



*LASER S.O.S. GROUP*

GALAXY  
LASER POWER & POWER METER  
USER MANUAL



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# GENERAL

## 1.1-Introduction

To exploit all possibilities offered by GALAXY, we recommend to carefully read this manual.

GALAXY is the most versatile measurement monitor for thermal heads available on the market today. Its price-to-performance ratio is absolutely outstanding , since it has been specifically imagined and designed to be everybody's tool for laser measurement.

It allows wavelength correction for more precise measurements on the most popular lasers , bears a fast analog bargraph for laser tweaking and has a wide dynamic range, measuring powers from 1mW up to 10KW and energies from 1mJ to 300J.

GALAXY can be plugged to any of Laser SOS detectors, via a simple connection to the measurement head by means of its standard Intelligent Interfacing System (IIS) and can operate on 3 different modes. Other than power, it can measure energy and work as a FIT , or probe mode: this is the case of those applications that do not need long term measurements and simply require once in a while laser power checks.

GALAXY can thus be used on the field , for service purposes, or in laboratory where he can make sophisticated signal analysis with its optional SW.

External interfacing can be done with the Analog output or the digital RS232 .

## 1.2-Unpackaging and Inspection

Each instrument has been carefully inspected and tested prior to shipment . Unpack and assure that no damage occurred during transport and handling.

Any damage must be immediately reported to Laser Point and to the Carrier.

Do not use the GALAXY and its associated detector/s if the delivered parts look damaged, or if you suspect that they do not operate properly.

## 1.3-Power requirements

GALAXY works both as a battery operated unit, using two 2 LR6 (AA -1.5 V) non -rechargeable batteries, or through the line , at 12 VDC –50mA, with its optional external power supply.

The battery holder is located on the bottom rear of the instrument.

## SPECIFICATIONS

### Power Meter Mode

Power Ranges:	1mW to 10kW
Resolution:	0.5‰ for any Full Scale
Response Time	<1-5 sec. ( depends on each specific head)

### Energy Meter Mode

Power Range:	1mJ to 300J
Resolution:	0.5‰ for any Full Scale
Response Time:	<1-5 sec ( depends on each specific head)

### FIT Mode

Power Ranges:	1mW to 10kW
Resolution:	0.5‰ for any Full Scale
Response Time:	4 sec (final value)

### Tuning

- Displays a Digital Bargraph for Tuning Direction
- Displays Actual Power Value
- Displays Variations (as %) form Tuning Initial Value

### Selections

#### Wavelengths

EXC :	UV and excimer laser (250-350nm)
VIS:	Visible (400-700nm)
LD:	Laser Diodes (800-900nm)
Yag:	Nd-Yag (1064 nm)
Erb:	Erbium (2943 nm)
CO2 :	CO2 (10600nm)

User's Own Calibration Factor  
UCF

### General

Digital Display:	4-digit LCD readout
Monitor accuracy:	±0.5%
Scales:	3 scales (00.00 / 000.0 / 0000) ,head dependent with 0.5‰ resolution
Analog Output:	0-2V ±1.0%
Digital Output:	RS-232 on DB9Connector

### Temperature Compensation and Over-Temperature Alarm

Overload Alarm : Red Led warns for intermittent power use

Input voltage:	12VDC Adapter
Batteries:	2 LR6 (AA -1.5 V)
Battery life:	250 hours ; OFF State one year
Dimensions (mm) :	150 (W) x 105 (H) x 45 (D)
Weight:	500g

### Operating environment:

- °Storage Temperature:-10 to 60 °C
- ° Range of Use :5 to 45 °C
- °Reference Conditions : 21 ± 4 °C ;RH 20-80%

## PANEL DESCRIPTION

### 3.1-Front Panel



Fig.1- Front Panel

1. -Green Led : measures mW, when lit
2. - Green Led : measures mJ, when lit
3. - 4 Digit LCD screen displays:



- 7segments, 4 digit power/energy values
- measurement unit
- wavelength /UCF
- percent variation of power on small 3digit display
- offset ( $\pm$  VALUE)
- low battery
- Temperature/ Tuning bar

