ELECTRONIC TEST & POWER SYSTEMS

LAB-GSS

HIGH CURRENT MODULAR BATTERY CYCLERS

POSITIVE PROBLEM SOLVING

The LAB-GSS is a bidirectional battery cycler able to implement charge/discharge cycles. This integrated approach features high dynamics enabling users to switch quickly between quadrants.

When sinking energy from the energy storage device under test, the LAB-GSS automatically inverts the DC to AC and synchronises this output to the grid. A variety of control methods are available. As standard each module is built with isolated analogue and RS-232 interfaces. Front panel control and display along with IEEE 488.2 (GPIB), USB, RS-422, CAN & Ethernet interfaces are optionally available. An optional battery cycling GUI is available as well as a function generator, allowing users to implement complex tests.

- Stackable up to 1500V/Very High Powers
- Mains Regeneration of the DC Sink Energy
- Excellent GUI with Built-in Scope Function
- Function Generator with V/I Capability
- Optional Battery Cycling Software
- Adjustable Internal Resistance

CONTENTS

STANDARD MODELS

SELECTION TABLE

Part Number	Maximum Power	Q1 Source Voltage Range[1]	Q4 Sink Voltage Range[1]	Current Range[1,2]
65VDC MODULES				
LAB-GSS 20-65	20kW	0 - 65Vdc	6 - 65Vdc	0 to ± 385A
LAB-GSS 32-65	32kW	0 - 65Vdc	6 - 65Vdc	0 to ± 600A
LAB-GSS 20-65-2	40kW[3]	0 - 130Vdc	6 - 130Vdc	0 to ± 770A
LAB-GSS 32-65-2	64kW[4]	0 - 130Vdc	6 - 130Vdc	0 to ± 1200A
LAB-GSS 32-65-3	96kW[4]	0 - 195Vdc	6 - 195Vdc	0 to ± 1800A
LAB-GSS 32-65-4	128kW[4]	0 - 260Vdc	6 - 260Vdc	0 to ± 2400A
LAB-GSS 32-65-8	256kW[4]	0 - 520Vdc	6 - 520Vdc	0 to ± 4800A
130VDC MODULES				
LAB-GSS 20-130	20kW	0 - 130Vdc	12 - 130Vdc	0 to ± 192A
LAB-GSS 32-130	32kW	0 - 130Vdc	12 - 130Vdc	0 to ± 308A
LAB-GSS 20-130-2	40kW[3]	0 - 260Vdc	12 - 260Vdc	0 to ± 384A
LAB-GSS 32-130-2	64kW[4]	0 - 260Vdc	12 - 260Vdc	0 to ± 616A
LAB-GSS 32-130-3	96kW[4]	0 - 390Vdc	12 - 390Vdc	0 to ± 924A
LAB-GSS 32-130-4	128kW[4]	0 - 520Vdc	12 - 520Vdc	0 to ± 1232A
LAB-GSS 32-130-8	256kW[4]	0 - 1040Vdc	12 - 1040Vdc	0 to ± 2464A
400VDC MODULES				
LAB-GSS 20-400	20kW	0 - 400Vdc	50 - 400Vdc	0 to ± 63A
LAB-GSS 32-400	32kW	0 - 400Vdc	50 - 400Vdc	0 to ± 100A
LAB-GSS 20-400-2	40kW[3]	0 - 800Vdc	50 - 800Vdc	0 to ± 126A
LAB-GSS 32-400-2	64kW[4]	0 - 800Vdc	50 - 800Vdc	0 to ± 200A
LAB-GSS 32-400-3	96kW[4]	0 - 1200Vdc	50 - 1200Vdc	0 to ± 300A
LAB-GSS 32-400-4	128kW[4]	0 - 1500Vdc	50 - 1500Vdc	0 to ± 400A
LAB-GSS 32-400-8	256kW[4]	0 - 1500Vdc	50 - 1500Vdc	0 to ± 800A
500VDC MODULES				
LAB-GSS 20-500	20kW	0 - 500Vdc	40 - 500Vdc	0 to ± 50A
LAB-GSS 32-500	32kW	0 - 500Vdc	40 - 500Vdc	0 to ± 80A
LAB-GSS 20-500-2	40kW[3]	0 - 1000Vdc	40 - 1000Vdc	0 to ± 100A
LAB-GSS 32-500-2	64kW[4]	0 - 1000Vdc	40 - 1000Vdc	0 to ± 160A
LAB-GSS 32-500-3	96kW[4]	0 - 1500Vdc	40 - 1500Vdc	0 to ± 240A
LAB-GSS 32-500-4	128kW[4]	0 - 1500Vdc	40 - 1500Vdc	0 to ± 320A
LAB-GSS 32-500-8	256kW[4]	0 - 1500Vdc	40 - 1500Vdc	0 to ± 640A
600VDC MODULES				
LAB-GSS 20-600	20kW	0 - 600Vdc	50 - 600Vdc	0 to ± 40A
LAB-GSS 32-600	32kW	0 - 600Vdc	50 - 600Vdc	0 to ± 66A
LAB-GSS 20-600-2	40kW[3]	0 - 1200Vdc	50 - 1200Vdc	0 to ± 80A
LAB-GSS 32-600-2	64kW[4]	0 - 1200Vdc	50 - 1200Vdc	0 to ± 132A
LAB-GSS 32-600-3	96kW[4]	0 - 1500Vdc	50 - 1500Vdc	0 to ± 198A
LAB-GSS 32-600-4	128kW[4]	0 - 1500Vdc	50 - 1500Vdc	0 to ± 264A
LAB-GSS 32-600-8	256kW[4]	0 - 1500Vdc	50 - 1500Vdc	0 to ± 528A

