

**External RIOs for connection to the powerIO-Box via Modbus RTU**

- 6 x digital input
- 1 x analog input 0-10 V
- 1 x analog input passive
- 3 x digital outputs pot. free (Imax 16A)
- 4 x digital outputs 24V/0,5A
- 1 x analog output 0-10V



Technische Daten

<b>General data</b>	Name/Type	powerIO®-RIO 1 T1.R100
	Item number	100107
	Color	black
<b>Electrical data</b>	Nominal voltage	DC 24V
	Power consumption during operation	Internal max. 2,4W
	Power consumption sleep mode	0,6W
	Connection power supply / control	M12 cable 5-pin with open end: 24V DC, GND, Bus A, Bus B, Shield
<b>Digital outputs - Transistor</b>	Quantity	4 (each with status LED and manual override)
	Output current (MOSFET, non-floating)	5...500 mA (leakage current max. 0.1 mA) Load resistance not less than 48 Ω
	Output voltage	Source operation 24 V DC
	Voltage drop	max. 0.4 V at 0.5 A
<b>Digital outputs - relay</b>	Quantity	3 (each with status LED and manual override)
	Coil power consumption	16,7 mA / 24V DC per relay
	Nominal load	16 A / 250 V AC or 16A / 30 V DC
	Nominal voltage/max. switching voltage	250/400 V AC
	Max. switching capacity AC1	4000 VA
	Max. switching capacity AC3	500 W / 230V AC
	Max. switching capacity AC15	750 VA / 230V AC
	Lifetime	10x10 <sup>6</sup> (at nominal load)
	Relay type with interchangeable socket	FINDER 41.61.9.024.0010
	<b>Digital inputs</b>	Quantity
Input voltage		24V (or external voltage see jumper)
<b>Analog Output</b>	Power consumption	max. 150 mA with loaded DIs
	Quantity	1x 0-10V (with manual override)
	Power consumption	max. 20 mA (DC)
	Load capacity of the outputs	10 mA (short circuit proof)
<b>Analog input</b>	Resolution AO	10 Bit
	Linearity error	< +/- 2%
	Quantity	1x 0-10V
	Power consumption	max. 40 mA (DC)
<b>Analog input passive</b>	Resolution AI	10 Bit
	Impedance	20 M Ω
	Quantity	1 (with status LED)
<b>Communication</b>	Connection	PT1000 (characteristic curve stored)
	Communicative control	Modbus RTU
<b>Security</b>	Addressing	Via rotary switch
	Protection class IEC/EN	IP 66
	Ambient temperature	-20...50°C
	Storage temperature	-20...70°C
	Ambient Humidity	Max. 95% r.h., non-condensing
	Maintenance	Maintenance-free
	Weight	465 g
	Dimensions	160x140x83 mm

