



Steropes LED light source Operating Manual.





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1 About this manual

The material in this manual is subject to change. No rights can be derived from the content of this manual.

The content of this manual is valid for firmware version higher or equal than 1.0.0.

In this manual, the following symbols are used to draw your attention.

-  : Practical tip
-  : Note



2 General introduction

The Steropes LED light source is a member of the Admesy Cyclopes series. The Steropes LED light source offers a unique accuracy and stability of the light output. The light output of the Steropes LED light source is controlled by an optical feedback loop, which guarantees that the output is within 0.1% accurate to the value set by the user.

The Steropes can be controlled via USB or programmed at a specific level by the user and used without a PC. At all times the optical feedback loop controls the output.

2.1 Steropes highlights :

Light source is stable within 10ms.

USB and RS232 communication interfaces.

Stand alone mode

Switch disable function

Light source is available in different colours (R,G,B,W).

2.2 Standards

The Steropes LED is compliant to the USBTMC standard and can be used in combination with external provided USBTMC compliant libraries without the need for additional drivers. It can also be used with LibUSB (open source)

Currently it has been tested on Windows, Linux and Apple OSX using NI VISA (<http://www.ni.com/visa>)

and using the open source driver provided by Agilent

(http://www.home.agilent.com/upload/cmc_upload/All/usbtmc.html) on Linux (i686, x86_64 and ARM).

For installation instructions on the Agilent USBTMC driver, refer to the Linux Brontes howto from the Admesy web site (http://www.admesy.nl/products/docs/Admesy_Brontes_Linux_howto.pdf).

3 Electrical interfaces



3.1 USB interface

The USB mini B connector is used to connect the Steropes LED light source to a PC/Laptop.

The Steropes LED light source complies to the USBTMC class protocol and can therefore be used directly with third party provided VISA compliant libraries like NI-VISA .

3.2 RS232 interface

RS232 is provided to connect the Steropes LED light source to any host that doesn't provide USB or for which no USBTMC drivers exist. Using RS232 the high speed options of the light source are still available, only transfer of data to the host is reduced in speed. It is recommended to use USB in case the high update rates are needed.

i The USB cable should not be connected together with the RS232 cable.

The following table shows the RS232 port configuration.

| Baud rate | Data bits | Parity | Stop bits | Flow control | Termination character |
|-----------|-----------|--------|-----------|--------------|-----------------------|
| 115200 | 8 | None | 1 | None | LF = '\n' |

Table 1: RS232 port configuration

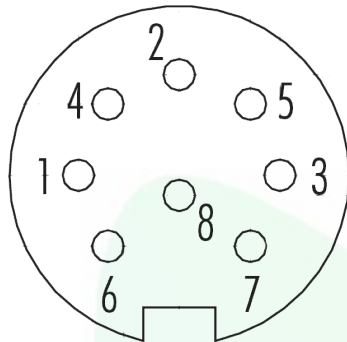
The RS232 connection is not a SUBD cable, a RS232 cable can be ordered at Admesy.

3.3 GPIO interface

The general purpose IO can be used for the following functions :

- Triggering the Steropes from an external source or triggering an external source from the Steropes.
- USB communication and RS232 communication for industrial usage.

The GPIO provides one trigger input, USB communication , RS232 communication and power in.



Steropes LED rear side view



Manufacturer: Binder.
Part number: 09 0571 00 08

GPIO pin layout

| Pin | Function |
|-----|-------------|
| 1 | 9V |
| 2 | GND |
| 3 | D- (USB) |
| 4 | D+ (USB) |
| 5 | VBUS (USB) |
| 6 | XTX (RS232) |
| 7 | XRX (RS232) |
| 8 | Trigger in |

⚠ *The USB connections on the GPIO are meant for applications where the standard USB-B connector does not provide enough mechanical robustness. They should never be used together with the USB-B connector.*

Admesy can provide the needed cable connector or can customize the cable to fit your needs.

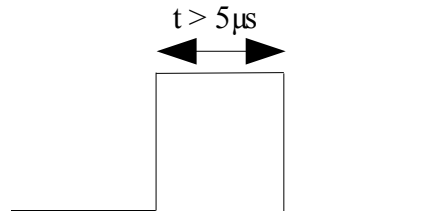
The 9V input (pin 1) can be used together with GND (pin 2) to provide power to the Steropes.

When using this power connection, please refer to the power supply table on the next page.

3.3.1 Triggering

The Steropes LED light source can be triggered when it's operating in USB, RS232 or stand alone mode. In stand alone mode, the configured measurement will be carried out once a trigger arrives. When triggering is enabled, the trigger output line will be set to a high level once the light source is stable.

Trigger signals are edge triggered and should comply to the following diagram.



