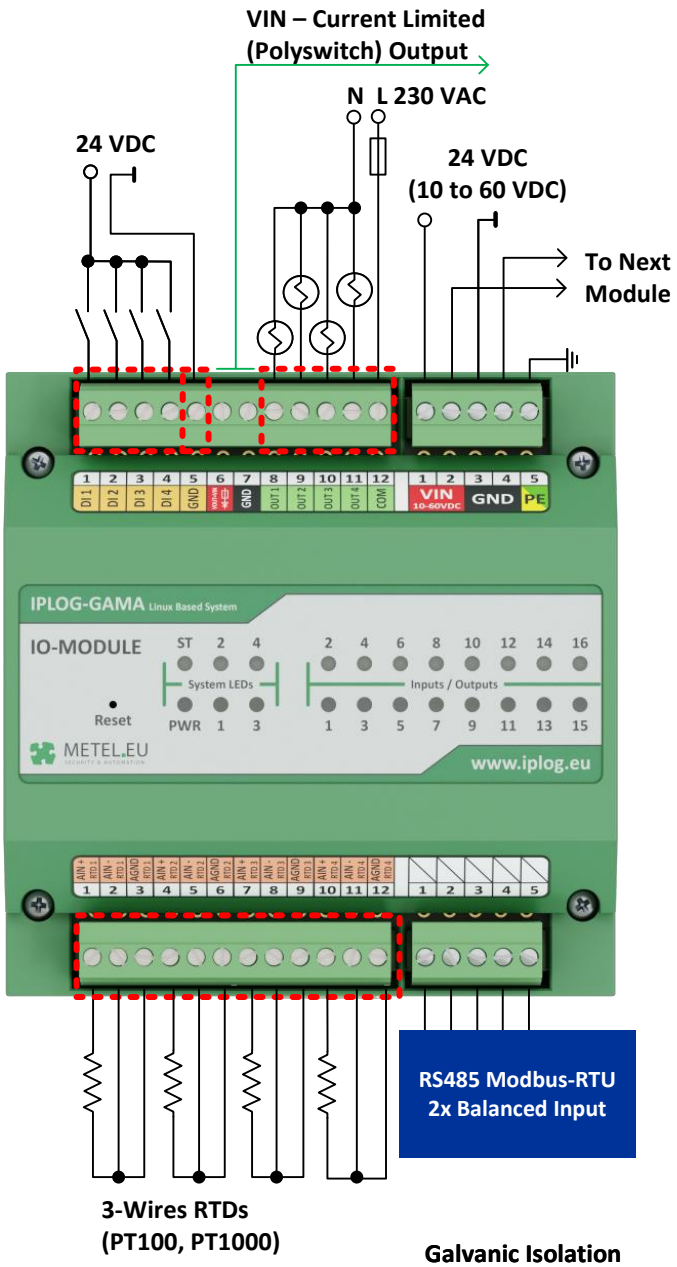
- 4x 24-bit Analog RTD Inputs
- 4x SSR Outputs
- 4x 24 V Digital Inputs
- 1x Slot for IF Module
- Operating Range –40°C to +70°C
- 600 W Integrated Surge Protections

PRODUCT NAME	CODE	NOTE
AI4.1-05-DIN	6000-0307	1x RS485, 2x ALARM INPUT

AI4.1 is an industrial module which can be easily adapted for a wide range of tasks. It can be used as IPLOG-G submodule or as standalone addressable module at MODBUS RTU bus.

	PARAMETER	VALUES	NOTE
DEVICE	Power Supply	24, 48 VDC	10 to 60 VDC
	Consumption	Max. 1.5 W	
	Surge Protection	600 W	10/1000 µs
	Operating Range	–40 to +70 °C	
	Storage Range	–40 to +70 °C	
	Humidity	Max. 95 %	No-condensing
	Dimension	120 x 123 x 49,5 mm	W x H x D
	Weight	Max. 0.38 kg	
	Installation	DIN35 or Flat Surface	
	Device Class	I	EN 61140
	Ingress Protection	IP 20	EN 60529
	Cover Material	ABS UL94 V0	
	Degree of pollution	II	EN 60664-1
	Connections	Screw Terminals	
	Conduct. cross-section	Max. 2.5 mm²	

	PARAMETER	VALUES	NOTE
CPU	Series	32-bit MCU	
	Frequency	64 MHz	
	Flash	512 kB	
	RAM	64 kB	



Safety Precautions

If dangerous voltage is applied to the terminals, only personnel with appropriate electrical education may perform installation and servicing of the equipment. In the event of a fault, the device must be sent to the producer for repair. The device must be earthed in accordance with national standards. We recommend the manipulation of terminal blocks, only in the event they are not in the presence of dangerous voltage. Failure to comply with this recommendation may result in the risk of electrical shock.

