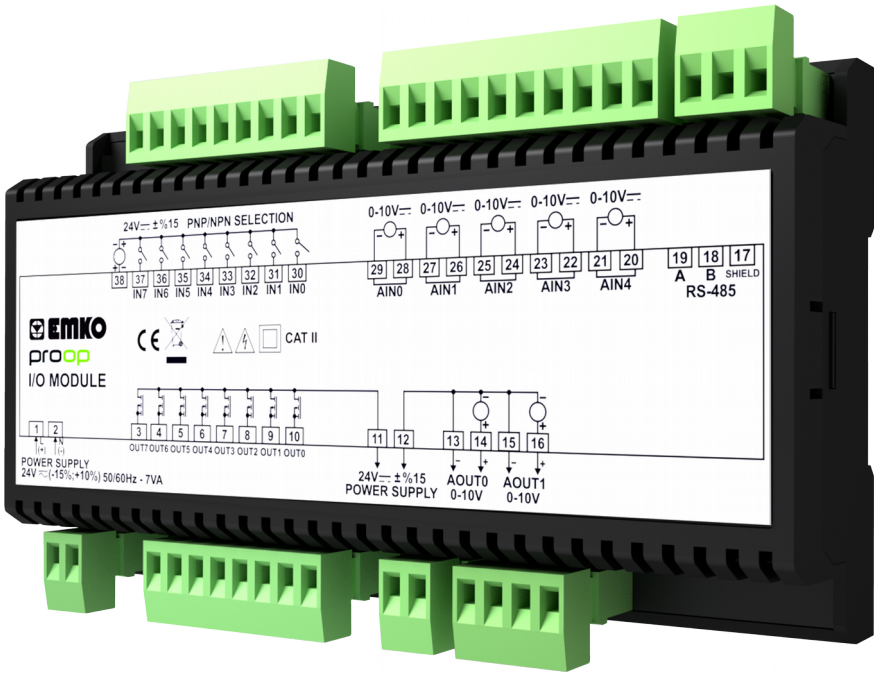


proop-I/O Module
User Manual

EMKO

Preface

Proop-I/O Module is used with the Proop device. It can also be used as a data path for any brand. This document will be helpful the user to install and connect Proop-I/O Module.

- Before begin the installation of this product, please read the instruction manual.
- The contents of the document may have been updated. You can access the most updated version at www.emkoelektronik.com.tr

⚠	This symbol is used for safety warnings. User must pay attention to these warnings.

Environmental Conditions

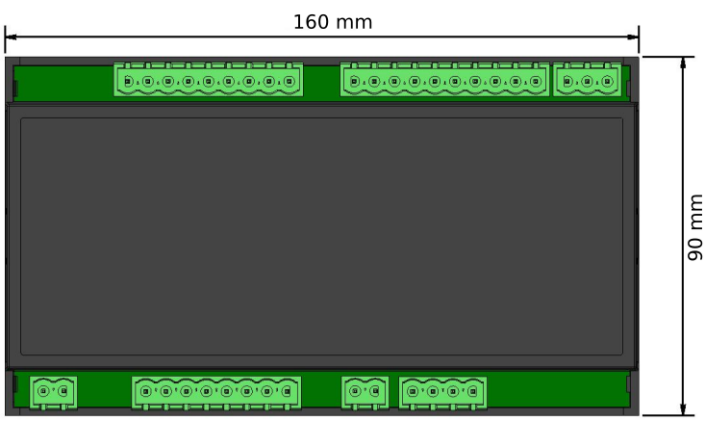
Operating Temperature	:	0-50C
Maximum Humidity	:	0-90 %RH (None Condensing)
Weight	:	238gr
Dimension	:	160 x 90 x 35 mm

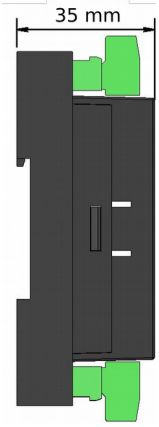
Features

Proop-I/O Module are divided into several types according to inputs-outputs. The types are as follows.

