MiCOM C264-P
Feeder Protection and Control Solution

MiCOM C264-P is the most advanced Feeder Protection and Control solution directly taking advantage of the MiCOM C264 experience. Optimized for HV and MV IEC61850 Digital Control Solutions, the MiCOM C264-P combines the powerfull I/Os management, Ethernet communication capabilities and fast automation schemes of the MiCOM C264 with an independent dedicated Feeder Protection module.

MiCOM C264-P is the ultimate solution for your electrical asset optimisation and quality improvement in an evolving environment.

As part of the Schneider Electric PACiS solution, the MiCOM C264-P takes directly benefits from the engineering flexible tools and maintenance applications.

MiCOM C264-P as an open platform, relying on state-of-the-art technology, is the element for progressive retrofit of existing installations, as well as for new sites.

INDEPENDENT PROTECTION MODULE IN A BAY COMPUTER

MiCOM C264-P has a dedicated independent Protection CPU board with a direct management of the Feeder Circuit Breaker. Compare to all existing One-Box Feeder protections, the MiCOM C264-P provides the highest security level combined with the most powerful processing, communication and configuration facilities and makes it the ideal tool for improving substation supervision, automation, maintenance and protection.

MiCOM C264-P enables innovative automation & protection schemes thanks to an extremely fast (event driven) engine and robust topological processing. Combining any data available on the 10/100 Mbps IEC61850 Ethernet network eliminates conventional wiring and facilitates cost versus dependability decisions within a substation.

OPTIMIZED ENGINEERING VERSUS CONVENTIONAL DESIGNS

The multifunctional capabilities of MiCOM C264-P optimize system engineering as fewer devices result in less wiring, training and maintenance. Its modern XML and SCL configuration interfaces allow information to be shared between the various configuration tools used in the project, thus
MiCOM C264P

reducing the overall engineering time.

REDUCE TROUBLE SHOOTINGS AND MAINTENANCE COST

Thanks to this modular architecture with all card withdrawable construction, the MiCOM C264-P minimize replacement time and provides via the integrated WEB server all detailed necessary maintenance information to the local or remote maintenance team.

INTEGRATION OF TODAY’S AND TOMORROW’S COMMUNICATION PROTOCOLS

MiCOM C264-P is fully compatible with modern communication standards IEC61850, IEC60870-5-104, DNP3 over IP, IEC60870-5-101/103 and MODBUS, while its modular design will make it easy to upgrade in line with future advances in communication technology.

PROTECTION FEATURES

The MiCOM C264-P ensures feeder management and bay control using powerful protection and fast automation feature providing an efficient single box solution for HV and MV applications such as :

- MV feeder lines,
- Overhead lines and underground cables (back-up protection on HV systems),
- Insulated, solid or resistance earthed and Petersen coil earthed neutral system,
- MV subscribers, Industry, Transport,
- Generator and transformer schemes.

MiCOM C264-P supports the following protection functions:

- Phase & earth Overcurrent (50/51, 50N/51N),
- Phase & earth Directional Overcurrent (67, 67N),
- Wattmetric (32N),
- Negative sequence overcurrent (46).
- Undercurrent (37),
- Undervoltage (27) and Over-voltage (59) and residual Over-voltage (59N)
- Over and Under-frequency (81O/81U),
- Rate of frequency change (81R)
- Thermal overload (49)
- Breaker failure (50BF)

Phase and earth overcurrent (50/51, 50N/51N)

Three independent stages are available for phase and earth fault protection. For the first and second stage the user may independently select definite time delay or inverse time delay with different type of curves (IEC, IEEE/ANSI, RI). The third stage can be configured for peak detection and with definite time only. The IDMT stages have definitive or IDMT reset timer to reduce clearance times when intermittent faults occur. Dedicated EPATR A, B, C curves are available with dedicated Earth CT.

Phase and earth directional overcurrent (67, 67N)

Each phase overcurrent stage of MiCOM C264-P can be independently configured as directional protection with specific characteristic angle (RCA) and boundaries. Each directional stage provides instantaneous reverse (mirror) information.