Manufacturer: Tyco electronics part number:

solder

Straight Cable Plug, crimp: 1051638-1

Right-Angle Cable Plug, crimp: 1052063-1

clamp

Straight Cable Plug, Crimp: 1050721-1

Right-Angle Cable Plug, Crimp: 1051140-1



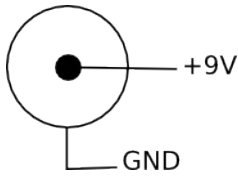
3.3.2 I/O

The GPIO can currently only be used in stand alone mode. When operating in this mode, the I/O is used to output the result of a measurement.

3.4 Power connections

The Steropes LED light source should be connected to either powered USB or using a 9V DC power supply. When using RS232 the Steropes LED light source needs to be powered via the external adapter.

In case a 9V adapter is used, Admesy can only guarantee stable measurement results and CE compliance when using the supplied adapter.



The unit shall be powered by a 9Vdc voltage or via a standard USB PC-port , reinforced separated from Mains, with a limited energy of < 150VA and < 8A.

When stable mounting is needed, the GPIO power input pins (pin 1 & pin 2) can be used to supply power to the Steropes LED light source colorimeter.

For power ratings, please refer to the power supply table.

| | Min voltage | Typical voltage | Max voltage | Consumption |
|--------------------|-------------|-----------------|-------------|------------------|
| USB powered | 4.75V | 5.00V | 5.25V | Typical 50-600mA |
| DC-adapter powered | 8.50V | 9.00V | 9.50V | Typical 50-600mA |
| GPIO powered | 8.50V | 9.00V | 9.50V | Typical 50-600mA |

Table 2: Power supply table

💡 When using the external power connector, the Steropes LED light source can be driven to 100% output. Without the external power the light output is limited to 50%.

4 Communications protocol

4.1 USB

The Steropes LED light source can be connected to any USB host that runs Windows, Linux or Apple OSX. The Steropes LED light source is a USBTMC compliant device. This makes the Steropes LED light source directly usable in programming languages like NI's Labview and Labwindows or any other language that supports USBTMC.

The Steropes LED light source has two interfaces build in, which require a different device driver to be used.

Firmware updater (USB RAW device driver, Vendor ID : 0x1781, Product ID 0x0E92)

Steropes LED light source (USBTMC device driver , Vendor ID : 0x1781, Product ID 0x0E95)

When the Steropes LED light source is connected to the host, it will start the Steropes LED light source firmware. As soon as the firmware is idle to receive commands, the Power LED goes to the on state.

The firmware updater is a RAW USB device and in order to install this device in Windows, a driver must be installed which is supplied by Admesy. Besides upgrading to new firmware, it is also allowed to downgrade firmware in case this is required. Note that older firmware also may require the use of older software libraries and/or executable versions of software.

The Steropes LED light source is USBTMC compliant and can be used with libraries that contain a USBTMC compliant driver like NI-VISA. The Steropes LED light source colorimeter is a USB 2.0 Full speed device.

In case a USB host is detected, it is assumed that the Steropes LED light source operates only via USB. This means that RS232 is not functional. Triggering via USB is allowed, but needs to be enabled via software.

4.2 RS232

Steropes LED light source commands are equal for all interfaces. Note that for high speed transfers it is best to use USB.

5 Device drivers

5.1 USB

Since the Steropes LED light source is an USBTMC device, drivers exists for many platforms and processor architectures. The following table provides an overview of these platforms.

| Driver name → | NI-VISA | Libusb | Native kernel driver | Agilent USBTMC |
|--------------------|---------------|----------|----------------------|----------------|
| Windows 98 | untested | untested | not available | untested |
| Windows NT | untested | untested | not available | untested |
| Windows XP | ☑ | ☑ | not available | untested |
| Windows VISTA | ☑ | ☑ | not available | untested |
| Windows CE | untested | untested | not available | untested |
| Apple OSX PPC | ☑ | untested | not available | unknown |
| Apple OSX Intel | ☑ | untested | not available | unknown |
| Linux i386 (32bit) | ☑ | ☑ | Kernel >= 2.6.28 | ☑ |
| Linux i386 (64bit) | 32bit mode | ☑ | Kernel >= 2.6.28 | ☑ |
| Linux ARM | not available | ☑ | Kernel >= 2.6.28 | ☑ |
| Linux other | not available | ☑ | Kernel >= 2.6.28 | ☑ |

Untested : Available, but not tested by Admesy.

Native kernel driver : Driver included with the operating system

Admesy supports all tested platforms but does not provide standard applications on all platforms. The above matrix is provided to show the possible platforms for software development.

5.2 RS232

When no USB driver is available or the host system does not provide USB, RS232 can be used as it does not require additional drivers for the Steropes LED light source.

6 Command set description

The functions of the colorimeter can be described via the following categories :

- System commands
- Configuration commands
- Measurement commands
- Trigger programming commands

The Steropes LED light source uses SCPI like commands for control and measurement. These are ASCII based commands and follow specific rules regarding syntax. Although the Steropes LED light source colorimeter uses SCPI like commands, they deviate from the SCPI standard.