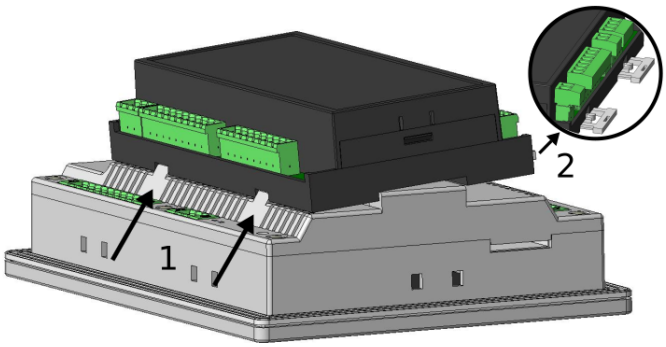
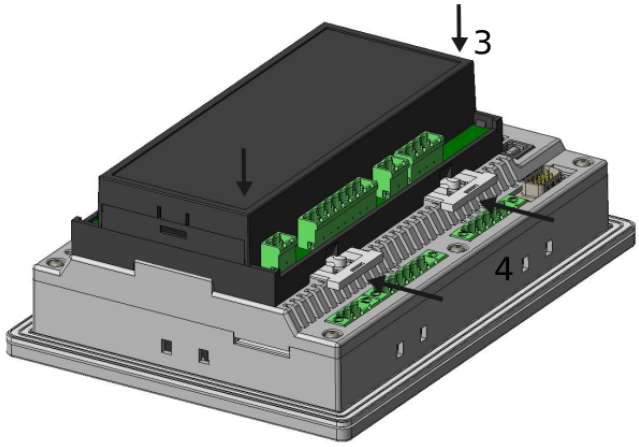
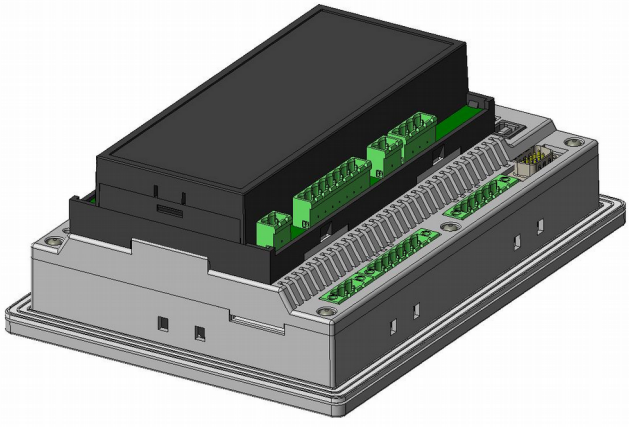
Product Type	A	B	C	D	E	F
Proop-I/O.P	**2**	**2**	**1**	**3**		
Module Supply						
24 Vdc/Vac (Isolation)	**2**					
Communication						
RS-485 (Isolation)		**2**				
Digital Inputs						
8x Digital			**1**			
Digital Outputs						
8x 1A Transistor (+V)				**3**		
Analog Inputs						
5x Pt-100 (-200...650°C)					**1**	
5x 0/4..20mAdc					**2**	
5x 0...10Vdc					**3**	
5x 0...50mV					**4**	
Analog Outputs						
2x 0/4...20mAdc						**1**
2x 0...10Vdc						**2**

Dimensions

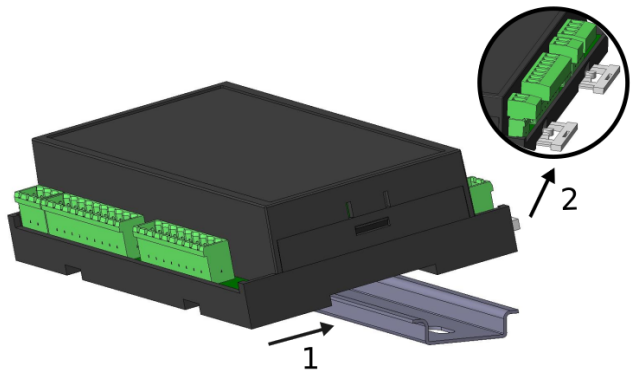
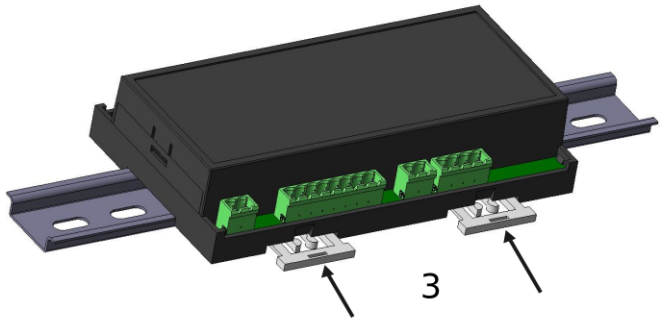




Mounting of Module on Proop Device

	**1-** Insert the Proop I/O Module to the holes of Proop device as in the picture. **2-** Check the locking parts are plugged in the Proop-I/O Module device and pulled out.
	**3-** Press the Proop-I / O Module device firmly in the specified direction. **4-** Insert the locking parts by pushing them in.
	**5-** The inserted image of module device should look like the one on the left.

Mounting of Module on DIN-Ray

	**1-**Drag the Proop-I/O Module device onto the DIN-ray as shown. **2-** Check the locking parts are plugged in the Proop-I/O Module device and pulled out.
	**3-** Insert the locking parts by pushing them in.
	**4-** The inserted image of module device should look like the one on the left.

Installation

	Before beginning installation of this product, please read the instruction manual and warnings below carefully.

A visual inspection of this product for possible damage occured during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

Do not use the unit in combustible or explosive gaseous atmospheres.
Do not expose the unit to direct sun rays or any other heat source.
Do not place the unit in the neighbourhood of magnetic equipment such as transformers, motors or devices which generate interference (welding machines, etc.)
To reduce the effect of electrical noise on device, Low voltage line (especially sensor input cable) wiring must be separated from high current and voltage line.