## Safety Instructions

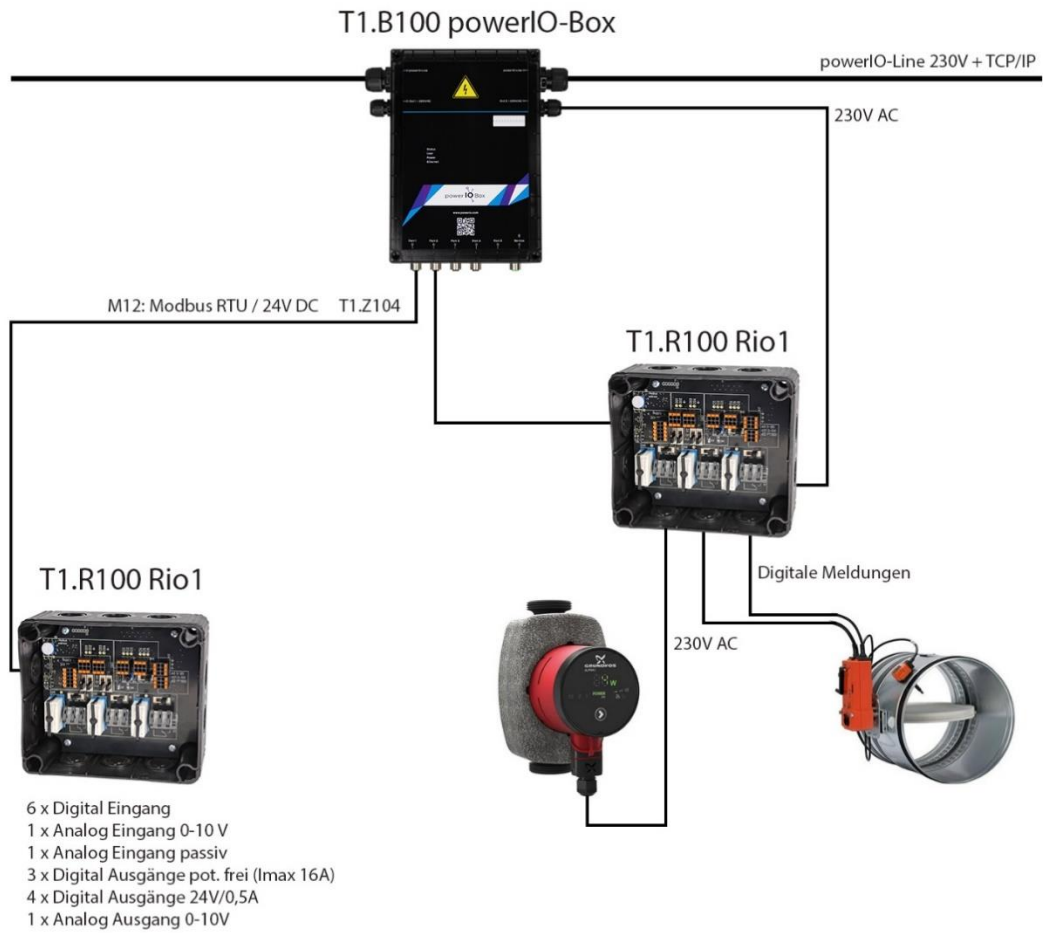


- It is not permitted to install the **powerIO®-RIO 1** in the immediate vicinity of frequency converters. Frequency inverters must be wired with all protective measures to ensure that the required regulations and guidelines are observed (for example line filters etc.).
- The supply voltage must correspond to the specifications in the documentation
- The connection terminals located inside the device may only be wired by authorized and instructed qualified personnel.
- Do not carry out any wiring work under voltage. There is a risk of electric shock as some terminals may carry 230/400 V. The installation must be carried out by authorized personnel. The legal and official regulations must be observed.
- Avoid connecting and disconnecting plug connections (under voltage). This could destroy the devices!
- Make sure that no objects, e.g. screws, screen remnants, sleeves or other fastening material get into the device.
- This device is designed for use in stationary heating, ventilation and air conditioning systems. It is forbidden to use the device for applications outside the specified field of application, especially not in airplanes or any other means of transportation in the air.
- Avoid installation in places with extreme and rapid temperature changes. Please note that an outdoor application is only possible if no water, snow, ice, sunlight or aggressive gases directly affect the box and if it is guaranteed that the environmental conditions are always within the limits of the data sheet.