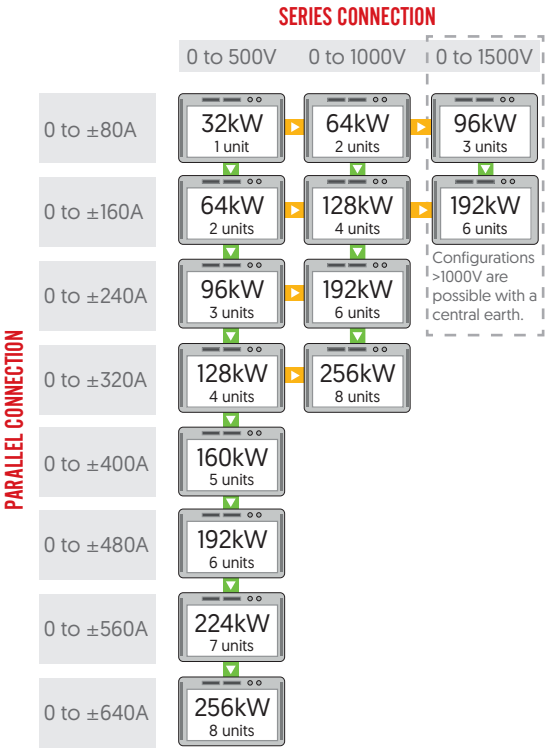
[1] Values for multi-module systems represent the widest operating points. The full current range is not possible with the full voltage range simultaneously. Please see operating range diagrams on page 4 for the V/I range of a specific configuration.
[2] The maximum current that can be recycled derates as the voltage reduces beneath the lower level. Please contact ETPS for the characterisation.
[3] Composed of 20kW LAB-GSS modules. [4] Composed of 32kW LAB-GSS modules. Please contact ETPS for a full breakdown of possible module combinations.

MODULAR POWER SYSTEMS

Larger systems can be composed of smaller 20kW or 32kW LAB-GSS modules. Up to 64 of these modules can be arranged in series, parallel or matrix array configurations to create larger systems.

Each module is able to operate independently, so that systems can be reconfigured, expanded or broken up as needs dictate. Inbuilt system comms allow users to switch between various set-ups.

The modular approach is useful for test houses and research labs who regularly test different sized energy storage devices. Individual modules can be used for the day to day testing of multiple small devices, then grouped together for larger projects. The diagram shows all the possible combinations with eight 32kW/500V modules.

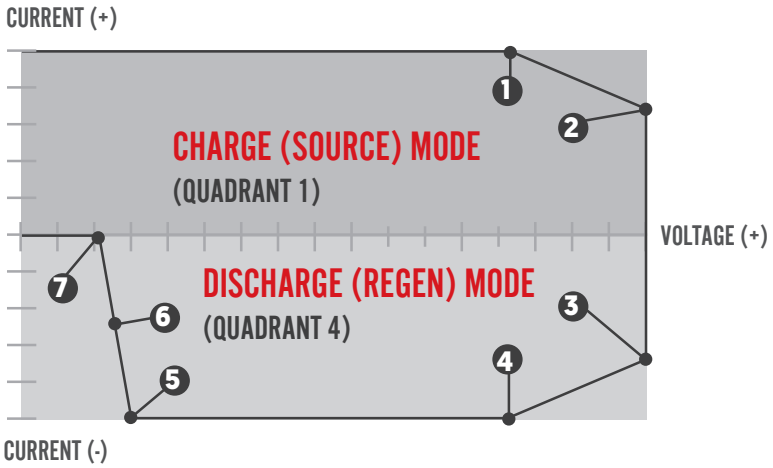


CABINET OPTIONS

Units can be treated to a laboratory rack or flight case integration. Common options include mains cables, passive indication of any residual DC voltage, isolation monitoring of DC cables and a panel mounted emergency stop. Switch panels with removable DC links can be fitted for modular systems. This simplifies the reconfiguration between series, parallel or independent use. Simple wheeled cabinets are also available.

Having a programmable battery cycler mounted into a flight case on castors is often advantageous, especially when several departments or test cells share the same equipment. Multiple power systems can be fitted into the same flight case. Door hangers are fitted for convenience. Existing ETPS systems can also be retrospectively integrated into new flight cases where requested.

OPERATING RANGE

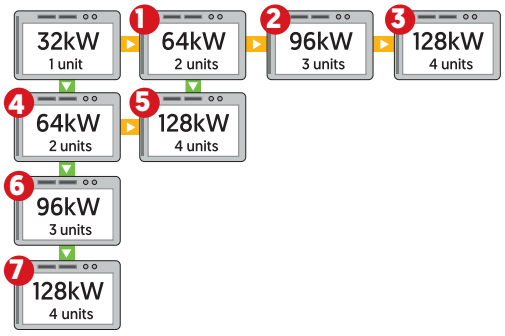


OPERATING RANGE (PER MODULE)

