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2in LASER MICROMETER

USER'S GUIDE

Introduction

The 2in Laser Micrometer is Metralight's most recent development in the field of non contact size and position measurement. As the name suggests, it's an industry leading sensor capable of accurate measurements of objects up to 2 inch (50.8mm).

This unit has an impressive sub-micron resolution of 0.4375 µm , with a fast measurement rate of 1404 measurements/second.
There are no moving mechanical parts in this laser micrometer to adjust or recalibrate (solid-state electronics only).
Certainly well suited for use in fast moving production lines.

The 2in Laser Micrometer sensor, has several outputs to allow simple system integration (RS232, Analog, USB, Relay outputs). For Example, this allows the user to develop applications offline using the USB port, and later migrate to the actual production system using either RS232 or the analog interface. Relay outputs can be used for switching if minimum/ maximum or when other limits are reached (limit values can be programmed via OLED touch display or from host PC).
Output can be customized for any application e.g. Ethernet, SPI, serial, and Parallel can also be implemented.
For easy SW development, Metralight, Inc. offers sample software with source code (VB.NET and Excel macro).

The 2in Laser Micrometer Sensor has standard modes of position, diameter, gap and center. This can be customized, to measure minimum and maximum, range of tolerances (see Application section for more information).

Specification

Measurement

Sensor Range	50.75 mm (2 in)
Resolution (Pixel size)	0.4375 µm
Repeatability	10 µm (Edge position, calibrated distance)
Response Time	0.712 ms
Non-Linearity	±15 µm (edge mode, calibrated distance)
Measuring Modes	Edge1, Edge2, Diameter, Gap, Center, Solid
Custom Modes	*Call MetraLight for additional custom modes*

Interface

I/O connectors	DB9, DB25, DB37, MINI-B USB, RJ45 or Custom
Interface (I/O)	Serial (RS232), Analog (voltage), Parallel binary (TTL), USB, Ethernet, 4 Relays or OC transistors (NPN), 2 optocoupler inputs
Power supply	18 to 24 VDC / 300mA
User Interface	OLED Touch display

General

Detection Method	670nm Class I Laser Diode through-beam with CCD
Overall Dimension	120 x 95 x 25 mm (emitter), 120 x 110 x 25 mm (receiver)
Mounting holes	10x M6
Weight	344g
Operating Temp.	0ºC to 50ºC (32ºF to 122ºF)
Storage Temp.	-20ºC to 70ºC (-4ºF to 158ºF)

Principle of operation

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The 2in laser micrometer uses parallel beam which form active scanning line. When an object is placed in the detection line, measured edge (in case of diameter - 2 edges) are required to be in the active area.
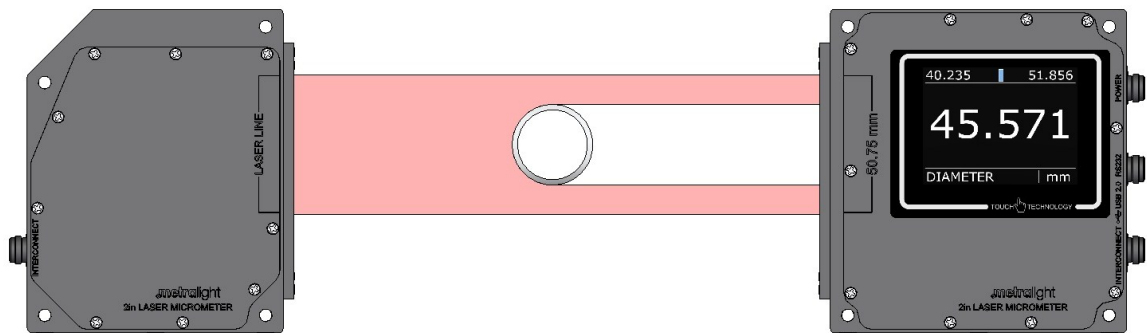

