Your Partner for **Battery Condition Monitoring, Diagnostics** and **Maintenance**

InnoSys

INTRODUCTION

As society advances into the information age, the level of automation continues to increase. Our reliance on electrical power, telecommunications, finance, transportation and other industries has also grown. There is thus a higher demand for reliable power supply systems; be it in an electrical substation, telecommunications machine room, mobile base station, or UPS system, batteries play an irreplaceable role as the backup power supply. In most cases, batteries are the only energy source sustaining loads during a failure of the main power supply. Any problem with the batteries would cause equipment to cease operation and lead to other major operational incidents.

Very often when faults occur in the municipal power system, the system's power supply will also be lost – or can only be sustained for a very short time. Therefore, customers are mostly concerned with whether or not there is sufficient capacity in the batteries. Apart from the verification discharge test, there is no simple method to measure the actual existing battery capacity. This is also the reason why, up till now, no instrument yet exists that can directly measure battery capacity without discharge.

Inuo-BMM Main System Unit

Various Modules

Battery Cell Monitoring and Maintenance Module

Inuo-BMM

Battery On-line Monitoring and Maintenance System: **Inuo-BMM**

For these reasons, Inuosys has successfully developed an on-line test equipment that integrates real time battery voltage monitoring, on-line dynamic-ohm measurement, automatic discharge characteristics, Battery Maintenance and Voltage Dispersion Integrated Analysis (VOCD Integrated Analysis).

The Battery Monitoring and Maintenance System model, Inuo-BMM is not only capable of detecting poor battery performance and promptly revealing batteries with potential problems, it also has on-line battery maintenance functions. It can determine battery performance trends through battery voltage and dynamic-ohm measurement, perform on-line balancing and adjustment of the battery's charge voltage when necessary. This enables easy battery maintenance and delays battery failure, thereby extending the battery's useful life span.

At the same time, we also provide battery analysis software, which carries out calculation of actual battery capacity using our patented battery integrated analysis, a mathematical model technology based on battery voltage dispersion and other factors. This provides an effective measure for remote battery monitoring, maintenance, query and analysis.

System highlights

- Uses high precision (16 bit) A/D to measure battery voltage, effectively reflecting changes in battery voltage
- Uses on-line DC dynamic-ohm measurement method, accurately testing battery dynamic resistance changes on-line
- Modularly designed system comprising main monitoring unit/host, battery voltage acquisition and maintenance module, communications module, data reception and release server
- Main unit is able to communicate with our patented Wireless Voltage Acquisition modules
- Built-in battery performance analysis model, including battery voltage analysis model and composite analysis model (VOCD Integrated Analysis)
- Automatically monitors on-line cell voltage, battery bank voltage, charge and discharge current and temperature; provides fast and accurate data acquisition
- Measures load capacity of each cell through dynamic instantaneous DC high-rate discharge; fast evaluation of battery performance
- Measures battery bank capacity through static discharge of constant-current and displays various parameters and curves during the discharge process in real-time
- Various communications modes: LAN, RS232, RS485, etc., meeting communications requirements of different systems
- Multi-protection and alarm indication functions
- Predicts the capacity and life expectancy of the battery by conducting complete and comprehensive failure analysis on the battery and its interrelated information continuously on the basis of probability distribution, fuzzy logic and artificial neural network etc.
- Promptly determines battery's operating status based on voltage and DC dynamic-ohm changes; if undercharge or overcharge trends are discovered in the battery, adjustments are performed on-line to restore the battery's normal operating status and extend the battery's useful life
- Uses simple circuit design plan, under the premise of guaranteeing functions and performance; achieves high reliability and accurate results in recording
- Performs on-line balancing and adjustment of battery's charging voltage when necessary in order to achieve battery maintenance functions and delay battery failure, thereby extending the battery's life span

Inuo-BMS

Battery On-line Monitoring System: **Inuo-BMS**

Battery On-line Monitoring System, Inuo-BMS is a simplified version of Inuo-BMM. It has all the functions of Inuo-BMM except for battery maintenance for each individual cell. It is suitable for monitoring the performance of the various types of batteries. It is ideal and indispensable protective equipment for DC systems.