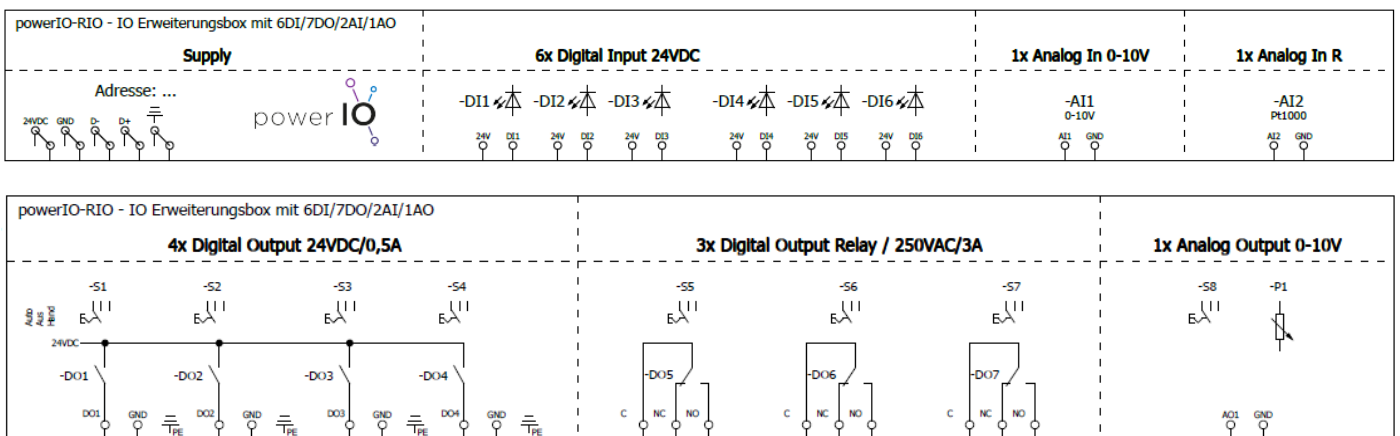
## Product features

<b>System description</b>	The <b>powerIO®-Rio 1</b> is an expansion box with classic digital and analog inputs and outputs. It serves to connect non-communicative devices. After connection to the <b>powerIO®-Box</b> , the inputs and outputs can be read/written directly via Modbus TCP. Outputs each with manual override (switch/pot). Feedback of manual override via Modbus. Addressable with rotary switch. Connection via Modbus RTU.
<b>Installation</b>	The <b>powerIO®-Rio 1</b> is mounted decentrally in the immediate vicinity of sensors/actuators. For example in heating circuits, directly at the ventilation unit or in rooms for individual room control. The <b>powerIO®-Rio</b> is connected to the <b>powerIO®-Box</b> by means of the M12 plug cable. Power supply and bus communication are directly available.
<b>Connections</b>	Clamp:  K1 -K15: 1,00 mm <sup>2</sup>  K5-K7: 2,5mm <sup>2</sup> 230V


Systemaufbau



Electrical connection diagrams



General Modbus notes

<b>General data</b>	Protocol	Modbus RTU
<b>Addressing</b>	Rotary switch position 0:	<b>Address 1 – FIX: Baud 38.400 - 8N1</b> (8=Word Length „8“, N=Parity „None“, 1= Stop Bit „1“)
		<b>(If the rotary switch is moved to position 0, it always overwrites previous communication parameters to the above mentioned parameters)</b>
	Rotary switch position 1:	Address 1 (Baud via register or last setting)
	...	...
	Rotary switch position 9:	Address 9 (Baud via register or last setting)
<b>Communication parameters</b>	Modbus RTU	<ul style="list-style-type: none"> <li>• Modbus address (via rotary switch)</li> <li>• Baud rate (via Modbus register)</li> <li>• Word Length (via Modbus register)</li> <li>• Parity (via Modbus register)</li> <li>• Stop Bits (via Modbus register)</li> </ul>
<b>Supported Functioncodes</b>	<b>FC1:</b> Read Coil Status <b>FC5:</b> Write Single Coil <b>FC15:</b> Write Multiple Coils  <b>FC2:</b> Read Input Status <b>FC4:</b> Read Input Registers  <b>FC3:</b> Read Holding Registers <b>FC6:</b> Write Single Register <b>FC16:</b> Write Multiple Registers	
	Gaps between addresses can be read/written nevertheless but have no function.	

