Version: 2012-06-27

BACS®

BACS ® - Battery Analysis & Care System

3rd Generation Battery Management System

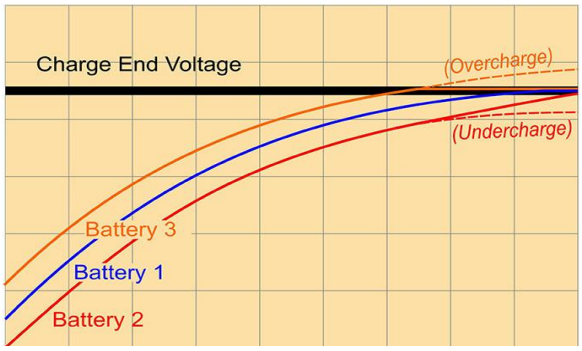
- **Monitoring, individual charging /discharging & alarm system for accumulators**
- **Avoid unnoticed or unexpected battery failures, extending the battery lifespan and preserving the reliability of the complete system**

The patented BACS „**B**attery **A**nalysis & **C**are **S**ystem" now the 3rd generation is the most advanced product on the market today providing an Ethernet-network integrated battery monitoring and management system. Using web-management technology it checks the internal resistance, the temperature and the voltage of every single accumulator sequentially.

Through our patented ***EQUALISATION*** process it corrects the charging voltage of each accumulator individually. The accumulators are kept in the optimal voltage operating range.

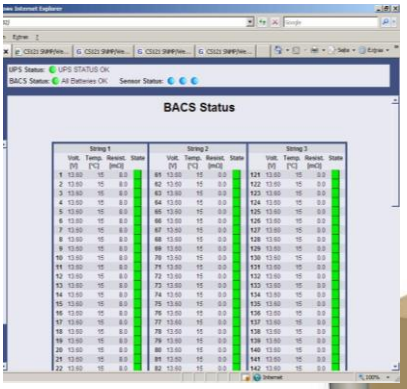
The constant monitoring and controlling of the individual charging voltages for each accumulator guarantees the availability of the battery at all times – making the Achilles Heel of a UPS/ INVERTER systems (or any other battery powered device) a thing of the past!

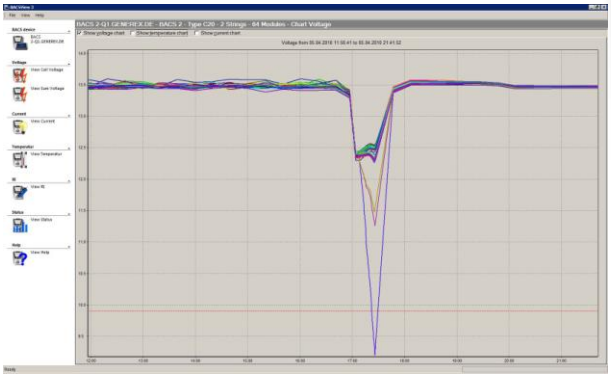
In addition, it can manage environmental measurements (temperature, humidity, acid fill level, hydrogen gas concentration, etc.) and appliances (UPS, inverters and other devices).
BACS is the ideal system for all lead-acid based accumulators (open/wet cells, maintenance free, gel, AGM), etc.



Charging process of accumulators with BACS® patented Equalisation – the charging of battery 3 is capped to prevent overcharging that could cause gassing. Supply of charging energy to battery 2 is continued and boosted until the target charging voltage is obtained. Battery 1 performs ideally and is not regulated.

BACS® web server displays here the battery status of 140 accumulators. Any change in impedance, temperature and voltage is displayed and stored. Status LEDs show a change of color if any accumulator drifts beyond thresholds.





Discharge process displayed via the BACS VIEWER software shows the voltage drop of several batteries during a discharge, unnoticed by the UPS/ Inverter. In a later stage these accumulators would make the complete system collapse.

BACS® Features at a Glance

- **Monitoring and regulating the charging process:** The system is designed for monitoring and regulating lead-acid based accumulators in a group of batteries.

- **Individual voltage regulation:** BACS® is regulates the voltage supply for every accumulator from the charger/UPS/ INVERTER. This results in a homogenous set of accumulators with at most capacity and lifespan. This regulation process is patented as “EQUALISATION”.

- **Avoid overcharging:** Through the EQUALISATION process the unnoticed overcharging of individual batteries (gassing, dry-out, thermal runaway) is prevented.

- **Avoid undercharging:** Through the EQUALISATION process the unnoticed undercharging of individual batteries (sulphation, loss of capacity) is prevented.

- **Indicator of battery problems:** Typical battery problems like sulphation, corrosion, gassing, dry-out, thermal runaway etc. are visible through a rise of Impedance and temperature.

- **Avoid sulphation :** Sulfation is a typical problem for UPS/ Inverter batteries because they are consistently held at a float charge level for a long time. Its not guaranteed that ALL accumulators have really been fully charged when the UPS/ INVERTER charge switches from boost charging to float charging. The result maybe that some accumulators are overcharged, while others have never been fully charged. EQUALISATION avoids sulphation through the process of bringing the overcharged and undercharged accumulators to a balanced voltage level.

- **Protection of neighbour batteries:** BACS avoids damages on neighbouring accumulators through the Equalisation process in balancing all individual voltages of the accumulators.

- **Increase battery capacity:** BACS® guarantees, through EQUALISATION, a full charge level and the optimal capacity of a battery system.

