- **BACS is a Battery Management & Monitoring system**
- **BACS will prevent unexpected outages due to battery failures**
- **BACS will increase battery service life and battery capacity**

… BACS is a holistic battery management system and global market leader…

GENEREX's 3rd generation BACS® (**B**attery **A**nalysis & **C**are **S**ystem) is the most advanced product of its kind on the market today with more than 1 million units installed. As an Ethernet network integrated battery monitoring and management system, BACS® uses web management technology to monitor the temperature and internal resistance and to regulate the voltage of every single battery, or even cell in string applications such as UPS, storage systems etc. Through our patented balancing process—called **Equalization*** in Europe and **Balancing** elsewhere—BACS® manages the charging voltage of all batteries with the charger's target value keeping all batteries within optimal voltage operating range.

… BACS is the ultimate all-in-one solution

BACS® is able to monitor and manage all aspects of the infrastructure around the batteries – starting with monitoring environmental measurements such as temperature, humidity, acid fill level, hydrogen gas concentration, pressure, air conditioning systems etc. and can even manage or trigger any 3rd party sensors. BACS has an interface for all types of UPS, UPS inverters, transfer switches, generators, and any other alarm dry contacts. BACS is also able to handle, *simultaneously,* other network structures like BACnet, SNMP and MODBUS.

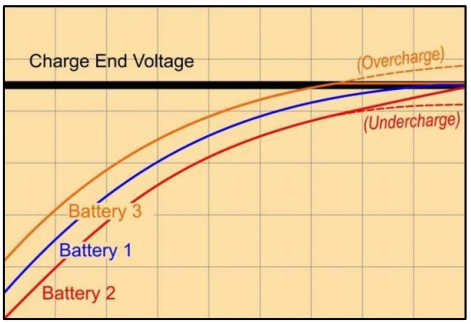
… BACS is able to manage complex emergency situations

As a fully featured, programmable logic controller (PLC), BACS is able to manage a complete full-automatic emergency procedure. BACS can operate as a standalone solution as well as part of a complex management control service. Core features are holistic management of 3rd party devices as well as a holistic emergency notification system that can keep, store and provide all necessary information that help emergency response teams to react as quickly as possible.

BACS® is the ideal system for lead-acid batteries (open/wet cell, maintenance free, gel, AGM, etc.), as well as NiCad, NIMH and most types of Li-Ion batteries.

BACS features

- **Equalization/Voltage Balancing**

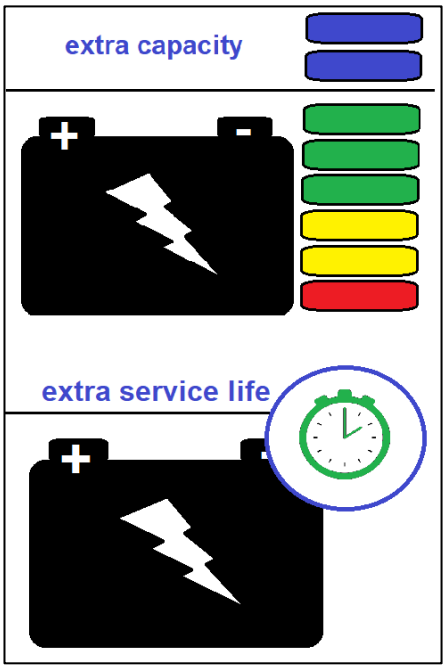


BACS® patented process called **Equalization** (or **Balancing**) manages the voltage supply from the charger or UPS for every battery or cell. BACS® is designed to monitor and manage the charging voltage level and the distribution of charging current of all types of batteries towards the average voltage provided by the battery charger:

This process ensures that the batteries/cells reach full charge levels and keep this level for optimal capacity and improved lifespan. This leads into an ideal harmonized charging curve for each battery string

The Equalization (Balancing) process prevents the unintended overcharging of batteries. By preventing overcharging, BACS® helps to avoid gassing, dry-out and thermal runaway. The Equalization (Balancing) process also prevents unintended undercharging. By preventing undercharging, BACS® helps to avoid sulfation and loss of capacity.

- **INCREASE BATTERY CAPACITY AND SERVICE LIFE**



Protection meets improved performance SOC

BACS® guarantees, through Equalization (Balancing), each battery is 100% SOC – This will achieve optimal performance of the battery systems.

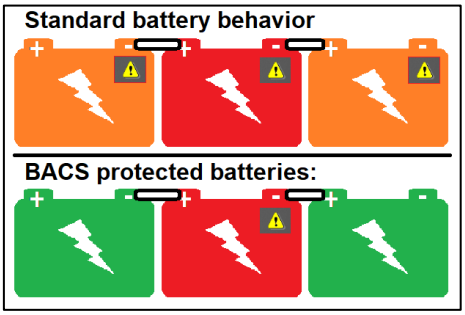
Extended Service Life SOH

The constant avoidance of overcharge/undercharge by the Equalizing (Balancing) process has a massive effect on the service life of the batteries SOH:

The service life of a high voltage string of batteries depends on the weakest cell of the weakest battery in the string. Typically, in a UPS the service life of such a battery string is 50-60% of the battery manufacturers “Design Life”.

Since Equalizing (Balancing) maintains each single battery within the string optimal voltage levels, damaging effects of improper charging is eliminated. By doing so, BACS allows the use of batteries within a string application now to reach Design Life and beyond!

- **PROTECT NEIGHBORED BATTERIES**



By balancing the voltages of all batteries within a string, BACS® prevents damages caused by defective batteries to their neighbors in the string.

It is well known that after a few years a failing battery block cannot be replaced against a new block without damaging the remaining older blocks in the battery string.

This effect made it impossible to swap out older used batteries against new ones, the end user had to replace all batteries against new ones, although the majority of the remaining batteries were still good.

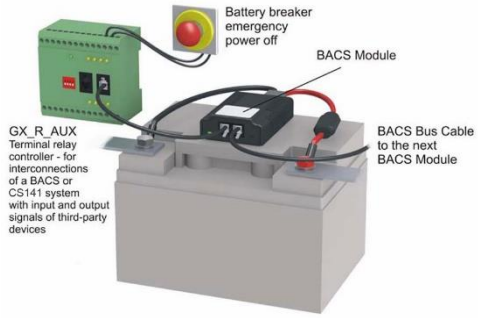
- **DETECT IMMINENT BATTERY ISSUES**

Typical battery problems like sulfation, corrosion, gassing, dry-out and thermal runaway are detectable by interpreting the BACS measurements. Changes in impedance, temperature and current in a battery string indicate hidden damages in your battery string.

- **DETECT / PREVENT STRATIFICATION**

By visualizing an increase in impedance and drifting voltages, the user can detect a battery stratification. From time to time, in order to reverse stratification, a battery's acid-gel-water mix requires rectification. After a discharge, the user can verify by the lower impedance and improved Equalizing (Balancing) performance that the stratification has been reversed and the batteries are healthy again.

- **THERMAL RUNAWAY PREVENTION**



BACS detects a thermal runaway risk by monitoring the cell/block temperatures and optionally the current of the string. In case a thermal runaway is detected, the BACS system can automatically trigger the battery breaker to open to isolate the battery strings. This principle is in accordance to the International Fire Code 2018 Section 1206.2.10.7 and is mandatory in various US battery installations.

The GX_R_AUX module provides 4 relay contacts and 4 digital inputs. Therefore, it controls up to 4 breakers. The digital inputs read the battery breaker status and display it in the BACS® web interface. Other alarm devices (for example, audio alarms) may be connected to the outputs or digital inputs of the GX_R_AUX.

- **BATTERY REPLACEMENT NEEDED**

By monitoring impedance trends, BACS® allows the user to detect weak or damaged batteries in early stages of deterioration. Timely replacement of bad batteries is vital to improving the lifespan of the battery system as a whole.

- **ADVANCE WARNING SYSTEM**

Because it monitors key battery parameters and sets thresholds, BACS® is able to provide advance warning—via audio, visual, and network messages of any system event that requires attention.

BACS® monitors UPS system data and environmental parameters (temperature, humidity, hydrogen gas concentration, acid fill level, DC/AC current ripple, dry contacts, etc.). Alerts can be set up and this information can be accessed via multiple communication systems.

BACS® web server displays the battery status of 140 batteries, 16 dry contacts, 8 analogue measuring's and 1 UPS – all on one screen and one network address. Status LEDs (green/yellow/red) show a change of color if any battery drifts beyond configured thresholds.

- **MODBUS/BACnet/PROFIBUS/LONBUS/SNMP**

BACS® provides integration to building or network management systems using SNMP/MODBUS/BACnet clients to read the system data through IP. Modbus RTU can also be provided using RS232 / RS485 communication. Conversion to PROFIBUS and LONWORKS is provided through optional converters.

BACS® includes a full qualified UPS Manager, SNMP adapter and MODBUS and BACnet server. Users have the freedom to choose which management platform and how to link the BACS system with UPS, generators, chargers, transfer switches or any other device to manage the site where the batteries are installed.

- **REMOTE MAINTENANCE: Monitoring without compromising IT security – Email Traps ®**

Eliminate blind spots in your monitoring concept even if network loss to remote networks is a regular problem in your IT security concept:

BACS® is a network product and designed to work with any VPN, IP forwarding or other remote access configuration. Additionally, BACS provides remote monitoring thru « Email Trap ® », our email based remote monitoring function with UNMS Software. Using the UNMS you can monitor any BACS installation worldwide thru Email – without the security issues that you may encounter when setting up VPN access. Very large networks can be monitored safely thru Email Traps® and UNMS software.