Location and Designation of Connectors and LEDs

NOTE: The order of the terminal numbers in the table below corresponds to the order of the terminal numbers found on the device.

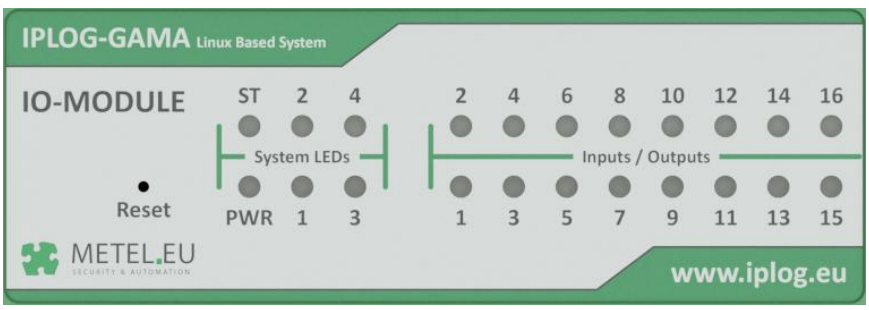
CONNECTOR A			LED	
12	COM	Common Terminal of OUT 1-4		
11	OUT 4	Normally Open	OUT4	Closed = Log. 1 = Lights
10	OUT 3	Normally Open	OUT3	Closed = Log. 1 = Lights
9	OUT 2	Normally Open	OUT2	Closed = Log. 1 = Lights
8	OUT 1	Normally Open	OUT1	Closed = Log. 1 = Lights
7	GND	Ground		
6	VOUT	Power Output Max. 100 mA, VOUT = VIN – 0.7 V		
5	GND	Common Ground Terminal of Digit, Inputs 1 to 4		
4	DI 4	Digital Input 24 V - DC / AC	DI4	Log. 1 = Lights
3	DI 3	Digital Input 24 V - DC / AC	DI3	Log. 1 = Lights
2	DI 2	Digital Input 24 V - DC / AC	DI2	Log. 1 = Lights
1	DI 1	Digital Input 24 V - DC / AC	DI1	Log. 1 = Lights

CONNECTOR B			LED	
5	PE	Earthing Terminal		
4	GND	Power Input – Minus Terminals Terminals are Internally Interconnected	PWR	Power is Connected, LED Lights Up.
3				
2	VIN 10-60 V DC	Power Input – Plus Terminals Terminals are Internally Interconnected		
1				

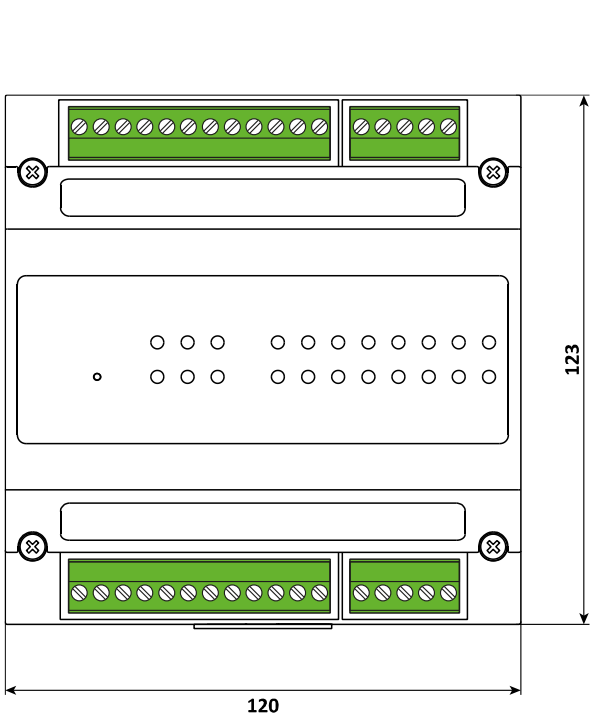
CONNECTOR C			LED	
12	AGND	Ground for RTD4	RTD4	Flashing = Connected and Configured Sensor
11	AIN-	Analog Input – RTD4		
10	AIN+	Analog Input + RTD4		
9	AGND	Ground for RTD3	RTD3	Flashing = Connected and Configured Sensor
8	AIN-	Analog Input – RTD3		
7	AIN+	Analog Input + RTD3		
6	AGND	Ground for RTD2	RTD2	Flashing = Connected and Configured Sensor
5	AIN-	Analog Input – RTD2		
4	AIN+	Analog Input + RTD2		
3	AGND	Ground for RTD1	RTD1	Flashing = Connected and Configured Sensor
2	AIN-	Analog Input – RTD1		
1	AIN+	Analog Input + RTD1		

