

# DCU5610

## INPUT/OUTPUT MODULES

### TECHNICAL SPECIFICATIONS

Input/output (I/O) modules are important part of Dynamic Control Unit. Their purpose is to connect physically DCU to controlled process through wires and pre-process electrically the signals streamed to / from DCU.

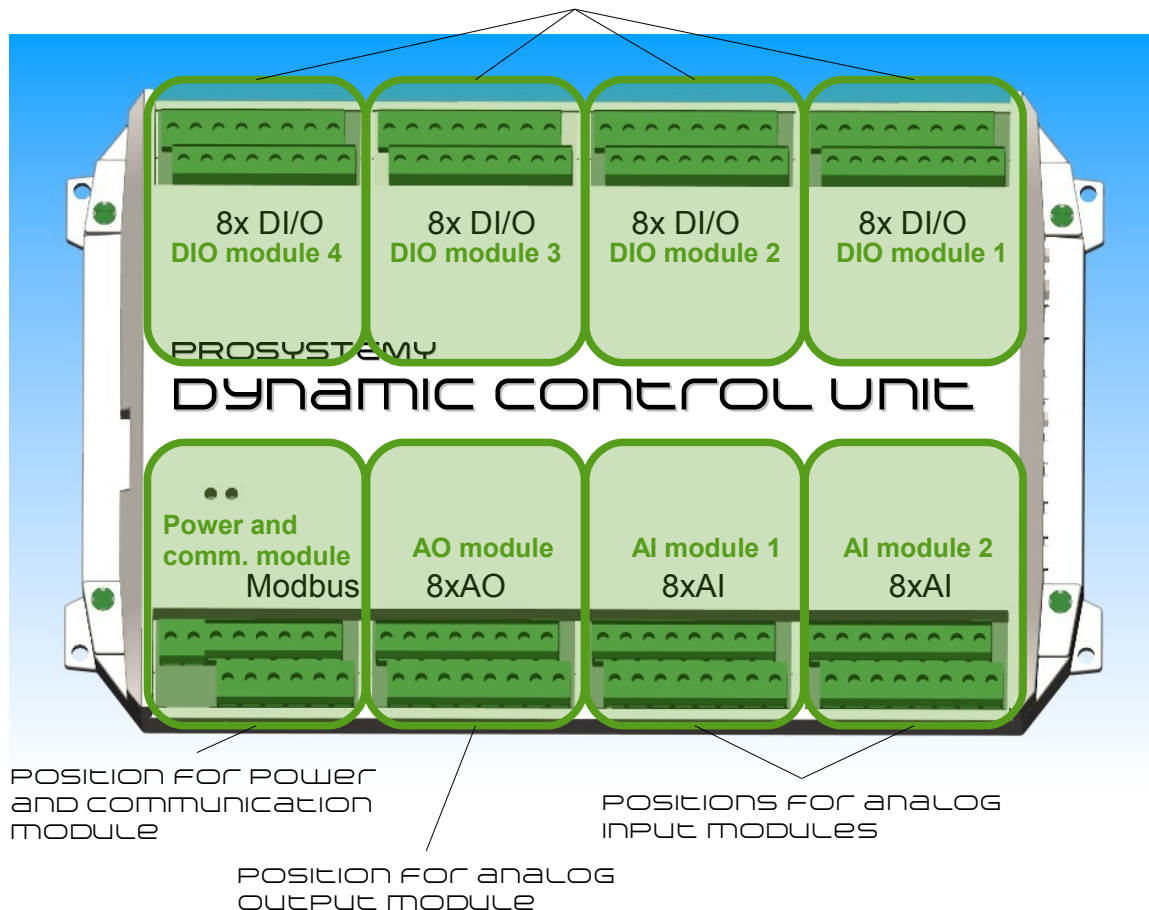
There are five groups of I/O modules:

- Power and communication module (only one type)
- Analog output modules (type 0-10V and type 0-20mA)
- Analog input modules (type 0-10V, type NTC10k, type 0-20mA, type on-measure)
- Digital input modules (only one type)
- Digital output modules (type 24VDC and type Relay)

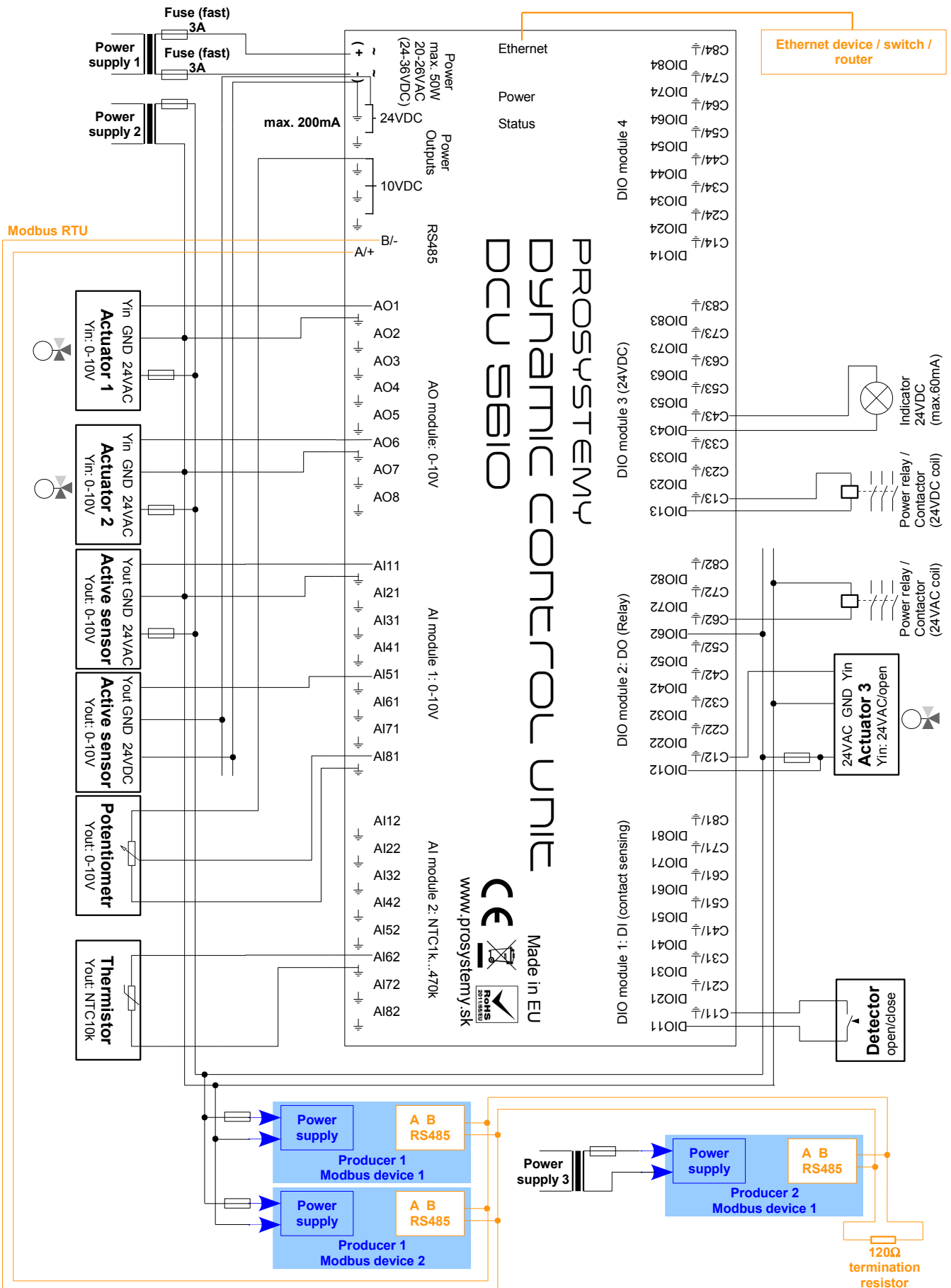
Each type of I/O modules has its specific purpose and is destined for a specific type of electrical signal. Modules may not be placed anywhere into DCU. Connectors on the bottom of each I/O modules determine where a module may be placed. Figure shows positions for each group of I/O modules.

