

# Portable laser micrometer

## Gen. 3 (2021)

Technical specification (rev.B, October 2022)



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# 1. Introduction

- Handheld Innovation in Non-Contact Measurement
- Battery Powered (runs from internal Li-Ion battery – up to 10 hours)
- Communication and battery charging over USB or Ethernet (active POE)
- Wi-Fi (802.11b/g)
- Embedded LINUX OS including web server, SSH access
- Integrated web measuring application – remote access using mobile phone available (using Wi-Fi)
- 4GB memory
- 3900 measurements per second
- High resolution color OLED Display
- Membrane/capacitive Keyboard
- Laser Device (Laser Diode 670 nm Class I)
- Custom Modes Available: Centering, Minimum Measurement, Maximum Measurement, Thickness, Range of Tolerances

## 2. Specification

<b>Measurement Range</b>	28 mm (1.10")
<b>Resolution</b>	0.4375 $\mu$ m
<b>Repeatability</b>	3 $\mu$ m (Edge Position, Calibrated Distance)
<b>Response Time</b>	0.333 ms
<b>Non-Linearity</b>	< 10 $\mu$ m (Edge Position, Calibrated Distance)
<b>Measuring Modes</b>	Edge1, Edge2, Diameter, Gap, Center, Solid
<b>Power</b>	USB Powered (5 V/150 mA) / Internal Li-Ion (up to 10 h running)
<b>Wired Connection/Interface</b>	Micro USB B connector / Ethernet
<b>Communication protocol</b>	Modbus TCP (measured values only) or full featured custom protocol
<b>Wireless</b>	Wi-Fi 802.11b/g
<b>Display</b>	OLED, 320 x 320
<b>Memory</b>	4GB
<b>Overall Dimension</b>	131 x 97 x 23 mm (5.16" x 3.82" x 0.9")
<b>Weight</b>	280 g (9.88 oz)

*Table 1: Sensor specification*

# 3. Description

## 3.1 Dimensions

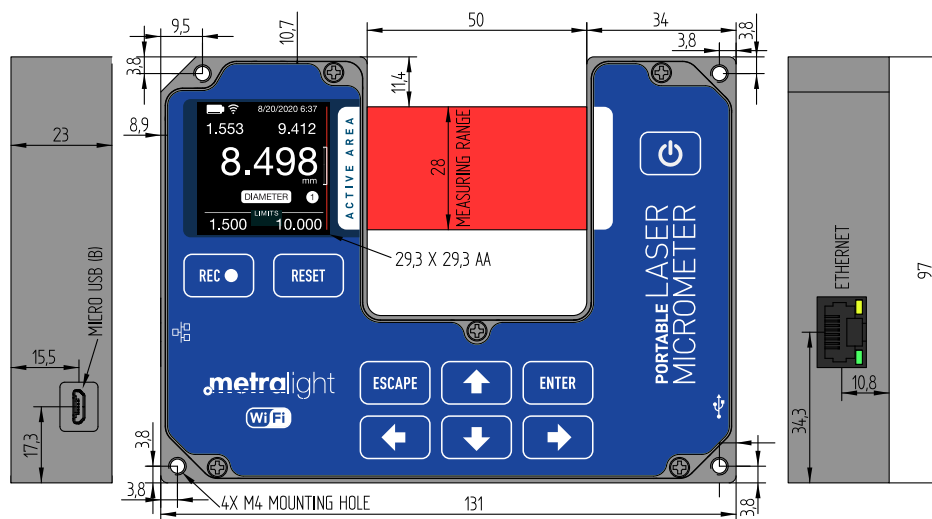


Image 1: Portable sensor dimensions (mm)

## 3.2 Interface

Sensor offers multiple connection options. Each of provided interfaces can be used to communicate with sensor using tcp/web api or to use integrated measuring web application. Sensor also supports Modbus TCP (measured values and min/max only). Detailed specification of modbus registers is documented in documentation page of integrated web application.

### 3.2.1 USB 2.0

Communication with the sensor and charging is provided by USB Micro B connector. Driver installation may be needed for network over USB usage (see chapter [Driver installation \(page 8\)](#) for details).

### 3.2.2 Ethernet

Ethernet interface can be used both for communication and charging using active POE.

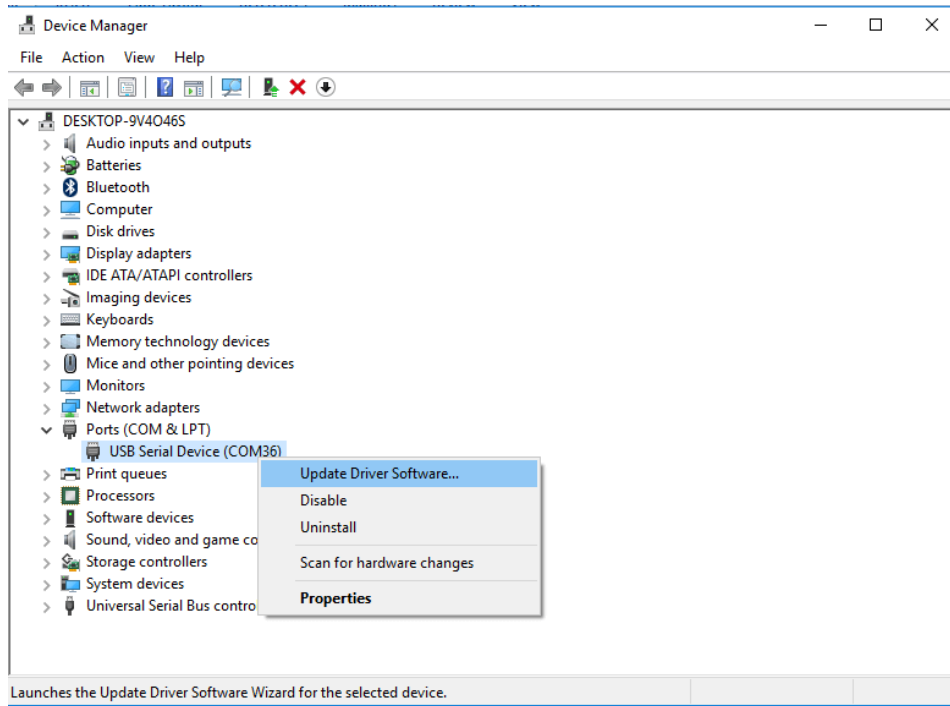
### 3.2.3 Wi-Fi

Wi-Fi to be either in AP mode or client mode (see chapter [Settings \(page 14\)](#) for details). When in AP mode, sensor creates own wireless network. When in Client mode, the sensor can connect to any available wireless network in the area.

