



USER MANUAL

U-LINK | PC Interface for power and energy detectors

WARRANTY

All Gentec-EO products carry a one-year warranty from the date of shipment on material or workmanship defects when used under normal operating conditions.

Gentec-EO will repair or replace, at its sole discretion, any product that proves to be defective during the warranty period.

The warranty does not cover damages caused by product misuse, product modifications, accidents, abnormal operating or handling conditions, or third-party battery leakage. Any attempt by an unauthorized person to alter or repair the product voids the warranty. Gentec-EO is not liable for consequential damages of any kind.

CLAIMS

For warranty service, please contact your Gentec-EO representative or fill out an RMA request:

<https://www.gentec-eo.com/contact-us/support-rma-request>

To help us answer your request more efficiently, please have your product serial number ready before contacting customer support.

Upon receipt of return authorization, ship the product according to the RMA instructions. Do not ship items without a return authorization. Transport is at the customer's expense, in both directions, unless the product has been received damaged or non-functional. Gentec-EO assumes no responsibility for the damage caused in transit.

SAFETY INFORMATION

Do not use a Gentec-EO device if the monitor or the detector looks damaged or if you suspect that the device is not operating properly.

Appropriate installation must be done for water-cooled and fan-cooled detectors. Refer to the specific instructions for more information. Wait a few minutes before handling the detectors after they are powered up. The surfaces of the detectors get very hot, and there is a risk of injury if they have not cooled.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference by taking one or more of the following steps:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet that is on a different circuit than the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved in writing by Gentec-EO Inc. may void the user's authority to operate this equipment.

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1. U-LINK SINGLE-CHANNEL LASER POWER AND ENERGY METER

1.1. INCLUDED WITH YOUR U-LINK

The following items are included with U-LINK (USB):

Description	Part name	Part number
U-LINK (USB) PC interface	U-LINK (USB)	203510
1.8 m USB-mini cable	MAE-USB	202372
Calibration certificate		

The following items are included with U-LINK (RS-232):

Description	Part name	Part number
U-LINK (RS-232) PC interface	U-LINK (RS-232)	203994
1.8 m RS-232 cable (DB9 female connector)	MAE-RS-232	201860
9V power supply and regional AC cable	MON-9V	200960
Calibration certificate		

The following items can be purchased separately:

Description	Part name	Part number
Analog output cable for U-LINK	MAE-ANALOG	201958
External trigger cable for U-LINK (USB)	MAE-TRIG	201956
Sync-out cable for U-LINK (USB)	ULK-SYNC	205117

1.2. INTRODUCTION

The U-LINK is a microprocessor-based power and energy interface that uses the latest technology to provide a multitude of options in a user-friendly environment. It is a complete power and energy PC interface, which can provide a statistical analysis of your measurements. Moreover, it can be updated over the Internet by connecting the USB or RS-232 port to a personal computer.

The U-LINK (USB) and RS-232 versions have enhanced communication capabilities that take advantage of the USB or RS-232 port for data acquisition and remote control depending on the U-LINK version. It can transfer data to a PC for more sophisticated data analysis and respond to commands through the communication interface.

Easy software upgrade

Take advantage of the latest improvements of our user-friendly software. You can download the latest software version anytime from our website www.gentec-eo.com and install it on your PC.

1.3. SPECIFICATIONS

The following specifications are based on a one-year calibration cycle, an operating temperature of 18 °C to 28 °C (64 °F to 82 °F) and a relative humidity not exceeding 80%.

Table 1. Table of specifications

		U-LINK	
		USB	RS-232
Power meter specifications			
Compatible heads	XLP series, HP series, UP series, PH series, UM series, THz-D series		
Power range	4 pW to 100 kW		
Power scales ¹ (PH series photodetectors)	300 pW, 10 nW, 30 nW, 100 nW, 300 nW, 1 μW, 3 μW, 10 μW, 30 μW, 100 μW, 300 μW, 1 mW, 3 mW, 10 mW, 30 mW, 100 mW, 300 mW, 1 W, 3 W		
Power scales ¹ (UP, HP, XLP thermal detectors)	300 uW, 1 mW, 3 mW, 10 mW, 30 mW, 100 mW, 300 mW, 1 W, 3 W, 10 W, 30 W, 100 W, 300 W, 1 kW, 3 kW, 10 kW, 30 kW, 100 kW		
Power scales ¹ (UM-B series pyroelectric detectors)	100 μW, 300 μW, 1 mW, 3 mW, 10 mW, 30 mW, 100 mW, 300 mW		
Resolution (digital)	Selected scale / 8388608 (power mode) Selected scale / 3754 (energy mode, pyroelectric power mode)		
Monitor accuracy ²	± 0.5% ± 3 μV from 20% to full scale		
Data transfer rate ³	15 Hz at 24-bit resolution 10 Hz at 12-bit resolution (pyroelectric detectors) 10 Hz (THz-B V2) One reading per pulse (energy mode)		
Statistics	Current value, maximum, minimum, average, standard deviation, RMS stability, PTP stability		
Data storage	Continuous on PC hard drive		
Analog output update delay ⁴	600 ms		
Energy meter specifications			
Compatible heads	QE series, UP and XLP in energy mode, PE series, calorimeters		
Energy range	2 fJ to 30 kJ		
Energy scales ¹ (PE series photodetectors)	300 fJ, 1 pJ, 3 pJ, 10 pJ, 30 pJ, 300 pJ, 1 nJ, 3 nJ, 10 nJ, 30 nJ, 100 nJ, 300 nJ, 1 μJ, 3 μJ, 10 μJ, 30 μJ, 100 μJ, 300 μJ, 1 mJ, 3 mJ, 10 mJ, 30 mJ		
Energy scales ¹ (QE, UP thermal detectors)	10 μJ, 300 μJ, 3 mJ, 10 mJ, 30 mJ, 100 mJ, 300 mJ, 1 J, 3 J, 10 J, 30 J, 100 J, 300 J, 1 kJ, 3 kJ, 10 kJ, 30 kJ		
Resolution (digital)	Selected scale / 3754		

¹ Varies with detector head.

² Voltage bias can introduce an error into low power measurements with low sensitivity detectors. It is essential to use the zero offset to re-zero the U-LINK before making a measurement in these conditions. It is always good practice to use the zero offset.

³ This is PC dependent. The host PC must be fast enough to receive and process incoming data. Recommended: Intel Duo Core processor with a 2.4-GHz clock speed or better.

⁴ Analog output update time following a new measurement. Typical value. Hardware and firmware dependent. Takes into account the delay used by the monitor to interpret the measurement and update the analog output.

	U-LINK	
	USB	RS-232
Accuracy ⁵	1.0% ± 50 µV < 500 Hz 2.0% ± 50 µV 500 Hz to 10 kHz	
Default trigger level	2%	
Software trigger level	0.1% to 99%, 0.1% resolution	
Data transfer rate ³	10k Hz maximum 2.5 kHz ASCII mode	1 kHz maximum 500 Hz ASCII mode
Frequency measurement	0.1 to 1000 Hz: 2% ± 0.1 Hz 1000 to 10000 Hz: 5% ± 1 Hz	
Statistics	Current value, maximum, minimum, average, standard deviation, RMS stability, PTP stability, number of pulses, repetition rate, average power	
Data storage	Continuous on PC hard drive	
Analog output update delay ⁴	350 µs	
PC software specifications		
Display rate	3 Hz numeric display 3 Hz bar graph display and needle display 3 Hz in real-time mode 15 Hz in graph mode	
Data displays	Real time, scope, averaging, statistics, digital tuning needle, histogram, setup	
General specifications		
User input correction factors	One multiplier and one offset (seven-digit floating point)	
Analog output	0 – 2.0 V user-defined, full scale, ± 1% of measurement, ± 5 mV	
Analog output refresh rate ⁶	50 Hz	
External trigger	3.3 V up to 12 V DC signal Non-isolated	
External trigger pulse width	1 µs minimum	
External trigger timing requirements	See below	
Internet upgrades	USB	RS-232
PC serial commands	USB	RS-232
Dimensions (without stand)	91 (L) x 57 (W) x 26 max (H) mm	
Weight	101 g	105 g
Power supply	USB 5V 150 mA	9-12 VDC 200 mA

Note: Specifications are subject to change without notice

⁵ Including linearity.

⁶ Typical value. Hardware and firmware dependent. Contact your nearest Gentec-EO agent for more information.

1.3.1. External trigger timing requirements

The beginning of the external trigger signal must arrive in a time window relative to the beginning of the laser pulse. This window begins 20% of the rise time before the laser pulse and ends one rise time after the beginning of the pulse minus the minimum trigger pulse width.

Example for QE12LP-H-MB detector head:

- The following value is found in the detector head user manual
- Signal rise time = 550 μ sec
- 20% of rise time = 550 X 20% = 110 μ sec
- Rise time minus minimum trigger pulse width = 550 - 1 = 549 μ sec

Therefore, the acceptable window for the beginning of the external trigger pulse is from 110 μ sec before the laser pulse begins to 549 μ sec after the laser pulse begins. Incorrect energy measurements may result if the trigger pulse occurs outside of this window.