During installation of the equipment in the panel, sharp edges on metal parts can cause cuts on the hands, please use caution.
Mounting of the product must be done with its own mounting clamps.
Do not mount the device with inappropriate clamps. Do not drop the device during installation.

If possible, use shielded cable. To prevent ground loops the shield should be grounded on one end only.

To prevent electric shock or damage to the device, do not apply power to the device until all of the wiring is completed.
The digital outputs and supply connections are designed to be isolated from each other.

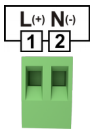
Before commissioning the device, parameters must be set in accordance with desired use.
Incomplete or incorrect configuration can be dangerous.
The unit is normally supplied without a power switch, fuse, or circuit breaker. Use a power switch, fuse, and circuit breaker as required by local regulations.
Apply only the rated power supply voltage to the unit, to prevent equipment damage.

If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and disconnect the device from the system.
Never attempt to disassemble, modify or repair this unit. Tampering with the unit may result in malfunction, electric shock, or fire.

Please contact us with any questions related to the safe operation of this unit.
This equipment must be used in the manner specified in this instruction manual.

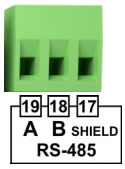
Connections

Power Supply



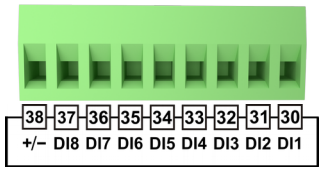
Terminal
+
-

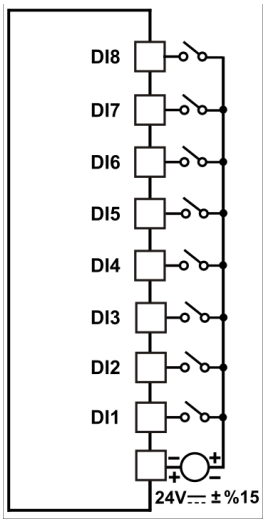
Communication Link with HMI Device



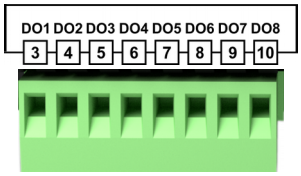
Terminal
A
B
GND

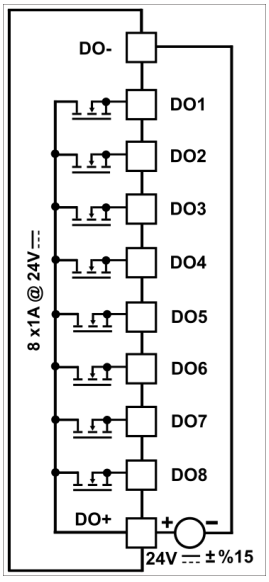
Digital Inputs



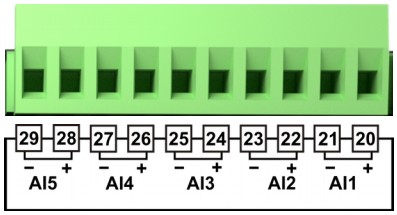
Terminal	Comment	Connection Sheme
DI8	Digital Inputs	
DI7		
DI6		
DI5		
DI4		
DI3		
DI2		
DI1		
+/-	NPN / PNP Selection of Digital Inputs	

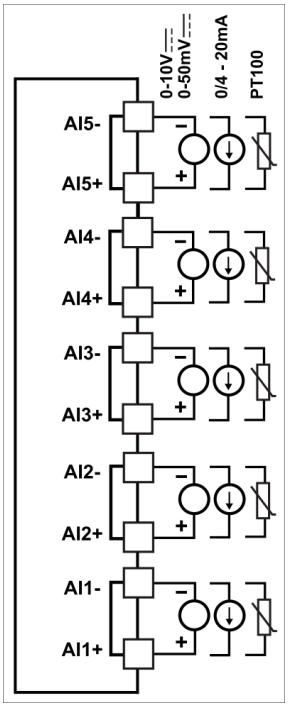
Digital Outputs



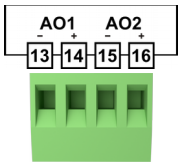
Terminal	Comment	Connection Sheme
DO1	Digital Outputs	
DO2		
DO3		
DO4		
DO5		
DO6		
DO7		
DO8		

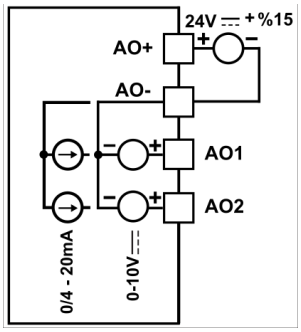
Analog Inputs



Terminal	Comment	Connection Scheme
AI5-	Analog Input5	
AI5+		
AI4-	Analog Input4	
AI4+		
AI3-	Analog Input3	
AI3+		
AI2-	Analog Input2	
AI2+		
AI1-	Analog Input1	
AI1+		

Analog Outputs



Terminal	Comment	Connection Scheme
AO+	Analog Output Supply	
AO-		
AO1	Analog Outputs	
AO2		

