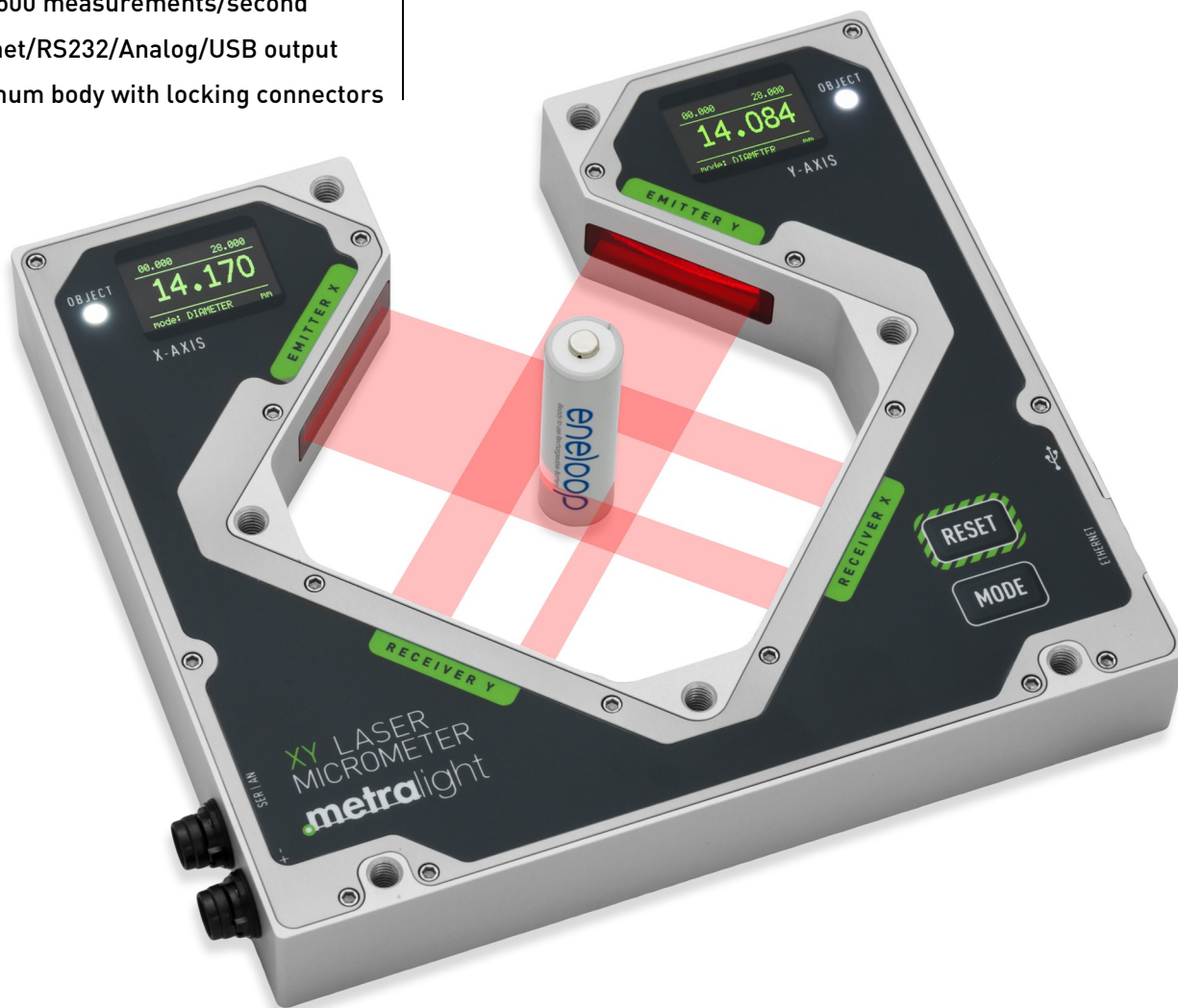


Features

Compact size, no external controller
 Measurement Range: 0 to 28mm
 Sub-micron Resolution of 0.4375 μm
 Fast 2500 measurements/second
 Ethernet/RS232/Analog/USB output
 Aluminum body with locking connectors

USER'S GUIDE



Custom Options

Parallel, SPI, other serial interface
 Centering, Min/Max measurement,
 Range of Tolerances
 Custom Size and Package available
 Custom Applications

Typical Applications

Measurement of various types of materials in a wide range of industries (metal, plastic, glass, ceramics, wood,...)
 Position and Diameter Measurement in same time, checking of size and tension of wire (cable) on automated lines.
 Diameter measurement of tube/pipe (in process or sampling)

The MXY Laser Micrometer is a precise, 2-axis non-contact measurement instrument, for use in various industries. With an impressive sub-micron resolution of 0.4375 μm , coupled with a fast response time of 0.391ms.

In addition, there are no moving mechanical parts in this laser micrometer to adjust or recalibrate (solid-state electronics only)

The MXY Micrometer is certainly well suited for use in fast moving production lines (online measurement) or offline measurement. All Metralight sensors are well known for its simplicity in operation and ease of system integration.