- **Real time battery test using UPS functions**

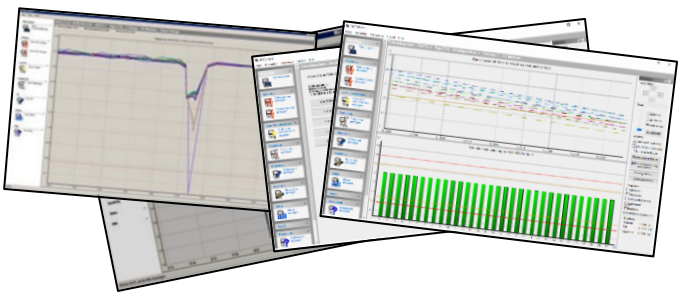
BACS® is designed to manage UPS and charger in parallel to Battery Management. Through this feature the end user may watch the effect of a UPS battery test in real time. No need to apply a dummy load, simply start a UPS test to see the performance of your batteries.

- Test your emergency measures in real time
- Maintain all configurations without a system reboot
- Plan scheduled test routines
- Scheduled Impedance measurements

- **Professional Tools for battery experts**

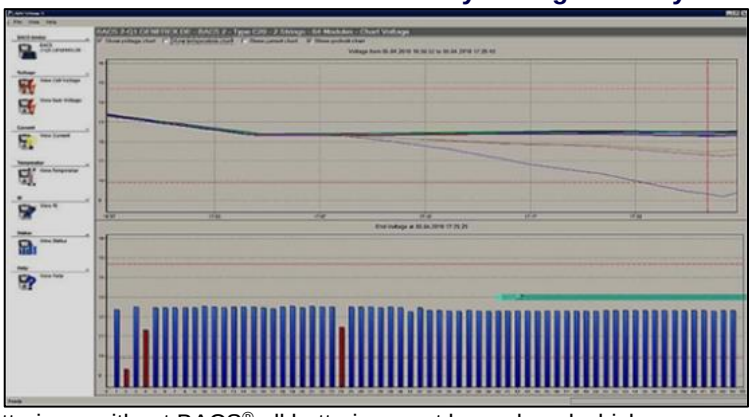
BACS VIEWER - powerful free software tool included
The unique BACS® VIEWER software can do more than just fetch data from the Manager and free local memory for data logging. After downloading the battery data, the BACS® VIEWER software is a powerful tool for analyzing and archiving. It can be used to add useful documents like wiring descriptions, reports, guarantee certificates, maintenance plans, handouts for technical staff, analyze battery data, timelines and many more. BACS® VIEWER software can be used to manage maintenance work for an infinite number of BACS® Systems:

- Analyze the battery data and trends
- Discharge analysis and faulty battery detection
- Plan maintenance windows to shorten down time
- Determine required spare parts
- Create automatic status reports



Investigate and search for any problem before an incident occurs – The internal conditions of the battery are no longer a blind spot to your critical facility.

Example: Finding a damaged battery:

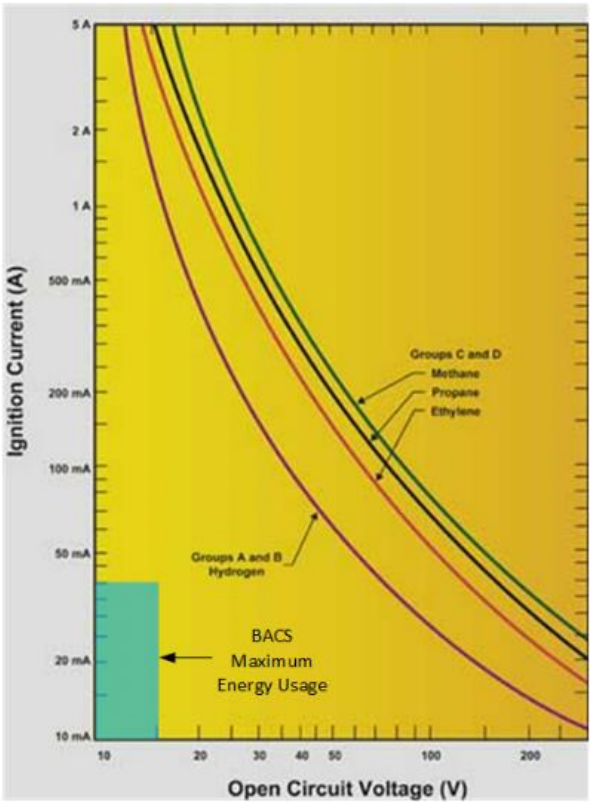


The BACS® VIEWER shows the individual battery voltage of all accumulators at the end of a discharge.

The red dotted line shows the voltages when power has returned. The lower bar graph indicates those accumulators that have collapsed early and have been discharged to a very low level. These batteries are a risk to the entire system.

With this important information, it is possible to plan replacing only damaged batteries – without BACS® all batteries must be replaced which means a long down time and enormous extra costs not only because replacing all batteries must be paid, it is also an eminent downtime of the complete UPS system.

- **ATEX/Intrinsically safe evaluation**



The oil and gas industrial market requires extreme safety regulations regarding explosive gases. These facilities do utilize stationary battery systems for utility and UPS backup power. Under normal conditions on VRLA batteries the hydrogen is contained within the battery. Although the potential for hydrogen to be released is low any battery monitoring or management system requires an ATEX or Intrinsically safe certification.

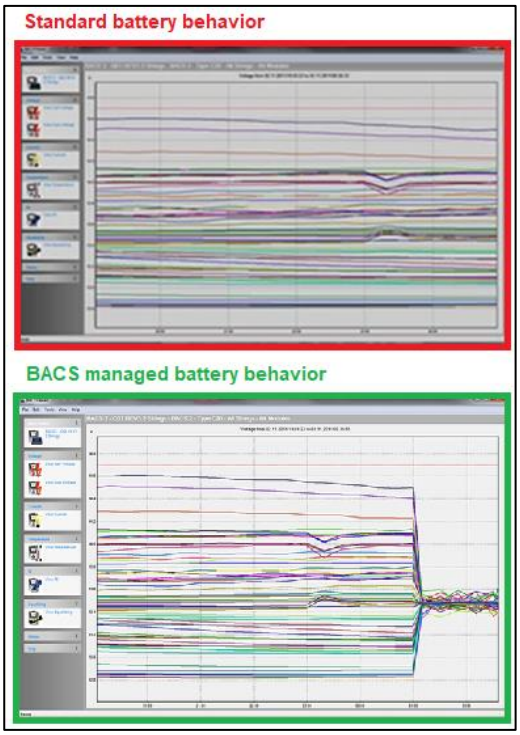
BACS® is under evaluation for ATEX/Intrinsically safe certification. Due to the modular design and operating at a low voltage and current BACS provide an advantage in oil and gas market: The energy requirements of BACS fall well below the ignition curves to classify them as intrinsically safe without additional hardware.
In the case of higher regulations, the BACS modules and supporting cable assemblies can be placed in an ATEX enclosure.

Battery Management vs Battery Monitoring

Stationary battery monitoring systems have been present in the market since the late 1970's. They were to provide the real-time State of Health (SOH) of the battery system. Although the battery monitor provided SOH information to indicate failing batteries it never was designed to correct the origins of battery failure, over and under charging.

Stationary battery systems are used in utilities, telecom, and UPS applications. A modern uninterruptable power supply (UPS) consists of a charger (Rectifier) and a DC to AC converter (Inverter) and its functionality depends highly on the performance of its battery pack. Just one "failed" battery may reduce the reliability of the entire system and may cause a catastrophic event.

The battery string is made up of individual cells or blocs. The rectifier charges the battery string as one unit and does not take into account the individual cells or blocs. Each cell or bloc is design with a fixed specification but each one has its own unique electrochemical properties. The slightest difference with the cells or blocs will cause a voltage imbalance within the strings. This will result in some cells or blocs to be overcharged causing positive grid corrosion and other cells or blocs to be undercharged causing sulfation. As the string voltages have become higher (in some cases up to 600VDC) the voltage imbalance has become greater.

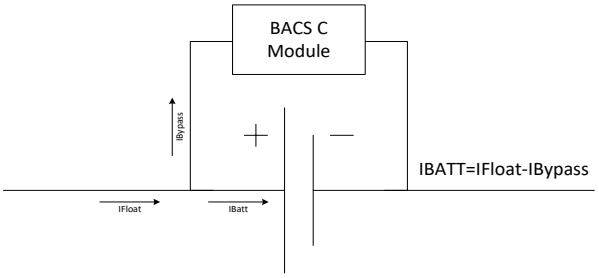


BACS® VIEWER SCREENSHOT
As seen by BACS®, **the same 5-year-old system** as shown in the previous graphic, this time, after the application of the patented Equalization (Balancing) process. Within a few hours, this process brings the variance in float voltage to within 1/100th of a volt of the level recommended by the manufacturer.

The voltage imbalanced is accelerated when new and old cells or blocs are mixed into the string. Industry standard suggests if more than 20-25% of the blocs are required to be replaced in the string the entire string should be replaced. The reason is that the unbalanced voltages will occur when old and new blocs are mixed.

