BACS4 - NEW HOUSING. NODULE C44 NEW TECHNOLOGY. NEW BENCHMARK.

Backwards compatible & future-proof Compatible with BACS 3 network devices. NEW: suitable for all modern battery types with cell voltages from 0.7-4.8 V! More on page 2

Compact & maintenance-free

Fully enclosed design, no cooling fins, no dust – fully maintenance-free. *More on page 6*

Dual LED visibility

Two status LEDs: one facing forward, one facing upward – always visible, regardless of cabinet or rack position. *More on page 6*

Designed for SMART BATTERIES

Guide rails allow precise plug-and-play integration into battery systems. *More on page 9*

High measurement precision

Impedance values 30% more accurate, temperature readings 50% more precise – thanks to the 6-wire BC6 cable. *More on page 5*

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Cybersecure & updatable

The European ST processor and the ability to perform remote firmware updates during operation comply with modern cybersecurity guidelines. *More on page 10*

Integrated safety

GENEREX

Thanks to integrated high-voltage fuses inside the module housing, the measurement cables are more flexible, more robust, and more cost-efficient – while maintaining the highest level of safety. *More on page 4*

Top balancing

Passive balancing only during the final charging phase – minimal heat, maximum cell life. *More on page 3*

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PAGE 2 // THE NEW VOLTAGE MEASUREMENT RANGE!

BACS 4 can process cell voltages from 0.7 V to 4.8 V – ideal for all modern battery chemistries, including:

- Nickel-cadmium (NiCd)
- Lithium-ion, LiFePo4, LTO
- · Lead-acid (Pb)
- Modern hybrid cells

Especially in critical applications such as UPS systems, stable and interference-free integration of the sensor electronics is crucial. The closer the measurements and controls can be applied to each individual battery cell, the more accurate the result. In the previous generation, there was a limitation: the electronics of that time only allowed measurement down to a minimum of 1.0 volts during discharge. Below that, the sensor system would shut down and restart as soon as the battery cell exceeded 1.0 volts again.

With the C44 module, voltages can now be measured below 0.7 V – significantly deeper than the minimum discharge limit typically allowed for battery cells.



PAGE 2 // COMPATIBLE AND FUTURE-PROOF

Despite all technical innovations, BACS4 remains fully compatible:

Communication continues to run via the familiar B4B-CRJxxxx-series bus cables, which have been in use since 2008. Existing WebManagers of the hardware generations HW141 (from 2016) and HW161 (from 2022) are fully compatible.

Legacy measuring cables (BC4 and BC5), however, are not compatible, as they are built differently. A mixed installation of C40 and C44 modules in the same system is not possible.

PAGE 3 // TOP BALANCING



One of the most important innovations in the fourth generation of BACS is the so-called Top Balancing.

This is an optimized form of passive balancing, developed specifically for stationary reserve power systems – systems in which the battery typically remains charged over long periods and is only discharged in emergencies or for testing purposes.

The previous passive balancing method in BACS 3 was successfully used in the market for over 16 years, but required regulated temperature dissipation through cooling fins. The new Top Balancing builds upon the proven BACS 3 technology – but is more targeted and energy-efficient:

- Only during the final charging phase ("Top"), an active voltage equalization is initiated. After that, the system regulates itself down to a minimum.
- The resulting heat is dissipated directly through the housing cooling fins are no longer required.

The method originates from the automotive sector (used for lithium cells), where compact design is critical and minimal internal heating is required. This is also advantageous in industrial environments: Top balancing ensures safety, efficiency, and extended battery life – while also simplifying the overall system design.

Advantages for stationary battery systems:

- · Lower continuous load on the cells
- Reduced energy consumption for balancing currents

- No significant heat generation allowing fully enclosed housing and no heating of the battery
- Top Balancing is a prerequisite for use in SMART BATTERIES



PAGE 4 // SAFETY + FLEXIBILITY THROUGH NEW FUSES IN THE HOUSING

One of the core features of BACS has always been its integrated safety logic – especially the automatic high-voltage shutdown in fault conditions to prevent fires caused by defective battery cells.

After 16 years on the market, we are proud to offer a technology that – despite millions of installed modules – has never caused a battery fire.