Technical Features

Power Supply

Power Supply	:	24VDC
Permissible Range	:	20.4 - 27.6 VDC
Power Consumption	:	3W

Digital Inputs

Digital Inputs	:	8 Input	
Nominal Input Voltage	:	24 VDC	
Input Voltage	:	**For Logic 0**	**For Logic 1**
		< 5 VDC	>10 VDC
Input Current	:	6mA max.	
Input Impedance	:	5.9 kΩ	
Response Time	:	'0' to '1' 50ms	
Galvanic Isolation	:	500 VAC for 1 minute	

High Speed Counter Inputs

HSC Inputs	:	2 Input(HSC1: DI1 and DI2, HSC2: DI3 and DI4)	
Nominal Input Voltage	:	24 VDC	
Input Voltage	:	**For Logic 0**	**For Logic 1**
		< 10 VDC	>20 VDC
Input Current	:	6mA max.	
Input Impedance	:	5.6 kΩ	
Frequency range	:	15KHz max. for single phase 10KHz max. for double phase	
Galvanic Isolation	:	500 VAC for 1 minute	

Digital Outputs

Digital Outputs		8 Output
Outputs Current	:	1 A max. (Total current 8 A max.)
Galvanic Isolation	:	500 VAC for 1 minute
Short Circuit Protection	:	Yes

Analog Inputs

Analog Inputs	:	5 Input			
Input Impedance	:	**PT-100**	**0/4-20mA**	**0-10V**	**0-50mV**
		-200°C-650°C	100Ω	>6.6kΩ	>10MΩ
Galvanic Isolation	:	No			
Resolution	:	14 Bits			
Accuracy	:	±0,25%			
Sampling Time	:	250 ms			
Status Indication	:	Yes			

Analog Outputs

Analog Output	:	2 Output	
		0/4-20mA	**0-10V**
Galvanic Isolation	:	No	
Resolution	:	12 Bits	
Accuracy	:	1% of full scale	

Internal Address Definitions

Communication Settings:

Parameters	Address	Options	Default
ID	40001	1–255	1
BAUDRATE	40002	0- 1200 / 1- 2400 / 2- 4000 / 3- 9600 / 4- 19200 / 5- 38400 / 6- 57600 /7- 115200	6
STOP BIT	40003	0- 1Bit / 1- 2Bit	0
PARITY	40004	0- None / 1- Even / 2- Odd	0

Device addresses:

Memory	Format	Arange	Address	Type
Digital Input	DIn	n: 0 – 7	10001 – 10008	Read
Digital Output	DOn	n: 0 – 7	1 – 8	Read-Write
Analog Input	AIn	n: 0 – 7	30004 – 30008	Read
Analog Output	AOn	n: 0 – 1	40010 – 40011	Read-Write
Version*	$(aaabbbbbccccccc)_{bit}$	n: 0	30001	Read

***Note:**The a bits in this address are major, b bits are minor version number, c bits indicate device type.
Example: Value read from 30001 $(0x2121)_{hex}$ = $(0010000100100001)_{bit}$,
a bits $(001)_{bit}$ = 1 (Major version number)
b bits $(00001)_{bit}$ = 1 (Minor version number)
c bits $(00100001)_{bit}$ = 33 (The device types are indicated in the table.)
Device version = V1.1
Device type = 0-10V Analog Input 0-10V Analog Output

Device Types:

Device Type	Value
PT100 Analog Input 4-20mA Analog Output	0
PT100 Analog Input 0-10V Analog Output	1
4-20mA Analog Input 4-20mA Analog Output	16
4-20mA Analog Input 0-10V Analog Output	17
0-10V Analog Input 4-20mA Analog Output	32
0-10V Analog Input 0-10V Analog Output	33
0-50mV Analog Input 4-20mA Analog Output	48
0-50mV Analog Input 0-10V Analog Output	49

The conversion of the values read from the module according to the analog input type is described in the following table:

Analog Input	The Value Range	Conversion Factor	Example of value shown in PROOP
PT-100 -200° – 650°	-2000 – 6500	$x10^{-1}$	Example-1: The read value as 100 is converted to 10°C.
			Example-2: The read value as 203 is converted to 20.3°C.
0 – 10V	0 – 20000	$0.5x10^{-3}$	Example-1: The read value as 2500 is converted to 1.25V.
0 – 50mV	0 – 20000	$2.5x10^{-3}$	Example-1: The read value as 3000 is converted to 7.25mV.
0/4 – 20mA	0 – 20000	$0.1x10^{-3}$	Example-1: The read value as 3500 is converted to 7mA.
			Example-2: The read value as 1000 is converted to 1mA.

The conversion of the values write at the module according to the analog output type is described in the following table:

Analog Output	The Value Range	Conversion Rate	Example of Value Written in Modules
0 – 10V	0 – 10000	$x10^{3}$	Example-1: The value to be written as 1.25V is converted to 1250.
0/4 – 20mA	0 – 20000	$x10^{3}$	Example-1: The value to be written as 1.25mA is converted to 1250.