This system is microcomputer-controlled, highly-automated, flexible and easy to use on-site. It can perform on-line monitoring of individual battery voltage, terminal voltage of battery bank, charge/discharge current and temperature. It can also test for load capacity through dynamic discharge, test for battery capacity through static discharge, determine battery performance and charge trend through integrated measurements, perform analysis, and reveal and trigger an alarm for failed batteries. It possesses a network communication function to perform real-time monitoring and data management for battery bank monitoring system of each substation through Ethernet using remote servers.

System highlights:

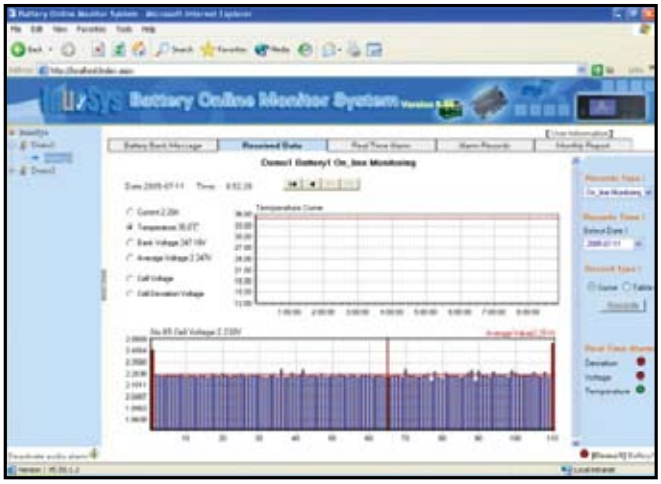
- The system is modularly designed and consists of monitoring host, battery voltage acquisition module, communications module, data reception and release server
- Main unit is able to communicate with our patented Wireless Voltage Acquisition modules
- Built-in battery performance analysis model, including battery voltage analysis model and composite analysis model (VOCD Integrated Analysis)
- Automatically monitors and controls on-line cell voltage, battery bank voltage, charge and discharge current and temperature; provides fast and accurate data acquisition
- Measures load capacity of each cell through dynamic instantaneous DC high-rate discharge; fast evaluation of battery performance
- Measures battery pack capacity through static discharge of constant-current and displays various parameters and curves during the discharge process in real-time
- Various communications modes: LAN, RS232, RS485, etc., meeting communications requirements of different systems
- Multi-protection and alarm indication functions
- Continuously conducts complete and comprehensive failure analysis on the battery and its interrelated information on the basis of probability distribution, fuzzy logic and artificial neural network etc., in order to predict the capacity and life expectancy of the battery

