

INTRODUCTION

The AlignxB wafer alignment sensor is compact sensor primary designed for alignment of solid and transparent wafers. High performance optics with precise calibration allows accurate edge measurement. Image data are processed in sensor, no external controller is used.



1. SPECIFICATION

Detection Method :Laser through-beam with CCD image sensor
Light Source: 405 nm or 670 nm Class I Laser Diode
Measurement Range: 140 microns (0.006 in) up to 28 mm (1.10 in)
Resolution: 14 (7) μm for parallel and 0.4375 μm for USB interface
Repeatability: 14 μm for parallel and 3 μm for USB interface
Response Time: 0.391 ms
Non-Linearity: 0.1%
Power: 12 to 24 VDC / 170mA or USB powered
Logic levels: 0V (logical "0") and 5V (logical "1")
Connections: 2 x 10 pin double-row header, USB mini-B
Interface (Input and Output): Parallel binary (5V logic), USB
Indicators: Green LED = Sensor ON ; Blue LED = Object Present
Data Format: 11 (12) bit parallel, USB
Data Range: 0 up to 2000 (4000) pixels
Dimension: 97.8 mm x 71.1 mm x 21.6 mm (3.85 in x 2.80 in x 0.85 in)
Weight: 170g (5.9oz)

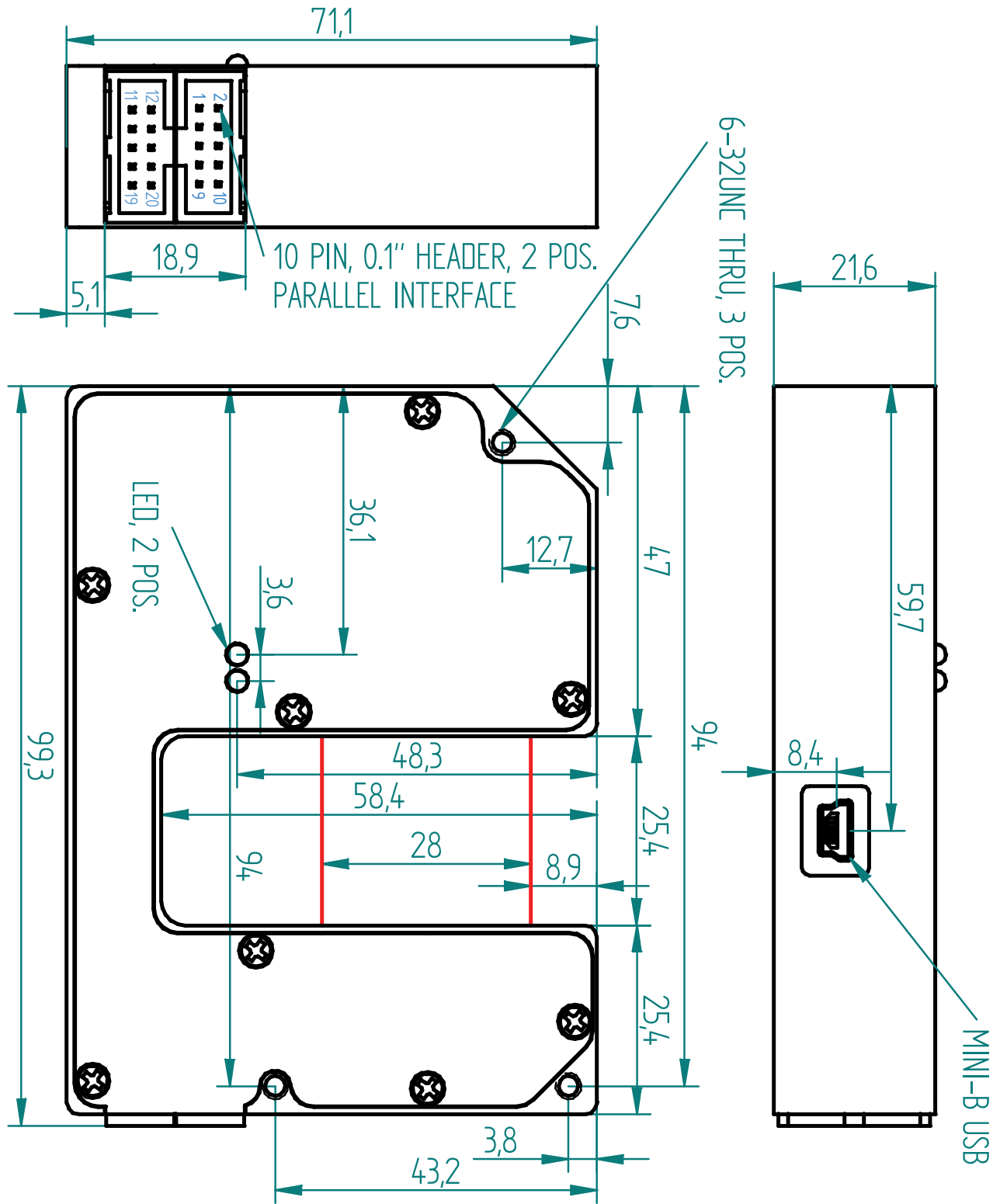
metralight

AlignxB WAFER ALIGNMENT LASER SENSOR

October 2012, rev.A

2. DIMENSIONS

All dimensions in mm | email at: info@metralight.com for 3D model