The MXY Micrometer has standard Ethernet, USB, RS232, Analog outputs. If USB port is used, it's self powered from USB port. Ethernet allows easy integration of multiple sensors). Parallel (for PLC) or SPI interfaces are available too. Customization requests are welcomed.

For easy SW development, Metralight Inc. offers sample software with source code (VB.NET and Excel macro).

Measurement of object in 2 plains (X and Y) is useful in automated lines for checking of diameter of wire/cable, tubing, pipes, needles and other circular/oval objects.

The MXY Micrometer sensor has 6 standard modes (EDGE1, EDGE2, DIAMETER, CENTER, GAP, SOLID EDGE, SOLID DIAMETER). This can be customized to measure Center, Minimum and Maximum , Gap between objects, range of tolerances. (see Application section for more information)

The Sensor uses high contrast OLED display for each axis for direct measurement displaying, this is used for quick test verification without a need of using host PC or PLC.

Measurement

Sensor Range	140µm (0.006 in) up to 28 mm (1.1 in)
Resolution (Pixel size)	0.4375 µm
Repeatability	3 µm (Edge position, calibrated distance)
Response Time	0.391 ms
Non-Linearity	<5 µm (Edge position, calibrated distance)
Measuring Modes	Edge1, Edge2, Diameter, Gap, Center, Solid
Custom Modes	<i>Call Metralight for additional custom modes</i>

Interface

Indicators	White LED = Object Present
I/O connectors	DB9, DB25, DB37, MINI-B USB
Interface (I/O)	Ethernet, Serial (RS232)/Analog , USB, Parallel binary (TTL)
Power supply	12 to 24 VDC / 160mA

General

Detection Method	670nm Class I Laser Diode through-beam with CCD
Overall Dimension	170.18 x 152.4 x 25.4 mm (6.7" x 6" x 1")
Mounting holes	7x M6
Weight	800g (27oz)
Operating Temp.	0°C to 50°C (32°F to 122°F)
Storage Temp.	-20°C to 70°C (-4°F to 158°F)

Table 1: Specification.

MXY Laser Micrometer uses two parallel beams to measure position or size of objects in two perpendicular planes. An object is simply placed in the detection line, and the measured edge (in case of diameter - both edges) must be in the active area.

The position and size of the shadow is measured via the CMOS image sensor. Gap and Center can also be measured. Optimal position of the object is in the center of sensor (center of mounting holes, see picture bellow and Dimensions section).

