



MLM - LASER TRIANGULATION SENSORS



- **Laser Triangulation & CCD array technique with intelligent digital signal processing.**
- **Non-Contact Measurement of Distance, Displacement, Thickness & Difference.**
- **Matching Paired Sensors will automatically provide width/thickness or differential measurement.**
- **Works on almost any surface.**
- **Measurement ranges: 70 - 170 mm. (2.75 - 6.69 IN)**
- **Resolution: 0.001 mm to 0.005 mm**
- **Measurement frequency of 2000 Hz**
- **Robust plus compact design**
- **RS232 or RS422 Serial Interface**
- **Analog Output 4—20mA or 1—9VDC**
- **Synchronized thickness measurement with two sensors.**
- **Secondary Environmental Enclosure are available including Air Purged, Air Cooled and Water Cooled with Air Purging.**

Performance

Model	MLM72.5	MLM75	MLM82.5	MLM95	MLM120
Measured range (mm)	5	10	25	50	100
Measuring range (mm)	70 - 75	70 - 80	70 - 95	70 - 120	70 - 170
Center distance (mm)	72.5	75	82.5	95	120
Resolution at short range (mm) ²⁾	0.001	0.001	0.001	0.001	0.001
Resolution at long range (mm) ²⁾	0.001	0.001	0.002	0.002	0.005
Measurement Linearity (mm) ²⁾	±0.003	±0.004	±0.008	±0.013	±0.025
Laser Spot Diameter (mm)	Ø 0.1	Ø 0.3	Ø 0.3	Ø 0.4	Ø 0.4

1)= Static measurement on white paper at measuring/sampling frequency, without any averaging of the serial output signal: 2·σ » 2 times the standard deviation.

Typical Applications

- Level Measurement
- Distance Measurement
- Thickness Measurement
- Weight/Volume Control
- Constant Tension Control
- Roll Diameter
- Profile Measurement
- Control of Vacuum in Containers
- Measurements for feedback in Production Lines
- Measurements for Quality Control and Statistics
- Vibration Monitoring of a Rotating Object
- Control of Surface Treatments

General Description

The MLM Laser Triangulation Sensors (LTM) is a compact unit with integrated optics and signal processor for precise measurement of distance or product thickness and width. A focused laser spot is illuminated on the object and the image distance determined by internal CCD array. LED's indicate when the object is at center or is outside measuring range. Installation software is provided for connection to a PC and to display measured values. Measurement of data is via RS232 and analog outputs.

All standard MLM models operate at a measuring frequency of 2000 measurements per second. All standard MLM models operate at a serial output update frequency of either 1000 or 2000 measurement points per second.

All standard MLM models have a programming/select functionality. Group mode is the main feature. In Group Mode a running average is calculated over a user specified number of measuring points. The user also programs the sensor to disregard a number of, usually all, bad (zero) measuring points before calculating the average value. The average values are calculated at full measuring frequency and are used for converting the analog signals. Several median filters and Level Mode are other available features.

Two identical MLM LTM's when connected together automatically provide change in thickness, width or difference values. The MLM standard models operate at a 2kHz measuring frequency and at a 1kHz or 2kHz update frequency, and have a serial interface baud rate of 38400 or 115200.

These LTM's can be programmed to output the value in median filter format, simple average or as running average filter where the user specifies the number of measuring points for the filter block as well as the number of bad zero values to be ignored before calculating and outputting the average value via both the serial and analog outputs. The simple average filter compresses the measuring points into one single output disregarding missing values. A level mode is also available that inverts the outputted values.

These LTM's have a broad range of usage for measurement of surfaces where other devices fail. Ideal for measuring of wood, plastic, glass, rubber, paper, foam, textiles, food product, cold, hot or molten metals as well as various liquids.

MODULOC Technology - Lasers for Precise Product Measurement

MODULOC Control Systems Ltd.
 Wheathamstead, Hertfordshire, AL4 8SB United Kingdom
 Phone: +44 (0)845 873 6501 FAX: +44 (0)158 283 1980
 E-Mail: sales@moduloc-intl.com Website: www.moduloc-intl.com

MODULOC Control Systems, Inc.
 500 Garden City Drive. - Suite 2B, Monroeville, PA 15146 USA
 Phone: 412-824-1260 FAX: 412-824-8890
 E-Mail: sales@moduloc-usa.com Website: www.moduloc-usa.com

