Redundant battery charger, master-slave, MA2 Series

gentec

SERIES MA2

The MA2 Series battery charger was designed to provide one of the most reliable power source for batteries and connected loads!

Inspired by more than 30 years of expertise in the power source domain, the MA2 charger design integrates well-proven and robust technologies, offering a flexible and adaptable solution to nowadays requirements for evolution and security in electric power plants.

Equipped with advanced remote monitoring functions, the MA2 charger minimizes the costs related to battery maintenance, without compromising the installation reliability!

✓ **Life expectancy of more than 30 years**

✓ **Ultra heavy duty**

✓ **Well-proven technology (thyristors)**

✓ **125 V_{DC} output voltage**
(24V, 48V, 110V, 220V and 250V also available)

✓ **Master-slave architecture**

✓ **Customer support from a large team of engineers and technicians**

✓ **Optimal battery charging**

✓ **Battery monitoring and automatic testing (with lower maintenance)**

✓ **Embedded WEB Server**

✓ **DNP3 communication protocol**

✓ **Secure access**

MA2 Series

"MA" SERIES EVOLVES... HERE IS "MA2" SERIES!

The MA2 charger is the logical evolution of the legendary MA charger. The MA2 fulfills the telemetry requirements **to monitor remotely** the battery chargers. Also, it features many new functions providing, among others, **battery monitoring** in order to optimize its maintenance. In the longer term, the monitoring of many batteries, including their coupled chargers, allows to establish a history, over many years, regarding the performance of the whole park of batteries, which helps predict each battery life expectancy. Here are some of these new functions:

- Battery remote maintenance (e-maintenance).
- Multiple measurements, alarms and indicators monitoring such as: battery current, battery float current, ambient temperature in battery room, battery temperature, etc.
- Battery automated testing.
- Two (2) Ethernet communication ports allowing exchanges with the charger using DNP3 Protocol or through the embedded Web server.

MA vs MA2 Comparison	MA Series	MA2 Series
Hydro-Quebec standards approval	✓	✓
Master-slave architecture	✓	✓
Local access	✓	✓
Large LCD graphic display	-	✓
Event log	-	✓
Data recording	-	✓
Secure remote access	-	✓
DNP3 communication	-	✓
2 Ethernet optical & copper links	-	✓
Embedded Web server	-	✓
Ethernet link maintenance	-	✓
Time stamped data	-	✓
Battery current measurement	-	✓
Automated battery tests	-	✓
Battery float current (I_{bat_float}) measurement and monitoring	-	✓[1]
Battery temperature	-	✓[1]
Ambient temperature of battery room	-	✓[1]
Vac supply voltage measurement	-	✓

[1] Functions available with BJ BATT option (Battery junction box).

Additional benefits:

- **Reduces site maintenance by doing it remotely.**
- **Minimizes engineering related costs: no more connections required for numerous alarm contacts.**
- **Eliminates the addition of many 4-20mA sensors for the transmission of analog signals (voltages, currents, etc.) in some projects.**
- **Optimizes battery lifespan.**
- **Battery monitoring and automatic testing.**
- **Fully configurable through WEB interface: no external tool required.**
- **Facilitates compliance with NERC PRC-005-2 requirements** (for the maintenance of protection systems).

Reliable, scalable and powerful charger adapted to power industry requirements!

Converting an "MA" charger to an "MA2" charger

Take advantage of the MA2 charger by converting your MA charger. An conversion kit easy to install is available.

DATA COMMUNICATION

Recover data, build battery performance history!

The charger supports communication through DNP3 Protocol (level 2). You may establish a connection through any of the two (2) Ethernet ports (both optical and copper) available on the charger. With this connection, the MA2 charger can transmit all measurements, alarms and indicators to a processing or control center. You may also control remotely the charger through this connection (to select the master, to set the voltage switching, battery testing, etc.). By saving the data history transmitted by the charger, the processing center will be able to analyze the battery and charger long-term performance.

WEB ACCESS TO INFORMATION

Make your job easier by accessing the charger WEB server!

Using any commercial WEB browser, the MA2 charger provides various information pages, such as:

- A *dashboard* presenting the charger status in real time.

- The actual operating *parameters* set for the charger.

- The current readings for *measurements, alarms and indicators*.

- Recovery mechanisms for data *history* saved by the charger.

- *Maintenance* information allowing software updating.