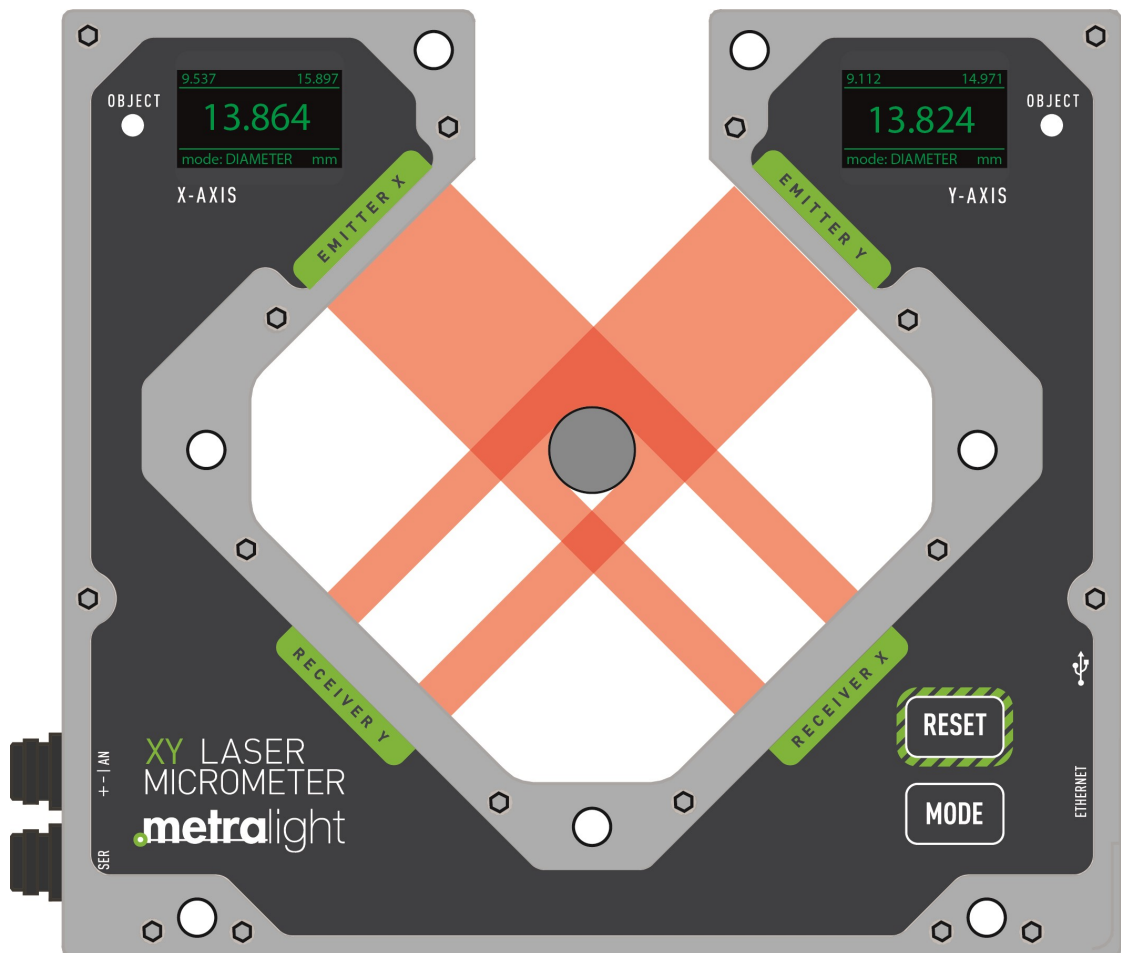


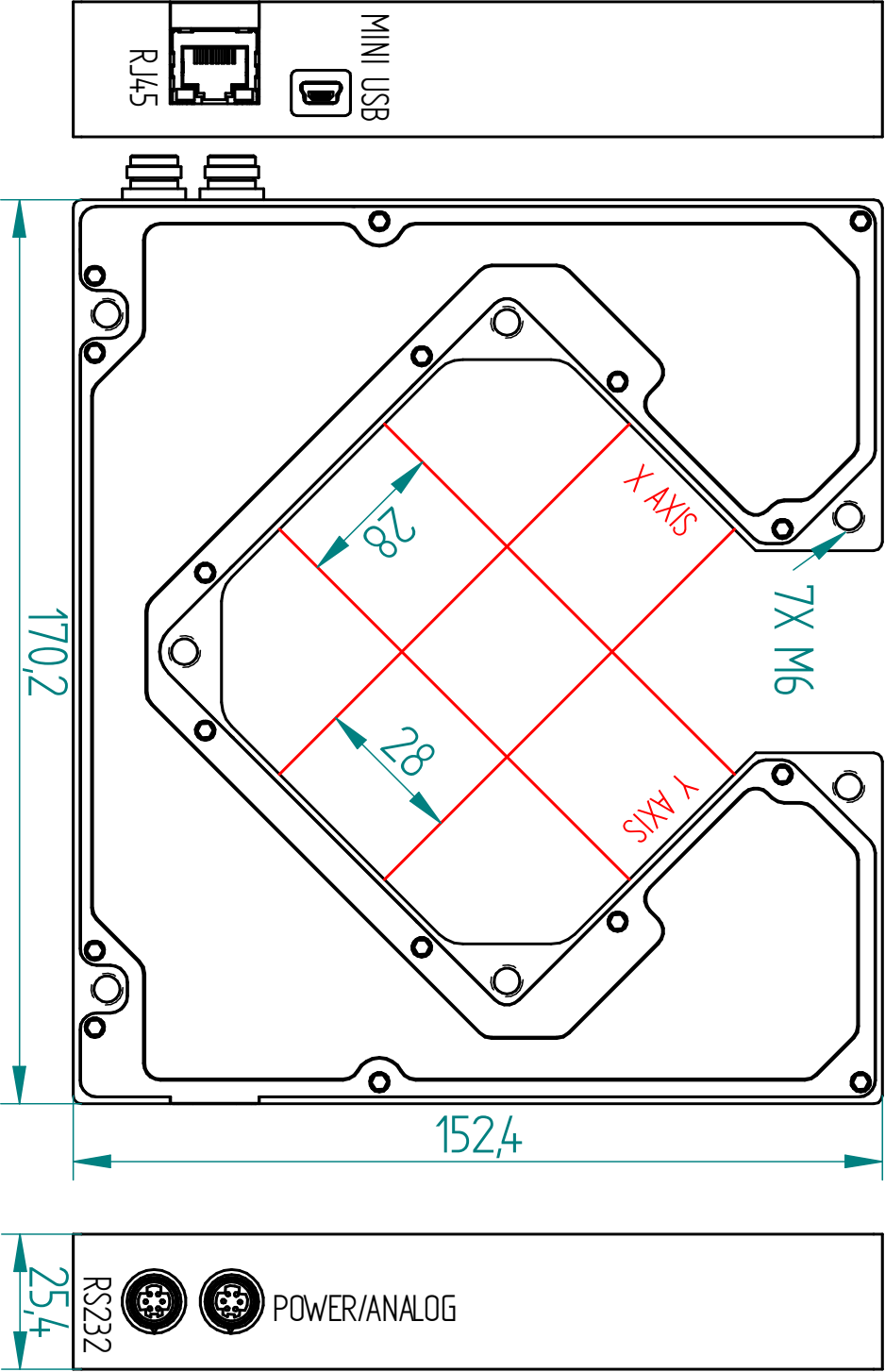
Figure 1: Parallel beam and shadow of an object.

