

MiCOM C264

Modular Substation Computers



MiCOM C264
in 40TE



MiCOM C264
in 80TE

Improving competitiveness and performance is the key to success in the modern energy world market. New solutions must be developed to optimize assets and take advantage of the rapidly changing environment. Substation automation represents one of the major solutions for accomplishing such objectives.

Schneider Electric offers flexible tools for the progressive retrofit of existing installations, as well as for new substations. Open platforms, relying on state-of-the-art technology, enable innovative automation scheme design and future-proof connectivity.

MiCOM C264 is the latest generation of modular substation computers. In addition to the traditional input/output (I/O) management, MiCOM C264 acts as an IEC61850 computer, a powerful Ethernet gateway, a measurement center and a fast automation processor.

As a remote terminal unit (RTU), a bay controller, a data concentrator, a protocol converter or a voltage regulator, MiCOM C264 is the compact solution to countless applications installed in demanding electromagnetic conditions.

SEAMLESS MODERNIZATION OF EXISTING INSTALLATIONS

MiCOM C264 provides seamless integration to existing substation assets, thanks to its polyvalent interfaces and natural expandability. Its powerful processing, communication and configuration facilities make it the ideal tool for improving substation supervision, automation and maintenance.

OPEN PLATFORM FOR INNOVATIVE REAL-TIME AUTOMATION SCHEMES

MiCOM C264 enables innovative automation schemes thanks to an extremely fast (event driven) engine and robust topological processing. Combining any data available on the 10/100 Mbps Ethernet network eliminates conventional wiring and facilitates cost versus dependability decisions within a substation or between substations.

OPTIMIZED ENGINEERING VERSUS CONVENTIONAL DESIGNS

The multifunctional capabilities of MiCOM C264 optimize system engineering as fewer devices result in less wiring, training and maintenance. Its modern XML configuration interfaces allow information to be shared between the various configuration tools used in the project, thus reducing the overall engineering time



CUSTOMER BENEFITS

- Seamless modernization of existing installations
- Open platform for innovative, real-time automation schemes
- Optimized engineering versus conventional designs
- Integration of today's and tomorrow's communication protocols

INTEGRATION OF TODAY'S AND TOMORROW'S COMMUNICATION PROTOCOLS

MiCOM C264 is fully compatible with modern communication standards such as IEC 61850, IEC 60870-5-104, DNP3, IEC 60870-5-101/103, and MODBUS, while its modular design will make it easy to upgrade in line with future advances in communication technology.

FUNCTIONS

MiCOM C264 substation computers use a range of modular products at both hardware and functional levels. They have the following main functions:

Binary Input Processing

MiCOM C264 offers five types of binary input (BI) processing:

- Single point (SP)
- Double point (DP)
- Multiple point (MP)
- System input (SI) point for C264 internal information coming from configurable, built-in routines and computer status.
- Logical combination of digital inputs

All are acquired and time-stamped with a 1ms accuracy and discrimination.

Furthermore, C264 contains multiple base BI processing options, such as toggle filtering, persistence filtering, motion filtering, undefined state filtering, manual suppression, substitution, forcing of invalid BI and faulty indications. With IEC 61850 protocol on the substation LAN, BI is transmitted on a client/server basis using "Report" or "Goose" messages.

The GOOSE mode is used to transmit BI data extremely quickly on the substation LAN to create reflex automation schemes.

Binary Counter Inputs

The binary counter inputs (BCT) are acquired via digital input boards. Each BCT may be configured as single or double counter. The content of these counters is locally stored in secured memory. Counters are transmitted periodically or on request, according to their configuration. After a stop/restart of the unit, counting is continued with the stored value as the initial value. Operator can set locally or remotely each counter value.