BACS provides a full battery management system which includes a full comprehensive State of Health (SOH) monitor as well as the management features to prevent the over and under charging through our Equalization (Balancing) process. BACS is fully web browser-based equipping the user with a simple intuitive user interface.

The BACS battery management systems uses a passive voltage balancing technique called passive equalization. BACS will measure each individual cell or bloc voltage and calculates the average voltage (target voltage) of the string. In the event that the cell or bloc voltage is above the target voltage (overcharging) BACS will activate a bypass current to provide enough float current to keep the cell or bloc charged while preventing overcharging. The cell or bloc that is below the target voltage (undercharging) is not bypassed and the voltage on that cell or bloc rises naturally toward the target voltage at the same time as the voltage of potentially overcharged cells or blocs is allowed to moderate. BACS functions by virtue of Kirchhoff's current laws. The specification of the BACS is to balance within 1/100th of a volt of the target voltage of the string.

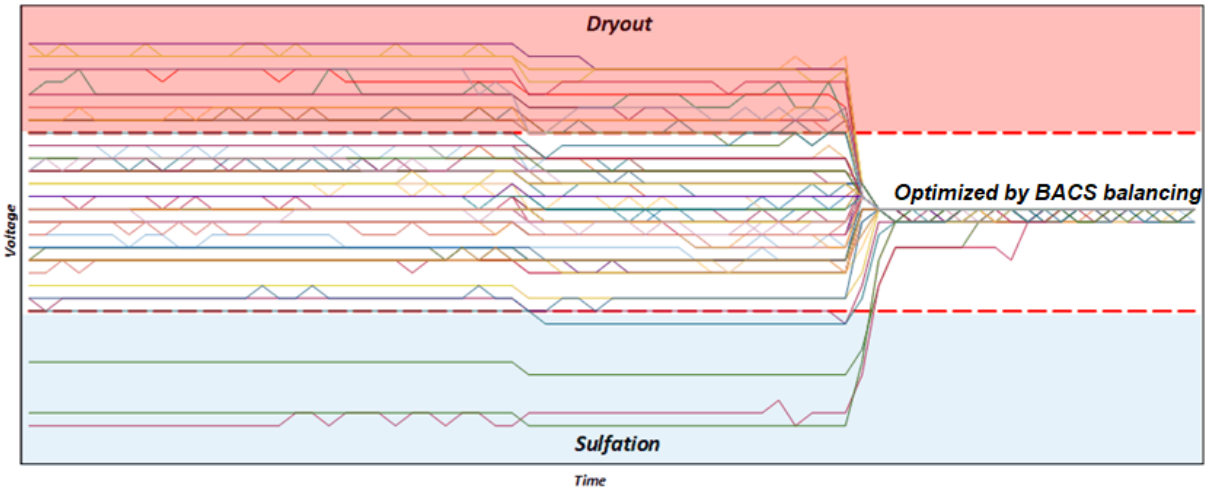


The BACS Advantage

The real advantage to battery management with BACS® is that it identifies and corrects the leading cause of battery failure. Just displaying the state of health of the battery is not enough. A Battery Management System should not only detect imminent battery failure but tell the user why batteries are failing, provide a reliable Advance Warning System and should automatically initiate actions to counteract battery issues. In a word, a good BMS should not only monitor but regulate – "manage" all batteries!

A battery management system like BACS will allow the user to treat their battery systems as assets versus commodity. Battery management with BACS® will increase capacity, extend service life, reduce premature failures, reduce waste, and most importantly lower your capital expenses.

BACS® is the only BMS on the market that both - monitors and manages batteries!



Through Equalization (Balancing), system batteries are kept at an optimal charging voltage and SOC (State of Charge) at 100%, and, therefore, in an optimal SOH (State of Health).

Features of the BACS WEBMANAGER product family

- **High-tech made in Germany / Made in the USA**

  The most powerful and flexible UPS management card worldwide is the CS141 – the basis of the BACS WEBMANAGER. Running on an ARM Cortex A8 CPU, 10/100Mbit Auto-sensing Ethernet, 3 serial RS-232 Interfaces, 1 USB Port, AUX port for connecting an external interface Card with 4 dry-contact, external alarms output/input and connecting the BACS modules. Available also as MODBUS RS485 interface at COM2.

- **Security made in Germany / Made in the USA**

  Data protection is very important to GENEREX - the CS141 security concept is therefore designed to comply with both German and American data protection laws. Furthermore, the transparent and intuitive system design can be configured to fit to any local compliance regulations.

- **Graphical interfaces**

  The in-build web server is designed for intuitive monitoring and configuration via the network, to configure the extensive functions of the BACS WEBMANAGER and perform even the most powerful statistical analysis in the BMS market. Statistical values of all connected devices are displayed graphically - UPS, temperature, humidity, etc. Additionally, the BACS WEBMANAGER provides options to communicate with UNMS (UPS Network Management System) - or any type of other 3rd part management software based on SNMP, MODBUS or BACnet. Thanks to the GENEREX API, the BACS WEBMANAGER offers additional interfaces for customers who wish to program the settings on the device using self-defined scripts.

- **Scheduler**

  Use the intuitive task scheduler to plan recurring tasks such as UPS battery tests, AUX output switching, or any other tasks the devices connected to the BACS WEBMANAGER can offer.

- **Data logging**

  Measurement values and alarms are logged to the non-volatile storage of the BACS WEBMANAGER. The time synchronization function through NTP ensures that all log entries are precise.

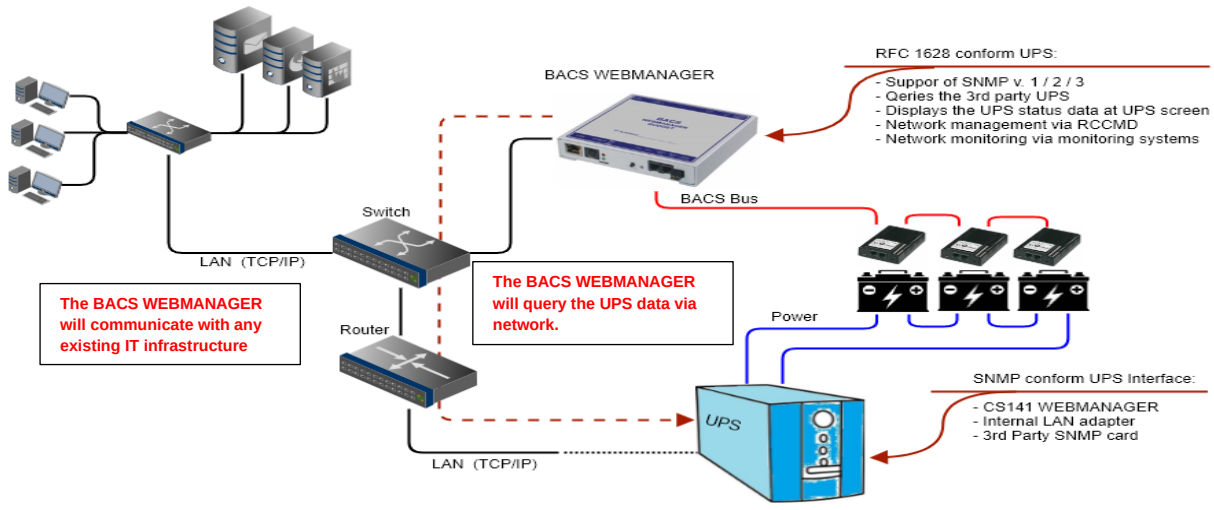
- **Email/SMS**

  Integrated email client via SMTP can be configured to relay either all or specific messages. Compatible with SMTP email systems such as MS Exchange/Outlook, Lotus, and many others.