# 4. Driver installation

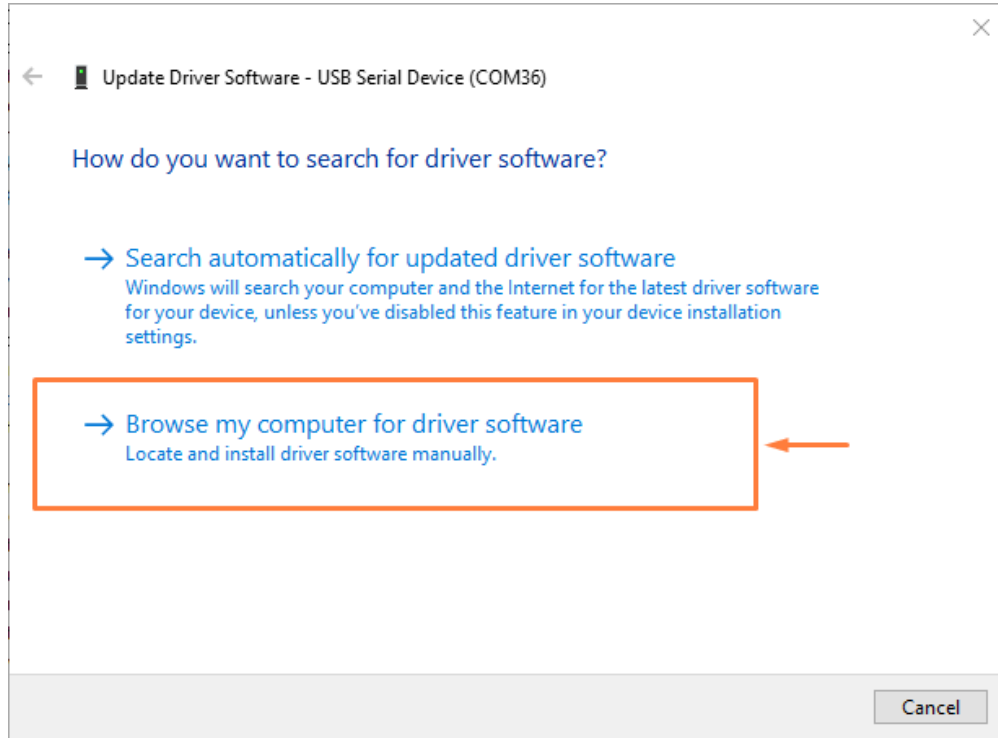
If the RNDIS driver installs automatically then USB network will work. If it installs as USB Serial Device (as in Windows 10 for example) then continue using following steps:

1. Click here to [download](#) the RNDIS Driver. Extract the downloaded zip files.
2. Open Device Manager. Portable is detected as USB Serial Device at COM port under the PORTS & LPT. Right click on it and select "Update Driver Software"