3. OPERATIONAL

The AlignxB sensor is a self contained photoelectric sensor. It's primary designed to be used in wafer Prealigners (to detect notch/flat and center of wafer), but can be used in other applications too. Output is in a 11(12) bit parallel binary data format. 11(12)bit data output represents position in pixels. Pixel size is 14(7) μ m. Parallel interface allows precise synchronization of sensor data with angular position of wafer.

Standard MODES can be set for SOLID or TRANSPARENT (solid wafer - detect first solid edge, ignoring all other edges, transparent detect last edge, ignoring any edges before). MODE changes during measurement will not take effect until the *next measurement cycle*.

MODES		
Pin 16 (logical "0" or "1")	Description	Mode
0	First Interruption	Solid
1	Last Interruption	Transparent

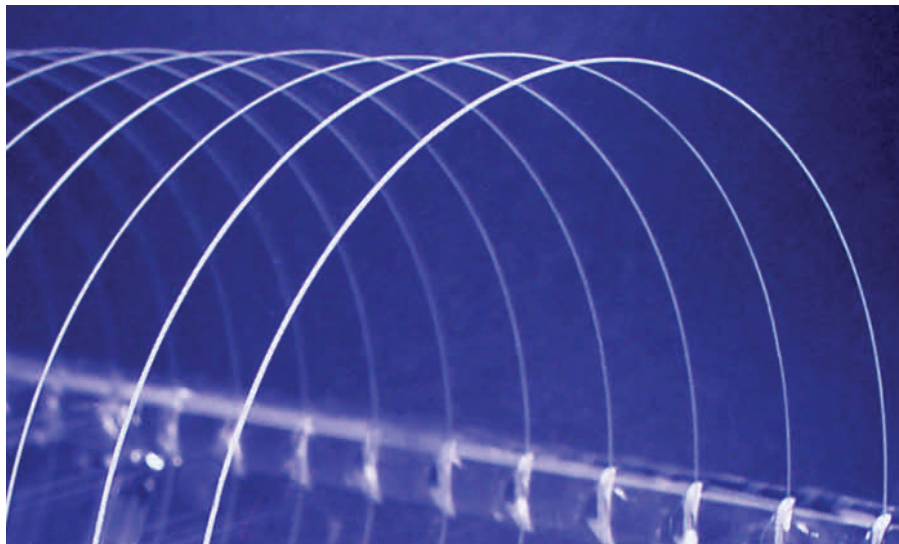


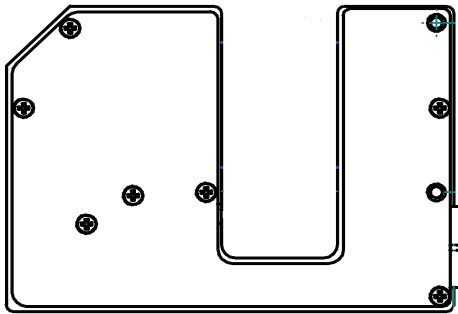
Figure: Transparent wafers

The AlignxB sensor uses collimated (parallel) beam. This optical configuration allows large gap between light emitter and image receiver. AlignxB has fix gap of 25.4mm (1"). Thin bowed wafers also benefit from large gap. Other Metralight sensors can be used if larger gap is required (e.g. for vacuum chamber, see RX, MX series).