- **Early warning to replace batteries:** Through impedance trending you can see in the early stage that some accumulators are damaged or simply weaker than others. The earlier accumulators are replaced the better for an increased lifetime of the complete battery system !

- **Battery alert system :** Through monitoring of key parameters of the accumulators and measuring against set thresholds, the system is able to give you pre-warnings via audible, visible and network messages that attention is required.

- **Battery breaker switching at thermal runaways:** Through the embedded dry contact output the BACS system may trip the battery breaker in case of high battery temperature. A stringwise battery disconnection is possible..

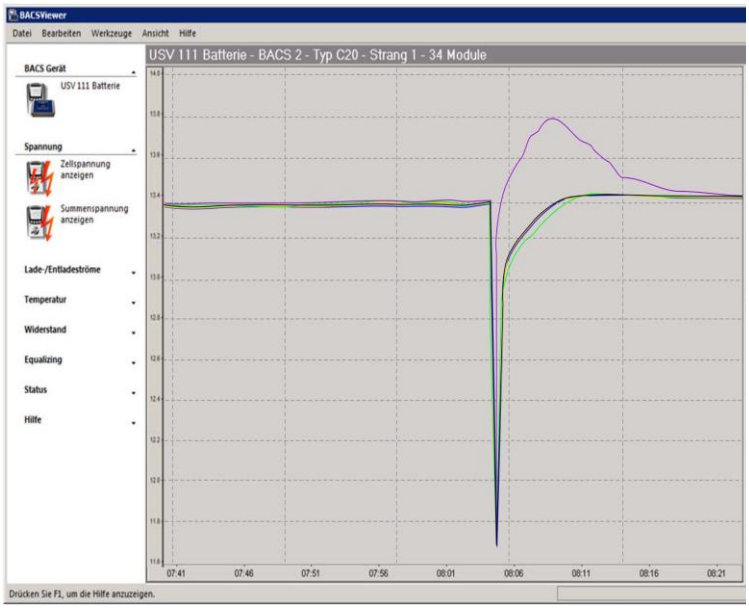
- **Power & Environmental alert system :** The BACS system monitors environmental parameters (temperature, humidity, hydrogen gas concentration, acid fill level, DC current, etc.) and UPS/ INVERTER system data. This information including alarm alerts is available via a mix of multiple communication systems.

- **Maintenance:** A BACS system improves the service quality by providing remote monitoring through Internet, VPN or other network for downloading real time data and battery history for analysis. Single, individual battery tests are now possible without the effort to disconnect batteries from the group. Maintenance and battery testing are able to take place at time, under real operating conditions, without downtime of the system!

- **UPS/ Inverter Power manager :** A BACS system includes a full qualified SNMP and MODBUS manager - compatible to any UPS/ Inverter vendor in the market!

- **MODBUS/PROFIBUS/LONBUS/SNMP :** A BACS system allows MODBUS clients to read the data of the BACS system through IP and RS232 and through SNMP. Through optional converters a conversion to PROFBIS and LONBUS is possible.

- **Free BACS VIEWER analysis software :** Provides graphical BACS data analysis and reports !



The free BACS VIEWER software shows the EQUALISATION of a battery within a string or 32 batteries (shown as bold violet line) during a discharge/rechargingprocess .

BACS EQUALISATION avoids that this violet accumulator gets overcharged, while other accumulators still require further charging.

BACS Description

The reliability of an accumulator based power supply can only be guaranteed when the availability of each accumulator is at 100% capacity all of the time!

The BACS® battery modules have instruments for taking exact measurements of the internal resistance, temperature and voltage which are valuable for making a precise analysis of each battery. The data is transferred through a bus system to the BACS WEBMANAGER which is at the same time the manager for UPS, inverters, environmental sensors and other devices.

The BACS WEBMANAGER acts as the central control unit by gathering, evaluating and storing all information on its internal flash MEMORY. A display shows the actual status of the accumulators, a 2nd display shows the actual UPS/ INVERTER data and a 3rd display shows environmental data and alarm contacts status. The web browser interface of the system is designed for easy configuration, displaying all system values and events, a flexible EVENT MANAGER is the programming interface for automatic reactions in case of alarms.

The BACS WEBMANAGER compares constantly the individual accumulator voltage in relation to the current voltage level of the overall system. This value is sent to every BACS® module which starts counter steering. This process is called “EQUALISATION” and ensures that the voltages of all accumulators are balanced.

The BACS® system limits the charge to the overcharged accumulators to avoid gassing and the drying out that would occur from this action. Each individual accumulator receives an optimal charging voltage through this EQUALISATION process.

Limiting the charging voltages of the accumulator increases the durability and reliability of the whole system considerably.