4. - Warning Green/Red Led
5. - Tuning and Power selection key . Also scrolls wavelengths and UCF
6. – Energy selection key. Also scrolls wavelengths and UCF
7. –ON/OFF Key- Also allows instrument zeroing and parameter confirmation

### 3.2-Top Panel



Fig.2- Top Panel

- 1- DB9 Connector –Female for RS-485 connection
- 2- DB15 Connector –Female for detector connection

### 3.3-Bottom Panel



Fig.3-Bottom Panel

- 1- 3.5mm Mono Jack Plug for 0-2V Analog Output
- 2- 2.5mm Power Plug for 12V DC, 50 mA external power

### 3.4-Rear Panel



Fig.4-Rear Panel

- 1- Lift
- 2- Battery Holder: houses Q.ty 2 AA 1.5V batteries

## BEFORE GETTING STARTED



**WARNING!** The user of this instrument must be trained to the use of lasers and their associated risks. Laser SOS is in no way liable for any damage resulting from misuse, careless or use above rated limits for the instrument.

**IMPORTANT:** Take all the required safety procedures to work with laser beams and wear suitable protection glasses all the time!

Be extremely careful with radiation either backreflected or backscattered from detector surfaces, housings, mounts and stainless steel post!

Measurement heads temperatures may reach 85°C.

### 4.1-Installation

Connect the GALAXY to its associated detector head by means of the DB 15 connector located on monitor top panel (fig2- Pos2). You may now press the ON/OFF key to start .

Allow at least 5 minutes of warm up, after turn-on, to achieve maximum stability of electronics and for the thermal stabilization of detectors.

### 4.2-How to Use the Keys

The GALAXY has been designed to provide easy and immediate access to all its functions. Three soft touch keys , whose major functions are described below, govern the instrument :

1-ON/OFF (Zero). Press and release to switch the instrument ON; press for 3 sec to switch the instrument OFF. During the measurement session pushing shortly on the key will Zero the stored measurement value and display.

2-T/P. Pressing the T/P key for 2 sec gives access to the Tuning Function or allows return to the Power Measurement Function.

The mW led, associated to the Power Measurement Function, lights for those low power measurement heads whose full scale is set in mW: this is automatically done by the GALAXY as it reads the detector specifications stored within its DB15 connector.

3-E. Pressing the E key provides access to the Energy Measurement Function .

The mJ led, associated to the Energy Measurement Function, lights for those low power measurement heads whose full scale set in mJ: this is automatically done by the GALAXY as it reads the detector specifications stored within its DB15 connector.



### 4.3- Wavelength and UCF (User Calibration Factor) Selection

By selecting the band or Wavelength of your interest, the GALAXY will read the corresponding wavelength correction values based on spectral data measured from each coating or absorber which are stored within the detector's EEPROM . The GALAXY display will show :

EXC : to mean the UV and excimer laser range (250-350nm)

VIS: to mean the visible range (400-700nm)

LD: to mean the Laser Diodes range (800-900nm)

Yag: to mean the Nd-Yag wavelength at 1064 nm

Erb: to mean the Erbium wavelength at 2943 nm

CO2 : to mean the CO2 wavelength at 10600nm

UCF: for the user's own calibration factor

The wavelength/UCF selection is simply made by clicking the T/P and E keys to scroll up and down the bands.

Allowable wavelengths are restricted to the head specific absorber type or coating: for this reason some selections are inhibited on the GALAXY.

### 4.4-Power, Energy, FIT Operational Modes

The GALAXY can work on different operational modes. It can be used as a power meter, as an energy meter or as a power probe , when working with the FIT heads.

The selection is automatically made by the monitor when it reads the detector EEPROM, as the unit is switched on.

A FIT head can only provide values of laser power in measurements that last 4 seconds. This timing is generated by an internal firmware and is sufficient to provide precise , yet once in a while, readings. There is no need , for the user, to measure manually or provide the time window to the laser shutter.

