (not used)
8. RJ-45 Ethernet connection
9. Typical connection of digital input (sink type). C0 and C1 are the common points for the isolated groups I0x and I1x respectively
10. Typical connection of current analog input (field device with power supplied separately from analog signal)
11. Typical connection of current analog input (field device with power supplied with the analog signal, 2-wire)
12. Typical connection of voltage analog input
13. Typical connection of RTD analog input (3-wire)
14. External power supply connection (24VDC)

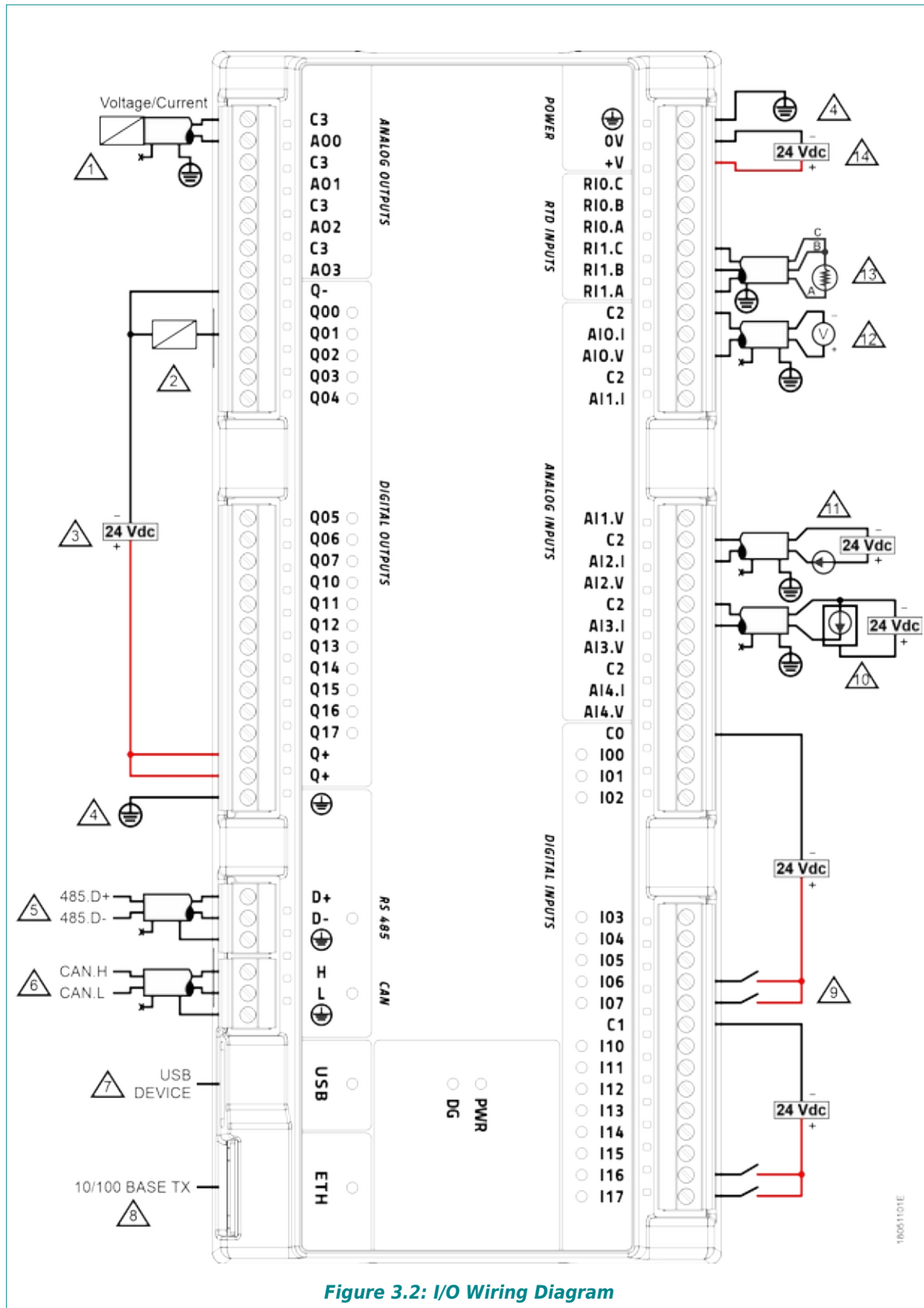


Figure 3.2: I/O Wiring Diagram