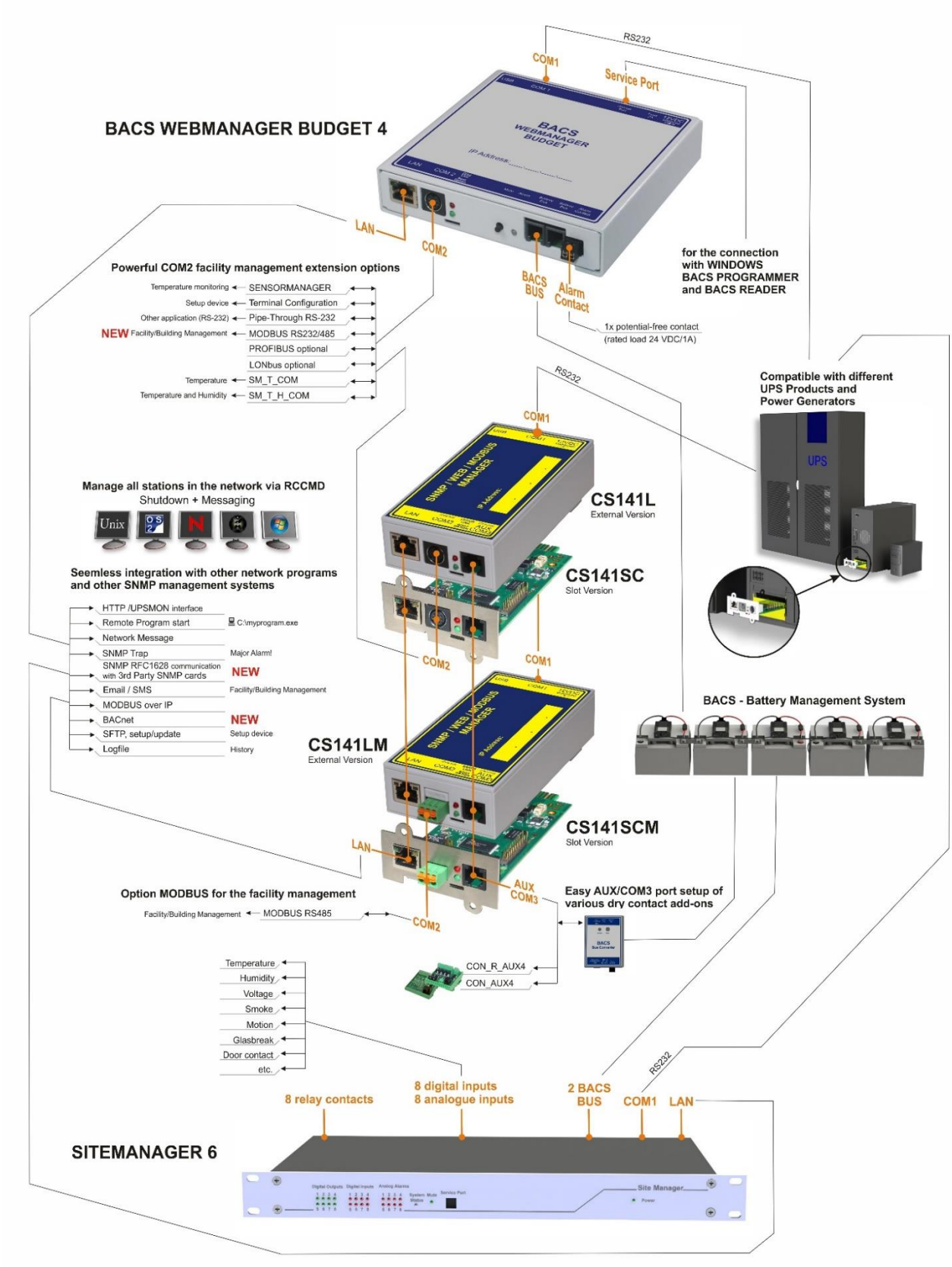
- **Network Services and Security**

  The BACS system has full qualified UPS manager on board and supports all kinds of network protocols like SNMP V2/V3, IPv4/IPv6, HTTP/HTTPs, DNS, DHCP, SMTP, NTP, SFTP, UPSTCP (UNMS), MODBUS over IP, MODBUS/PROFIBUS over RS232 or RS485, BACnet and GENEREX proprietary network protocols like UPSTCP (for UNMS) and RCCMD for network computer shutdown management.

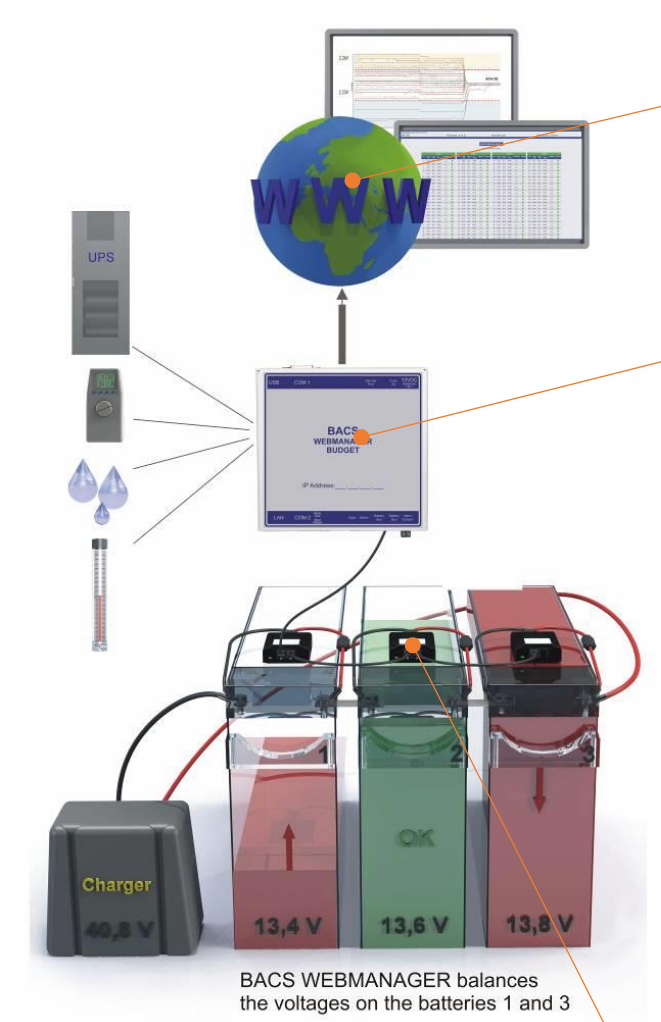
  The BACS WEBMANAGER provides manifold security features to ensure a maximum of network security. The BACS WEBMANAGER uses industrial standards to provide HTTPs and SSL encrypted communication with user created certificates. It can be configured to deny outdated or invalid certificates and it provides encrypted SNMP communication (V3), but also less secured systems are supported. Advanced password security and hard-coded user management provides configuration menus according to user level. As a special feature, the BACS WEBMANAGER provides tools to assist network administrators during network security auditing of a network segment.



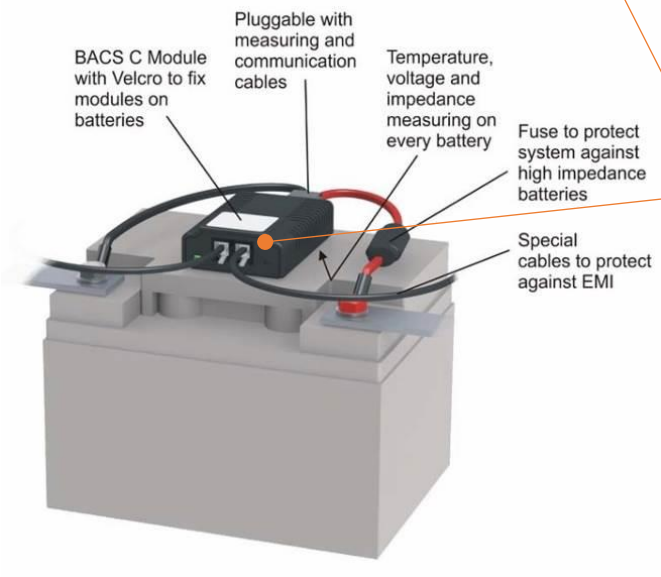
FUNCTION OVERVIEW: BACS WEBMANAGER



BACS® System Components



BACS WEBMANAGER balances the voltages on the batteries 1 and 3



BACS® VIEWER

Network monitoring software for professional deep battery analyzing, statistical data evaluation and advanced maintenance management.

BACS® WEB-MANAGER in 5 versions

3 external versions incl. a Rack model plus 2 UPS slot versions

Management of up to 510 BACS® C modules in up to 16 parallel strings.

Includes a full-qualified UPS-SNMP & MODBUS and BACnet manager at COM 1 and over Network for the monitoring of a UPS/inverter/rectifier/generators or other devices with a serial interface or network SNMP interface.

COM2 for optional environmental sensors (e.g. temperature, humidity, current, acid fill level, etc.).
One programmable alarm relay output, one alarm-LED, one alarm buzzer, mute button.

Integrated web server for status display configuration of all alarm thresholds (battery impedance, voltage, temperature, UPS alarms, environmental alarms, etc. network messaging system (email, SMS, SNMP, RCCMD, MODBUS, BACnet and (optional) PROFIBUS and LONBUS.

Data logger for all measuring data, current sensors (optional) for charge and discharge current measuring.
Compatible to UNMS monitoring software