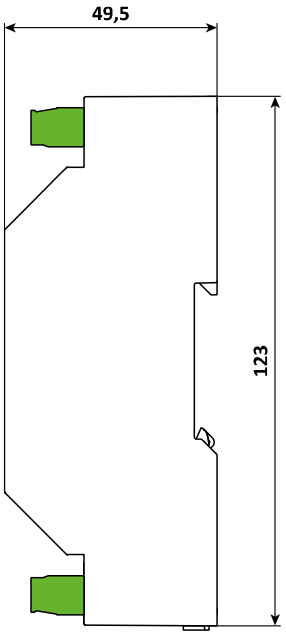
LED		LED	
1	BUS 1 (Tx = Red / Rx = Green)	3	IF05 Input BI1 Sabotage Short = Log. 1 = Lights
2	BUS 2 (Tx = Red / Rx = Green)	4	IF05 Input BI2 Sabotage Short = Log. 1 = Lights

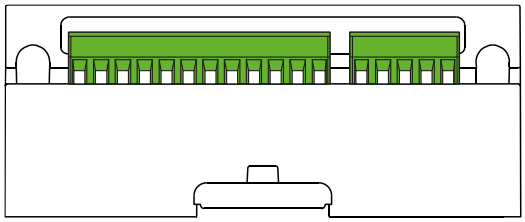
Galvanic Isolation

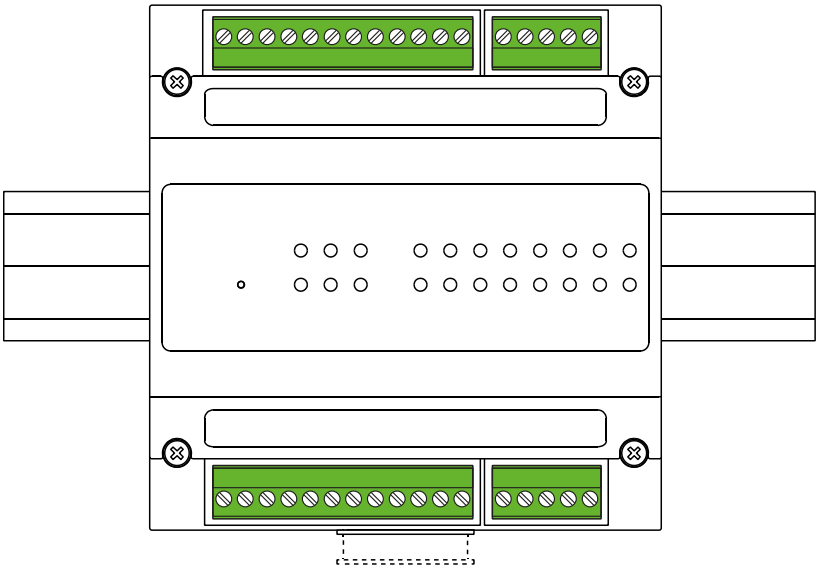


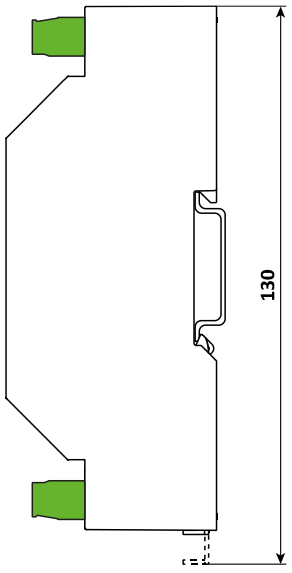
Dimensions and Installation of DIN Version