Analog Input Specific Addresses:

Parameter	AI1	AI2	AI3	AI4	AI5	Default
Configuration Bits	40123	40133	40143	40153	40163	0
Minimum Scale Value	40124	40134	40144	40154	40164	0
Maximum Scale Value	40125	40135	40145	40155	40165	0
Scaled Value	30064	30070	30076	30082	30088	-

Analog Input Configuration Bits:

AI1	AI2	AI3	AI4	AI5	Description
40123.0_{bit}	40133.0_{bit}	40143.0_{bit}	40153.0_{bit}	40163.0_{bit}	**4-20mA/2-10V Select:** 0 = 0-20 mA/0-10 V 1 = 4-20 mA/2-10 V

The Scaled Value for analog inputs is calculated according to the state of the 4-20mA / 2-10V Selection configuration bit.

Analog Output Specific Addresses:

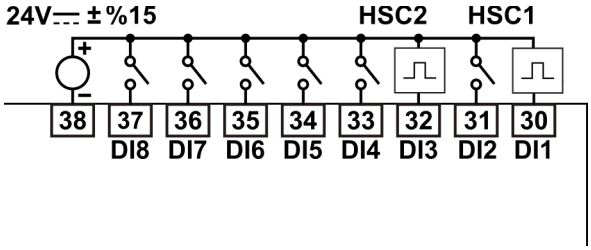
Parameter	AO1	AO2	Default
Minimum Scale Value for Input	40173	40183	0
Maximum Scale Value for Input	40174	40184	20000
Minimum Scale Value for Output	40175	40185	0
Maximum Scale Value for Output	40176	40186	10000/20000
Analog Output Function 0: Manual use 1: Using the scale values above, it reflects the input to the output. 2: It drives the analog output as PID output, using the minimum and maximum scale parameters for the output.	40177	40187	0

In case the analog output function parameter is set to 1 or 2;

- AI1 is used as input for A01 output.
- AI2 is used as input for A02 output.

*** Not:** Mirroring the input to output feature (Analoque Output Function = 1) cannot be used in modules with PT100 inputs.

HSC(High Speed Counter) Settings



Single Phase Counter Connection

High-speed counters count high speed events that cannot be controlled at PROOP-IO scan rates. The maximum counting frequency of a high-speed counter is 10kHz for Encoder inputs and 15kHz for counter inputs.
There are five basic types of counters: single-phase counter with internal direction control, single-phase counter with external direction control, two-phase counter with 2 clock inputs, A/B phase quadrature counter and frequency measurement type. Note that every mode is not supported by every counter. You can use each type except the frequency measurement type: without reset or start inputs, with reset and without start, or with both start and reset inputs.
- When you activate the reset input, it clears the current value and holds it clear until you deactivate reset.
- When you activate the start input, it allows the counter to count. While start is deactivated, the current value of the counter is held constant and clocking events are ignored.
- If reset is activated while start is inactive, the reset is ignored and the current value is not changed. If the start input becomes active while the reset input is active, the current value is cleared.

HSC Modbus Addresses:

Parameters	Address	Default
HSC1 Configuration ve Mode Select*	40012	0
HSC2 Configuration ve Mode Select*	40013	0
HSC1 New Current Value (Least Significant 16 byte)	40014	0
HSC1 New Current Value (Most Significant 16 byte)	40015	0
HSC2 New Current Value (Least Significant 16 byte)	40016	0
HSC2 New Current Value (Most Significant 16 byte)	40017	0
HSC1 Current Value (Least Significant 16 byte)	30010	0
HSC1 Current Value (Most Significant 16 byte)	30011	0
HSC2 Current Value (Least Significant 16 byte)	30012	0
HSC2 Current Value (Most Significant 16 byte)	30013	0

*** Note:** This parameter;
- Least Significant byte is the Mode parameter.
- Most Significant byte is the Configuration parameter.

HSC Configuration Description:

HSC1	HSC2	Description
40012.8_{bit}	40013.8_{bit}	**Active level control bit for Reset:** 0 = Reset is active low 1 = Reset is active high
40012.9_{bit}	40013.9_{bit}	**Active level control bit for Start:** 0 = Start is active low 1 = Start is active high
40012.10_{bit}	40013.10_{bit}	**Counting direction control bit:** 0 = Count down 1 = Count up
40012.11_{bit}	40013.11_{bit}	**Write the new current value to the HSC:** 0 = No update 1 = Update current value
40012.12_{bit}	40013.12_{bit}	**Enable the HSC:** 0 = Disable the HSC 1 = Enable the HSC
40012.13_{bit}	40013.13_{bit}	Reserve
40012.14_{bit}	40013.14_{bit}	Reserve
40012.15_{bit}	40013.15_{bit}	Reserve

HSC Modes:

Mode	Description	Inputs			
	HSC1	**DI1**	**DI2**	**DI5**	**DI6**
	HSC2	**DI3**	**DI4**	**DI7**	**DI8**
0	**Single Phase Counter with Internal Direction**	Clock			
1		Clock		Reset	
2		Clock		Reset	Start
3	**Single Phase Counter with External Direction**	Clock	Direction		
4		Clock	Direction	Reset	
5		Clock	Direction	Reset	Start
6	**Two Phase Counter with 2 Clock Input**	Clock Up	Clock Down		
7		Clock Up	Clock Down	Reset	
8		Clock Up	Clock Down	Reset	Start
9	**A/B Phase Encoder Counter**	Clock A	Clock B		
10		Clock A	Clock B	Reset	
11		Clock A	Clock B	Reset	Start
12	**Reserve**				
13	**Reserve**				
14	**Period Measurement (with 10 µs sampling time)**	Period Input			
15	**Counter / Period Ölçümü (1ms sampling time)**	Max. 15 kHz	Max. 15 kHz	Max. 1 kHz	Max. 1 kHz

Specific Addresses for Mode 15:

Parameter	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	Default
Configuration Bits	40193	40201	40209	40217	40225	40233	40241	40249	2
Period Reset Time (1-1000 sn)	40196	40204	40212	40220	40228	40236	40244	40252	60
Counter low-order 16-bit value	30094	30102	30110	30118	30126	30134	30142	30150	-
Counter high-order 16-bit value	30095	30103	30111	30119	30127	30135	30143	30151	-
Period low-order 16-bit value(ms)	30096	30104	30112	30120	30128	30136	30144	30152	-
Period high-order 16-bit value(ms)	30097	30105	30113	30121	30129	30137	30145	30153	-

Configuration Bits:

DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	Description
40193.0_{bit}	40201.0_{bit}	40209.0_{bit}	40217.0_{bit}	40225.0_{bit}	40233.0_{bit}	40241.0_{bit}	40249.0_{bit}	**DIx enable bit:** 0 = DIx enable 1 = DIx disable
40193.1_{bit}	40201.1_{bit}	40209.1_{bit}	40217.1_{bit}	40225.1_{bit}	40233.1_{bit}	40241.1_{bit}	40249.1_{bit}	**Count direction bit:** 0 = Count down 1 = Count up
40193.2_{bit}	40201.2_{bit}	40209.2_{bit}	40217.2_{bit}	40225.2_{bit}	40233.2_{bit}	40241.2_{bit}	40249.2_{bit}	**Reserve**
40193.3_{bit}	40201.3_{bit}	40209.3_{bit}	40217.3_{bit}	40225.3_{bit}	40233.3_{bit}	40241.3_{bit}	40249.3_{bit}	**DIx count reset bit:** 1 = Reset the DIx counter

PID Settings

The PID or On/Off control feature can be used by setting the parameters determined for each analog input in the module. The analog input with PID or ON/OFF function activated controls the corresponding digital output. The digital output associated with the channel whose PID or ON/OFF function is activated cannot be driven manually.
Analog input AI1 controls digital output DO1.
Analog input AI2 controls digital output DO2.
Analog input AI3 controls digital output DO3.
Analog input AI4 controls digital output DO4.
Analog input AI5 controls digital output DO5.

PID Parameters:

Parameter	Description
PID Active	Enables PID or ON/OFF operation. 0 = Manual use 1 = PID active 2 = ON/OFF active
Set Value	It is the set value for PID or ON/OFF operation. PT100 values can be between -200.0 and 650.0 for input, 0 and 20000 for other types.
Set Offset	It is used as Set Offset value in PID operation. It can take values between -325.0 and 325.0 for PT100 input, -10000 to 10000 for other types.
Set Hysteresis	It is used as Set Hysteresis value in ON/OFF operation. It can take values between -325.0 and 325.0 for PT100 input, -10000 to 10000 for other types.
Minimum Scale Value	Working scale is the lower limit value. PT100 values can be between -200.0 and 650.0 for input, 0 and 20000 for other types.
Maximum Scale Value	Working scale is the upper limit value. PT100 values can be between -200.0 and 650.0 for input, 0 and 20000 for other types.
Heating Proportional Value	Proportional value for heating. It can take values between 0.0 and 100.0.
Heating Integral Value	Integral value for heating. It can take values between 0 and 3600 seconds.
Heating Derivative Value	Derivative value for heating. It can take values between 0.0 and 999.9.
Cooling Proportional Value	Proportional value for cooling. It can take values between 0.0 and 100.0.
Cooling Integral Value	Integral value for cooling. It can take values between 0 and 3600 seconds.
Cooling Derivative Value	Derivative value for cooling. It can take values between 0.0 and 999.9.
Output Period	Output is the control period. It can take values between 1 and 150 seconds.
Heating/Cooling Select	Specifies the channel operation for PID or ON/OFF. 0 = Heating 1 = Cooling
Auto Tune	Starts Auto Tune operation for PID. 0 = Auto Tune passive 1 = Auto Tune active

*** Note:** For the values in dotted notation, 10 times the real value of these parameters are used in Modbus communication.