Figure: Parallel beam and shadow of an object

In a typical application where a diameter is measured, the object should be placed in the middle and in calibrated distance (specified when ordered). The sensor processes the CCD data and outputs result in binary pixel format representing the position or size of objects. 2in laser has also 4 relay outputs. Internal limits (e.g. minimum and maximum diameter) can be programmed. When limits are reached relay switches its contacts. This allows easy system integration with minimum no external logic or other processing. Open collector outputs are available too.
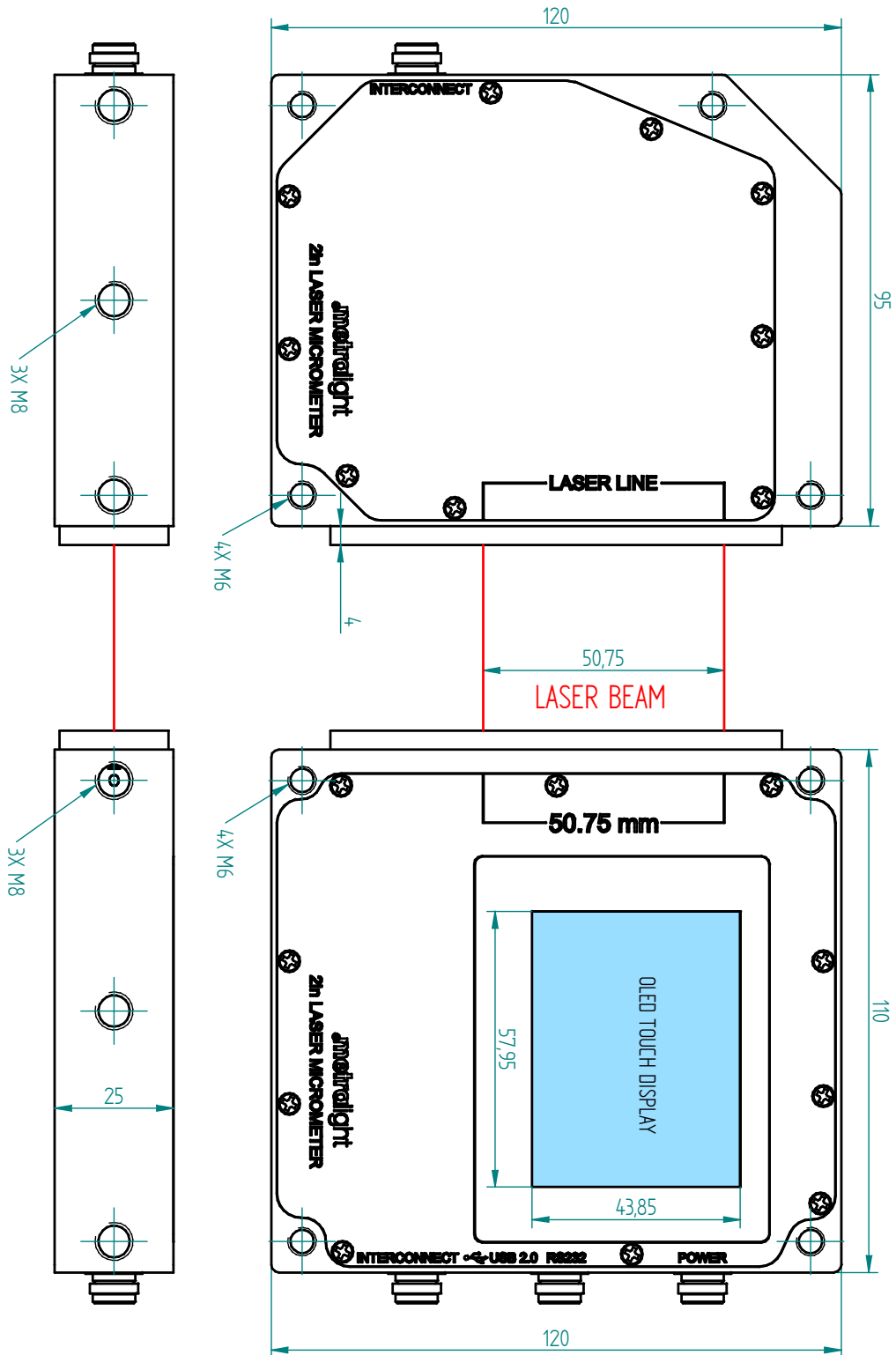
Sensor has also 2 optocoupler inputs. These can be used for custom functions, like external trigger or mode changing etc.

