



## RTU7M – modular RTU system

### General description

Modular system RTU7M is designed for maximal flexibility in solution designing for different types of applications across the power distribution monitoring and control.

RTU7M uses distributed data and signal processing. It means, that each modular card in system has its own dedicated processor, which solves independent tasks and cards only exchange the data between themselves via highspeed bus. This topology offers highest reliability and excellent computing power, while system power consumption is not high. It allows also high flexibility for future development and customization for different users.

System expansion for large systems with hundreds and thousands of signals is realized via interconnection of communication cards in individual RTU7M units. One chosen unit then works as data concentrator and communication unit with SCADA for all other units. From the point of user, system then looks like one large RTU. System or communication redundancy can be solved as well.

Highspeed busbar allows fast data exchange between cards. It is possible to link any measuring card and their evaluated data to any other analog and digital I/O card signal. It is especially useful for applications, like for example:

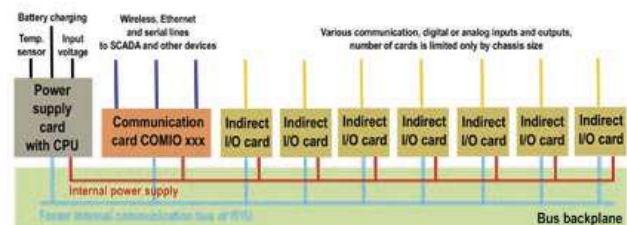
- ❑ Protection relay functionality of RTU7M - fast reaction of any digital output in system for measured data, if they are evaluated as a fault on power lines according to ANSI standards.
- ❑ There can be measured currents on each feeder, but voltage can be measured only at one point (for ex. on busbar) and this information including phase shift can be shared for precise calculation of P and Q for each feeder. It saves a lot of costs.
- ❑ Broken fuse detection in grids – there can be evaluated phase shift or other values differences between feeders or in front and behind the fuse.



Example of configuration for Recloser or Load Break Switch monitoring and control



Example of configuration for primary substation monitoring and control with integrated 3 protection relays for MV feeders



RTU7M internal architecture

### Standards

The whole modular unit RTU7M and its components were tested according to the following technical standards (unless stated otherwise in the detailed technical specifications of each card):

#### EMC:

EN 61000-4-2	EN 61000-4-8	EN 61000-4-17
EN 61000-4-3	EN 61000-4-9	EN 61000-4-18
EN 61000-4-4	EN 61000-4-10	EN 61000-4-29
EN 61000-4-5	EN 61000-4-11	EN 61000-6-5
EN 61000-4-6	EN 61000-4-12	EN 50130-4
EN 61000-4-7	EN 61000-4-16	EN 60255-26

#### EMI:

EN 55022	EN 55032
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#### Electrical safety

EN 61010-1	EN 60255-27	EN 60950-1
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#### Environment

EN 60068-2-1	EN 60068-2-6	EN 60068-2-27
EN 60068-2-2	EN 60068-2-14	EN 60068-2-30

### Technical specification for all RTU7M products

Operating temperature	-25 °C to +55 °C (after consulting with producer up to 70 °C)
Storage temperature	-30 °C to +75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Ingress protection	IP 20



## RTU7M – chassis and bus backplanes



Example of chassis for 10 cards with bus backplane

### General description

The chassis consists of aluminum profiles and is adapted for mounting on a wall, panel, 19" rack (version with 16 slots), and also on DIN rails on demand. We offer versions for fitting with bus backplanes with 2, 5, 8, 10 and 16 slots.

There are also available 2, 3 and 5-slot chassis in stainless steel version with powder coating protection. These versions are used especially for standardized types of configurations used in large numbers.

All slots and cards have connectors with key, what protects against inserting an improper card into the slot. The specification, where it is possible to insert the specific type of card into the slot, is described for each card in the user manual for the modular RTU.

RTU7M chassis has three subgroups of product lines:

- ☒ **Standard** - chassis with 2 up to 16 slots,
- ☒ **Distributed system** - 2-slot and 3-slot chassis focused for standalone applications or for expansion of larger RTU7M systems. They are few options:
  - DIN rail or panel mounting,
  - integrated power supply on bus backplane, standard 10 – 30 V DC, optionally others after consulting with producer, isolated or non-isolated,
  - additional serial communication RS-485 on backplane, isolated or non-isolated, supported MODBUS RTU and HioCom2 communication protocols.

There is available only 2-slot bus backplane for both 2 or 3-slot chassis, the 3-slot chassis is usually used with 2-slot EP cards (protection relay cards), which uses only one slot in bus backplane. Power supply and serial line connector is located on the bottom of chassis.

- ☒ **Stackable** – special project-based design for application with demand of future growing system. The core is based on 2-slot chassis, which can be interconnected by bus connector located on left or right side of chassis. The system features are the same as standard product line. This product line is available only for special projects after consulting with producer.

### Basic features

- ☒ chassis with bus with 2, 5, 8, 10 or 16 slots,
- ☒ keyed slots, protection against the insertion of improper card into the position,
- ☒ modularity, easy expandability of I/O,
- ☒ wall, panel or 19" rack mounting.



Example of RTU7M bus backplane with 10 slots

### Technical specification of standard product line

Labeling of chassis by number of slots	RTU7M CASE-2 RTU7M CASE-5 RTU7M CASE-8 RTU7M CASE-10 RTU7M CASE-16
Labeling of busses by number of slots	RTU7M BUS-2N RTU7M BUS-5N RTU7M BUS-8N RTU7M BUS-10N RTU7M BUS-16N

### Technical specification of version for distributed systems

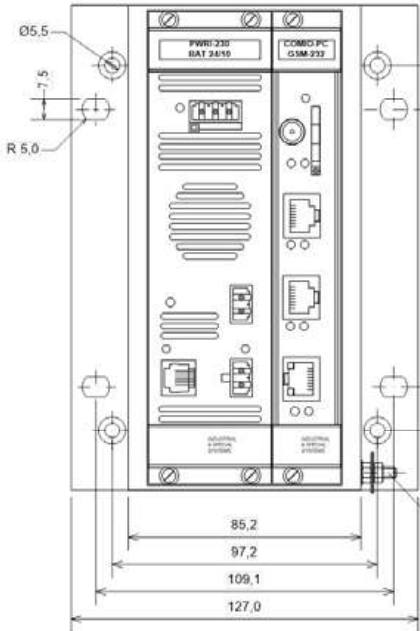
Labeling of chassis by number of slots	RTU7M CASE-2E x-PDxx-x RTU7M CASE-3E x-PDxx-x
Labeling of busses by number of slots	RTU7M BUS-2E x-x



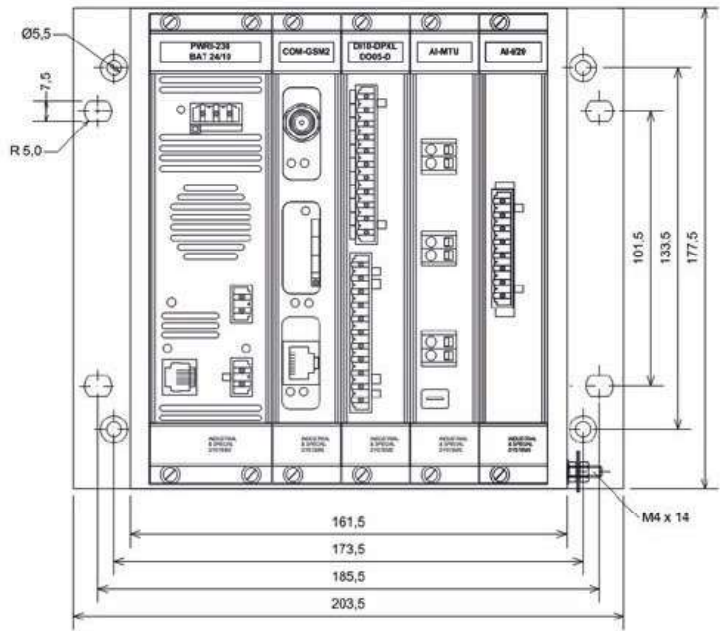
Example of Distributed RTU7M solution – complete protection relay with wide communication abilities



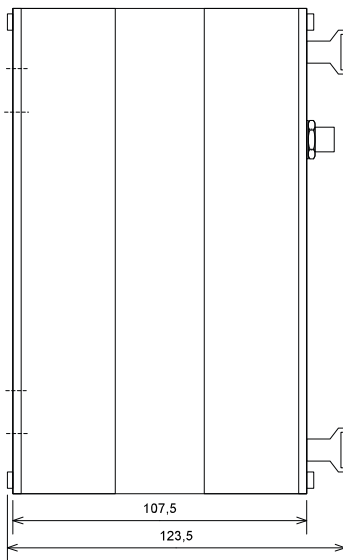
### Standard chassis dimensions (mm)