Default Settings of MODBUS Communication

Device ID: **1** | Speed: **115 200** | Parity: **None** | Data bits: **8** | Stop bits: **1**

Modbus registers

	Subject	Type	R/W	Value	Offset
Device Identification	Product Type	u8[3]	R		1002–04
	Serial Number	u32	R		1005–06
	PCB Version	u32	R		1007–08
	PCB Revision	u16	R		1009
	FW Version Major	u16	R		1010
	FW Version Minor	u16	R		1011
	FW Version - Revision	u32	R		1012–13
	IF#01 Slot State	u16	R	0 = N/A 1 = IF#01 not Inserted 2 = IF#01 Inserted, CRC error 3 = IF#01 Inserted, CRC OK	1021
	IF#01 Product Type	u8[3]	R		1022–24
	IF#01 Serial Number	u32	R		1025–26
	IF#01 PCB Version	u32	R		1027–28
	IF#01 PCB Revision	u16	R		1029
Device Control	Reset	u16	RW	55203 = To Reboot	1201
	Bootloader / Application	u16	R	0x00A – Application, 0x00B – Bootloader	1203
	Restart to Bootloader (1)	u16	RW	617 = To Bootloader else = deactivate bootloader	1204
Device Status	Board Power Voltage	u16	R	105 = 10,5V	1311
	Board Temperature	s16	R	-200 = -20,0°C 250 = 25,0°C	1321

(1) To activate the bootloader, it is necessary to write a value of 617 in the registry and restart the device. To reactivate the application, enter any value other than 617 in the appropriate registry and restart the device. If the device is in the bootloader, the LED 1 will flash red.

	Subject	Type	R/W	Value	Offset
BUS 1 Settings	Baudrate	u16	RW	192 = 19 200 bps 1152 = 115 200 bps 9216 = 921 600 bps 10000 = 1 000 000 bps	2110
	Databits	u16	RW	8 = 8b, 9 = 9b	2111
	Parity	u16	RW	78 = None 69 = Even 79 = Odd	2112
	Stopbits	u16	RW	10=1, 20=2, 15=1,5	2113
	MODBUS address	u16	RW	1 - 247	2120

	Subject	Channel	Type	R/W	Value	Offset
IF-05 States of Inputs	Balanced Input 1 $_{BIN}$	DI#33	bit	R	0 = inactive 1 = active	3033
	Balanced Input 2 $_{BIN}$	DI#34	bit	R		3034
	Balanced Input 1	AI#33	u16	R	1000 = 1000 Ω 0 = 0 Ω	5033
	Balanced Input 2	AI#34	u16	R		5034

	Subject	Channel	Type	R/W	Value	Offset
States of Digital Inputs and Outputs	Digital Input 1	DI#01	bit	R	0 = inactive 1 = active	3001
	Digital Input 2	DI#02	bit	R		3002
	Digital Input 3	DI#03	bit	R		3003
	Digital Input 4	DI#04	bit	R		3004
	COIL Output 1	DI#05	bit	R		3005
	COIL Output 2	DI#06	bit	R		3006
	COIL Output 3	DI#07	bit	R		3007
	COIL Output 4	DI#08	bit	R		3008
	RTD 1	DI#09	bit	R		3009
	RTD 2	DI#10	bit	R		3010
	RTD 3	DI#11	bit	R		3011
	RTD 4	DI#12	bit	R		3012
	Inputs	DI#16 - DI#01	u16	R	0x0000 - 0x0FFF	3001

	Subject	Channel	Type	R/W	Value	Offset
Input Mode	Digital Input 1	DI#01 mode	u16	RW	0 = None(1) 1 = Falling Edge 2 = Rising Edge 3 = Change Edge	3101
	Digital Input 2	DI#02 mode	u16	RW		3102
	Digital Input 3	DI#03 mode	u16	RW		3103
	Digital Input 4	DI#04 mode	u16	RW		3104
Counter	Digital Input 1	DI#01 counter	u32	R		3201 - 02
	Digital Input 2	DI#02 counter	u32	R		3203 - 04
	Digital Input 3	DI#03 counter	u32	R		3205 - 06
	Digital Input 4	DI#04 counter	u32	R		3207 - 08