Since 2010, the high-voltage fuses have been integrated into the measuring cable (types BC4/BC5) and required manual calibration. The cables were then sealed with protective foil and textile sheathing. This solution was technically effective, but:

- · expensive to manufacture
- · dependent on calibrated special cables
- mechanically stiff and difficult to install

With BACS 4, this concept has been completely rethought: The fuses are now embedded directly on the PCB inside the module housing! For the first time, two high-voltage fuses have been integrated into such a compact design that they can trigger reliably and with-out arcing – while maintaining full measurement precision. No other BMS manufacturer currently offers this type of internal high-voltage protection.

Advantages of the new fuse technology:

- No more encapsulated components inside the cable
- More flexible, cost-effective, and robust measuring cable (BC6)
- Greater mechanical durability with unchanged safety function
- Simplified inventory management and increased installation robustness

BACS remains the only BMS system to offer fully integrated high-voltage protection – now even more compact and reliable, and still combined with precise impedance measurement.



PAGE 5 // MAXIMUM PRECISION – IMPEDANCE AND TEMPERATURE MEASUREMENT

With the new C44 module, GENEREX takes measurement accuracy to a new level. A major advancement lies in the completely redesigned connection socket, which is also used in the SMARTBATTERY.

Instead of the previous 4-pin connection, the C44 now features a modern 6-pin socket. For the first time, this allows the use of two fully separate lines for positive and negative poles, plus two lines for the temperature sensor within the SMARTBATTERY or at the negative pole in the BC6 measuring cable – the foundation for high-precision measurements directly at the battery.

Technical advancement:

- 30% higher precision in impedance measurement compared to Generation 3
- 50% higher accuracy in temperature measurement
- Improved capacity readings due to more precise measurement data from direct pole contact



NEW: BC6 cable with temperature sensor

This improved temperature measurement also has a positive impact on the determination of the State of Charge (SoC) – i.e. the battery's charge and capacity measurement. Temperature data is now directly factored into the system's capacity calculation, making the displayed capacity significantly more precise.

Comparison: In the previous model, the temperature sensor was either located inside the housing (2–4 mm away from the battery), or externally attached to the battery casing with adhesive tape. Both methods had disadvantages:

- Ambient temperature measurement near the battery was imprecise and sluggish
- External sensors required time to register temperature changes

PAGE 6 // COMPACT HOUSING, DUAL LED INDICATORS AND 100 % MAINTENANCE-FREE

The new BACS C44 module not only brings more functionality, but also a completely redesigned exterior.

Compared to the previous C40 model, the housing is approx. 2.5 cm shorter. This space-saving design allows for easier integration in compact battery environments and makes the C44 the ideal sensor for modern SMARTBATTERY-compatible batteries.

One particularly practical innovation is the use of two status LEDs:

- The first LED continues to shine horizontally ideal for front panels in racks or battery cabinets
- · The second LED is new and now shines vertically upward

This makes the sensor's operating status visible both from the front and from above – especially helpful in SMARTBATTERY installations. This dual visibility improves ease of use in the field. But it's not just the exterior that's new – the inside has also been completely rethought:

The C44 does away with cooling fins entirely. In previous Generation 3 models (C40), waste heat was dissipated through fins – which required some housing ventilation. With C44, this is no longer needed: the heat buildup is so minimal – thanks to top balancing – that no active or passive ventilation is required. This means one clear additional benefit:

100 % maintenance-free.

With BACS 3 modules, dust would accumulate in the cooling fins due to airflow, and had to be regularly cleaned with compressed air – especially in dusty industrial environments. With the new C44, this maintenance is eliminated entirely. Its sealed design prevents the intrusion of dust and dirt from the outset.



2 red and green LEDs

Even liquids now find it much harder to penetrate the housing and cause corrosion.

In summary, the new C44 housing design offers:

- Increased compactness (-2.5 cm housing length)
- Improved visibility via two LEDs (front & top)
- Full maintenance-free operation and ruggedness through sealed housing
- · Designed specifically for SMARTBATTERY use
- Optimized thermal management without cooling fins

PAGE 7 // SAFETY ARCHITECTURE AND MINIATURIZATION

More compact dimensions, integrated fuse technology and a newly engineered measurement cable: BACS 4 demonstrates how safety, functionality and installation comfort can be combined within minimal installation space.