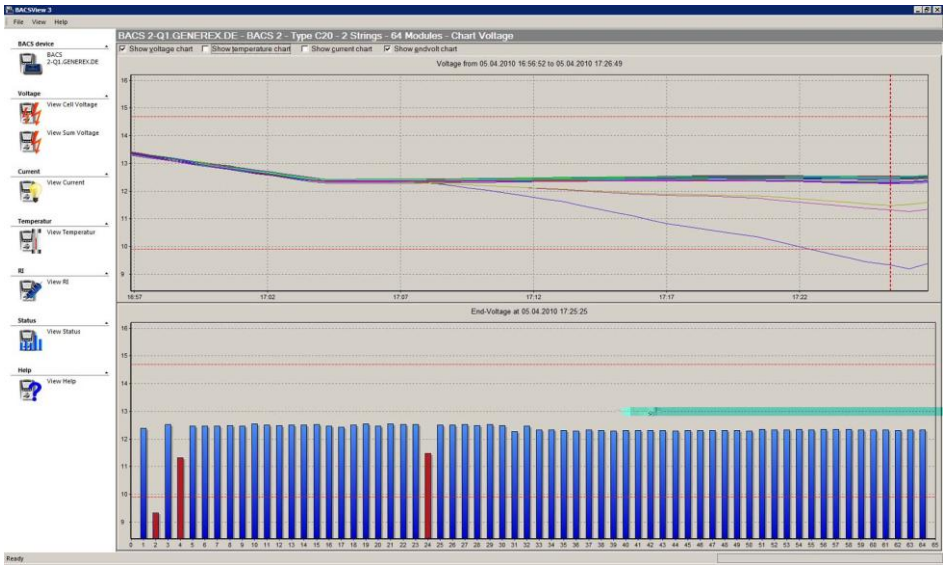
Rising internal resistance of an accumulator due to corrosion or sulphate deposits will trigger an alarm. Alarm values can be configured to match the type of battery. This „early warning system“ makes it possible to warn users (by email, email-to-SMS, network message, SNMP, RCCMD, MODBUS, PROFIBUS, LONBUS etc.) far in advance about battery weaknesses before it is too late. For instance, should sulfation increase internal resistance, the user can reverse this process with a series of discharging and charging cycles. The effect of such „battery training” on the internal resistance can be read immediately!

In addition to internal resistance, the values for voltage, temperature, regulating activities and the number of charging / discharging cycles are constantly monitored and compared with preset thresholds. When any of the threshold values are exceeded, corresponding alarms will be communicated using the network connection, modem (optional), email, SMS, SNMP, RCCMD, MODBUS and (optional) PROFIBUS or LONBUS.

At the BACS-Manager an alarm buzzer acoustically warns the users. An alarm LED on the module and on the BACS-Manager shows the alarm optically.

The BACS WEBMANAGERs are equipped with a large flash MEMORY or SD memory cards that can log all system data for a duration of at least 6 months and up to 3 years dependent of the size of the system. All data can be downloaded and archived over the network in order to free-up storage capacity for further data logging and for analysis using the BACS VIEWER software or other graphical tools.

The alarms for other devices connected to the BACS WEBMANAGER (e.g. UPS/ INVERTER) are also logged in separate files with a date and time stamp and shown in the web interface. The BACS WEBMANAGER is equipped with a real-time clock for precise data/time stamps in the log files, additionally the system time is automatically synchronized with a network time server (SNTP).



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. In the lower bar graph is shown which accumulators have collapsed earlier than others and have been discharged. to a very low level. These accumulators are a risk to the complete system.

Accumulators in UPS/ INVERTER applications

In a typical UPS/ INVERTER battery installation there could be many accumulators (singles cells, multiple cells like 6Volt 12Volt accumulators) that are connected in series to archive a very high voltage in the string. Modern UPS/ INVERTER with IGBT Rectifiers are working very efficiently, but require a high string voltage, compared to the string voltages of older type Transformer UPS/ INVERTER systems. This increase in string voltage has in turn increased the number of accumulators required within a string. It is not unusual to have 800 Volts or more within a string of accumulators – with the equivalent number of batteries/cells. Modern UPS/ INVERTER tend to have to use many more accumulators per string, but smaller capacities to avoid more space in the server rooms.

Short battery life in UPS/ INVERTER usage: The more accumulators that are in a string, the more cables, connectors, distances are involved which leads to higher and lower potential within the battery string. The more resistive materials accumulator placement, length of cabling etc. the more differ the impedances within the accumulators of this string and the more the charging levels are different. This effect gets over the time so dramatic that it is even visible from the different voltage levels of the accumulators withing the string. The differences will in the beginning in the 10th's of a volt but over time an accumulator that is at the stated float of 13.60 Volt will drop incrementally as other accumulators rise as the current will flow elsewhere.
Taking in to play that all accumulators are not created equal, it is just logic that in a string their individual accumulators/cells will never get the correct amount of charge they need to prevent sulfation and dry out as well as premature aging and failure.

For years, this was simply commonly accepted and nobody ever thought it could be a problem to have voltage difference in a battery string of 1 Volt or more. Since there was no technical solution the manufacturer did not focus on this problem and simply recommended to replace accumulators far earlier than the designed lifetime to reduce the risk for battery failures. Nowadays it is commonly accepted that in a UPS/ INVERTER application the lifetime of a 12Volt battery is just 50%-60% of the design life.

Customers who have suffered from failing UPS/ INVERTER batteries did not feel comfortable just to change batteries more often since it would not guarantee a safe operation with the new batteries that could collapse without warning. A high string voltage UPS/ INVERTER cannot tolerate a missing accumulator and the complete system collapses at a single point of failure.