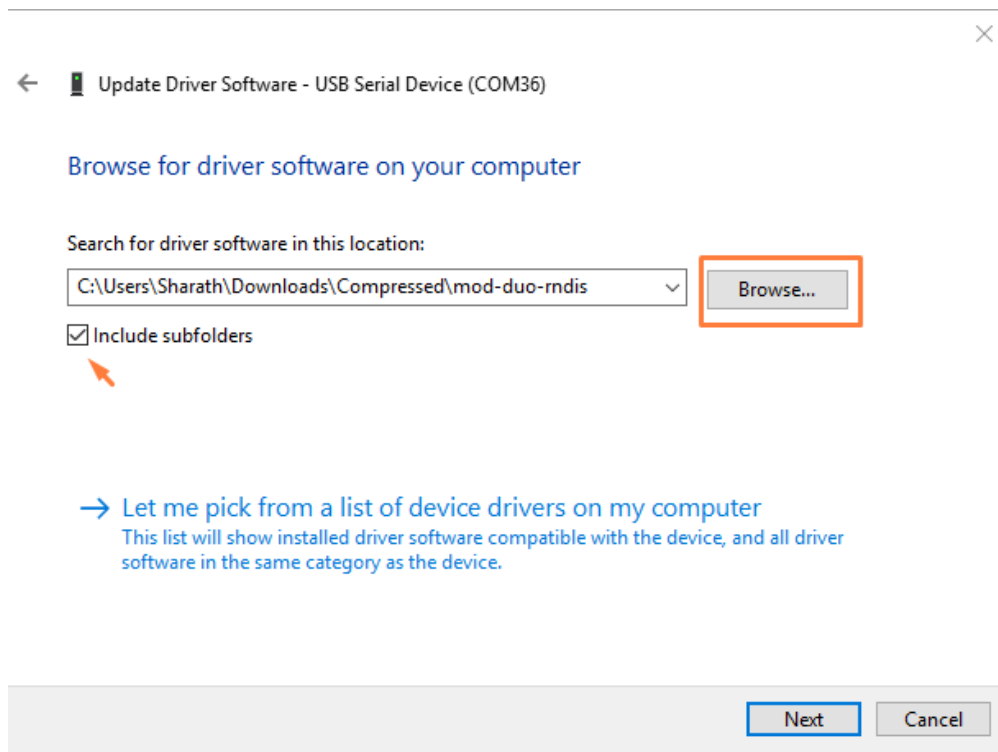


3. Select "Browse my computer for driver software".

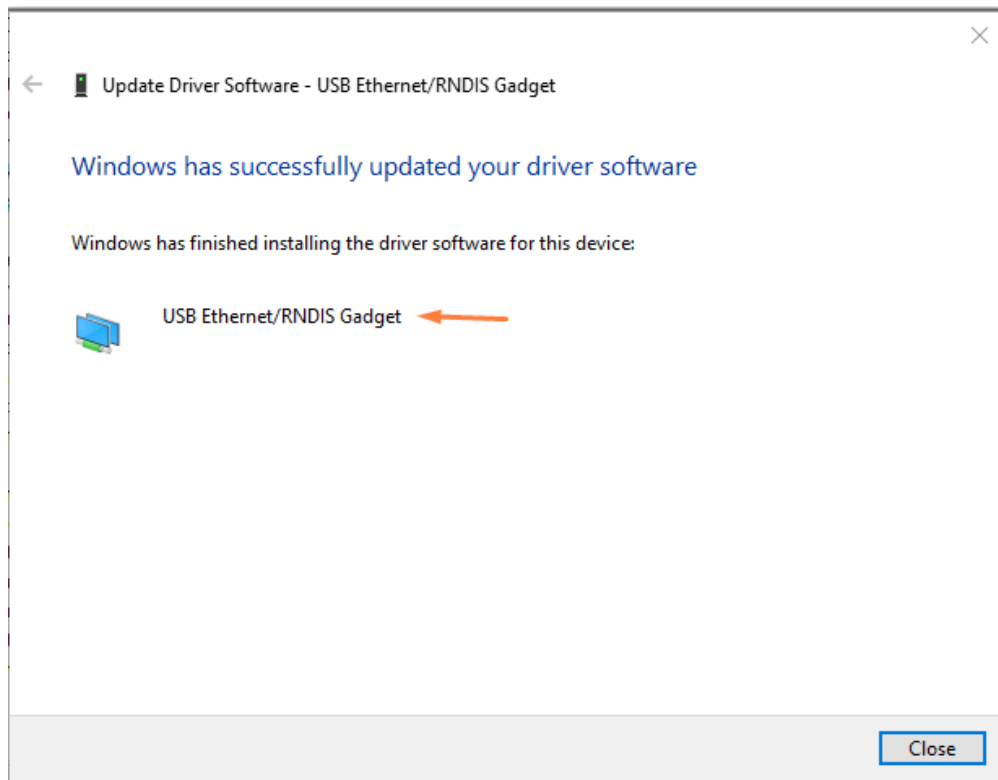
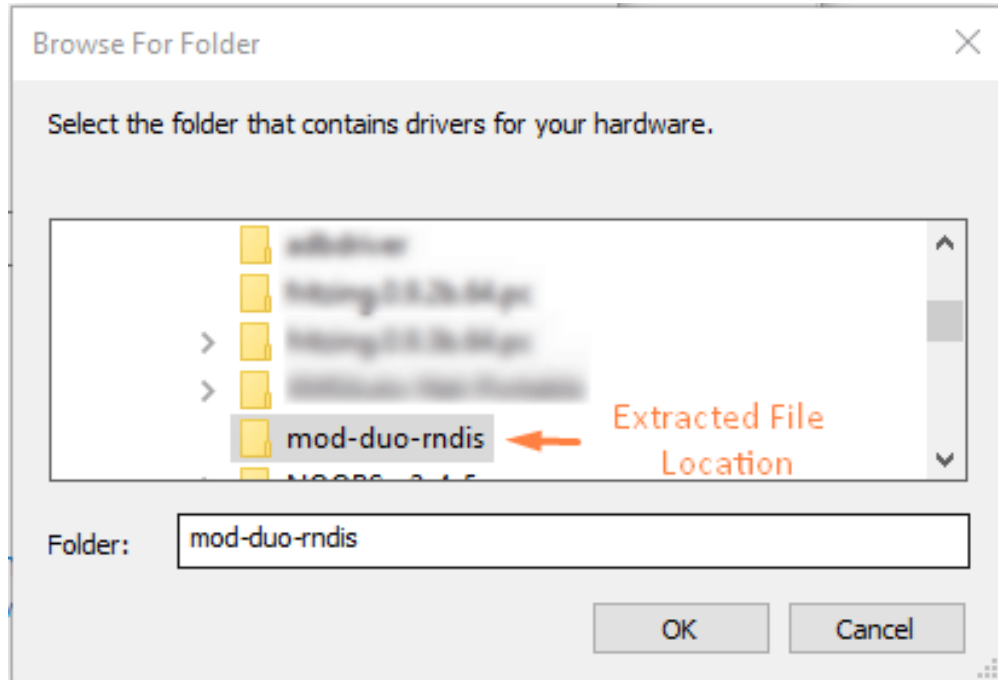




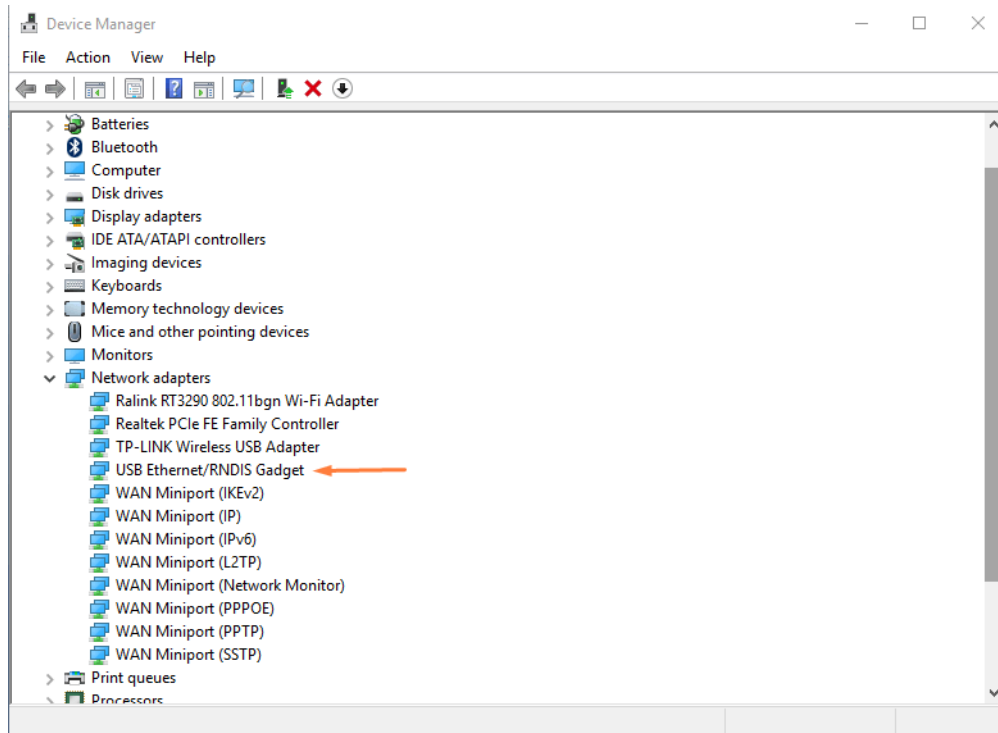
4. Choose the location where you extracted the driver files on your PC.



5. Select the Extracted driver folder which is mod-duo-rndis. Click ok and click Next. This will install the driver.



6. Now you can able to see the RNDIS in Network adapters.



## 5. Display screens

Display screen can be changed using LEFT/RIGHT arrows.

### 5.1 Measuring

Main screen contains:

- **Battery status:** Indicates current battery level.
- **Charging status:** Displayed only when battery is charging.
- **Wifi status:** Displayed only when wifi is either in AP or client mode.
- **Min, Max:** Minimum and maximum measured values. RESTART button resets stored MIN&MAX.
- **Current value:** Display currently measured value.
- **Units:** Measuring units - millimeters or inches.
- **Value mode:** Indicates if currently displayed value is absolute or relative to value set in the sensor. See [Value mode \(page 15\)](#) for details.
- **Measuring mode:** Measuring mode of the sensor - diameter, center, gap, etc. ENTER button changes the mode.
- **Object-in status:** Displays number of detected objects in measuring zone
- **Min/max limit:** limits used to compare against measured value, if outside limits - measured value color changes to red and flag is set in data read using api. Limits are set per measuring mode.