Sensor processes CMOS image sensor data and outputs measurement in a binary pixel format representing position/size of object(s). Sensor processing can also be customized upon customer request, to include maximum/minimum, average values, etc.

Dimensions

4

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



MXY sensor has Ethernet or RS232/Analog or USB output. All outputs run in parallel. For RS232, Analog, Ethernet there is a requirement of power connection (RED / BLACK wire). When USB interface is used, sensor is powered from USB port. Ethernet can be powered alternatively over passive POE (Power Over Ethernet, unused wires of Ethernet). Metralight recommend Ubiquiti switch, with powered ports (no external power supply needed).

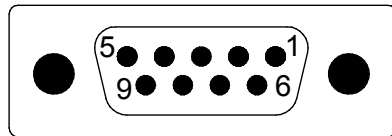
MXY sensor comes with 3 cables. Power/Analog cable has circular latching connector on one side and 6 wires pigtail on the other end. RS232 cable has DB9 Female connector on HOST side (this can be connected directly to PC). Third cable is MINI-B USB cable. If RS232 or Analog interface is used, connect POWER wires (RED to +12 to 24VDC and BLACK) to GND. Other wires can be used for Analog output.

USB Interface

MXY sensor uses MINI-B type USB connector. Sensor is powered from USB port. After driver installation (www.ftdichip.com) Virtual Com Port is created, therefore communication with the sensor is the same as with RS232 interface (see Command Set in following chapter).

RS232 Interface

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



Pin 2 TXD
Pin 3 RXD
Pin 5 GND

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

Figure 2: DB9 Female connector (from sensor).

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

Analog Interface

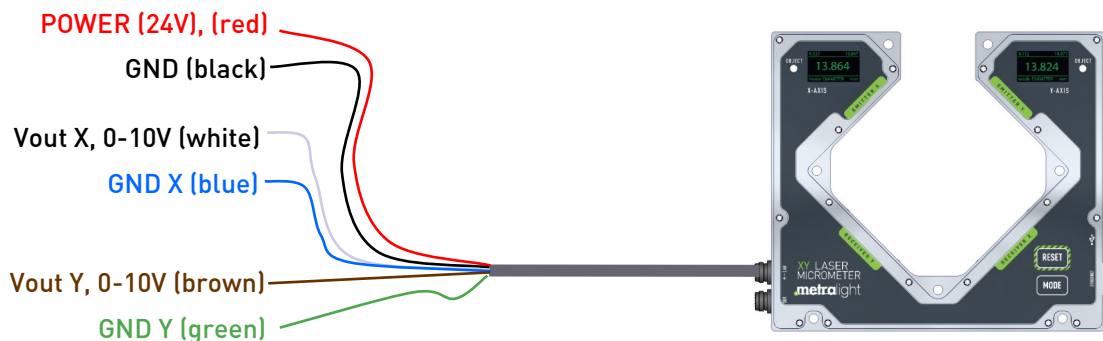


Figure 3: Power/Analog cable connection.