Dimensions

Housing: Aluminum/Glass
Housing Rating: IEC IP65
Weight w/o Cable: 0.37 Kg
Cable Length: 2.5 M

General Specifications

Serial Output ^{2) 4)}	RS232 Standard - up to 115200 baud ^{2) 4)}	Supply Voltage	20 - 36VDC
Serial Output ^{2) 4)}	RS422 (optional) ^{2) 4)}	Power Consumption	4.5 Watt max.
Analog Output ³⁾	1-9VDC & 4-20mA ³⁾	Humidity	Max 90% RH (non condensing)
Measuring Frequency	2000 Hz	Operating Temperature	0°C to +45°C (32°F to 113°F)
Output Frequency ¹⁾	1000/2000 Hz ¹⁾	Storage Temperature	-20°C to +70°C (-4°F to 158°F)
Temperature Deviation	±0.03% of F.S./°C	Product Temp. Limit	Standard 450°C/842°F
Light Source	Visible 655 nm Laser	Laser Class ⁴⁾	Class II, IEC 2

1)= Static measurement on white paper at measuring/sampling frequency, without any averaging of the serial output signal: 2-6 x 2 times the standard deviation.

2)= The default baud rate is 38400 at 1kHz update frequency. The 115200 baud rate is at 2kHz update frequency.

3)= Analog output Resolution: 14 Bit DAC's are used for the conversion of the 18 bit digital distance result, an integer value with a nominal resolution of 0.001 mm.

4)= Serial/Digital and Analog output are updated at the measuring frequency of 2 kHz except if the Simple Average Filter is activated.

Filter & User Settings available

All MLM LTM's have a Programming / Select functionality.

There are 3 kinds of Averaging Filters: Median Filter, Simple Average and Running Average Filter. These filter settings can be set individually and operate simultaneously (and additive), as can most other user settings.

In Group Mode a running average is calculated over a user specified number of measuring points (group). The user also programs the sensor to disregard a number of bad (zero) / missing measuring points before calculating the average value. It is recommended to suppress the maximum number of "0" values. The running average value is calculated at full measuring frequency and is also used for converting the analog signal, either 4-20 mA or 1-9 V.

The Simple Average Filter compresses a number of measuring points, from 1 to 200, into one single output value by making an average disregarding any "0"/missing values present.

Several Median filters, actually from 3 to 31 is available, as well as Sample Hold Mode, where the last valid measurement value is kept as the output value in case of missing "0" measuring points.

Level Mode inverts the measuring values, in this setting the closer distances will be output as high values whereas distances far away will be output as low values.

Two MLM LTM's can be interconnected to automatically form a Thickness/Width measuring system. This default setting can be change to a Difference setting/mode, where any difference in the measured distance of the 2 sensors is reflected in the output of the Master sensor as being either in the high or low domain of the measuring range.

Option: -R4

Provides a RS422 serial interface in place of the standard RS232 serial interface.

Measuring Frequency 2 kHz

Output rates are user specified, as the sensor can be programmed to make an average of up to 200 measurements (disregarding all zero/missing values) and output it as a single point. In this way the output rate can be lowered from 2000 Hz in steps down to 10 Hz. This is done with the Simple Average Filter.

The baud rate can also be changed. An output frequency of 2 kHz requires a baud rate of 115200. 38400 baud will reduce serial output rate to 1 kHz.

Thickness Measurement

All MLM LTM's when connected to an identical MLC model will automatically transform into the Master or the Slave of a synchronized Thickness Measuring System .

An MLM LTM will automatically turn itself into being either the Master or the Slave half part of a thickness measuring system when connected to an identical MLM LTM model.

The Master LTM reads the digital distance data as send from the Slave LTM over their RS232 or RS422 serial interfaces, and after taking its own distance information into account, it will output the change in thickness in its calculated digital form as well as a converted analog signal. The LTM must always be synchronized, and will measure on transparent targets alternately from one side if they are wired to measure at 1 kHz (half) frequency.

A pair of MLM LTM's will thus measure thickness or width without any control box or special calibration from the factory. MLM LTM's can also be programmed to operate in Difference Mode instead of measuring thickness. This unique characteristic of the ML LTM's are available in all models of the MLMN, MLC and MLS product families.

MODULOC Technology - Lasers for Precise Product Measurement

MODULOC
Control Systems

Your Local Sales Representative:

We reserve the right to alter specifications without prior notice. Specifications without tolerances are typical values.



Bulletin. MC-MLM-10-05
May 2010