WEB Page "Dashboard" →

BATTERY AUTOMATIC TEST

Remotely connect to the charger... and to the battery! Minimize maintenance efforts!
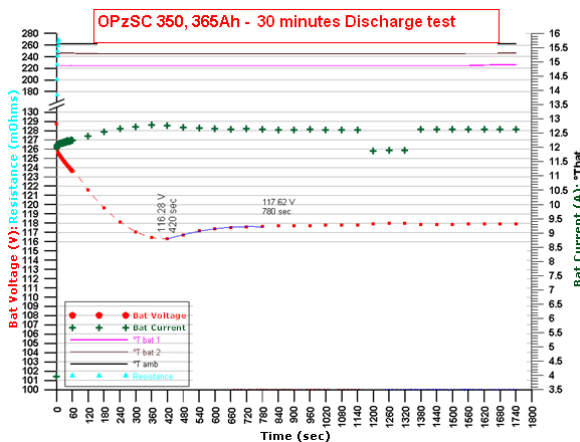
Battery test: voltage and current curves

A particular attention was paid on MA2 charger to integrate features allowing maintenance optimization for the battery. A function for automatic testing is integrated to check if the battery can supply a load connected for a certain time, without reaching a minimum voltage. During this test, the rectifier is shut down. The test fails if the battery voltage gets below an alarm threshold before reaching the end of the test period. In such a case, the rectifier is restarted at once.

The battery tests can be performed periodically either fully automatically, either manually on site or remotely. A WEB page allows to configure the test parameters. All tests generate an event from which data can be retrieved in a WEB page, from the charger, allowing to plot curves (voltage, current, etc.) or to build a battery performance history.

MONITORING THE BATTERY FLOAT CURRENT

Reduce the frequency of your battery maintenance!

The battery junction box (BJ BATT) is optional. This junction box is equipped with a current sensor to measure the float current (I_{bat_float}) required by a fully charged battery. The float current intensity is very low (a few milliamps) and keeps the battery at full charge.

- A float current increase means a **change in the battery state, which may be a sign that the battery is aging**. In such a case, the charger triggers an alarm: *"High float current"*.

- A null value for this current means that **a battery cell, or a connection, is opened**. In this case, the charger triggers a alarm: *"Low float current"*.

The BJ BATT junction box provides the ability to notify maintenance staff regarding an abnormal condition of the battery. Then, the evaluation of the battery should be made according to the maintenance procedures stated by the battery manufacturer.

Battery junction box (BJ BATT)

Monitoring the float current allows to reduce the frequency of interventions in accordance with maintenance standards set by NERC PRC-005-2 for the maintenance of protection systems.

## Measure battery temperature and extend its life expectancy!

The BJ BATT junction box is also equipped with 3 temperature sensors to measure the temperature of 2 battery cells and the ambient temperature around the battery. When the adjustable thresholds are exceeded, the charger triggers alarms to signal: *"High battery temperature"* and *"High ambient temperature"*.

By this battery temperature monitoring, it is possible to control the operating environment for the batteries, which allows optimizing their lifespan.