BACS® C MODULE & CABLE

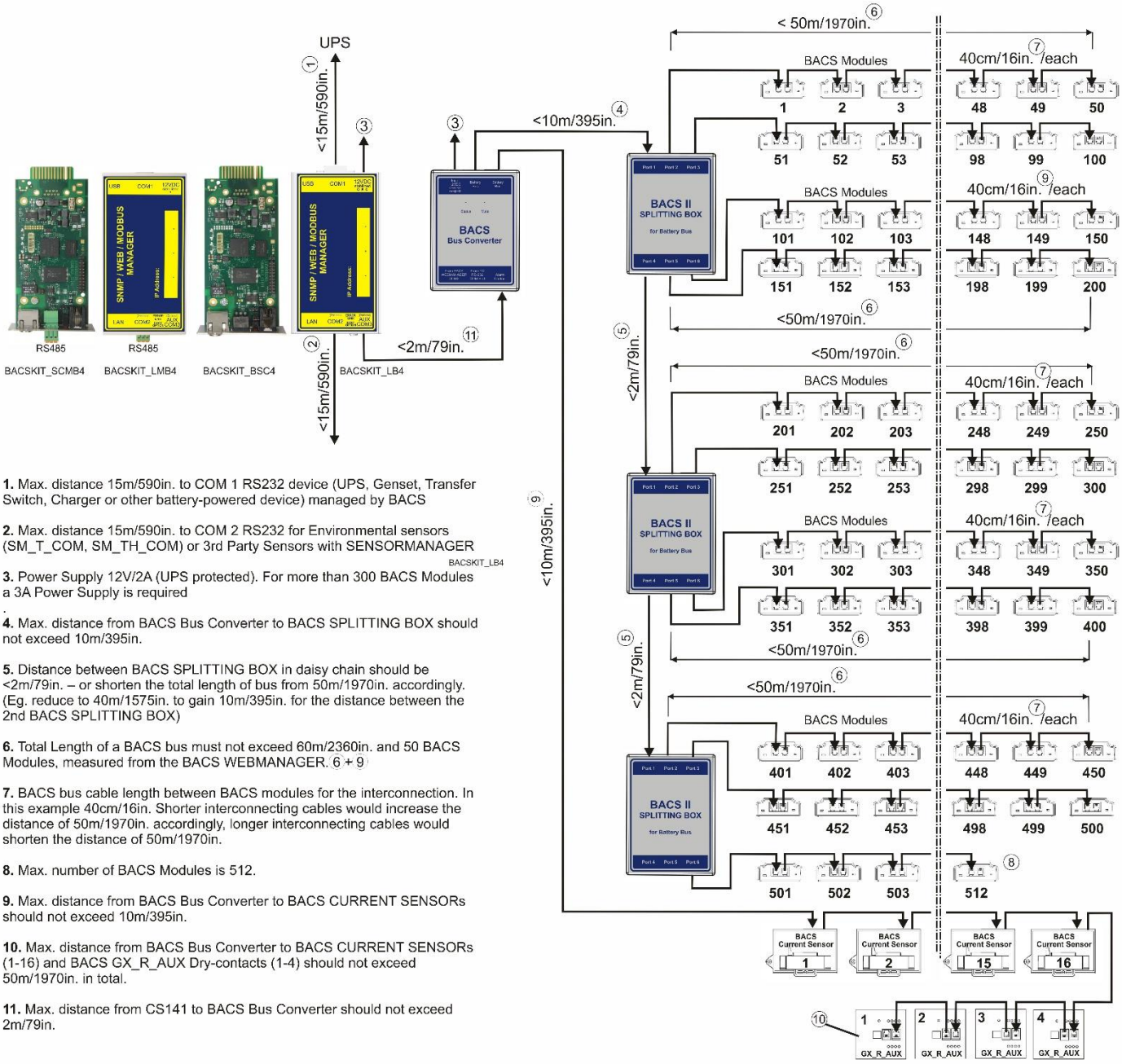
Diagram of a BACS® module installation:

A calibrated measuring cable with two high-voltage fuses connected to the positive and the negative Battery poles uses a 4-string wire for measuring the individual battery data.

The BACS® module measures through an integrated sensor the surface temperature of the accumulator, the voltage and the impedance.

The BACS® module is available in 5 different types: 16-volt, 12-volt, 6-volt, 4-volt, 2 volts for Lead/Acid, NiCad, NiMH and Lithium Ion batteries.

BACS® System Components



1. Max. distance 15m/590in. to COM 1 RS232 device (UPS, Genset, Transfer Switch, Charger or other battery-powered device) managed by BACS

2. Max. distance 15m/590in. to COM 2 RS232 for Environmental sensors (SM_T_COM, SM_TH_COM) or 3rd Party Sensors with SENSORMANAGER BACSKIT_LB4

3. Power Supply 12V/2A (UPS protected). For more than 300 BACS Modules a 3A Power Supply is required

.

4. Max. distance from BACS Bus Converter to BACS SPLITTING BOX should not exceed 10m/395in.

5. Distance between BACS SPLITTING BOX in daisy chain should be <2m/79in. – or shorten the total length of bus from 50m/1970in. accordingly. (Eg. reduce to 40m/1575in. to gain 10m/395in. for the distance between the 2nd BACS SPLITTING BOX)

6. Total Length of a BACS bus must not exceed 60m/2360in. and 50 BACS Modules, measured from the BACS WEBMANAGER. 6 + 9

7. BACS bus cable length between BACS modules for the interconnection. In this example 40cm/16in. Shorter interconnecting cables would increase the distance of 50m/1970in. accordingly, longer interconnecting cables would shorten the distance of 50m/1970in.

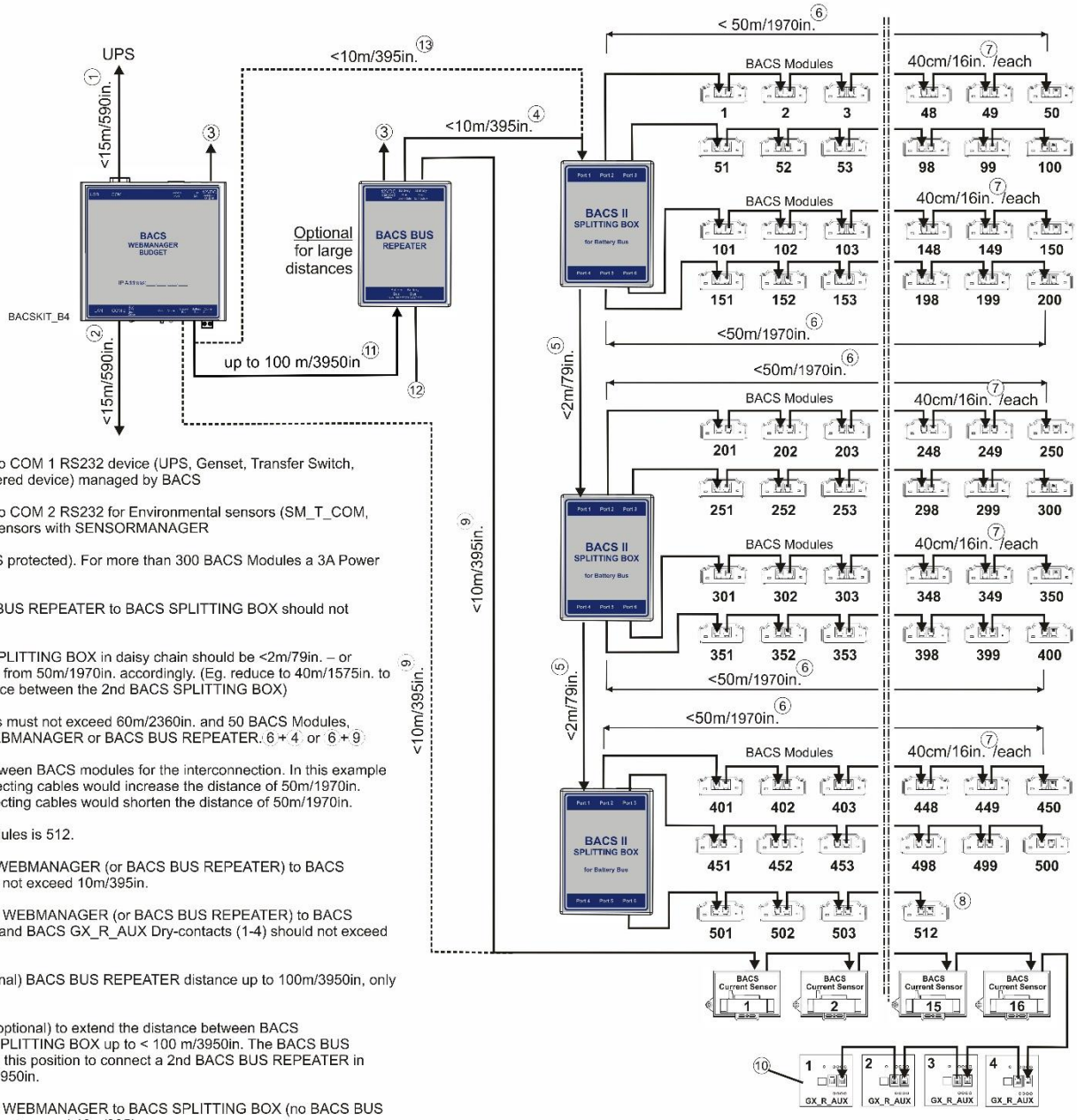
8. Max. number of BACS Modules is 512.

9. Max. distance from BACS Bus Converter to BACS CURRENT SENSORs should not exceed 10m/395in.

10. Max. distance from BACS Bus Converter to BACS CURRENT SENSORs (1-16) and BACS GX_R_AUX Dry-contacts (1-4) should not exceed 50m/1970in. in total.

11. Max. distance from CS141 to BACS Bus Converter should not exceed 2m/79in.

BACS® System Components



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2. Max. distance 15m/590in. to COM 2 RS232 for Environmental sensors (SM_T_COM, SM_TH_COM) or 3rd Party Sensors with SENSORMANAGER

3. Power Supply 12V/2A (UPS protected). For more than 300 BACS Modules a 3A Power Supply is required

4. Max. distance from BACS BUS REPEATER to BACS SPLITTING BOX should not exceed 10m/395in.

5. Distance between BACS SPLITTING BOX in daisy chain should be <2m/79in. – or shorten the total length of bus from 50m/1970in. accordingly. (Eg. reduce to 40m/1575in. to gain 10m/395in. for the distance between the 2nd BACS SPLITTING BOX)

6. Total Length of a BACS bus must not exceed 60m/2360in. and 50 BACS Modules, measured from the BACS WEBMANAGER or BACS BUS REPEATER. 6 + 4 or 6 + 9

7. BACS bus cable length between BACS modules for the interconnection. In this example 40cm/16in. Shorter interconnecting cables would increase the distance of 50m/1970in. accordingly, longer interconnecting cables would shorten the distance of 50m/1970in.