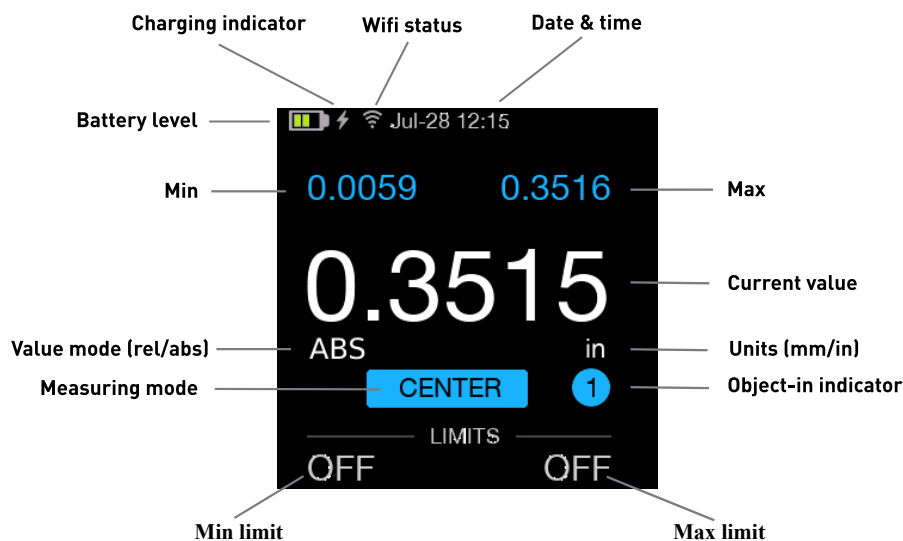


Image 2: Measuring screen

## 5.2 Pixel profile

Display sensor pixels profile and threshold.

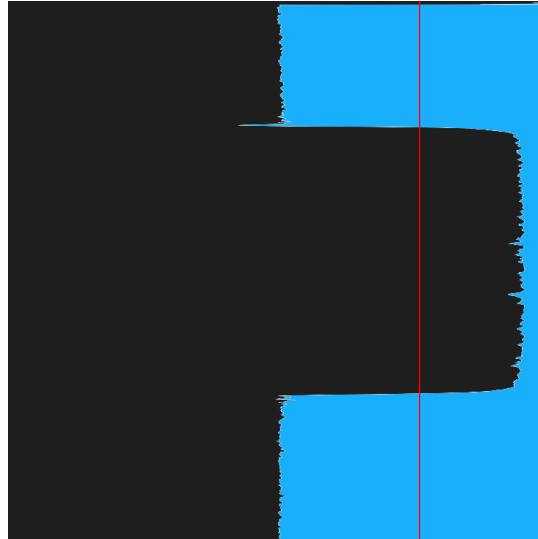


Image 3: Pixel profile and threshold

## 5.3 Status screen

Display stream settings and IP addresses.

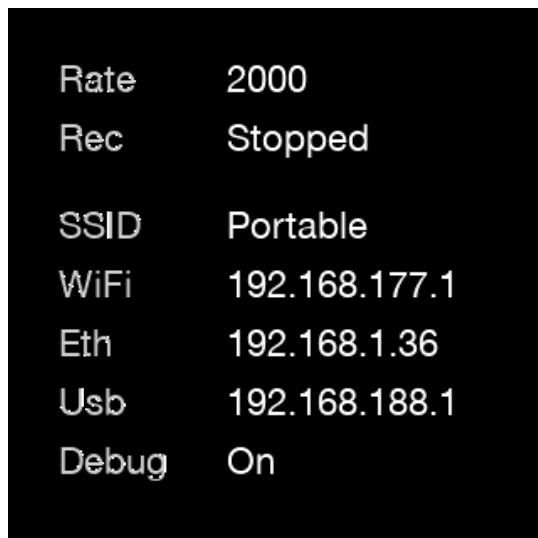


Image 4: Pixel profile and threshold

## 5.4 Settings

Sensor parameters settings screen:

- Mode - select measuring mode
- Units
  - mm
  - inch
- Average - select number of samples for value averaging
- Wi-Fi
  - WiFi - configures mode of operation:
    - On-client (connects to existing WiFi network)
    - On-AP (creates own network)
    - Off
  - SSID - list of available networks
  - AP name - configure network name
  - AP password - configure network password
  - AP channel - configure channel
  - Status - shows current status and IP address
- Date - Set date and time
- Normalize - performs user normalization
- Normalization - normalization type is selected:
  - user (normalization made using previous menu option or by command via USB)
  - default (factory)
- System info - system information: version, CPU temperature, etc.

## 6. Value mode

Sensor work in two different value modes (indicated on main screen):

- **Absolute (ABS):** Value measured by the sensor, ie. diameter of object, is directly displayed. Number is always zero or higher.
- **Relative (REL):** Displayed value is the result of subtraction of value measured by the sensor, ie. diameter of object, from previously saved number (hereinafter referred to as standard). Number can be either positive and negative.

Value mode and saved standard value is bound to specific measuring mode and is saved during mode change and during power off. Relative values also work in saved streams and through api.

**Important:** When in relative mode and no object is placed inside measuring range, the sensor displays zero - same value as when object is inserted and the value is same as standard. To distinguish those situations object in indicator has to be taken into account.

### 6.1 Switching to relative mode

1. Put object inside measuring range
2. Push and hold RESET button
3. Wait until indicator on display is changed from ABS to REL and the value is reset to zero.

The measured standard value can also be updated using Mode tab inside integrated web application and thus can be also used as offset.

### 6.2 Switching to absolute mode

1. Remove object from measuring range
2. Push and hold RESET button
3. Wait until indicator on display is changed from REL to ABS.

# 7. Integrated web application

Sensor provides integrated web application for making measurements, saving data streams and sensor settings. Web application is responsive and optimized for mobile phones and tablets.

## 7.1 Main application screen

Main application screen shows, similarly to main sensor screen, currently measured value including measured min/max, measured mode, object-in indicator and min/max limits. Stream recording can be configured and started.