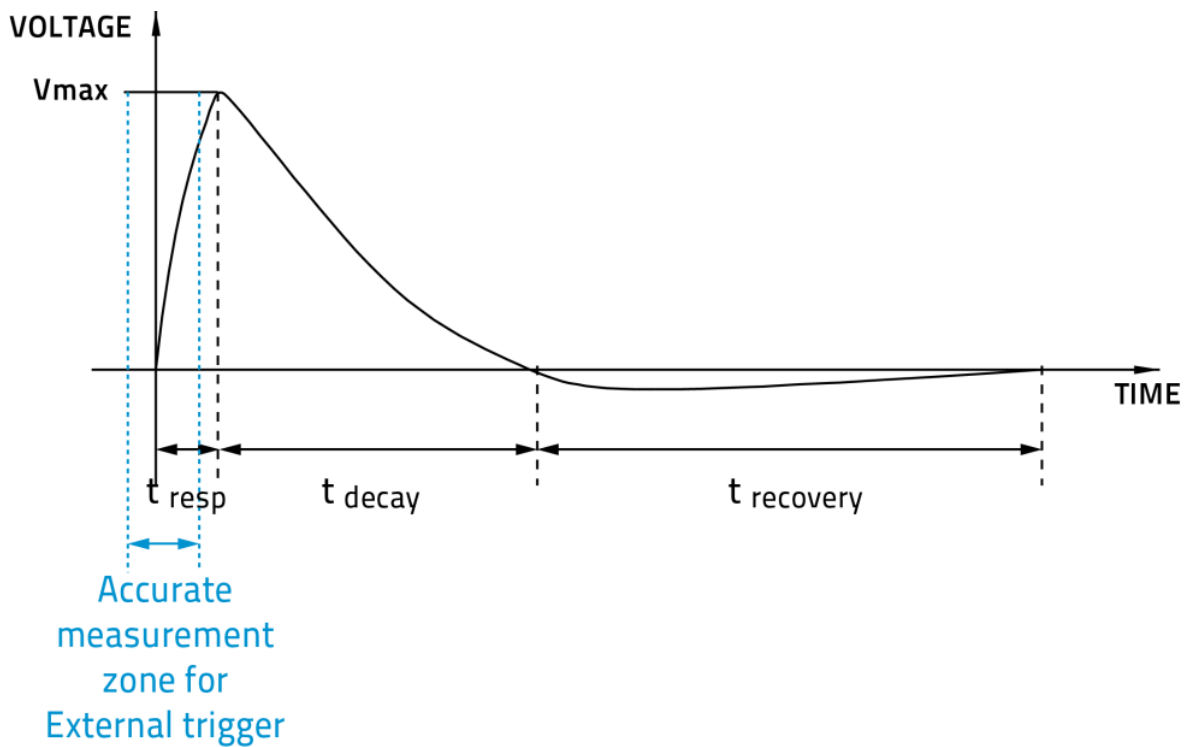


Figure 1. Valid external trigger window

1.4. CONNECTIONS



Figure 2. U-LINK (USB) front panel

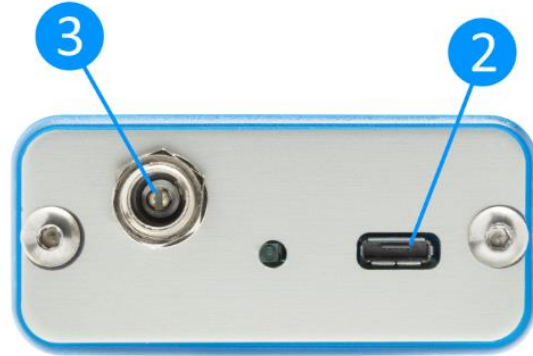


Figure 3. U-LINK (RS-232) front panel

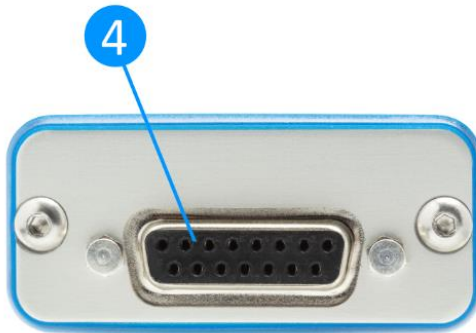


Figure 4. U-LINK (USB) and U-LINK (RS-232) rear panel

1 USB communication and power

The U-LINK (USB) allows remote control and data transfer between the U-LINK and a computer that has a USB communication port. The U-LINK is also powered via this port on the USB model.

2 Multi-function port

The features available on this port vary depending on the U-LINK model.

Table 2. Multi-function port feature availability

	USB	RS-232
Analog Output	Available	Available
RS232	Not available	Available
Trigger Input	Available	Not available
Sync Output	Available	Not available

This connector is a Micro-USB AB receptacle. To create your own adapter cable, a standard Micro-USB A or Micro-USB B connector can be used. If the cable conforms to the USB specification, use the table below:

Table 3. Multi-function port cable assignment

	USB wire colour
Analog output	Red
Trigger input / RS-232 RX	Green
Sync output / RS-232 TX	White
Ground	Black and shield

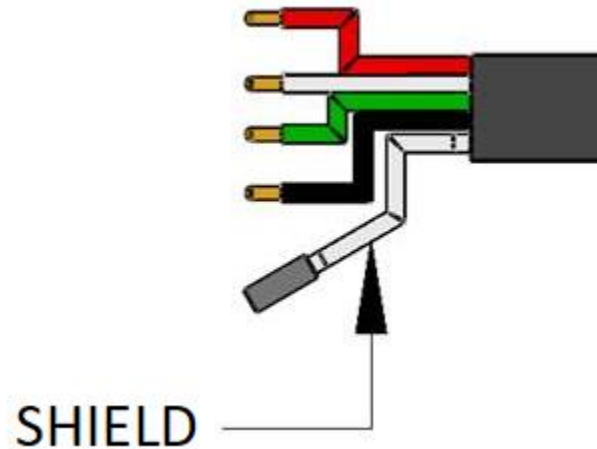


Figure 5. USB cable wire diagram

Analog output

For monitoring laser average power or energy by using external equipment such as a chart recorder, a computer with an analog interface, a voltmeter, etc., use this port with Gentec-EO part number 201958 MAE-ANALOG for this feature.

The output signal represents a DC analog voltage proportional to the amplified and anticipated power detector response in the case of a power measurement. In the case of an energy measurement, the output signal is a DC voltage representing the pulse energy value.

The user must enter the maximum output voltage and the maximum power/energy scale in the PC-Gentec-EO software or via serial commands. The measured power or energy is then scaled to the output voltage and to the selected range according to the following equation:

$$\text{Output} = (\text{measurement} \times \text{maximum output voltage}) / \text{maximum analog output range}$$

For example, with a 10 W maximum analog range and 2.0 V maximum output voltage:

2.0 V corresponds to 10 W

1.0 V corresponds to 5 W

Another useful example: To set the analog output so that 1 V corresponds to a measurement of 56 W, with a maximum output voltage of 2 V, the maximum analog output range must be set to 112 W according to the following equation:

$$\text{Maximum analog output range} = 56 \times 2.0 = 112$$

Specifications on the analog output:

Maximum output voltage: 2.0 V

Connector type: Female BNC

Full-scale accuracy: 1% of measured value

The analog output should be used with a high-impedance load.

RS-232

The U-LINK (RS-232) allows remote control and data transfer between the U-LINK and a computer, a terminal, or any device that has a serial communication port. Replacement RS-232 adapter cables can be ordered using the Gentec-EO part number 201860 MAE-RS232. Do not use an RS-232 adapter with a U-LINK (USB).

Table 4. RS-232 U-LINK cable pin-out

Pin number	Signal
1	No connection
2	TX
3	RX
4	No connection
5	Signal GND
6	Do not connect (reserved)
7	No connection
8	No connection
9	No connection

TX: data transmitted from the U-LINK (output)

RX: serial commands received by the U-LINK (input)

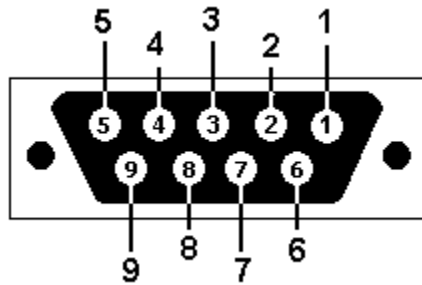


Figure 6. DB9 - view looking into female connectors on RS-232 U-LINK cable

Trigger input

The U-LINK (USB) allows connection to an external trigger input for energy measurements. Use Gentec-EO part number 201956 MAE-TRIG, which has a male BNC connector, for this input. Refer to section 1.3.1. External trigger timing requirements for timing requirements.

Sync output

The U-LINK (USB) can trigger another U-LINK (USB) via its sync output. Use Gentec-EO part number 205117 ULK-SYNC and a BNC cable to connect two U-LINKs together. The U-LINK with the sync output enabled must be in self-triggered energy mode. When it detects an energy pulse, it will send a signal via its sync output connection to the other U-LINK in external triggered energy mode, starting a measurement on the other U-LINK. The sync output signal should only be connected to the external trigger input of another Gentec-EO U-LINK energy monitor.

3 External power supply input jack

Input voltage required: 9-12 VDC/200 mA.

Note: The external power supply input is provided only for the U-LINK with the RS-232 serial connection option.



Permanent damage may occur to the device if an external power supply other than the GENTEC-EO 200130, 200960, SPU15A-105 or SPU15A-104 is used. Please call GENTEC-EO or your local distributor if extra power supplies are needed for a particular setup.

4 Detector head input jack

The U-LINK uses a DB-15 female connector to mate with the detector heads (probes).