The Power Measurement Mode is set as a default function when the GALAXY is switched on; entering into the Energy Measurement Mode is simply accomplished by pushing the E key.

### 4.5-Temperature Compensation

Air cooled and FIT heads are provided with a temperature sensor used by the GALAXY to linearize the head response and advise, with a COOL message on the display, when the head has overtaken its max allowable temperature.

For those heads not bearing the temperature sensor, the bar will be only displayed during the auto initialization at instrument start up .

### 4.6-Analog Output

The Analog Output ranges from 0-2 Volts of head full scale , whose value is displayed when the head is switched on.

Power/Energy values corresponding to the output voltage are given by the following formula:

$$W = \frac{V_{AnOut}}{2} Wfs$$

EXAMPLE:

With a display reading of 1780W and 3000W full scale,  $V_{AnOut} = 1,186 \text{ V}$

The Analog Out can bear an override of 125%, up to 2.5V.

## OPERATION

### 5.1- Initial Selections : Wavelength and UCF (User Calibration Factor)



1 – Connect the GALAXY monitor to the Detector Head via its DB15 male connector.  
(Fig 2- pos.2)

Switch the instrument ON (Fig1- pos.6): the GALAXY logo appears on the screen. The temperature bar also lights-on, scaling up.

This preliminary phase last 4 sec: the instrument acquires all parameters from the measurement head and learns the kind of SW necessary to elaborate signals .



2-The GALAXY starts a circuit a self-diagnostic procedure, during which all screen segments and bars are shown .



3- The above cycle completed, the display will show the nominal, full scale power in W or mW of the detector in use

Note: if the head is programmed to provide both energy and power, the display will however show power .



4 –The next message to appear is the stored wavelength (e.g. YAG), hold from a former session. If there is no need for a change, confirm by pressing the ON-OFF key (Fig1-pos 6) . If the detector will operate at a different wavelength, scroll up or down the  $\lambda$  buttons (Fig1. pos 5 & 7) to select another .



5 –Once the wavelength for a new measurement has been selected, e.g. CO2, confirm by pressing the ON-OFF button (Fig1-pos 6)



6–When confirming the new wavelength, a zeroing is also accomplished. The display will show the selected new wavelength while the (Fig1-pos 4) led will blink green for 2 sec, to confirm the zeroing.

Note: no radiation must hit the detector during this operation.



7-A  $\pm$  sign appearing on the display will mean that there is a residual offset after zeroing.

Press ON/OFF for zeroing again until the offset is removed.



8-The User Calibration Factor gives the customer the possibility to modify the value of calibration sensitivity, in a reversible way, from 01.% up to 999.9% (or from 1/1000 up to 10 times).

The original sensitivity is set as 100% so, any time it is needed to recupe that value, it is sufficient to go back to 100.0



The UCF can be used :

- in case of light damages on coatings ( for major burns it is suggested to change the sensor)
- in case of detection after partializing devices (eg filters, beamsplitters, mirrors) to track the main beam
- have measurements aligned to other references



The UCF is effective on each measurement mode of GALAXY (power , energy, Fit) .

To access the UCF scroll up or down the  $\lambda$  buttons (Fig1. pos 5 & 7)



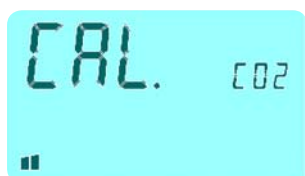
Once it has been selected, the existing UCF can be changed by acting on the same  $\lambda$  pushbuttons to increase/ decrease its value .

Press ON/OFF to confirm and start measurements

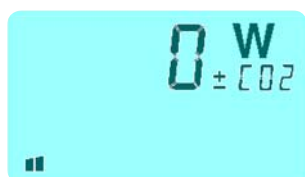
## 5.2-Power Measurement Mode



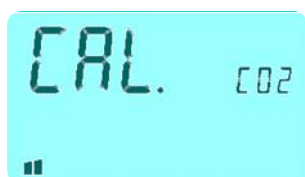
1- Follow the procedures 1 to 7 as described in the previous Section.