8. Max. number of BACS Modules is 512.

9. Max. distance from BACS WEBMANAGER (or BACS BUS REPEATER) to BACS CURRENT SENSORs should not exceed 10m/395in.

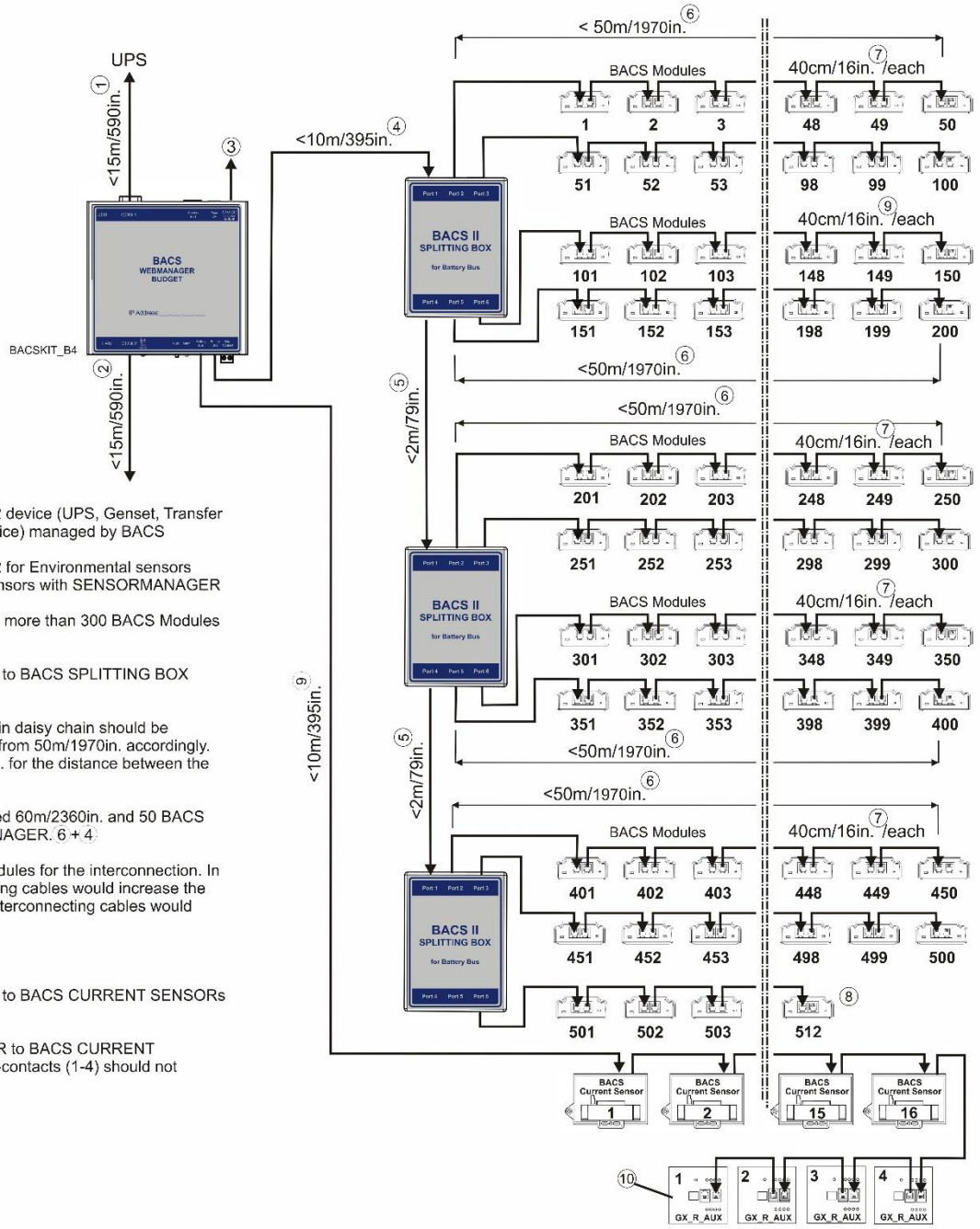
10. Max. distance from BACS WEBMANAGER (or BACS BUS REPEATER) to BACS CURRENT SENSORs (1-16) and BACS GX_R_AUX Dry-contacts (1-4) should not exceed 50m/1970in. in total.

11. BACS bus port with (optional) BACS BUS REPEATER distance up to 100m/3950in, only 1 bus cable required.

12. BACS BUS REPEATER (optional) to extend the distance between BACS WEBMANAGER and BACS SPLITTING BOX up to < 100 m/3950in. The BACS BUS REPEATER has a 2nd Port at this position to connect a 2nd BACS BUS REPEATER in series to gain another 100m/3950in.

13. Max. distance from BACS WEBMANAGER to BACS SPLITTING BOX (no BACS BUS REPEATER between) should not exceed 10m/395in.

BACS® System Components



1. Max. distance 15m/590in. to COM 1 RS232 device (UPS, Genset, Transfer Switch, Charger or other battery-powered device) managed by BACS

2. Max. distance 15m/590in. to COM 2 RS232 for Environmental sensors (SM_T_COM, SM_TH_COM) or 3rd Party Sensors with SENSORMANAGER

3. Power Supply 12V/2A (UPS protected). For more than 300 BACS Modules a 3A Power Supply is required

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4. Max. distance from BACS WEBMANAGER to BACS SPLITTING BOX should not exceed 10m/395in.

5. Distance between BACS SPLITTING BOX in daisy chain should be <2m/79in. – or shorten the total length of bus from 50m/1970in. accordingly. (Eg. reduce to 40m/1575in. to gain 10m/395in. for the distance between the 2nd BACS SPLITTING BOX)

6. Total Length of a BACS bus must not exceed 60m/2360in. and 50 BACS Modules, measured from the BACS WEBMANAGER. 6 + 4

7. BACS bus cable length between BACS modules for the interconnection. In this example 40cm/16in. Shorter interconnecting cables would increase the distance of 50m/1970in. accordingly, longer interconnecting cables would shorten the distance of 50m/1970in.

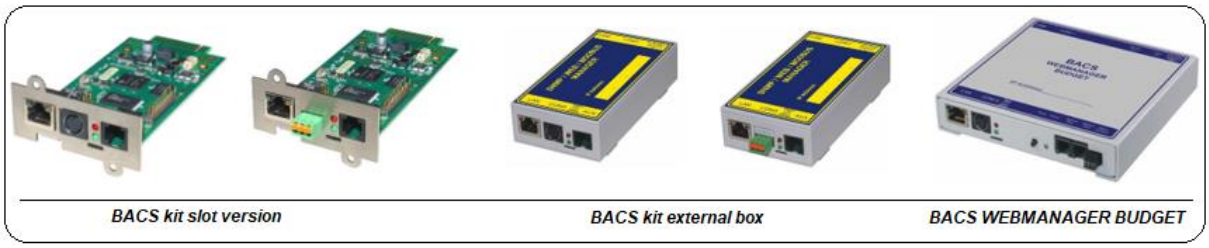
8. Max. number of BACS Modules is 512.

9. Max. distance from BACS WEBMANAGER to BACS CURRENT SENSORs should not exceed 10m/395in.

10. Max. distance from BACS WEBMANAGER to BACS CURRENT SENSORs (1-16) and BACS GX_R_AUX Dry-contacts (1-4) should not exceed 50m/1970in. in total.

Technical data

General technical data: CS141 / BACS Webmanager Product family



	CS141 PRODUCT SERIES GENERAL DATA
Processor and memory	ARM Cortex A8 800MHz CPU, 30 MB storage for battery history.
Operating condition	Temperature 0 - 70°C, max. humidity 20 - 95%, non-condensing
MTBF (calculated)	849192 hours; 96,9 years
Power consumption	At 12V default power supply consumption approx. 150mA. Note: At BACS a CONVERTER is included.
Operating condition	Temperature 0 - 70°C, max. humidity 20 - 95%, non-condensing
MTBF (calculated)	849192 hours; 96,9 years
Display	2x LED (Manager status, UPS/device alarm)
External BACS kit CS141 housing	Polystyrene, RAL 7035 (light gray) CE, UL/NEMKO certified
SLOT BACS kit CS141 housing	Slot card “SC format” for UPS devices witch compatible slots UL- Certification
BACS Webmanager Budget housing	Aluminum, RAL 7035 (light gray) UL/NEMKO certificated
Number of possible BACS modules	The Standard Power supply (2000 mA) grants power for up to 360 BACS C modules. For up to 512 modules and sensors, ask for larger power supply.