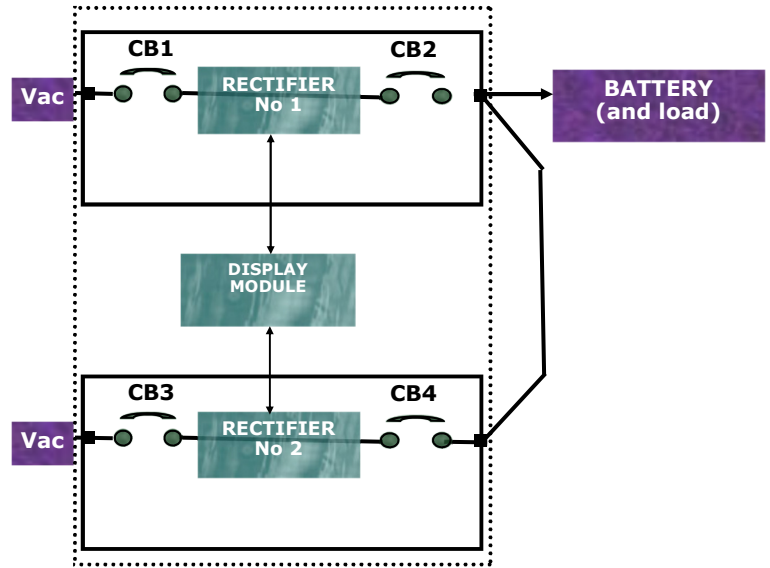## WIRING DIAGRAM FOR BATTERY JUNCTION BOX
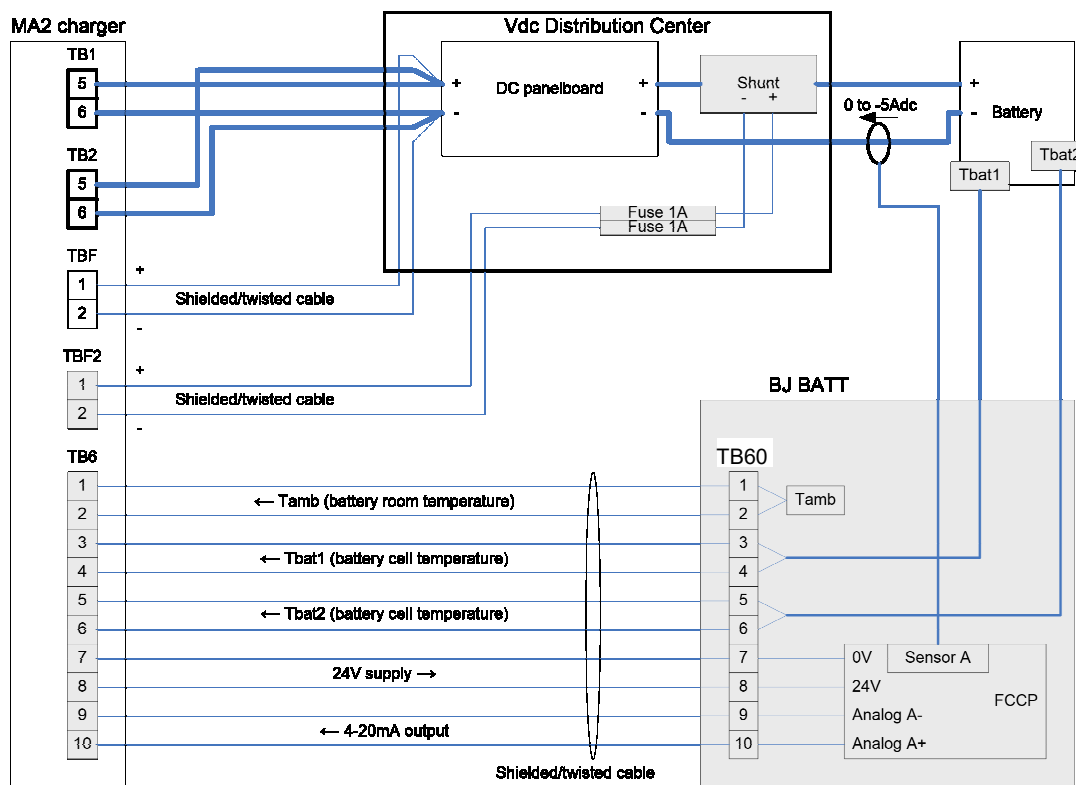
FUNCTIONAL CHARACTERISTICS

A RELIABLE POWER SUPPLY SOLUTION

Thanks to a redundant architecture of *"master-slave"* type, the MA2 series chargers ensure a great supply reliability. The MA2 series consist of two (2) battery chargers: one *"master"* and one *"slave"*. Normally, the *"master charger"* supplies the load. If the *"master charger"* fails, then the load is automatically transferred to the *"slave charger"*, acting then as a *"backup"*.

It is possible to assign manually the *"master"* role to either one of the chargers. Also, it is possible to configure a periodic alternation of the chargers operating mode, for both chargers to wear equally with time while validating their proper functioning. Note that a counter keeps track of the number of months that each charger operated to supply the load.