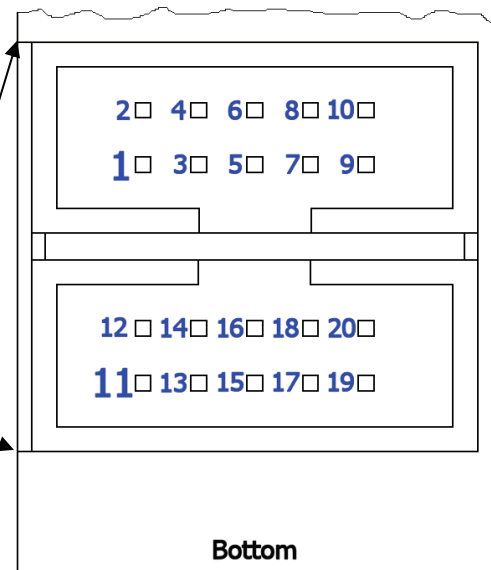
USB INTERFACE

The AlignxB sensor integrates USB port. This is useful for troubleshooting of prealigner. USB port adds other functions, not available on parallel interface. USB interface allows to read Data, Mode, Raw image signal, Firmware, etc. Raw image data is great tool for evaluation of transparent wafers with very thin edge or for sensor cleanness checking. USB port provides higher resolution (0.4375 μ m) and accuracy than parallel port.

4. CONNECTION (PARALLEL)



The AlignxB sensor uses standard two 10 pin headers (0.100" spacing).



Use pins 17,18 (+12 to 24VDC) and 19,20 (GND) for powering AlignxB sensor. Alternatively sensor can be powered via USB connector. Avoid "hot plugging" when the sensor is powered.

PIN	TYPE	NAME	DESCRIPTION
1	OUT	DATA0	Data bit 0 (LSB)
2	OUT	DATA1	Data bit 1
3	OUT	DATA2	Data bit 2
4	OUT	DATA3	Data bit 3
5	OUT	DATA4	Data bit 4
6	OUT	DATA5	Data bit 5
7	OUT	DATA6	Data bit 6
8	OUT	DATA7	Data bit 7
9	OUT	DATA8	Data bit 8
10	OUT	DATA9	Data bit 9
11	OUT	DATA10	Data bit 10
12	OUT	DATA11	Data bit 11(MSB)
13	OUT	DATA_READY	Data ready at end of measurement cycle
14	OUT	OBJECT_IN	Object Detected
15	IN	TRIGGER	Triggers measurement cycle
16	IN	MODE	Change mode SOLID (logical "0") /TRANSPARENT (logical "1")
17,18	POWER	+PWR	12 - 24 VDC
19, 20	POWER	GND	Ground