To (re-)place an I/O module top cover needs to be removed. I/O module can then be released/placed by pulling / pushing gently while holding screw terminal. See Figure with DCU decomposition.

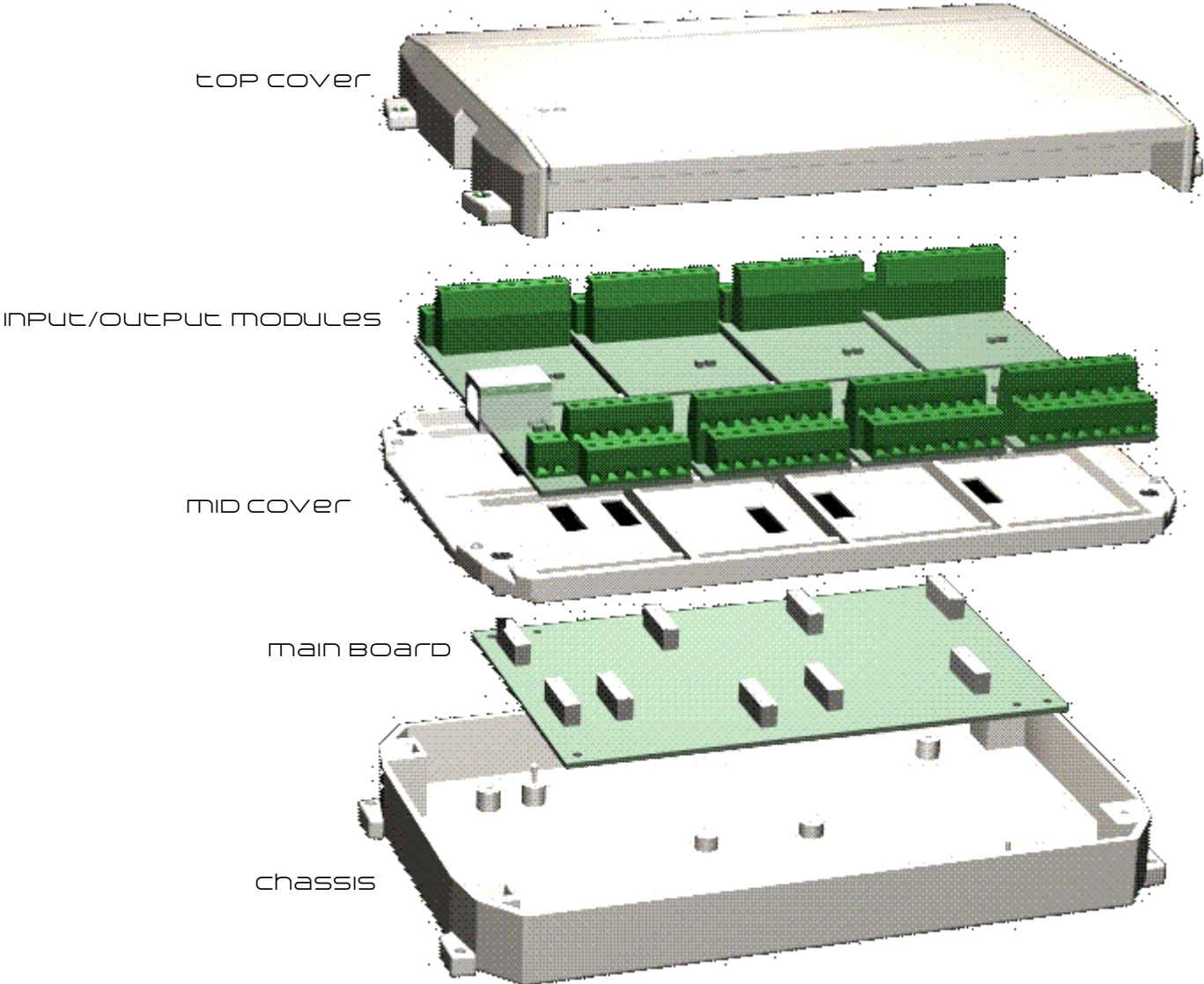
POSITIONS FOR DIGITAL INPUT OF DIGITAL OUTPUT MODULES



# EXAMPLE OF WIRING DCU CONTROLLER



COMPONENTS OF DCU CONTROLLER



## POWER / COMMUNICATION MODULE



### FUNCTIONAL DESCRIPTION

Power and communication module (PA1.2) has the following functions:  
 Power entire DCU including all I/O modules.  
 Protect DCU from overcurrent and overvoltage.  
 Provide Ethernet connection via RJ45 connector.  
 Provide serial RS485 connection via screw terminal connector.  
 Provide auxiliary power supply 24VDC to power an external devices requiring direct current.  
 Provide auxiliary reference supply 10VDC.  
 Indicate status of Ethernet communication with LED lights.  
 Indicate status of DCU via two LED lights.

### ELECTRICAL SPECIFICATIONS

Input power supply 20 - 26VAC or 24-36VDC

**Note:** Minimal acceptable voltage is 14VDC, but the following limitations has to be taken into account in such situation: A) Auxiliary power supply 24VDC is not working properly. B) Digital output modules must be DC voltage type, not relay (relays would not be switched correctly). Moreover, output voltage of these voltage digital outputs correspond to connected power supply voltage (min. 14VDC).

**Note:** It is recommended to use separate power supply only for DCU controller and other power supplies for connected control devices - sensors, actuators, Modbus devices...

Maximal input current 2A.