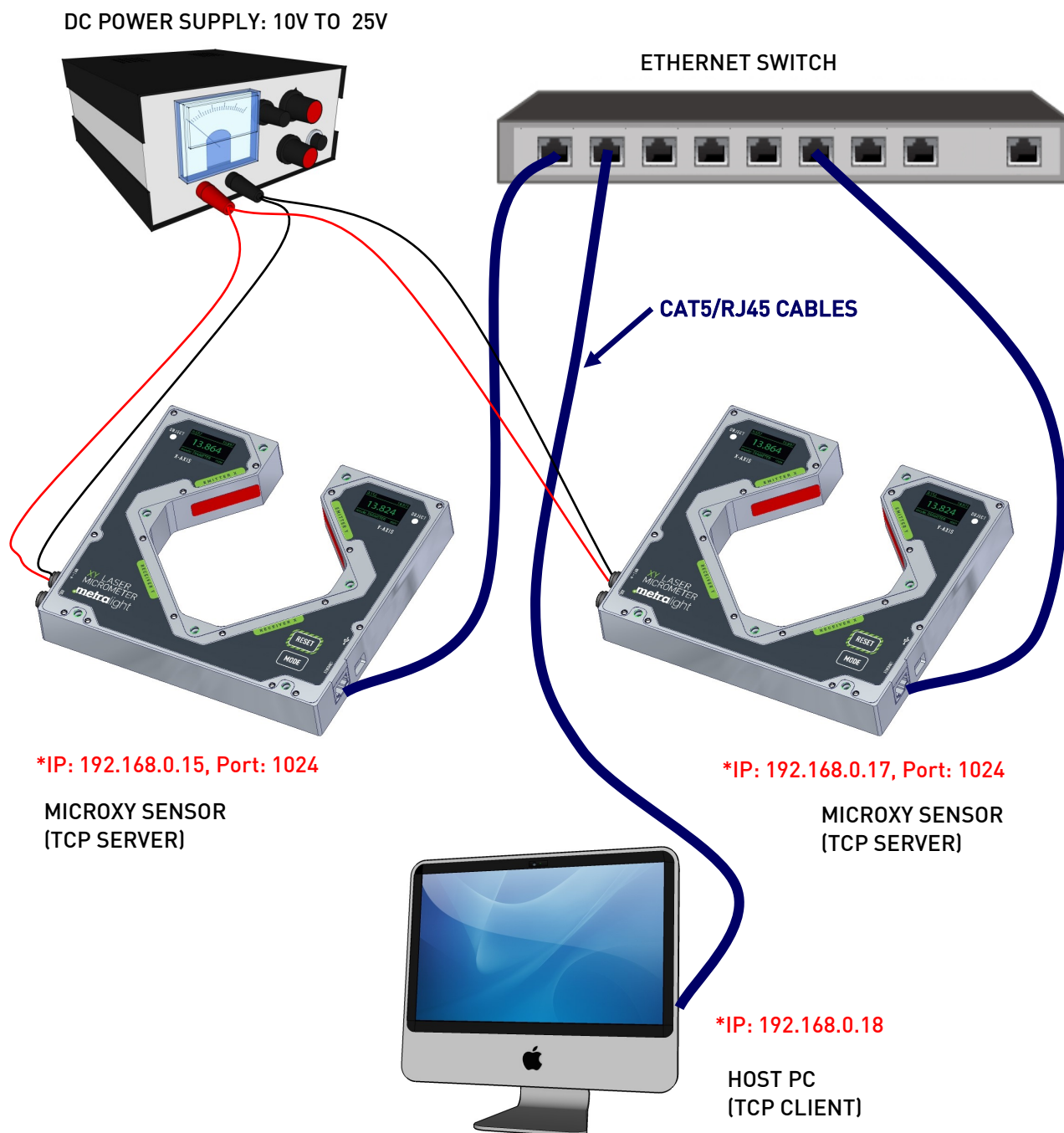


Figure 4: Ethernet connection.

For the MXY Laser Micrometer there are 3 basic commands: DATA, STREAM and MODE. There is always 1 byte command being sent from PC to micrometer. Sensor response varies in length for different commands. For DATA command there are 5 bytes for each data request (or multiple of five if more datas are requested). STREAM START command triggers sensor to send 5-byte length data packets until STREAM STOP is issued. There is no response for STREAM STOP command. MODE command has 1 byte response (echoes back MODE command).

Command's byte high nibble determines command type and low nibble represents parameter of this command:

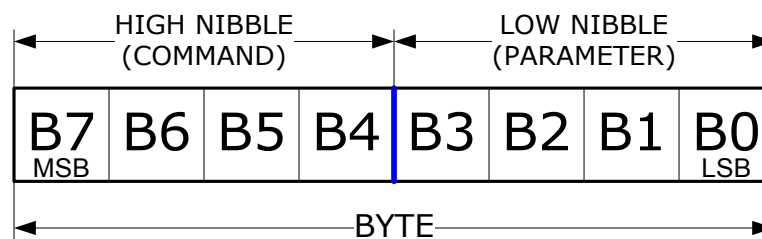


Figure 5: Command with parameter structure

When data are requested (DATA command or STREAM START), micrometer responds with 5 byte-length packets (2 data bytes for X and 2 bytes for Y axis and 1 info byte).

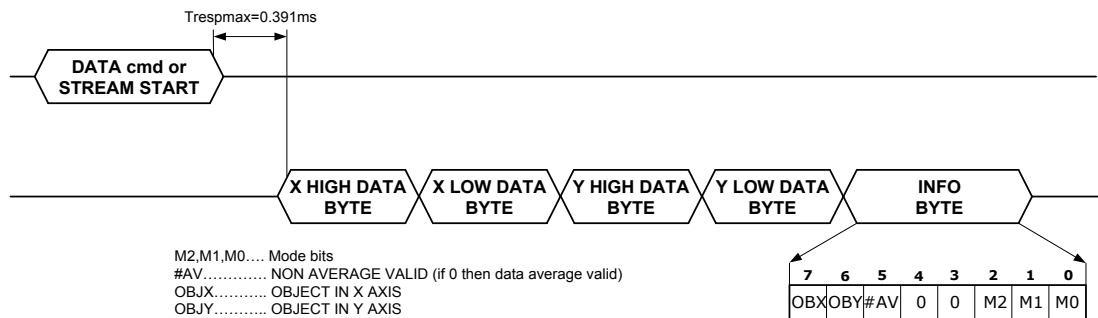


Figure 6: 1 Data Packet (5bytes)

If more data is requested then response is multiplier of 5 bytes. E.g. PC requests 4 data (via DATA command) then micrometer returns 20 bytes. If STREAM START command is issued then Micrometer continuously sends 5 byte packets until STREAM STOP command is sent. Typical PC cannot read data in full speed mode (1250 readings/s) when 1 data only is requested and sensor triggered again. For high speed applications more data should be requested per one command (DATA command with parameter for more than 1 data or STREAM command). This method allows constant data sampling frequency. This constant frequency is also maximum data frequency.