The U-LINK works with all Gentec-EO power and energy detectors that have this DB-15 connector, except certain, older THz-D models with an incompatible DB-15 head. It automatically recognizes every power or energy detector head, which ensures accurate auto-calibration. More importantly, it can take advantage of our Personal Wavelength Correction certificate. It reads the memory in the smart interface connector (version 5 and higher) to provide a wavelength correction that is based on spectral data measured from that specific detector.

The U-LINK may not recognize some of the earlier heads.



This DB-15 connector, though similar to that of the former TPM-310 and TPM-330 monitors, is incompatible with the power detector heads of PS-310 series version 1 and PS-330 series version 1. These heads used a different technology and do not have the same pin-out configuration.

The Gentec C-300 adapter can be used to connect the power detector heads of PS-310 series and PS-330 series versions 1 and 2. Please contact your local Gentec-EO distributor or the nearest Gentec-EO office for further information. Any attempt to modify connectors of the early version heads to mate with the U-LINK can result in damage to the device.

2. OPERATING INSTRUCTIONS

First, install the PC-Gentec-EO software on your computer, along with the USB drivers. Please find the latest version on our website at <https://www.gentec-eo.com/resources/download-center>. The software will list the attached Gentec-EO devices available to connect. As soon as you are connected, you are ready to adjust the settings (please refer to the PC-Gentec-EO manual).

2.1. INSTALLING THE USB DRIVER

Plug the U-LINK into a USB port on the PC. If the PC supports USB 1.1, Windows detects the new device and prompts you for the software drivers. A window will open that says "Found New Hardware – USB Device" and after a few moments, the "Found New Hardware Wizard" will appear.

The USB drivers are available on our website at <https://www.gentec-eo.com/resources/download-center>.

At the end of this process, a new serial COM port will be added to the list of communication ports. It may be used as any other serial port. The COM port will then be listed in the PC-Gentec-EO software.

Verify COM port

To verify the USB installation and find the COM port number, open the device manager and scroll down to ports (COM & LPT) and double click that line. One of the options should be:

USB-to-serial port (COM#)

Note the COM port number, you will need it for the next step.

2.2. QUICK MEASUREMENT PROCEDURE

This section will show you how to make a laser power or energy measurement with U-LINK and a Gentec-EO power or energy detector.

U-LINK automatically recognizes all the Gentec-EO power heads and energy heads of version 5 or higher. All customized technical data required for optimum operation of the detector will be automatically downloaded from the EEPROM in the DB-15 connector. These data include all the necessary head parameters such as sensitivity, model, serial number, version, wavelength correction factors, time response and others. U-LINK does not support energy detectors before version 5.

Quick power and energy measurement procedure:

1. Install the PC-Gentec-EO software on your PC. Install also the U-LINK drivers.
2. Install the power or energy detector head on its optical stand.
3. First, slide the connector latch to the right to unlock the connector.
4. Connect a compatible power or energy detector head to the U-LINK using the probe input jack (see Section 1.4 Connections). The U-LINK allows hot-swapping between heads.
5. Slide the latch to the left to lock the connector into place.
6. Connect U-LINK to your computer via USB.
7. Start the PC-Gentec-EO software. Click the connect button in the top left corner and select your U-LINK from the list of devices that appear.
8. Power heads will default to power measurement. Energy heads will default to energy measurement. The display will default to a dual display in real-time and scope in auto range mode. Remove the head's protective cover and start the laser.
9. Put the detector head into the laser beam path. Leave it there for a few minutes until the detector has reached an equilibrium temperature. The entire laser beam must be within the sensor aperture. Do not exceed maximum specified densities, energies, or powers. For the most accurate measurement, spread the beam across 60% to 80% of the sensor area.

Power heads can be used with both CW and pulsed lasers.

Energy heads can only be used with pulsed lasers.

Adjusting the zero (step 10-A for power heads and 10-B for photodiode heads).

1. The power read by the U-LINK when no laser beam is incident on the detector may not be exactly zero. For power measurements, this is because the detector is not thermally stabilized or there is a heat source in the field of view of the detector. For photodiode measures, zeroing will remove the detector's offset.
 - a. Block off laser radiation to the detector. To reset the zero, wait until the reading has stabilized and click zero in the toolbar ribbon. The zero will be taken for all scales in auto scale mode or for the current scale if you have selected a scale.
 - b. If you have connected a photodiode to U-LINK, you must cover the diode. Click zero in the toolbar ribbon, and the zero offset will be taken for all scales.

Notes:

- Refer to specific power detector documentation for complete installation and operating instructions.
 - Power detectors are thermal sensors and are thus sensitive to temperature variations.
 - For high-precision measurements, it is recommended to:
 - Allow the power detector temperature to stabilize before zeroing.
 - Touch only the stand when handling the power detector. Do not touch the detector head.
 - Do not zero energy detectors, such as the QE series.
 - Avoid forced airflow or drafts around the detector.
2. Apply the laser beam to the detector head.
 3. The laser beam average power or energy can be displayed in several ways for your convenience:
 - a. Digitally for real-time measurements.
 - b. On a scope graph to evaluate the laser's variations in time.
 - c. On a digitally produced analog display using a needle for easy visualization of the laser beam power variation during laser fine-tuning.
 - d. Averaged over a certain number of measurements.
 - e. Complete statistical results over a certain period of time.

3. USER INTERFACE

Please refer to the PC-Gentec-EO manual for more information concerning the user interface. The manual can be downloaded on our website at <https://www.gentec-eo.com/resources/download-center>.

4. SERIAL COMMUNICATION

4.1. DESCRIPTION

The U-LINK has two main communication modes: binary mode for fast data acquisition and ASCII mode for human-readable output. Both modes require text input commands which must follow the rules stated in this section.

The USB class used by U-LINK (USB) is a CDC or communications device class. This means it shows up in the host PC as a COM port, but it is not a COM port, rather a true full-speed USB port or Virtual Com Port (VCP). You can talk to it as if it were an RS-232 port and take advantage of faster speeds offered by USB. Follow the Windows prompts (if necessary) to install the USB drivers. The USB drivers are fully tested and digitally signed by Microsoft.

Open the appropriate port in your software with standard COM port tools. None of the port settings matter with a VCP, so leave them at whatever default they are in. It is a real USB connection.

The U-LINK (RS-232) features a typical RS-232 port, and port settings do have an effect. Be sure to use the correct settings, indicated later in this section.

4.2. SETTING UP COMMUNICATION WITH THE U-LINK

Connect the monitor

Use your favorite serial terminal emulator to connect to the COM port. Some example serial terminal programs are:

- CoolTerm: <https://freeware.the-meiers.org/>
- PuTTY: <http://www.putty.org/>
- RealTerm: <https://realterm.sourceforge.io/>

If you need to know the COM port number, you can find it in the Windows device manager.

For U-LINK RS-232, use the following communication parameter settings:

Bits per second	115,200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

To echo commands

The commands you type will not appear in the terminal window unless you set up the terminal emulator to do so. Only the response from the monitor will be displayed. If you prefer to see the commands you are typing, enable "Local Echo" or the equivalent setting.

Test the connection

In the terminal window, type *VER. If the response you receive tells you the version of your MAESTRO, you are successfully connected and ready for serial command action.

4.3. SERIAL COMMAND FORMAT

Commands are sent as text strings. The response will either be data or an empty string.

All text commands must begin with a trigger character (*). You do not need to end with a line feed or a carriage return. Parameters must NOT be separated by spaces. Characters do not have to be capitalized, mixed upper and lower cases are OK. Replies to all text mode commands are also in text mode and end with a carriage return and a line feed.

In case of an error, the reply string is one of the following:

"Command Error. Command not recognized."

or

"Command Error. Command must start with '*'."

Because all text mode replies end with a carriage return <CR> or line feed <LF> (or both), a text reply contains tabulations when many elements need to be separated in the string. This is useful when exporting data to a spreadsheet.

4.4. BINARY MODE OUTPUT FORMAT

The U-LINK's resolution is 12 bits for the joulemeter mode. To keep compatibility with other Gentec-EO monitors, a 14-bit value is sent, but the two LSB of the low byte are nonsignificant.

Only the joulemeters support the binary mode. Thermopiles in energy mode, thermal heads in standard mode, and photodetectors output only in ASCII.

By default, the joulemeters are in ASCII mode. To turn on the binary mode, send the command *SS11. Please refer to the serial command section for more information.

All commands are valid in binary mode and are sent as text strings as well. Only the commands *CAU, *CVU, *CEU, and *CTU will return binary results. All other commands will reply in ASCII.

Examples to Decode Binary Commands

Decoding *CAU or *CVU

If you send *CAU, U-LINK will send continuous data with 2 bytes per pulse.

If you send *CVU, U-LINK will send the current measurement with 2 bytes per pulse.

Bit 7 of each byte is the order bit, and the rest is the binary data. If the order bit is 0, the byte is the high byte (MSB). If the order bit is 1, the byte is the low byte (LSB). You must then mask out the order bit, shift the MSB, add the two bytes, and apply scaling. See the example below.

The 2 bytes are decoded as follows:

High byte: 0XXX XXXX in binary

0 indicates this is the high byte, and X is the upper binary data. If the measurement is over-range, this byte is 0xFE.

Low byte: 1XXX XYYY in binary

1 indicates this is the low byte, X is the lower binary data, and Y is nonsignificant data. Y will always be 0 for measurement data. If the measurement is over-range, this byte is 0x7F.