Analogue Inputs Processing

MiCOM C264 offers five types of measurement, processing analogue inputs (AI) from:

- Analogue Inputs (AI)
- Digital Measurement (DM)
- Direct Measured-value (CT/VT)
- Communication network

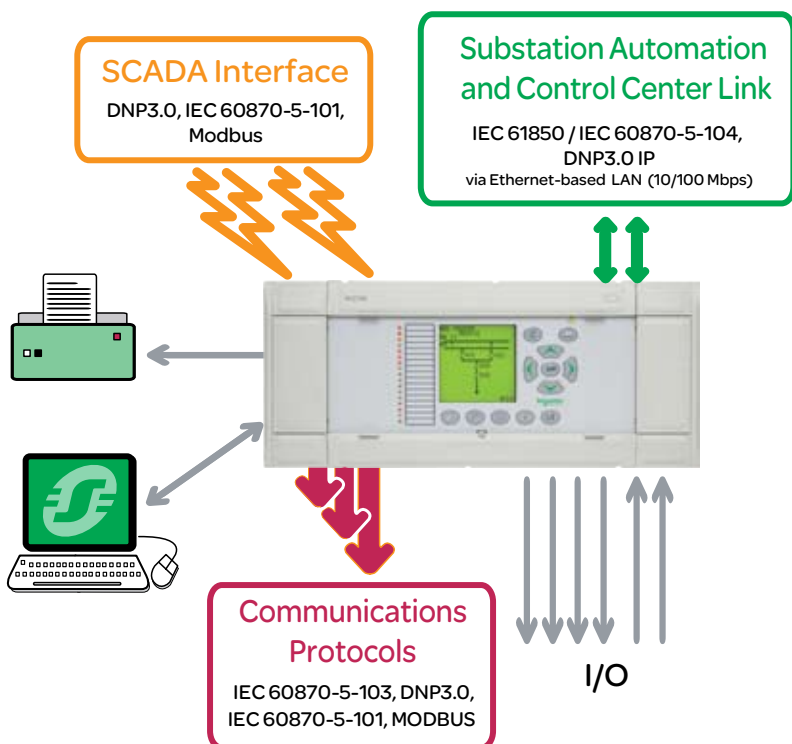
Analogue Inputs are voltage or current DC values, representing an external value, delivered by transducers. Measurements can be received through the communication network as periodical messages or as changes of state (variation, threshold, and invalidity) in various formats including floating, binary, Gray, decimal, BCD coded form.

Analogue Outputs Processing

Analogue outputs are used to interface auxiliary devices requiring analog inputs (eg. Measurement viewers, Generators, Motors, etc.). The Analog outputs are issued from Analog setpoints values received or generated by the MiCOM C264. A quality indication is available with the Read Inhibit output relay associated to each analog output. The Analog output values are secured via an external power supply (48VDC) keeping the value even if the MiCOM C264 power supply is shut-down.

Digital Measurement Processing

The digital measurement (DM) inputs are acquired via digital input boards. MiCOM C264 allows the acquisition of a digital value coded on N wired BI. Each BI represents part of the DM value, and can be either one of two values (low or high). These DM values are used to process measurements and tap indications. Acquisition may be carried out either in BCD-coded form, binary, Gray, decimal, or 1 among N. The DM inputs are used to acquire the tap changer positions (TCP) through the BI.



MiCOM C264 architecture with SCADA interface, Substation automation, IEDs links, SOE printer, remote access, I/O,...

Measured-Value Acquisition

Four currents (CT) and five voltages (VT) calculated from the direct primary measures are monitored. Two of the five voltages can be configured for busbar's voltages.

Derived Values

A multitude of values are derived from the direct primary measures (currents and voltages), such as:

- RMS currents and voltages
- Network frequency and Phase angle
- Active, reactive and apparent powers (P, Q, S – total and per phases)
- Power factor
- Sequence components (direct, inverse, zero-sequence for I and U)
- Synchro-check information: ΔF , ΔV , ...

Digital Outputs

Digital outputs are used to apply a switching voltage to an external device in order to execute single or dual, transient or permanent commands. MiCOMC264 contains multiple security and self-checks, such as relay coil energizing, relay command, relay coil biasing, relay driving registers.

Furthermore, during configuration, a control may be changed to one of the following modes:

- Select Before Operate once (SBO once)
- Select Before Operate many (SBO many)
- Direct execution The SBO once mode is used for controls via set points or ancillary devices, as well as synchronized or non synchronized circuit breakers, transformers, disconnectors and earthing switches.

The SBO many (Selection, Execution, and Deselection) control sequence is used for the control of transformers.

Bay/Substation Interlocking

The MiCOM C264 provides 2 methods of interlocking:

- Equation method, using logical equations
- Topological Interlocking method, using predefined rules and substation topology specially tailored for digital control systems.