Power consumption min. 2W (DCU main board powered, no outputs connected), max.50W (all outputs used)

Auxiliary power supply 24VDC, max. 200mA

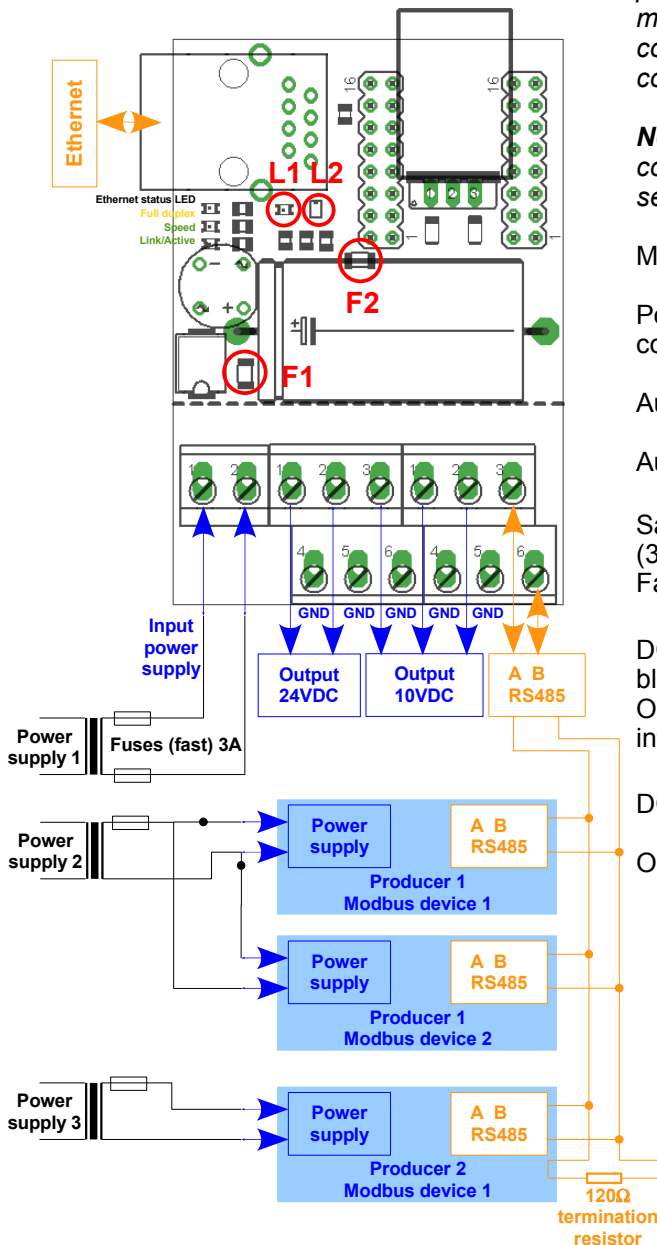
Auxiliary reference supply 10VDC, max. 10mA

Safety fuses F1 and F2. Fuse F1 (3A, Slow Blow) together with transil (36V) guarantee input power to be less then (> 27VAC). Fuse F2 (2,5A Fast Acting) is short circuit protection.

DCU status LED light L1 (red/green) indicates DCU state. Green blinking - unit OK control application stopped or none. Green still - unit OK, application running. Red blinking - unit is working but it has some internal error. Red still - unit is not working properly.

DCU status LED light L2 (blue) – indicate that power is on.

Operational temperatures 0°C - 60°C.



## ANALOG OUTPUT MODULE 0-10V



### FUNCTIONAL DESCRIPTION

Analog output module 0-10V (AO1\_0) provides 8 channels of analog outputs 0-10V. Each output signal is generated with 12-bit DA converter.

### ELECTRICAL SPECIFICATIONS

Output voltage 0-10V

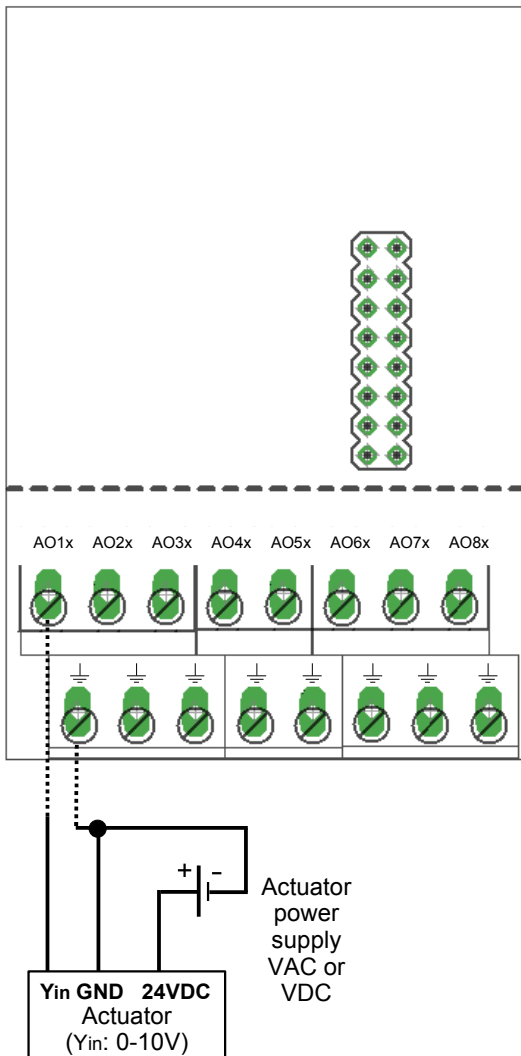
Max. output current 30mA

Max. error 0,6% of full range

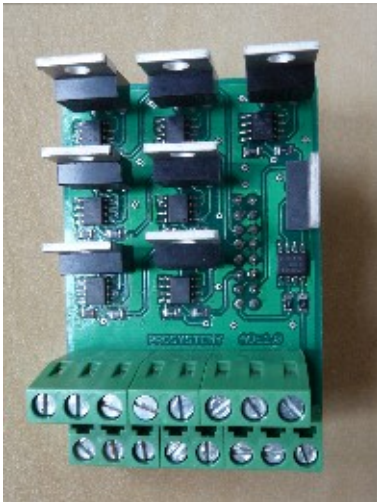
Operational temperatures 0°C - 60°C

**Note:** Wiring example for an actuator (electrical valve, damper,...) is shown in Figure.

**Attention, power supply for DCU CAN NOT BE USED to power connected actuators. A different transformer or DC power supply must be used!**



## ANALOG OUTPUT MODULE 0-20mA



### FUNCTIONAL DESCRIPTION

Analog output module 0-20mA (AOc1\_0) provides 8 channels of analog outputs for 8 independent current loops 0-20mA. Each output signal is generated with 12-bit DA converter.