Wattmetric (32N)

The wattmetric protection protects the element against a forward and reverse ground fault wether the earthing is resistif, capacitif or inductif (Peterseen Coil). DMTn and IDMT tripping characteristic allows protection coordination of elements over the network.

Under and over voltage (27, 59, 59N)

The MiCOM C264-P provides two independent undervoltage stages and two independent over-voltage stages. They are definite time elements. Each stage can be configured to operate in single-phase mode or three phase mode.

An additional residual over-voltage stage that
Multifunction IEDs MiCOM C264P

Can be used for generic earth faults detection, particularly in insulated neutral system or as backup at busbar level.

Broken conductor detection (37)

The definite time undercurrent protection of the MiCOM C264-P allows typically simple broken conductor detection or loss of load.

Thermal overload (49)

The thermal overload protection is mainly dedicated for lines and transformers and includes a thermal replica element based on the true RMS value of the current, up to 10th harmonic. Alarm and overload thresholds and time constant are fully programmable to match each application requirement.

Over and under frequency (81O, 81U)

MiCOM C264-P Frequency protection supports 6 thresholds linked to 6 timers (definite time characteristic). Each threshold could be set to under frequency or over frequency. Protection frequency runs each signal period.

Rate of frequency changes (81R)

This protection supports 6 stages, based on average of instantaneous rate of range, derived from the instantaneous frequency calculated each period. Each threshold is settable as over or under rate of frequency change.

Auto-recloser (79)

MiCOM C264-P manages an integrated auto-recloser operating in single and/or three pole mode. Up to four auto-reclosing shots are available and the delay for each is independently configurable. Auto recloser can be initiated either internally in the bay unit or via external protection devices using digital inputs.

Trip circuit supervision (50BF)

The purpose of this function is to supervise the continuity of the trip circuit of a circuit breaker by a dedicated undercurrent threshold. The circuit breaker failure function can be activated by trip of a generic protection or/and external command. The circuit breaker failure protection can be used for tripping upstream circuit breakers.

Two options are available: two wires or four wires. The two-wire option permits verification of the trip circuit continuity only when the circuit breaker is closed. The four-wire option permits verification of the continuity in either position.

Cold load pickup

MiCOM C264P allows automatic or manual blocking or raising of trip settings for a period after the breaker is closed, avoiding unexpected trips.

Protection setting groups

2 separate groups of protection settings are available within the MiCOM C264P and can be activated via an IEC61850 command, a manual action or any physical input.

Derived values

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

- RMS currents and voltages
- Network frequency and Phase angles
- Active, reactive and apparent powers (P, Q – total), power factor
- Sequence components (positive and negative sequence for I and U)
- Currents and phase-phase voltage magnitudes (direct or derived)

Disturbance recording

MiCOM C264-P provides Disturbance file recording initiated by:

- Change of state of binary digital inputs/outputs
- Protection threshold crossing
- Operator’s request

The record length (pre and post time) and the number of records is user adjustable.

FEEDER BAY MANAGEMENT

Binary Input processing

MiCOM C264-P offers five types of Binary Input processing (Single point, Double points, Multiple points, System Input and Logic Input), all acquired and timestamped at 1 ms accuracy and discrimination.

Furthermore, C264-P contains multiple base BIs processing options, such as toggle filtering, persistence filtering, motion filtering, undefined state filtering, manual suppression, substitution, forcing of invalid BIs and faulty indications.

Combining IEC61850 protocol on the substation...
LAN, Bls are transmitted on a client/server basis. IEC61850 GOOSE mode is used to transmit Bls data extremely quickly on the substation LAN to create reflex automation schemes.

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 controls. MiCOM C264-P 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 set to one of the following modes:
- Select Before Operate
- Direct Execute (DE)

Measurement inputs processing
MiCOM C264-P offers five types of measurement from:
- Analogue inputs (AI)
- Digital measurement (DM)
- Protection-value acquisition (CT/VT)
- Derived values
- Communication network

Analogue inputs processing
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, BCD and others.

