SO-52v21

Remote Terminal Unit

Comprehensive and efficient solution for reliable applications due to ruggedized modular structure and flexible configuration software. It ensures the key principles of confidentiality, integrity and availability.

Applications

SO-52v21 Remote Terminal Unit performs all automation and measurement functions required for industrial applications. It can be applied in e.g. electrical power substations, power plants, chemical plants, waste water treatment plants and others. Extended communication resources enable the operation in versatile communication networks based on Ethernet, GPRS/GSM, radio transmission in dedicated and open channels or separated networks.

Due to versatile communication capabilities and extended cyber security features SO-52v21 is dedicated for SMART GRID applications especially.
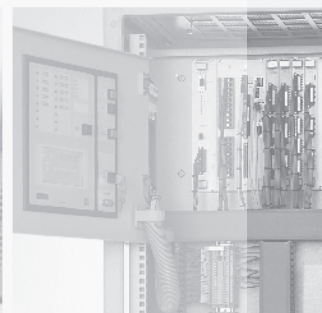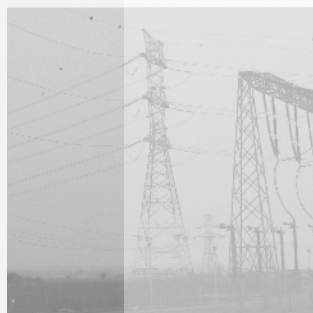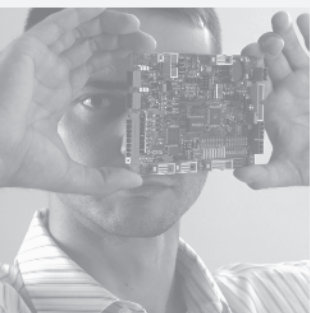
Features

SO-52v21 is based on dual-core processor. Its operating system is supported by ARM system core. The DSP core supports a specialized real time system for controls, automation, power quality assessment etc.

The cryptography and encryption methods are used to protect against unauthorised attempt to stored or transferred information from/to the RTU.

The parameters of the application software may be edited by secured configuration software. The controller may be powered by various voltages. The buffered redundant power supply is available.

The modular structure with no rotating components is installed in a ruggedized, metal case with guide bars and mounting fasteners. The controller is rack or panel mounted. Installation on a DIN rail is also possible on request.

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Functionality

The standard features of the RTU may be activated and parameterized remotely or locally using pConfig configuration software, running IEC 60870-5-101 and –104 communication interfaces. The configuration is secured by a separated configuration server. Algorithms of particular control and regulation functions are created using the functional software environment, compliant with IEC 61131. The range of parameterization for input and output signals and analog signals depends on the application and is summarised below.

FUNCTIONALITY	DESCRIPTION
Programmable filter	The program time filter assigned to each input separately, 1 ms resolution
Flattering	Binary input oscillation suppression
Negation	The active state for each binary input may be selected as logical "1" or "0"
One-bit inputs	Any input of a given input module may be defined as a one-bit input
Two-bit inputs	Any pair of inputs for a given module may be defined as two-bit logical inputs
Output signals timing	For each output it is possible to parameterize the duration time of control signals
"1 from n" control	If selected, then only one command can be executed in a given time
Control interlocking	Rejecting controls or accepting them only in a specific, defined set of conditions
Control time	The control signal duration is defined in the range from 0,1 to 1000 sec
Elongation time	The defined time in which this control remains active despite the occurrence of the signal to the control termination
Output resistance checking	In the "select" phase the resistance of the output circuit is measured
Wiring continuity checking	In the "select" phase the contacts of an external component or circuit are checked
Wiring earthing checking	In the "select" phase it is checked whether the executive circuit is not earthed
Current flow measurement	During a control in the "operate" phase the current flow is measured
Mains noises suppression	Selectable suppressing of 50Hz, 60Hz, 16.7Hz noises in analog signals
Smoothing	For each input the configurable smoothing function may be assigned
Zero-area suppressing	Selected area in which fluctuations around the zero value are suppressed
Reliability monitoring	Detection of analog values outside of the acceptable range

Transmission

SO-52v21 RTU supports various transmission media, e.g. galvanically separated RS-232 and RS-485 connections, Ethernet network in the TP100 or FX100 standard, dedicated fiber optic connections. The transmission may be also performed via wire telephone modems supported by the RS-232 serial communication and the internal GSM/GPRS modem.

Protocols

The RTU performs communication with external SCADA/NMS systems and SAS substation devices in various protocols. Standard communication protocols IEC 60870-5-101, ...102, ...103, ...104, DNP 3.0, IEC 61850 and specialized protocols are available. The protocols are specified with the use of the configuration software according to defined profiles. The protocol interoperability checklists are provided on request.