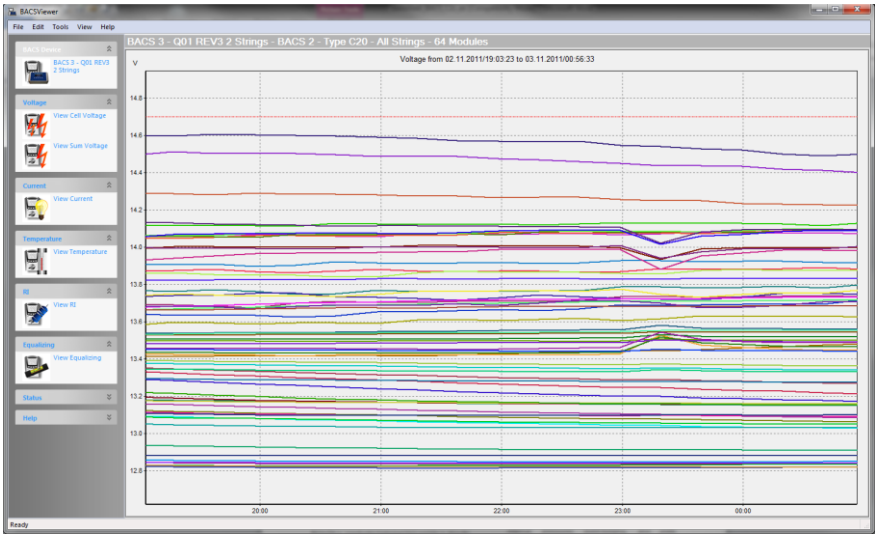
Manufacturers have counteracted this issue by offering the customers redundant systems with at least 2 strings of accumulators. This reduces the risk drastically, but has several disadvantages (Costs, space for installation, higher service efforts) – and still it is no guarantee – the user can not see what is going on in the battery strings and only theoretically can reduce the risk by adding as many strings as possible.

To reduce the risk of unnoticed battery failures and loss of backup, customers installed automatic transfer switches to their redundant UPS/ INVERTER and Generators as the main backup in case of a power failure.

Also this extremely costly solution is still not safe since - all Generators need a few seconds to start, so there always will be a number of accumulators between the UPS/ INVERTER and Generator. Also the Generators starter battery is another risk factor – **and the battery remains the Achilles Heel of every UPS/ INVERTER or other battery backup system.**

Knowing this, customers began to install monitoring systems “BMS” for batteries. Such systems should not only show why batteries are failing (Voltage differences, Rising impedance etc.) but also start automatic counteractions. **BACS is the only system on the market which does not only “monitoring” but is regulating the system through its EQUALISATION!**

The following screen shows the battery voltages of a batteries connected in a string that would be found in every UPS/ INVERTER system today, which is <u>not</u> managed by BACS. The individual voltages after 5 years differ in a a window of more than 1.8 Volt.



BACS VIEWER screenshot:

An UPS with 64 * 12Volt batteries after 5 years in operation shows that voltages have drifted within a large window of 1.8Volt between the lowest and the highest battery.

Voltages <u>without</u> the Equalisation process after 5 years in operation.
Following pictures shows the same Batteries, now <u>with</u> EQUALISATION

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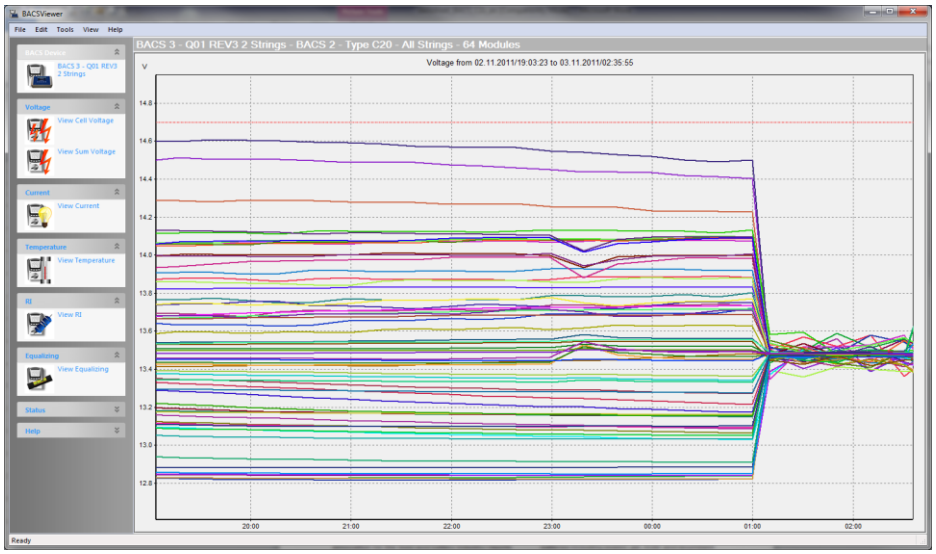
Due to individual differences in the accumulators the voltages are not identical. The longer such differences have been in place and the accumulators have not received a separate, balancing charge, the more the accumlators start drifting until they finally show a difference of 1 Volt or more – like in the screenshot of such 5 year batteries above.

With the introduction of the BACS patented EQUALISATION technology in 2004 the system is now able to eliminate all the voltage/charging differences in a string of accumulators. through its "Equalisation" process. The Equalisation process brings all accumulators to 1/100th of Volt for each accumulator on the string, despite its interconnections or location in that string and keeping the accumulator at full charge and within the stated manufacturing float voltages.

The following screen shows the voltages of the same 5 year old accumulators a few hourse after BASC technology has started its Equalisation process.