Analog output processing
Analogue outputs are used to interface auxiliary devices requiring analog inputs (e.g. Measurement viewers, Generators, Motors, etc...). The Analogue outputs are issued from Analog setpoints values received or generated by the MiCOM C264-P. A quality indication is available with the Read Inhibit output relays 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-P power supply is shut-down.

Digital measurement processing
The digital measurement (DM) inputs are acquired via digital input boards. MiCOM C264-P allows the acquisition of a digital value coded on N wired Bl. Each Bl 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.

Protection value acquisition
Four currents (3 phase CTs & 1 earth CT) and four voltages (3 phase VTs & 1 neutral VT) derived from the direct primary measures are monitored and sampled at 32 samples/cycle.

Programmable logic
MiCOM C264-P allows an operator to configure specific control sequences or automations (e.g. automatic switching, sequences, busbar transformer, ). MiCOM C264-P takes fully benefits of the IEC61850 GOOSE capabilities in substation with distributed automation schemes.

The PSL (Programmable Scheme Logic) is dedicated to fast automation applications.

The optional PLC (Programmable Logic Controller) tool is fully compliant to IEC61131-3 programming language. It is dedicated to sequential automation applications.

Event logging

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**Table key:**
- x = free slot for installing I/O modules or switch in the MiCOM C264C.
- o = free slots for installing I/O modules or switch in the MiCOM C264.

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## Cases

<table>
<thead>
<tr>
<th>Cases</th>
<th>C264-P (40TE) 3 free slots</th>
<th>C264-P (80TE) 13 free slots</th>
<th>Max. I/Os per type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Io modules</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>Digital Input Unit</td>
<td>D8U200 or D8U210 (16 DIs)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Digital Input Unit</td>
<td>D8U200 (10 DIs)</td>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>Circuit Breaker Control</td>
<td>CC1200 (8DI Unit / 4COs s)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Analogue Input Unit</td>
<td>AIU201 (4Ais)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Analogue Input Unit</td>
<td>AIU210 (6Ais)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Analogue Output Unit</td>
<td>AO200 (4AOs)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Measurement Unit</td>
<td>TM210 (4CTs/4VTs)</td>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>Ethernet switch board</td>
<td>SWU, SWR or SWD</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

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x = free slot for installing I/O modules or switch in the MiCOM C264C.

o = free slots for installing I/O modules or switch in the MiCOM C264.
The MiCOM C264-P allows the storage of events in 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**

MiCOM C264-P provides a cost-effective method for interfacing data already wired on legacy devices (IEDs) to a substation automation system (such as DCS). IED’s data integration can be done via Ethernet-based links or via several serial links.

**Local control, operation with LCD display**

The control of switching devices is possible using the MiCOM C264-P front panel LCD. Operating actions are performed in a simple and intuitive way, directly from “Mimic” views for the devices control and on dedicated panels for data monitoring (i.e. measurements, events list, alarms, etc.) and maintenance.

The operator panel can be mounted separately from the rack (up to five/fifteen 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.

**Self monitoring**

Comprehensive self-monitoring procedures within the C264-P 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.

**Time Synchronization**

The MiCOM C264-P 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).

**Maintenance Web server**

The C264-P 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-P maintenance data (Hardware/Software, Communication, I/Os values) and to upload the up-to-date Sequence of Event File.

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 & SCL data allows simple integration of C264-P into heterogeneous systems. The MiCOM C264-P protection settings (2 setting groups) are accessible via the MiCOM S1 setting software, running on a PC over Ethernet.

![MiCOM C264-P serial communication ports](image)

### Com. 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 | Reserved for expert maintenance (RS232 in the front panel)

MiCOM C264-P direct operator interface with an optional local HMI
MiCOM C264-P provides dual configuration databases: one is active and one is “reserved”; it offers fast and secure database update facility, specially in case of global system configuration evolution.

**Embedded rugged Ethernet Switch (SNMP managed)**

The MiCOM C264-P 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 and via 4 TX copper link for additional IEC61850 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).