Inuo-BMS Main Unit

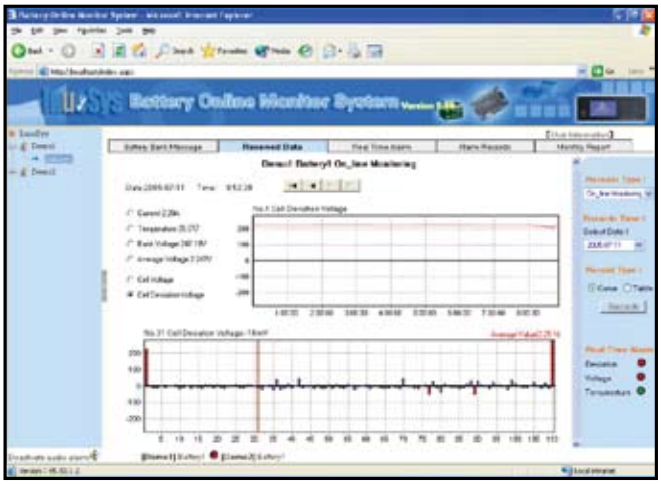
Voltage Acquisition Modules

Automatic Discharge Module

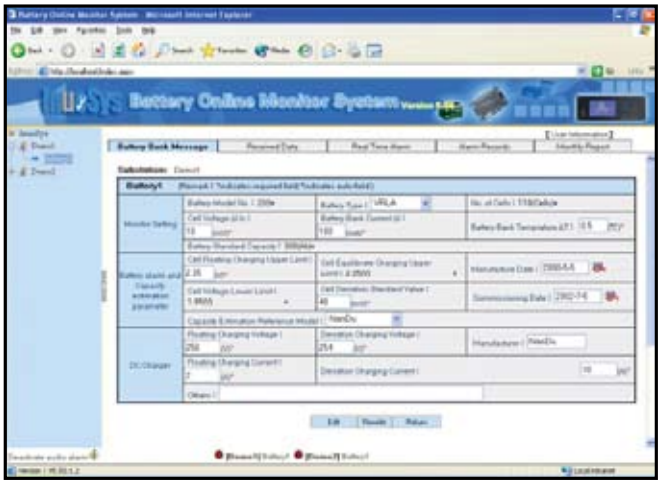
Software of Inuo-BMM & Inuo BMS



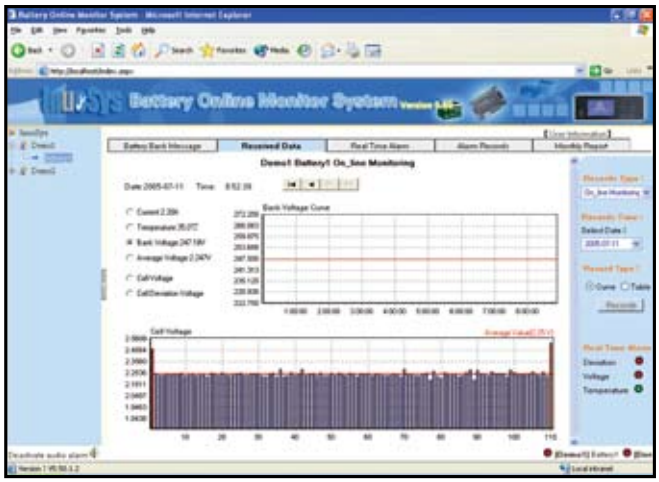
Battery Bank Information



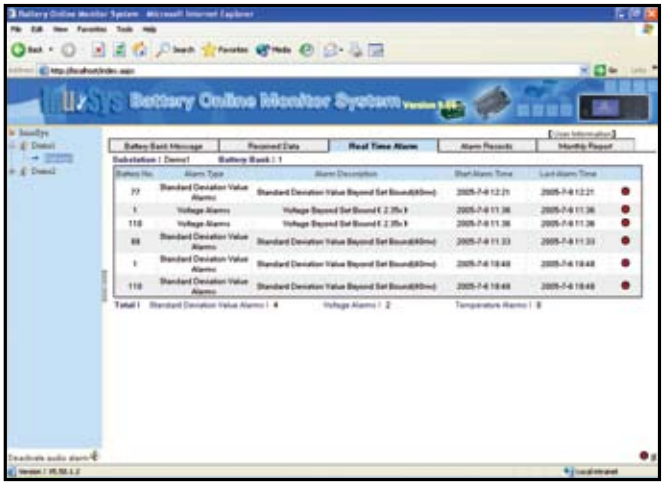
Cell Voltage Deviation Diagram



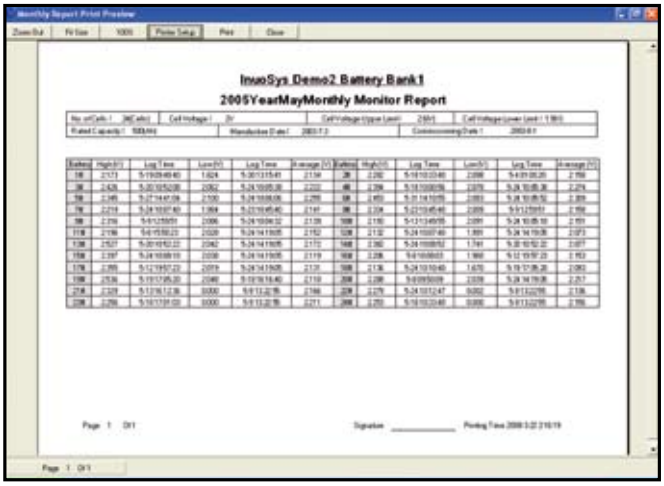
On-line Software Interface



Battery Cell Voltage

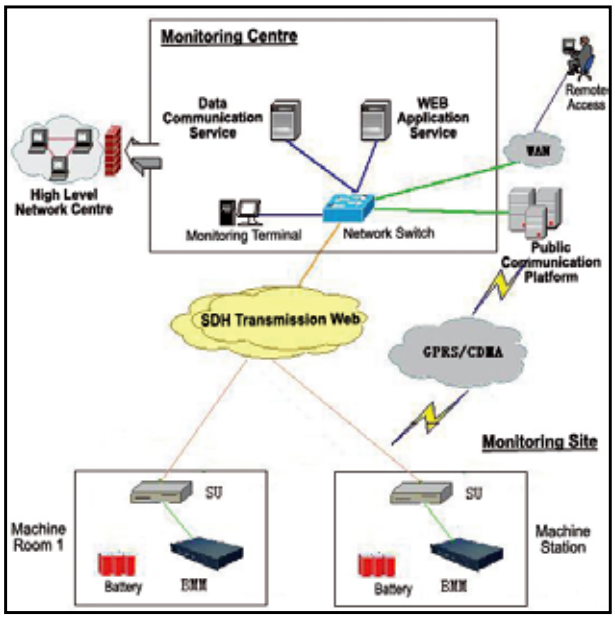


Real Time Alarm List

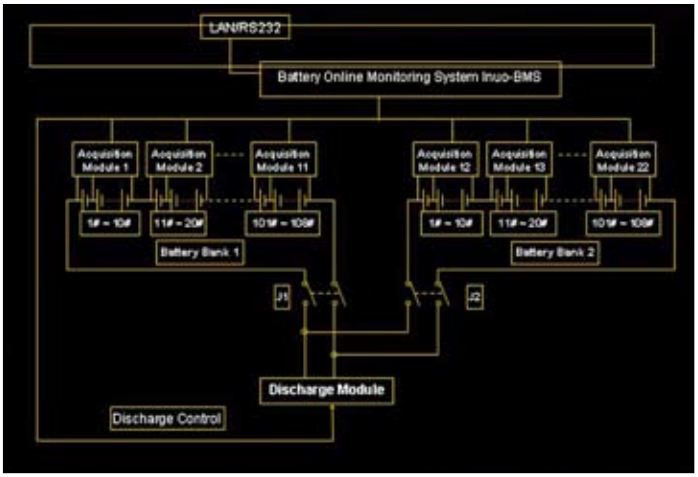


Detailed Monthly Report

System Configuration and Installation of Inuo-BMM & Inuo BMS



System Network Diagram



Inuo-BMS-Battery On-line Monitoring Schematic

Installation Cubicle

Onsite Wire Connection

TECHNICAL PARAMETERS

Inuo-BMM	
Operating Power Supply	48VDC or 110 / 220VDC / AC
Battery Maintenance	Automatic balance and adjust change of voltage to extend battery life
Power Consumption	Maximum 15W
Accuracy of battery voltage test	±0.5%
Range of battery voltage test	9 ~ 16V (applicable for 12V batteries, BMM-12) 1.5 ~ 3.0V (applicable for 2V batteries, BMM-02)
Dynamic-ohm measurement range	0.01mΩ - 100mΩ
Dynamic-ohm measurement accuracy	2.0%
Current test range	0 ~ ±1000 A (Based on battery capacity and load current)
Current measurement accuracy	±2.0%
Temperature measurement accuracy	±0.5°C
Input insulation resistance	500M at 1000V
Voltage downloading interval	1 - 60 minute (user configured)
Data output port	RS485 or RS232 (can be configured)