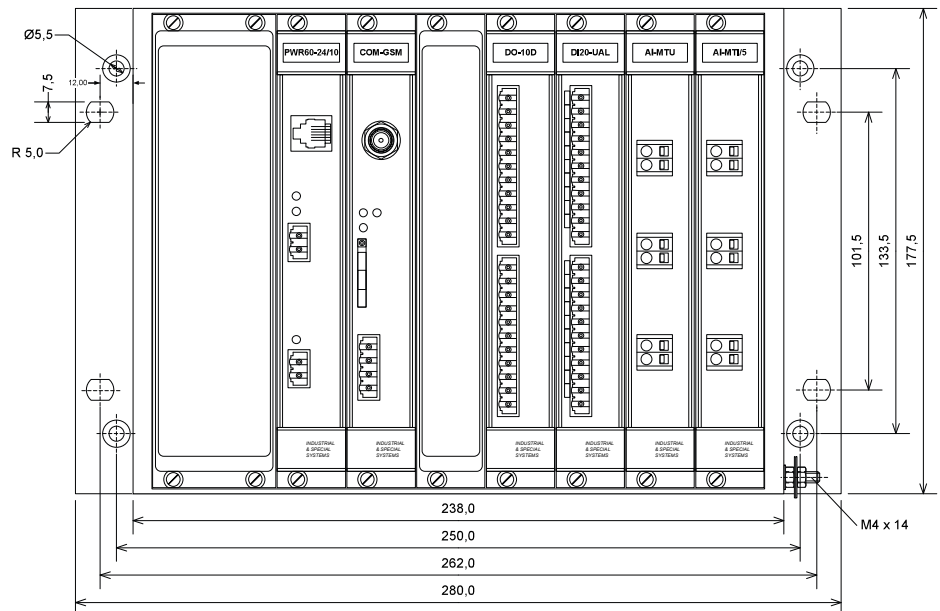
Dimensions of chassis with 2 slots



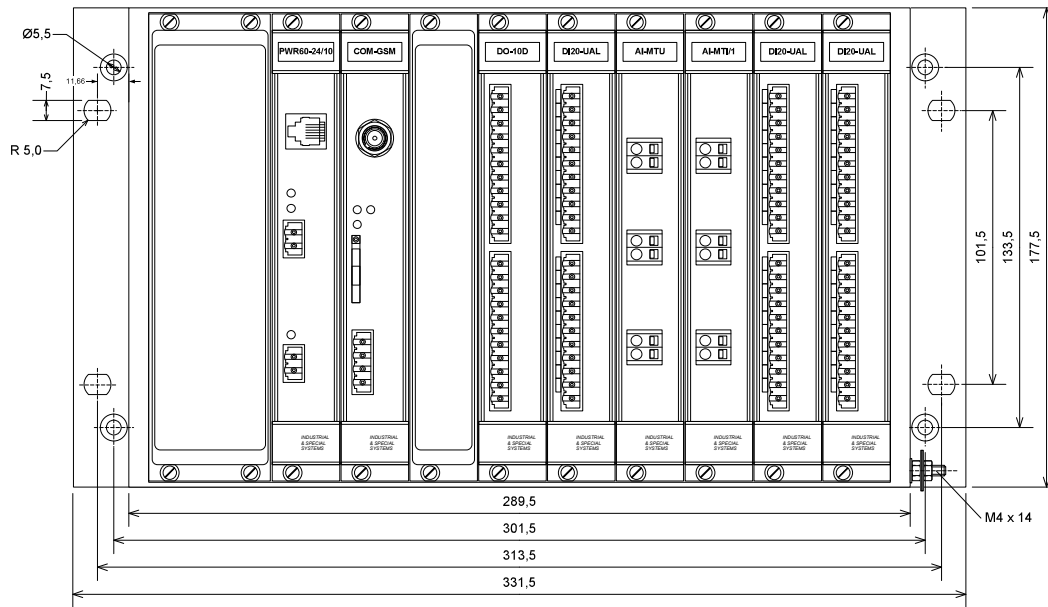
Dimensions of chassis with 5 slots



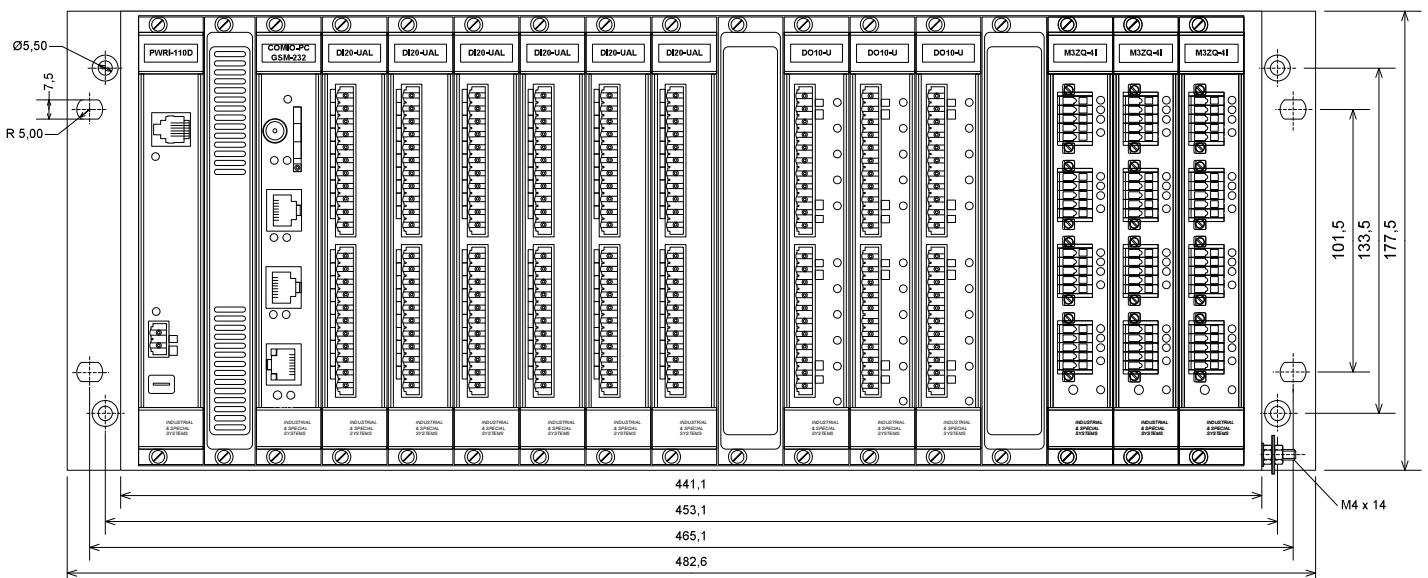
Side dimensions of all types of chassis



Dimensions of chassis with 8 slots



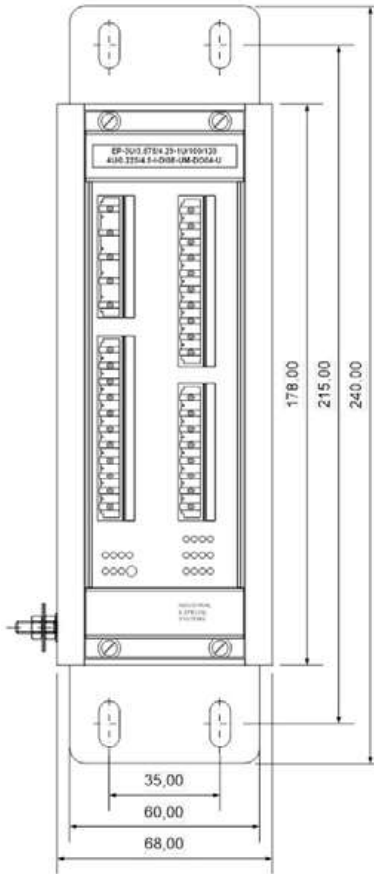
Dimensions of chassis with 10 slots



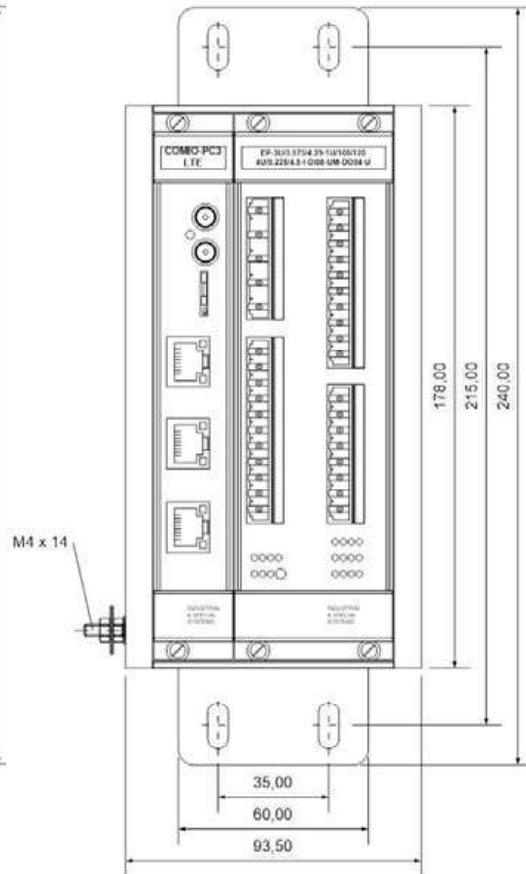
Dimensions of 19" chassis with 16 slots



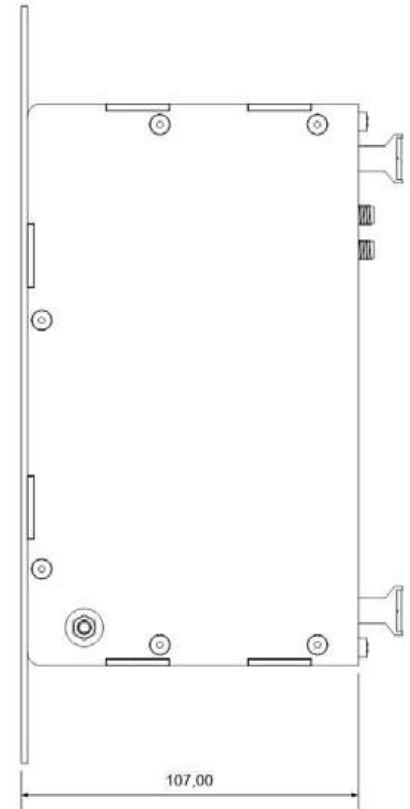
### Distributed system chassis dimensions (mm)



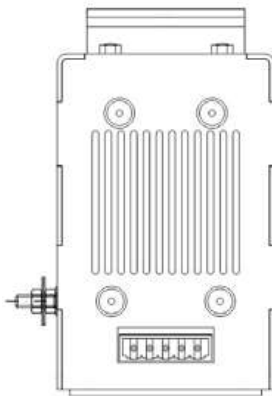
Dimensions of chassis with 2 slots



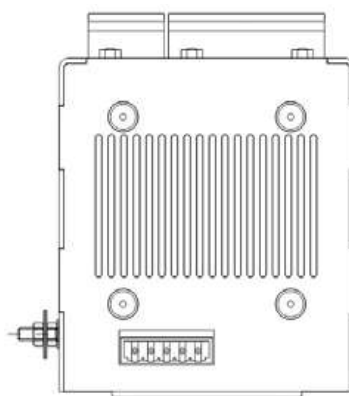
Dimensions of chassis with 3 slots



Side dimensions of both chassis



Bottom view of chassis with 2 slots



Bottom view of chassis with 3 slots



## RTU7M – power supply cards

### General description

Power supply cards serve for the powering of RTU7M, all cards and slave units in bus. We deliver two principally different types:

- ❑ DC, galvanically isolated card,
- ❑ AC / DC, galvanically isolated card with battery backup.

#### DC, galvanically isolated card

This card has a galvanically separated input from the output, a wide range of power supply voltage (according to the version of the card) and does not enable to connect the backup battery. The card is mostly used for the powering from DC power supplies or from a battery with various voltage levels according to the specification.



Card  
PWRI-220DH



Card PWRI-230  
BAT24/10

#### AC / DC, galvanically isolated card with backup

This card can be used for powering from AC or DC. The CPU on card PWRI controls the battery charging, input voltage and temperature measurement. During operation from the backup battery, the battery status is checked for protection against the full discharging. In the case of a decrease of the battery voltage below the minimal value, the unit enters into the shutdown regime for one minute. Information about this status, as well as the information about the outage of the input voltage is transferred into the master system. After one minute, if there is no restoration of the supply of input voltage, the unit is automatically switched off. The power supply card includes the integrated charger for 12 V or 24 V backup batteries with various capacities. The maximum maintenance charging current is 1 A. The charging of the battery is controlled by the CPU depending on the temperature, measured by digital sensor connected via RJ-12 connector on card. The battery capacity is periodically tested (loaded with a current 9 A for a 24 V battery and 4.5 A for a 12 V battery) and the value is transferred to the master system. The card is equipped with an auxiliary contact - connector ON REL, which works as life contact, used for battery protection against another discharging, when system is off. There is button BAT ON on card, which activates the unit during the operation only from the backup battery. The card also enables to measure the effective value of the primary power supply voltage within the whole supply range.