PID Modbus Addresses:

Parameter	AI1 Address	AI2 Address	AI3 Address	AI4 Address	AI5 Address	Default
PID Active	40023	40043	40063	40083	40103	0
Set Value	40024	40044	40064	40084	40104	0
Set Offset	40025	40045	40065	40085	40105	0
Sensor Offset	40038	40058	40078	40098	40118	0
Set Hysteresis	40026	40046	40066	40086	40106	0
Minimum Scale Value	40027	40047	40067	40087	40107	0/-200.0
Maximum Scale Value	40028	40048	40068	40088	40108	20000/650.0
Heating Proportional Value	40029	40049	40069	40089	40109	10.0
Heating Integral Value	40030	40050	40070	40090	40110	100
Heating Derivative Value	40031	40051	40071	40091	40111	25.0
Cooling Proportional Value	40032	40052	40072	40092	40112	10.0
Cooling Integral Value	40033	40053	40073	40093	40113	100
Cooling Derivative Value	40034	40054	40074	40094	40114	25.0
Output Period	40035	40055	40075	40095	40115	1
Heating/Cooling Select	40036	40056	40076	40096	40116	0
Auto Tune	40037	40057	40077	40097	40117	0
PID Instant Output Value (%)	30024	30032	30040	30048	30056	-
PID Status Bits	30025	30033	30041	30049	30057	-
PID Configuration Bits	40039	40059	40079	40099	40119	0
Auto Tune Status Bits	30026	30034	30042	30050	30058	-

PID Configuration Bits :

AI1 Address	AI2 Address	AI3 Address	AI4 Address	AI5 Address	Description
40039.0_{bit}	40059.0_{bit}	40079.0_{bit}	40099.0_{bit}	40119.0_{bit}	**PID pause:** 0 = PID operation continues. 1 = PID is stopped and the output is turned off.

PID Status Bits :

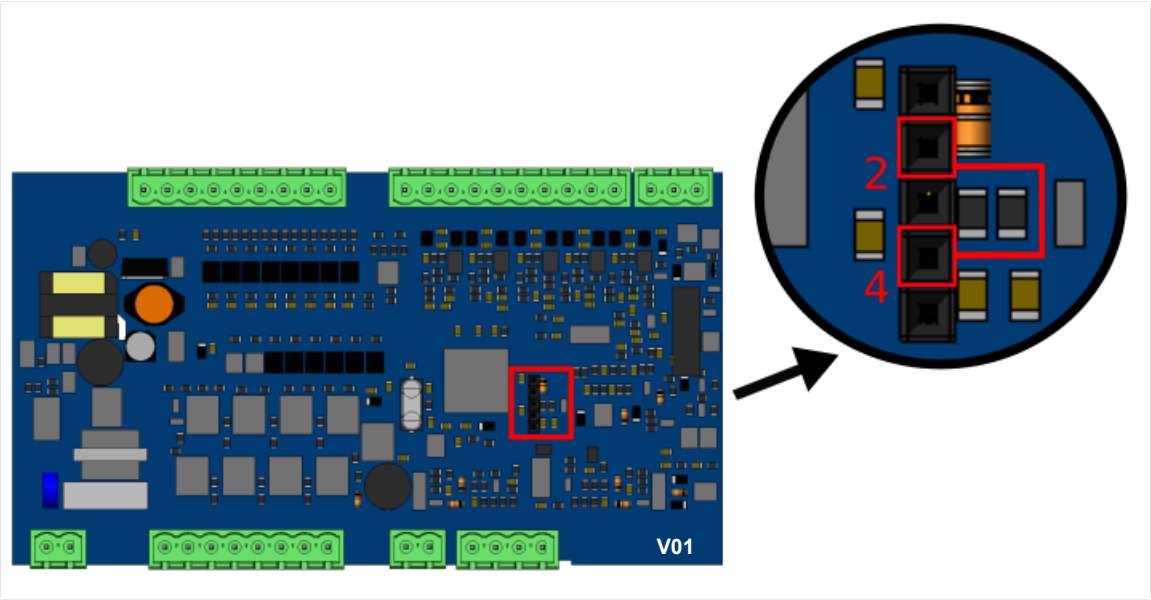
AI1 Address	AI2 Address	AI3 Address	AI4 Address	AI5 Address	Description
30025.0_{bit}	30033.0_{bit}	30041.0_{bit}	30049.0_{bit}	30057.0_{bit}	**PID calculation status:** 0 = Calculating PID 1 = PID is not calculated.
30025.1_{bit}	30033.1_{bit}	30041.1_{bit}	30049.1_{bit}	30057.1_{bit}	**Integral calculation status:** 0 = Calculating integral 1 = Integral is not calculated

Auto Tune Status Bits :

AI1 Address	AI2 Address	AI3 Address	AI4 Address	AI5 Address	Description
30026.0_{bit}	30034.0_{bit}	30042.0_{bit}	30050.0_{bit}	30058.0_{bit}	**Auto Tune first step status:** 1 = The first step is active.
30026.1_{bit}	30034.1_{bit}	30042.1_{bit}	30050.1_{bit}	30058.1_{bit}	**Auto Tune second step status:** 1 = The second step is active.
30026.2_{bit}	30034.2_{bit}	30042.2_{bit}	30050.2_{bit}	30058.2_{bit}	**Auto Tune third step status:** 1 = The third step is active.
30026.3_{bit}	30034.3_{bit}	30042.3_{bit}	30050.3_{bit}	30058.3_{bit}	**Auto Tune final step status:** 1 = Auto Tune complete.
30026.4_{bit}	30034.4_{bit}	30042.4_{bit}	30050.4_{bit}	30058.4_{bit}	**Auto Tune Timeout error:** 1 = There is a timeout.