Part Number	Point 1 (Q1)	Point 2 (Q1)	Point 3 (Q4)	Point 4 (Q4)	Point 5 (Q4)	Point 6 (Q4)	Point 7 (Q4)
LAB-GSS 20-65	53V / 385A	65V / 308A	65V / -308A	53V / -385A	6V / -385A	4V / -193A	2V / 0A
LAB-GSS 20-130	104V / 192A	130V / 154A	130V / -154A	104V / -192A	12V / -192A	9V / -75A	4V / 0A
LAB-GSS 20-400	317.5V / 63A	400V / 50A	400V / -50A	317.5V / -63A	50V / -63A	30V / -21A	20V / 0A
LAB-GSS 20-500	400V / 50A	500V / 40A	500V / -40A	400V / -50A	40V / -50A	25V / -20A	15V / 0A
LAB-GSS 20-600	500V / 40A	600V / 33.3A	600V / -33.3A	500V / -40A	50V / -40A	40V / -20A	30V / 0A
LAB-GSS 32-65	53V / 600A	65V / 492A	65V / -492A	53V / -600A	6V / -600A	4V / -300A	2V / 0A
LAB-GSS 32-130	104V / 308A	130V / 246A	130V / -246A	104V / -308A	12V / -308A	9V / -120A	4V / 0A
LAB-GSS 32-400	320V / 100A	400V / 80A	400V / -80A	320V / -100A	50V / -100A	30V / -33A	20V / 0 A
LAB-GSS 32-500	400V / 80A	500V / 64A	500V / -64A	400V / -80A	40V / -80A	25V / -32A	15V / 0A
LAB-GSS 32-600	484.8V / 66A	600V / 53.3A	600V / -53.3A	484.8V / -66A	50V / -66A	40V / -33A	30V / 0A

PARALLEL CONNECTION

SERIES CONNECTION



OPERATING RANGE (SYSTEMS)

	LAB-GSS 32-65	LAB-GSS 32-130	LAB-GSS 32-400	LAB-GSS 32-500	LAB-GSS 32-600
Single Module	0 to 65V, 0 to ± 600A	0 to 130V, 0 to ± 308A	0 to 400V, 0 to ± 100A	0 to 500V, 0 to ± 80A	0 to 600V, 0 to ± 66A
Configuration 1	0 to 65V, 0 to ± 1200A	0 to 130V, 0 to ± 616A	0 to 400V, 0 to ± 200A	0 to 500V, 0 to ± 160A	0 to 600V, 0 to ± 132A
Configuration 2	0 to 65V, 0 to ± 1800A	0 to 130V, 0 to ± 924A	0 to 400V, 0 to ± 300A	0 to 500V, 0 to ± 240A	0 to 600V, 0 to ± 198A
Configuration 3	0 to 65V, 0 to ± 2400A	0 to 130V, 0 to ± 1232A	0 to 400V, 0 to ± 400A	0 to 500V, 0 to ± 520A	0 to 600V, 0 to ± 264A
Configuration 4	0 to 130V, 0 to ± 600A	0 to 260V, 0 to ± 308A	0 to 800V, 0 to ± 100A	0 to 1kV, 0 to ± 80A	0 to 1.2kV, 0 to ± 66A
Configuration 5	0 to 130V, 0 to ± 1200A	0 to 260V, 0 to ± 616A	0 to 800V, 0 to ± 200A	0 to 1kV, 0 to ± 160A	0 to 1.2kV, 0 to ± 132A
Configuration 6	0 to 195V, 0 to ± 600A	0 to 390V, 0 to ± 308A	0 to 1.2kV, 0 to ± 100A	0 to 1.5kV, 0 to ± 80A	0 to 1.5kV, 0 to ± 66A
Configuration 7	0 to 260V, 0 to ± 600A	0 to 520V, 0 to ± 308A	0 to 1.5kV, 0 to ± 100A	N/A	N/A

INPUT

STANDARD FEATURES (PER MODULE)

TECHNICAL DATA	
AC Line Voltage / Current Relationship[1]	3 × 380VAC ± 10% / 34Arms (20kW units), 54Arms (32kW units) 3 × 400VAC ± 10% / 32Arms (20kW units), 51Arms (32kW units) 3 × 415VAC ± 10% / 31Arms (20kW units), 49Arms (32kW units) 3 × 440VAC ± 10% / 29Arms (20kW units), 47Arms (32kW units) 3 × 460VAC ± 10% / 28Arms (20kW units), 45Arms (32kW units) 3 × 480VAC ± 10% / 27Arms (20kW units), 43Arms (32kW units)
Line Frequency	48 - 62Hz
Mains Connection Type	3L + PE (no neutral)
Powerfactor at P_{MAX} (Q1 Active / Q4 Mode)	≥0.99
Protective Conductor Current at 50Hz[2]	<20mA
Touch Current Unweighted[2]	<20mA
Touch Current Weighted[2]	<2mA
Load Regulation (CV, CC)	<± 0.1% of full scale value (Typical value for 0 – 100 % load variation, at constant line input and temperature conditions.)
Line Regulation (CV, CC)	<± 0.1% of full scale value (Typical value for input voltage variation within 380 VAC ± 10 % – 480 VAC ± 10 %, at constant load and temperature conditions.)

[1] At nominal output power and nominal line voltage. Soft-start to limit turn-on surge currents.
[2] According to IEC60990: Protective conductor current: 50 Hz component at 400 VAC/50Hz/P_{NOM}. For weighted touch current: Measured for perception/reaction. Protection with earth leakage circuit breaker possible. An additional PE connection is necessary.

HIGHLIGHTED FEATURE

ACTIVE POWER FACTOR CORRECTION

The LAB-GSS has Active Power Factor Correction (PFC) circuit integrated into the input stage as standard. This enhances the overall efficiency of the modules across the output power range when compared to a unit that does not have active PFC. In practice, this means a significant lower peak current value, a decrease of RMS value of the phase current and less perturbations of other equipment running on the same grid.