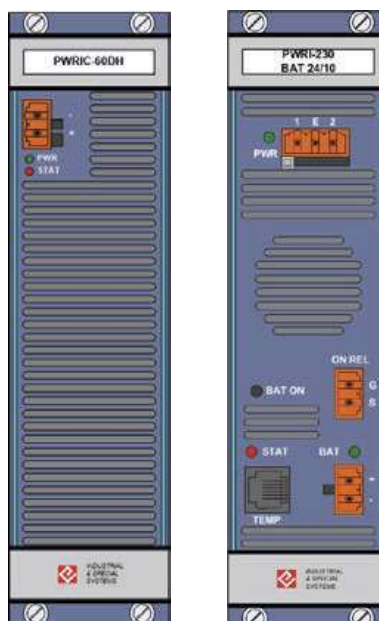
### Technical specification of galvanically isolated power supply cards

Card	PWRI(C)-60DH	PWRI-110DH	PWRI-220DH
Input voltage	10–60 V DC (max. 60 W)	70–150 V DC (max. 40 W)	180–370 V DC (max. 50 W)
Version availability	PWRI standard, version PWRI-C on demand	Standard 110DH, ver. 110D (20 W) on demand	Standard 220DH, ver. 220D (20 W) on demand
Range in User Center	0–60 V	0–10 V	
Max. input current	6 A DC	0.9 A DC	0.5 A DC
Input protection	Fuse 10 A	Fuse 5 × 20 F 5 A	Fuse 5 × 20 F 3.15 A
External protection	In case of connection to network system IT, it is necessary two-pole protection.		
Output voltage	+5 V DC / 10 A (50 W)	+5 V DC / 8 A (40 W)	
Isolation	Input-output 4 kV AC	Input-output 3 kV AC	
Battery voltage	Backup battery is not supported		
Connectors	1 × WAGO 231-302/026-000 (part of delivery)		
Wire cross-section	0.08–2.5 mm <sup>2</sup>		
Signaling LED	PWR, STAT	PWR	
Dimensions (with mounted front panel)	45 × 172 × 92 mm (W × H × D)		
Position in bus	1		



### Technical specification of galvanically isolated power supply cards with battery backup

Card	PWRIC-230 BAT24/10	PWRIC-230 BAT12/10	PWRIC-57 BAT24/10	PWRIC-57 BAT12/10
Input voltage	90–260 V AC / 47–63 Hz 130–360 V DC		50–140 V AC / 47–63 Hz 70–200 V DC	
Range in User Center	0–360 V		0–200 V	
Max. input current	1 A AC; 0.8 A DC		1.7 A AC; 1.2 A DC	
Max. output power	50 W			
Input protection	Fuse T 4 A			
External protection	Recommended circuit breaker 4 A or 6 A char. C. In case of connection to network system IT, it is necessary two-pole protection.			
Output voltage	+5 V DC / 5 A (25 W), -5 V DC / 0.3 A (1.5 W)			
Isolation	Primary – secondary 3 kV AC for 1 minute Primary – ground 1.5 kV AC for 1 minute Secondary – ground 500 V AC for 1 minute			
Battery voltage	24 V	12 V	24 V	12 V
Range in User Center	0–30 V	0–15 V	0–30 V	0–15 V
Max. battery loading current	1 A (optionally lower current after consulting with producer)			
Max. battery maintenance voltage	27.4 V	13.7 V	27.4 V	13.7 V
Battery protection	3.2 A polyswitch			
Switch off voltage (battery protection)	22 V	11 V	22 V	11 V
Battery tester	Yes			
Testing current	9 A	4.5 A	9 A	4.5 A
Auxiliary contact ON REL	Contact (type NO) 250 V / 3 A AC, 30 V / 3 A DC			
BAT ON (switch on button)	Yes, usage for switch on of unit running from battery			
Measurement accuracy	±0.5 %, measuring of voltage on input and battery			
Temperature sensor	Measured range -55 to +125 °C, accuracy ±0.5 °C in range -10 to +85 °C			
Connectors	2 × WAGO 231-302/026-000, 1 × WAGO 231-303/026-000 (part of delivery), RJ-12		2 × WAGO 231-302/026-000, 1 × WAGO 231-303/026-000 (part of delivery), RJ-12	
Wire cross-section	0.08–2.5 mm <sup>2</sup>			
Signaling LED	PWR, STAT, BAT			
Dimensions (with mounted front panel)	45 × 172 × 92 mm (W × H × D)			
Position in bus	1			



Front panels with connectors for individual types of power supply cards



## RTU7M – power backup cards

### General description

Power backup card enables to use the batteries for RTU7M backup. Card switches automatically between external power supply and connected battery, if the power is lost. It also charges the battery and checks the status.

#### Power backup card RTU7M CHG(I)

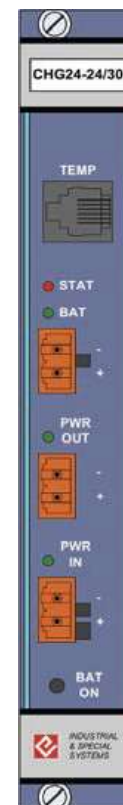
Power backup cards are designed for DC. They do not have the function of power supply for the RTU, they only provide stable voltage on output, if the power is lost. There must be installed the appropriate power supply card in the RTU. The output from power backup card is connected to the input of power supply card.



Card RTU7M  
CHG24-24/30

One power backup card can provide the backup for the RTU, where it is fitted in and also for another RTUs (up to maximal load). Thus, it is not necessary to have the power backup card in each RTU in system, there is only necessary to use the batteries and external power supply with sufficient performance.

The charging process is controlled in accordance with ambient temperature and the status of battery is regularly checked. Version CHG1 is galvanically isolated from bus.



Front panel of card  
RTU7M CHG

Modular RTU

### Technical specification

Card	RTU7M CHG24-24/30	RTU7M CHG148-48/30
Input voltage	20–30 V DC (max. 250 W)	42–60 V DC (max. 450 W)
Range in User Center (Source voltage)	0–30 V	0–60 V
Max. input current	10 A DC	8,5 A
Input / output / battery protection	Fuse 5 × 20 F 16 A	Fuses F 12 A / F 8 A / F 8 A
External protection	In case of connection to network system IT, it is necessary two-pole protection.	
Output voltage / current	Same as input voltage 20-30 V DC / 8 A (200 W)	Same as input voltage 42-60 V DC / 5 A (250 W), 39V – when running from battery
Battery voltage	24 V	48 V
Range in User Center (Battery voltage)	0–30 V	0-60 V
Max. battery loading current	3.0 A (can be set in parameterization SW)	
Max. battery maintenance voltage	27.4 V	54.8 V
Switch off voltage (battery protection)	22 V	44 V
Battery tester	Yes	
Testing current	8.5 A	8 A
Temperature sensor	Measured range -55 to +125 °C, accuracy ±0.5 °C in range -10 to +85 °C	
Connectors	2 × WAGO 231-302/026-000 (part of delivery), RJ-12	
Wire cross-section	0.08–2.5 mm <sup>2</sup>	
Signaling LED	STAT, PWR IN, PWR OUT, BAT	
Measurement accuracy	±0.5 % for input and battery voltage	
Dimensions (with mounted front panel)	25 × 172 × 92 mm (W × H × D)	
Position in bus	Any	





## RTU7M – communication cards and modules

### General description

The communication cards serve for ensuring the communication of the RTU7M with the master system and for communication with slave units. These cards contain several communication interfaces and they have the direct support of many industrial communication protocols and services. The cards also support various company protocols (e.g. protocol for communication with wireless sensors of current Z7D).

We produce two principally different versions of the cards. The first version labeled as COMIO4 contains a 32-bit processor and the second version labeled as COMIO-PC2 and COMIO-PC3 (follow-up generation), contains a built-in PC with operating system on the basis of OS LINUX.

Both types of communication cards have some interfaces defined as fixed and some as optional. Optional interfaces can be fitted with modules CIOMOD and configured according to the demands of the stated application. It is necessary to separately specify these modules in orders. You can see the available options in the table below. Communication parameters are set in the web interface.

### Supported communication protocols and services

IEC 60870-5-101	DCON	Radius
IEC 60870-5-104	DLMS	Syslog
IEC 60870-5-103	SQL	SNMP
IEC 61850	OPC UA	NTP
DNP3.0	HTTPS	SSH
Modbus RTU	IPSec	SCEP
Modbus TCP	OpenVPN	HioCom2



Cards COMIO4 and COMIO-PC2



Examples of communication modules

### Communication card COMIO4

This card is fitted with four communication interfaces, which provide the user with freedom during the selection of a suitable communication protocol and the interface. The card can also be used as a communication converter or a data concentrator for slave units.

### Table of standard combinations for individual interfaces of COMIO4 cards

Card	COMIO4-1ETH	COMIO4-2ETH	COMIO4-CIR	COMIO4-O
Communication interface COM1	Position for module CIOMOD-232/485 UMTS/GSM/(E)GPRS	Position for module CIOMOD-232/485/UMTS/GSM/(E)GPRS/GPS2	Position for module CIOMOD-OPT	Position for module CIOMOD-232/485/OPT UMTS/GSM/(E)GPRS
Communication interface COM2	Switchable RS-232/422/485			Fixed optical interface OPT
Communication interface COM3	Position for module CIOMOD-232/485	Ethernet 10/100 Mbps	Position for module CIOMOD-OPT	Position for module CIOMOD-232/485-OPT
Communication interface COM4	Ethernet 10/100 Mbps			
Supported com. protocols	MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, FTP, HTTP			
Memory	FLASH 64 Mbit, MRAM 256 kbit, optionally MicroSD card			
Consumption	1.5 W			
Position in bus	Any, recommended 2 or 3			

**Note:** other combinations can be supplied according to the demands of customer after consultation with product manager.



### Communication card COMIO-PC2 and COMIO-PC3

These cards are also fitted with several communication interfaces and due to its higher intelligence, they offer greater options than COMIO4 card. For example, it includes the ability to manage a larger number of slave units, the use of special protocols for secured communication or in the case of special requirements, these cards can be used for client modification for communication options, such as the implementation of other standards and special protocols, etc.