Customized measurements are available upon request.

Dimensions

INTERCONNECT

120

95

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LASER LINE

4X M6

4

3X M8

50,75

LASER BEAM

50.75 mm

4X M6

3X M8

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OLED TOUCH DISPLAY

57,95

43,85

25

110

INTERCONNECT USB 2.0 RS232 POWER

120

For detailed dimensions, please download 2D drawing or 3D model from http://www.metralight.com

Display

2in Laser Micrometer introduces high contrast OLED touch display. Touch display is very easy to use and allows to change display units (mm or inch or pixels), measuring mode and reset MIN and MAX recorded values. Display can be customized to show data in different formats or graphs can be displayed. Display module has large internal flash memory, so data can be recorded.

Figure: OLED touch display

TOP LEFT number displays recorded MINIMUM value.

TOP RECTANGLE indicates presence of an object.

TOP RIGHT number displays recorded MAXIMUM value.

BIG NUMBER in center displays current data.

BOTTOM LEFT indicated measuring mode.

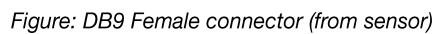BOTTOM RIGHT displays measuring units.

Except main number, all values are touch sensitive. E.g. when user presses measuring mode field, measuring mode is changed to next one.

Host Interface

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2in Laser Micrometer has RS232, Analog, USB, Relays or OC transistors (NPN) outputs (or custom, e.g. Ethernet). User can use any of these. For all interfaces there is a requirement of power connection (RED and BLACK wire). See Power/Analog section below.

Power/Analog Output

Connect sensor per picture below:

Note: If Analog interface is not used leave GREEN and BROWN wire unconnected.

RS232 Interface

Figure: DB9 Female connector (from sensor)

Pin 1	NA
Pin 2	TXD
Pin 3	RXD
Pin 4	NA
Pin 5	GND
Pin 6	NA
Pin 7	NA
Pin 8	NA

Please use following COM PORT Settings:

BaudRate: 115200 b/s
Databits: 8
Parity: None
Stop Bits: 1
Flow Control: None

For connection between sensor and host (e.g. PC) use only straight wired extension cable DB9M to DB9FM (not crossed or null modem).

USB Interface

2in Laser Micrometer uses MINI-B type USB connector. Sensor must be powered from external power supply (see Power/Analog section above).

Command Set

Use following Command Set when using RS232 or USB port. USB port is accessed same way as RS232 port. In case of USB port, software drivers create Virtual Com Port (VCP).

For the 2in Laser Micrometer there are 3 basic commands: DATA, STREAM and MODE. There is always 1 byte being sent from PC to micrometer (Command with parameter is always 1 byte). Each byte high nibble represents command and low nibble represents parameter of this command:
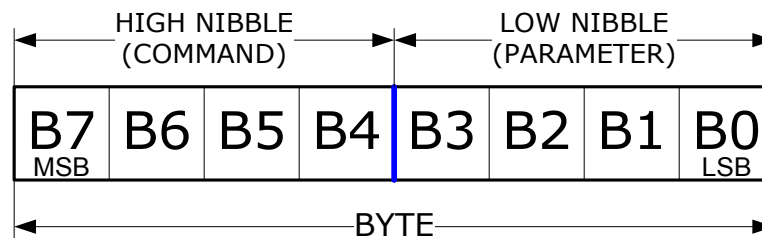

Figure: Command with parame-

When data are requested (DATA command or STREAM START), micrometer responds with 4 byte-length packets (3 bytes for data and 1 info byte).