The inbuilt active PFC is also ideal for operating the power supply from a generator. Generators tend to be sensitive against high current peaks, and their voltage controllers may have some stability problems with non-sinusoidal load currents. The active PFC feature forms a lowpass filter and therefore, both the repetitive current peaks and also the harmonic content is enhanced. This will help the generator system maintain a stable and reliable output.

OPTIONS

CODE	DESCRIPTION
/FILTER	Input air filter

HIGHLIGHTED OPTIONS

DC INPUT

Where users only have access to a DC link, special CON-DSS bidirectional units have been produced with a DC input. The full functionality of the power supply is still provided. To further information, please see the separate CON-DSS datasheet.

GENERAL SPECIFICATIONS

STANDARD FEATURES (PER MODULE)

TECHNICAL DATA	
Operating Modes	Constant Voltage (0 to 100% of V_{MAX}) Constant Current (0 to ±100% of I_{MAX}) Constant Power (±5% to ±100% of P_{MAX})
Internal Resistance Range	AdjustableΩ_{MAX} = (V_{NOM} / I_{NOM})
Switchable Output Capacitance	6mF / 17.2mF (65V and 130V modules) | 0.09mF / 0.9mF (400V, 500V and 600V modules)
Interfaces	Analogue & RS-232
Remote Sense	0 - V_{MAX}
Efficiency	Up to 92%
CV Load Regulation and Set Tracking	1.1ms (Typical recovery time to within <5 % band of set value for a load (or set value) step 10-90 %, ohmic load, at constant line input and temperature.)
Set Value Tracking CC (With Quadrant Change)*	<2ms (65V and 130V modules) | <3ms (400V, 500V and 600V modules)
Set Value Tracking CC (Without Quadrant Change)*	<2ms
Over Voltage Protection (Programmable)	0 - 110% of V_{MAX}
Over Voltage Protection (Response Time)	50µs - 1600ms
Over Current Protection (Programmable)	0 - 110% of I_{MAX}
Over Current Protection (Response Time)	50µs - 1600ms
Output Ripple (300Hz Vpp): 65V/130V Modules	<0.2% (Typical value at nominal ohmic load, line asymmetry < 1 Vrms)
Output Ripple (300Hz Vpp): 400V-600V Modules	<0.5% (Typical value at nominal ohmic load, line asymmetry < 1 Vrms)
Output Ripple (300Hz Vrms): 65V/130V Modules	<0.05% (Typical value at nominal ohmic load, line asymmetry < 1 Vrms)
Output Ripple (300Hz Vrms): 400V-600V Modules	<0.1% (Typical value at nominal ohmic load, line asymmetry < 1 Vrms)
Output Noise (40kHz-1MHz): 65V/130V Modules	<0.2Vpp / <0.05Vrms (Typical value at nominal ohmic load, line asymmetry < 1 Vrms)
Output Noise (40kHz-1MHz): 400V-600V Modules	<1Vpp / <0.2Vrms (Typical value at nominal ohmic load, line asymmetry < 1 Vrms)
Stability (CV, CC)	<± 0.05% (Maximum drift over 8 hours after 30 minute warm-up time, at constant line input, load and temperature conditions)
Temperature Coefficient (CV)	<0.02% of full scale value per°C (Typical change of output values versus ambient temperature, at constant line input and load conditions)
Temperature Coefficient (CC)	<0.03% of full scale value per°C (Typical change of output values versus ambient temperature, at constant line input and load conditions)

* Rise/ fall time for 10%-90% of a set step.

HIGHLIGHTED FEATURES

SENSE COMPENSATION

Sense plus terminals are built into the LAB-GSS for the connection of sense wire which compensates for voltage drops in the load lines. This has a number of advantages over traditional sense. It is permitted to interrupt the load line during operation (voltage on). The maximum voltage drop compensation is adjustable. The voltage difference between LAB-GSS output and sensing point is monitored. If a set limit is exceeded, the LAB-GSS unit shuts off. This is particularly useful for applications with long cables often prone to unwanted voltage drops.

INTERNAL RESISTANCE RANGE

Each module is built with a user programmable internal resistance range as standard. This makes the power supplies ideal for users for who need to simulate the output of energy storage devices such as battery packs, fuel cell stacks and super capacitors. The exact range varies by module and can be viewed in the selection table. An extended programming range is available on request by selecting the /IRXTS option below.

OPTIONS

CODE	DESCRIPTION
/IRXTS	Maximum adjustable internal resistance range extended to 32,000mΩ
/CANCABLE	Connecting cable for multi-unit operation
/RMB	Remote Measure Box for higher dynamics in multi-unit operation
/EMIFILTER	EMI filter for DC output

SOFTWARE/SOFT TOOLS

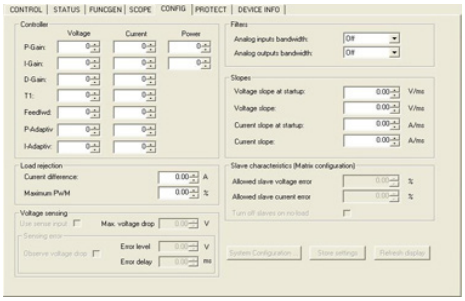
STANDARD TOP CONTROL GUI

All LAB-GSS units come with a simple and intuitive TopControl operating GUI as standard. Live values of the power system are displayed graphically along with any warning and error messages. The software provides a variety of second level parameters, ideal for users who like to optimise their test processes. In standard user mode the operator can remotely program set values, enable voltage output as well as the ability to analyse different variables including set and actual values via the integrated scope.