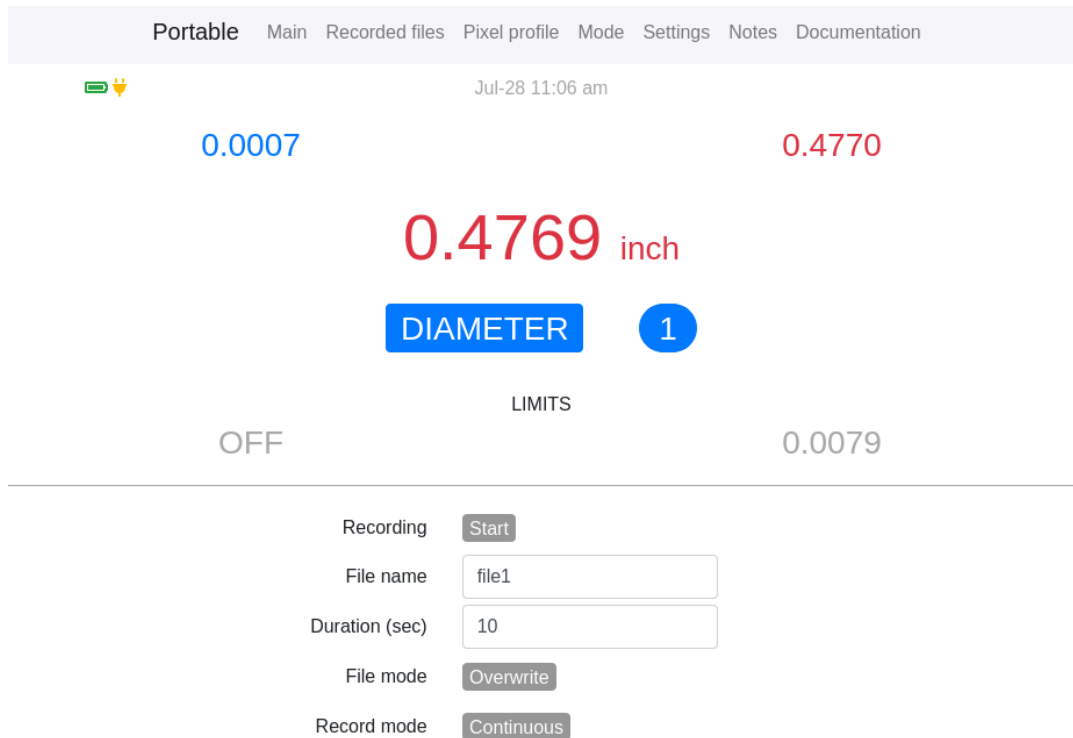
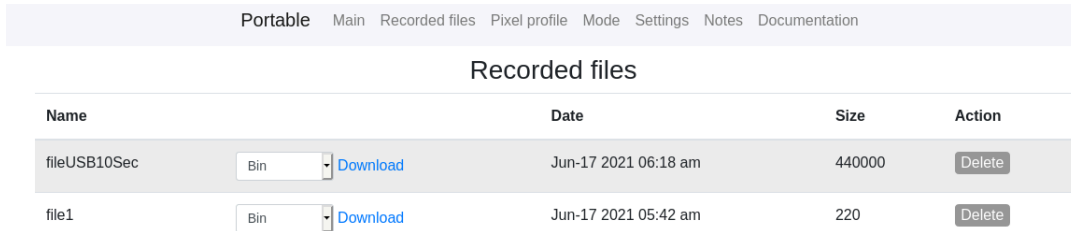


Image 5: Main web application screen



## 7.2 Recorded files

Screen is used to manage recorded stream files.



Name		Date	Size	Action
fileUSB10Sec	Bin <input type="button" value="Download"/>	Jun-17 2021 06:18 am	440000	<input type="button" value="Delete"/>
file1	Bin <input type="button" value="Download"/>	Jun-17 2021 05:42 am	220	<input type="button" value="Delete"/>

Image 6: Recorded files screen

## 7.3 Pixel profile

Shows pixel profile measured by the sensor. Type of displayed profile can be changed.

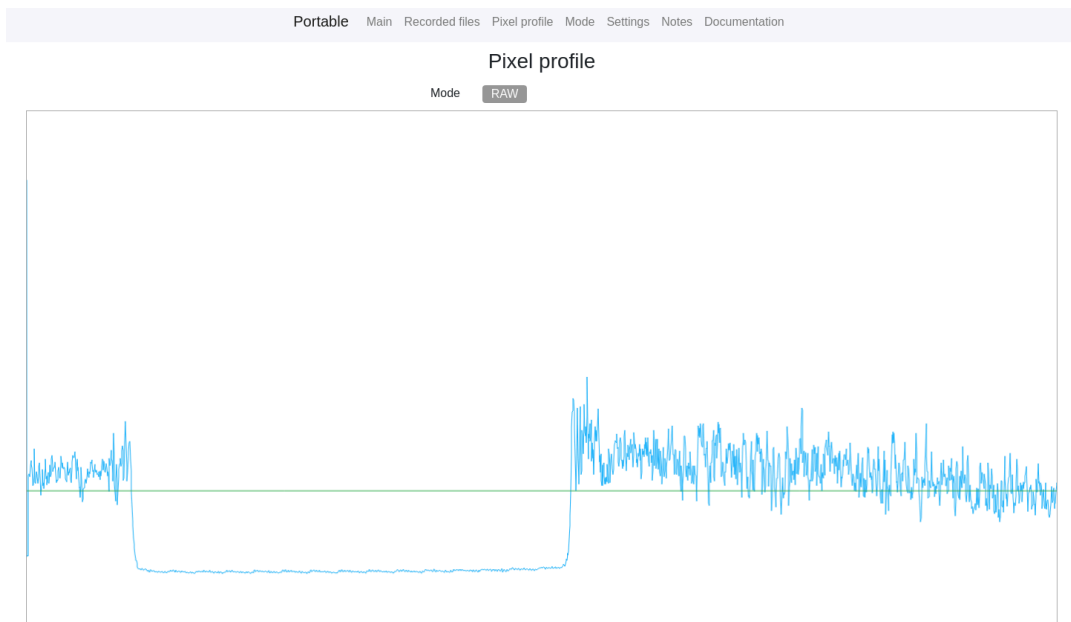


Image 7: Pixel profile screen

## 7.4 Modes

Modes tab contains visualization of measured mode. Modes can be switched by click on mode image. Limits can be set for displayed mode.