M2,M1,M0…. Mode bits
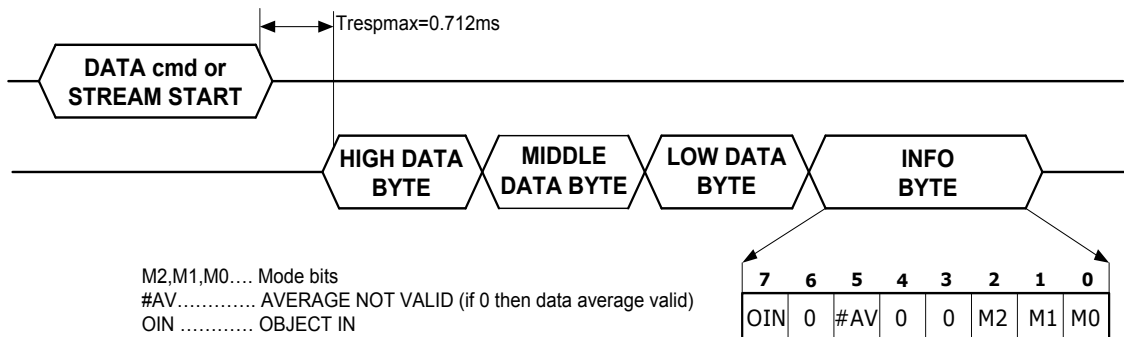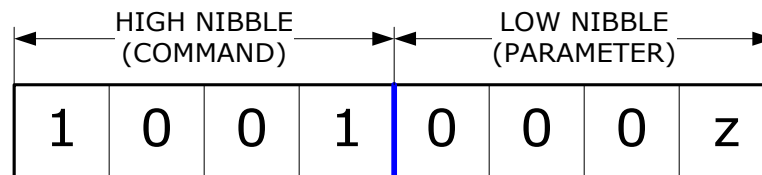#AV…………. AVERAGE NOT VALID (if 0 then data average valid)
OIN ………… OBJECT IN

Figure: 1 Data Packet (4 bytes)

If more data is requested then response is multiplier of 4 bytes. E.g. PC requests 4 data (via DATA command) then micrometer returns 16 bytes. If STREAM START command is issued then Micrometer continuously sends 4 byte packets until STREAM STOP command is sent. Typical PC (running WINDOWS) cannot read data in full speed mode (1404 measurements/s) when 1 data only is requested and sensor triggered again. For high speed applications more data should be requested per 1 command (DATA command with parameter for more than 1 data or STREAM command). This method allows constant (maximum) data sampling frequency.

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LASER ON/OFF command

HIGH NIBBLE (COMMAND)				LOW NIBBLE (PARAMETER)			
1	0	0	1	0	0	0	z

Command: **LASER**
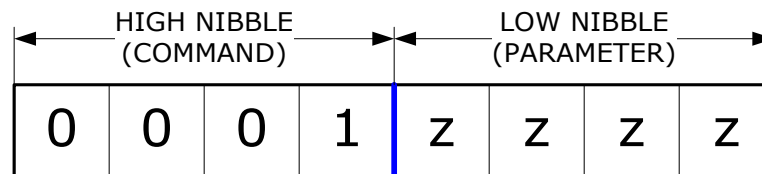Parameter: **z** represent Laser ON/OFF
Laser ON: z = 1, Laser OFF z = 0
Response: No response

Example 1:
PC sends: 10010001 (0x91) for Laser ON
PC sends: 10010000 (0x90) for Laser OFF

DATA command

HIGH NIBBLE (COMMAND)				LOW NIBBLE (PARAMETER)			
0	0	0	1	z	z	z	z

Command: **DATA**
Parameter: **zzzz** represent number of data (2^{zzzz}) being requested
Response: 2^{zzzz}{data}, where {data} is 4 byte-length packet response
Response length (bytes): $4 * 2^{zzzz}$

Example 1: This command serves as basic Get Data command. Let's say we need to read size of object, just once:

PC sends: 00010000 (0x10)
Micrometer response: 00000010 10100100 10110111 10000010

Description: First 3 data bytes: 00000010 10100100 10110111= 0x01A4B7=107703, this is diameter in pixels. 1 pixel measures 0.4375µm, then diameter = 107703 * 0.4375 = 47.120mm
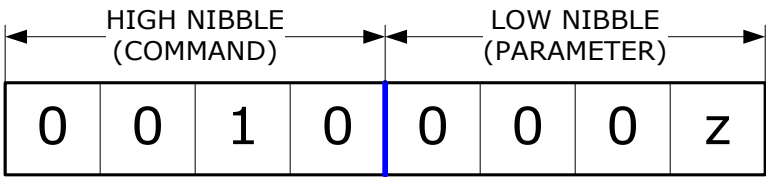
Last byte (info byte): 11000010. MSB Bit =1 Object IN, #AV=0 (average valid), MODE=010 (Diameter mode)

