



# MC400

Mains controller for multiple genset applications  
with and mains circuit breaker management

## DESCRIPTION

Microcontroller based device, aimed for managing the mains (and the relative circuit breaker) in applications composed by multiple generators operating in parallel. Multiple **MC400** controllers are allowed for each system, to manage multiple mains.

**MC400** performs a continuous check of the mains voltages characteristics; in case of anomalous voltages, it can immediately operate on the MCB circuit breaker (loads protection from abnormal mains voltages) and start the generators to supply the loads (AMF function).

When the mains returns in correct conditions, it allows the gensets synchronization to the mains ("reverse synchronization"), avoiding a blackout on the loads ("short time parallel").

While the generators are in parallel to mains, **MC400** continuously checks the mains to detect any faults, (interface protection): in case of anomalies, it opens the MCB circuit breaker to isolate the generators from the mains.

**MC400** is a "master" device, designed for the management of a Mains Circuit Breaker (MCB) and a Master Gensets Circuit Breaker (MGCB).

This makes the controller particularly suitable and effective for mains emergency applications ("MSB+MSTP" - Multiple Stand-by + Multiple Short Time Parallel), production in parallel to the mains applications ("MPtM" - Multiple Parallel to Mains) and mixed applications ("MSB+MPtM" - Multiple Stand-by + Multiple Parallel to Mains).

**MC400** is designed to simultaneously synchronize all generating sets (controlled by SICES parallel controllers) to the mains, with the soft transfer of the loads from the generator sets to the mains, thus avoiding any blackout on the loads during the short time parallel.

The embedded "gensets management logics depending on the loads", integrates perfectly with the same management present in the SICES parallel controllers.

**MC400** can be combined only with SICES GC400 parallel controllers. In addition, if the plant includes a tie breaker, it can be controlled by the SICES BTB200 controller. Communication between devices is managed with a single CANBUS connection (PMCBus).

- > The centralization of the start/stop commands towards the generators.
- > An internal synchronizer with voltage, frequency and phase differences control.
- > The centralized management of active power setpoints for the generators, to allow the gradual transfer of the loads with a specifiable rate.
- > The centralized management of power factor setpoints for the generators, when operating in parallel with the mains.
- > The production in parallel to mains at fixed power (BASE LOAD), with the power setpoint for the generators settable by parameter or by analogue input.
- > The production in parallel to mains at variable power (IMPORT EXPORT, variable production on the generators to guarantee a fixed power on the mains), with power setpoint for the mains settable by parameter or by analogue input.
- > The loss of mains protections (interface protections), to isolate the generators from the mains in case of failure on the mains itself.
- > The LOAD SHEDDING function (non-priority loads disconnection), with 4 available levels.
- > The PEAK SHAVING and PEAK LOPPING functions (start of generators due to excessive consumption of the loads from the mains).
- > Taking advantage of the internal calendar clock (with rechargeable backup battery):
  - Periodical genset's start-up with programmable rate, in order to verify their efficiency (this test can be done without load, in parallel to the mains or in island mode by transferring the loads from the mains to the generators).
  - Selectable days and time intervals in which the generators must never be started.
  - Selectable days and time intervals in which the generators must be started even if the mains is present.
  - Periodical and "on-event" history logs.
- > Embedded alarm horn.
- > Multilanguage display (EN, IT, FR, PT, ES, RU)

MC400 offers true RMS measures for:

- > Mains voltages.
- > Genset bus bars voltages.
- > Circulating currents towards the mains.
- > Active, reactive, apparent powers and power factors on the mains (total and by phase).
- > Active, reactive, apparent powers and power factor on gensets bus bars (total).

MC400 is equipped with a series of inputs and outputs, both digital and analogue, all completely and freely configurable, to respond at each specific needs of the application.

Thanks to the configurable AND/OR, it is possible to configure specific operating sequences for each type of application.

The controller is equipped with a graphic monochrome display 128x64 pixel 70x38 mm, with an attractive and immediate design with icons and symbols, for a quick view of measurements (mains and gensets) and system statuses. It also allows the manual opening and closing of both the mains circuit breaker (MCB) and the master genset circuit breaker (MGCB), via two dedicated buttons.

## INPUT – OUTPUT AND AUXILIARY FUNCTIONS



8 Digital inputs



8 Digital outputs



3 Analogue inputs



2 Analogue outputs



AND/OR  
control logics



Event  
history log



16 Calendars and  
3 timers



USB



RS232



RS485



Ethernet connection

- 8+1 digital inputs (one for the emergency push button)
- 8 digital outputs (4 transistors and 4 relays).
- 6 analogue inputs 0...2kOhm.
- 2 insulated analogue outputs -10/+10V.