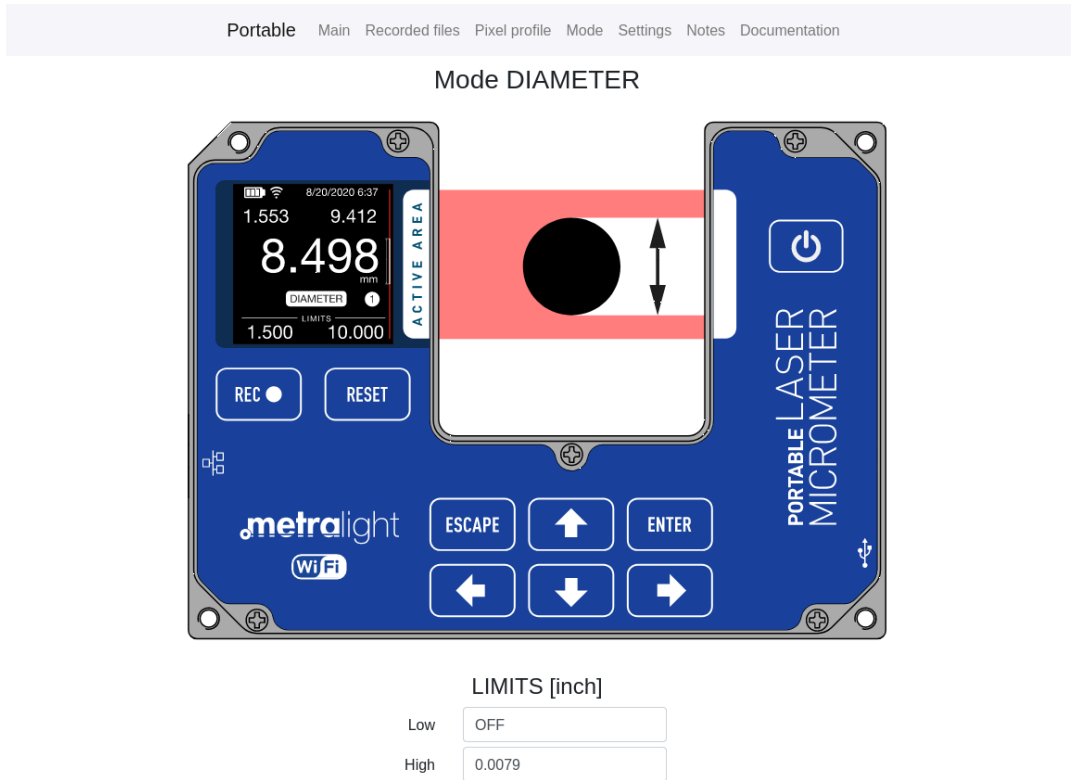


Image 8: Modes screen

## 7.5 Settings

Various sensor settings can be changed using this screen.

The screenshot shows a web application interface for settings. At the top, there is a navigation bar with the following tabs: Portable, Main, Recorded files, Pixel profile, Mode, Settings, Notes, and Documentation. The 'Settings' tab is active. Below the navigation bar, the page is titled 'General'. The settings are organized into two main sections: 'General' and 'Recording'. The 'General' section includes: Mode (DIAMETER), Units (inch), Screen saver interval (10 minutes), Normalization (User), Normalize (Run), Rate (Normal (2000 Hz)), Date and time (2021-07-28 11:09:32), Average of the number of measurements (1), Object filter (0.0040 [inch]), Api enabled (On), Reset settings (Reset), and Disable www interface (Disable). The 'Recording' section includes: File name (file1), File mode (Overwrite), Record mode (Continuous), and Duration (10).

Section	Setting	Value
General	Mode	DIAMETER
	Units	inch
	Screen saver interval	10 minutes
	Normalization	User
	Normalize	Run
	Rate	Normal (2000 Hz)
	Date and time	2021-07-28 11:09:32
	Average of the number of measurements	1
	Object filter	0.0040 [inch]
	Api enabled	On
Recording	Reset settings	Reset
	Disable www interface	Disable
	File name	file1
	File mode	Overwrite
Record mode	Continuous	
Duration	10	

*Image 9: Settings screen*

## 7.6 Notes

Screen is used to save custom text notes inside sensor.

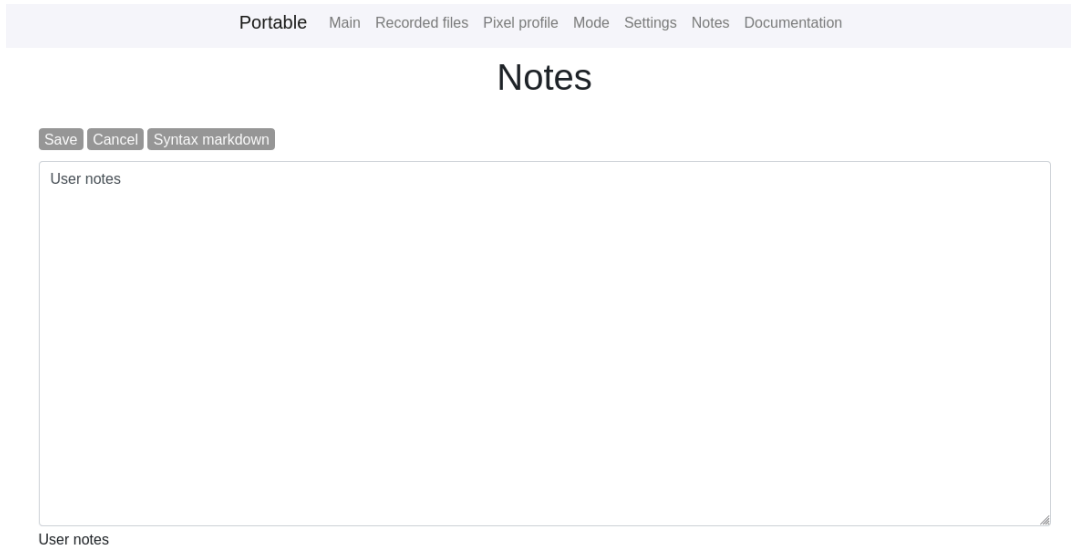


Image 10: Notes screen

## 7.7 Documentation

Screen contains information about sensor usage - api, error codes, modbus configuration, etc. Api commands can be tested using api tester.

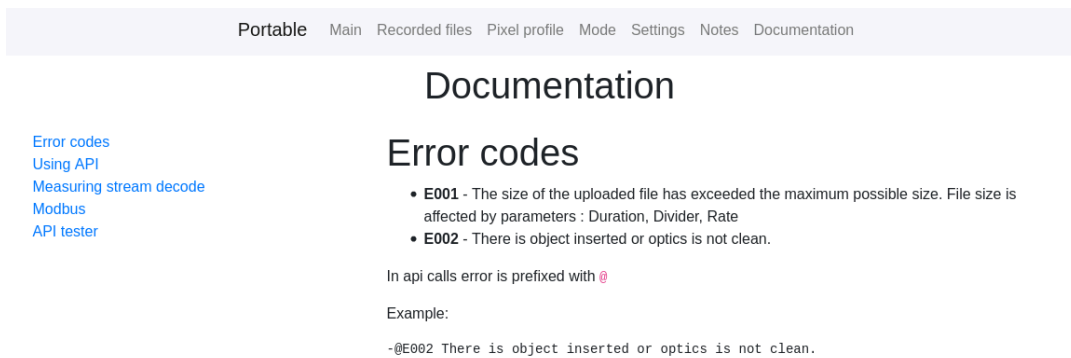


Image 11: Documentation screen

## 8. Communication APIs

Sensor can communicate with external applications using TCP or http api. Both can be turned ON/OFF using sensor settings menu.

TCP api server is running on port 4477. Http api is available on address /api/cmd or /api/cmdmulti, see details below.

Commands and responses are always escaped using newline (\n). All commands are documented and can be tested using api tester on documentation page of integrated web application.

### 8.1 Request

Starts with a "+" sign. The specific api command may or may not implement set/get command - some only work as get, some as set.

#### 8.1.1 Get

Get call is used mainly for reading (does not change the internal state of the server)

```
+get cmd [parameters]\n
```

#### 8.1.2 Set

The call set usually changes the state, they perform actions that change something

```
+set cmd [= parameters]\n
```

### 8.2 Response

First character defines the type of response.