The scope function can simultaneously record up to 8 system variables. Recording can be started manually or by a defined trigger event from any variable of the system. All actual and set values (currents/voltages/power/internal resistance) can be recorded. Other recordable items include system temperatures, intermediate DC circuit, low voltage auxiliary power supplies, error related values and variables from the controller section.

A password protected section is available to the advanced user and service technician. In addition to the standard functions the authorised user is able to:

- Program linear ramp functions at start up and set value steps during operation
- Configure multi-unit operation
- Program the PID controller parameters
- Program the unit's limit values
- Calibrate and adjust values as necessary
- Update the firmware



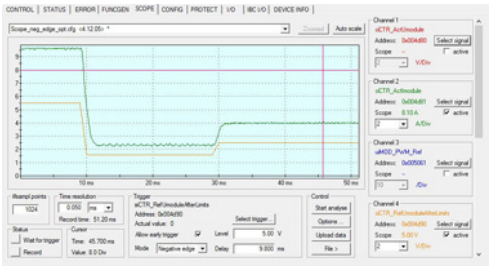
OPTIONAL SOFTWARE

CODE	DESCRIPTION
/TFE	Integrated function generating engine with application area (parametric) programming
/BATCONTROL	Energy storage and drive cycling GUI
/SAS	Solar array simulation GUI (includes TFE option)
/BATSIM	GUI simulating battery characteristics with adjustable parameters
/CAPSIM	GUI simulating the electrical characteristics of capacitors with adjustable parameters

HIGHLIGHTED OPTION

FUNCTION GENERATOR (/TFE)

Complex DC charge/discharge waveforms can be implemented through an optional embedded function generator. The highly programmable nature of the function generator allows users to plot out exact waveforms. This is often advantageous when emulating a power device with a very specific behaviour profile. For example, when quality testing fuel cell powered equipment, the specific discharge profile a motor demands on the fuel cell can be programmed and replicated.



As well as custom shapes, standard square, sawtooth and sine waveforms can be plotted against time. Voltage/current and voltage/power relationships can also be programmed where necessary. Parametric programming is possible, where instead of the time axis, an input variable (V_{IN}, I_{IN} or P_{IN}) can be selected.

HIGHLIGHTED OPTION

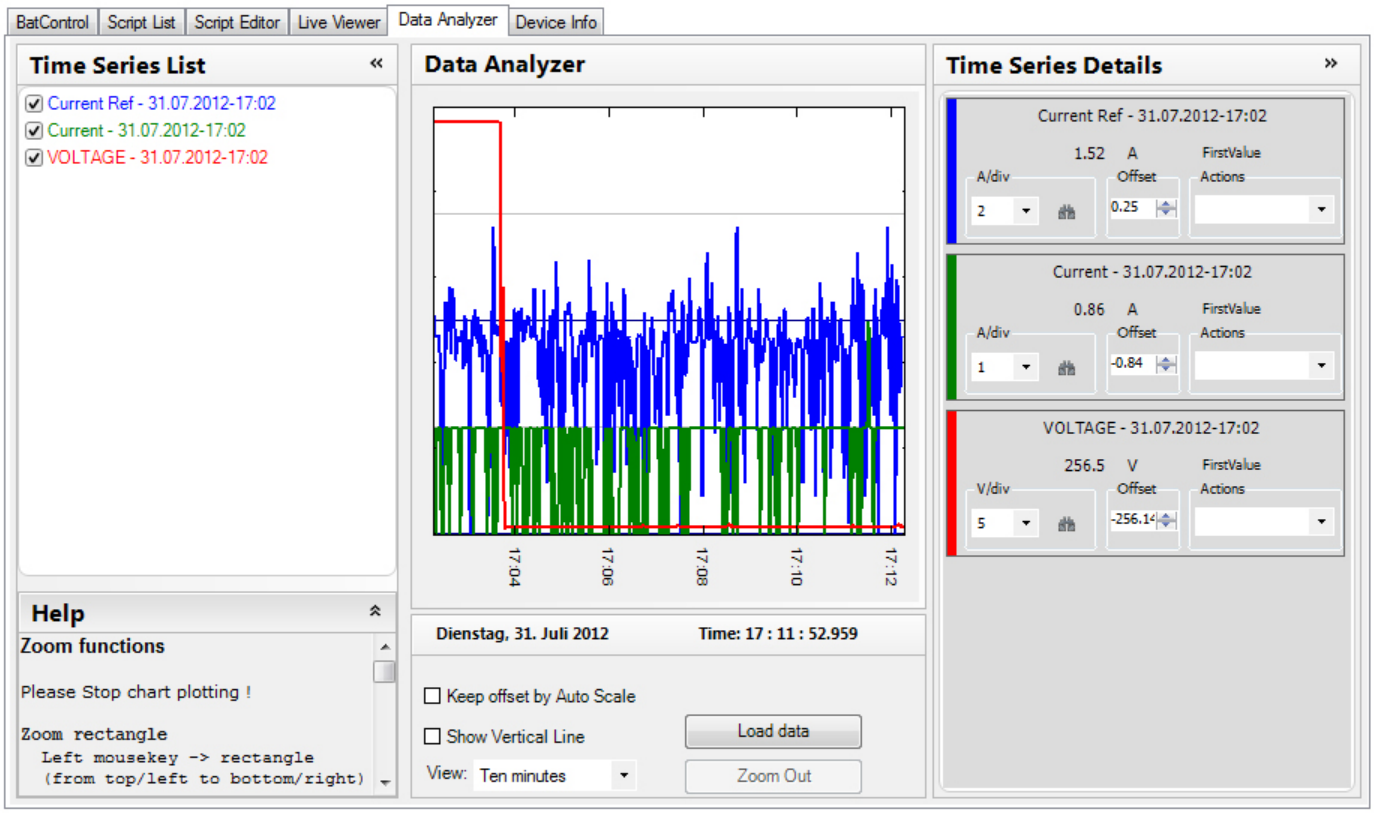
BATTERY CYCLING (/BATCONTROL)