Auto-recloser

The MiCOM C264 can manage one auto-recloser per bay (up to 12 bays per unit). The integrated autoreclosers operate for 1 Phase and/or 3 Phases mode. Up to four auto-reclosing cycles are available and the time delay for each is independently configurable. Auto reclosers can be initiated either internally in the bay unit or via external protection devices using digital inputs.

Synchro-check

The synchro-check function can be used in conjunction with automatic or manual reclosure. The function (limited to one bay) determines the difference between the amplitude, phase angles and frequencies of two voltage vectors. Locking and coupling modes are available and a deadline and dead bus logic are also included.

Trip Circuit Supervision

The purpose of this function is to supervise the continuity of the trip circuit of a circuit breaker. Two options are available: two wires or four wires. The two-wire option lead to a verification of the trip circuit continuity when the circuit breaker is closed.

The four-wire option permits verification of the continuity in either position. If the circuit breaker is single phased, it will be necessary to supervise the continuity of the trip circuit separately for each phase.

Voltage Regulation

The Automatic Voltage Regulation (AVR) function is used to automatically maintain the correct voltage at the lower voltage of transformers. Controlling the tap changer of a transformer changes the secondary voltage.

AVR in MiCOM C264 is a compact Voltage Regulation solution for IEC61850 systems in Distribution and Transmission S/S . It is able to manage one transformer or up to four transformers in parallel.

AVR in MiCOM C264 provides:

- Active and reactive compounding in order to maintain the voltage at a remote location
- Homing in order to adjust a transformer to the voltage of the busbar to which it will be connected
- For Transformers in parrallel: Minimizing circulating current method, Master/follower mode, Optimised transformer ratio.

Programmable Logic

The MiCOM C264 allows an operator to configure specific control sequences or automations (e.g. automatic switching, sequences, busbar transformer, load shedding). The automation applications are based on local or remote information accessed via an Ethernet network. Results of the automation function are also configured to have a local or remote action. There are two different ways of performing automation functions:

- Programmable Scheme Logic (PSL)
- Programmable Logic Controller (PLC)

The PSL is dedicated to fast automation applications. This automation is event-driven (there is no cycle time) and is achieved through the use of programmable logic gates and delay timers. The PLC (optional) tool is fully compliant with IEC 61131-3 programming language. It is dedicated for complex or sequential automation applications.

Event Logging

The MiCOM C264 allows the storage of events in a non-volatile ring memory. The events are archived with their time stamp in chronological order. Up to 2000 of the latest events are stored.

IED Gateway and Data Concentrator

The MiCOM C264 provides a cost-effective method for interfacing and concentrate data from various communicating devices (IED) to a substation automation system (such as DCS), or to a remote control center. Also, it provides a tunneling mode to the IED remote engineering for monitoring and maintenance. IED integration can be done via Ethernet-based links or serial links.

Local Control, Operation and Display

The control of switching devices is possible using a graphical backlit LCD and keypads. Operating actions are performed in a simple and intuitive way via switching between bay panels (up to 12) for switchgear control and dedicated panels for monitoring (i.e. measurements, events list, alarms, etc.), display and maintenance. The operator panel can be mounted separately from the rack (up to five meters), if required, to provide a high level of flexibility in mounting positions.

Access barriers protect the enter mode to guard against inadvertent or unauthorized changes to parameters or triggering of control functions.



MiCOM C264-P
direct operator interface with an optional local HMI

Self Monitoring

Comprehensive self-monitoring procedures within the C264 ensure that internal hardware or software errors are detected and do not cause malfunctions. As the auxiliary voltage is turned on, a functional test is carried out.

Cyclic self-monitoring tests are run during operation and if test results deviate from the default value then the corresponding signal is entered into the non-volatile monitoring signal memory. The result of the fault diagnosis determines whether the C264 device is blocked or the system just issues a warning.

Waveform Recording

The MiCOM C264 provides two types of waveform recording:

- Fast Waveform Record (FWR), which stores samples at maximum sampling frequency
- Slow Waveform Record (SWR), which stores

RMS measurements over a longer period Both modes can run simultaneously.