### ELECTRICAL SPECIFICATIONS

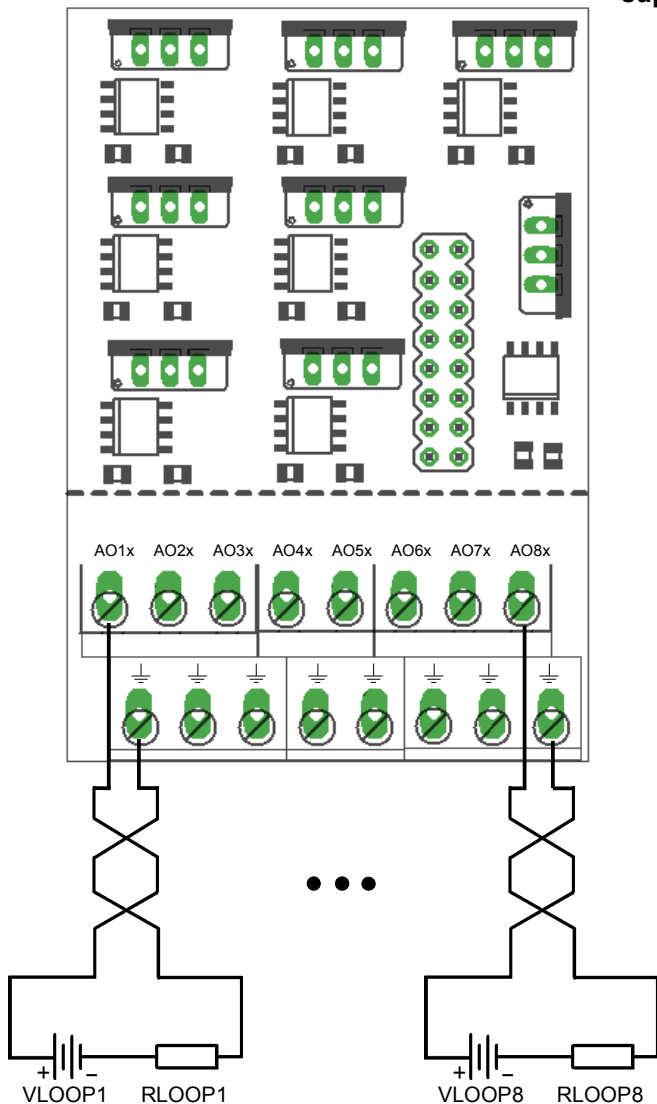
Loop supply voltage range 12 – 32VDC (standard 24VDC)

Output current 0-20mA.

Operational temperatures 0°C - 60°C.

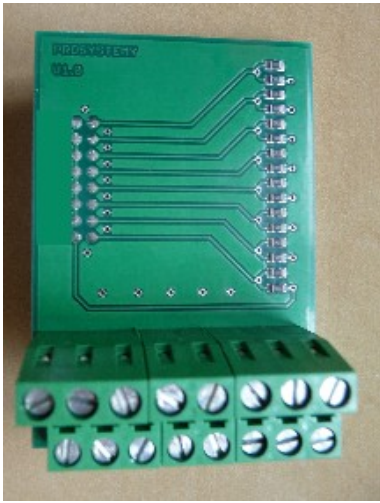
*Note: Wiring example is shown in Figure.*

**Attention, each current loop requires its own independent power supply!**





## ANALOG INPUT MODULE 0-10V



### FUNCTIONAL DESCRIPTION

Analog input module 0-10V (Alv1\_0) provides 8 channels of analog inputs that reads signal 0-10V. Each input signal is processed with low-pass anti-aliasing filter (Sallen-Key, signal to noise = -6dB) and 12-bit AD converter.

### ELECTRICAL SPECIFICATIONS

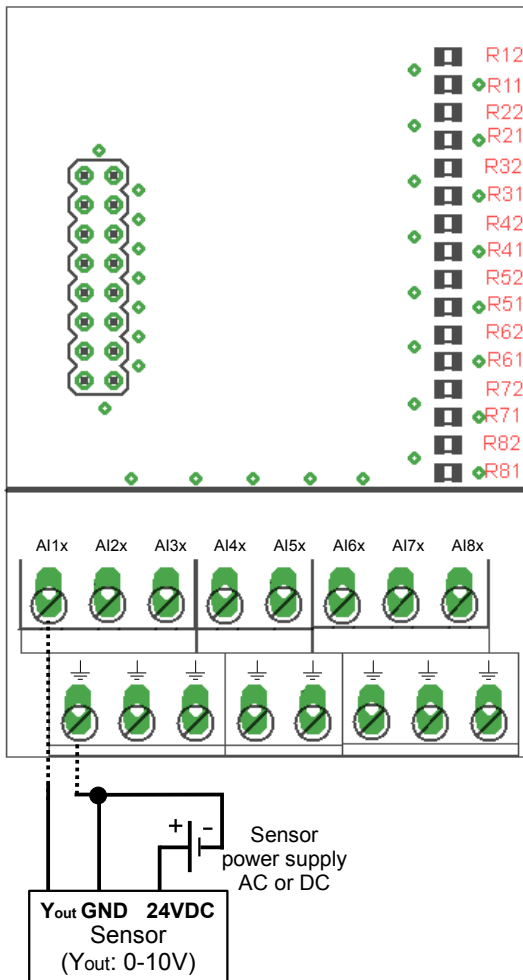
Input voltage 0-10V

Min. input current 42 $\mu$ A

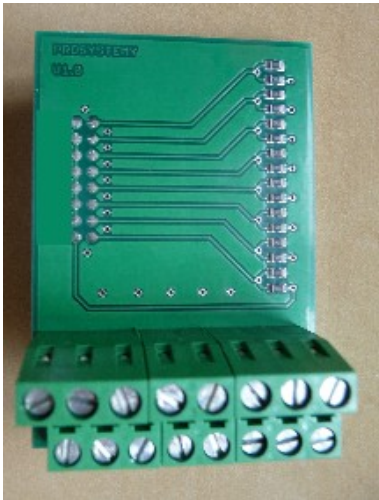
Max. error 0.77% of full range

Operational temperatures 0°C - 60°C

**Note:** In case of 0-10V AI module, the resistors R11 ... R82 are not present on the module. Wiring example is shown in Figure.



## ANALOG INPUT MODULE NTC10K



### FUNCTIONAL DESCRIPTION

Analog input module NTC10k (AI<sub>n1\_0</sub>) provides 8 channels of analog inputs that reads resistance of a connected NTC thermistor with varying resistance. Depending on required range and precision, negative thermistors from 1kΩ up to 470kΩ may be connected, see graph below. Each input signal is processed with low-pass anti-aliasing filter (Sallen-Key, signal to noise = -6dB) and 12-bit AD converter.