	Subject	Channel	Type	R/W	Value	Offset
Measured Resistance Values	RTD 1	AI#01	s32	R	1000 = 1 Ω 0 = 0 Ω -1000 = -1 Ω	5051-52
	RTD 2	AI#02	s32	R		5053-54
	RTD 3	AI#03	s32	R		5055-56
	RTD 4	AI#04	s32	R		5057-58
Temp.	RTD 1 Temp	AI#06	s32	R	1000 = 1 °C 0 = 0 °C -1000 = -1 °C	5061-62
	RTD 2 Temp	AI#07	s32	R		5063-64
	RTD 3 Temp	AI#08	s32	R		5065-66
	RTD 4 Temp	AI#09	s32	R		5067-68
Type of Inputs	RTD 1 Type	AI#01 Par.	u16	RW	0 - None(1) 1 - PT100 2 - PT500(2) 3 - PT1000	5101
	RTD 2 Type	AI#02 Par.	u16	RW		5102
	RTD 3 Type	AI#03 Par.	u16	RW		5103
	RTD 4 Type	AI#04 Par.	u16	RW		5104
Type of Connections	RTD 1 Mode	AI#11 Par.	u16	RW	0 - None(1) 2 - 2-Wire(2) 3 - 3-Wire	5111
	RTD 2 Mode	AI#12 Par.	u16	RW		5112
	RTD 3 Mode	AI#13 Par.	u16	RW		5113
	RTD 4 Mode	AI#14 Par.	u16	RW		5114
Resistance Correction PT1000	RTD 1 Offset	AI#21 Par.	s16	RW	1000 = 1 Ω 0 = 0 Ω(1) -1000 = -1 Ω	5121
	RTD 2 Offset	AI#22 Par.	s16	RW		5122
	RTD 3 Offset	AI#23 Par.	s16	RW		5123
	RTD 4 Offset	AI#24 Par.	s16	RW		5124
Resistance Correction PT100	RTD 1 Offset	AI#31 Par.	s16	RW	1000 = 1 Ω 0 = 0 Ω(1) -1000 = -1 Ω	5131
	RTD 2 Offset	AI#32 Par.	s16	RW		5132
	RTD 3 Offset	AI#33 Par.	s16	RW		5133
	RTD 4 Offset	AI#34 Par.	s16	RW		5134

(1) Default Settings
(2) Preliminary

Subject		Channel	Type	R/W	Value	Offset
SSR Outputs	Output 1	DO#01	bit	RW	0 = inactive 1 = active	4001
	Output 2	DO#02	bit	RW		4002
	Output 3	DO#03	bit	RW		4003
	Output 4	DO#04	bit	RW		4004
	Outputs	DO#16 - DO#01	u16	RW	0x0000 - 0x000F	4001
Outputs Mode	Output 1	DO#01 Mode	u16	RW	1 - State(1) 2 - PWM 3 - Pulse(2)	4201
	Output 2	DO#02 Mode	u16	RW		4202
	Output 3	DO#03 Mode	u16	RW		4203
	Output 4	DO#04 Mode	u16	RW		4204
State of Output Mode	Output 1	DO#01 M_st	u16	RW	0 = inactive 1 = active	4301
	Output 2	DO#02 M_st	u16	RW		4302
	Output 3	DO#03 M_st	u16	RW		4303
	Output 4	DO#04 M_st	u16	RW		4304
Pulse Width HIGH	Output 1 PWM High	DO#01 Par1	u16	RW	0 = None(1) 1 = 100µs 10 = 1ms	4401
	Output 2 PWM High	DO#02 Par1	u16	RW		4402
	Output 3 PWM High	DO#03 Par1	u16	RW		4403
	Output 4 PWM High	DO#04 Par1	u16	RW		4404
Pulse Width LOW	Output 1 PWM Low	DO#01 Par2	u16	RW	0 = None(1) 1 = 100µs 10 = 1ms	4601
	Output 2 PWM Low	DO#02 Par2	u16	RW		4602
	Output 3 PWM Low	DO#03 Par2	u16	RW		4603
	Output 4 PWM Low	DO#04 Par2	u16	RW		4604