Besides the basic communication functions in RTUs, they can be also used as a communication/protocol converter or data concentrator (also simultaneously). The COMIO-PC3 card is the newest and the most powerful version, it is equipped with real-time RTC circuit (with backup) and internal temperature sensor. Its communication interfaces can be enhanced via card ESW2, which is then connected with COMIO PC3 card internally and offers physical separation of two LANs.

### Table of standard combinations for individual interfaces of COMIO-PC2 a PC3 cards

Card	COMIO-PC2	COMIO-PC3	COMIO-PC3-LTE
Communication interface COM1	Position for modules LTE, UMTS, GSM/(E)GPRS, RS-232, RS-485	Ethernet 10/100 Mbs, isolation 3 kV AC/1 min. (NET1)	LTE
Communication interface COM2	Switchable RS-232 / RS-485	Ethernet 10/100 Mbs, isolation 3 kV AC/1 min. (NET2)	Ethernet 10/100 Mbps isolation 1.5 kV AC/1 min. (NET2)
Communication interface COM3	Switchable RS-232/485 power supply +5 V / 0,3 A	Console RS-232 (RJ11)	Switchable RS-232/422/485 isolation 2.5 kV DC/1 min.
Communication interface COM4	Ethernet 10/100 Mbps	Switchable RS-232/422/485 isolation 2.5 kV DC/1 min.	Switchable RS-232/422/485 power supply +5 V / 0.3 A isolation 2.5 kV DC/1 min.
Communication interface COM5	-	Switchable RS-232/422/485 power supply +5 V / 0.3 A isolation 2.5 kV DC/1 min.	-
Supported communication protocols	All mentioned on previous page in the list of Supported communication protocols and services		
Memory	FLASH 256 MB, RAM 128 MB, optionally MicroSD	FLASH 8 GB, RAM 256 MB, optionally MicroSD	
Other functions	RTC	Thermal sensor, RTC	
Consumption	3.5 W (without fitted CIOMOD module in position COM1)	3.5 W	4.5 W
Position in bus	Any, recommended 2 or 3		

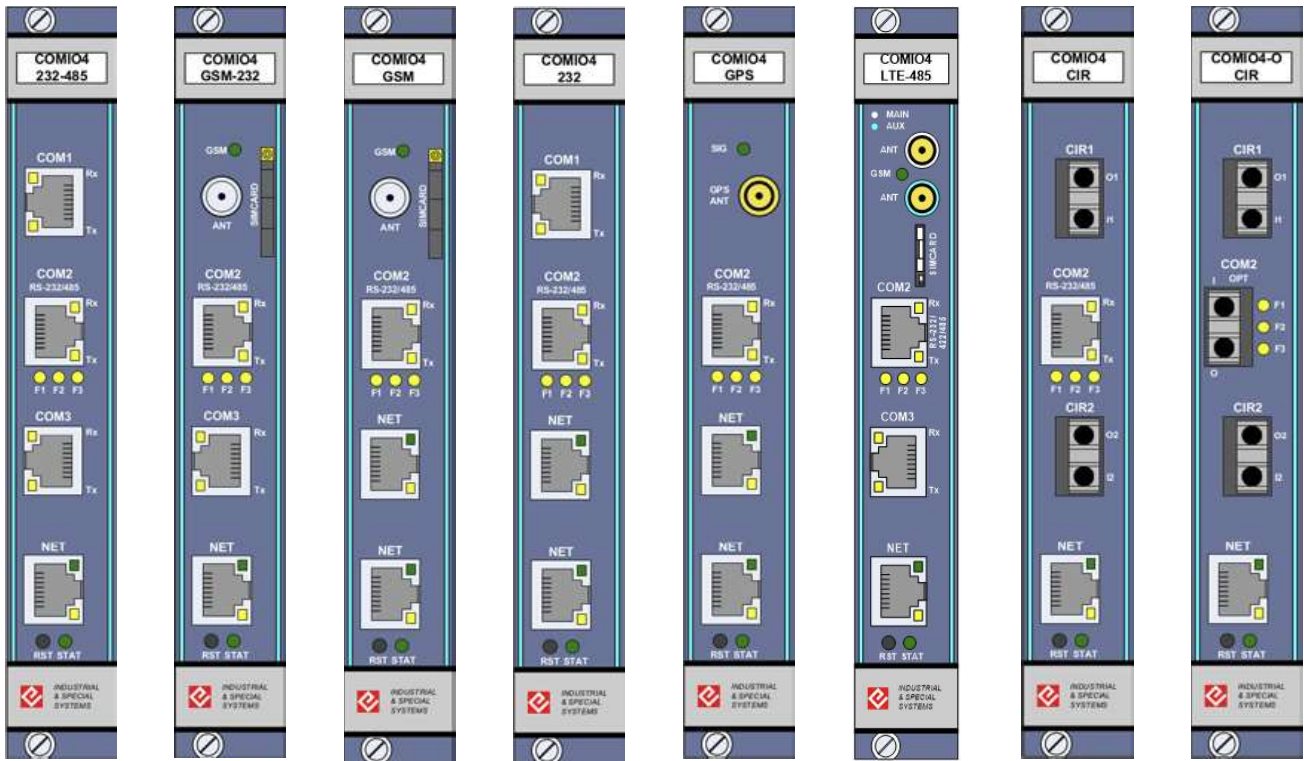
### Technical specification of CIOMOD modules

Module	CIOMOD-GSM5	CIOMOD-GSM6_EHS6	CIOMOD-GSM6_ELS61-E	CIOMOD-GSM8
Communication interface	UMTS Dual-Band GSM Dual-band GPRS Class 12 EDGE Class 12 HSDPA Cat. 8 HSUPA Cat. 6	UMTS Penta-band GSM Quad-band GPRS Class 12 EDGE Class 12 HSDPA Cat. 8 HSUPA Cat. 6	LTE Penta-band GSM Dual-band LTE UE Cat. 1 GPRS Class 12 EDGE Class 12	LTE Penta-band UMTS Dual-band GSM Dual-band LTE UE Cat. 1 HSDPA Cat. 24 HSUPA Cat. 6 GPRS Class 12 EDGE Class 12
Antenna connector	FME	SMA	SMA	SMA
Signals	RxD, TxD, RTS, CTS	RxD, TxD, RTS, CTS	RxD, TxD, RTS, CTS	RxD, TxD, RTS, CTS
Max. consumption	1 W	1 W	1 W	1 W

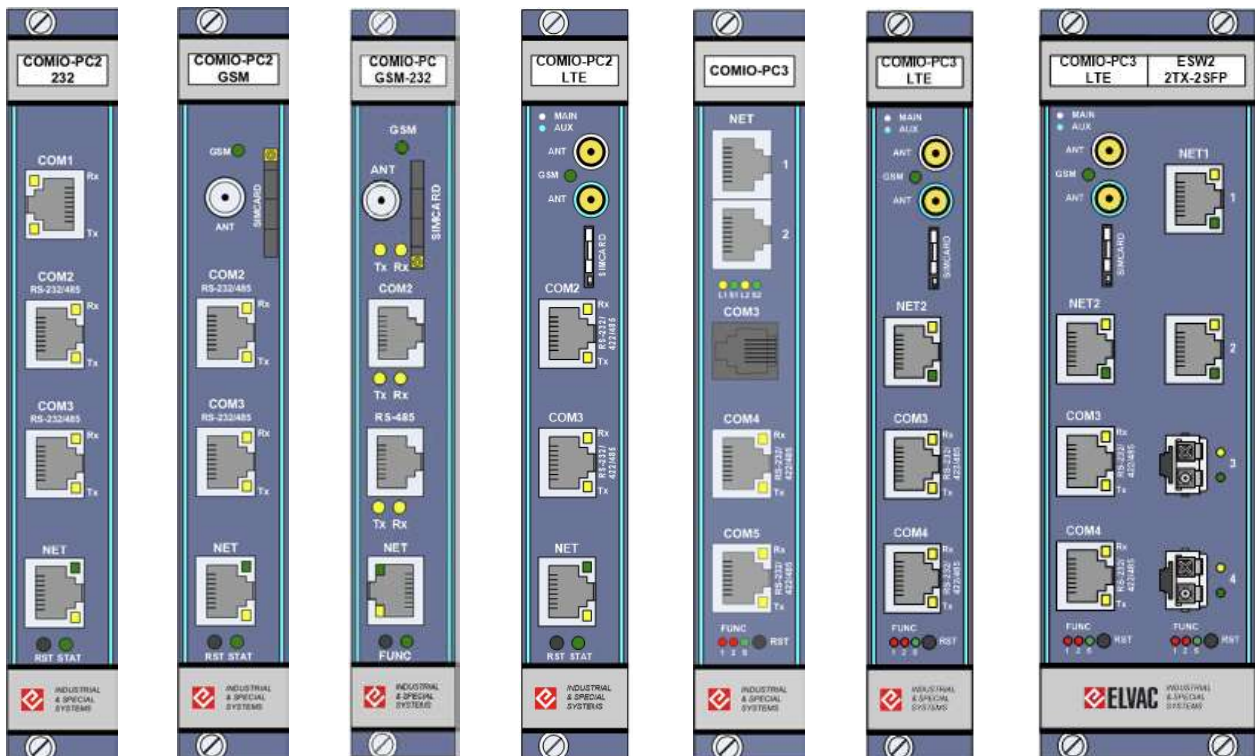
Module	CIOMOD-OPT	CIOMOD-232	CIOMOD-485	CIOMOD-GPS2
Communication interface	Optical interface	RS-232 (isolation 2 kV AC for 1 min.)	RS-485 (isolation 2 kV AC for 1 min.)	GPS antenna GPS/QZSS GLONASS
Connector	SC	RJ45	RJ45	SMA
Max. communication speed	-	230.4 kbps (460.8 kbps)	230.4 kbps (921.6 kbps)	-
Signals	RxD, TxD	RxD, TxD, RTS, CTS	A, B, (+5 V)	-
Max. consumption	1 W	1 W	1 W (2 W)	0.5 W



Modular RTU



Front panels with connectors of cards COMIO4



Front panels with connectors of cards COMIO-PC2 and PC3

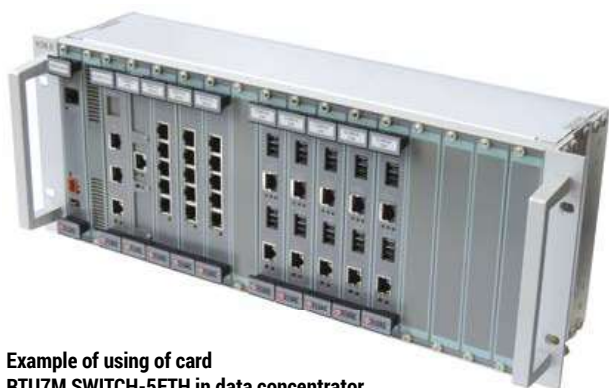


## RTU7M – card with ethernet switch

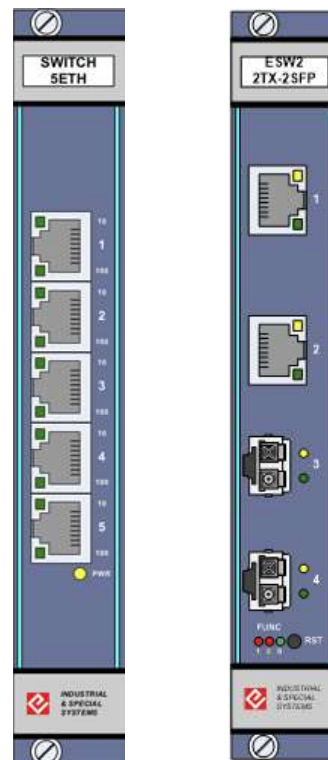
### General description

In cases where it is necessary to expand the number of communication links with an Ethernet interface, the RTU7M SWITCH-5ETH card is available. Basically, it is the traditional Ethernet switch in the form of the card for RTU7M, which means that internally, this card does not communicate with the RTU unit, it only takes the power from it. All connections are done externally using connecting cables. The advantage is that it is not necessary to resolve the power supply and backup as in the case of external switches, and it will save the space. The number of cards installed into the system is limited only by the space in the chassis.