6.1 Command structure

Every command starts with a semicolon “:”, which identifies the root of the command tree. Each further keyword is also separated a semicolon. In case parameters need to be specified, the last keyword and parameters are separated by a single space character. In case more than one parameter needs to be specified, the parameters need to be separated by a comma.

The command tables show commands in long and short format. The short format is specified by upper case characters. It is allowed to use long and short format or a mixed form. Optional keywords are shown between brackets [...]. Commands are case insensitive, so it is allowed to use both or a mix of upper and lower case.

Example commands :

| Command table syntax | Valid command syntax examples | Notes |
|----------------------|--|-------|
| :MEASure:TEMPerature | :measure:temperature :measure:TEMPERATURE :meas:temp :MEAS:TEMP | |

6.2 System commands

The following command can be used to control the Steropes LED light source system or read information about the system.

Table 3: System commands

| Command syntax | Parameters | Purpose |
|----------------------|------------|----------------------------------|
| .*CLS | none | Clear status |
| .*IDN? | none | Identification Query |
| .*RST | none | Reset Command |
| .*STB? | none | Read Status Byte Query |
| .*TST | none | Self-Test Query |
| .*FWD? | none | Firmware date Query |
| .*FWT? | none | Firmware time Query |
| .*SYSTem:VERSion? | none | Get system version information |
| .*SYSTem:ERRor? | none | Retrieve the last occurred error |
| .*SYSTem:ERRor:NEXT? | none | Retrieve previous errors. |

Table 4: System commands

Note, the Status byte can be used to retrieve information about the status of a command or the system

Return values of the status command can be seen in the table below :

| Code | description |
|------|---|
| 0 | System is idle |
| 1 | Data is available |
| 2 | Command processed |
| 4 | Data in buffer (should not occur) |
| 8 | An error occurred. Use “.*SYSTem:ERRor?” to get the exact error that occurred. |

6.3 Configuration commands

Configuration commands are used to set parameters of the Steropes light source that are used by the controlling functions.

Table 5: Configuration commands

| Command syntax | parameters | Range | Purpose |
|----------------------|-----------------|--------------------------|---|
| :CONFigure:LUM | intensity | 0 – 1000 | Sets the light intensity. |
| :CONFigure:LUM? | none | | Retrieves the set light intensity |
| :CONFigure:MODE | Enum (0,1,2) | USB,RS232,STANDALO NE | Configure the Steropes operating mode. |
| :CONFigure:MODE? | None | | Retrieves the current operating mode |
| :CONFigure:BAUDRATE | baud rate | 0 – 5 (9600 - 230400) | Set RS232 baud rate |
| :CONFigure:BAUDRATE? | none | | Returns the current setting. |
| :CONFigure:TRIG | Trigger | 0 – 1 | Set trigger mode |
| :CONFigure:TRIG? | none | | Returns the current setting. |
| :CONFigure:SWITCH | Use Switch, | 0=No 1=Yes | Sets if the switch is being used |
| :CONFigure:SWITCH? | None | | Retrieves if the Switch is being used |
| :SET:LUMinance | Luminance | 0 – 1000 | Set the current (regulated) intensity value |
| :READ:LUMinance | None | | Retrieves the current set (regulated) intensity value in percentage (%) |
| :READ:SWITCH | None | | Retrieves in what state the switch is |
| :MEASure:TEMPerature | none | | Measure temperature of Sensor head, CPU and LED board |
| :MEASure:XYZ | none | | Measure XYZ |

6.4 User EEPROM commands

The following commands can be used to store values in the user EEPROM space. Note that they are not stored until a :EEPROM:WRITE command is given. It is advised to reboot the Steropes after writing new values to the EEPROM.

| Command syntax | Parameters | Range | Purpose |
|-----------------------|---------------|-------|---|
| :EEPROM:STARTUP:READ | None | | Copies startup conditions from EEprom to internal variables. |
| :EEPROM:STARTUP:WRITE | Steropes mode | 0 - 2 | Copies internal variables to EEprom and set sets Steropes mode |
| :EEPROM:WRITE | none | | Write all settings to EEprom. This command fixes the EEprom values. |
| :EEPROM:READ:SN | None | | Reads the serial number. |

7 Operating modes

Operation is possible as slave device for a host PC or as stand alone device. In slave mode the Steropes LED light source listens to commands send by the host PC as mentioned in the previous paragraphs.

The modes of the Steropes LED light source are :

- 1) USB mode
- 2) RS232 mode
- 3) Stand alone mode

In all modes, USB is still active but when only USB is used, it is recommended to set it to USB mode so that the Steropes LED light source responds in the fastest possible way to commands.

The operating mode must be selected via the Steropes LED light source application. All target values can be measured using the configuration utility or input manually.

Once the USB cable is connected, the Steropes LED light source will automatically leave the stand alone mode and listen to USB communication. In stand alone mode, power should be connected via the dedicated 9V power input or via the 9V input of the GPIO connector.

In stand alone mode, trigger in -and output can be enabled to synchronize for the highest possible speed.

8 Mechanical drawing (mounting holes)