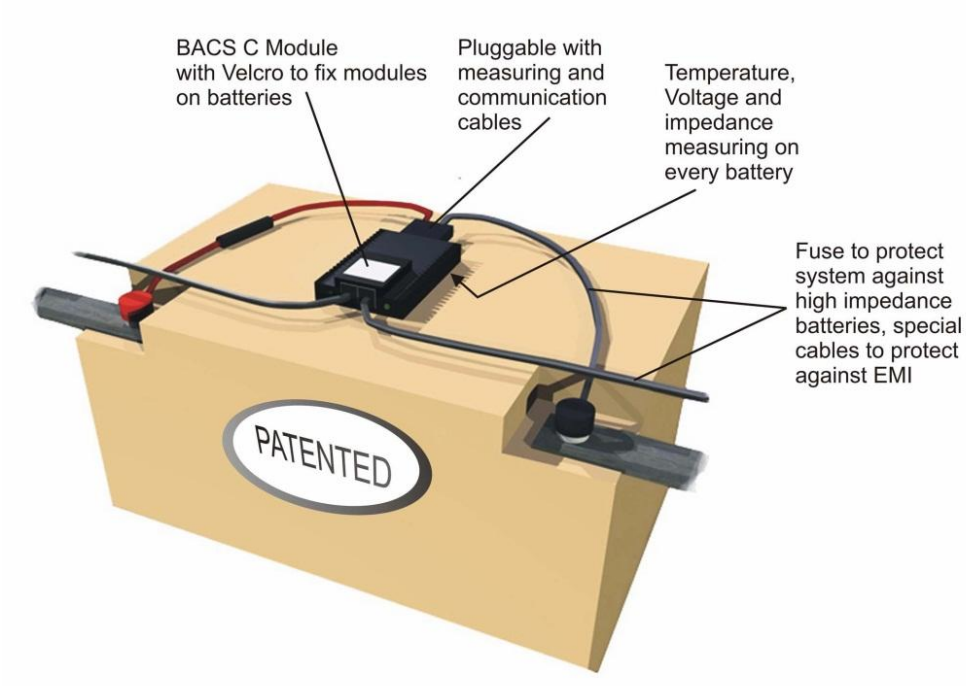
BACS VIEWER screenshot:

The same 5 year old battery string above, now with BACS Equalisation. Within a few hours the Equalisation brings all accumulators to within 100th volt of each other and keeping the accumulators at the manufacturers stated float charge.

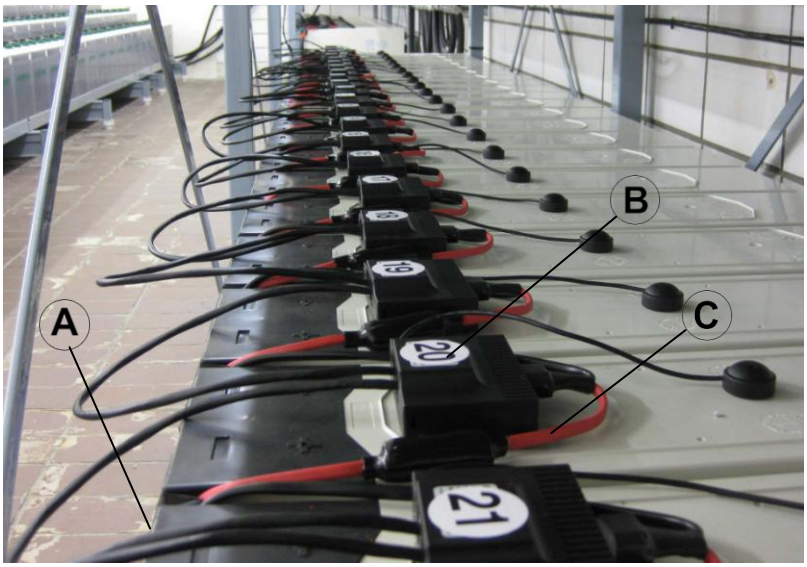
BACS Equalisation process is correcting the negative influence that cause premature accumulator failures due to voltage and impedance differences within a string.

A general description about the Equalisation principle and explanation why this extends battery life drastically and extends cycle life by about a factor of 3 is scientifically explained in the INTELEC Paper 32.1 "Life Extension through charge Equalisation of Lead-Acid Batteries" by Philip T. Krein Member of IEEE

Based on scientific expertise and our own investigations from 2002 to 2004 the BACS patent has been established.



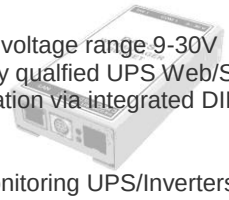
BACS® System Components



A BACS WEBMANAGER BUDGET

External and UPS Slot version

- Manages up to 256 accumulators in 1 - 10 parallel strings
- Power supply voltage range 9-30V
- Includes a fully qualfied UPS Web/SNMP manager
- Simple installation via integrated DIN rail

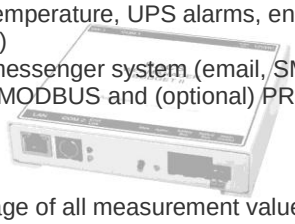


Interfaces

- COM 1 for monitoring UPS/Inverters and other devices through a serial interface.
- COM2 as for optional environmental sensors (e.g. temperature, humidity, current, hydrogen gas, acid fill level etc.)
- 1 programmable dry-contact relay output