Display Module and Control Cards

CHARACTERISTICS, LOCAL DISPLAY

LCD display, 95mm X 54mm, 480 x 272 with secure access (3 levels)

Battery charger:
  – V_{dc} voltmeter, range: 0-120%, ±0.1V
  – dc ammeter, range: 0-120%, ±1.0%
  – V_{ac} voltmeter, range: 0-80%, ±1%, from 80 to 120%. ±0.25%

Battery:
  – V_{dc} voltmeter, range: 0-120%, ±0.1V
  – Ammeter (I_{bat}), range: 0-100% of battery shunt full scale, with ±1.0% accuracy
  – Float current (I_{bat_float}) (BJ option required),
     range: 0 to −3A_{dc}, ±0,5%, from −3 to −5A_{dc}, ±1.0%

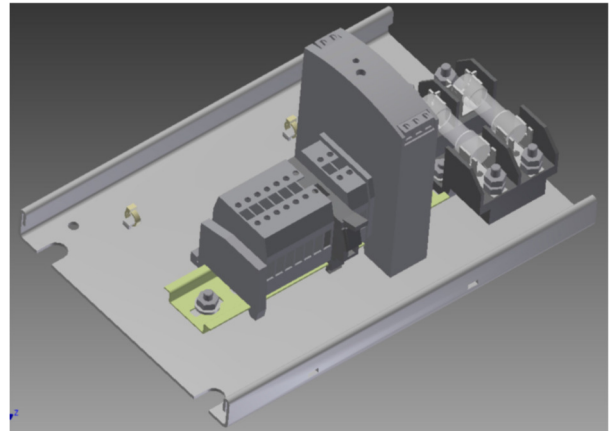| List of available indicators and alarms	MA2 Series
Charger failure	✓
Over limits voltage	✓
Charger high current	✓
Charger high output voltage	✓
Vac failure	✓
Over limits Vac voltage	✓
Excessive recharge	✓
GND fault (+/−) (Note: can be deactivated)	✓
Battery low voltage	✓
Battery high voltage	✓
Battery test fault	✓
Battery high float current	✓[1]
Battery low float current	✓[1]
Battery high ambient temperature	✓[1]
Battery high temperature (nº 1 or 2)	✓[1]
Load on *"slave"*	✓
Equalize voltage indicator	✓
Microprocessor failure	✓
Alarm relay failure	✓
[1] Available with BJ BATT option	

UPGRADE YOUR "MA" CHARGER... TO "MA2"!

It is possible to adapt an MA charger by integrating MA2's various functions. This upgrading to MA2 can be done on site by the client's technical team while minimizing the period for keeping the equipment out-of-service. The **basic upgrading** requires only the replacement of the control module. This module is entirely compatible with the existing MA module (physically and electrically). The upgrading is therefore a very easy task.

In order to take advantage of all MA2 functions, the following options are required: **EI** (interface elements), **BJ** (BJ BATT junction box), and **VCA** (measurement of V_{AC} power supply voltage).

Basic assembly to upgrade an MA charger

39862-05	MA2 Control module, 125V_{dc}, V_{ac} input, 1 ph.
39862-06	MA2 Control module, 125V_{dc}, V_{ac} input, 3 ph.

- The basic assembly includes updates of the drawings and the material lists of the existing charger.
- The 2 original control boards are transferred into the new module, thus minimizing calibration requirements.

Control module dimensions (mm): 177 (H) x 344.5 (L) x 314 (D).

EI Option (Interface Elements)

45395-03	125 or 250 V_{dc} interface elements: these are components (terminal strips, power supply, cables, etc.) mainly used to connect a battery junction box (BJ BATT). This option is also required for the measurement of the battery current (I_{bat}) and for the battery automated test.

- The components are already assembled on a mounting plate to facilitate installation into the existing MA charger.

Mounting plate dimensions (mm): 106 (H) x 230 (L) x 160 (D).

BJ Option (BJ BATT battery junction box)

45148-06	BJ BATT battery junction box (gray color).

- The BJ BATT box is normally installed in the battery room.
- EI option is also required to connect the junction box to the charger.

BJ BATT junction box dimensions (mm): 356 (H) x 314 (L) x 102 (D).

VCA option (V_{ac} power supply voltage measurement)

45397-01	Measurement unit, 120, 208, or 240V_{ac}, single-phase.
45397-02	Measurement unit, 208V_{ac}, three-phase.
45397-03	Measurement unit, 600V_{ac}, single-phase.
45397-04	Measurement unit, 600V_{ac}, three-phase.

- The components are already assembled on a mounting plate to facilitate installation into the existing MA charger.

Mounting plate dimensions (mm):
- Single-phase: 56 (H) x 170 (L) x 100 (D);
- Three-phase: 56 (H) x 305 (L) x 100 (D).