DATA command

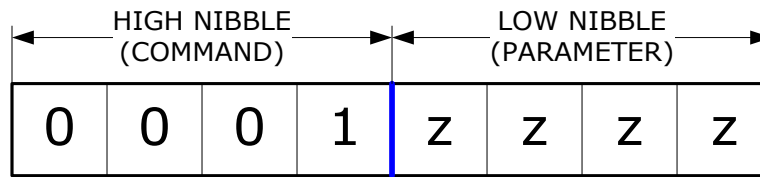


Figure 7: Data Command.

Command: **DATA**

Parameter: **zzzz** represent number of data (2^{zzzz}) being requested

Response: $2^{zzzz}\{data\}$, where $\{data\}$ is 5 byte-length packet response (X axis High Byte, X axis Low Byte, Y axis High Byte, Y axis Low Byte, Info Byte)

Response length (bytes): $5 * 2^{zzzz}$

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: 10100100 10110111 10011101 10011111 10000010

Description:

First two bytes (X axis data) = 10100100 10110111 = 0xA4B7=42167, this is diameter in pixels. 1 pixel measures 0.4375 μ m, then diameter (X axis) = 42167 * 0.4375 = 18.448mm

Third and Fourth bytes (Y axis data) = 10011101 10011111 = 0x9D9F=40351, this is diameter in pixels. 1 pixel measures 0.4375 μ m, then diameter (Y axis) = 40351 * 0.4375 = 17.653mm

Last byte (info byte) = 11000010. Bit OBX=1 (Axis X object present), Bit OBY=1 (Axis Y object present), #AV=0 (average valid), MODE=010 (Diameter mode)

Example 2: User request 16 continuous datas:

PC sends: 00010100 (0x14)

Micrometer response: Sixteen 5 bytes packets

STREAM command

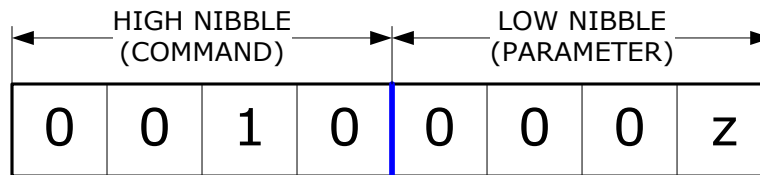


Figure 8: Stream Command

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 5 byte-length packet response

Response length (bytes): finite number (multiplier of 5) 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)

Micrometer response: No response

MODE command

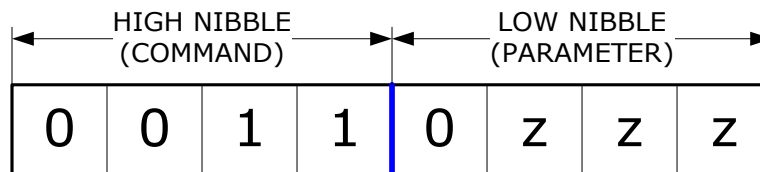


Figure 9: Mode Command.

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)

Micrometer response: 00110010 (0x32)

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

Table 2: Modes. table

Code Example

7

Code example RS232 or USB interface (VB.NET)

```
Dim buffer(0) As Byte = 16           '1 data command in Byte format
Dim ValueX, ValueY,temp As Single    'Measured values X and Y axis in µm
Dim ObjectX,ObjectY As Boolean       'Object in X and Y axis

SerialPort.ReadExisting()             'Clear buffer
SerialPort.Write(buffer, 0, 1)        'Writes data command
ValueX = 0.4375*(256 * SerialPort.ReadByte() + SerialPort.ReadByte()) 'Get X high and low byte
ValueY = 0.4375*(256 * SerialPort.ReadByte() + SerialPort.ReadByte()) 'Get Y high and low byte

temp=SerialPort.ReadByte()
ObjectX=temp>>7 'set X object
ObjectY=(temp<<1) >> 7 'set Y object
```

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 10: MicroStudio SW

Ethernet Settings, Code Example

The MXY Sensor (TCP server) communicates with the host (TCP client) using command set above. For first testing Metralight recommends TCP terminal SW (RealTerm, Termite, etc..). Default IP address of MXY sensor is 192.168.0.16, PORT 1024. Port number is fix, IP address can be changed via USB interface (in Microstudio SW).

Code example ETHERNET interface (VB.NET)

```
Dim tcpC1 As TcpClient '
Dim stream1 As NetworkStream '
Dim out_buffer(0) As Byte 'output buffer for commands
Dim ValueX, ValueY As Double
out_buffer(0) = &H10 'command: request for 1 data
tcpC1 = New TcpClient()
tcpC1.Connect("192.168.0.9", 1001) 'connect to IP address and port..
stream1 = tcpC1.GetStream()
stream1.Write(out_buffer, 0, out_buffer.Length) 'send request for data
'.. Wait for sensor response.. And read data
If stream1.DataAvailable Then
    bytes = stream1.Read(rdata, 0, rdata.Length)
    ValueX = 0.4375*(256 * rdata(0) + rdata(1)) 'X value in µm
    ValueY = 0.4375*(256 * rdata(2) + rdata(3)) 'Y value in µm
    'status in rdata(4)
End If
tcpC1.Close()
```

MXY Laser Micrometer uses two high contrast OLED Displays. Two buttons allows quick measuring MODE change and RESET recorded MIN and MAX (on displays). Two white LEDs indicate OBJECT presence for each axis. See picture below.