2- Measurements are automatically done by sending the laser beam onto the detector.  
The time to display the final power value depends on the head in use . A fast accelerating algorithm within the GALAXY will strongly reduce the intrinsically slow head response time; nevertheless, for some slower detectors it will take a few seconds to reach the 100% value



3- To make a new measurement press Zero (ON/OFF) to refresh the display.  
Should a  $\pm$  sign appear on the display, it will mean the presence of a residual offset after zeroing.



Press once more ON/OFF for zeroing, until the offset is removed.  
A new measurement can now be done.

## 5.3-Laser Tuning

Laser Tuning is only allowed in Power Mode. Proceed, following the next instructions, to achieve a high resolution tweaking of your laser.



1-By pushing the T/P key on the front panel for > 2 sec, the TUNE function is activated.



A TUNE message appears on the screen for about 1 sec.



The existing power level is then displayed, together with the bargraph, positioned at its center; it will move downward or upward depending on tuning direction.

The smaller digits show the power variations, expressed as percent, from the initial power value.

The max allowable variation is  $\pm 12\%$  of full scale, after which a Zero has to be done.



2-EXAMPLE A:

-Initial value was 2774W.

-After tweaking the new value is 2635W.

-The bargraph shows the direction of tuning and a 5% drop (-) of power.



EXAMPLE B:

-A better tuning has been done and value is now 2996W

- The bargraph shows the direction of tuning and an 8% increase of power

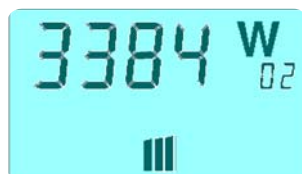


EXAMPLE C:

-Tuning has increased the power level to above 12% (19% on the example): the bargraph is at its limit. It is necessary to reset.



3- Shortly push the T/P key to Zero both bar and % value.



Tuning may continue as described above.



4- To sort the Tuning Function and return to Power Measurement Mode, simply press the T/P key for >2 sec.

The bar, will again show the head temperature (if this function is activated).

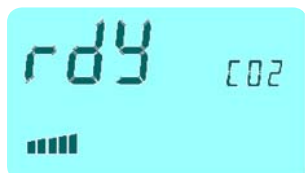
## 5.4-Energy Measurement Mode

The GALAXY monitor allows the measurement of single shot energies , function available on most of thermal heads manufactured by Laser SOS .



1 – Follow the procedures 1 to 7 as described in section 5.1

The Energy Mode will be enabled by pushing the E button (Fig1.-Pos 7)



2 – Press the Zero button (Fig.1 Pos 6) and arm the meter . A “READY” (rdy) message appears and the led (Fig1-Pos 4) lights as steady green .



3 –When an incoming signal overtakes a preset threshold, a “TRIGGERED” (tr'd) message is displayed and the led (Fig1-Pos 4) lights as flashing green. Thresholds are specific for each head model and typically are set at 2% of the head full scale.



4 – The measured value appears preceded by J (Joule), the energy measurement unit .

The led (Fig1-Pos 4) shifts from green to steady red, to show that the head is reaching its thermal equilibrium; during this period any further measurement is inhibited.

The inhibition period is specific for each head and is safely set to be 3-4 times the head intrinsic response time : it can last up to several seconds .

– As soon as the led (Fig1-Pos 4) turns to green, the unit is ready to accept another laser pulse.

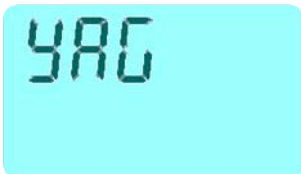
Press the E key again to return to power.

## 5.5-Fit Measurement Mode

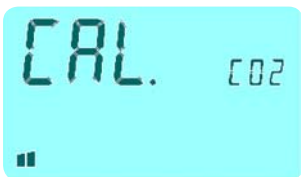


1-Follow the procedures 1 to 5 of Section 5.1

The GALAXY will automatically recognize that its working mode is Fit



2- After the wavelength has been confirmed, the FIT logo appears on the screen.