The trigger can be initiated by:

- Change of state of binary digital inputs/outputs
- Measurement threshold violations
- Request from an operator

The MiCOM C264 allows an operator to adjust the record length (pre and post-time) to raise the number of records. Waveform records are stored using COMTRADE 2001 binary format.

Power Quality Functions

The MiCOM C264 provides the following power quality functions:

- Total Harmonic Distortion (%THD up and including 15th harmonic)
- Total Demand Distortion (TDD) on voltage and currents



Time Synchronization

The MiCOM C264 internal clock can be synchronised :

- by an operator
- by an IRIG-B GPS clock (via the IRIG-B input)
- by an Ethernet SNTP server,
- by a time telegram message issued by remote Scada (DNP3.0, IEC60870-5-101 or IEC60870-5-104).

In addition the MiCOM C264 can be configured as an SNTP Time server on Ethernet network.

Maintenance Web Server

The C264 offers various Maintenance Web Server facilities, directly accessible with a standard Internet Browser. Maintenance operators benefits of these remote new facilities to visualise the C264 maintenance data (Hardware/Software, Communication, I/Os values) and to upload the up-to-date Sequence Of Event File (SOE) . The Ethernet / Internet / Intranet connection remain to be secured externally.

Configuration & Settings

Based on pre-defined libraries, individual configurations can be created rapidly. Importing XML and SCL data allows simple integration of C264 into heterogeneous systems. It is possible to modify the C264's settings on line, with the MiCOM S1 setting Tool (over Ethernet). The MiCOM C264 provides dual configuration databases: one active and one reserved for fast and secure switching in case of system configuration changes. For C264 standalone applications, In order to help operators to avoid any database loss, the source database can be saved in the C264 non-volatile memory.

Comm. Ports	Configurations	
Port N° 1	RS232 / RS422 / RS485	
Port N° 2	RS232 / RS485	
Port N° 3	RS232	RS485/ Optical (option)
Port N° 4	RS232	RS485/ Optical (option)
Port N° 5	Dedicated to Maintenance Experts (RS232 in the front panel)	

MiCOM C264 communication ports per device and associated configurations

Ethernet Communication and Switches (SNMP Managed)

Based on its powerful 32 bits microprocessor, MiCOM C264 is natively equipped with 2 Ethernet ports: 2 separate IP addresses can be freely configured and connected on separate LANs (Example : independent connections for local Station Bus and remote Scada) .

The MiCOM C264 integrates (as an option) a rugged Ethernet switch board (SWX) for Star, Redundant ring (SNMP management) or Dual attachment (SNMP) architectures. The connection to the substation LAN is realised via 2 FX optical fibre (multi- mode or single-mode) and via 4 TX copper link for additional Ethernet devices. On ring architecture, the self-healing mechanism ensures efficient Ethernet communication even in case of a broken fibre optic or any device failure. In this case, the network recovery time is less than 1 ms (up to 96 Ethernet switches in the ring)

PERFORMANCE

I/O processing capacities including direct and IED points, the C264 can process up to:

- 2048 binary digital inputs (BI)
- 1024 digital outputs (DO)
- 1024 analogue inputs (AI)
- 128 binary count inputs (BCT)
- 128 digital setpoints (SP)
- 4 CT (currents) and 5 VT (voltages)
- 16 IEDs per serial link (typical) - 40 max.
- 64 Tap Position Indication (TPI)

Local HMI:

Detachable up to 5 or 15 meters (optional)

Storage Capacities

- Records are stored in non-volatile memory
 - 2000 events, 1ms time stamped in the Sequence of Event log (circular buffer),
 - up to 8 Slow or Fast waveform records.
- FWR records store up to 8 analogue measurements (32 samples per cycle) and up to 128 digital inputs/outputs. The total recording time is equal to 9.6s.
- SWR records store up to 8 RMS measurements (time calculation settable from 1 cycle to 1 hour) and up to 128 digital inputs/outputs. The total recording size is equal to 5000 values.

Five records of waveform and disturbance files come from IED devices connected to the C264.