To conduct advanced tests, BatControl software is available for LAB-GSS modules. The GUI allows the power systems to perform both preset and user defined cycling tests on battery packs and capacitors. A variety of performance issues can be investigated such:

- Battery charge/discharge cycles
- System degradation tests
- Battery lifetime tests
- Fuel cell loading
- Comparative studies
- Shot and burst overload tests
- Internal charge counter
- Record, replicate & review test data
- Automated drive cycle loading and simulation (standard and user defined)

The discharge time of a battery can often differ depending on the end user application. For example a motor in an industrial process that has to accelerate fast and brake hard, will discharge a pack quicker than one that operates at a constant speed.

Previous data collected in experiments can be imported and recreated. This allows the power system to create any desired user profile in a lab environment. The effects it has on battery performance can then be analysed in-depth. Drive cycles testing of electric motors can be implemented via the same software.



INTERFACES

STANDARD RS-232 INTERFACE

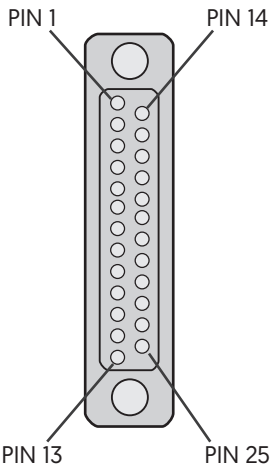
The RS-232 interface is configured as a Sub-D 9 pin connector (female) and is located on the front panel. This interface can be optionally moved to the rear panel. The graphical user interface, TopControl is operated via RS-232. The software runs on Windows and allows the user to control, measure and configure the power system.

TECHINCAL DATA	
Isolation to Electronics and Earth Configuration	125 Vrms
Baud Rate	38,400 baud
Resolution (programming & readback)	0.025% FS (for V & I), 0.1% FS (for P & Ri)

STANDARD ANALOGUE INTERFACE

The control port is configured as a Sub-D 25 female connector and is located on the rear panel. It allows output values to be set and read proportionally using a 0-10Vdc analogue signal. Digital inputs and outputs enable various functions such as the interlock and output ON/OFF. A 10Vdc reference is provided for analogue control. Digital functions are switched via a high/low signal. A 24Vdc supply voltage is provided for these functions. The control port is labelled X105.

TECHINCAL DATA	
Isolation to Electronics and Earth	125 Vrms
Unit Ready/Error	Relay Contact
Output Voltage ON / Warnings	Relay Contact
Actual Voltage Readback 0 - 100%	0 to 10V
Actual Current Readback -100% to 100%	-10V to 10V
Resolution (programming & readback) for V, I, P, Ri	0.2% FS
Output Voltage Off/On	0/24VAC/DC
2 Digital Application Inputs	0/24VAC/DC
Interlock Circuit	0/24VDC
Voltage Setting 0 to 100%	0 to 10V
Current Setting -100% to 100%	-10V to 10V
Power Setting 0% to 100%	+10V to 0V
Internal Resistance Setting 0% to 100%	0V to 10V



PIN	SIGNAL	I/O	DESCRIPTION
1	AGND	I	Analogue ground for pins 2–4, 14–16
2	VREF	I	Voltage setpoint input 0–10 V
3	IREF	I	Current setpoint input 0–10 V
4	IACT	O	Current feedback output 0–10 V
5	0 VDC	O	0 VDC I/O ground for pin 25[1]
6	+10 VDC	O	Analogue reference voltage
7	COM	I	(connected to pin 17) 0VDC DigIn; common ground for pins 8–9, 18–20, 24
8	APP_DIGITALIN_4; CLEAR_ERROR	I	Digital input 0-2V /10-24V DC
9	VOLTAGE_ON	I	Digital input 0-2/10-24V DC
10	OK/ALARM_b[2]	O	Relay output 1 normally open
11	OK/ALARM_a[2]	O	Relay output 1 common
12	RUN_b[2]	O	Relay output 2 normally open
13	RUN_a[2]	O	Relay output 2 common
14	PREF	I	Power limit analogue input 0–10 V
15	RREF	I	Ri-simulation analogue input 0–10 V

PIN	SIGNAL	I/O	DESCRIPTION
16	VACT	O	Voltage feedback output 0–10 V
17	COM	I	(connected to pin 7) Common ground to pins 8–9, 18–20, 24
18	APP_DIGITALIN_1	I	Digital input (low) 0-2 VDC/(high) 10–28 VDC
19	APP_DIGITALIN_2	I	Digital input (low) 0-2 VDC/(high) 10–28 VDC
20	APP_DIGITALIN_3; ANAOG_ REFERENCE_ SELECT	I	Digital input ((low) 0-2 VDC/(high) 10–28 VDC Analogue reference select
21	WARN_a[2]	O	Relay output 3 normally open
22	WARN_b[2]	O	Relay output 3 normally closed
23	WARN_c[2]	O	Relay output 3 common
24	INTERLOCK_IN_+	I	Input Interlock +
25	+24 VDC	O	24VDC I/O Aux power output 24 VDC, max. 0.2 A

[1] Pin 5 (0 VDC) is used as the reference earth for pin 25 (24 VDC) and is connected internally to the equipotential bonding via a 1 kΩ resistor to earth.
[2] Maximum switching current: 1 A; maximum switching voltage: 24 V.