### ELECTRICAL SPECIFICATIONS

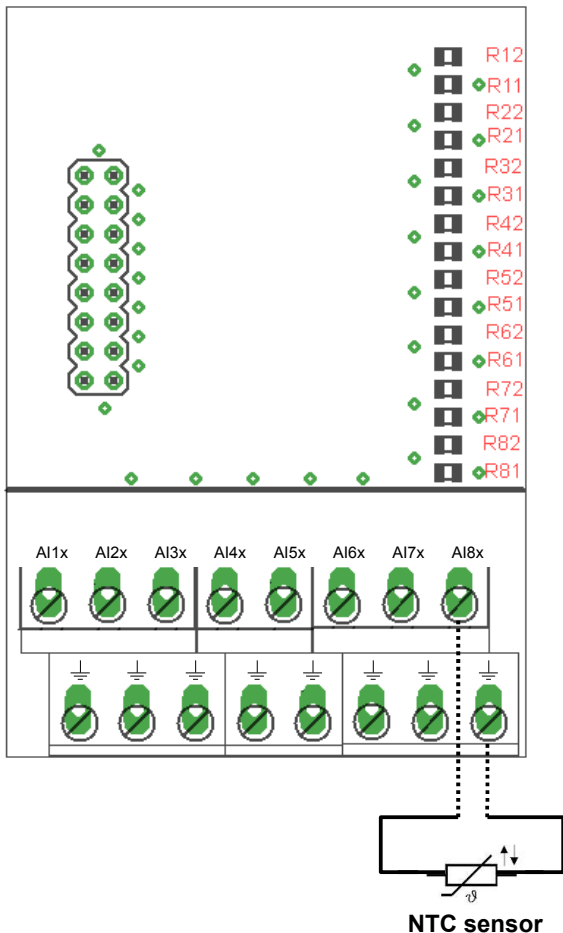
Input voltage 0-10V

Min. input current 42μA

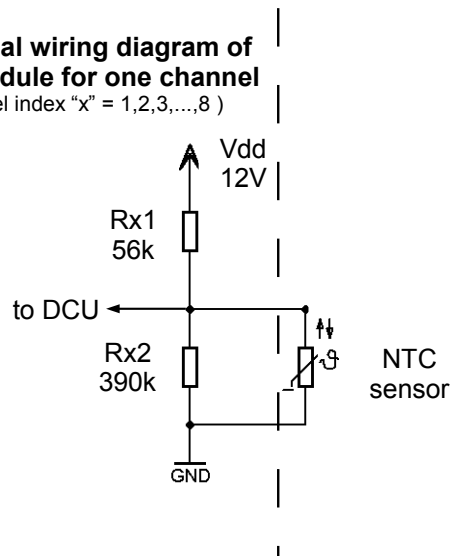
Max. error 0.77% of full range

Operational temperatures 0°C - 60°C

**Note:** Wiring example is shown in Figure. Resistances R11, R21,...R81 = 56kΩ, resistances R12, R22, R82 = 390kΩ

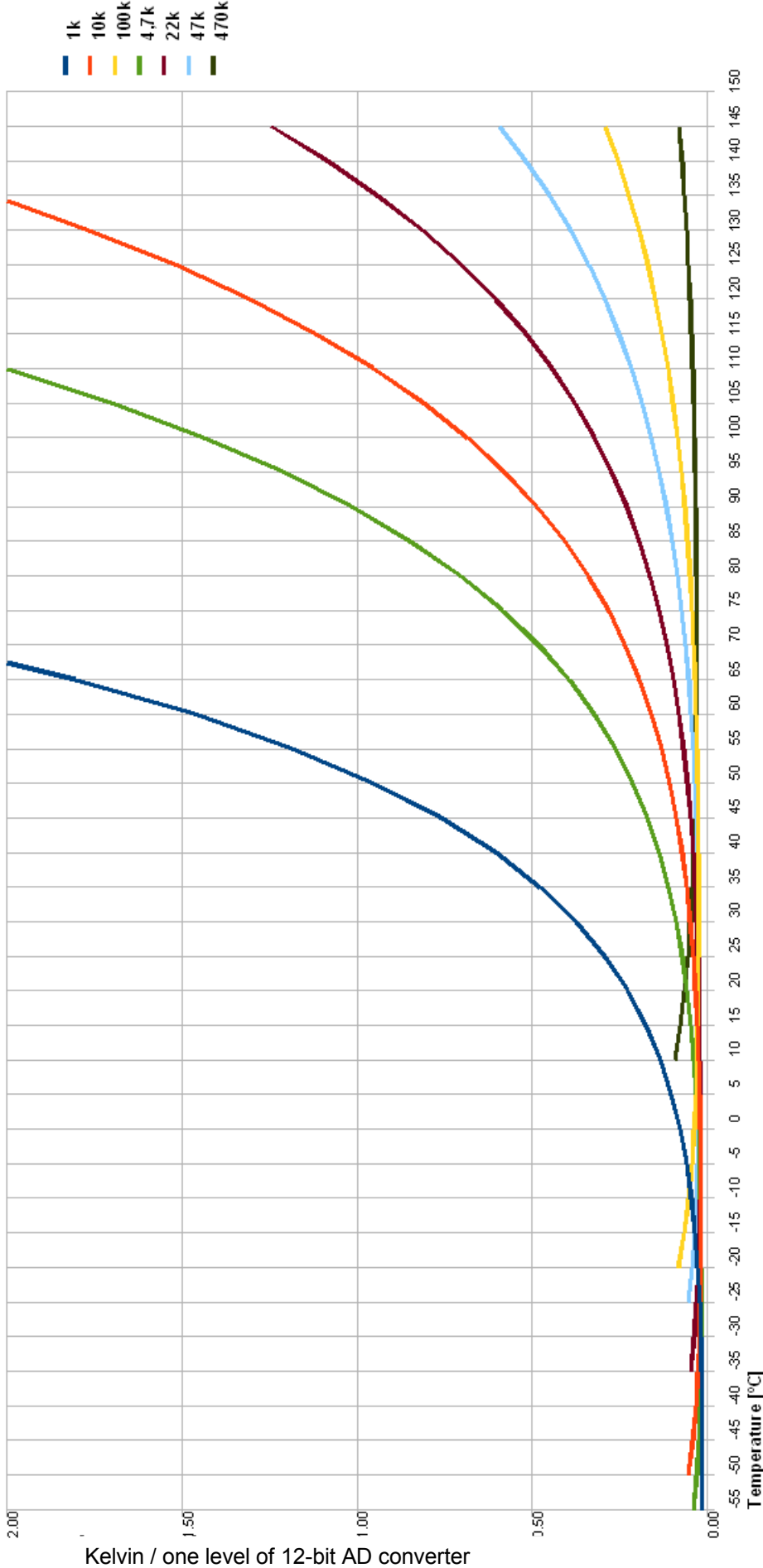


**Internal wiring diagram of AI module for one channel**  
(channel index "x" = 1,2,3,...,8)

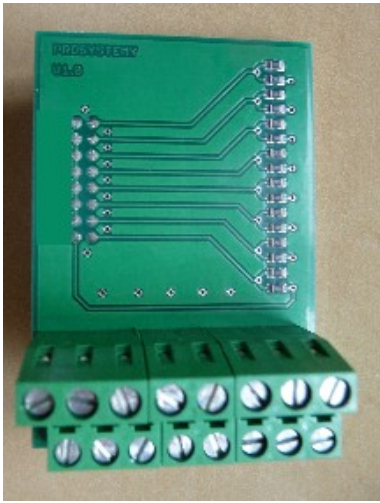




# ANALOG INPUT MODULE NTC10K



## ANALOG INPUT MODULE 0-20mA



### FUNCTIONAL DESCRIPTION

Analog input module 0-20mA (A1c1\_0) provides 8 channels of analog inputs that reads input signals of varying current from 0-20mA. Each input signal is processed with low-pass anti-aliasing filter (Sallen-Key, signal to noise = -6dB) and 12-bit AD converter.