BACS kit product bundle differences to general data:

	**BACS® WEBMANAGER BUDGET SC (slot version)** Order No. BACSKIT_BSC4
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, COM3=BACS battery bus) 1x RJ12 for battery bus converter 1x RJ45, 10/100Mbit Ethernet

	**BACS® WEBMANAGER BUDGET L** Order No. BACSKIT_LB4
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, COM3=BACS battery bus) 1x RJ12 for battery bus converter 1x RJ45, 10/100Mbit Ethernet

	**BACS® WEBMANAGER BUDGET SCM RS485 (slot version)** Order No. BACSKIT_SCMB4
Interfaces	2x RS-232 interfaces, (COM1= UPS/power device, COM3=BACS battery bus), 1 * RS485 = COM2 1x RJ12 for battery bus converter 1x RJ45, 10/100Mbit Ethernet

	**BACS® WEBMANAGER BUDGET LM RS485** Order No. BACSKIT_LMB4
Interfaces	2x RS-232 interfaces, (COM1= UPS/power device, COM3=BACS battery bus), 1x RS485 1x RJ12 for battery bus converter 1x RJ45, 10/100Mbit Ethernet

BACS WEBMANAGER BUDGET differences to general data:

	BACS® WEBMANAGER BUDGET - 12V Order No. BACSKIT_B4
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, service port for Windows BACS READER and PROGRAMMER software) USB 2x battery bus converter outputs internal 1x RJ45, 10/100Mbit Ethernet 1x potential-free contact (2 pole screw wire size 1,0 mm², rated load 24 VDC /1A
	
Dimension	130 x125 x 30mm = 5,12 x 4,92 x 1,18 in. (W x L x H)
Weight	180g

	BACS® WEBMANAGER BUDGET - 18V-72V Order No. BACSKIT_B4
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, service port for Windows BACS READER and PROGRAMMER software) USB 2x battery bus converter outputs internal 1x RJ45, 10/100Mbit Ethernet 1x potential-free contact (2 pole screw wire size 1,0 mm², rated load 24 VDC /1A
	
Dimension	130 x125 x 30mm = 5,12 x 4,92 x 1,18 in. (W x L x H)
Weight	180g
	Technical data: TRACOPOWER TCL 024-112DC
	
Input	18V – 72V DC
Output	12V 2000mA DC stabilized up to 390 BACS Modules
Notes	Input safeguarding fuse (recommended circuit breaker 6-16A / characteristic C) is not included.

	BACS® WEBMANAGER BUDGET - 90V-375V Order No. BACSKIT_B4_375
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, service port for Windows BACS READER and PROGRAMMER software) USB 2x battery bus converter outputs internal 1x RJ45, 10/100Mbit Ethernet 1x potential-free contact (2 pole screw wire size 1,0 mm², rated load 24 VDC /1A
	
Dimension	130 x125 x 30mm = 5,12 x 4,92 x 1,18 in. (W x L x H)
Weight	180g
Number of modules	The power supply provides 1960mA are for up to 392 BACS C modules and other BACS components.
	Technical data: TRACOPOWER TPCL 030-112DC
	
Input	90 – 375V VDC or 85 - 264VAC
Output	12V 2200mA DC stabilized up to 390 BACS Modules
Notes	Input safeguarding fuse (recommended circuit breaker 6-16A / characteristic C) is not included.

BACS All-In-One - Solution:

SITEMANAGER 6 Order No. SITEMAN_6 	
Processor and memory	ARM Cortex A8 800MHz CPU, 30 MB storage for battery history Non-volatile memory for alarm notification after power loss
Power consumption	40 watts max.
Interface	RS-485 interface for other devices / Adapter for RS232 support
Inputs	8 digital inputs (opened / closed configurable) 8 analog inputs (0 - 10V, 4 - 20mA, 0 - 20mA configurable via jumpers) 2 x RJ10 for BACS battery bus
Outputs	8 relay outputs (changer, max. 230V/ 4A AC/DC)
Network	10/ 100Mbit LAN
Supported protocols	Email, HTTP/HTTPs, SNMP, SNTP, MODBUS Over IP, BACnet, UPSTCP, DHCP, DNS, sFTP
Front Display	LED alarm display, LED operating status display
Dimensions	483 x 162 x 44mm, (483 x 212 x 44mm incl. SM_LOOM) 19,00 x 6,38 x 1,73in, (19,02 x 8,35 x 1,73in incl. SM_LOOM)
Weight	2262 g
Operating condition	Temperature 0 - 70°C, max. humidity 20 - 95%, not condensing
Network management	UNMS II Network Management software
Network Adapter	Optional PROFIBUS, LONBUS adapter
Additional sensors	Smoke/fire alarms, motion detectors, door contacts etc., connection of any other alarm contact indicator, which output signal is between 0 - 10V,4 -20mA or rather 0 - 20mA (configurable via jumpers)
Actuators	flash light, alarm buzzer, relay-switches, external switches, etc.

BACS Accessories

BACS® BUS CONVERTER 5

Order No. BACS_BUS_CONV_V

Construction	Conversion and galvanic separation of the BACS battery bus to the BACS WEBMANAGER BUDGET plus real time clock (RTC) timer for the BACS WEBMANAGER.
Power Supply	Stabilized external 12V/2000mA
Number of modules	Standard Power supply grants power for up to 360 BACS C modules. For up to 510 Modules and sensors, a larger power supply is available.
Interface	2x RJ10 for BACS battery bus 1xRJ12 for COM3 BACS WEBMANGER BUDGET 1xMiniDin8/RS232 interface for serial connection to workstation. 1x2,1mm DC connector socket for power supply via external power supply 1x potential-free contact (2 pole screw terminals for 1,0 mm² /24 VDC /1A)
Display	Optical display (LED)
Alarm	Internal alarm buzzer with acknowledge button
Housing	Polystyrene
Optional parts	Optional: Adapter from mini-8 to RS232 for the BACS Reader, with junction cable mini-8 1.5m
Dimension	91,5 x 67 x 25 (W x H x D)
Weight	120g

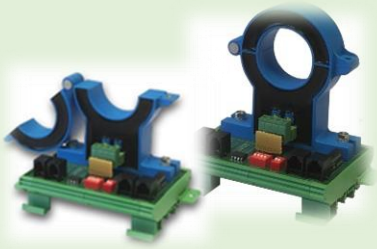
BACS® SPLITTING BOX

Order No. BCII_SPLITT

Construction	Passive splitter for BACS communication cables, designed to optimize the overall cable lengths and to create an optical pleasant wiring. In addition to the extension of the 2 BACS bus inputs of the BACS CONVERTER.
Power supply	Passive element, no additional power supply required
Interfaces	5* RJ10 for BACS bus cables 1x RJ10 input connector for BACS bus data input
Housing	Polystyrene
Dimension	91,5 x 67 x 25 (B x H x T)
Weight	90g

BACS® DC current sensor 50/200/400/1000/2000 Ampere

Ord. No: BACS_CSH50, BACS_CSH200, BACS_CSH400, BACS_CSH1000, BACS_CSH2000



Construction	DC current sensor for measuring battery string discharge and charging process +/-50A, +/-200A, +/-400A, +/-1000A, +/-2000A DC Current transducer diameter hole: 21mm [0,82in] (BACS_CSH50) /40 mm [1.57in]
Power supply	Intern powered by BACS bus
Power consumption	60mA
Interfaces	2x RJ10 for BACS bus cable, pluggable system
Housing	DIN Rail
Dimension (LxWxH)	110 x 82 x 125 mm = 4,33 x 3,22 x 4,92 in. (LxWxH)
Weight	420g

	BACS® bus interface GX_R_AUX Order No. GX_R_AUX
	Description: Input alarms and Output relay management. A typical application is the control of a battery breaker in case of "thermal runaway" alarm in the battery system. Applies to US Norm International Fire Code IFC 608.3 for isolating UPS batteries in case of a thermal runaway. In case of a high battery temperature and increasing voltages during float charge, the GX_R_AUX may open the battery breaker to stop a further increase of the temperatures in the batteries. Individual programming of the relays through web interface. Inputs: 4 digital inputs (configurable NO/NC) Outputs: 4 Relay potential-free outputs (NO/NC) / 50VAC – 2A, 30VDC – 1A Power supply: Powered by BACS bus, no external power supply Power consumption: 170mA Housing: Polyamide, pluggable system DIN rail Dimension: 75 x 75 x 45mm = 2,95 x 2,95 x 1,77 in. (LxWxH) Weight: 170g
	BACS® external temperature sensor Order No. BACS_TS1L23, BACS_TS1L90
	Construction: External temperature sensor for BACS REV 3 (Optional). If this sensor is attached, the internal temperature sensor of the BACS module will be automatically switched off. Cable length: 23cm (9.06in) / 88cm (34,65in) cable Delivery content: Sensor only, has to be attached to the BACS C module by a qualified BACS service engineer Housing: UL certified material, voltage proofed up to 1000V Measuring range: -10°C - +90°C, precision: +/- 1°C dimension: 2cm x 1.5cm x 1cm) (0.87 x 0.58 x 0.37 Inch “)