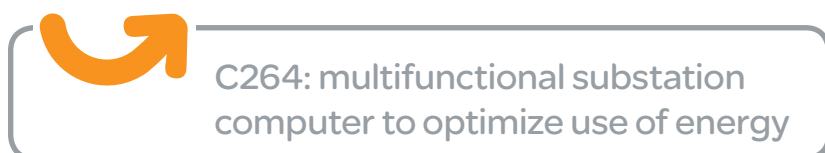
Protocol Capabilities

Ethernet-based communication:

- Per 10/100Base-TX, auto-crossing or per 100Base-FX
- Communication using IEC 61850, IEC 60870-5-104 (Multi-client) or DNP3.0 IP protocols,
- Embedded Ethernet switch module with up to six ports (permitting a compact connection of various devices or input/output extensions)

SCADA & IED serial communication:

- Up to two SCADA or four IED links per C264 device
- SCADA protocol can be switched between: DNP3.0, IEC 60870-5-101, MODBUS,
- IED Protocol can be switched between: DNP3.0, IEC 60870-5-103, MODBUS, IEC 60870-5-101
- Transmission rate: configurable up to 38.4 kbps



Redundancy

At substation level and/or bay level an optional redundant controller can be used to avoid the loss of critical functions at these levels.

Multi-bay Management

Management of up to 128 bays per unit is possible. Multi-bay panels manage graphically up to 12 panels with a maximum of eight animated devices per panel on the local LCD.

RESOLUTION AND ACCURACY

Time Synchronization

1 ms accuracy when using synchronization via Ethernet network or IRIG-B input.

Digital Inputs (DI)

1 ms time tagging.

Digital Outputs (DO)

Operating time, typically <7ms.

Direct CT/VT Acquisition

- 64 sampled values per period
- 0.2% accuracy for AI and RMS values full scale
- 0.5% accuracy for P, Q, S calculations
- 0.5% accuracy for Sequence components (Id, Ii, Io, Vd, Vi, Vo) and power factor
- 0.01Hz accuracy for frequency
- 1° accuracy for Phase angles
- Calculation up to 15th harmonic.

Other Analogue Inputs (AI)

0.1% accuracy of the full scale on the transducer.

Programmable Scheme Logic

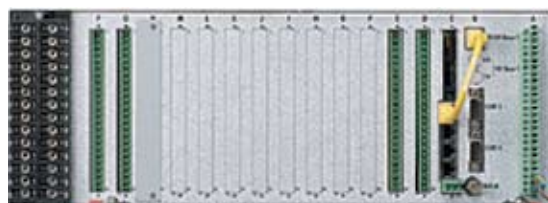
Execution time is < 5 ms.

Programmable Logic Controller (PLC)

The configurable automation functions (PLC programs) can be scheduled from 50ms up to several seconds.



MiCOM C264-P 40 TE and 80 TE rear panels



COMPLIANCE WITH STANDARDS

MiCOM C264 complies with IEC 60255-27:2005, European Commission Low Voltage Directive 73/23/EEC, IEEE standards and CE mark.



EMC

- IEC 61000-4-12:1995 (IEC 255 Part 22-1) - High frequency disturbance: Class III (2.5 kV)
- IEC 61000-4-2-2:2002 (IEC 60255-22-2) -Electrostatic discharge: Level 4 (8kV contact, 15kV air)
- IEC 61000-4-3:2002 (IEC 60255-22-3) - Radiated immunity: Level 3 (10 V/m-1GHz)
- IEC 61000-4-4:2001 (IEC 60255-22-4) - Fast transient or burst: level 4
- IEC 61000-4-5:2001-Surge immunity: Level 4
- IEC 61000-4-6:2003 - High frequency conducted immunity: Level 3
- IEC 61000-4-8:1993 - Power frequency magnetic field immunity: Level 5 (100A/m for 1mn ; 1000A/m for 3s)
- IEC61000-4-9:1993 - Impulse magnetic field immunity: Level 5 (1000A/m pulses)
- IEC61000-4-10:2001 - Damped oscillatory magnetic field immunity: Level 5 (100A/m at 100kHz and 1MHz)
- IEC 61000-4-16:1998 - Power frequency immunity: CM 500 V/DM 250 V via 0.1µF
- EN 55022:2003 (CISPR 22) - Conducted emission: Gr. I, class A (from 0.15 to 30 MHz)
- EN 55022:2003 (CISPR 22) - Radiated emission: Gr. I, class A (from 30 to 1000 MHz, 10m)

Insulation

IEC 60255-5:2000:

- High voltage impulse test: 5 kV (1.2/50 µs), 0.5J
- Insulation voltage test: 2 kV rms, 1minute

TECHNICAL DATA

Design

Surface mounting cases (4 U, 40/80T) are included, suitable for flush mounting on 19" cabinets and panels.