Example 2: User request 16 continuous datas:

PC sends: 00010100 (0x14)
Micrometer response: Sixteen 4 bytes packets

STREAM command

0	0	1	0	0	0	0	z

HIGH NIBBLE (COMMAND) — LOW NIBBLE (PARAMETER)

Command: **STREAM**
Parameter: **z=1 for STREAM START, z=0 for STREAM STOP**
Response: {data}{data$_{n+1}$}{data$_{n+2}$}{data$_{n+3}$}{data$_{n+.}$}, where {data} is 4 byte-length packet response
Response length (bytes): finite number (multiplier of 4) starting with STREAM START and ends with STREAM STOP.
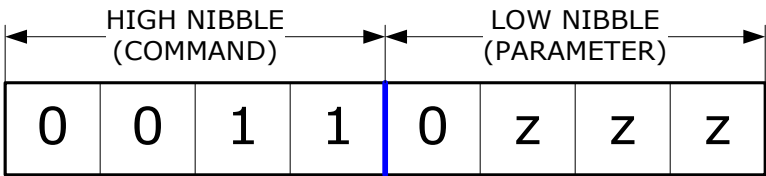
Example 1: Start of data stream.

PC sends: 00100001 (=0x21)
Micrometer response: {data}{data$_{n+1}$}{data$_{n+2}$}{data$_{n+3}$}{data$_{n+}$}...,

Example 2: Stop of data stream

PC sends: 00100000 (=0x20)

MODE command

0	0	1	1	0	z	z	z

HIGH NIBBLE (COMMAND) — LOW NIBBLE (PARAMETER)

Command: **MODE**
Parameter: **zzz=000 to 111** (see mode table and MODES DEFINITION)
Response: echoes back sent byte
Response length (bytes): 1

Example 1: Set Diameter Mode

PC sends: 00110010 (=0x32)

Figure: Mode table

| zzz	000b	001b	010b	011b	100b	101b	110b	111b
Mode	Edge 1	Edge 2	Dia	Gap	Center	Solid Edge	Custom	Custom

Code example (Microsoft VB.NET)

```
Dim buffer(0) As Byte = 16                      '1 data command in Byte format
Dim Value as Single                             'Measured value in µm
Dim Object as Boolean                           'Object in
SerialPort.ReadExisting()                               'Clear buffer
SerialPort.Write(buffer, 0, 1)                  'Writes data command
Value = 0.4375*(65536*SerialPort.ReadByte()  +
+ 256 * SerialPort.ReadByte() + SerialPort.ReadByte()) 'Reads high, middle and low byte
If SerialPort.ReadByte() > 127 Then       'Checks Object
                    Object = True               'Is Object
          Else :
                    Object = False              'Is no Object
          End If
```

Metralight, Inc. provides sample application (MicroStudio, see below), this is a demonstration application which reads and display/save data (and export to Excel). Source code is included for custom modification. Please contact Metralight for any SW modification/development. Metralight provides a complete solution HW+SW and mechanical.