Another option is card ESW2 equipped with two metallic Ethernet ports and two SFP ports, which can be internally connected with COMIO-PC3 communication card. Then Ethernet ports on COMIO PC3 card and on ESW2 can work in physically separated networks.



Example of using of card RTU7M SWITCH-5ETH in data concentrator



Front panel of cards RTU7M SWITCH-5ETH and ESW2 2TX-2SFP

### Technical specification

Card	RTU7M SWITCH-5ETH	ESW2 2TX-2SFP
Interface	5 × RJ-45, 10/100BaseT(X) auto negotiation speed, Full/Half duplex mode, auto MDI/MDI-X connection	2× RJ-45, 10/100BaseT(X) auto negotiation speed, Full/Half-duplex mode, auto MDI/MDI-X connection, 2× SFP module
Standards	IEE 802.3, 802.3u, 802.3x	
Consumption	Max. 3 W	Max. 1,5 W without SFP modules
Position in bus	Any	



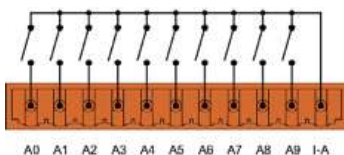
## RTU7M – digital inputs

### General description

Digital output cards (DO) offer 10 relay outputs with eight NO contacts and two changeover contacts

### Active DI – dry contact

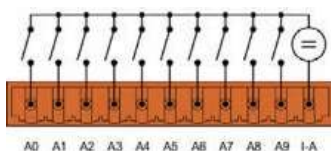
Card is equipped with its own galvanically isolated voltage source. Input is excited after connection of input pin with external shared pin via external contact.



Active inputs connection

### Passive DI – wet contact

These inputs do not have the voltage source fitted. They are activated after connection of external voltage.



Passive inputs connection



Digital input card



Front panel of DI card

### Basic features

- ❑ 20 × digital input,
- ❑ isolation 3.75 kV AC,
- ❑ indication of excitation of input,
- ❑ time filter can be set up by SW for both logical levels,
- ❑ optional double-bit signaling (ex. defining of interposition of power element),
- ❑ configurable maximal allowed number of changes on input per time interval,
- ❑ input sampling with period 1 ms,
- ❑ impulse counter and period measuring with data storage into memory with backup.

### Processing of input digital signals

The digital input card has its own processor, which processes the input signals and communicates with other cards in RTU chassis through the internal bus. Digital inputs are sampled with the period of 1 ms. The following step is filtration of the signal changes. The time filter can be set for both logical levels. If the change on the digital input lasts the stated time, the stated logical level is declared valid and sent to the master system, if required. With each change, it is monitored the exceeding of the maximal set number of changes per minute. If the maximal number of changes is exceeded, the value is transferred with a telemetric error. This prevents the useless transfer of oscillating values. The card can be parameterized also for usage with AC signaling voltage.

These cards can be used as simple digital inputs with one or double-bit signaling and can also be used for reading of impulses and measuring of the period with the storage of the status into the memory with backup. This can be used in applications for measuring of energy and media consumption (the function depends on the firmware used).

### Technical specification of DI cards

Card	DI20-UAM	DI20-UPS	DI20-UPM	DI20-UPL	DI20-UPX	DI20-UPXL	DI10-UPXL
Inputs number	20						10
Inputs type	Active (switching by dry contact)	Passive (switching by external voltage, both polarities)					
Level H	Closed	9–25 V	20–60 V	35–60 V	75–150 V	150–300 V	150–300 V
Level L	Open	0–4 V	0–10 V	0–17 V	0–20 V	0–60 V	0–60 V
Current in inputs	2.4 mA	2.5–7 mA	1.9–6 mA	1.7–3 mA	1.3–2.7 mA	1–2 mA	1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms						
Allowed number of changes per minute	0–255						
Isolation voltage	3.75 kV AC for 1 minute						
Overtoltage category						CATIII/300V	CATIII/600V CATIV/300V
Consumption	2.3 W	1.1 W					
Connectors	2 × WAGO 231-311/026-000, part of delivery						
Wire cross-section	0.08–2.5 mm <sup>2</sup>						
Position in bus	Any						



## RTU7M – digital outputs

### General description

Digital output cards (DO) offer 10 relay outputs with eight NO contacts and two changeover contacts.



Digital output card

The digital output card has its own processor, which, through the signal exciter, switches the relay according to the stated requirements. The card behaves as a slave unit in the RTU7M series, data is transferred on an internal bus of the RTU7M, which serves as the communication bridge. New versions of card (from Y2019) support new high-speed bus, which enables to use automation functions. There is also available backward reading of relay status. The card enables the remote upgrading of FW.

### Basic features

- ❑ 10 × relay DO 8 A/250 V AC or 8 A/24 V DC,
- ❑ 8 × NO contact, 2 × changeover contact,
- ❑ HW and SW protection against accidental switching of output,
- ❑ adjustable time of closed contact,
- ❑ interference protection during switching of relay contact,
- ❑ special functions of some DO (thermostat control, protection relay).

### Security of digital outputs

Great attention is focused on protection against accidental switching of the DO. It is resolved at two levels:

- ❑ SW level - a two-phase control of the relay switching is used. To be the command executed, the unit must receive two identical commands for switching of a relay in the stated time interval,
- ❑ HW level - each relay is controlled by two exciters. To perform the switching, both exciters must be activated at the same time. Each exciter is controlled by its own processor.

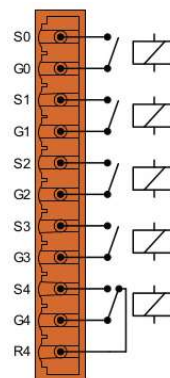
### Special functions

Depending on the type of FW, some DO may have a reserved function. An example is the switching of the heating in the switchboard cabinet depending on the temperature measured by the external sensor, function for controlling of the power switch during the evaluation of the earth fault, short circuit or overcurrent, etc.

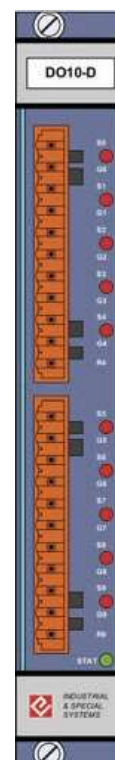
### Technical specification of DO cards

Card	DO10-U
Outputs number	8 × relay (NO contact), 2 × relay (changeover contact)
Time of closed contact	10 ms to 655 with step 10 ms
Isolation contact-coil	5 kV AC for 1 minute
Isolation between open contacts	1 kV AC for 1 minute
Contacts load	8 A/250 V AC, 8 A/24 V DC
Durability	2 × 10 <sup>7</sup> cycles
Relay switching	Protected against accidental switching. It is separated slave unit for RTU7 series.
Consumption	3 W
Connectors	2 × WAGO 231-311/026-000, part of delivery
Wire cross-section	0.08–2.5 mm <sup>2</sup>
Position in bus	Any

Front panel of DO card



Output connectors wiring





# RTU7M – combined cards of digital inputs and outputs

## General description

The card provides 10 digital inputs, 5 relay outputs with 4 normally open contacts and 1 changeover contact. It is also available in version with passive or active DI.

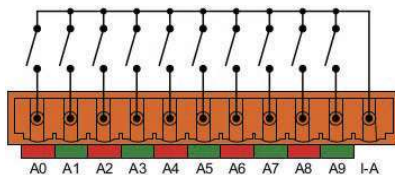
The card has its own CPU and time stamps are assigned directly on card. New versions of card (from Y2019) support new high-speed bus, which enables to use automation functions. There is also available backward reading of relay status.



Combined card of digital I/O

### Active DI – dry contact

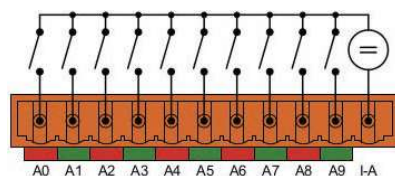
The card is equipped with its own galvanically isolated voltage source. Input is excited after connection of input pin with external shared pin via external contact.



Active inputs connection

### Passive DI – wet contact

These inputs do not have the voltage source fitted. They are activated after connection of external voltage.

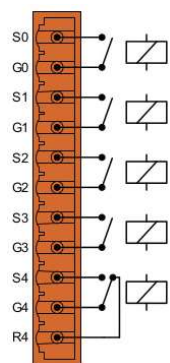


Passive inputs connection

## Basic features

### Inputs

- ❑ 10 × digital input with indication of input excitation,
- ❑ isolation 3.75 kV AC,
- ❑ time filter can be set up by SW for both logical levels,
- ❑ optional double-bit signaling,
- ❑ configurable maximal allowed number of changes on input per time interval,
- ❑ input sampling with period 1 ms,
- ❑ impulse counter and period measuring with data storage into memory with backup.



Outputs connection

### Outputs

- ❑ 5 × relay 8 A@250 V AC / 8 A@24 V DC,
- ❑ 4 × normally open contact, 1 × changeover contact,
- ❑ HW and SW protection against accidental switching,
- ❑ adjustable time of closed contact,
- ❑ interference protection during switching of relay contact,
- ❑ special functions (thermostat control, protection relay).