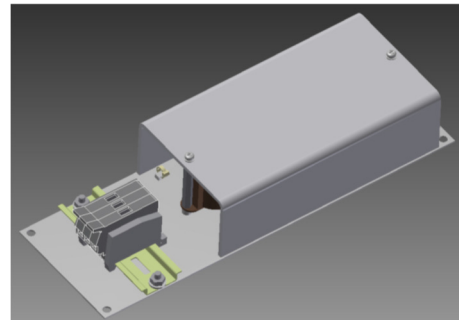**MA2 control module (basic assembly)**

Interface elements (EI option)
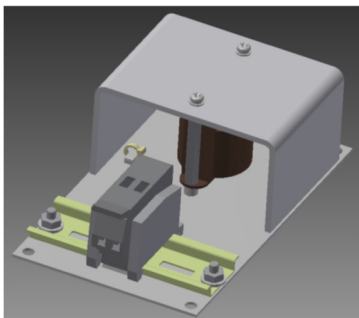
V_{ac} **three-phase voltage measuring (VCA option)** →

← V_{ac} **single-phase voltage measuring (VCA option)**

ELECTRICAL CHARACTERISTICS, "MA2" CHARGER

Input voltage:	120, 208, 220, 240, 277, 480 or 600V_{ac}, single-phase/three-phase, 60Hz ± 6% (50Hz optional).
Output voltage:	24, 48, 110, 125, 220 or 250V_{dc}, other output voltages available upon request.
Output current:	10, 20, 30, 40, 50, 60, 80, 100, ..., 600A (setting range from 50% to 100%).
Voltage regulation:	± 0,25% for a load variation from 0 to 100% of the nominal output current, combined with a ±10% variation of the input voltage variation, also combined with a ±5% frequency variation. No battery is connected to the system during these measurements.
AC ripple voltage:	2% RMS of the output voltage for the same conditions described for previous item: *"Voltage regulation"*.
Efficiency:	90% at full load.
Alarm contacts:	5A at 250V_{ac}/30V_{dc}, 0.5A at 125V_{dc}, configurable.
Protection:	Input: thermomagnetic breaker / output: thermomagnetic breaker (2 poles).
Fan:	By natural convection (forced for a charger with a capacity ≥ 350A) except for the battery section that can be provided with a fan (for a system with a vented battery in the same cabinet as the battery charger).
Acoustic noise:	Less than 65 dBA at one meter, at nominal power.
Environmental:	Operating temperature: −10ºC to 50ºC (derating of 1% per ºC above 40ºC). Storage temperature: −20ºC to 70ºC, relative humidity: 0 to 95% at 25ºC.

Communication port:	2 Ethernet ports (both optical and copper) (DNP3, HTTPS):
	   – optical: 100Mbps with an LC duplex connector (100BASE-FX);
	   – copper: 10/100/1000Mbps with an RJ-45 connector (10/100/1000BASE-X).

Quality assurance program:	ISO9001:2008.
Dielectric strength test:	according to IEC 60255-5.
Impulse voltage test:	compliant with IEC 60255-5.
Surge withstand capability (SWC) test:	compliant with ANSI/IEEE C37.90.1/ IEC 60255-22-1 / -4.
Dry heat tests:	according to IEC 68-2-2.
Damp heat tests:	compliant with IEC 68-2-3.
Cold tests:	compliant with IEC 68-2-1.
EMC testing (radiated / conducted emissions):	compliant with IEC 61000-4-3.
Electrostatic discharge (ESD):	compliant with IEC 61000-4-2
Fire resistance:	compliant with UL94 V-0 and V-1.
Shock and vibration test:	compliant with IEC 255-21-1.
Supply perturbation test:	compliant with SN62.1008 from Hydro-Quebec (class C-II type B).
Run-in test (96 hours):	compliant with SN62.1008 from Hydro-Quebec (class C-II type B)

ELECTRICAL CHARACTERISTICS, BATTERY JUNCTION BOX (BJ BATT)

(Negative) float current of the battery (I_{bat_float}):
- Input range: 0 to −5.0A_{dc}.
- Corresponding output: 4 to 20mA (Note: toward the TB6 terminal block on MA2 charger).
- Accuracy according to input range: 0.2% from 0 to −3.0A_{dc}, 0.7% from −3.0 to −5.0A_{dc} (full scale).

(Negative) current during battery recharge:
- Input range: ≤−5.0A_{dc}.
- Corresponding output: about 22mA.