Example 1: Using *CAU or *CVU

U-LINK is measuring 151 mJ in a 300 mJ scale. The data sent by U-LINK will be: 0x40B4.

Decode this as follows.

1. Look at bit 7 of each byte to determine the high and low bytes.
2. Keep bits 0 to 6 of each byte (logical AND with 0x7F).
3. Shift the high byte left by 7 bits (multiply by 128 as a 16-bit value).
4. Add the high and low bytes (logical 16-bit OR).
5. Switching to floating point, divide the result by the full-scale value, 16382.
6. Multiply the result by the set scale, 300 mJ.

The two data bytes are 0x40 and 0xB4. In binary, they are: 0100 0000 and 1011 0100.

The order bit is 0 for the high byte and 1 for the low byte. The high byte is, therefore, 0x40, and the low byte is 0xB4.

The data is the lower 7 bits of each byte or high byte of 0x40 and low byte of 0x34.

Shifting the high byte by 7 results in $0x40 \times 128 = 0x2000$.

Adding this value to the low byte results in 0x2034 or 8244 in decimal.

Dividing by the full-scale value "300 mJ / 16382", we get: $(8244 / 16382) \times 300 \text{ mJ} = 151 \text{ mJ}$.

If the value of these bytes is 0xFE7F, an out-of-scale condition exists.

Decoding *CEU or *CTU

If you send *CEU or *CTU U-LINK will send data with 9 bytes per pulse.

The nine bytes are decoded as follows:

- | | |
|--------|---|
| Byte 8 | Always 0x02, which is ASCII STX. Lets the host know this is the start of data. |
| Byte 7 | The scale index, OR'd with 0x80. This is done so that it can never be the STX or ETX byte. If the scale was set to 29, then this byte would be hex (29) = 0x1D. OR this with 0x80 and the value sent is 0x9D. |
| Byte 6 | The upper 7 data bits of the energy, OR'd with 0x80. If the pulse is over range, this byte is 0xFE. |
| Byte 5 | The lower 7 data bits of the energy, OR'd with 0x80. If the pulse is over range, this byte is 0x7F. |
| Byte 4 | The upper 7 bits of the pulse period timer OR'd with 0x80 (28 bits total). |
| Byte 3 | The next 7 bits of the pulse period timer OR'd with 0x80 (28 bits total). |
| Byte 2 | The next 7 bits of the pulse period timer OR'd with 0x80 (28 bits total). |
| Byte 1 | The lower 7 bits of the pulse period timer OR'd with 0x80 (28 bits total). |
| Byte 0 | Always 0x03, which is ASCII ETX. Lets the host know this is the end of data. |

Examples to Decode Binary Commands

Example 2: Using *CEU and *CTU

U-LINK is measuring 151 mJ in a 300 mJ scale. The pulse frequency is 20 Hz. The data sent by U-LINK will be: 0x0297A0B681DBDAFC03.

Decode this as follows.

1. The valid data is between the 0x20 (Start of Text) and 0x03 (End of Text) codes.
2. Valid data is 0x97A0B681DBDAFC.
3. The first byte is the scale, OR'd with 0x80.
4. The second and third bytes are the data, each OR'd with 0x80.
5. The remaining 4 bytes are the pulse period counts, each OR'd with 0x80.

The scale byte is 0x97. Mask off bit 7 results in 0x17 or 23 in decimal. Refer to Table 7. Scale number 23 is 300 mJ.

The energy data bytes are 0xA0B6. If these bytes are 0xFE7F, an out-of-scale condition exists.

If no out-of-scale conditions exist, mask off bit 7 of each byte, then follow steps 3 to 6 of the procedure to decode *CAU readings.

The pulse period bytes are 0x81DBDAFC. Mask off bit 7 of each byte, shift and OR the bytes in order resulting in a 28-bit value, in this case 0x36ED7C, or 3599740 in decimal. The period timer is based on a 72 MHz clock, so the period is found as:

- $3599740 \text{ counts} / 72 \times 10^6 \text{ counts per second} = 49.9 \mu\text{s}$
- The pulse frequency will be $1 / 49.9 \mu\text{s} = 20 \text{ Hz}$

4.5. LIST OF SERIAL COMMANDS FOR THE U-LINK

Note: U-LINK also supports M-LINK and T-RAD legacy commands for software compatibility. Please refer to the user manuals for those products for a list of legacy serial commands.

Also note that the detector heads compatible with T-RAD cannot be used on the U-LINK. Only Version 2 THZ-B Series heads can be used with U-LINK. Any attempt to modify a detector head, cable or monitor, or use of a modified detector with a monitor, will void the warranty.

Table 5. Serial Commands

Command	Command Name	Description
DISPLAY		
*SCS	Set scale	Manually sets the scale and disables auto-scale selection
*SSU	Set scale up	Changes scale to the next higher scale
*SSD	Set scale down	Changes scale to the next lower scale
*GCR	Get current scale index	Returns the current scale index (between 0 and 41)
*SAS	Set auto-scale	Enables the auto-selection of the most appropriate scales
*GAS	Get auto-scale	Returns auto-scale status
*DVS	Display valid scale	Displays the valid scales for the connected head
*STL	Set trigger level	Sets the internal trigger level for pulse energy
*GTL	Get trigger level	Returns trigger level value
*GMD	Get measure mode display	Returns the current measure mode of the monitor
DATA ACQUISITION		
*CVU	Query current value	Gets the value currently in ASCII or binary
*CAU	Send continuous transmission of data	Sends the values in ASCII or binary to the serial port with the data sampling setting
*CEU	Send continuous value with frequency	Sends continuous value with frequency in ASCII or binary
*CTU	Send current value with frequency	Sends current value with frequency in ASCII or binary

Command	Command Name	Description
*CSU	Stop the CAU command	Stops the *CAU or *CEU output
*NVU	Query new value ready	Determine if new reading is available or not
*GRR	Get laser frequency	Sends the laser rep rate frequency in ASCII
*SS1	Set joulemeter data mode	Sets the joulemeter data mode: binary or ASCII
*GBM	Get joulemeter data mode	Returns the joulemeter data mode: binary or ASCII
*TIM	Set moving average window	Sets time window of moving average for power measurements
*QTM	Query moving average window	Returns time window of averaging for power measurements
SETUP		
*PWC	Set Personal Wavelength Correction in nm	Specifies the wavelength in nm
*PWM	Set Personal Wavelength Correction in microns	Specifies the wavelength in microns (for THZ heads only)
*GWL	Get wavelength	Returns the wavelength in nm
CONTROL		
*ANT	Set anticipation	Turns the anticipation on or off
*GAN	Get anticipation status	Returns the anticipation status
*AVG	Noise suppression	Applies the noise suppression algorithm
*SOU	Set zero offset	Zeroes the reading
*COU	Clear zero offset	Undoes the zeroing of the reading for a power detector
*GZO	Get zero offset	Returns the zero-offset status
*SDZ	Set diode zero offset	Zeroes the reading for all the scales for a photo detector
*MUL	Set user multiplier	Sets the multiplier value
*GUM	Get user multiplier	Returns the current multiplier value
*OFF	Set user offset	Sets the offset value
*GUO	Get user offset	Returns the current offset value
*SSE	Set single-shot energy mode	Sets the single-shot energy mode
*GSE	Query single-shot energy	Returns if SSE mode is enabled
*ATT	Set attenuator	Sets the attenuator
*GAT	Get attenuator	Returns the attenuator status
*ET	External trigger	Activates or deactivates the external trigger
*POL	Set external trigger polarity	Sets the polarity of the external trigger input
*SYN	Set sync output mode	Activates or deactivates the sync output for energy heads
*AOB	Set analog output scale	Sets the analog output maximum scale in joules or watts
*SFS	Set analog output voltage	Sets the analog output voltage maximum in volts
*TAU	Set LIA time constant	Sets the LIA time constant for THz-B detectors
*AOD	Set analog output dwell time	Sets the length of the analog output pulse
INSTRUMENT AND DETECTOR INFORMATION		
*BPS	Change baud rate	Sets the baud rate for RS-232
*VER	Query version	Gets firmware version of the monitor
*STS	Query status	Retrieves the detector information and monitor settings
*ST2	Query extended status	Returns the extended status table
*GSV	Query firmware version	Returns firmware version number
*IDN	Query instrument ID	Returns monitor type
*MLK	Set M-LINK command mode	Allows compatibility with M-LINK commands

All text commands must begin with a trigger character (*) and do not require a line feed or a carriage return. All parameters must NOT have a space between the command and the list of parameters, nor between the parameters themselves. The characters do not have to be uppercase, and mixed cases are OK. Replies to all text mode commands are also in text mode and end with a carriage return and line feed.

4.6. DETAILED DESCRIPTION OF THE SERIAL COMMANDS FOR U-LINK

4.6.1. Display

01 - Set Scale

This command is used to force the display of the current data into a specific scale. The minimum value of each scale is always zero. The maximum value of each scale can be found in the table below. The parameter must be one of the identifiers in the table below and have two digits. Sending this command will disable the auto-scale function if it is enabled.