### ELECTRICAL SPECIFICATIONS

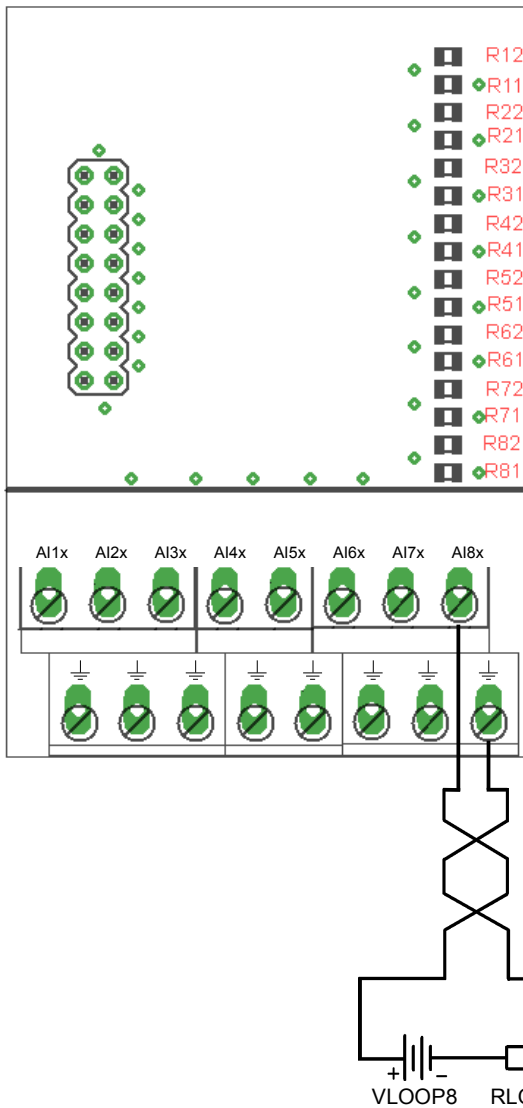
Input voltage 0-10V

Min. input current 42 $\mu$ A

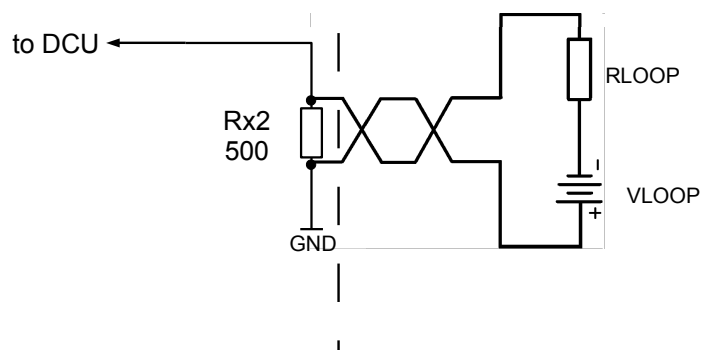
Max. error 0.77% of full range

Operational temperatures 0°C - 60°C

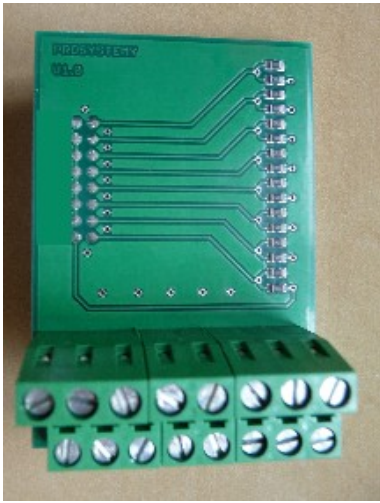
**Note:** Wiring example is shown in Figure. Resistances R11, R21,...R81 are removed, resistances R12, R22, R82 = 500 $\Omega$



**Internal wiring diagram of AI module for one channel**  
(channel index "x" = 1,2,3,...,8 )



## ANALOG INPUT MODULE PT1000



### FUNCTIONAL DESCRIPTION

Analog input module PT1000 (Alp1\_0) provides 8 channels of analog inputs that reads resistance of a connected positive thermistor with varying resistance. Depending on required range and precision, positive thermistors PT100, PT1000, and Ni1000 may be connected, see graph below. Each input signal is processed with low-pass anti-aliasing filter (Sallen-Key, signal to noise = -6dB) and 12-bit AD converter.