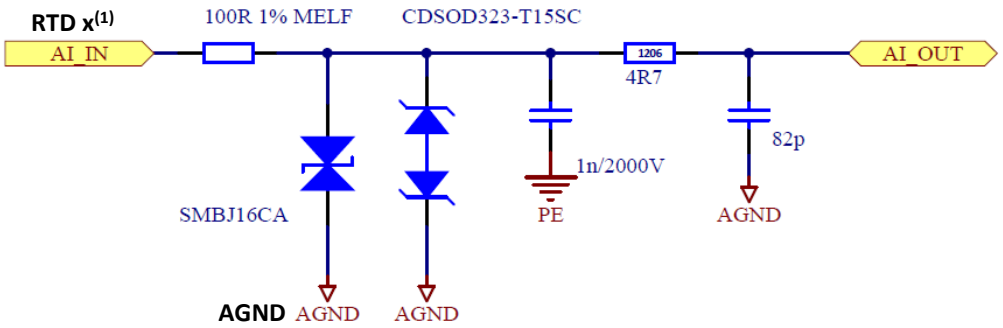
(1) Default Settings
(2) Preliminary

REVISION: 201912 – Default
202111 – Updated list IF modules
202606 – DIN version

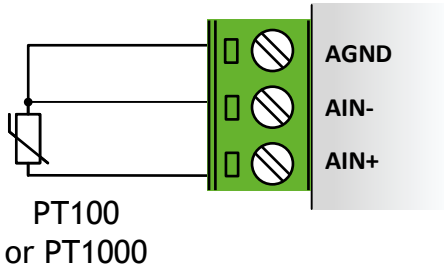
RTD inputs are intended for connection of PT100 and PT1000 resistance temperature sensors. Depending on their mechanical design, they allow highly accurate temperature measurement over a very wide range. RTD inputs support three-wire sensor wiring with resistance-compensated connection wires.

🕮 **The measured values are transmitted by the AD converters connected to the RTD inputs to the control program directly in Milliohms and degrees Celsius. When designing a control program, it is therefore not necessary to complicate the translated measured values from hexadecimal values.**

Internal Connection



Example of Connection



The PT100/PT1000 sensor is connected between the AIN+ / AIN- terminals and the compensating wire to the AGND terminal. To avoid interference, we recommend using a shielded cable connection.

Technical Parameters

Parameter	Value	Note
Resistive Ranges	PT100, PT1000	
Sensor Connection	3-wires	
Sampling Rate	1 kSps	
Resolution	24-bit	
Isolation Voltage	1.000 V_{RMS}	RTDx / CPU
	No	Between RTDx
Overvoltage Protection	600 W	10 / 1000 µs

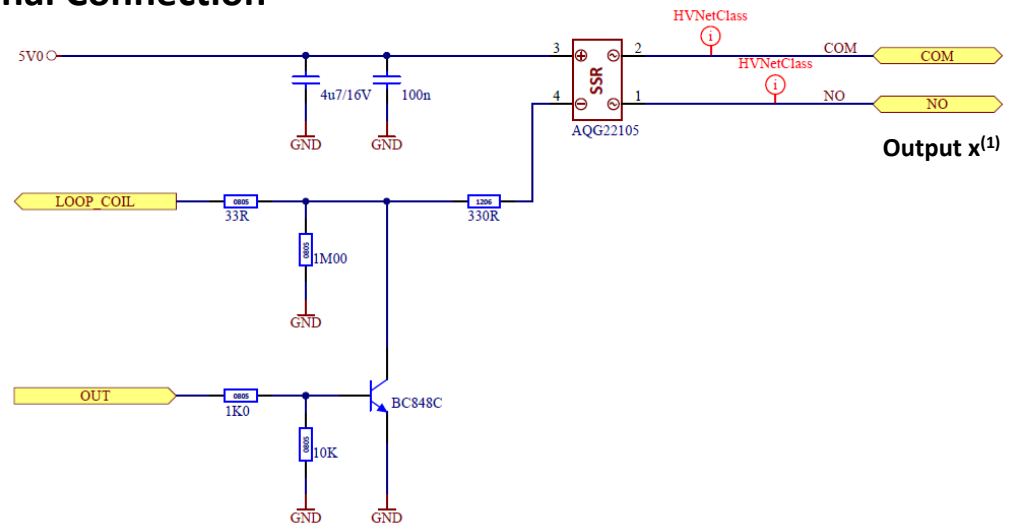
(1) The letter „x“ replaces the input number.