Security

The service access to the RTU is protected by password confirmation. Centralized authentication with AAA protocols is performed. IPsec VPN protocol is used to secure the communication. The IEC 60870-5-7 standard is implemented.
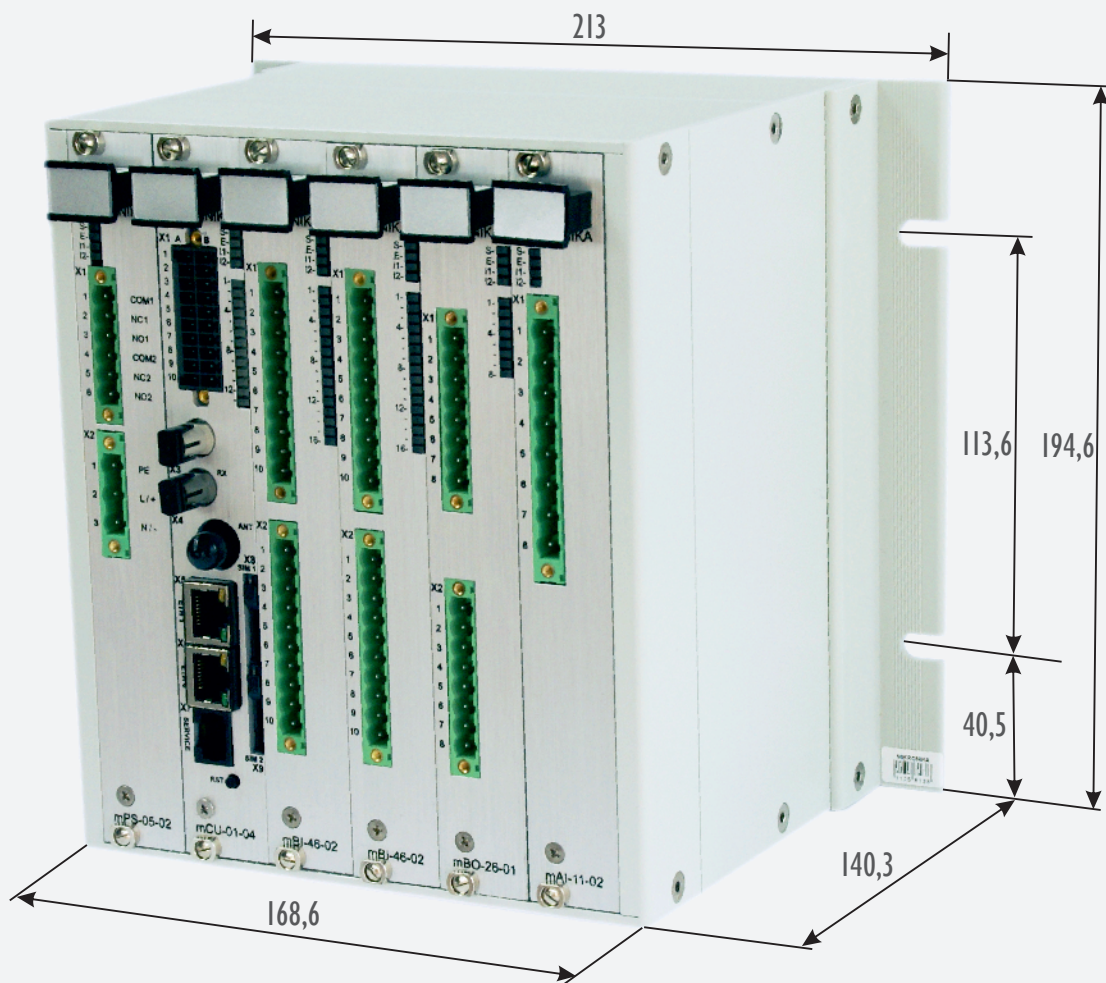
Modules

The quantity and type of controller modules are selected during the application design phase. The hardware resources may be extended or changed. The controller may be equipped with the following modules:

- processor — system and application software, performs input/ output activity, supports communication protocols
- binary inputs — 16 binary inputs 24, 48, 110 or 220V DC with/without hysteresis
- binary outputs — 8 binary outputs with optional wiring continuity assessment
- analog measurements — 8 analog inputs with selectable range ±20mA/0÷20mA/4÷20mA or 4 current inputs 1A/5A and 4 voltage inputs 57,7V/100V/ 230V AC/DC
- analog outputs — 6 analog outputs, selectable range ±20mA, 0÷20mA, 4÷20mA
- specialised modules — water conductivity measurement, PTC or NTC temperature measurement, others
- supply 230/220V AC/DC — features also 24V buffer accumulator internal charging with temperature supervision
- supply 18÷75V DC or 230V AC/DC — power supply basic and reserve modules can be installed

The power supply modules can operate parallely to establish fully redundant controller's power supply.

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An example of RTU, dedicated fot SMART GRID applications:

CPU module

The Central Processor Unit module performs all functions connected to data acquisition, processing and communication with external systems and devices. The module performs all controls, interlocking, automation and peripheral testing.

Binary inputs

The 16 binary input module with the nominal Us control voltage 24V or 48V or 220V AC/DC. All object inputs are galvanically isolated. Inputs are arranged in groups of 8 inputs with a common pole. Each input has an implemented hysteresis.