### ELECTRICAL SPECIFICATIONS

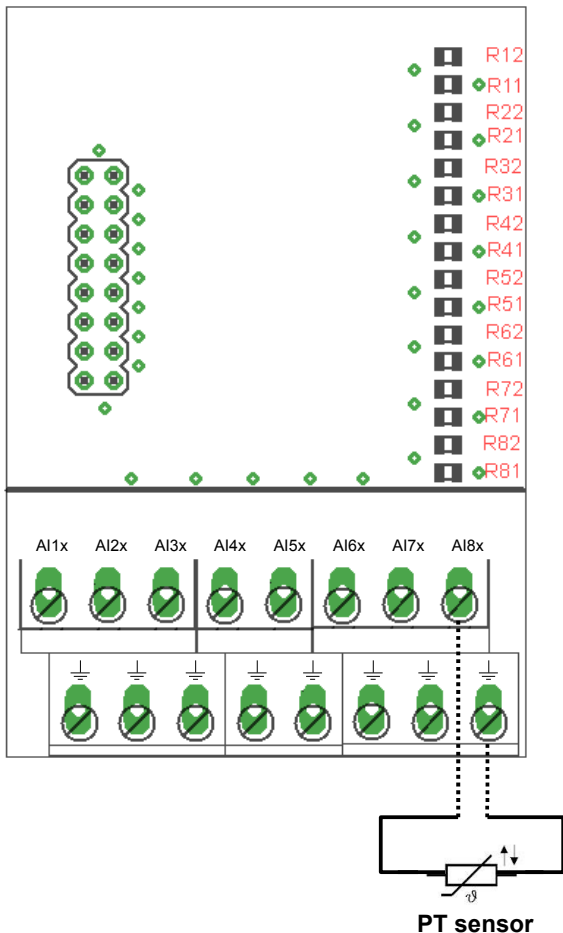
Input voltage 0-10V

Min. input current 42µA

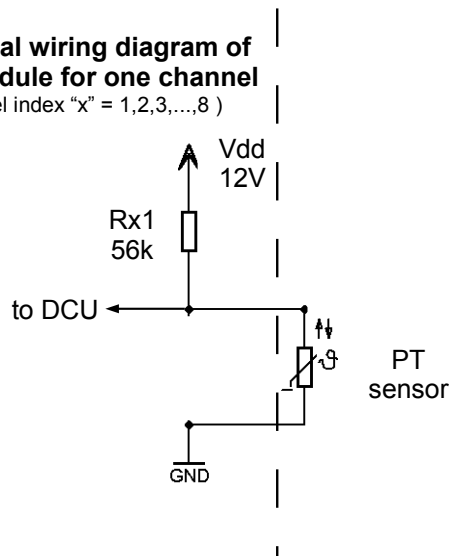
Max. error 0.77% of full range

Operational temperatures 0°C - 60°C

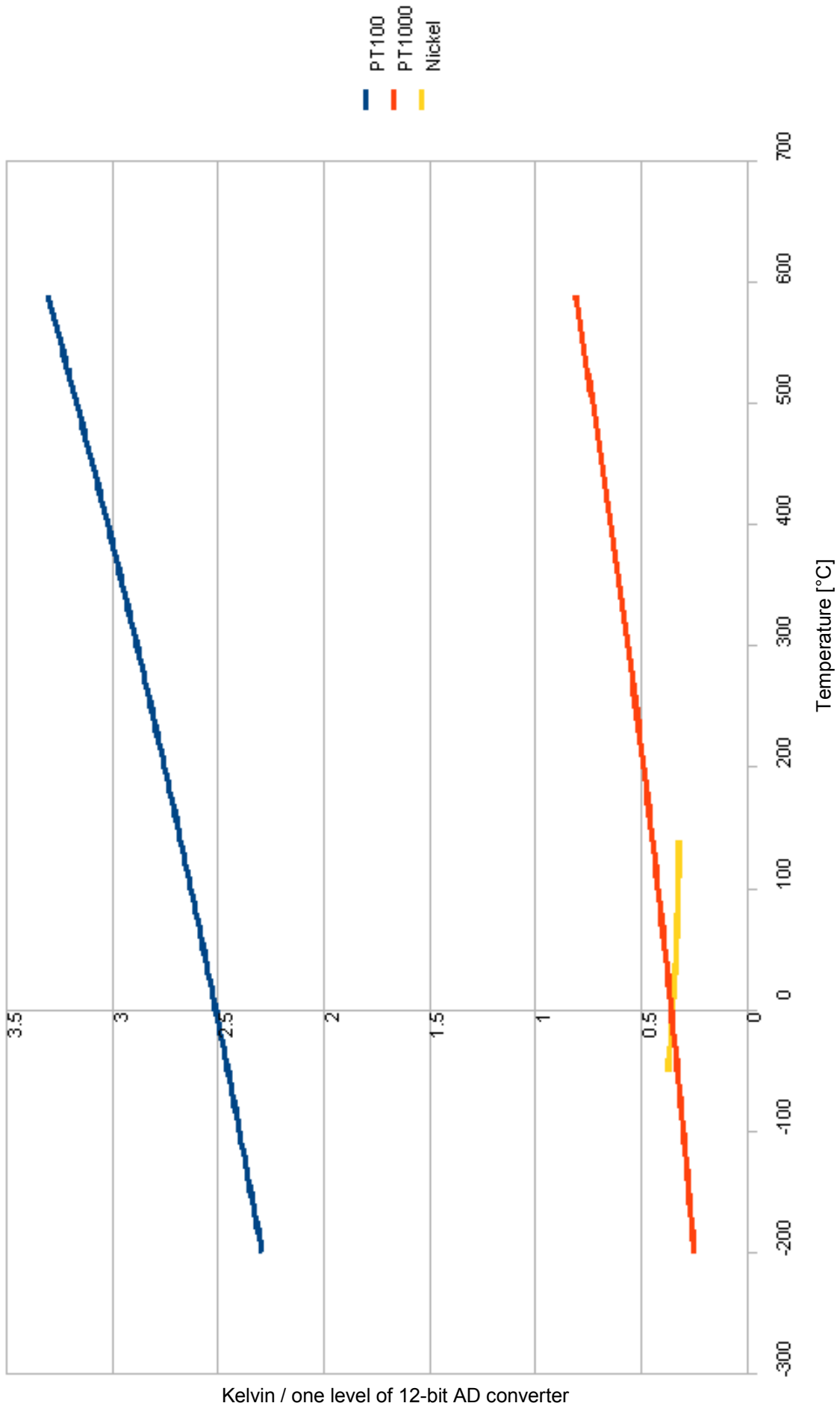
**Note:** Wiring example is shown in Figure. Resistances R11, R21,...R81 = 56kΩ, resistances R12, R22, R82 are removed.



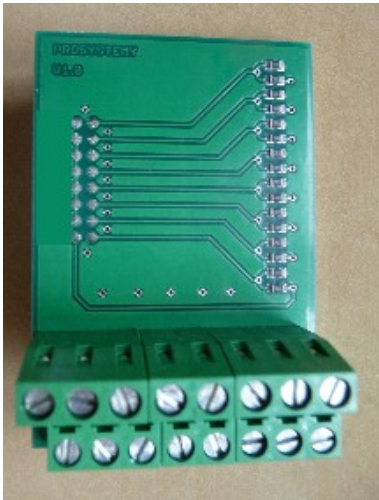
### Internal wiring diagram of AI module for one channel (channel index "x" = 1,2,3,...,8)



# ANALOG INPUT MODULE PT1000 - MEASURING PRECISION



## ANALOG INPUT MODULE ON-MEASURE



### FUNCTIONAL DESCRIPTION

Analog input module On-measure (Alo1\_0) provides 8 channels of analog inputs that reads electrical signal according to specifications given by customer. Each input signal is then processed with low-pass anti-aliasing filter (Sallen-Key, signal to noise = -6dB) and 12-bit AD converter.

Each channel may be specified for different type of input signal. Customer may specify each channel as a standard type channel (channel 0-10V, channel NTC10k, channel 0-20mA, channel PT1000) or he can define directly values of resistances R11 ... R82 or combine both types of specifications.

### Example of Analog Input module On-measure specification:

Channel 1 : 0-10V  
 Channel 2 : 0-10V  
 Channel 3 : NTC10k  
 Channel 4 : NTC10k  
 Channel 5 : PT1000  
 Channel 6 : PT1000  
 Channel 7 : R71=1kohm, R72=100ohm  
 Channel 8 : R81=1kohm, R82 not connected

### ELECTRICAL SPECIFICATIONS

Input voltage 0-10V

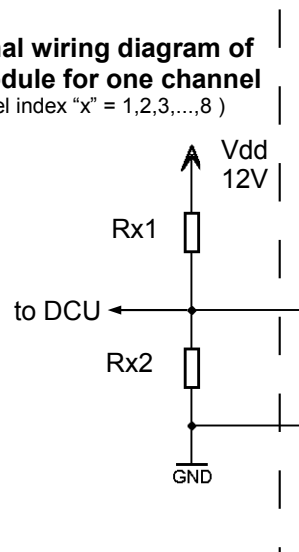
Min. input current 42 $\mu$ A

Max. error 0.77% of full range

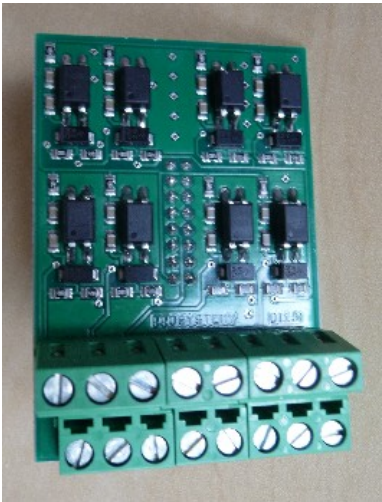
Operational temperatures 0°C - 60°C

**Note:** Wiring example is shown in Figure. Resistances R11, R21,...R81 = 56k $\Omega$ , resistances R12, R22, R82 removed.