A native 10/100 Mbps Ethernet connection is available (electrical/optical), together with two to four serial communication links (software configurable).

Internal rugged Ethernet switch boards (simple, or switch for redundant Ethernet ring with self-healing or switch for Dual Ethernet star) allow construction of multiple applications using fewer devices and demanding a high level of EMC immunity.

The direct CT/VT interface avoids the use of external transducers. Digital inputs and outputs eliminate interposing relays. Removable connectors simplify installation.

Degree of Protection:

- IP20 for the MiCOM C264 (80TE) case
- IP50 for the MiCOM C264C (40TE) case body
- Front panel (LCD or Leds): IP 52 for both cases

Power Supply

- Nominal Auxiliary Voltage: 24 VDC, 48-60 VDC, 110-125 VDC, 220 VDC, and 230 VAC 50/60 Hz, $\pm 20\%$, and 40W max. admissible consumption
- Stored-Energy: for up to 50 ms power supply interruption
- Dual source power supply (option)

AC Measurement Inputs

- Nominal frequency (FNOM): 50/60 Hz
- Operating range: 45 to 66 Hz
- Accuracy: 0.2% FS at FNOM

CT Measurements Inputs:

- Nominal current: 1A or 5A (IN)
- Nominal consumption per phase: < 0.15A at IN
- Load rating: 20A in continuous, 30A for 3s, 100A for 1s

VT Measurements Inputs:

- Nominal voltage: 57.7 to 500 V
- Nominal consumption per phase: < 0.1 VA at 130 V
- Maximum measurable voltage : 577 Vrms

DC Analogue Inputs

Range (independently configurable):

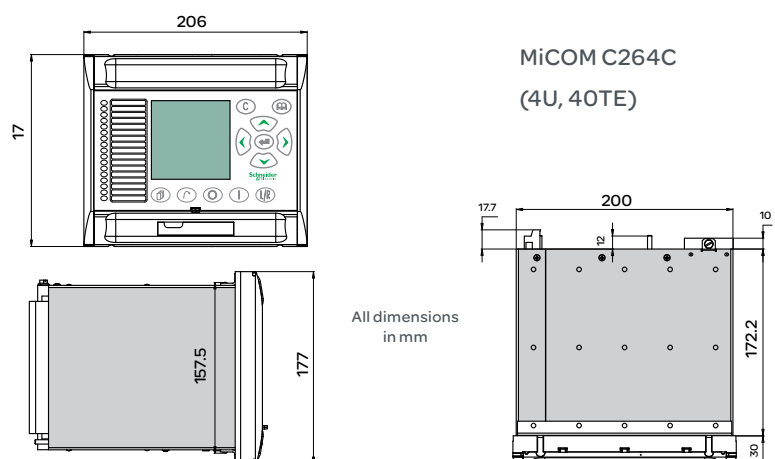
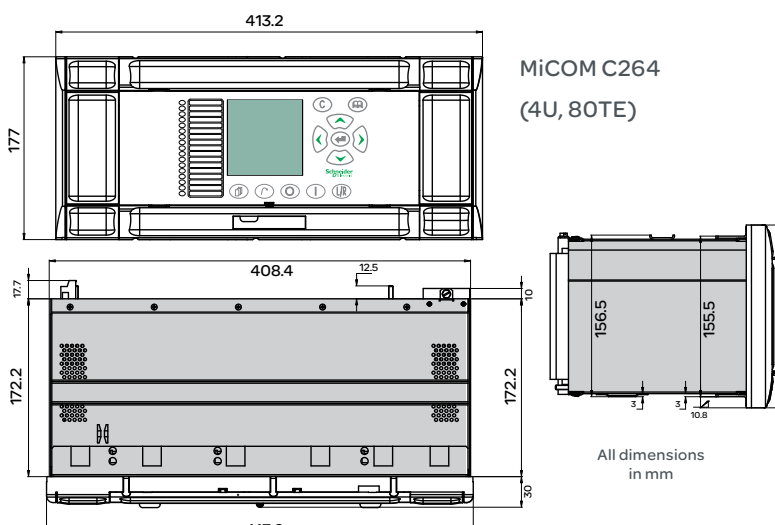
- ± 1.25 , ± 2.5 , ± 5 and $\pm 10V$
- ± 1 , ± 5 , ± 10 and ± 20 mA
- 0-1, 0-5, 0-10, 0-20 and 4-20 mA
- A/D converter resolution: 15 bits + sign
- Rejection ratio mode (at 50/60 Hz):
- CMMR (common): > 100 dB
- Accuracy at 25°C:
- Better than 0.1% in voltage or currents (full scale at 25 °C)