Command	Parameters	Answer
SCS	Range index	None

Table 6. Measurement scale indexes

Index	Value	Index	Value
00	1 picowatt or picojoule	21	30 milliwatts or millijoules
01	3 picowatts or picojoules	22	100 milliwatts or millijoules
02	10 picowatts or picojoules	23	300 milliwatts or millijoules
03	30 picowatts or picojoules	24	1 watt or joule
04	100 picowatts or picojoules	25	3 watts or joules
05	300 picowatts or picojoules	26	10 watts or joules
06	1 nanowatt or nanojoule	27	30 watts or joules
07	3 nanowatts or nanojoules	28	100 watts or joules
08	10 nanowatts or nanojoules	29	300 watts or joules
09	30 nanowatts or nanojoules	30	1 kilowatt or kilojoule
10	100 nanowatts or nanojoules	31	3 kilowatts or kilojoules
11	300 nanowatts or nanojoules	32	10 kilowatts or kilojoules
12	1 microwatt or microjoule	33	30 kilowatts or kilojoules
13	3 microwatts or microjoules	34	100 kilowatts or kilojoules
14	10 microwatts or microjoules	35	300 kilowatts or kilojoules
15	30 microwatts or microjoules	36	1 megawatt or megajoule
16	100 microwatts or microjoules	37	3 megawatts or megajoules
17	300 microwatts or microjoules	38	10 megawatts or megajoules
18	1 milliwatt or millijoule	39	30 megawatts or megajoules
19	3 milliwatts or millijoules	40	100 megawatts or megajoules
20	10 milliwatts or millijoules	41	300 megawatts or megajoules

Default: Auto-scale selection



Example

The following example sets the scale to 3 nanowatts or nanojoules.

Command: *SCS07

Answer:

02 - Set scale up

This command is used to force the display of the current data into the next higher scale.

Command	Parameters	Answer
SSU	None	None

03 - Set scale down

This command is used to force the display of the current data into the next lower scale.

Command	Parameters	Answer
SSD	None	None

04 - Get current scale index

This command returns the scale index between 0 and 41. Please refer to the set scale command (SCS) details for the complete scale index table.

Command	Parameters	Answer
GCR	None	Index from 0 to 41

**Example**

Command: *GCR

Answer: Range: 10<CR><LF>

05 - Set auto-scale

This command is used to force the display into auto-scale.

Command	Parameters	Answer
SAS	1: on 0: off	None

Default: 1 (on)

06 - Get auto-scale

This command returns whether or not the auto-scale option is activated.

Command	Parameters	Answer
GAS	None	1: on 0: off

**Example**

Command: *GAS

Answer: AutoScale: 1<CR><LF>

07 - Display valid scale

This command is used to display all of the valid scales the connected head supports. The scales are displayed alongside their scale index. Please refer to the set scale section for the list of scales.

Command	Parameters	Answer
DVS	None	The list of valid scales

The following example is for a UP19K, which can have the following scales:

- 100 mW
- 300 mW
- 1 W
- 3 W
- 10 W
- 30 W
- 100 W

**Example**

Command: *DVS

Answer: [22]: 100.0 m<CR><LF>
 [23]: 300.0 m<CR><LF>
 [24]: 1.000<CR><LF>
 [25]: 3.000<CR><LF>
 [26]: 10.00<CR><LF>
 [27]: 30.00<CR><LF>
 [28]: 100.0<CR><LF>

08 - Set trigger level

This command sets the internal software trigger level when using the device in energy mode.

Command	Parameters	Answer
STL	Trigger level (in percentage) must be four characters	None

Default: 2%

The value should be set between 0.1 and 99.9.

**Example**

Command: *STL15.4 (15.4%)
 *STL00.2 (0.2%)

Answer:

09 - Get trigger level

This command returns the trigger level in %. The value is between 0.1% and 99.9%.

This is for joulemeters and wattmeters in energy mode only.

Command	Parameters	Answer
GTL	None	Returns the trigger level in %.

**Example**

Command: *GTL

Answer:
Trigger level: 2.0<CR><LF>

10 – Get measure mode display

This command returns the current measurement mode. Depending on the head, it can be power mode in W, energy mode in J or single shot energy mode in J (SSE).

Command	Parameters	Answer
GMD	None	Power = 0 Energy = 1 SSE = 2

**Example**

Command: *GMD

Answer: Mode: 0<CR><LF>

4.6.2. Data acquisition11 - Query current value

This command is used to query the value that is currently being displayed by the monitor. The value is displayed in watts or in joules. For joulemeters, the data can also be in binary format (refer to section 4.4).

If you send this command with an energy detector attached, but before a trigger event has occurred, it will return "No New Data Available".

Command	Parameters	Answer
CVU	None	Data in ASCII (scientific notation) or in binary format

**Examples**

For example, a 506.601 W reading and a -12.25631 mW reading would be displayed as shown below.

Command: *CVU

Answer: +5.066010e+02<CR><LF>

Command: *CVU

Answer: -1.225631e-02<CR><LF>

12 - Send continuous transmission of data

This command is used to send data to the serial port, according to the data sampling setting. For joulemeters, the data can also be in binary format (refer to section 4.4).

Command	Parameters	Answer
CAU	None	Data in ASCII (scientific notation) or in binary format



Examples

For example, with a wattmeter, a reading of around 500 milliwatts would be displayed like this until the command *CSU is sent.

```
Command: *CAU      Answer:  +5.066010e-01<CR><LF>
                          +5.066012e-01<CR><LF>
                          +5.066014e-01<CR><LF>
                          +5.066022e-01<CR><LF>
                          +5.066032e-01<CR><LF>
                          +5.066042e-01<CR><LF>
                          ...
```

With a joulemeter, a reading of around 500 millijoules would be displayed like this until the command *CSU is sent.

```
Command: *CAU      Answer:  +5.066010e-01<CR><LF>
                          +5.066012e-01<CR><LF>
                          +5.066014e-01<CR><LF>
                          +5.066022e-01<CR><LF>
                          +5.066032e-01<CR><LF>
                          ...
```

13 - Send continuous values with frequency

U-LINK will send continuous energy data and the pulse repetition rate in Hz. They are comma-separated. This is for joulemeters only. For joulemeters, the data can also be in binary format (refer to section 4.4).

Command	Parameters	Answer
CEU	None	Continuous value with pulse repetition rate in Hz in ASCII (scientific notation) or binary format



Example

This example is for a 32 Hz laser:

```
Command: *CEU      Answer:  +5.066010e-01,32.0<CR><LF>
                          +5.066012e-01,32.0<CR><LF>
                          +5.066015e-01,32.0<CR><LF>
                          +5.066021e-01,32.0<CR><LF>
                          ...
```

14 - Send current value with frequency

U-LINK will send the current measurement and the pulse repetition rate in Hz. They are comma-separated. This is for joulemeters only. For joulemeters, the data can also be in binary format (refer to section 4.4).

Command	Parameters	Answer
CTU	None	Current value with pulse repetition rate in Hz in ASCII (scientific notation) or binary format

**Example**

This example is for a 32 Hz laser:

Command: *CTU

Answer: +5.066010e-01,32.0<CR><LF>

15 - Stop the CAU or CEU command

This command is used to stop the real-time transfer enabled by the CAU and CEU commands.

Command	Parameters	Answer
CSU	None	None

16 - Query new value ready

This command is used to check whether a new value is available from the device. Though optional, its use is recommended when used with single pulse operations.

This is for joulemeters only.

Command	Parameters	Answer
NVU	None	New Data Available or New Data Not Available

**Example**

Command: *NVU

Answer: New Data Not Available <CR><LF>

17 - Get laser frequency

This command is used to get the laser frequency.

This is for joulemeters only.

Command	Parameters	Answer
GRR	None	Data in ASCII

18 - Set binary joulemeter mode

This command is used to set the monitor in binary or ASCII mode.

This is for joulemeters only.

Command	Parameters	Answer
SS1	0= ASCII 1= Binary	None

**Example**

Command: *SS11

Answer:

19 - Get binary joulemeter mode

This command returns whether or not the binary joulemeter mode is activated for serial communication.

This is for joulemeters only.

Command	Parameters	Answer
GBM	None	1: On 0: Off

**Example**

Command: *GBM

Answer: Binary Joulemeter Mode: 0<CR><LF>

20 – Set moving average window

This command will set the window for the moving average calculation. This moving average is applied as a smoothing factor to all power measurements. The window value is in seconds.

Command	Parameters	Answer
TIM	Window length in seconds	None

Default: The default value is 0.2 seconds.

**Example**

The following example sets the window length to 2.5 seconds.

Command: *TIM2.50

Answer:

21 – Query moving average window

This command will return the moving average window time in seconds.

Command	Parameters	Answer
QTM	None	Window length in seconds

Default: 0.2 Seconds



Example

Command: *QTM

Answer: 0.2<CR><LF>

4.6.3. Setup

22 - Set Personal Wavelength Correction in nm

This command is used to specify the wavelength in nm being used on the detector. The EEPROM in the detector contains measured spectral data for a wide range of wavelengths. A valid value is set between the lowest and highest wavelengths supported by the device, and it should not be a floating-point value. The input parameter must have five digits. If the desired wavelength does not have five digits, you must enter a zero-padded number. For example, to set the wavelength at 514 nm, you must enter 00514.

Specifying zero as a wavelength or providing an out-of-bound value as a parameter has no effect.

Command	Parameters	Answer
PWC	Wavelength nm	None

Default: Calibration wavelength (typically 1064 nm, varies with the detector model)



Example

The following example sets the wavelength to 1550 nm.