Number of inputs	2 groups of 8 binary inputs, galvanically isolated
Input voltage U_s	0÷60V DC or 0÷220V DC
Input current	2,7mA / 24V DC
Input impedance	8.9kW / 24V DC
Voltage strength	2.5kV / RMS 1 min
Hysteresis	U_{LOW}=0.25U_s; U_{HIGH}=0.7U_s

Binary outputs

Binary output module can operate with the nominal control voltage Us 24V or 48V or 220V. All outputs are galvanically separated. Outputs may operate in various configurations, in the „single", „one and half" and „double" modes. The detection of the output circuit earthing fault can be also performed. The scope of the supervision function has to be selected separately for each output. Please see the manual for details.

Number of outputs	8 control outputs with additional arming relay
Output voltage	0÷60V DC; 0÷220V DC
Current load	8A/24V DC; 0.2A/220V DC
Voltage strength	2.5kV / RMS 1 min

Controls are performed in the "select before operation" mode. The controller can perform external wiring checking during the subsequent control stages. The scope of performed supervising operation can be selected by configuration software for each output separately.

Measurements

Analog measurement module of 8 analog inputs is available. Analog inputs are galvanically isolated from the internal logic of the controller.

PARAMETER	LOW CURRENT	CURRENT / VOLTAGE
Number of inputs	8 isolated analog inputs	8 isolated analog inputs
Measurement nominal range	±20mA, ±5mA, 0÷20mA, 4÷20mA	1A/5A AC and 220V AC/DC, 57.7/100V AC
Input resistance	120W	1MW (voltage inputs)
Maximal value of input current	50mA	up to 150% In (nominal current)
Maximal value of input voltage	-	up to 300% Un (nominal voltage)
Measurement class	0.1	0.1
Measurement resolution	16 bit	16 bit
Voltage strength	2.0kV AC or 2.5kV / RMS 1min	2.5kV / RMS 1min

Analog outputs

Analog output module of 6 analog outputs is available. Analog outputs are galvanically isolated from the internal logics of the controller.

Features

Number of outputs	6 separated analog outputs
Outputs range	DC, ±20mA, ±5mA, 0÷20mA, 4÷20mA, programable
Output signal class	0.1
D/A converter resolution	16 bit
Voltage strength	2.0kV AC or 2.5kV / RMS 1min

Power supply

SO-52v21 RTU may be equipped with the 230/220V AC/DC power supply module. The module can charge and supervise 24 V accumulator or two 12V accumulators.

The controller may be equipped also with a redundant power supply modules of the input voltage range 18V÷75V DC or 85÷230/220V AC/DC.

Technical data

Power supply

PARAMETER / FACTOR	STANDARD	TEST LEVEL	CRITERION
Main supply 230V AC	IEC 60870-2-1	-20 +30%	ACx
Main supply 220V DC	IEC 60870-2-1	-20 +30%	DCx
Reserve supply 24V-60V DC	IEC 60870-2-1	18V ÷ 90V	DCx
Accumulator supply 24V DC	IEC 60870-2-1	21V ÷ 29V	DCx

Electromagnetic compatibility (EMC)

PARAMETER / FACTOR	STANDARD	TEST LEVEL	CRITERION
Voltage dips	IEC 61000-4-11	Class 3	A
Power supply interruptions	IEC 61000-4-11	Class 3	A
Voltage changes	IEC 61000-4-11	Level 1	A
Surge disturbances 1.2/50 - 8/20 µs	IEC 61000-4-5	Level 4	A
Fast electric transient states	IEC 61000-4-4	Level 4	A
Electrostatic discharges (ESD)	IEC 61000-4-2	Level 4	A
Electromagnetic emission			Level B

Isolation withstand

PARAMETER	STANDARD	TEST LEVEL	CRITERION
Electric strength - voltage strength testing (AC voltage)	IEC 60870-2-1	2.0kV / RMS 1min	VW2
Electric strength - testing with surge voltage (surge:1.2/50µs)	IEC 60255-5	2.5kV / 1.25µs	VW2

Environmental conditions

PARAMETER / FACTOR	STANDARD	TEST LEVEL	REMARKS
Operational temperature range	IEC 60068-2-1 and IEC 60688 group III	-20°C to 70°C 96 hours test	---
Humid heat, cyclically	IEC 60068-2-30	2 cycles / 12 hours	---
Dry heat	IEC 60068-2-2	24 hours	---
Coldness	IEC 60068-2-1	24 hours	---
Dust and humidity resistance	IEC 60529	IP51	standard casing

Mechanical strength

PARAMETER / FACTOR	STANDARD	TEST LEVEL	CRITERION
Resistance to long-lasting sinusoidal vibrations	IEC 60255-21-1 Class 1	Acceleration=1g / 10÷150Hz, tunable, 160min x 3 axes	No damage
Resistance to constant surges	IEC 60255-21-2 Class 2	Acceleration=10.0g / 11ms 2000 surges x 3 axes	No damage
Resistance to single surges and strikes	IEC 60255-21-3 Class 2	Acceleration=30.0g / 11ms 6 surges x 3 axes	No damage