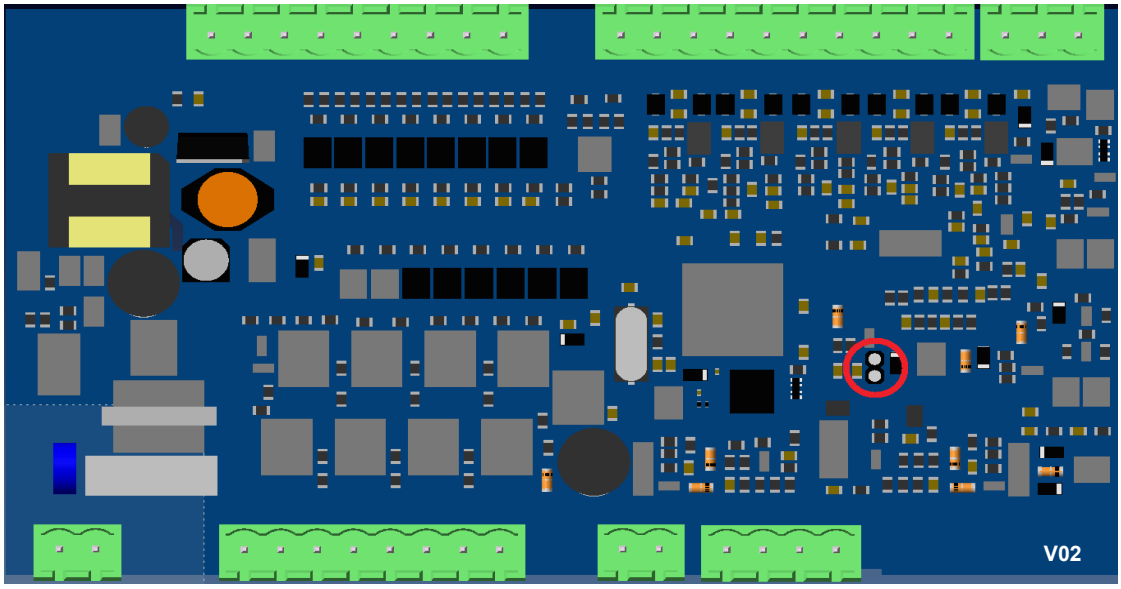
Installing Communication Settings by Default

For cards with version V01;



1- Power off the I/O Module device.
2- Lift the cover of the device.
3- Short circuit pins 2 and 4 on the socket shown in the picture.
4- Wait for at least 2 seconds by energizing. After 2 seconds, the communication settings will return to default.
5- Remove the short circuit.
6- Close the device cover.

For cards with version V02;



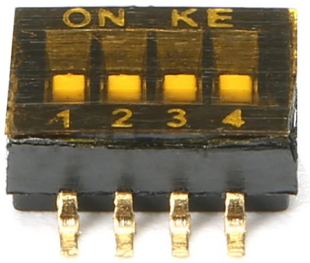
1- Power off the I/O Module device.
2- Lift the cover of the device.
3- Put a jumper on the socket shown in the picture.
4- Wait for at least 2 seconds by energizing. After 2 seconds, the communication settings will return to default.
5- Remove the jumper.
6- Close the device cover.

Modbus Slave Address Selection

The slave address can be set from 1 to 255 at address 40001 of the modbus. In addition, the Dip Switch on the card can be used to set the slave address on V02 cards.

	DIP SWITCH			
SLAVE ID	**1**	**2**	**3**	**4**
Not1	ON	ON	ON	ON
1	OFF	ON	ON	ON
2	ON	OFF	ON	ON
3	OFF	OFF	ON	ON
4	ON	ON	OFF	ON
5	OFF	ON	OFF	ON
6	ON	OFF	OFF	ON
7	OFF	OFF	OFF	ON
8	ON	ON	ON	OFF
9	OFF	ON	ON	OFF
10	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF
12	ON	ON	OFF	OFF
13	OFF	ON	OFF	OFF
14	ON	OFF	OFF	OFF
15	OFF	OFF	OFF	OFF

DIP SWITCH



Note 1: When all of the Dip Switches are ON, the value in Modbus register 40001 is used as the slave address.

Warranty

This product is warranted against defects in materials and workmanship for a period of two years from the date of shipment to Buyer. The Warranty is limited to repair or replacement of the defective unit at the option of the manufacturer. This warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts.
Do not clean the case with hydrocarbon based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device.

Other Informations

Manufacturer Information:
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Bursa Organize Sanayi Bölgesi, (Fethiye OSB Mah.)
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