The SSR (Solid State Relay) outputs are equipped with somiconductor relays for switching AC-powered loads. Outputs programmable with METEL IEC 61131-3 IDE or Bash scripts in Linux support 2 operating modes:

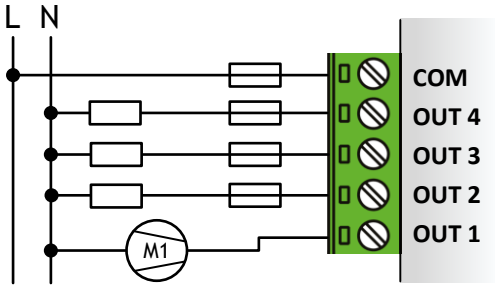
- **PWM mode** for speed control of small asynchronous motors (fans, pumps).
- **Two-state mode** (state mode), where the output is permanently on / off (heating control).

The logic status of each output is signaled by the corresponding OUT1 - 4 LED located on the front panel. For details, refer to the table "Location and Designation of Connectors and LEDs".

Internal Connection



Example of Connection



The SSR outputs are connected to OUT1 - OUT4 terminals with a common COM terminal and galvanic isolation from other circuits. The example on the left shows the connection of the heating elements and the fan. The PLC driver controls the outputs via Modbus registers. Depending on the selected mode, the outputs are controlled in two states (State mode) or analogue (PWM mode).

All terminals where dangerous voltages may occur due to their use / connection must be protected by an external circuit breaker or fuse. For SSR output terminals, we recommend using a max. 1A circuit breaker for the OUT1 - OUT4 terminal and 4A for the COM terminal.

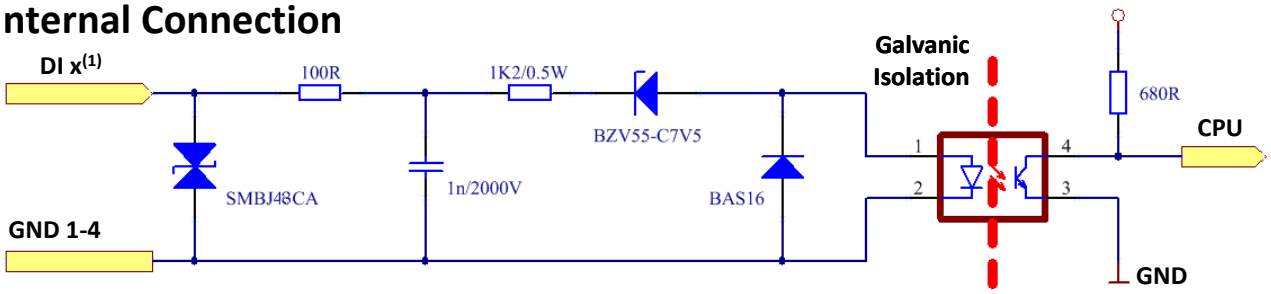
Technical Parameters

Parameter	Value	Note
Output Type	MOSFET	
Voltage	75 VAC to 264 VAC	45 to 65 Hz
Current Load	Max. 1 A	Minimal 20 mA
Contact Form	SPST (1 Form A)	
Isolation Resistance	Min. 10^9 Ω	Input / Output
Breakdown Voltage	3.000 Vrms	Input / Output
Isolation Voltage Between SSR Outputs	1.500 Vrms	

(1) The letter „x“ replaces the output number.

Optically isolated inputs are optimised for 24V DC/AC levels. They can be connected to external devices such as sensors, switches, buttons, door contacts etc. Each input serves also to counter functions where local CPU counts pulses into the internal memory accessible from METEL IEC 61131-3 IDE or directly from Linux scripts. Inputs are divided into groups with common GND terminals. For details please see the table „Location and Designation of Connectors and LEDs “. Logic state 1 of each input is signalized by a relevant LED diode on the front panel.