**PERFORMANCES**

**I/O processing capacities**

Including internal, direct and IEDs points, MiCOM C264-P can process up to:
- 5012 binary digital inputs (BI)
- 024 digital outputs (DO)
- 1024 analogue inputs (AI)
- 16 analogue outputs (AO)
- 128 digital setpoints (SP)
- 4 protection CTs (Phase and Earth) and 4 VTs (Phase-Phase, Phase-Neutral and Neutral)
- 16 IEDs per serial link (typical) – 64 max.

**Local HMI:**

Detachable up to 5 or 15 meters (optional)

**Storage capability**

The records are stored in non-volatile memory.
- up to 2000 events-1ms time stamped as SOE
- up to 8 disturbance file records:
  - 32 samples per cycle
  - total recording time : up to 9.6 seconds (50Hz)

**Protocol capabilities**

- Ethernet-based communications:
  - Per 10/100 Base-Tx, auto-crossing or per 100 Base-Fx (with Ethernet switch)
  - Communications using IEC61850, IEC60870-5-104 or DNP3.0 IP protocols
- Integrated Ethernet switch module with 4 TX ports and/or 2 FX (SNMP managed with SWR21x -ring- or SWD21x -dual attachment- boards)

**SCADA & IED serial communications:**
- Up to two SCADA or four IED links per C264-P device
- SCADA protocol can be switched between: DNP3.0, IEC60870-5-101, MODBUS
- IED Protocol can be switched between: DNP3.0, IEC60870-5-103, MODBUS, IEC60870-5-101
- Transmission rate: configurable, up to 38.4 kbps

**Redundancy**

At substation level and/or bay level an optional redundant MiCOM C264-P can be offerd to secure all the critical functions at these levels.

**Multi-bay management**

MiCOM C264-P manages up to 12 independent bay panel mimics with a maximum of 8 animated devices on the local LCD.

**COMPLIANCE WITH STANDARDS**

MiCOM C264-P complies with IEC, IEEE standards and EC mark.

**IEC61850 protocol**

- International IEC61850 level A Certificate by KEMA

**EMC**

- IEC61000-4-12:1995 (IEC255 Part 22-1) – High frequency disturbance: Class III (2.5 kV)
- IEC61000-4-2:2002(IEC60255-22-2) – Electrostatic discharge: Level 4 (8kV contact, 15kV air)
- IEC61000-4-3:2002 (IEC60255-22-3) – Radiated immunity: Level 3 (10 V/m-1GHz) and IEEE C37.90.2 (35 V/m- 1GHz)
- IEC61000-4-4:2001 (IEC60255-22-4) – Fast transient or burst: level 4
- IEC61000-4-5:2001–Surge immunity: Level 4
- IEC61000-4-6:2003– High frequency conducted immunity: Level 3
- IEC61000-4-8:1993 – 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 (1000 A/m pulses)
- IEC61000-4-10:2001 – Damped oscillatory magnetic field immunity: Level 5 (100 A/m at 100 kHz and 1 MHz)
Multifunction IEDs

MiCOM C264P

- IEC61000-4-16:1998 – Power frequency immunity: CM 500 V/DM 250 V via 0.1μF
- EN 55022:2003 (CISPR 22) – Conducted emission: Gr. 1, class A (from 0.15 to 30 MHz)
- EN 55022:2003 (CISPR 22) – Radiated emission: Gr. I, class A (from 0.15 to 30 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. Natively, Ethernet connection and four serial communication links (configurable) are available. Internal rugged Ethernet switch board (for simple star, or switch for redundant Ethernet ring -SNMP managed, or switch for dual physical star- SNMP managed) allows construction of multiple applications using fewer devices and demanding a high level of EMC immunity.