Command: *PWC01550

Answer:

23 - Set Personal Wavelength Correction in microns

This command is used to specify the wavelength in microns for THZ detectors only. The EEPROM in the detector contains measured spectral data for a wide range of wavelengths. A valid value is set between the lowest and highest wavelengths supported by the device. The input parameter must have five digits and can be a floating-point value. If the desired wavelength does not have five digits, you must enter a zero-padded number. For example, to set the wavelength at 10.6 microns, you must enter 010.6. Please note that the resolution is limited as follows:

Wavelength range	Resolution limit
Less than 100 μm	10 nm
Greater than 99.99 μm or less than 1000 μm	100 nm
Greater than 999.9 μm	1 μm

Specifying zero as a wavelength or providing an out-of-bound value as a parameter has no effect.

Command	Parameters	Answer
PWM	Wavelength μm	None

Default: Calibration wavelength (typically 1064 nm, varies with the detector model)



Example

The following example sets the wavelength to 25 microns (25,000 nm).

Command: *PWM025.0

Answer:

24 - Get wavelength

This command returns the wavelength in nm.

Command	Parameters	Answer
GWL	None	Returns the wavelength in nm



Example

Command: *GWL

Answer: PWC: 1064<CR><LF>

4.6.4. Control

25 - Set anticipation

This command is used to enable or disable the anticipation processing when the device is reading from a wattmeter. The anticipation is a software-based acceleration algorithm that provides faster readings using the detector's calibration.

Command	Parameters	Answer
ANT	1: On 0: Off	None

Default: On



Example

The following example sets on the anticipation.

Command: *ANT1

Answer:

26 - Get anticipation status

This command returns the anticipation status. If the anticipation is not available, it will always be at "off".

Command	Parameters	Answer
GAN	None	1: On 0: Off



Example

Command: *GAN

Answer: Anticipation: 0<CR><LF>

27 - Noise suppression averaging

Sets the sampling size of the noise suppression. For pyroelectric detectors and UM detectors only.

The joulemeter mode has a special proprietary algorithm that can lower the noise-induced error when reading low energy levels, or energy readings of any level with noise present. This feature greatly reduces the effect of noise on the peak-to-peak measurement in joulemeter mode. The monitor will need to measure the number of pulses selected in the sampling size before the algorithm will settle to the noise suppressed value. Once the readings have stabilized, any subsequent reading will be stable until the sampling size is changed. The system will then stabilize to the new value. Larger sampling sizes will result in more noise suppression. Noise suppression works best with the external trigger. This function will greatly improve the accuracy of the lowest scale or in any scale when used in a noisy environment.

The parameter must consist of exactly three digits.

Command	Parameters	Answer
AVG	Number of samples to include in the moving average	Ok

**Example**

The following example sets the sampling size to 16 pulses.

Command: *AVG016

Answer: Ok.<CR><LF>

28 - Set zero offset

This command subtracts the current value from all future measurements the moment the command is issued to set a new zero point. This command does not work with photodiodes. Please refer to *SDZ.

Command	Parameters	Answer
SOU	None	Autoscale: Please Wait... Done! Fixed scale: None

**Example (when in auto-scale)**

Command: *SOU

Answer: Please Wait...<CR><LF>
Done!<CR><LF>

29 - Clear zero offset

This command undoes the zero offset command to set the zero point at zero.

Command	Parameters	Answer
COU	None	None

30 - Get zero offset

This command returns whether the zero offset has been activated or not.

Command	Parameters	Answer
GZO	None	1: On 0: Off

**Example**

Command: *GZO

Answer: Zero: 0<CR><LF>

31 - Set diode zero offset

This command subtracts the current value for all available scales from all future measurements the moment the command is issued to set a new zero point.

This is for photodiodes only. Please refer to *SOU for other detectors.

Command	Parameters	Answer
SDZ	None	Autoscale: Please Wait... Done! Fixed scale: None



Example (when in auto-scale)

Command: *SDZ

Answer: Please Wait...<CR><LF>
Done!<CR><LF>

32 - Set user multiplier

This command is used to set the value of the user-specified multiplier.

Command	Parameters	Answer
MUL	8-character numerical value	None

Default: 1



Example

The following example sets multiplier = 33

Command: *MUL00000033
Or
*MUL3.3000e1

Answer:

33 - Get user multiplier

This command returns the multiplier value.

Command	Parameters	Answer
GUM	None	Current multiplier value



Example

Command: *GUM

Answer:
User Multiplier: 1.0000000E+00<CR><LF>

34 - Set user offset

This command is used to set the value of the user-specified offset.

Command	Parameters	Answer
OFF	8-character numerical value	None

Default: 0



Example

The following example sets the offset to 1.5 milliwatts or 1.5 millijoules.

Command: *OFF0.001500	Answer:
or	
*OFF1.500e-3	

The other option available is the zero offset. The zero offset operation is done first, before the user multiplier and user offset are added to the calculation.

35 - Get user offset

This command returns the offset value.

Command	Parameters	Answer
GUO	None	Current offset value



Example

Command: *GUO	Answer:
	User Offset: 1.5000000E-03<CR><LF>

36 - Set single-shot energy mode

This command is used to toggle to single-shot energy mode when using a wattmeter. It is recommended to wait at least 2 seconds after this command before sending another command to avoid communication problems.

Command	Parameters	Answer
SSE	1: On 0: Off	None

Default: Off

37 - Query single-shot energy

This command returns whether or not a wattmeter is in singles-shot energy mode.

Command	Parameters	Answer
GSE	None	SSE: 0 or SSE: 1

38 - Set attenuator

This command is used to adjust the processing of the monitor with the readings of the head, depending on whether the head is using an external attenuator or not.

Command	Parameters	Answer
ATT	1: On 0: Off	None

Default: Off

**Example**

The following example sets on the attenuator which means that the attenuator is on the detector.

Command: *ATT1

Answer:

39 - Get attenuator

This command returns the attenuator status. If the attenuator is not available, it will always be off.

Command	Parameters	Answer
GAT	None	1: On 0: Off

**Example**

Command: *GAT

Answer: Attenuator: 0<CR><LF>

40 – External trigger

Activates or deactivates the external trigger for monitors which have an external trigger option.

Command	Parameters	Answer
ET	1: On 0: Off	None

**Example**

Command: *ET1

Answer:

41 – Set external trigger polarity

Sets the external trigger polarity to either a rising edge or falling edge.

Command	Parameters	Answer
POL	0: Rising edge 1: Falling edge	None

Default: 1 (falling edge)

**Example**

Command: *POL0

Answer:

42 – Enable/disable sync output

Enables or disables the sync output feature. If this feature is enabled, the sync output cable, Gentec-EO part number 100-205117, can be used along with a second U-LINK and an external trigger cable 100-201956 to synchronize the two monitors. Refer to the item "Trigger input" of Section 1.4 for more information.

Command	Parameters	Answer
SYN	1: On 0: Off	None

**Example**

Command: *SYN1

Answer:

43 – Set analog output scale watts/joules

Sets the output scale of the analog output feature. The value entered is the maximum value of the analog output in watts or joules. Please see the item “Analog output” in Section 1.4 for more information. The value entered must be entered in scientific notation as the example below and must contain exactly eight characters.

Command	Parameters	Answer
AOB	Analog scale W/J	None

Default: 1.00 W/J

**Example**

The following example sets the analog output scale to 5 watts/joules.

Command: *AOB5.00E+00

Answer:

44 – Set analog output voltage range

Sets the output range of the analog output feature. The value entered is the maximum value of the analog output in volts. Please see the item “Analog output” in Section 1.4 for more information. The value entered must be entered in scientific notation as the example below and must contain exactly eight characters.

Command	Parameters	Answer
SFS	Analog scale volts	None

Default: 2.70 volts

**Example**

The following example sets the analog output scale to 2 volts.

Command: *SFS.00E+00

Answer:

45 – Set lock-in amplifier time constant

Sets the value of the lock-in amplifier time constant used for THz Series B V2 heads that require the use of the lock-in amplifier. The value is in seconds and must be entered in the same format as the example below, using exactly five characters.

Command	Parameters	Answer
TAU	LIA time constant seconds	None

Default: 1 second

**Example**

The following example sets the LIA time constant to one quarter second or 10 seconds.

Command: *TAU0.250	Answer:
or	
*TAU10.00	

46 – Set analog output dwell time

Sets the amount of time in seconds the analog output will remain active after a successful energy measurement before returning to zero. If the value entered is zero, the analog signal will not return to zero and will continue to output the last conversion value. The value entered must be entered in scientific notation as the example below and must contain exactly eight characters.

Command	Parameters	Answer
AOD	Analog output dwell time	None

Default: 0 (do not return to zero)

**Example**

The following example sets the analog output dwell time to 2 seconds.

Command: *AOD2.00E+00	Answer:
-----------------------	---------

4.6.5. Instrument and detector information

47 - Change baud rate for RS-232

This command is used to default baud rate of the RS-232 model. This will permanently change the baud rate and save it in the monitor's flash memory. If you want to change it back, you will have to send the command again at the new baud rate. If you want to update the monitor's firmware, you will have to change the baud rate to 115200.

Command	Parameters	Answer
BPS	0 1 2 3 4	9600 19200 38400 57600 115200
		ACK: (New Baud Rate)

Default: 4 (115200 bps)



Example

Command: *BPS0

Answer: ACK: 9600<CR><LF>

48 - Query version

This command is used to query the device to get information about the firmware version and the device type.