5. TIMING DIAGRAM (PARALLEL)

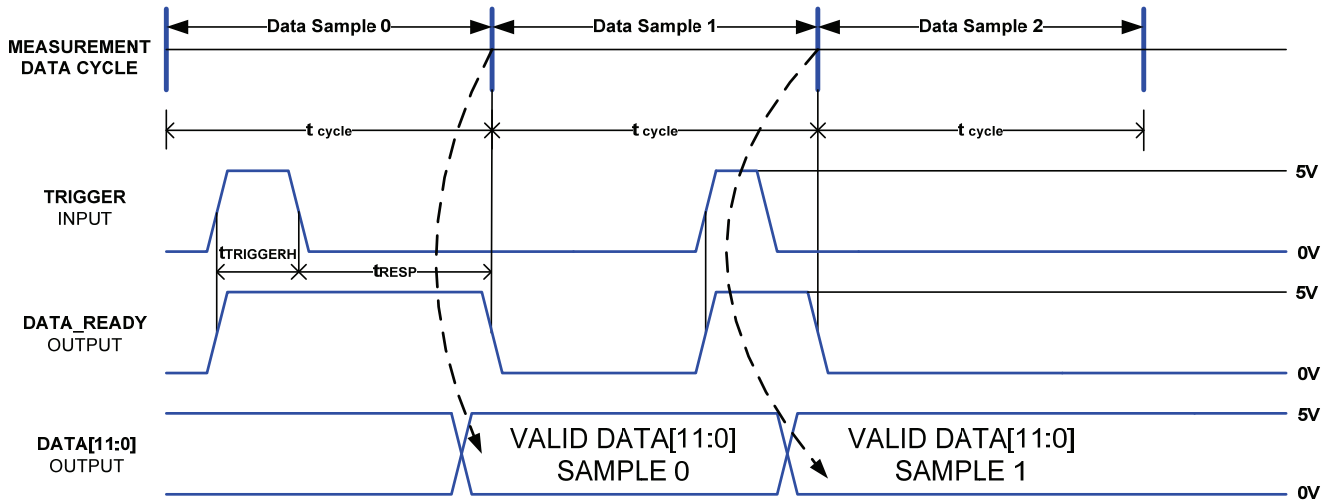
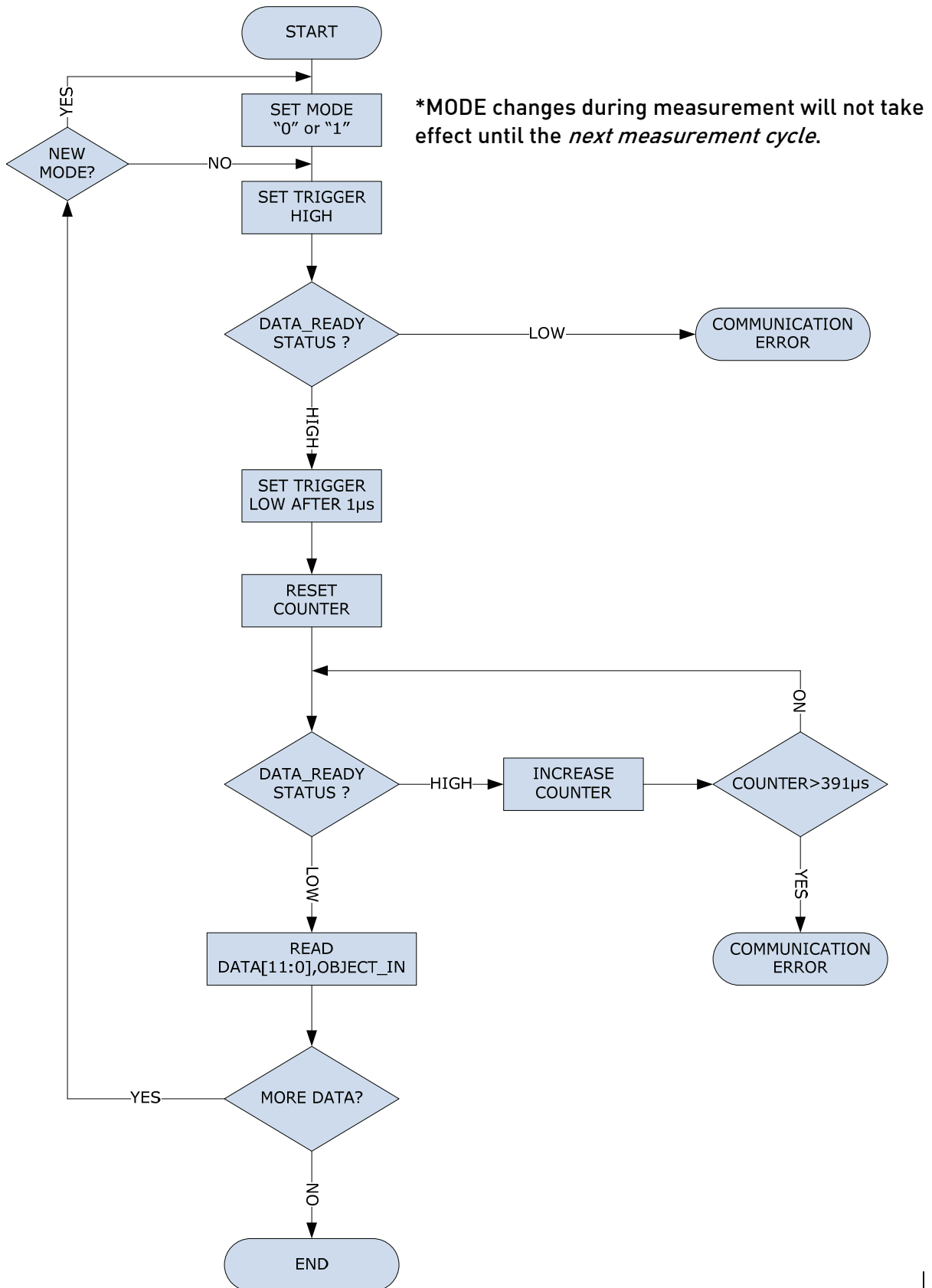