Figure: MicroStudio SW
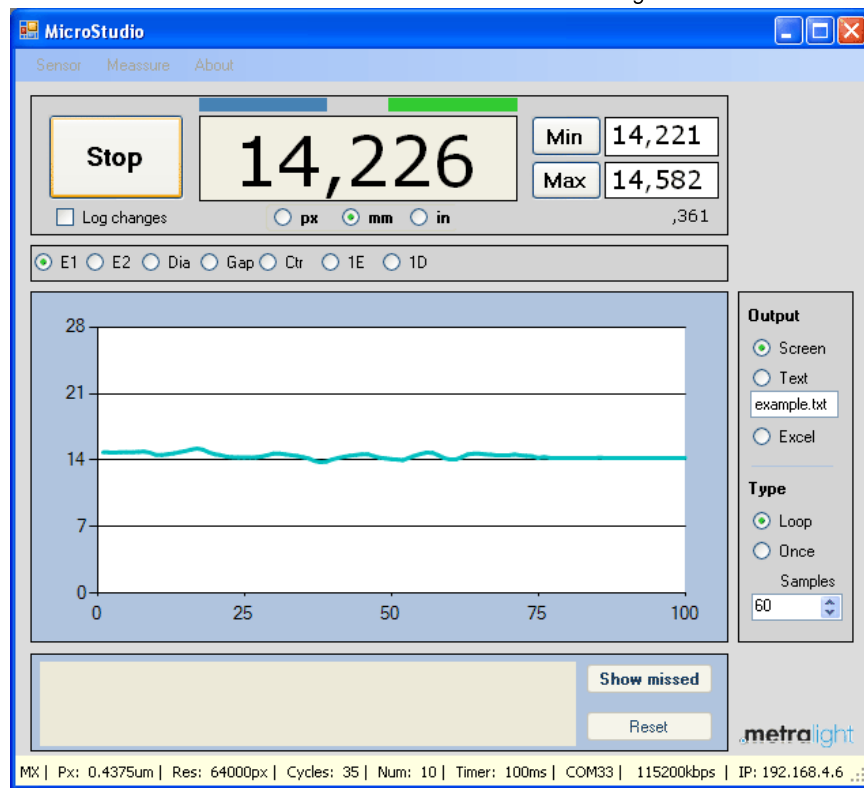
Installation

Installation notes

- USE APPROPRIATE MOUNTING SCREWS (SEE MECHANICAL DRAWING)

- AVOID DIRECT SUNLIGHT !!! AND ALL OTHER LIGHT SOURCES WITH WAVELENGTH CLOSE TO 670nm (see Optical filter transmittance on figure below).

⚠ !

- ALWAYS KEEP OPTICAL WINDOWS CLEAN, FREE FROM DUST AND FINGERPRINTS , AVOID SCRATCHES ON THE OPTICAL WINDOWS.

- APPLY CORRECT VOLTAGE - SEE ELECTRICAL SPECIFICATION

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Package, Warranty, Contacts
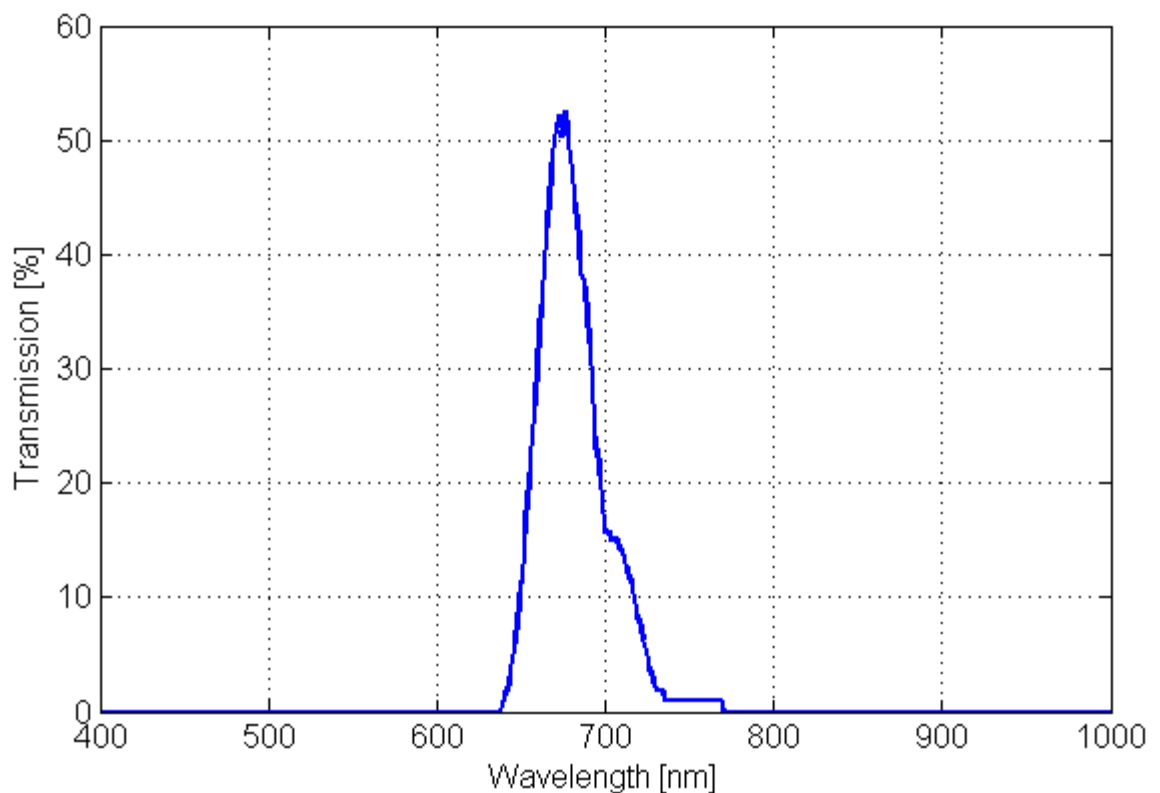
Package components