OPTIONAL INTERFACES

CODE	DESCRIPTION
/HMI	This provides front panel control and measurement via a menu driven LCD screen. Most users prefer their units to be fitted with HMI. For systems comprised of multiple units or where only remote control is required, cost can be saved by not including front panel controls and display.
/RS232REAR	RS-232 on front and rear panel (time shared mode with RS-232 on front).
/RS422	Differential serial interface (time shared mode with RS-232).
/IEEE	When specified, an integrated IEEE 488.2 interface is built into the rear panel (RS-232 only possible on rear panel). The programming terms employed are compliant with Standard Commands for Programmable Instrumentation (SCPI), making the LAB-GSS ideal for system integration.
/CANOPEN	On request an additional serial interface built to the CAN/CANopen standards can be integrated into the rear panel (RS-232 only possible on rear panel).
/CANMP	Integrated CANmp interface (RS-232 only possible on rear panel).
/OPTOLINK	Rear panel integrated fibre optic interface (RS-232 only possible on rear panel).
/USB	Integrated USB interface. (RS-232 only possible on rear panel). The graphical user interface, TopControl can be operated over the USB port. RS-232 and USB cannot be used at the same time.
/ETH	Ethernet interface with listener and talker functions over a LAN (RS-232REAR required).
/CAN+USB	Combined CAN and USB interface.

HIGHLIGHTED OPTION

CAN MP CAN MULTI-PURPOSE INTERFACE (/CANMP)

CANmp is a high speed digital interface operating at 1kHz. The interface gives users the capability to customise the CAN protocol. Up to 50 messages are user configurable. Along with the CAN ID the data length code, byte order, start bit, data type and signal factor can be adjusted by the user. A DBC file is provided and messages can be easily configured within the standard windows software. Messages can be sent cyclically or upon receipt of a sync or syncID signal.

SAFETY & PROTECTION

STANDARD FEATURES (PER MODULE)

TECHNICAL DATA	
Max. Reactive Load Voltage	≤ 110% Vmax
Mounted In Cabinet	Up to IP 54
Basic Construction	IP 20 (current bars on rear side excluded)
EMC Emission / Immunity	EN 61000-6-4 / EN 61000-6-2
Low Voltage Directive 2014/35/EU	EN 50178
Connection to UK Grid	ER G59-3 tested

OPTIONS

CODE	DESCRIPTION
/ISR	Integrated safety relay for shutdown to EN 13849-1 Cat 2/3
/PACOB	Protection against accidental contact of DC current bars
/RPP	Automatic voltage matching with reverse polarity protection

HIGHLIGHTED OPTIONS

AUTOMATIC VOLTAGE MATCHING WITH RPP (/RPP)

Reverse Polarity Protection (RPP) is recommended for energy storage devices without an automatic voltage matching circuit. With the LAB-GSS energised but output off, the RPP senses the voltage of the connected energy storage device. A contactor is closed after matching the voltage, to prevent large inrush currents and arcing on start up.

INTEGRATED SAFETY RELAY (/ISR)

For additional safety, a mechanical interlock is available for the mains input of the LAB-GSS. The integrated safety relay provides shutdown safety according to EN 13849-1 category 2/3. The ISR is connected to the external safety switch loop. If the external loop is opened, the DC-output of the power system is powered down immediately.

PROTECTION AGAINST OUTPUT BARS (/PACOB)

A specially produced cover is available which provides protection against accidental contact of AC and DC current bars.

ISOLATION

STANDARD FEATURES (PER MODULE)

TECHINCAL DATA	
Line to Case	1670Vdc for 1s
Output to Case	2540Vdc for 1s (65V and 130V modules) | 2540Vdc for 1s (400V, 500V and 600V modules)
Transformer	4800Vac
Output to Case	10.8 MΩ / high impedance (X109 open)
Per DC Bar	35nF (65V and 130V modules) | 13.6nF (400V, 500V and 600V modules)
- Bar / + Bar[1]	+680Vdc / -680Vdc (65V and 130V modules) | +1000Vdc / -1000Vdc (400V, 500V and 600V modules)

[1] Maximum working voltage including DC output voltage.

MECHANICAL

STANDARD FEATURES (PER MODULE)

TECHINCAL DATA	
Dimensions	19" x 9U x 634mm (W x H x D), a full cabinet integration service is available on request
Weight	97kg
Line Input Connections	Terminal block 4 x 25mm^2
Output Terminals	Nickel-plated copper bars - Length: 40mm, 1 hole 9mm in each bar

OPTIONS

CODE	DESCRIPTION
/LCAL	Integrated liquid cooling of the power stage
/RCU	The RCU provides the HMI functions via cable at a distance of up to 40m. The RCU is available in a compact desktop case or as a 19" rackmount unit.
/4111	Ruggedisation specification for vehicle mount projects

HIGHLIGHTED OPTIONS

RUGGEDISATION SPECIFICATION (/4111)

Ruggedisation of units to military standards is possible. Many previous modifications have been carried out for shipborne and vehicle projects. Our design team can work with you to meet specific requirements and standards. This ensures suitability in harsh conditions by providing protection against shock, vibration and humidity.