Fig. 2: Timing Diagram

Symbol	Description	Min.	Typ.	Max.
tCYCLE (μs)	1 cycle time	---	391	---
tRESP (μs)	Response time	1	---	391
tTRIGGERH (μs)	TRIGGER HIGH time	1	---	---

The timing diagram shows, that a HIGH to LOW signal on the TRIGGER, commences a data output at the end of the current measurement cycle. The HIGH to LOW signal on the DATA_READY confirms a Valid Data event. The maximum response time between the TRIGGER input and the DATA_READY output is 391 μs. This DATA is presented to the output pins and retained until the next TRIGGER event. In the absence of a TRIGGER event, the previous data will be held indefinitely. This process allows slow processing computers to by-pass several measurement cycles between measurement readings. *See Flowchart on next page for typical operation.*

6. TYPICAL OPERATION FLOWCHART



7. USB COMMAND SET

Driver and settings

AlignxB micrometer uses FT232R chip as USB interface (drivers can be downloaded from <http://www.ftdichip.com>. If micrometer is connected to PC USB port, driver automatically creates Virtual Com Port (VCP). Check PC settings for assigned VCP number (in case of MS Windows this can be found in "Device Manager in "Ports" section).

When communicating with VCP following setting should be used:

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

Metralight provides sample application for communication with AlignxB sensor via USB port (download latest revision from www.metralight.com). For custom SW use following commands.

Command Set

AlignxB sensor uses 3 basic commands: DATA, STREAM and MODE. There is always 1 byte being sent from host to micrometer.

When data are requested (DATA command and STREAM START), micrometer responds with 3 byte - length packets (2 bytes for data and 1 info byte).

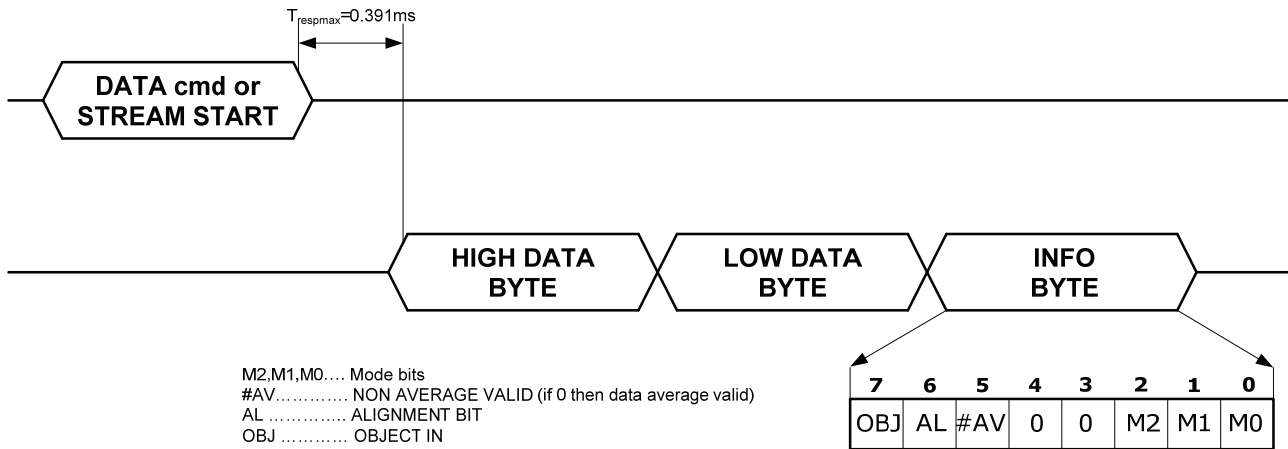


Fig.2: 1 Data Packet (3 bytes)

If more data is requested then response is multiplier of 3 bytes. E.g. PC requests 4 data (via DATA command) then micrometer returns 12 bytes. If STREAM START command is issued then Micrometer continuously sends 3 byte packets until STREAM STOP command is sent.

Typical PC (running WINDOWS) cannot read data in full speed mode (2557 readings/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).