(Positive) current during battery discharge:
- Input range: ≥ 0A_{dc}.
- Corresponding output: about 2mA.

Ambient temperature (T_{amb}), temperature of 2 battery cells (T_{bat1}, T_{bat2}):
- By thermistor, accuracy: 2ºC.

Power supply voltage: 24V_{dc}.

CABINETS: battery charger (125V$_{DC}$), "MA2" SERIES

Cabinet models	Maximum capacity (amp)	Confi-guration	125 V$_{dc}$ charger dimensions Height x Width x Depth (mm)	Max. Weight (approx.)
MAS050 (note 1)	50 A	SU	1800 x 600 x 600	409 Kg / 900 lb
MA150	150 A	---	1800 x 1214 x 600	636 Kg / 1400 lb
MA230	230 A	---	2000 x 1500 x 750	841 Kg / 1850 lb
MA325	325 A	---	2000 x 1800 x 800	1432 Kg / 3150 lb
MA500 (note 2)	500 A	---	2170 x 1800 x 800	1955 Kg / 4300 lb
MAB1200-1 (note 3)	20 A	BI	2000 x 1200 x 805	591 Kg / 1300 lb
MAB1200-2 (note 3)	20 A	BI	2000 x 1200 x 850	614 Kg / 1350 lb
MAB1500-1 (note 3)	50 A	BI	1850 x 1496 x 805	659 Kg / 1450 lb
MAB1500-2 (note 3)	50 A	BI	2000 x 1496 x 805	682 Kg / 1500 lb
MAB1500-3 (note 3)	50 A	BI	2000 x 1496 x 820	773 Kg / 1700 lb

Note 1: Both chargers are installed one above the other in this cabinet model; ideal for limited spaces where the dimensions of the standard cabinet (MA150) are excessive.
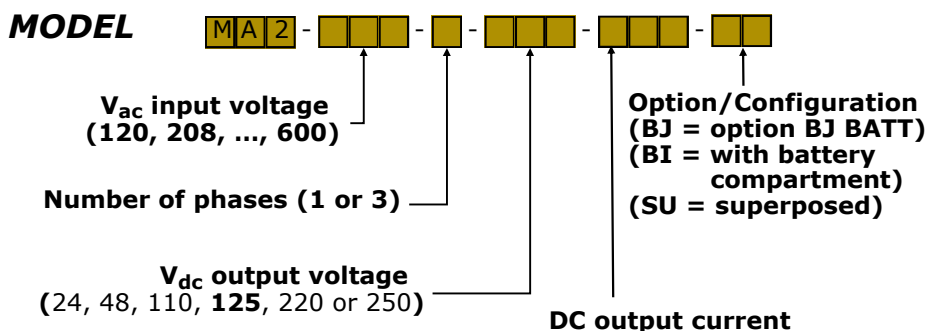
Note 2: The MA325 and the MA500 cabinets have the same dimensions, but the MA500 model offers a movable top cover, 170 mm high, for venting. For easier transport and installation, the top cover can be removed and later reinstalled on-site.

Note 3: For chargers with a battery installed in the same cabinet, the required dimensions are determined according to the battery dimensions. Contact Gentec to find out which cabinet fits your needs.

CHARACTERISTICS

Material: Cold laminated steel.
Type: NEMA 1 (other types are optional).
Ventilation: Steel mesh
Colour and finish: Green 24241 or grey ASA 61 semi-gloss (other colors and finishes are optional).
Service entry: Front access only.

To order a charger:

MODEL M A 2 - ☐☐☐ - ☐ - ☐☐☐ - ☐☐☐ - ☐☐

V$_{ac}$ input voltage (120, 208, …, 600)

Number of phases (1 or 3)

V$_{dc}$ output voltage (24, 48, 110, **125**, 220 or 250)

DC output current

Option/Configuration
(BJ = option BJ BATT)
(BI = with battery compartment)
(SU = superposed)

For over 50 years, Gentec has been a leader in the energy sector. Gentec solutions share a concern for efficiency in energy management and they distinguish themselves by their reliability, their ruggedness and their durability. These solutions play an essential role to ensure reliability in electric networks. Gentec is the ideal partner for end-to-end technology solutions!

Battery charger with battery installed in a single cabinet
("BI" configuration)

IPC   C-TPAT   ISO 9001:2008

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