## Processing of input digital signals

DI are sampled with the period of 1 ms. The following step is filtration of the signal changes. The time filter can be set for both logical levels. If the change on the DI lasts the stated time, the stated logical level is declared valid and sent to the master system, if required. With each change, it is monitored the exceeding of the maximal set number of changes per minute. If the maximal number of changes is exceeded, the value is transferred with a telemetric error. This prevents the useless transfer of oscillating values. The card can be parameterized also for usage with AC signaling voltage.

Cards can be used as DI with one or double-bit signaling and can also be used for reading of impulses and measuring of the period with the storage of the status into the memory with backup (ex. for consumption metering applications).

## Security of digital outputs

Great attention is focused on protection against accidental switching of the DO. It is resolved at two levels:

- ❑ SW level - a two-phase control of the relay switching. To be the command executed, the unit must receive two identical commands for switching of a relay in the stated time interval,
- ❑ HW level - each relay is controlled by two exciters. To perform the switching, both exciters must be activated at the same time. Each exciter is controlled by its own processor.

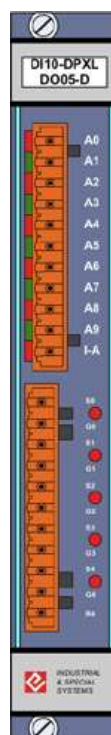
## Special functions

Depending on the type of FW, some DO may have a reserved function. An example is the switching of the heating in the switchboard cabinet depending on the temperature measured by the external sensor, function for controlling of the power switch during the evaluation of the fault on the line, etc.



### Technical specification of combined DI and DO cards

Card	DI10-UAM DO05-U	DI10-UPS DO05-U	DI10-UPM DO05-U	DI10-UPL DO05-U	DI10-UPX DO05-U	DI10-UPXL DO05-U
Inputs number	10					
Inputs type	Active (switching by dry contact)	Passive (switching by external voltage, both polarities)				
Level H	Closed	9–25 V	20–60 V	35–60 V	75–150 V	150–300 V
Level L	Open	0–4 V	0–10 V	0–17 V	0–20 V	0–60 V
Current in inputs	2.4 mA	2.5–7 mA	1.9–6 mA	1.7–3 mA	1.3–2.7 mA	1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms					
Allowed number of changes per minute	0–255					
Isolation voltage	3.75 kV AC for 1 minute					
Outputs number	4 × relay (NO contact), 1 × relay (changeover contact)					
Time of closed contact	10 ms to 655 with step, 10 ms					
Isolation contact-coil	5 kV AC for 1 minute					
Isolation between open contacts	1 kV AC for 1 minute					
Contacts load	8 A / 250 V AC, 8 A / 24 V DC					
Durability	2 × 10 <sup>7</sup> cycles					
Relay switching	Protected against accidental switching. Controlled via digital signals from main CPU.					
Consumption	Max. 2.5 W	Max. 2 W				
Connectors	2 × WAGO 231-311/026-000, part of delivery					
Wire cross-section	0.08–2.5 mm <sup>2</sup>					
Position in bus	Any					



Front panel of combined DIO card





## RTU7M – analog inputs, fault indicators

### General description

Measurement cards are fitted with a powerful signal processor for processing of measured signals. The RTU7M unit serves as a communication bridge for the data transmission. There is possible to use more cards in one chassis in any position. After consultation with the manufacturer, it is possible to adjust the parameters of inputs.

### M3ZQ cards with fault indicator function

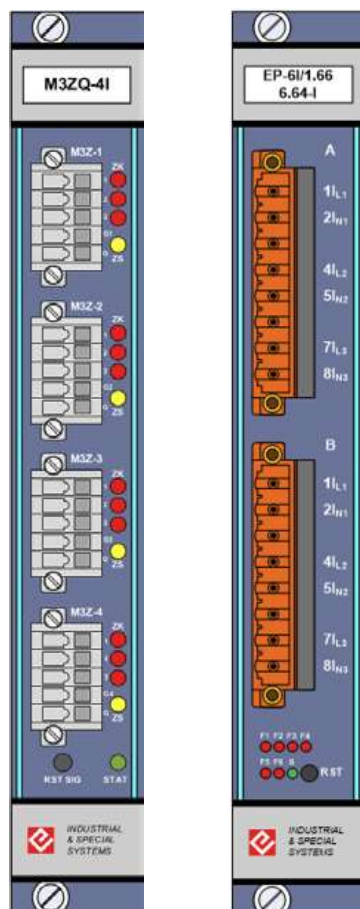
In power industry applications, these cards are used as indicators of short circuits, over-currents and earth faults. They are especially suitable for use in cable networks. In the case of three-phase alternating measurements, there are regularly calculated the effective values of currents in individual phases, effective value  $I_0$  and average value of current  $I_{avg}$ . In addition, there is evaluated the exceeding of the parameterized limits for individual phase currents and the current 0. After exceeding of the limits during the stated period, there are signaled the earth fault, short circuit and the overcurrent. All inputs are galvanically isolated from the remaining part of the unit. Individual inputs are not galvanically separated between each other.

### AI-xI a AI-xID cards

These cards are designed for the measurement of output DC current signals from sensors and measuring converters. They are produced with various input numbers (3, 6, and on request up to 9 or 12). All inputs are galvanically isolated from the remaining part of the unit. According to the card type, individual inputs can be galvanically separated between each other. The measuring range can be parameterized in the RTU UC. Ranges 0 to 20 mA DC, 4 to 20 mA DC, -20 to +20 mA DC are available. Measurements of current are processed using a powerful signal processor. If the measured value is out of the parameterized range of measurement, it is transferred as invalid.

### EP-6I cards with fault indicator function

Card is designed as an independent unit with two groups of three-phase current measurements. All inputs are galvanically isolated from each other and also from the unit. Three-phase current measurements are processed by the high-performance digital signal processor. For each three-phase measurement input is implemented function of short-circuits detection, overcurrents and earth-faults detection. Optionally it is possible to evaluate the short-circuits and overcurrents by activation of a filters for the first harmonic component of measured signal. All limits for fault on lines evaluation, parameters for auto-transferring of measurements and failure notifications can be parametrized remotely.



Front panels of indirect analog measuring cards



### Technical specification of analog input cards

Card	M3ZQ-2I	M3ZQ-4I	AI-12I/5/6-I	AI-3ID/20/20-I	AI-6ID/20/20-I	AI-6ID/20/20-AI	* EP-6I/1.66/6.64-I
Inputs number	2 × 3	4 × 3	4 × 3	1 × 3	2 × 3	2 × 3	2 × 3
Inputs type	Isolated differential inputs 2,5 kV for 1 min.					Isolated from the rest of the unit and between themselves, 4 kV for 1 minute	
Signal processing	Own processor, 10-bit A/D converter					Own processor, 16-bit A/D converter	
Measured variable	Current						
Nominal range	20 mA AC ±20 mA DC		5 mA AC ±5 mA DC	0–20 mA DC 4–20 mA DC ±20 mA DC		1,66 mA AC ± 1,66 mA DC	
Overloadability	40 mA AC permanently ±40 mA DC permanently		6 mA AC permanently ±6 mA DC permanently	±24 mA DC permanently		6,64 mA AC permanently ± 6,64 mA DC permanently 0,166 A AC for 1 s ± 0,166 A DC for 1 s	
Range in RTU UC	0–40 mA		0–6 mA	0–20 mA for measuring 0–20 mA 0–20 mA for measuring ±20 mA 4–20 mA for measuring 4–20 mA		0–6,64 mA	
Input resistance	20.13 Ω	20.13 Ω	130 Ω	26.5 Ω		10 Ω	25,5 Ω
Measuring accuracy (nominal range)	±0.5 %					± 0,3 %	± 0,3 %
Measuring accuracy (overloaded)	±1 %			±0.5 %		± 0,3 %	± 0,3 %
Sampling	According to the used firmware						
Power consumption	3 W	3 W	1.5 W	2 W	2,5 W	2,5 W	2,5 W
Connectors	4 × WAGO 734-105/107-000	4 × WAGO 734-105/107-000		1 × WAGO 734-105/107-000	2 × WAGO 734-105/107-000	2 × WAGO 231-308/107-000	
Wire cross-section	0.08–1.5 mm <sup>2</sup>					0,08–2,5 mm <sup>2</sup>	
Position in bus	Any						

\* Next standard versions: EP-6I/20/200-I (20/200mA), EP-6I/1-5A/10A-I, EP-6I/1A/30A-I, see EP cards



## RTU7M – combined analog input cards, fault indicators and protection relays

### EP card without DI/DO with 3V and 3I measurement

This card is the basic type of card fitted with three voltage inputs with overloading of 1.2 (optionally  $1.3 \times U_n$ ) and three current inputs with different overloadability according to the type of application. Nominal ranges are adapted to various types of measuring transformers of voltage (VT) and current (CT). The values in the overloaded ranges are also measured. In all cases, the maximal overloading (the robustness) of the analogue inputs is 100 A for 1 s.

Usually, the overloading about  $2 \times I_n$  is used in applications of P, Q, U, I measurement, the overloading  $10 \times I_n$  is used in applications like indicator of earth faults and short circuits and the overloading  $30 \times I_n$  is used in applications working as a protection relay.

Three-phase measurements of current and voltage are processed by a powerful signal processor. Other values are calculated, e.g.  $U_{12}$ ,  $U_{23}$ ,  $U_{13}$ , P, Q, S, f, etc. Both groups of inputs are galvanically isolated from the remaining part of the unit with 4 kV AC isolation for one minute. This isolation is also between both groups of analogue inputs and between individual current inputs.

The card provides two blocks of protective functions with the optional local and remote indication of faults and provides faults recording (COMTRADE). From the protective functions, the ANSI 27/59, 46BC, 47, 50, 50N, 51, 51N, 59, 59N, 67, 67N, 81 are supported.

There are six programmable LED indicators on the front panel of the card that can be used for local signaling of faults. For the local reset of the signaling, it is possible to use the RST button whose function can also be programmed.

### EP card with DI/DO with 4V and 4I measurement

Compared with EP cards without DI/DO, these cards are fitted with digital inputs and outputs and with analogue inputs for measurement of  $I_0$  and  $U_x$  (for measurement of  $U_0$  or other voltage variable). The card can serve as complete protection relay. Cards are produced with eight digital inputs and four digital outputs. Through the card parameterization, it is possible to set the source of measurement  $I_0$  and  $U_0$ . The card can calculate  $I_0$  and  $U_0$  from the measurements of the phase currents and voltages or can measure them via fourth analogue inputs. This solution increases the sensitivity and accuracy of earth fault protection, if summation measuring current and voltage transformers are available.

Similarly to EP card without DI/DO, all protective functions are available, as well as fault recorder. In addition, automation functions for reclosing and disconnection in the voltage-free pause are available.

According to the type of the card, digital inputs are designed for various values of signaling voltages 24, 48, 110 and 220 V DC. They can be connected as active or passive.



