



REMOTE MONITORING SPECIFICATION FOR
WIND-SOLAR-BATTERY-DIESEL HYBRID POWER PLANT

OVERALL SYSTEM SPECIFICATION¹	
System Components	<ul style="list-style-type: none"> ➤ Application server ➤ Communication Plug ➤ Voltage sensor modules ➤ Current sensor modules ➤ Temperature sensor modules ➤ Power Supply unit
Management server deployment	<ul style="list-style-type: none"> ➤ Globally on Internet
Battery Type	Tubular
Number of Current sensor per string	Typically 1
Number of Ambient Temperature sensor	1 per Battery Bank
Number of Voltage sensor	1 per battery (6 V nominal/ unit)
Number of Battery box temperature sensor ²	1 per battery
System security	<ul style="list-style-type: none"> ➤ Communication between server and Communication Plug encrypted to provide confidentiality and data Integrity ➤ User and device (power plant) authentication and Authorization ➤ Replay protection
SYSTEM PARAMETER SPECIFICATION	
Parameters used to detect status of components & complete hybrid system	<ul style="list-style-type: none"> ➤ Input Current from Wind Generator ➤ Voltage at Wind battery interface ➤ Duration of above input ➤ Input Current from Solar Module ➤ Voltage at Solar Battery interface ➤ Duration of above input ➤ Input Current from AC/DC charger ➤ Voltage at charger battery interface ➤ Duration of above input ➤ Total Input Current to battery ➤ Battery Voltage ➤ Duration of above input

¹ Standard Configuration

² To identify thermal run-away conditions in VRLA batteries



Battery parameters used to calculate the State of Charge (SOC) and State of Health (SOH)	<ul style="list-style-type: none"> ➤ Battery Input Current ➤ Battery Output Current ➤ Battery unit voltage ➤ Battery Total Voltage ➤ Battery box temperature ➤ Battery on charge/ on discharge status ➤ Rate of change of Charge ➤ Rate of change of Voltage ➤ Depth of Discharge ➤ Cycle Count ➤ Estimated life of Battery used (evolved data) ➤ Past health of Battery (evolved data) ➤ Time ➤ Ambient Temperature 												
PLUG SPECIFICATION													
Power supply	230VAC or 48V DC or 24V DC												
Power dissipation	5 W												
Interface to sensor network	RS232												
Interface to application server	GPRS												
VOLTAGE SENSOR SPECIFICATION													
Power Consumption from BUS	0.05 W												
Power Consumption from Battery	0.15 W												
Measurement range	5 – 16 V												
Accuracy	1 %												
Operating Temperature	0 – 55 C												
LED Indicator	Indicating proper connection between Voltage sensor module and Battery Leads												
CURRENT SENSOR SPECIFICATION													
Power Consumption	0.1 W												
Current Range	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">MIN (A)</th> <th style="width: 25%; text-align: center;">MAX (A)</th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">50</td> </tr> <tr> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">100</td> </tr> <tr> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">200</td> </tr> </tbody> </table>		MIN (A)	MAX (A)		0	50		0	100		0	200
	MIN (A)	MAX (A)											
	0	50											
	0	100											
	0	200											
Accuracy	+ / - 2 %												
Operating Temperature	0 – 55 C												
Operating Mode	Non Invasive ³												
TEMPERATURE SENSOR SPECIFICATION													
Temperature Measurement Range	0 to 70 deg C												
Accuracy	+ / - 2 %												
PROTECTION MECHANISM SPECIFICATION													
Short Circuit protection	Fuse ⁴ on Sense Wire												
Protection from Open Cells in Battery	Fuse ⁵ on Sense Wire												
Isolation	Optical												
Noise on Battery leads due to Load	Filters												
Failure of any sensor module	Will not affect other sensor modules												

³ Not in Critical path⁴ Field replaceable glass case fuse⁵ Field replaceable glass case fuse