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

Power supply
Nominal Auxiliary Voltage:
- VA, nom: 24 VDC, 48-60 VDC, 110-125 VDC, 220 VDC, and 230 VAC 50/60 Hz, ±20%, and 40W max. admissible consumption

IRIG-B interface
- Standard: NF S 87-500, May 1987
- Interface: BNC plug

Time synchronisation
- < 1ms with IRIG B input

Protection CT & VT inputs
- Nominal frequency (FNom): 50/60 Hz
- Operating range: 45 to 66 Hz
- Sampling rate: 64 samples per cycle
- Voltage (resp. Current) accuracy : 0.5% at Vn (resp In)
- phase angles : ± 1° accuracy
- Pass band 10th harmonic

Protection CT: phase input
- Nominal current: 1A or 5A (IN)
- Operating range: 0.1-40 IN
- Nominal consumption per phase input: 0.05 VA (at IN =1A) : < 1,25 VA (at IN = 5A).
- Load rating per phase input: 4 IN in continuous, 30 IN for 10s, 100 IN for 1s
- Surge current: 250 IN
- Compatibility with external transformer : 5VA 5P10

Protection CT: earth input
- Nominal current: 1A or 5A (ION)
- Operating range: 0.01- 8 ION, 0.002-1 ION or 0.1-40 ION
- Nominal consumption earth input < 0.008 VA at 0.1 ION (rating 1A);
  < 0.175 VA at 0.1 ION (rating 5A).
- Load rating earth: 4 ION in continuous, 30 ION for 10s, 100 ION for 1s
- Surge current: 250 ION
- Compatibility with external transformer : 5VA 5P10

Protection VT inputs:
- Nominal voltage: 50 to 130 V (option 220 to 480 V)
- Nominal consumption per phase: < 0.5 VA at 130 V
- Thermal heating : 2 VN phase-neutral permanent, and 2.6 V phase-neutral for 10 s

DC Analogue inputs (AI)
- Range (independently configurable):
  - ±1.25, ±2.5, ±5 and ±10V (AIU201 only)
  - ±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
- Accuracy at 25°C:
  - Better than 0.1% in voltage(full scale at 25 °C)
  - Better than 0.1% in current (full scale at 25 °C)

Feeder protection Inputs/Outputs (DSP IOs)
- Digital inputs:
- Nominal wetting voltage:

MiCOM C264-P 40 TE and 80 TE rear view
• Vn,nom: 48-60 VDC, 110/125 VDC and 220 VDC, ±20%
• Power consumption per input:
  • 2 to 6 mA, maximum power dissipation is 0.45 W±20% per input
• Trip and Control output relays
• Operating voltage: 24 to 300 VDC or 250 VAC
  • Continuous current: 5 A
  • Short-duration current: 30A for 500ms, 100A for 30ms
  • Breaking capacity:
    DC: 100W resistive, 30W inductive (L/R=40ms)
    AC: 1250 VA resistive, 1250VA inductive (cosΦ = 0.7)

Digital inputs (DI)
• Nominal wetting voltage:
  • Vn,nom: 24 VDC, 48-60 VDC, 110/125 VDC and 220 VDC, ±20%
  • or Multi-voltage (24-250V) on the DIU210 board
  • 1ms time stamping resolution

Control/digital output relays
• Operating voltage: 24 to 300 VDC or 250 VAC
• Digital output relays:
  • Continuous current: 2.5 A
  • Short-duration current: 30A for 500ms, 100A for 30ms

DC analogue outputs
• Range (independently configurable):
  • ±5 mA and 0-5 mA
  • ±10 mA and 0-10 mA
  • ±20 mA, 0-20 mA and 4-20 mA
  • Accuracy at 25°C full scale: 0.1%
  • Deviation: < 100ppm/1°C
  • Output stabilization: < 100ms
  • AOU Watchdog relay:
    • Continuous current: 2.5 A
    • Short-duration current: 30A for 500ms, 100A for 30ms

Internal ethernet switches:
• Switches for Star architecture:
  • 4 x Tx ports (RJ45)
  • 2 Fx single or multi-mode ports;
• Switches for reduned Ethernet ring or Dual Attachment:
  • 4 x Tx ports (RJ45)
  • 2 Fx single or multi-mode ports for ring redundancy;
  • SNMP Managed.

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).