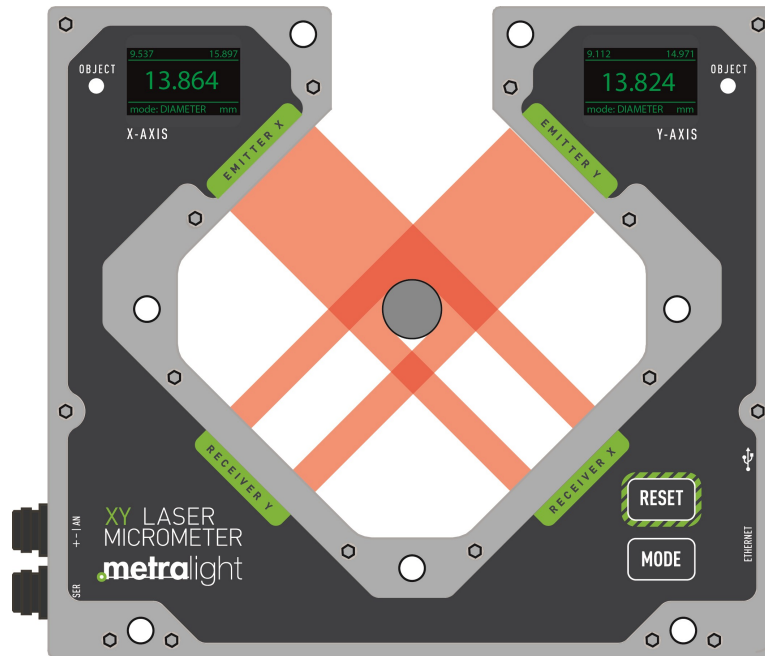


Figure 11: User's interface

Change of measuring mode made by MODE button is stored after 1min in EEPROM memory. After next power-up, this mode is restored. Measuring mode changed via RS232 or USB is not stored in EEPROM.

Display shows Minimum and Maximum recorded values (top line), current measurement (big middle number) and measuring mode with units on status line. See picture below.

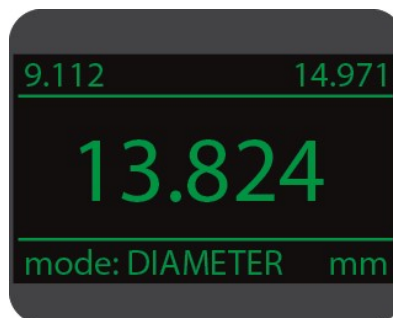


Figure 12: Display - enlarged

MODE and RESET button have alternative function. After power-up, if RESET button is pressed then **inch** unit are set, if MODE button is pressed then **mm** unit are set, If both buttons are pressed then **pixel** units are set. Units setting is then stored in EEPROM and restored after next power-up.