Insulation resistance between modules	500MΩ 1000V
Insulation strength between modules	1500VAC 50HZ
Data recording interval	15s (On-line operation monitoring / Static discharge test) 100 ms (Dynamic discharge test)
No. of batteries monitored	Maximum 240 units / 120 units x 2 banks
Communication method	LAN, RS232, RS485, MODEM
Communication protocol	CDT, POLLING or MODBUS etc.
Software operating system	Windows Server 2000 / 2003; Microsoft SQL 2000 / 2005
Analysis method	Voltage, Dynamic-ohm, Capacity and Dispersion Integrated Analysis (VOCD), Battery life / capacity prediction
Main Unit display	LCD status indicator
On-site configuration port	RS232 serial port
Query method	On-site display board query, remote computer query
Control Method	Microcomputer automatic control, also manual control or remote computer control
Alarm	Single channel contact output
Alarm reporting method	On-site: siren and light indicator, show alarm contact
Data Acquistion	RS485 or Wireless communication
CE-marking	EN 61326 EN 61010
Wireless communication	
Working frequencies	433.92MHz / 434.33MHz
Modulation system	FSK
Transmissive power	< + 10mW
Receiving sensitivity	-105dB
Operating Environment	
Ambient temperature	-10°C ~ +40°C
Relative humidity	< 90%
Ambient magnetic field	< 400A/m
External dimension (mm)	Main unit: 322 x 140 x 48
Weight	Main unit: 2.5Kg

Inuo-BMS	
Operating Power Supply	DS220V (220V DC Panel) DC110V (110V DC Panel) DC48V (48V DC Panel)
Dynamic discharge current	> 100A (220V DC Panel) > 200A (110V DC Panel)