**Internal wiring diagram of AI module for one channel**  
 (channel index "x" = 1,2,3,...,8 )



# DIGITAL INPUT MODULE



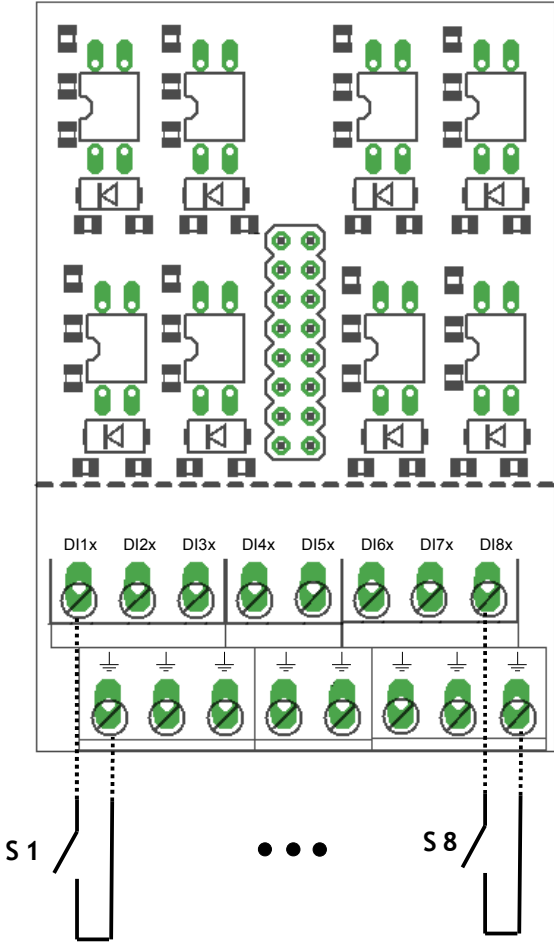
### FUNCTIONAL DESCRIPTION

Digital input module (DI1\_0) provides 8 channels of digital inputs sensing opened/closed contact. For sensing the contact 12VDC voltage is used.

### ELECTRICAL SPECIFICATIONS

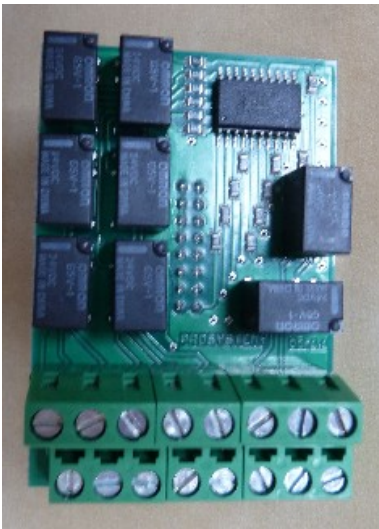
Switching contact resistance tolerance:  
logical 1 (closed contact) < 20kΩ  
logical 0 (opened contact) > 27kΩ

Operational temperatures 0°C - 60°C





## DIGITAL OUTPUT RELAY MODULE



### FUNCTIONAL DESCRIPTION

Digital output module (DO1\_0) provides 8 channels of digital outputs in form of opening/closing contact. 8 relays configured as normally open (NO) are performing the output.

### ELECTRICAL SPECIFICATIONS

Max. switched voltage for one output 24VAC/DC

Max. switched current for one output 500mA

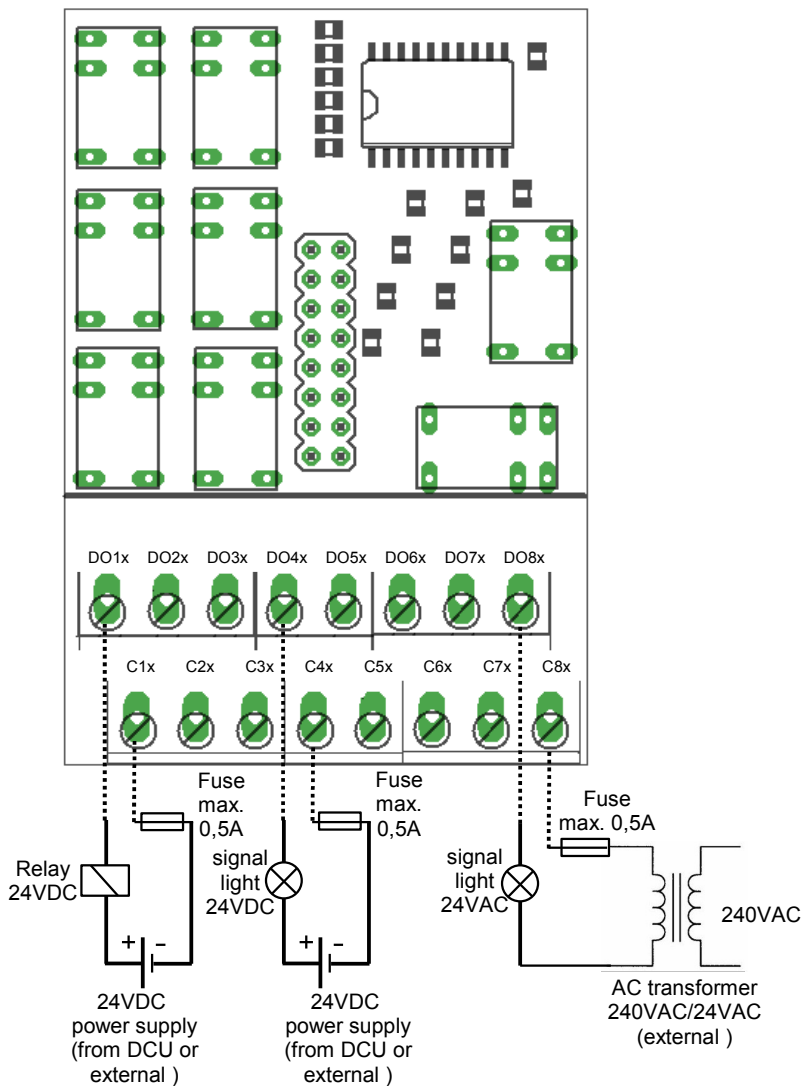
Max. operating frequency

mechanical 36,000 operations/hr

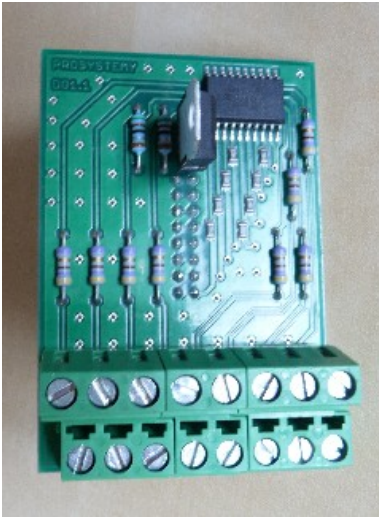
electrical 1,800 operations/hr (under rated load)

Operational temperatures 0°C - 60°C

**Note:** DO Relay module is properly working only with DCU power supply 24VAC or 24VDC and above. In case of other power supply, use DO voltage module instead.



## DIGITAL OUTPUT VOLTAGE MODULE



### FUNCTIONAL DESCRIPTION

Digital output module (DO1\_0) provides 8 channels of 24VDC / 0VDC digital outputs. The module is primarily destined for switching external relays. Each channel is equipped with short-circuit protection fuse Fx (x=1,...,8, RESISTOR, FUSIBLE, 470R, 330mW). Additionally, max. current of the module is limited to 500mA with a limiting circuit. This circuit is able to withstand only short-term over-current. In case of long-term over-current, it can be damaged.

### ELECTRICAL SPECIFICATIONS

Max. output current 500mA  
 Max. output current per channel 60mA  
 Output voltage 24VDC (see NOTES)  
 Operational temperatures 0°C - 60°C

**Attention!** DO voltage module is optimized for switching standard power relays with coil 24VDC, ~400mW (17mA). In case of other type of load, check functioning of the connected device, i.e. if the module provides sufficient voltage and current.