EP card 3U31 without DI/DO



EP card 4U41 with 8DI 4DO



EP card 4U41 with 8DI 4DO, 5A inputs with 30x overloadability

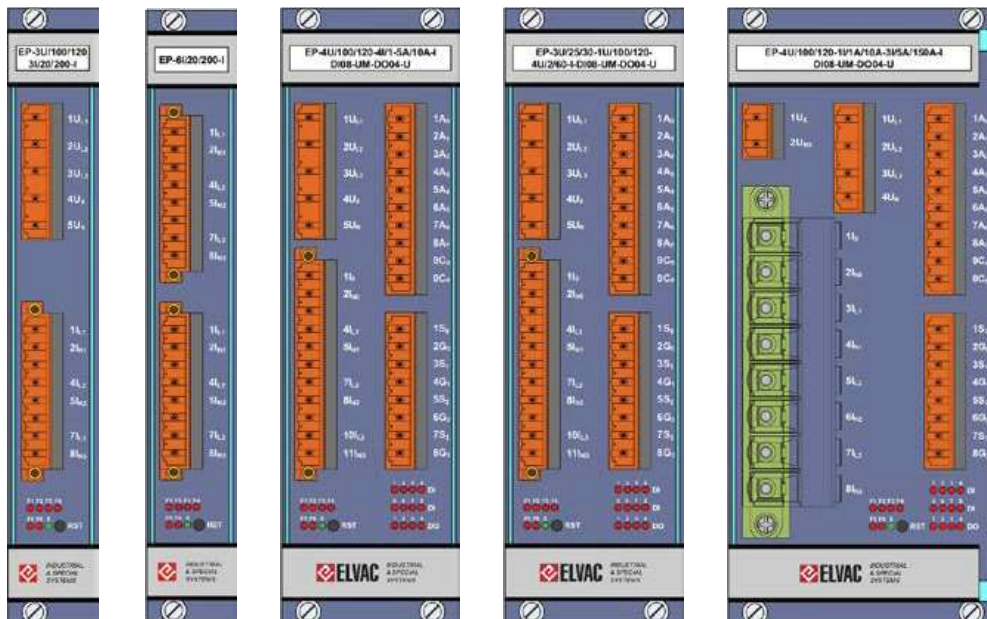
### EP cards with special combinations of inputs

EP cards are designed with certain number of analog and inputs that can be combined according to the needs of customer. After consultation with the producer, it is possible to prepare special combination of voltage or current inputs adjusted to the specific range of sensors used in given application. All protective functions, automation functions and fault recorder are available (same as EP cards with 4U 4I measurements). This way there were developed special cards for remotely controlled recloser and LBS applications, where are used different types of current and voltage sensors and many other applications.

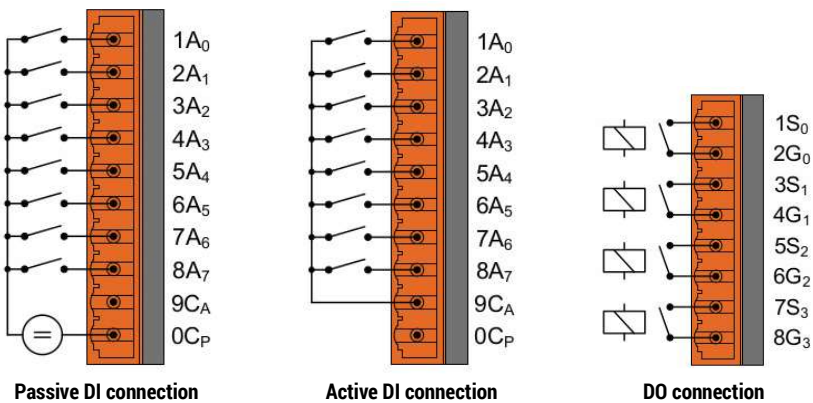
### Typical applications with special EP cards with DI/DO

- ☒ with sensors FSI 36 and FSU 36,
- ☒ with capacitive sensors VSO 25,
- ☒ for GVR reclosers,
- ☒ for Tavrida reclosers (including the solution with Rogowski coils for current measurements).
- ☒ sensors Zelisko,
- ☒ sensors TE.

Standard measured input ranges of cards are mentioned in the tables at the end of this chapter.

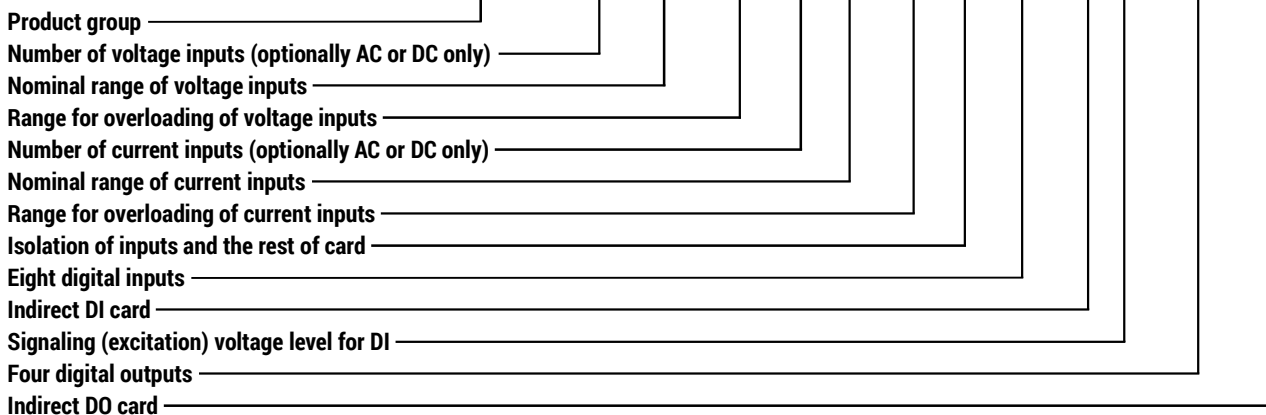


Examples of front panels of EP cards in 1-slot, 2-slot and 3-slot version



Product code description of EP cards

**RTU7M EP-4U/100/120-4I/20/200-I-DI08-U M-D004-U**



Modular RTU



## General parameters of EP cards

Signal processing	Its own processor, 16-bit A/D converter
Position in bus	Any

## Voltage inputs specification

Part of code	0.225/2.25	0.225/6.75	2/60	2.2/2.64	2.5/3
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group.				
Nominal range	0.225 V AC ±0.225 V DC	0.225 V AC ±0.225 V DC	2 V AC ±2 V DC	2.2 V AC ±2.2 V DC	2.5 V AC
Overloadability	2.25 V AC perm. ±2.25 V DC perm.	6.75 V AC perm. ±6.75 V DC perm.	60 V AC perm. ±60 V DC perm.	2.64 V AC perm. ±2.64 V DC perm.	3 V AC perm.
Range in RTU UC	0–2.25 V	0–6.75 V	0–60 V	0–2.64 V	0–3 V
Input consumption	1 mW by 2.25 V	1.7 mW by 6.75 V	35 mW by 60 V	1 mW by 2.64 V	1.5 mW by 3 V
Measuring accuracy (nominal range)	±0.3 %	±0.5 %	±0.5 %	±0.3 %	±0.3 %
Measuring accuracy (overloaded)	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %

Part of code	3.25/3.9	4/4.8	25/30	100/120	230/295
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group.				
Nominal range	3.25 V AC ±3.25 V DC	4 V AC	25 V AC ±25 V DC	100 V AC ±100 V DC	230 V AC ±230 V DC
Overloadability	3.9 V AC perm. ±3.9 V DC perm.	4.8 V AC perm.	30 V AC perm. ±30 V DC perm.	120 V AC perm. ±120 V DC perm.	295 V AC perm. ±295 V DC perm.
Range in RTU UC	0–3.9 V	0–4.8 V	0–30 V	0–120 V	0–295 V
Input consumption	1.6 mW by 3.9 V	1.6 mW by 4.8 V	2 mW by 30 V	70 mW by 120 V	0.1 W by 295 V
Measuring accuracy (nominal range)	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %
Measuring accuracy (overloaded)	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %



## Current inputs specification

Part of code	5/150	20/200	20/600	1/2A
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group. Individual current inputs are mutually isolated.			
Nominal range	5 mA AC ±5 mA DC	20 mA AC ±20 mA DC	20 mA AC ± 20 mA DC	1A AC ± 1 A DC
Overloadability	150 mA AC perm. ± 150 mA DC perm. 0.5 A AC for 1 s ± 0.5 A DC for 1 s	200 mA AC perm. ±200 mA DC perm. 2 A AC for 1 s ±2 A DC for 1 s	600 mA AC perm. ± 600 mA DC perm. 2 A AC for 1 s ± 2 A DC for 1 s	2 A AC perm. ± 2 A DC perm. 30 A AC for 1 s ± 30 A DC for 1 s
Range in RTU UC	0–150 mA	0–200 mA	0–600 mA	0–2 A
Input consumption	25 mW by 150 mA	35 mW by 200 mA	0.1 W by 600 mA	0.27 W by 2 A
Measuring accuracy (nominal range)	±0.5 %	±0.3 %	± 0.5 %	±0.3 %
Measuring accuracy (overloaded)	±0.3 %	±0.3 %	± 0.3 %	±0.3 %

Part of code	1-5A/10A	1A/20A	1A/30A	5A/150A
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group. Individual current inputs are mutually isolated.			
Nominal range	1 A AC ±1 A DC	1 A AC ± 1 A DC	1 A AC ± 1 A DC	5 A AC ± 5 A DC
Overloadability	5 A AC perm. ±5 A DC perm. 10 A AC for 1 min. ±10 A DC for 1 min. 100 A AC for 1 s ±100 A DC for 1 s	5 A AC perm. ±5 A DC perm. 10 A AC for 1 min. ±10 A DC for 1 min. 100 A AC for 1 s ±100 A DC for 1 s	8 A AC perm. ± 8 A DC perm. 20 A AC for 1 min. ± 20 A DC for 1 min. 100 A AC for 1 s ± 100 A DC for 1 s	20 A AC perm. ± 20 A DC perm. 150 A AC for 1 min. ± 150 A DC for 1 min. 500 A AC for 1 s ± 500 A DC for 1 s 1250 A peak for 100 ms
Range in RTU UC	0–10 A	0–20 A	0–30 A	0-150 A
Input consumption	0.85 W by 10 A	1.7 W by 20 A	5 W by 30 A	7 W by 150 A
Measuring accuracy (nominal range)	±0.3 %	± 0.5 %	± 0.5 %	± 0.5 %
Measuring accuracy (overloaded)	±0.3 %	± 0.3 %	± 0.3 %	± 0.3 %