### Communication:

- 1 USB port (Modbus RTU).
- 1 RS232 serial port (Modbus RTU). It supports an external GSM/GPRS modem (tested by SICES).
- 1 isolated RS485 serial port (Modbus RTU).
- 1 Ethernet port with RJ45 connector (Modbus TCP).
- 1 Insulated CANBUS interface for the connection of the expansion modules (EXBUS).
- 1 Insulated CANBUS interface for the connection of the other SICES controllers (PMCBUS).

### As option

- REWIND - GPRS/GSM/GPS device (for SIMONE)

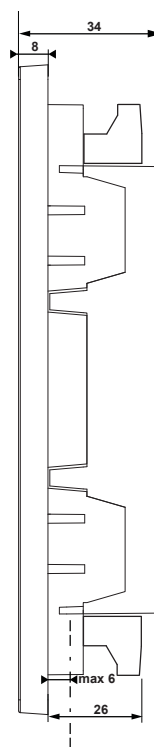
<b>Mains/Bus voltages:</b>	<p>L1-N, L2-N, L3-N, L1-L2, L2-L3, L3-L1.</p> <p>True RMS measure.</p> <p>Lx-N max. voltage &lt; 300Vac cat. IV.</p> <p>Rated input voltage: 100/400V (hardware option).</p> <p>Voltage input reading: 50000V max. (with external voltage transformers).</p>
<b>System and auxiliary currents:</b>	<p>L1, L2, L3, N (*).</p> <p>True RMS measure.</p> <p>Internal shunts.</p> <p>Rated input current: 5Aac.</p> <p>(*) <i>The fourth current measurement can be used for differential protection or for power measurement on genset's bus bars.</i></p>
<b>Mains and bus bars frequency:</b>	Resolution = 0.1 Hz. accuracy = $\pm 50\text{ppm}$ , $\pm 35\text{ppm}/^{\circ}\text{C}$ (typical).
<b>Supply voltage:</b>	Resolution = 0.1V.
<b>Calculated values</b>	<p>Active, reactive, apparent powers and power factors on the mains (total and single phase).</p> <p>Active and reactive energy counters (imported and exported).</p> <p>Total active and reactive power of all supplying gensets.</p> <p>Supplying gensets load percentage.</p> <p>Total active and reactive energy counters of all supplying gensets.</p>

## PROTECTIONS

<b>Interface protections (parallel to mains)</b>	<ul style="list-style-type: none"> <li>• Under voltage (27).</li> <li>• Under voltage with time dependent on voltage level (27T).</li> <li>• Under voltage linked to imported reactive power (27Q).</li> <li>• Over voltage (59).</li> <li>• Under frequency (81U).</li> <li>• Over frequency (81O).</li> <li>• ROCOF (df/dt, 81R).</li> <li>• Vector jump.</li> </ul>
<b>Mains protections (for emergency service)</b>	<ul style="list-style-type: none"> <li>• Under frequency (81U).</li> <li>• Over frequency (81O).</li> <li>• Under voltage (27).</li> <li>• Over voltage (59).</li> <li>• Voltage unbalance (46).</li> <li>• Wrong phases sequence.</li> </ul>
<b>Other protections</b>	<ul style="list-style-type: none"> <li>• Minimum exported power to the mains (32).</li> <li>• Max. current (50, 51, 50V, 51V)</li> <li>• High/low supply voltage.</li> </ul>

## TECHNICAL DATA

- > Supply voltage: 7...32 Vdc.
- > Power consumption: typical less than 5W (stand-by, controller switched on, LCD lamp switched off).
- > Operating frequency: 50Hz or 60Hz.
- > Transflective graphic LCD display, monochrome, with backlight.
- > Graphic display resolution: 128 x 64 pixel.
- > Graphic display dimensions: visible surface 70 x 38 mm.
- > Operating temperature: -25 °C to +60 °C.
- > Storage temperature: -30 °C to +80 °C.
- > Protection degree: IP65 (only with gasket correctly installed).
- > Weight: 1100g.
- > Overall dimension: 244 (W) x 178 (H) x 40 (D).
- > Panel cut-out: 218x159 mm (L x H).
- > EMC: conform to EN61326-1.
- > Safety: built in conformity to EN61010-1.



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