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

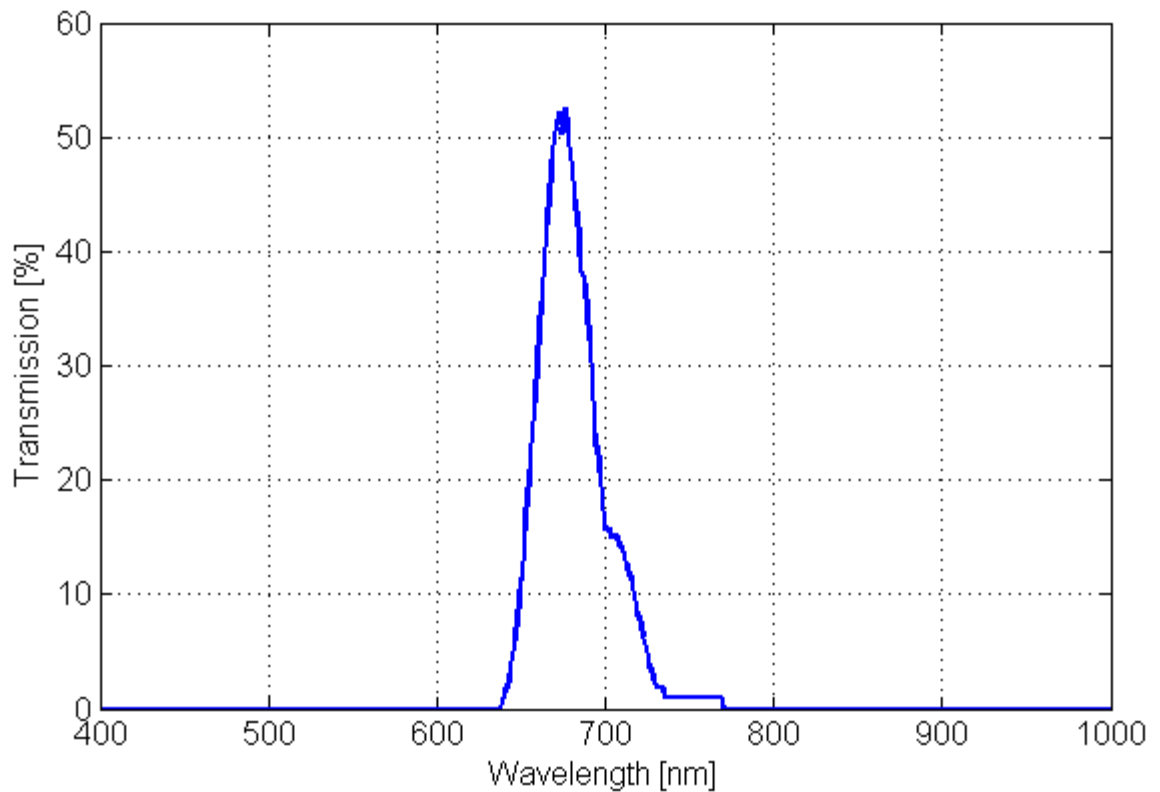


Figure 13: Ambient light optical filter

Package components

- MXY Sensor unit
- Power/Analog cable
- RS232 cable * some units
- USB cable
- POE injector, Ethernet cables * some units

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

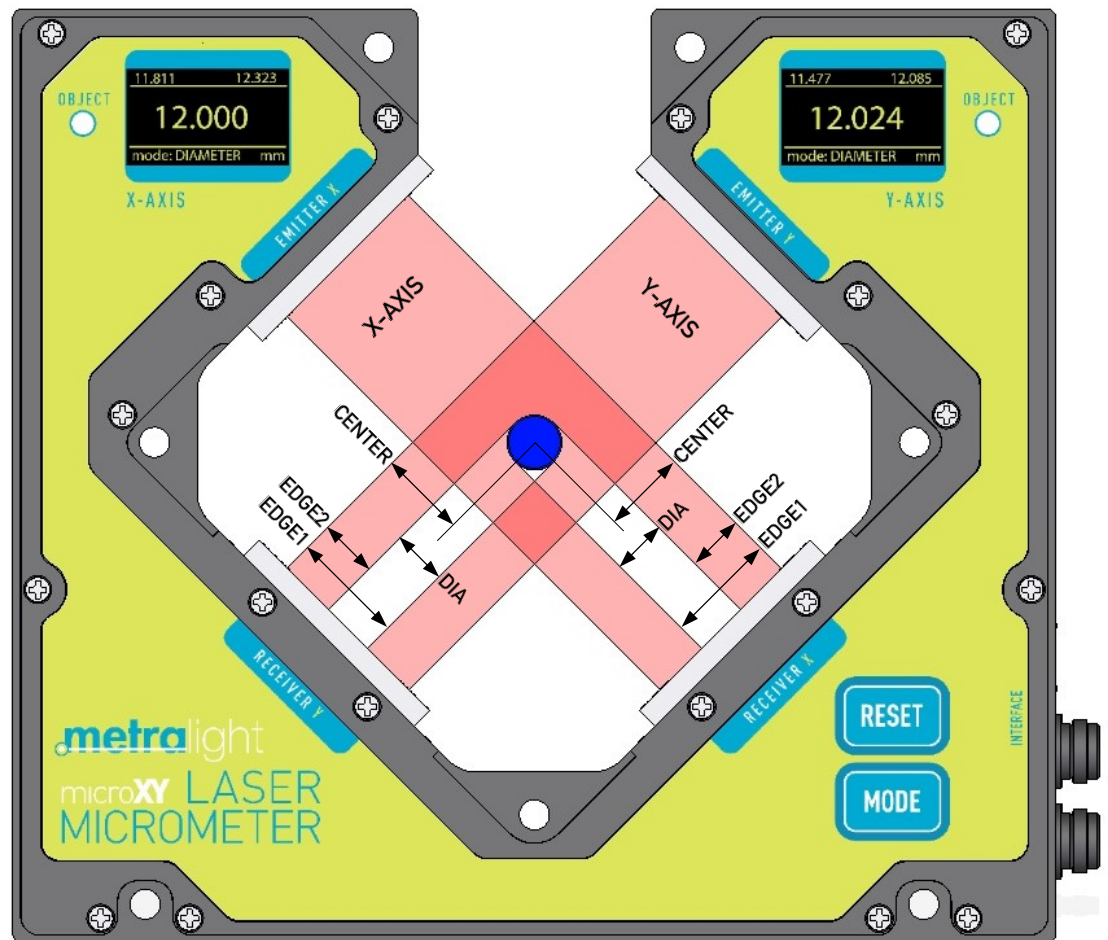


Figure14: Measuring modes