DC Analogue Outputs

Range (independently configurable):

- ± 5 , ± 10 , ± 20 mA and 4-20 mA
- A/D converter resolution: 15 bits + sign
- Output stability: < 100ms after command

DIMENSIONAL DRAWINGS



Digital Inputs (DI)

- Nominal voltage:
- Vn,nom: 24 VDC, 48-60 VDC, 110-125 VDC and 220 VDC, ±20%
- or Multi -voltage (24-> 250VDC) on the DIU210 board
- Power consumption per input:
- 2 to 6 mA, maximum power dissipation is 0,45 W ± 20% per input
- or short peak-current (>25mA) on the DIU210 board

Digital Measurement Inputs

Groups of 4, 8, 12, 16, 32 binary DI on boards as BCD, Binary, Gray, Decimal, 1-among-N coded inputs.

Control/Digital Output Relays

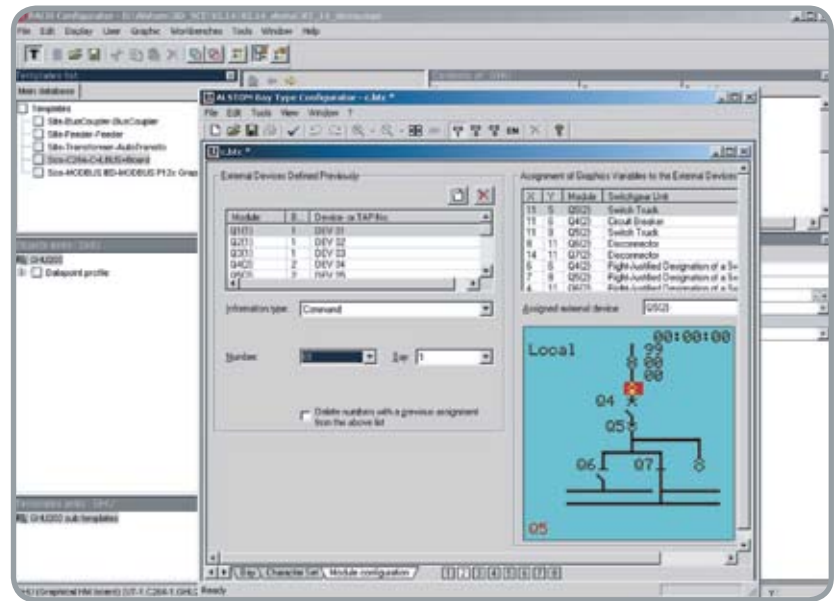
- Nominal Operating voltage range: 24 to 250VDC or 20 VAC
- Digital output relays:
- Continuous current: 5 A
- Short-duration current: 30A for 500ms, 100A for 30ms
- Breaking capacity : DC: 50W resistive, 15W inductive (L/R=20ms) AC: 1250 VA (cos Φ = 0,7)

Control Output Relays:

- Continuous current: 5 A
- Short-duration current: 30A for 4s, 250 A for 30ms
- Breaking capacity (Double pole contacts wired in serial) : DC: 100W resistive, 30W inductive (L/R=40ms) AC: 2000 VA (cos Φ = 0,7)

ENVIRONMENTAL CONDITIONS

- Operating temperature: -25°C to +70°C (-13°F to +158°F)
- Storage temperature: -40°C to +70°C (-40°F to +158°F)
- Ambient humidity range: ≥75 % relative humidity (annual mean), up to 56 days at = 93% relative humidity and 40 °C, condensation not permissible.



MiCOM C264 Configurator Database Tool

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