Administration and measuring

- Integrated web-server for easy configuration and status display
- Configuration of all thresholds (internal resistance, voltage, temperature, UPS alarms, environmental alarm etc.)
- Network messenger system (email, SMS, SNMP, RCCMD, MODBUS and (optional) PROFIBUS or LONBUS

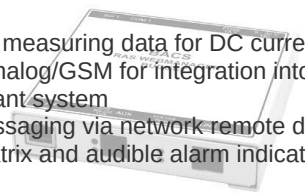


Storage

- Data storage of all measurement values in log files for graphical analysis via BACS VIEWER

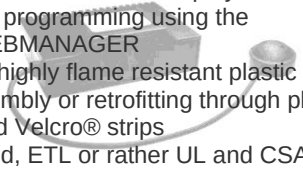
Options

- Additional measuring data for DC current
- Modem Analog/GSM for integration into UNMS teleassistant system
- Alarm messaging via network remote display LED remote matrix and audible alarm indication



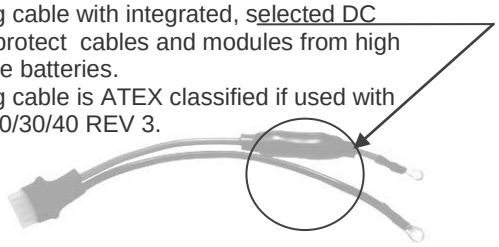
B BACS C Measuring Modules

- Battery module for monitoring individual accumulators from 7-6000 Ah that optimizes the battery capacity and increases durability for all types of lead batteries
- Patented "EQUALISATION" function for charging and distribution of voltages. Efficient balancing of voltage levels
- 16V-, 12V-, 6V-, 2V- and 1,2V models
- External, accurate temperature sensor (REV 2 default, REV 3 optional)
- Measurements of each individual accumulator for voltage, temperature, impedance
- LED for status and alarm display
- Automatic programming using the BACS WEBMANAGER
- Sealed in highly flame resistant plastic housing
- Easy assembly or retrofitting through plug-play cables and Velcro® strips
- CE certified, ETL or rather UL and CSA (Canada) certified
- ATEX classification prepared (Explosive Atmospheres) BACS C20/30/40 REV 3 : Group 2Cat.2, Zone 1, 21 T3
- FCC Class A approved



C BACS cables

- Easy installation through pluggable bus cables
- Special bus communication cables with strong resistance against electromagnetic interferences (EMI)
- Measuring cable with integrated, selected DC fuses, to protect cables and modules from high impedance batteries.
- Measuring cable is ATEX classified if used with BACS C20/30/40 REV 3.



BACS WEBMANAGER-Technical Data and Dimensions

BACS® WEBMANAGER BUDGET (external version)

Processor and memory	32-Bit RISC-Processor, 32 MB storage / 64 MB RAM up to 256 BACS Modules
Power consumption	At 12V default power supply = 200mA (the connected BACS Modules at the BACS BUS CONVERTER will be supplied via own power supply and need +5mA per BACS II module
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
Display	2x LED (Manager status, UPS/device alarm)
Housing	PVC, RAL 7035 (light gray) ETL listed, FCC class A
Dimensions	69 x 30 x 126mm (L x W x H)
Weight	110g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

BACS® WEBMANAGER BUDGET SC (slot version)

Processor and memory	32-Bit RISC-processor, 32 MB storage / 64 MB RAM up to 256 BACS Modules
Power consumption	At 12V default power supply = 200mA (the connected BACS Modules at the BACS BUS CONVERTER will be supplied via own power supply and need +5mA per BACS II Module
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
Display	2x LED (Manager Status, UPS/device alarm)
Housing	Slot card “SC format” for UPS devices witch compatible slots. ETL listed, FCC class A
Dimensions	60 x 20 x 130mm (L x W x H) – Slot card „SC format“
Weight	90g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

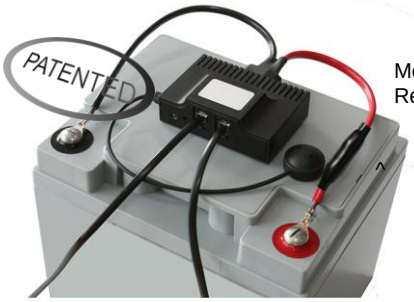
BACS® WEBMANAGER BUDGET II (external version)

Processor and memory	32-Bit RISC-processor, 32 MB storage / 64 MB RAM up to 330 BACS Modules
Power consumption	At 12V default power supply = 200mA, plus 5mA per BACS II Module At 24V/100mA, plus 3mA per connected BACS II Module (18-36V type) At 48V/50mA, plus 2mA per connected BACS II Module (36-72V type with at most 25 BACS II Modules at the bus)
Interfaces	2x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose) 2x battery bus converter outputs internal 1x RJ45, 10/100Mbit Ethernet
Display/Signal	3x LED (Manager status, UPS/device alarm, BACS alarm) 1x Buzzer with Mute button
Housing	Aluminium, RAL 7035 (light gray) ETL listed, FCC class A
Dimensions	130 x125 x 30mm (W x L x H)
Weight	180g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

BACS® RAS WEBMANAGER BUDGET

Processor and memory	32-Bit RISC-processor, 32 MB storage / 64 MB RAM up to 256 BACS Modules
Power consumption	At 12V/200mA (Manager) additionally per BACS II module +5mA at the CONVERTER (own power supply)
Interfaces	1x RS-232 interfaces, (COM1= UPS/power device) 1 x analogue telephone jack 1x battery bus converter external 1x RJ45, 10/100Mbit Ethernet
Display/Signal	4x LED (Manager status, Modem status, UPS/device alarm, Power LED) 1x Buzzer with Mute button
Housing	Aluminium, RAL 7035 (light gray) ETL listed, FCC class A
Dimensions	130 x125 x 30mm (W x L x H)
Weight	180g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

BACS Modules - Technical Data and Dimensions



BACS II C20 module with external temperature sensor for 12V accumulators between 7–300 Ah, with individual block voltage regulation, LED status and error display, and bus cable connections.