- Character "+" means reponse ok, response body follow "+" character
- Character "-" means error, error message follow "-" character

### 8.3 Examples

#### 8.3.1 Get / Ok

Request: `+get api.po1.battery.percentage\n`

Response: `+99\n`

#### 8.3.2 Set / Error

Request: `+set api.po1.battery.percentage=12\n`

Response: `-not allowed\n`

## 8.4 API call via http

The call only forwards command(s) to and sends the response from the server back to the client. Two options are available:

- Single command call - `/api/cmd`
- multiple commands in one http request - `/api/cmdmulti`

### 8.4.1 Single command

Send to `/api/cmd` using POST method.

Call example:

```
curl -X POST -H "Content-Type: application/json" \  
-d '{  
  "cmd": "get api.po1.battery.charging",  
}' \  
http://localhost:80/api/cmd
```

Response:

```
{  
  "data": "+0,77,0,1;0,2.802,4.123,0.477;1,6.565,4.926,6.280;2,0.075,0.875,  
4.906;3,1.865,0.238,4.301;4,4.193,3.383,3.845;5,0.127,0.793,0.269\n"  
}
```

### 8.4.2 Multiple command

Send to `/api/cmdmulti` using POST method.

Call example:

```
curl -X POST -H "Content-Type: application/json" \  
-d '{  
    "bat_ch":"+get api.po1.battery.charging",  
    "bat_proc":"+get api.po1.battery.percentage",  
    "unitset":"+set db.save.cfg.units=1",  
    "meas":"+get api.po1.measure.data 0 0"  
}' \  
http://localhost:80/api/cmdmulti
```

**Response:**

```
{  
    "data": {  
        "bat_ch": "+1\n",  
        "bat_proc": "+3\n",  
        "meas": "+0,77,0,1;0,2.351,5.554,3.173;1,3.086,5.851,2.998;2,0.773,  
2.178,2.456;3,3.527,5.376,1.877;4,5.833,5.943,0.502;5,0.920,4.304,2.551\n",  
        "unitset": "+ok\n"  
    }  
}
```

## 9. Measuring modes

Portable laser micrometer can measure edge position of an object (EDGE1, EDGE2 modes), diameter (DIA mode), center position (CENTER mode), gap between more objects (GAP mode) and edge position of solid object (SOLID mode). Other custom measuring modes. e.g. number of objects, vibration, etc. are available upon customer request. Measuring mode can be set via sensor buttons or from HOST PC via USB.

See appendix [Measuring modes \(page 27\)](#) for details.

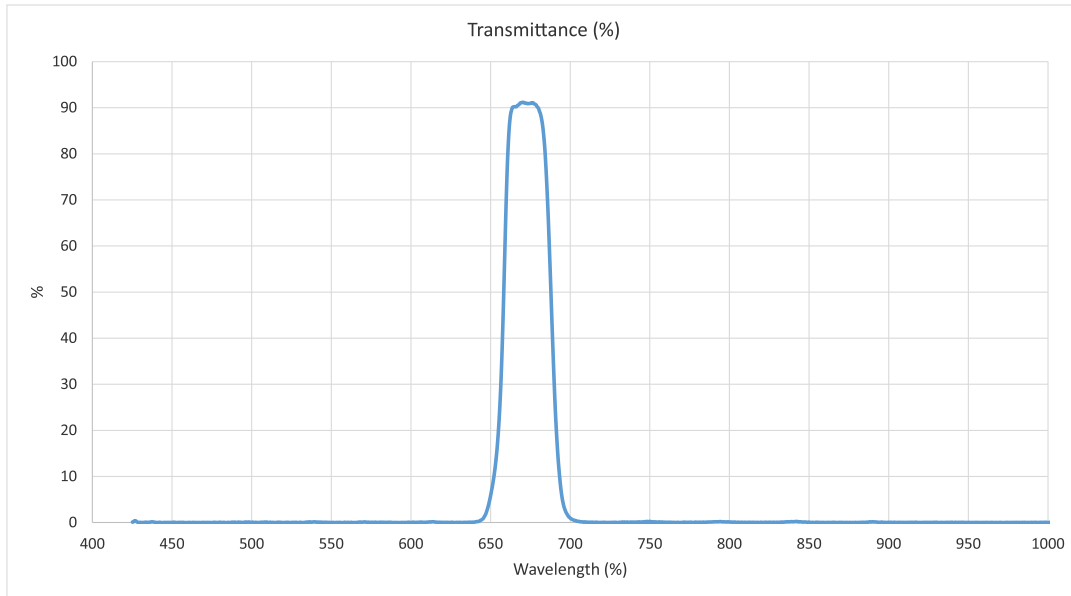


# 10. Installation

USE APPROPRIATE MOUNTING SCREWS (SEE MECHANICAL DRAWING)

AVOID ESPECIALLY 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.



*Image 12: Ambient light optical filter transmittance*

## Laser Safety

Portable sensor is classified as Class 1 Laser device. A Class 1 laser is safe for all conditions of use.



*Image 13: Class 1 Laser safety label*

# 11. Package, warranty, contacts

## Package components:

- 1x Portable laser micrometer
- Transport plastic case
- 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.

533 Airport Blvd. Suite # 400

Burlingame, CA 94010

phone: (650) 581 3088

fax: (650) 808 9830

email: [sales@metralight.com](mailto:sales@metralight.com)

technical support: [support@metralight.com](mailto:support@metralight.com)