Static discharge current	5A ~ 15A (220V DC Panel) 5A ~ 30A (110V DC Panel)
Power Consumption	Maximum 15W
Accuracy of battery voltage test	±0.5%
Range of battery voltage test	9 ~ 16 V (applicable for 12V batteries,) 1.5 ~ 3.0 V (applicable for 2V batteries)
Dynamic-ohm measurement range	0.01mΩ - 100mΩ
Dynamic-ohm measurement accuracy	2.0%
Current test range	0 ~ ±1000 A (Based on battery capacity and load current)
Current measurement accuracy	±1%
Temperature measurement accuracy	±0.5°C
Input insulation resistance	500M at 1000V
Voltage downloading interval	1 - 60 minute (user configured)
Data output port	RS485 or RS232 (can be configured)
Insulation resistance between modules	500MΩ 1000V
Insulation strength between modules	1500VAC 50HZ
Data recording interval	15s (On-line operation monitoring / Static discharge test) 100 ms (Dynamic discharge test)
No. of batteries monitored	Maximum 240 units / 120 units x 2 banks
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Alarm reporting method	On-site: siren and light indicator, show alarm contact
Data Acquistion	RS485 or Wireless communication
CE-marking	EN 61326 EN 61010
Wireless communication	
Working frequencies	433.92MHz / 434.33MHz
Modulation system	FSK
Transmissive power	< + 10mW
Receiving sensitivity	-105dB
Operating Environment	
Ambient temperature	-10°C ~ +40°C
Relative humidity	< 90%
Ambient magnetic field	< 400A/m
External dimension (mm)	Main unit: 322 x 140 x 48 Module: 136 x 85 x 27
Weight	Main unit: 2.5Kg