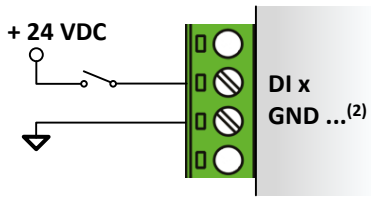
Internal Connection



Examples of Connections

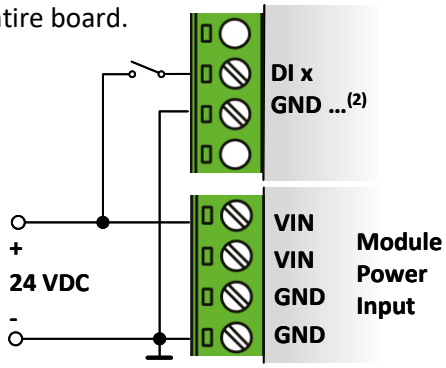
Optically Isolated Sinking Input

The input is powered from an external optically isolated power source. This wiring protects the system from the occurrence of ground loops.



Non-isolated DI Sinking Input

The input is powered from the same source as the entire board.



Technical Parameters

Parameter	Value	Note
Input Voltage DC / AC	Log. 0: −30 V to 5 V	
	Log. 1: +15 V to 30 V	Max. 50 V / 1 s
Digital Input Type	2 (24 VDC)	IEC 61131-2
Input Current	12 mA at 24 VDC	
Galvanic Isolation	2.500 V_{RMS}	DIx / CPU
	1.000 V_{RMS}	Between Groups of DI
Surge Protection	600 W	10 / 1000 µs
Max. Counting Frequency	20 kHz	Duty Cycle 1:1

(1) The letter „x“ replaces the input numbers.

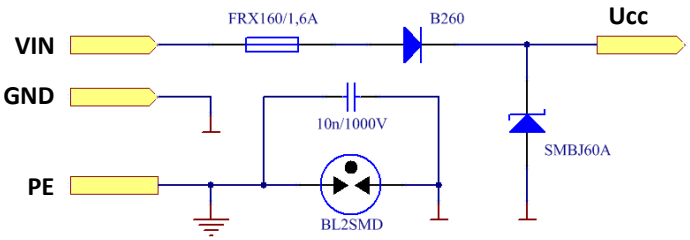
(2) Common ground terminal is shared by group of digital inputs. „...“ replaces the input numbers.

The PE terminal must be earthed according to the applicable standards in the country of installation. Correct grounding protects personnel against electric shock and improves device immunity from interferences. If dangerous voltage is applied to the terminals, only personnel with appropriate electrical education may perform installation and servicing of the equipment. Before any manipulation of the device, including disconnecting and connecting the terminals, the dangerous voltage must be disconnected.

POWER INPUT

The supply voltage is connected to VIN and GND terminals. The terminals are doubled for easier connection between the modules installed side by side.

Internal Connection of POWER INPUT



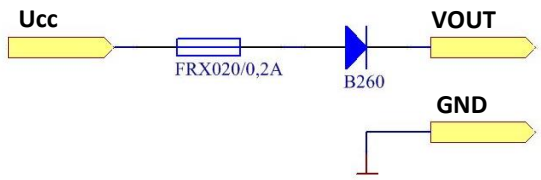
🕮 **The cover of the device is galvanically connected to the PE terminal which is galvanically isolated from the device electronic. It allows the user to use the device even in systems with a grounded + pole.**

Parameter	Value	Note
Input Voltage Range	10 to 60 VDC	
Surge Protection	600 W	10 / 1000 µs
Short Circuit Protection	Polyswitch	
Reverse Polarity Protection	Diode	

POWER OUTPUT

The power output VOUT provides an auxiliary supply voltage corresponding to the input voltage connected to the VIN input. Output current is limited to max. 100mA by a polytron

Internal Connection of POWER OUTPUT



Parameter	Value	Note
Output Voltage	VOUT = VIN – 0.7 V	
Surge Protection	600 W	10 / 1000 µs
Short Circuit Protection	Polyswitch	
Reverse Polarity Protection	Diode	