• Sensor unit (emitter and receiver)

• Power/Analog cable

• Interconnect cable

• RS232 cable

• USB cable

Warranty

METRALIGHT provides a **ONE YEAR** manufacturer's limited warranty against defective
materials and workmanship. Please do not attempt to open the unit, as this will
void all warranties.

Contacts

METRALIGHT, Inc.
1670 S. Amphlett Blvd., Unit # 214-M
Mailstop # 1008
San Mateo, CA 94402
phone: (650) 581 3088
fax: (650) 808 9830
email: sales@metralight.com
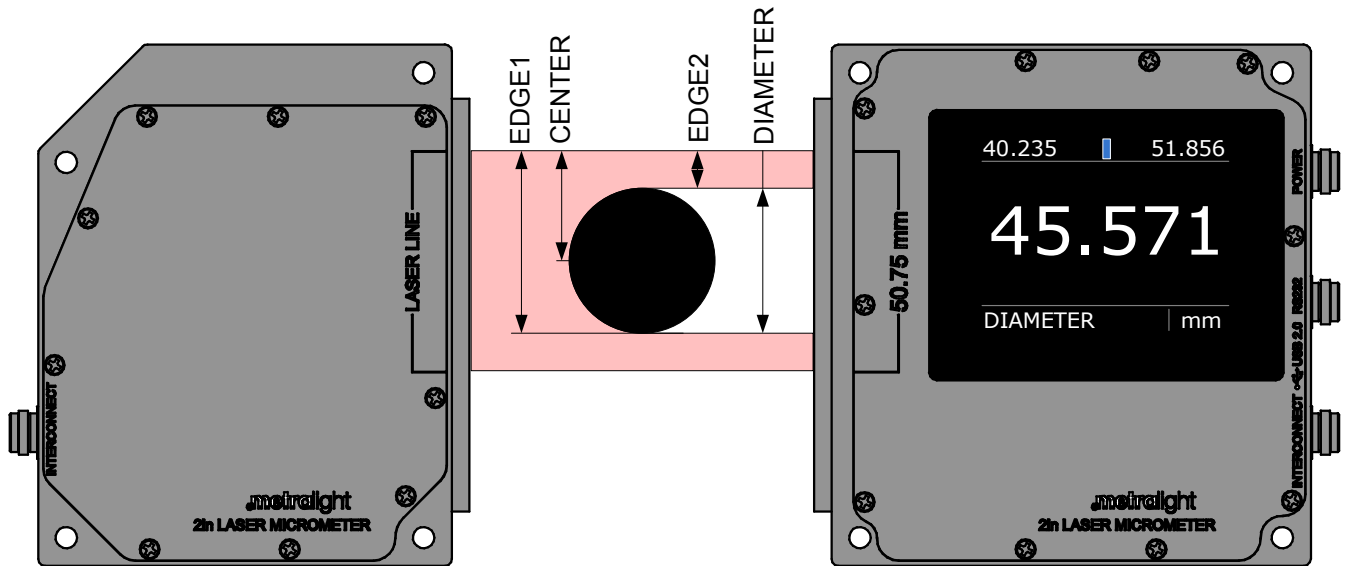technical support: support@metralight.com
web site: http://www.metralight.com

Appendix A – Modes Definition

Figure: EDGE 1, EDGE2, CENTER and DIA mode

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