7. USB COMMAND SET

DATA

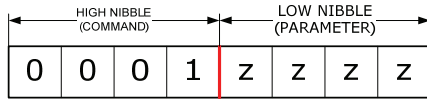


Fig.3: Data Command

Command: **DATA** (basic get Data command)

Parameter: **zzzz** is number of data being requested (=number of CCD frames)

Response: $2^{zzzz}\{data\}$, where $\{data\}$ is 3 byte-length packet response

Response length (bytes): $2^{zzzz}\{data\}=3 * 2^{zzzz}$

Example 1:

PC sends: 00010000 (=0x10) AlignxB response: 10100100 10110111 10000010

Description: 10100100 10110111= 0xA4B7=42167 this is diameter in pixel. 1 pixel measures 0.4375µm, then diameter = 42167 * 0.4375/1000 = 18.448mm

Example2: User request 16 continuous datas:

PC sends: 00010100 (=0x14) AlignxB response: Sixteen 3 bytes packets. For conversion see Example 1.

STREAM

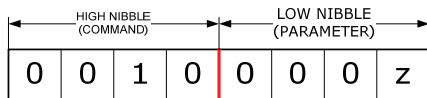


Fig.4: Stream Command

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 3 byte-length packet response

Response length (bytes): finite number (multiplier of 3) starting with **STREAM START** and ends with **STREAM STOP**.

Example 1: Start of data stream.

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

Example 2: Stop of data stream

PC sends: 00100000 (=0x20) AlignxB response: No response

MODE

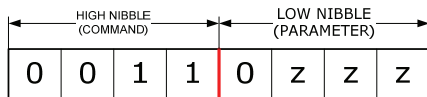


Figure: Mode Command

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) AlignxB response: 00110010 (=0x32)

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

8. INSTALLATION

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.

USE CORRECT VOLTAGE - SEE ELECTRICAL SPECIFICATION

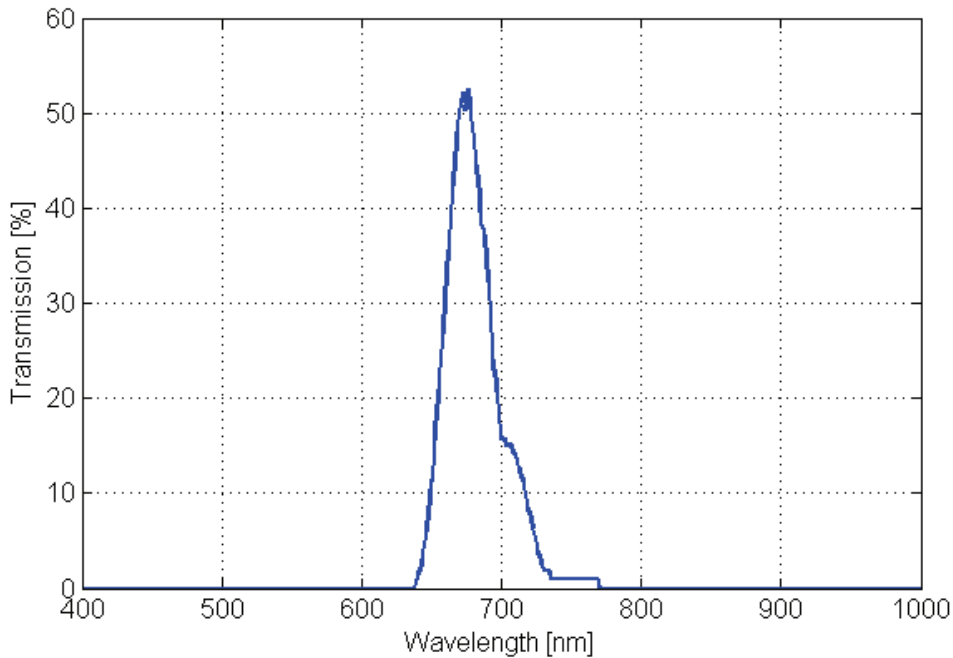


Figure: Ambient light optical filter

Laser Safety

AlignxB sensor is classified as Class 1 Laser device (Laser power < 0.39mW according to IEC 60825-1 or ANSI Z136.1). AlignxB uses 670nm or 405nm laser diode.

A class 1 laser is safe under all conditions of normal use.

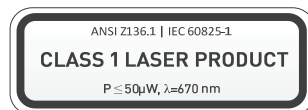


Figure: Class 1 Laser safety label

9. SAMPLE APPLICATION

Metralight, Inc. provides sample applications with included source codes for custom modifications. Please contact Metralight for any SW modification/development.

Metralight can provide a complete solution HW+SW and mechanical for your specific application.



Figure: Microstudio software screenshots

10. CONTACTS

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

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APPENDIX A, TYPICAL WAFER PROFILE