3-To carry on the first or any successive measurement, press and release the Zero key to make an automatic zeroing. The LCD displays “CAL” and the Led turns to steady green .  
The GALAXY is now armed and both the FIT logo and green led will blink.



4- Center the probe to the laser path and start measurements by opening the laser shutter.  
Take care that only the sensor surface intercepts the laser beam.



5- Measurement will start automatically, shown by a 4 sec. count down and displayed on the LCD by “Run ”; the LED blinks green . At the same time, the bar graph scales up showing the temperature increase in the sensor head, if appreciable.



6 - The measurement is over when the Led turns into steady red. Remove the probe from the laser beam: the display shows the measured power, and the remaining thermal capacity.

If the bar graph is below full scale, more measurements can be carried out before cooling the sensor head.

The next measurement can be executed after the Led automatically shuts off (approx. 5 to 25 sec, depending on the head). To perform a new measurement go back to pos 6.

## WARNING MESSAGES



2 –Should the measurement head reach its limit temperature, the LCD will show a COOL message , while the corresponding Led (Fig1-pos 4) turns into an intermittent red.

**IMMEDIATELY SWITCH OFF THE LASER OR CLOSE THE LASER SHUTTER!**

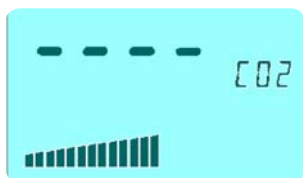
NOTE:

-If you are using a FIT head, use forced air or let the head cool down spontaneously.

**NEVER USE WATER OR OTHER LIQUIDS!**

-If you are using a head for power or energy measurement , this will mean a problem in the refrigerating circuit ( e.g.low water pressure, lack of fluid , obstructions) or at the heat exchange system for air cooled heads (e.g. fan, ambient Temp. , etc.)

Immediately spot and remove the causes.



3 – Should the head be exposed to levels exceeding its allowable full scale, the LCD will then show four short bars, indicating an overflow, rather than the standard numerical value.



4 - When the head is not properly connected, the LCD displays a “HEAD” warning message ; in this case check whether the connector is properly matched.

The GALAXY automatically switches off after 10 sec.



1 . Battery life is 250hours in condition of normal use . A “LOW BATTERY”. warning signal appears on the LCD display as a flashing battery :30-50 hours of residual use are available before the battery definitely dies.



## MAINTENANCE AND SERVICE

### 7.1-Battery Change

When changing the batteries, respect the polarity: inverting batteries will definitely damage the instrument.

### 7.2-On line servicing

For any urgent question on the instrument you may apply at [sales@lasersos.com](mailto:sales@lasersos.com)

### 7.3>Returns for Calibrations and Repair

Prior to shipment:

1-Ask directly to Laser SOS or one of his Distributors for the RMA (Return Material Authorization) Number. This will be issued and quotation will follow immediately after the receipt of material in Laser SOS .

2-Report: -Model Number -Serial Number -Purchase Order Number and date

-Shortly describe encountered problems (if any)

3-Deliver to (shipping and insurance prepaid): Laser SOS, Unit 3, Burrell Road, St. Ives, Cambs, PE27 3LE, UK

Return time: Time to calibrate instruments normally occurs within 10 working days after receipt . A faster service is available at an additional charge (please ask)

# WARRANTY

The GALAXY Laser Power/Energy Monitor is delivered with a one-year (1) warranty from date of shipment.

Warranty applies against material and/or workmanship defects, when the GALAXY has been properly installed, maintained and is used under normal operating conditions; the warranty does not cover damages related to accident or misuse. The warranty does not cover any damage due to battery leakage or misuse.

During the warranty period Laser SOS srl will repair or, at his option, replace any GALAXY monitor that proves to be defective provided the parts are returned to Laser SOS customer service facility or another facility authorized by Laser SOS.

Any attempt by an unauthorized person to alter or repair the product voids the warranty.

No other expressed warranty is given by Laser SOS.

In case of system malfunctioning or failure, contact Laser SOS directly or its local distributor to obtain a Return Authorization Number (RMA). This number must be reported on the outside of the shipping container.