ORDERING INFORMATION

I. Inuo-BMM: Battery On-line Monitor and Maintenance System

Type and Code		Description and Function	
Control Main Unit	**BMM-1048**	For 48VDC Battery Bank	Control BMM modules to maintain Battery Cell and collect data i.e. Cell Voltages, Charge / Discharge Current, Inter-ohm and Temperature. Transfer data to Main Server Computer. Able to handle One battery bank with maximum 24V Voltage Modules or 240 Cells and One Discharge module
	BMM-1110	For 110VDC or above Battery Bank	
Monitor and Individual Cell Maintenance Module	**BMM-2102**	For 1.8 / 2V per Cell system	Monitor and Individually charging Battery Cells. One module can maintain maximum 10 Cells
	BMM-2106	For 6V per Cell system	
	BMM-2112	For 12V per Cell system	
	BMM-2202	For 1.8 / 2V per Cell system	Monitor and Individually charging Battery Cells. One module can maintain maximum 20 Cells
	BMM-2206	For 6V per Cell system	
	BMM-2211	For 12V per Cell system	
External DC Power Supply	**BMM-2500**	External DC Power Supply Module for Voltage Acquisition Modules if more than 10 number of Acquisition to be supply by Main Unit	
Discharge Module	**BMM-3048**	For 24-60V Battery Bank	Automatically conduct Discharge Test and obtain capacity result. Maximum capacity 1000Ah per Module
	BMM-3110	For 110V Battery Bank	
	BMM-3220	For 220V Battery Bank	
DC Breaker	**BMM-4000**	High current DC breaker for protecting Discharge Module	
Change Over Controller	**BMM-4500**	Automatic changeover switch to disconnect Charger from Battery in order to conduct Discharge Test	
LAN Communication Module	**BMM-5000**	Select this option only if standard RS232 is not available at the Network Computer Server. Communication port build in the Main Unit	
Management Software	**BMM-6001**	Network Software for ≤ 10 Hosts	Data / Result / Alarm Management, Analysis and Print out; Battery Cell Diagnostic; Retrieve Data from Main
	BMM-6002	Network Software for ≤ 20 Hosts	
	BMM-6003	Network Software for > 20 Hosts	

II. Inuo-BMS: Battery On-line Monitor System

Type and Code		Description and Function	
Monitor Main Unit	**BMS-1000L**	For 48VDC Battery Bank	Collect Data i.e. Cell Voltages, Current, Discharge test results, Inter-ohm and Temperature from Modules. Trasfer data to Main Server Computer. Able to handle One battery bank with maximum 24 Voltage Modules or 240 Cells and One Discharge Module
	BMS-1000H	For 110VDC or above Battery Bank	
Voltage Acquisition Module	**BMS-2002**	For 1.8 / 2V per Cell system	Acquire of Cell Voltage Amplitude. One module can read maximum 10 Cells
	BMS-2006	For 6V per Cell system	
	BMS-2012	For 12V per Cell system	
External DC Power Supply	**BMS-2500**	External DC Power Supply Module for Voltage Acquisition Modules if more than 10 number of Acquisition to be supply by Main Unit	
Discharge cum Inter-ohm Measurement Module	**BMS-3048**	For 24-60V Battery Bank	Automatically conduct full / short time Discharge Test. Short Time Discharge test obtains Inter-ohm result. Maximum capacity 1000Ah per Module
	BMS-3110	For 110V Battery Bank	
	BMS-3220	For 220V Battery Bank	
DC Breaker	**BMS-4000**	High current DC breaker for protecting Discharge Module	
Change Over Controller	**BMS-4500**	Automatic changeover switch to disconnect Charger from Battery during Discharge Test and Inter-ohm measurement	
LAN Communication Module	**BMS-5000**	Select this option only if standard RS232 is not available at the Network Computer Server. Communication port build in the Main Unit	
Management Software	**BMS-6001**	Network Software for ≤ 10 Hosts	Data / Result / Alarm Management, Analysis and Print out; Battery Cell Diagnostic; Retrieve Data from Main Unit
	BMS-6002	Network Software for ≤ 20 Hosts	
	BMS-6003	Network Software for > 20 Hosts	

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