Command	Parameters	Answer
VER	None	Version and device type



Example

Command: *VER

Answer: U-Link Version 1.00.00<CR><LF>

49 - Query status

This command is used to query the device to get information about the following characteristics:

- Measure mode
- Maximum, minimum and current scale
- Maximum, minimum and current wavelength with and without attenuation
- Attenuator availability and status
- Detector model
- Detector serial number

Command	Parameters	Answer
STS	None	A hexadecimal structure described in the table below

The first byte represents the validity of the structure: 0 represents a valid line while 1 is the end of the structure. The next 4 bytes represent the address line, and the last 4 bytes are the actual value. The values are written on 32 bits, which means that all the values are written on two lines. The first line represents the LSB, and the second line represents the MSB.

The following table shows the output with an XLP12-3S-H2-INT-D0 (s/n 199672).

Table 7. STS data structure

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	0000	0003	3	Reserved
:0	0001	0000	0	Reserved
:0	0002	0003	3	Reserved
:0	0003	0000	0	Reserved
:0	0004	0000	0	Measure mode LSB
:0	0005	0000	0	Measure mode MSB
:0	0006	0015	21	Current scale LSB (refer to scale index *SCS)
:0	0007	0000	0	Current scale MSB (refer to scale index *SCS)
:0	0008	0019	25	Maximum scale LSB (refer to scale index *SCS)
:0	0009	0000	0	Maximum scale MSB (refer to scale index *SCS)
:0	000A	0011	17	Minimum scale LSB (refer to scale index *SCS)
:0	000B	0000	0	Minimum scale MSB (refer to scale index *SCS)
:0	000C	0428	1064	Current wavelength LSB (nm)
:0	000D	0000	0	Current wavelength MSB (nm)
:0	000E	2968	10600	Maximum wavelength LSB (nm)
:0	000F	0000	0	Maximum wavelength MSB (nm)
:0	0010	00C1	193	Minimum wavelength LSB (nm)
:0	0011	0000	0	Minimum wavelength MSB (nm)
:0	0012	0001	1	Is attenuator available LSB (1= yes 0 = no)
:0	0013	0000	0	Is attenuator available MSB (1= yes 0 = no)
:0	0014	0000	0	Is attenuator on LSB (1= yes 0 = no)
:0	0015	0000	0	Is attenuator on MSB (1= yes 0 = no)
:0	0016	2968	10600	Maximum wavelength with attenuation LSB (nm)
:0	0017	0000	0	Maximum wavelength with attenuation MSB (nm)
:0	0018	00C1	193	Minimum wavelength with attenuation LSB (nm)
:0	0019	0000	0	Minimum wavelength with attenuation MSB (nm)
:0	001A	4C 58	X L	Detector name (you must convert the hexadecimal values in ASCII characters)
:0	001B	31 50	P 1	
:0	001C	2D 32	2 -	

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	001D	53 33	3 S	
:0	001E	48 2D	- H	
:0	001F	2D 32	2 -	
:0	0020	30 44	D 0	
:0	0021	0000		0000 = Null termination character
:0	0022	0000		The rest of the characters are not valid until line 002A
:0	0023	0000		
:0	0024	0000		
:0	0025	40 03	@	
:0	0026	00 1A		
:0	0027	00 00		
:0	0028	E1 20	á	
:0	0029	00 3A	:	
:0	002A	39 31	1 9	Detector serial number (you must convert the hexadecimal values in ASCII characters)
:0	002B	36 39	9 6	
:0	002C	32 37	7 2	
:0	002D	00 00		0000 = Null termination character
:1	0000	00 00		End of structure

50 - Query extended status

This command is used to query the device to get information about the following characteristics:

- Measure mode
- Maximum, minimum and current scale
- Maximum, minimum and current wavelength with and without attenuation
- Attenuator availability and status
- Detector model
- Detector serial number
- Trigger level (0.001 to 0.999)
- Auto-scale mode
- Anticipation mode
- Zero offset mode
- User multiplier
- User offset

Command	Parameters	Answer
ST2	None	A hexadecimal structure described in the table below

The first byte represents the validity of the structure: 0 represents a valid line while 1 is the end of the structure. The next 4 bytes represent the address line, and the last 4 bytes are the actual value. The values are written on 32 bits, which means that all the values are written on two lines. The first line represents the LSB, and the second line represents the MSB.

The following table shows the output with an XLP12-3S-H2-INT-D0 (s/n 199672).

Table 8. ST2 data structure

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	0000	0003	3	Reserved
:0	0001	0000	0	Reserved
:0	0002	0003	3	Reserved
:0	0003	0000	0	Reserved
:0	0004	0000	0	Measure mode LSB
:0	0005	0000	0	Measure mode MSB
:0	0006	0011	17	Current scale LSB (refer to scale index *SCS)
:0	0007	0000	0	Current scale MSB (refer to scale index *SCS)
:0	0008	0019	25	Maximum scale LSB (refer to scale index *SCS)
:0	0009	0000	0	Maximum scale MSB (refer to scale index *SCS)
:0	000A	0011	17	Minimum scale LSB (refer to scale index *SCS)
:0	000B	0000	0	Minimum scale MSB (refer to scale index *SCS)
:0	000C	0428	1064	Current wavelength LSB (nm)
:0	000D	0000	0	Current wavelength MSB (nm)
:0	000E	2968	10600	Maximum wavelength LSB (nm)
:0	000F	0000	0	Maximum wavelength MSB (nm)
:0	0010	00C1	193	Minimum wavelength LSB (nm)
:0	0011	0000	0	Minimum wavelength MSB (nm)
:0	0012	0001	1	Is attenuator available LSB (1= yes 0 = no)
:0	0013	0000	0	Is attenuator available MSB (1= yes 0 = no)
:0	0014	0000	0	Is attenuator on LSB (1= yes 0 = no)
:0	0015	0000	0	Is attenuator on MSB (1= yes 0 = no)
:0	0016	2968	10600	Maximum wavelength with attenuation LSB (nm)
:0	0017	0000	0	Maximum wavelength with attenuation MSB (nm)
:0	0018	00C1	193	Minimum wavelength with attenuation LSB (nm)
:0	0019	0000	0	Minimum wavelength with attenuation MSB (nm)
:0	001A	4C 58	X L	Detector name (you must convert the hexadecimal values in ASCII characters)
:0	001B	31 50	P 1	
:0	001C	2D 32	2 -	
:0	001D	53 33	3 S	
:0	001E	48 2D	- H	
:0	001F	2D 32	2 -	
:0	0020	30 44	D 0	
:0	0021	0000		0000 = Null termination character
:0	0022	0000		The rest of the characters are not valid until line 002A
:0	0023	0000		
:0	0024	1F 00		
:0	0025	40 03	@	
:0	0026	00 1A		
:0	0027	0000		
:0	0028	E1 20	Á	
:0	0029	00 3A	:	
:0	002A	39 31	1 9	Detector name (you must convert the hexadecimal values into ASCII characters)
:0	002B	36 39	9 6	
:0	002C	32 37	7 2	
:0	002D	0000		0000 = Null termination character
:0	002E	0000	2.0	Trigger level LSB (between 0.1 and 99.9)
:0	002F	4000		Trigger level MSB (between 0.1 and 99.9)

Hexadecimal structure			Converted value	Definition
Valid	Address	Value		
:0	0030	0001	1	Is auto-scale mode on? LSB
:0	0031	0000	0	Is auto-scale mode on? MSB
:0	0032	0000	0	Is anticipation on? LSB
:0	0033	0000	0	Is anticipation on? MSB
:0	0034	0000	0	Is zero offset on? LSB
:0	0035	0000	0	Is zero offset on? MSB
:0	0036	0000	1.0000	Correction multiplier LSB
:0	0037	3F80		Correction multiplier MSB
:0	0038	0000	0.0000	Correction offset LSB
:0	0039	0000		Correction offset MSB
:1	0000	0000	0	End of structure

51 – Return firmware version

Returns the version number of the firmware installed in the U-LINK.

Command	Parameters	Answer
GSV	None	Version number



Example

Command: *GSV

Answer: 1.00.00

52 – Query instrument ID

Returns the name of the device.

Command	Parameters	Answer
IDN	None	Device name



Example

Command: *IDN

Answer: U-Link

53 – Set M-LINK compatibility mode

Allows the U-LINK to respond to legacy M-LINK commands. Please refer to the M-LINK manual for more details. Once activated, the U-LINK will stay in this mode, even after being unplugged.

The M-LINK SQL command will not function.

Command	Parameters	Answer
MLK	1: On 0: Off	None



Example

Command: *MLK1

Answer: <none>

4.7. ERROR MESSAGES

Error	Comment
Command error. Command not recognized.	Command is invalid.
Command error. Command must start with "*".	All text commands must begin with a trig character (*).
Detector not present	Detector head must be attached to execute this command.