One previous modification included modifying a LAB-GSS system to withstand up to 30g of mechanical shock across X, Y and Z axes. The PSU also could operate from temperatures as low as -10°C all the way up to 55°C. For more information about what ruggedisations have previously been achieved, please contact ETPS.

LIQUID COOLING (/LCAL)

Liquid cooling of the LAB-GSS's power stage is available for units which may be subject to naturally hot or uncontrolled environments. This enables operation up to 45°C with no performance derating.

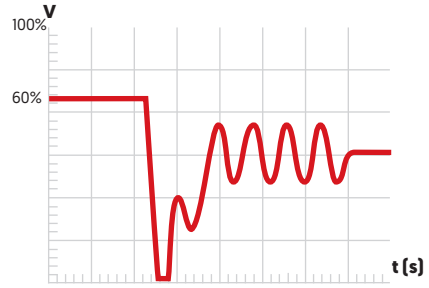
REMOTE CONTROL UNIT (/RCU)

The RCU is an external control unit for controlling multi-module systems, which reduces response times when implementing complex changes. The RCU is available as either a desktop unit or a 19" rackmounting module, with or without an emergency stop.

COMMON LAB-GSS APPLICATIONS

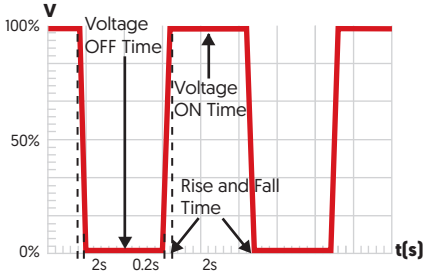
CRANKING CURVE TESTING

Electrical components within a vehicle's subsystem must be able to withstand a wide range of input voltage surges and drops during a start-up. The LAB-GSS can accurately recreate these conditions within a lab environment. This increases reproducibility and accuracy of results when compared to using real batteries. Hard to replicate conditions such as voltage cranking during a cold start can be achieved. Voltage/current and voltage/power relationships can be programmed against time where necessary.



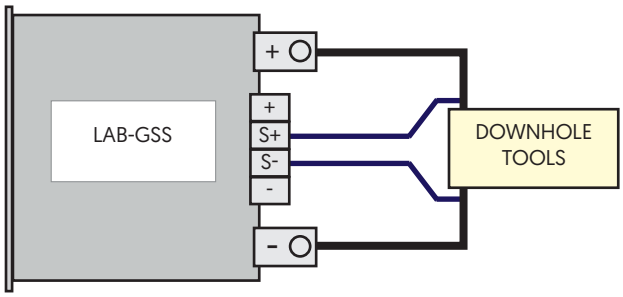
PULSED BATTERY CHARGING

Pulse charging interrupts the traditional DC charging curve with short relaxation periods. The technique is thought to improve battery discharge capacity and help facilitate longer cycle life. Some studies have shown that pulse charging is also helpful in eliminating concentration polarisation. The LAB-GSS's embedded function generator allows the PSU to deliver short burst of highly concentrated energy at user defined time intervals. The technique can also be used for powering lasers, electromagnets and plasma generation.



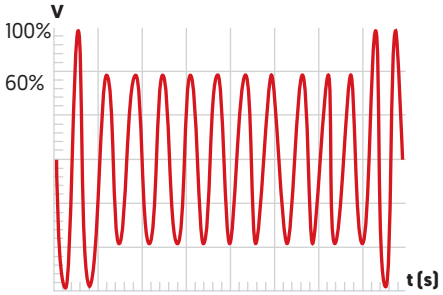
POWERING DOWNHOLE TOOLS

Applications with long load lines often suffer from unintended voltage drops, such as downhole tools used in hydrocarbon exploration. The LAB-GSS's sense plus allows voltage drops to be compensated for throughout the entire length of a load line. This feature is also ideal for powering subsea devices.



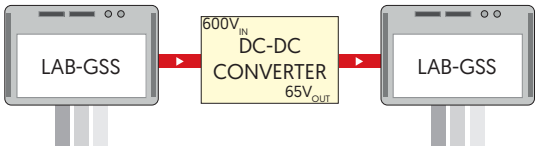
VOLTAGE DROPS & INTERRUPTS

In electronic systems sudden voltage interruptions may cause unexpected behaviour. Supply line disturbances may have several causes, including an additional switch on of large capacitive loads parallel to the supply line or a short circuit caused by loads sharing the supply. The LAB-GSS can generate many complex DC waveforms to test devices under realistic conditions to identify any potential issues.



INVERTER/CONVERTER TESTING

The DC input of virtually any power conversion device can be replicated. The influence that variables, such as line voltage variation, have on performance can be isolated and tested. This allows optimum operating conditions to be characterised to improve efficiency and performance.



FUEL CELL EMULATION

The discharge behaviour of an FCEV's fuel cell is often irregular. By using the function generator, both conservative and aggressive driver profiles can be replicated. This allows the LAB-GSS to perform effective quality testing of fuel cell powered components under all likely operating conditions.

“WE ARE POSITIVE PEOPLE”

ETPS engineer electronic power supply and testing systems. Our problem solving skills provide the spark of innovation to some of the world’s leading technology brands.

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