web site: <http://www.metralight.com>

# Appendix A. Measuring modes

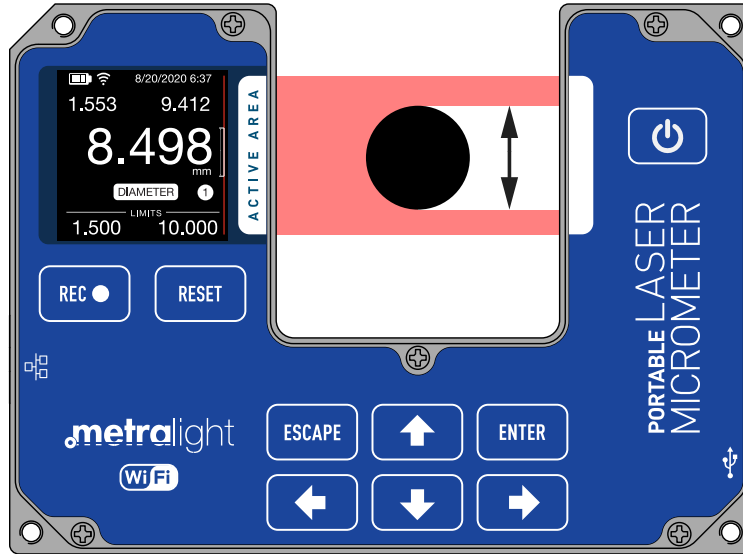


Image 14: Measuring mode: diameter

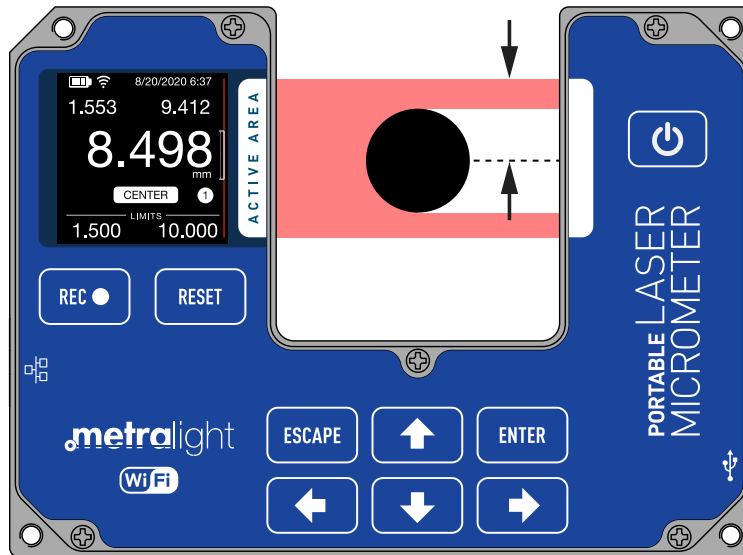


Image 15: Measuring mode: center

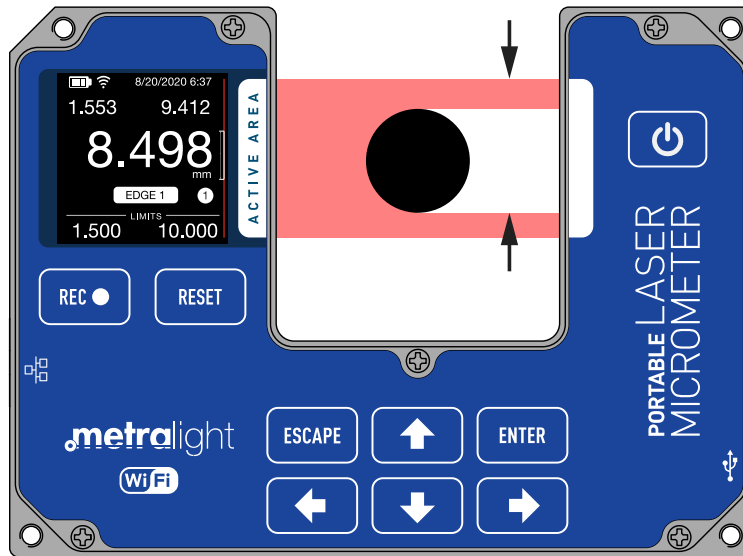


Image 16: Measuring mode: edge 1

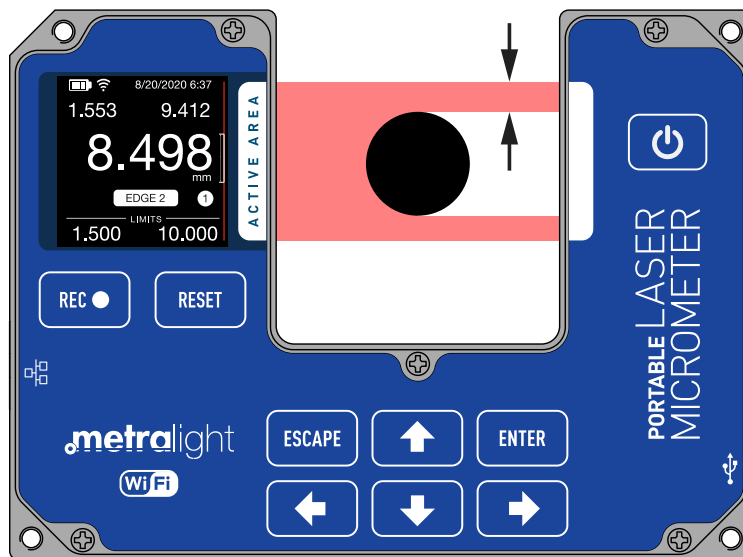


Image 17: Measuring mode: edge 2

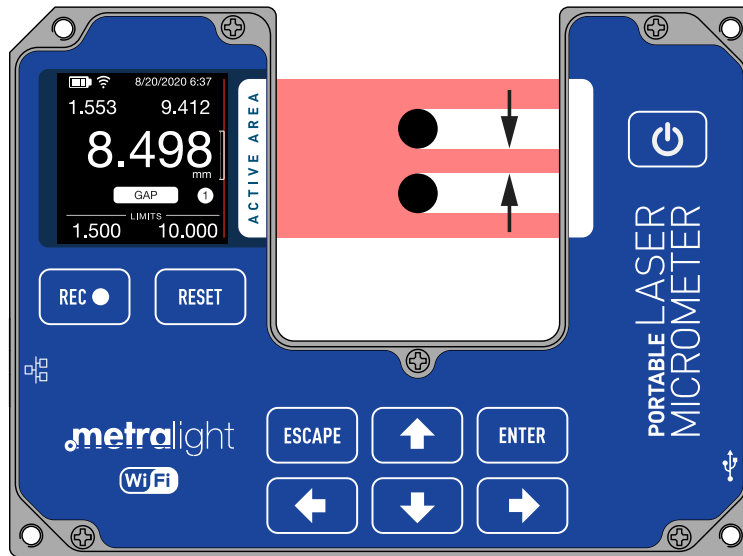


Image 18: Measuring mode: gap

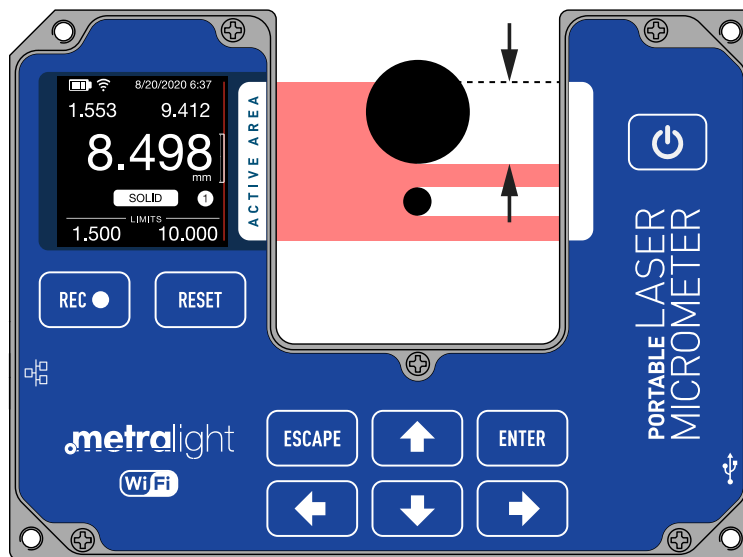


Image 19: Measuring mode: solid