New Dimensions and Mounting:

- Dimensions of the C44: 54 × 54 × 25 mm
- Two guide rails are located on the underside of the module
- The gap between the rails is used for retrofits with VELCRO® strips (Type 6)

New Cable Design:

The greatest engineering achievement of BACS 4 can be seen in the new BC 6 cable. Unlike its predecessors BC 4 and BC 5, it no longer contains any external fuse holders – making it much more flexible and easier to install.

> C44 PCB – integrated high-voltage fuse visible



High-Voltage Protection – Now Built Into the Module This technology has always made BACS unique: automatic disconnection in case of faults – with full measurement capability.

In BACS 3, due to space and safety limitations, the two high-voltage fuses had to be moved into the cable

- with great success: **16 years without a single fire**, **even with cell faults**.

Now, this safety feature has been fully integrated into the module: Two newly developed high-voltage fuses are mounted directly onto the circuit board, protected inside the housing. The risk of arc faults has been technically eliminated.

Result:

- · Safety architecture remains fully intact
- · Cable is more flexible, robust, and affordable
- The previously complex calibration cable is no longer needed

BACS C40 vs. C44 – Compactness comparison

Bottom side with guide rails / adhesive VELCRO®



PAGE 8 // INTELLIGENT CAPACITY MONITORING -NOW EVEN MORE PRECISE

BACS 4 takes battery capacity monitoring to the next level. With more precise temperature sensors, it allows for more accurate and reliable State of Charge (SoC) readings – per cell, in real-time and live.

Measurement Accuracy as a Competitive Advantage BACS 3 was already the only BMS capable of displaying individual cell capacity per battery unit. With BACS 4, this capability has been further refined: Improved sensor design, enhanced temperature routing and direct pole placement now allow for even more accurate SoC determination.



BACS 4 now displays the SoC of every single battery unit – live, digitally, and per cell.



Why is this important?

Accurate SoC data is essential for the strategic operation of battery systems – especially in UPS systems or data centers. Only with precise knowledge of each cell's capacity can overcharging, deep discharge, and unnecessary cell stress be avoided.

Advantages of the new BACS 4 capacity monitoring:

- More precise readings through internal temperature measurement
- Real-time capacity display per module
- Higher reliability via SoC warnings
- Extended lifespan through optimized cell management

PAGE 9 // DESIGNED FOR SMART BATTERIES

The BACS C44 was developed for use in so-called "SMART-BATTERIES" (patented) – i.e. batteries in which the measuring cable is pre-installed at the factory, and the "smart" electronics are inserted by the end user as needed.

This new generation of batteries greatly simplifies the installation of additional sensors. The C44 is optimized for this: It features two guide rails on its underside, which fit precisely into the slot inside the SMARTBATTERY housing. As a result, the module connects directly to the pre-installed connection cable inside the battery and locks into place automatically – no manual alignment, no adhesive strips, nothing else needed.

For classic applications where no SMARTBATTERY is used, the C44 is still ideal for retrofitting. The gap between the guide rails is designed to hold two VELCRO® strips (Type 6), allowing secure positioning for retrofits. This proven fastening method ensures a reliable hold, and the flexible BC6 measuring cable enables easy installation.

Advantages:

- Faster installation in SMARTBATTERIES (plug-and-play)
- Precise alignment via guide rails and automatic locking
- Compatible with existing retrofit solutions
- Robust and simple installation even with vibration or temperature fluctuations







PAGE 10 // UPDATE CAPABILITY AND CYBERSECURITY

BACS 4 is more than just a new hardware module – it's a system that evolves with its tasks.

Thanks to the new, high-performance processor from STMicroelectronics (Switzerland), BACS 4 is capable of receiving firmware updates during live operation – without physical access to the module.

This means:

- New features can be added at any time via software
- · Bugs or security issues can be fixed remotely
- The modules remain up-to-date for many years and can be upgraded with new features

This capability is particularly crucial with regard to cybersecurity. After deceptively realistic counterfeits from copycat vendors emerged, it became clear: the old BACS 3 processors were no longer up to date and allowed hackers to infiltrate customer systems using visual copies of BACS.

By switching to a European processor manufacturer that complies with all cybersecurity regulations, and by integrating proprietary security functions into BACS 4, the system is now no longer vulnerable to manipulation or copying.



BACS not only protects your batteries – but also your IT infrastructure.

It meets all EU cybersecurity requirements – currently the only BMS on the market to do so.

Any questions?

Contact our team for a consultation: support@generex.de/.us

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