BACS® Modules REV 2 & REV 3

Construction	Measuring modules with Equalisation BACS patent no.: DE 102004013351.4
Power consumption	Consumption at normal operation: 15-20mA Consumption at „Sleep Mode“: < 1mA (from REV 2.2)
Measuring precision Reference HIOKI	Internal resistance : < 10 % at C40, < 5% at C20/30 Voltage : < 0,5 % Temperature: < 5 %
Interfaces	2x RJ10 for BACS II battery bus Internal RS232 bus interface 1x button for the addressing Temperature sensor -35 bis + 85 °C
Display	Optical display LED (alarms red/green, mode red/green)
Housing	ABS housing (UL certified, flame retardant, cooling fins)
Dimensions, Weight	REV 2 80 x 55 x 27mm (L x W x H), 75g REV 3 55 x 80 x 24mm (L x W x H), 45g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
Int. Protection Rating	REV 2: IP 30, (coated version optional) REV 3: IP 42 coated against dust and condensate)
Designed for ATEX 94 (Explosive Atmospheres)	REV 2.2 – Group 2 Cat.3, Zone 2, T1 REV 3.0 – Group 2 Cat.2, Zone 1,21, T3
High Voltages Security tested	Protection against high ohmic batteries fault voltages up to 150 Volt (fuse opens, no damages on BACS module REV 3.1. At higher voltages the fuse opens, but BACS module is damaged. All REV 3.1 modules are designed for fault voltages up to 600 Volt
MTBF (calculated)	70.000 hours (8 years)

Module BACS® C20

	REV 3 - Module for 12Volt 7-600Ah lead batteries
Measuring value	7V – 17V
RI range	0.5-60mOhm
Equalisation power	0.15 A

New :

Module BACS® C23

	REV 3 - Module for 16Volt 7-600Ah lead batteries, Measuring of temperature and voltage
Measuring value	7V – 21V
RI range	0.5-60mOhm
Equalisation power	0.12 A

Module BACS® C30

	REV 3 - Module for 6Volt 7-900Ah lead batteries.
Measuring value	4.8V – 8.0V
RI range	0.5-60mOhm
Equalisation power	0.3 A

Module BACS® C40

	REV 3 - Module for 2Volt 7-5000Ah lead batteries Voltage and Temperature measurement
Measuring value	1.25V – 3.2V
RI range	0.05-2mOhm
Equalisation power	0.9 A (at 2.27V)

Module BACS® C42 REV 2 NiCd/NiMH

	REV 2 - Modul for 1.2Volt NiCd/NiMH & 2Volt lead batteries Voltage and Temperature measurement
Measuring value	0.7V – 2.4V
RI range	No RI measuring
Equalisation	0.9 A (at 2.27V)

New :

Module BACS® C42 REV 3 for NiCd/NiMH & Li-Ion

	REV 3 - Module for 2,4 Volt NiCd/NiMH & 2Volt lead batteries Voltage and Temperature measurement
Measuring value	1.2V – 3.6V
RI range	No RI measuring
Equalisation power	0.9 A (at 3.4V)

BACS Accessories - Technical Data and Dimensions

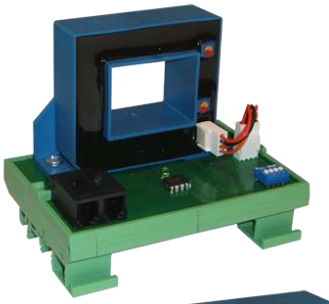
BACS® BUS CONVERTER 3 +

Construction	Conversion and galvanic separation of the BACS II battery bus to the BACS II WEBMANAGER Budget plus Real Time Clock (RTC) timer for the BACS II WEBMANAGER, if no timeserver is at hand into the network environment
Power supply	External 12V/800mA (default for up to160 modules), optional 12V/1500mA, for up to 300 modules.
Interfaces	2x RJ10 for BACS II battery bus 1xRJ12 for COM3 BACS II WEBMANGER Budget 1xMiniDin8/RS232 interface for serial connection to workstation. For CONVERTER 3 an adapter is required (see below) 1x2,1mm DC connector socket for power supply via external wall wart power supply 1x potential-free contact (2 pole screw terminal for max 1,0 mm², 125 VAC, 60 VDC and 1A)
Display	Optical display (LED) additionally, alarm buzzer with acknowledge button Optional: Adapter from mini-8 to RS232 for the BACS CONVERTER 3, with junction cable mini-8 1.5m
Housing	Polystyrene housing in grey
Dimension, weight	91,5 x 67 x 25 (W x H x D), 120g,
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing

BACS® SPLITTING BOX

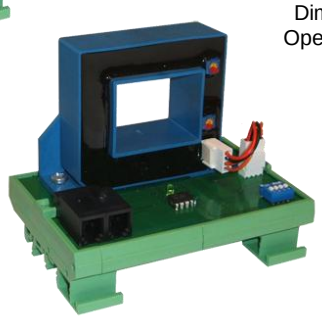
Construction	Passive splitter for BACS communication cables. For the optimization of the cable lenghts and for the creation of an optical pleasant wiring. In addition to the extension of the 2 BACS bus inputs at the BACS CONVERTER. We recommend to use the BACS SPLITTING BOX, if you want to connect more than 50 BACS modules into the BACS bus.
Power supply	Not required, passive element for the star wiring of BACS bus cables
Interfaces	5x RJ10 for BACS bus cable 1x RJ10 for the connection to BACS CONVERTER or rather BACS bus at BACS II WEBMANAGER
Housing	Polystyrene housing in grey
Dimension, weight	91,5 x 67 x 25 (B x H x T), 90g,
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensated

BACS DC Current Sensor 300/400



	Ord. No: BACS_CS300 or rather BACS_CS400
Construction	DC Current sensor for measuring battery string discharge and charging process +/-300A or rather 400A DC Current Transducer diameter hole : 40mm * 30mm
Power supply	Not required, passive element for the star wiring of BACS bus cables
Interfaces	2x RJ10 for BACS bus cable, pluggable system
Housing	DIN rail
Dimension, weight	Dimensions, weight: 110x90x76mm (LxWxH), 380g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensated

BACS DC Current Sensor 500/1000/1500



Ord. No: BACS_CS500, BACS_CS1000, BACS CS_1500
DC Current sensor for measuring battery string discharge and charging process +/-500A, 1000A, 1500A DC
Other technical details identical to BACS_CS300/400

BACS Control Cabinets - Technical Data and Dimensions

Version: 2012-06-27

Control cabinet for BACS systems - ready to install. With optical and audible display on the outside door, protection class IP 56. Only power supply and Ethernet cable has to be provided by the customer. Easy connection of inputs and outputs through a strip terminal

BACS® CONTROL CABINET Type 1

Contents :
1 * BACS WEBMANAGER BUDGET II,
1 * 12V Power supply (100 – 240V, 50/60Hz),
1 * CAT 6 Ethernet socket,
1 * Alarm contact (potential-free)
in Frontdoor integrated:
1 * POWER LED, 1 * BACS ALARM LED.
6 * spare bus communication cable
Dimension: 400 x 500 x 210 (WxHxD)

BACS® CONTROL CABINET Type 2

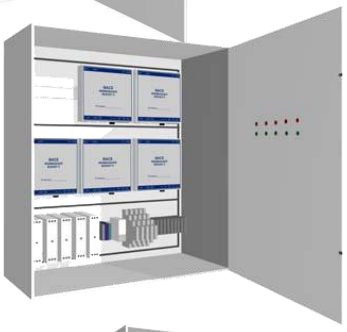
Contents :
2 * BACS WEBMANAGER BUDGET II,
2 * 12V Power supply (100 – 240V, 50/60Hz),
2 * CAT 6 Ethernet socket,
2 * Alarm contact (potential-free)
in Frontdoor integrated:
2 * POWER LED, 2 * BACS ALARM LED.
8 * spare bus communication cable
Dimension: 400 x 500 x 210 (WxHxD)

BACS® CONTROL CABINET Type 3

Contents :
3 * BACS WEBMANAGER BUDGET II,
3 * 12V Power supply (100 – 240V, 50/60Hz),
3 * CAT 6 Ethernet socket,
3 * Alarm contact (potential-free)
in Frontdoor integrated:
3 * POWER LED, 3 * BACS ALARM LED .
10 * spare bus communication cable
Dimension: 500 x 500 x 210 (WxHxD)

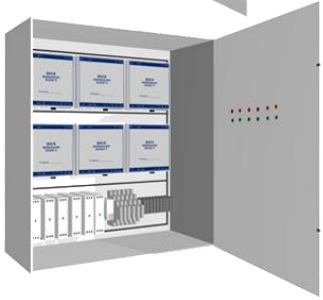
BACS® CONTROL CABINET Type 4

Contents :
4 * BACS WEBMANAGER BUDGET II,
4 * 12V Power supply (100 – 240V, 50/60Hz),
4 * CAT 6 Ethernet socket,
4 * Alarm contact (potential-free)
in Frontdoor integrated:
4 * POWER LED, 4 * BACS ALARM LED .
12 * spare bus communication cable
Dimension: 500 x 500 x 210 (WxHxD)



BACS® CONTROL CABINET Type 5

Contents :
5 * BACS WEBMANAGER BUDGET II,
5 * 12V Power supply (100 – 240V, 50/60Hz),
5 * CAT 6 Ethernet socket,
5 * Alarm contact (potential-free)
in Frontdoor integrated:
5 * POWER LED, 5 * BACS ALARM LED .
14 * spare bus communication cable
Dimension: 600 x 800 x 250 (WxHxD)



BACS® CONTROL CABINET Type 6

Contents :
6 * BACS WEBMANAGER BUDGET II,
6 * 12V Power supply (100 – 240V, 50/60Hz),
6 * CAT 6 Ethernet socket,
6 * Alarm contact (potential-free)
in Frontdoor integrated:
6 * POWER LED, 6 * BACS ALARM LED .
16 * spare bus communication cable
Dimension: 600 x 800 x 250 (WxHxD)