Modules and cables

		BACS® modules Generation 3
	Construction current consumption from battery Measuring precision Interfaces Housing Dimensions, weight Operating condition Int. protection rating High voltages security tested MTBF (calculated)	Measuring modules with passive balancing/equalization BACS patent no.: DE 102004013351.4 normal operation: 15 - 20mA (C20, C23, C30) 35 - 40mA (C40, C41) “Sleep Mode”: < 1mA Internal resistance: < 10 % at C40, < 5% at C20/30 Voltage: < 0,5 % Temperature: < 15 % 2x RJ10 for BACS battery bus Internal RS232 bus interface 1x button for the addressing Temperature sensor -35 bis + 85 °C Optical display LED (alarms red/green, mode red/green) ABS housing (UL certified, flame retardant, cooling fins) 55 x 80 x 24 mm = 2,17 x 3,15 x 0,94 in. (B x H x T), 45g Temperature 0 - 60°C, max. humidity 90%, not condensing IP 42 coated against dust and condensate Protection against high ohmic batteries fault voltages up to 150 Volt /per module (fuse opens). At higher voltages the fuse opens, but BACS module is damaged. All REV 3.1 modules are designed for fault voltages up to 1000 Volt 87.600 hours (10 years)
		**Module BACS® C23** Order No. BACSC23 REV 3 module for 16Volt 7-600Ah lead, NiCad, NiMH, Lithium batteries
	Voltage range RI range Equalization power	9.7V – 17V 0.5-60mOhm 0.12 A
		**Module BACS® C20** Order No. BACSC20 REV 3 module for 12Volt 7-600Ah lead, NiCad, NiMH, Lithium batteries (UL certified)
	Voltage range RI range Equalization power	9.7V – 17V 0.5-60mOhm 0.15 A
		**Module BACS® C30** Order No. BACSC30 REV 3 module for 6Volt 7-900Ah lead, NiCad, NiMH, Lithium batteries
	Measuring value RI range Equalization power	4.8V – 8.0V 0.5-60mOhm 0.3 A
		**Module BACS® C41** Order No. BACSC41 REV 3 module for 4Volt 7-900Ah lead, NiCad, NiMH, Lithium batteries (UL certified) (Auld)
	Measuring value RI range Equalization power	2.4V – 5.0V 0.5-30mOhm 0.3 A
		**Module BACS® C40** Order No. BACSC40 REV 3 module for 2Volt 7-5000Ah lead, NiCad, NiMH, Lithium batteries (UL certified)
	Measuring value RI range Equalization power	1.25V – 3.2V 0.02-6mOhm 0.9 A (at 2.27V)

BACS Cables

	BACS® measuring cables Order No. BC4B-xxxxx
	Description: Measuring cables made of UL certified material for BACS sensors type C40 REV 3. Unique high voltage precision fuses for system protection and precise measurements cable cross section: 2x1,50mm² nominal voltage U_0/U: 300V/500V fuses: 1000V/10A und 1000V/1A temperature range: -25°C – 70°C
	BACS® measuring cables Order No. BC4B-xxxxxH
	Description: Measuring cables made of halogen free, extremely fire resistant and oil resistant material, for BACS sensors type C40 REV 3. Unique high voltage precision fuses for system protection and precise measurements. cable cross section: 2x1,50mm² nominal voltage U_0/U: 300V/500V fuses: 1000V/10A und 1000V/1A temperature range: -15°C – 70°C Cable coating: halogen free in accordance with VDE0281 part 14
	BACS® measuring cables Order No. BC5-xxxxx
	Description: Measuring cables made of UL certified material for BACS sensors type C20 REV. 3, C23 REV. 3, C30 REV. 3 and C41 Rev. 3. Unique high voltage precision fuses for system protection and precise measurements cable cross section: 2x0,75mm nominal voltage U_0/U: 300V/300V fuses: 1000V/2A und 1000V/500mA temperature range: -25°C – 70°C
	BACS® measuring cables Order No. BC5-xxxxxH
	Description: Measuring cables made of halogen free, extremely fire resistant and oil resistant material, for BACS sensors type C20 REV. 3, C23 REV. 3, C30 REV. 3 and C41 Rev. 3. Unique high voltage precision fuses for system protection and precise measurements cable cross section: 2x0,75mm² nominal voltage U_0/U: 300V/300V fuses: 1000V/2A und 1000V/500mA temperature range: -15°C – 70°C Cable coating: halogen free in accordance with VDE0281 part 14
	BACS® bus cables Order No. B4BCRJx
	Description: High quality communication BACS bus communication cable Cable coating: halogen free in accordance with VDE0281 part 14 Contacts: twisted pair RJ10 Cable length: Various lengths available. See latest BACS price list for details

BACS® CONTROL CABINETS: Technical data and dimensions

Control cabinet for BACS® systems. Plug-play, with AC input plug (Euro) ready to install. With optical and audible display on the outside door, protection class IP 56. Easy connection of inputs and outputs through a strip terminal.

			**BACS® CONTROL CABINET Type 1** Order No. BACS_CC1
	Controller	1	BACS WEBMANAGER BUDGET
	Power	1	12V Power supply (100 – 240V, 50/60Hz)
	LAN	1	CAT 6 Ethernet socket
	Contacts	1	Alarm contact (potential-free), 230VC / 30VDC / 8A
	Front door	1	POWER LED
	Front door	1	BACS ALARM LED
	Spare parts	6	Spare bus communication cable
	Dimension	WHD	400 x 500 x 210 mm = 15,75 x 19,69 x 8,27 in.
	weight	kg	16,10
			**BACS® CONTROL CABINET Type 2** Order No. BACS_CC2
	Controller	2	BACS WEBMANAGER BUDGET
	Power	2	12V Power supply (100 – 240V, 50/60Hz)
	LAN	2	CAT 6 Ethernet socket
	Contacts	2	Alarm contact (potential-free), 230VC / 30VDC / 8A
	Front door	2	POWER LED
	Front door	2	BACS ALARM LED
	Spare parts	8	spare bus communication cable
	Dimension	WHD	500 x 500 x 210 mm = 19,69 x 19,69 x 8,27 in.
	weight	kg	20,20
			**BACS® CONTROL CABINET Type 3** Order No. BACS_CC3
	Controller	3	BACS WEBMANAGER BUDGET
	Power	3	12V Power supply (100 – 240V, 50/60Hz)
	LAN	3	CAT 6 Ethernet socket
	Contacts	3	Alarm contact (potential-free), 230VC / 30VDC / 8A
	Front door	3	POWER LED
	Front door	3	BACS ALARM LED
	Spare parts	10	Spare bus communication cable
	Dimension	WHD	500 x 500 x 210 mm = 19,69 x 19,69 x 8,27 inch
	weight	kg	22,70

BACS Plus Size BACS Control Cabinets are also available as:

BACS® CONTROL CABINET Type 4 Order No. BACS_CC4	**BACS® CONTROL CABINET Type 5** Order No. BACS_CC5	**BACS® CONTROL CABINET Type 6** Order No. BACS_CC6
- 4 * BACS WEBMANAGER BUDGET	- 5 * BACS WEBMANAGER BUDGET	- 6 * BACS WEBMANAGER BUDGET
- 4 * 12V Power 100 – 240V, 50/60Hz	- 5 * 12V Power 100 – 240V, 50/60Hz	- 6 * 12V Power 100 – 240V, 50/60Hz
- 4 * CAT 6 Ethernet socket	- 5 * CAT 6 Ethernet socket	- 6 * CAT 6 Ethernet socket
- 4 * Alarm contact (potential-free) 230VC, 30VDC, 8A	- 5 * Alarm contact (potential-free) 230VC, 30VDC, 8A	- 6 * Alarm contact (potential-free) 230VC, 30VDC, 8A
- 4 * POWER LED, - 4 * BACS ALARM LED	- 5 * POWER LED, - 5 * BACS ALARM LED	- 6 * POWER LED, - 6 * BACS ALARM LED
12 * spare bus communication cable	14 * spare bus communication cable	16 * spare bus communication cable
- Dimension: 600 x 760 x 210 mm 23,62 x 29,92 x 8,27 in, weight: 38,10 kg	- Dimension: 760 x 760 x 210 mm 29,92 x 29,92 x 8,27 in weight: 48,50 kg	- Dimension: 760 x 760 x 210 mm 29,92 x 29,92 x 8,27 in weight:.55,40 kg

Also available: BACS Control Cabinet with a full featured Windows Touch Panel All-In-One Computer*

		BACS® CONTROL CABINET with PC All Cabinets are also available with a fully featured Touch Panel Computer
 	RAM CPU Touch Panel USB COM LAN Wireless Power Consumption (max) Input voltage Graphic Software Operating Condition Relative humidity EMC Notes:	1*204-pin SODIMM DDR3L 1333MHz / up to 8GB Intel Bay Trial J1900 Quad Core 2GHz 15“ XGA TFT multi-point capacitive touch screen 4* USV 6 COMPorts 2 GLAN P 1 x Mini-PCIe slot, extensible 3G,Wifi wireless card 38,6 Watt max DC 12V, support reverse polartity protection VGA/HDMI Windows 10 Professional English Language BACS Tools Software packet pre-installed -30 ~80°C (-22~176°F) 5~95% (Non condensation) CD/FCC Class A The Operating system is a fully featured Windows 10 operating system and needs additional configuration work. not pre-configured – you need to configure it before first use.
How to order your BAC CC with Touch Panel PC:		
1 BACS WEBMANAGER + PC		BACS_CC1_TP
2 BACS WEBMANAGER + PC		BACS_CC2_TP
3 BACS WEBMANAGER + PC		BACS_CC3_TP
4 BACS WEBMANAGER + PC		BACS_CC4_TP
5 BACS WEBMANAGER + PC		BACS_CC5_TP
6 BACS WEBMANAGER + PC		BACS_CC6_TP

*for more information, contact, please contact the GENEREX sales team with sales@generex.de.