5. DECLARATION OF CONFORMITY

Application of Council Directive(s): 2014/30/EU The EMC Directive

Manufacturer's name: Gentec Electro Optics, Inc.
 Manufacturer's address: 445, Saint-Jean-Baptiste, Suite 160
 (Québec) G2E 5N7
 Canada

European representative name: Laser Components S.A.S.
 Representative's address: 45 bis Route des Gardes
 92190 Meudon (France)

Type of equipment: Laser Power/Energy Meter
 Model no.: U-LINK
 Year of test and manufacture: 2018



Standard(s) to which conformity is declared:

EN61326-1 (2013) Radiated Emissions Heavy Industrial Standard
 EN61326-1 (2013) Conducted Emissions Heavy Industrial Standard
 EN61326-1 (2013) Power Line Harmonics Heavy Industrial Standard (RS-232 Version)
 EN61326-1 (2013) Power Line Voltage Fluctuation & Flicker Standard (RS-232 Version)

Product standards

Product standard	Test standard	Description	Performance criteria
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN55011:2017 Class A / CISPR 11Ed6.1:2016 Class A	Radiated emissions	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN55011:2017 Class A / CISPR 11Ed6.1:2016 Class A	Conducted emissions	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-3-2:2014 (IEC61000-3-2:2014)	Power line harmonics	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-3-3:2013(IEC61000-3-3:2013)	Power line voltage fluctuation and flicker	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-2:2008 (IEC 61000-4-2:2008Ed.2)	Electrostatic discharge immunity ± 4 kV contact discharge ± 8 kV air discharge	Criteria B

Product standard	Test standard	Description	Performance criteria
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-3:2006+A1:2008+A2:2010 (IEC 61000-4-3:2006+A1:2007+A2:2010)	RF field immunity 10 V/m, 80 to 1000 MHz 3 V/m, 1.4 to 2 GHz 1 V/m, 2 to 2.7 GHz	Criteria A
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-4:2004+A1:2010(IEC 61000-4-4:2004+A1:2010)	Electrical fast transient/burst (EFT) immunity 2 kV peak	Criteria B
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-5:2006(IEC 61000-4-5:2005)	Electrical slow transient (surge) immunity 0.5 kV peak - differential mode 1 kV peak - common mode	Criteria B
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-6:2009(IEC 61000-4-6:2008Ed.3)	RF conducted immunity 3 Vrms, 150 kHz to 80 MHz	Criteria A
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-11:2004(IEC61000-4-11:2004Ed.2)	Voltage interruption immunity 100% dip, 20 mS - Perf. B 30% dip, 500 mS - Perf. C 60% dip, 200 mS - Perf. C 100% dip, 5 Sec - Perf. C	As shown
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	IEC 61000-4-8:2010	Magnetic field immunity 30 A/m, 50/60 Hz	Criteria A

Performance Criteria

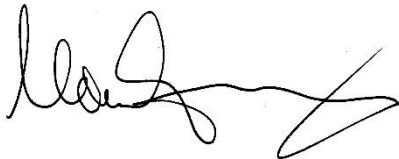
Performance criteria	Description
Criteria A	The DUT does not have any noticeable deviations in its performance before, during or after the application of the EMC test. If a range of performance is specified as normal operation, the DUT did not have any readings outside of this range before, during or after the application of the EMC test.
Criteria B	The DUT does not have any deviations of performance before or after the application of the EMC test, but during the application a deviation is noted that is not considered normal operation. When the EMC test is paused or completed, the DUT recovered on its own and did not require any user intervention to return it to normal operation. If a range of performance is specified as normal operation, the DUT's performance was outside of this range during the application of the test, but recovered on its own and operated within its normal range after the application of the EMC test. No permanent damage occurred to the DUT or any AE as a result of the disturbance.

Performance criteria	Description
Criteria C	<p>The DUT was operating normally before the application of the EMC test, but during the application, the DUT stopped operating normally and did not recover after the application of the EMC test until an operator intervened. This includes but is not limited to:</p> <ul style="list-style-type: none"> - Power cycling the DUT - Restarting the exercising software on the DUT - Unplugging and re-plugging the DUT or any AE <p>The act of "recovering" the DUT must be something that could be accomplished by the customer with little training.</p> <p>No permanent damage occurred to the DUT or any AE as a result of the disturbance.</p>
Additional criteria	<p>No incorrect data recorded while logging:</p> <p>U-LINK with thermal detector – XLP12-3S-H2-DO measuring 420 mJ \pm 5 mJ</p> <p>U-LINK with optical detector – PH100-SI-HA-DO measuring 100 μW \pm 1 μW</p> <p>U-LINK with energy detector – QE65-LP-S-MV-DO measuring 100 μW \pm 1 μW</p>

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

Place: Québec (Québec)

Date: November 14, 2018



(President)

6. UKCA DECLARATION OF CONFORMITY

Application of Council Directive(s): 2014/30/EU The EMC Directive

Manufacturer's name: Gentec Electro Optics, Inc.
 Manufacturer's address: 445, Saint-Jean-Baptiste, Suite 160
 (Québec) G2E 5N7
 Canada

European representative name: Laser Components S.A.S.
 Representative's address: 45 bis Route des Gardes
 92190 Meudon (France)

Type of equipment: Laser power/energy meter
 Model no.: U-LINK
 Year of test and manufacture: 2018



Standard(s) to which conformity is declared:

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 EN61326-1 (2013) Power Line Voltage Fluctuation & Flicker Standard (RS-232 Version)

Product standards

Product standard	Test standard	Description	Performance criteria
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EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN55011:2017 Class A / CISPR 11Ed6.1:2016 Class A	Conducted emissions	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-3-2:2014 (IEC61000-3-2:2014)	Power line harmonics	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-3-3:2013(IEC61000-3-3:2013)	Power line voltage fluctuation and flicker	Pass
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-2:2008 (IEC 61000-4-2:2008Ed.2)	Electrostatic discharge immunity ±4 kV contact discharge ±8 kV air discharge	Criteria B

Product standard	Test standard	Description	Performance criteria
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-3:2006+A1:2008+A2:2010 (IEC 61000-4-3:2006+A1:2007+A2:2010)	RF field immunity 10 V/m, 80 to 1000 MHz 3 V/m, 1.4 to 2 GHz 1 V/m, 2 to 2.7 GHz	Criteria A
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-4:2004+A1:2010(IEC 61000-4-4:2004+A1:2010)	Electrical fast transient/burst (EFT) immunity 2 kV peak	Criteria B
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-5:2006(IEC 61000-4-5:2005)	Electrical slow transient (surge) immunity 0.5 kV peak - differential mode 1 kV peak - common mode	Criteria B
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-6:2009(IEC 61000-4-6:2008Ed.3)	RF conducted immunity 3 Vrms, 150 kHz to 80 MHz	Criteria A
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	EN61000-4-11:2004(IEC61000-4-11:2004Ed.2)	Voltage interruption immunity 100% dip, 20 mS - Perf. B 30% dip, 500 mS - Perf. C 60% dip, 200 mS - Perf. C 100% dip, 5 Sec - Perf. C	As shown
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012) Heavy Industrial	IEC 61000-4-8:2010	Magnetic field immunity 30 A/m, 50/60 Hz	Criteria A

Performance criteria

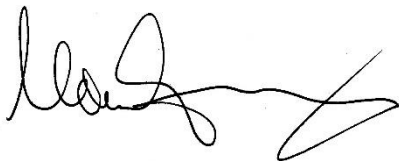
Performance criteria	Description
Criteria A	The DUT does not have any noticeable deviations in its performance before, during or after the application of the EMC test. If a range of performance is specified as normal operation, the DUT did not have any readings outside of this range before, during or after the application of the EMC test.
Criteria B	The DUT does not have any deviations of performance before or after the application of the EMC test, but during the application a deviation is noted that is not considered normal operation. When the EMC test is paused or completed, the DUT recovered on its own and did not require any user intervention to return it to normal operation. If a range of performance is specified as normal operation, the DUT's performance was outside of this range during the application of the test, but recovered on its own and operated within its normal range after the application of the EMC test. No permanent damage occurred to the DUT or any AE as a result of the disturbance.

Performance criteria	Description
Criteria C	<p>The DUT was operating normally before the application of the EMC test, but during the application, the DUT stopped operating normally and did not recover after the application of the EMC test until an operator intervened. This includes but is not limited to:</p> <ul style="list-style-type: none"> - Power cycling the DUT - Restarting the exercising software on the DUT - Unplugging and re-plugging the DUT or any AE <p>The act of "recovering" the DUT must be something that could be accomplished by the customer with little training.</p> <p>No permanent damage occurred to the DUT or any AE as a result of the disturbance.</p>
Additional criteria	<p>No incorrect data recorded while logging:</p> <ul style="list-style-type: none"> U-LINK with thermal detector – XLP12-3S-H2-DO measuring $420 \text{ mJ} \pm 5 \text{ mJ}$ U-LINK with optical detector – PH100-SI-HA-DO measuring $100 \text{ } \mu\text{W} \pm 1 \text{ } \mu\text{W}$ U-LINK with energy detector – QE65-LP-S-MV-DO measuring $100 \text{ } \mu\text{W} \pm 1 \text{ } \mu\text{W}$

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

Place: Québec (Québec)

Date: December 2, 2021



(President)

7. APPENDIX A – WEEE DIRECTIVE

Recycling and separation procedure for WEEE directive 2002/96/EC

This section is used by the recycling centre when the monitor reaches its end of life. Breaking the calibration seal or opening the device will void the U-LINK's warranty.

The complete device contains:

- 1 interface device
- 1 power supply (RS-232 model – power supply not made by Gentec-E0)
- 1 USB cable (USB model)
- 1 calibration certificate

Separation

Paper: manual and certificate

Plastic: device side enclosure

Wires: USB cable and power supply plug

Printed circuit board: inside the device

Aluminum: device enclosure

Opening the device



Figure 7. Opening U-LINK for recycling disposal

LEADER IN LASER BEAM MEASUREMENT SINCE 1972



POWER & ENERGY METERS



BEAM PROFILING



THZ MEASUREMENT

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