## Technical specification of digital inputs and outputs of EP cards

Part of code	DI08-UM-D004-U	DI08-UL-D004-U	DI08-UPX-D004-U	DI08-UPXL-D004-U
Inputs number	8			
Inputs type	Active (dry contact switching) Passive (switching by ext. voltage, both polarities)		Passive (switching by external voltage, both polarities)	
Level H of active DI Level H of passive DI	Closed 20–60 V	Closed 35–60 V	– 75–150 V	– 150–300 V
Level L of active DI Level L of passive DI	Open 0–10 V	Open 0–17 V	– 0–20 V	– 0–60 V
Input current of active DI Input current of passive DI	2.4 mA 1.9–6 mA	2.4 mA 1.7–3 mA	– 1.3–2.7 mA	– 1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms			
Allowed number of changes per min.	0–255			
Isolation voltage	4 kV AC for 1 minute			
Outputs number	4 × relay (NO contact)			
Time of closed contact	10 ms to 655 s, step 10 ms			
Isolation contact-coil	5 kV AC for 1 minute			
Isolation between open contacts	1 kV AC for 1 minute			
Contacts load	8 A/250 V AC, 8 A/24 V DC			
Durability	2 × 10 <sup>7</sup> cycles			
Relay switching	Protected against accidental switching			
Connectors	1 × WAGO 231-310/026-000, 1 × WAGO 231-308/026-000, part of delivery			
Wire cross-section	0.08–2.5 mm <sup>2</sup>			

### Power consumption of EP cards

- ☒ one-slot card – voltage and current measurement – 1.6 W,
- ☒ two or three-slot card – voltage and current measurement combined with passive DI/DO – 3.1 W,
- ☒ two or three-slot card – voltage and current measurement combined with active DI/DO – 3.5 W.

### Available combinations of EP cards - supported sensors and transformers

According to above mentioned list of voltage, current and digital inputs and outputs, there can be delivered different I/O combinations of EP cards. Some of them are standardly available, some of them can be prepared on demand. Then the combination can perfectly fit into any application with sensors used by different customers. Actual situation can be checked with producer.

There are typically supported the following sensors and transformers:

### Voltage measurement:

- ☒ direct measuring of 230 V AC,
- ☒ measuring transformers with 100 V output,
- ☒ other measuring transformers with outputs lower than 230 V AC,
- ☒ capacitive dividers - example brand KPB Intra,
- ☒ resistive type sensors with output 3.25 V – example brand Zelisko,
- ☒ capacitive type sensors with output 3.25 V – example brand TE Connectivity,
- ☒ voltage sensors in different types of Reclosers – Tavrída, GVR, Siemens and others.

### Current measurement:

- ☒ standard current transformers with 1 A or 5 A outputs,
- ☒ split-core or closed core current transformers with outputs from 1.66 mA up to 5 A,
- ☒ current transformers with voltage outputs 225 mV – example brand Zelisko,
- ☒ Rogowski coils.



## RTU7M AI-3U3I – power quality metering card

### General description

This card is designed for measurement of voltages and currents in three-phase systems with consecutive evaluation of quality of electrical energy and associated pointers, what is providing a complex picture about distribution grid and energy stream. Measured data can be stored into database and then analyzed and evaluated in SW application ENVIS (free of charge). System can send regular reports about the power quality in given time period or can send automatic alarms, if some selected parameters exceed the set values.



Card RTU7M  
AI-3U/230/300-3I/5A/7.5A-I

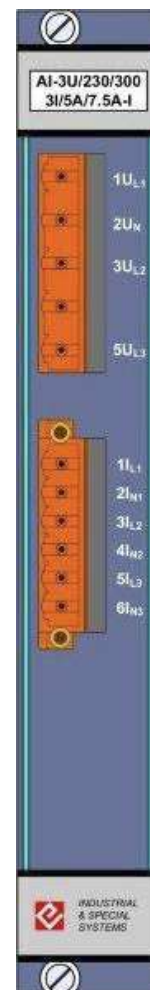
### Typical applications

- ❑ power quality metering,
- ❑ diagnosis and searching for causes of problems in network,
- ❑ remote monitoring of energy consumption or production.

### Basic features

- ❑ three or four independent voltage and current inputs (3x1p, 3p-wye, 3p-delta),
- ❑ energy meter supports 3 tariffs, single and three phase measurement in four quadrants for active and reactive energy,
- ❑ measurement U, I, P, Q, S, harmonic distortion power, PF, cos φ, symmetrical components, unbalance factor, THD, 50 harmonics, fundamental harmonics, frequency, active energy, reactive energy,
- ❑ 512MB memory for data logging,
- ❑ internal battery for 1-hour power backup,
- ❑ standards IEC61557-12, EN50160, class S (class A under development, check the availability with producer).

Front panel RTU7M  
AI-3U/230/300-3I/5A/7.5A-I



### Technical specification

Card	RTU7M AI-3U/230/300-3I/5A/7.5A-I
Voltage inputs number	3
Nominal range	3 × 230 V AC (wye, delta, aron)
Overloadability	300 V AC perm.
Range in RTU UC	4 - 300 V
Current inputs number	3
Nominal range	3 × 5 A AC
Overloadability	10 A AC perm., 90 A AC for 1s
Range in RTU UC	0,0125 - 7,5 A AC
Measuring accuracy	class S (class A under development, check the availability with producer)
Consumption	1W
Connectors	1× WAGO 231-536/108-000, 1× WAGO 231-935/001-000 (part of delivery)
Wire cross-section	0,08–2,5 mm <sup>2</sup>
Position in bus	Any





## RTU7M AI-4UF – fast analog input card

### General description

Fast measuring card is indirect card (card with internal CPU communicating through the internal serial bus with communication CPU) equipped with A/D converter and powerful signal CPU for processing of measured signals with fast changes. The card is equipped with 2 Ethernet ports, that allow to transfer a huge amount of data directly into communication card without occupation of internal bus.

This card is designed for measuring of fast voltage signals from various sensors. There are four voltage inputs, that are galvanically isolated from the rest of unit, but not between each other. The inputs are fitted with BNC connectors with input impedance 75 Ohms. The measuring range is adjustable in parameterization. Maximal voltage value on input is 1.28 V. Voltage is measured by 8-bit A/D converter with maximal sample rate 40MS/s. The card processes the signal from 10Hz to 20MHz. The upper frequencies are limited by fourth-order filter to 20 MHz.

### Typical applications

- ❑ fault detection on isolated overhead MV lines (contact of isolation with vegetation, subject lying on lines, conductor fallen on the ground),
- ❑ early warning of insulation failure and its transition into the earth fault or short circuit.

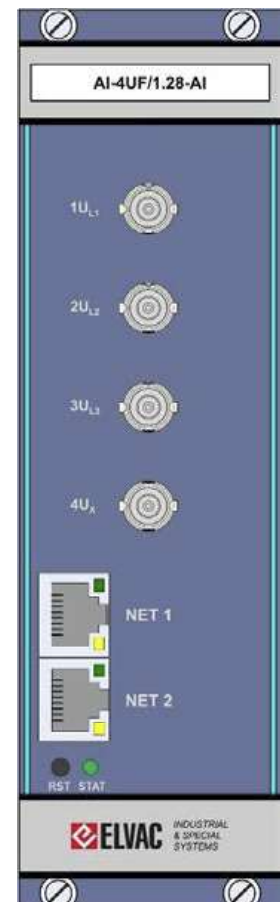
### Technical specification

Card	RTU7M AI-4UF/1.28-AI
Inputs	4
Measured variable	Voltage
Maximal measured value	1.28 V <sub>peak</sub>
Overloadability	4.3 V AC
Inputs type	Isolated 4 kV DC for 1 second from rest of the unit
Input impedance	75 Ω
Signal processing	8-bit A/D converter
Measured frequencies	10 Hz – 20 MHz for 3dB decrease
Accuracy	1% (10kHz, 25 °C)
Measuring category	CAT III, 150V
Sampling	According to used FW, usually 40 MS/s
Interfaces	2 × Ethernet 10/100 Mbps, embedded isolation 1,5 kV AC / 1 minute
Memory	SRAM 4MB
Connectors	4 × BNC, 2 × RJ-45
Consumption	6 W
Position in 5 / 8–10 / 16 slots bus	Any position



Card RTU7M AI-4UF/1.28-AI

Front panel of RTU7M AI-4UF/1.28-AI





## RTU7M AI-8T-I – temperature measuring card

### General description

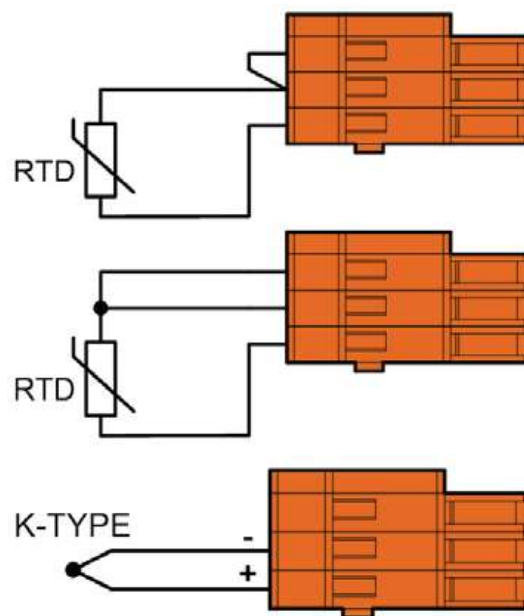
This card is designed for temperature measuring via RTD or thermocouples. The advantage is the possibility of simultaneous temperature measurement using different sensors. There are 8 independent measuring channels.

### Basic features

- ❑ 8 inputs for temperature sensors,
- ❑ supported sensors: PT100, PT1000, Ni120, Thermocouple K,
- ❑ 2 or 3-wire sensors connection (3-wires eliminate the cable length influence).

### Typical applications

- ❑ general temperature measuring in power industry applications,
- ❑ temperature check on voltage or current measuring sensors (provided by some type of sensors) – used for operating temperature check.



Different sensor types connection

### Technical specification

<b>Card</b>	<b>RTU7M AI-8T-I</b>			
Number of inputs	8			
Input types	Differential inputs isolated from the rest of unit, 2.5 kV 1 minute			
Signal evaluation	Own processor, 20-bit A/D converter			
Measured value	Temperature			
Sampling	9 Hz (all sensors)			
Consumption	1.6 W			
Connectors	8EDGK-2.50-03P-15			
Wire diameter	0.2-1.5 mm <sup>2</sup>			
Operating temperature	-20 to 65 °C			
Storage temperature	-30 to 85 °C			
Sensor type	PT100	PT1000	Ni120	Thermocouple K
Nominal range	-130 to 130 °C	-130 to 130 °C	-80 to 130 °C	-130 to 130 °C

Front panel of RTU7M AI-8T-I