Modbus Status Register Overview

FC1 / FC 5 / FC15

Address	Description Comment	Value range Enumeration	Unit	Scaling	Authorization
1	DO1 – Digital output 1	0/1	-	-	R / W
2	DO2 – Digital output 2	0/1	-	-	R / W
3	DO3 – Digital output 3	0/1	-	-	R / W
4	DO4 – Digital output 4	0/1	-	-	R / W
5	DO5 (relay) – Digital output 5	0/1	-	-	R / W
6	DO6 (relay) – Digital output 6	0/1	-	-	R / W
7	DO7 (relay) – Digital output 7	0/1	-	-	R / W

FC2

Address	Description Comment	Value range Enumeration	Unit	Scaling	Authorization
1	DI1 – Digital input 1	0/1	-	-	R
2	DI2 – Digital input 2	0/1	-	-	R
3	DI3 – Digital input 3	0/1	-	-	R
4	DI4 – Digital input 4	0/1	-	-	R
5	DI5 – Digital input 5	0/1	-	-	R
6	DI6 – Digital input 6	0/1	-	-	R
7	Switch position manual override Digital output DO1	0: Hand 1: Auto	-	-	R
8	Switch position manual override Digital output DO2	0: Hand 1: Auto	-	-	R
9	Switch position manual override	0: Hand	-	-	R

	Digital output DO3	1: Auto			
10	Switch position manual override Digital output DO4	0: Hand 1: Auto	-	-	R
11	Switch position manual override Digital output DO5	0: Hand 1: Auto	-	-	R
12	Switch position manual override Digital output DO6	0: Hand 1: Auto	-	-	R
13	Switch position manual override Digital output DO7	0: Hand 1: Auto	-	-	R
14	Switch position manual override Analog output AO1	0: Hand 1: Auto	-	-	R
15	Device Status LED green	0: 1: green	-	-	R
16	Device status LED red	0: 1: red*-/			R

### FC3 / FC6 / FC16

Adress	Description Comment	Value range Enumeration	Unit	Scaling	Authorization
3	Baud rate	1: 9600 2: 19200 3: 38400 4: 57600	Bd	-	R/W
8	Duration for activation of the safestate (timeout, in case of communication failure)	10	s	1	R/W
10	Bit 1: DO1 Bit 2: DO2 Bit 3: DO3 Bit 4: DO4 Bit 5: DO5 (Relay) Bit 6: DO6 (Relay) Bit 7: DO7 (Relay)	Decimal (0...127)  Bit 0: Off 1: On	-		R/W
11	AO1 - Analog Output1	0...10.000	mV	1	R/W
15	Safestate (after bus timeout) activate for Bit 1: DO1 Bit 2: DO2 Bit 3: DO3 Bit 4: DO4 Bit 5: DO5 (Relay) Bit 6: DO6 (Relay) Bit 7: DO7 (Relay)	Decimal (0...127)  Bit 0: Off 1: On	-		R/W
16	Safestate (after bus timeout) State for  Bit 1: DO1 Bit 2: DO2 Bit 3: DO3 Bit 4: DO4 Bit 5: DO5 (Relay) Bit 6: DO6 (Relay) Bit 7: DO6 (Relay)	Decimal (0...127)  Bit 0: Off 1: On	-	-	R/W
17	Safestate (after bus timeout) State for AO1 – Analog Output 1	0...10.000	mV	1	R/W

### FC4

Adress	Description Comment	Value range Enumeration	Unit	Scaling	Authorization
1	Type ID	HEX	-	-	R
2	Set Modbus address	1...9	-	-	R
3	Set baud rate	38400	Bd	-	R
5	Version	-	-	-	R
6	-				
7	-				

8	-				
9	-				
10	Analog 0-10V Input 1 - AI1	0...10000	V	0,001	R
11	Analog PT1000 Input 2 - AI2 (temperature)	-15000...15000	°C	0,01	R
12	Analog PT1000 input 2 - AI2 (resistance)	-	Ω		R
13	-				
14	-				
15	Digital Inputs 1 to 6  Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 Bit 6: DI6	Decimal (0...127)  Bit 0: Off 1: On	-	-	R

Web: <http://www.powerio.com/support>

## Further notes

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