The material should be returned to, transportation and insurance prepaid:

## LASER SOS GROUP

Unit 3, Burrell Road,  
St. Ives,  
Cambs,  
PE27 3LE,  
United Kingdom

TEL: +44 (0) 1480 460990

FAX: +44 (0) 1480 469978

EMAIL [sales@lasersos.com](mailto:sales@lasersos.com)

WEB: [www.lasersos.com](http://www.lasersos.com)

Laser SOS assumes no risk for damages occurred in transit.

## 8.1-Limited Liability

Prior to returning any unit, please provide a description of failure or encountered problems and consult the Service Dept. at Laser SOS to avoid unnecessary shipments.

Laser SOS will, at his option, repair or replace all defective parts without charge; however if Laser SOS determines that failure was caused by misuse, alterations, accident or abnormal condition of operation or handling, Customer will be billed for the repair and the repaired product will be afterwards returned , transportation and insurance prepaid.

# DECLARATION OF CONFORMITY

Application of Council Directive(s) : 89/336/EEC The EMC Directive  
73/23/EEC Low Voltage Directive

Type of Equipment: Laser Power/Energy Meter  
Model No.: GALAXY  
Year of test & manufacture: 2003

Standard(s) to which Conformity is Declared:

EN 50081-1:1992 Emission generic standard - Part 1: Residential, commercial and light industrial  
EN 50082-2:1995 Immunity generic standard - Part 1: Industrial

Standard	Description	Performance Criteria
EN 55022:1994 amendment 1: 1995 amendment 2: 1997	Limits and methods of measurement of radio interference characteristics of information technology equipment	Class B
EN 61000-4-2:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4.2: Electrostatic discharge.	Class B
EN 61000-4-4:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4: Electrical fast transient/burst immunity.	Class B

I the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Date : 4.12.03

# EUROPEAN UNION WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE 2002/96/EC

## NOTICE TO EUROPEAN UNION CUSTOMERS:

The European Parliament will enforce new Directives in 2006 concerning the disposal of electrical and electronic equipment such as the Monitoring and Control Instruments.

The regulations place responsibilities on the instruments supplier and the purchaser/user.

One of the actions required by suppliers is to inform users of their obligations.

The present instrument has been assessed in accordance with the European Parliament Directive 2002/96/EC on Waste Electrical and Electronic Equipment, usually referred to as the WEEE Directive.

The WEEE Directive requires that the instrument is disposed of at the end of its useful life in an environmentally responsible manner. Parts and materials that can be re-used and/or re-cycled have been identified in order that the use of new resources and the amount of waste going for landfill can be minimised.

The WEEE Directive requires that if you are replacing the instrument with a new equivalent product from the original supplier, then that supplier can collect the old item without cost to yourself. It is emphasised that this no-cost return option is only available when you purchase a new product of equivalent type that fulfils the same function. Please inform your supplier of your wish to have the old instrument collected when ordering the replacement.

If you wish to dispose of the instrument without replacing it then the appliance must not be mixed with unsorted municipal waste. The crossed-out wheeled bin symbol on the unit label or unit packaging, as shown in the table below, indicates this requirement.

You must ensure that the instrument is disposed of at an authorised treatment facility; details can be obtained from your local council.

Your rôle is critical and will help to ensure that the Earth's resources are maintained and that as much re-usable and re-cyclable material as possible is processed. It will also ensure that landfill volume requirements are kept at a minimum and that hazardous materials are not buried thereby providing potential future problems for the environment and human health.



### WHEELED BIN SYMBOL AND DESCRIPTION

The symbol apply to all Laser SOS electronic products placed on the European Market after August 13, 2005.

Laser SOS will affix the wheeled bin symbol with a bar to appropriate products. The bar indicates that the product was placed on the market after August 13, 2005.

The WEEE Directive comes into force in January 2006.



## *LASER S.O.S. GROUP*

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**W:** [www.lasersos.com](http://www.lasersos.com)

**A world class service from a world class company**