MODULOC® Control Systems

TECHNICAL DATA SHEET NO. TDS-ML-1000-001

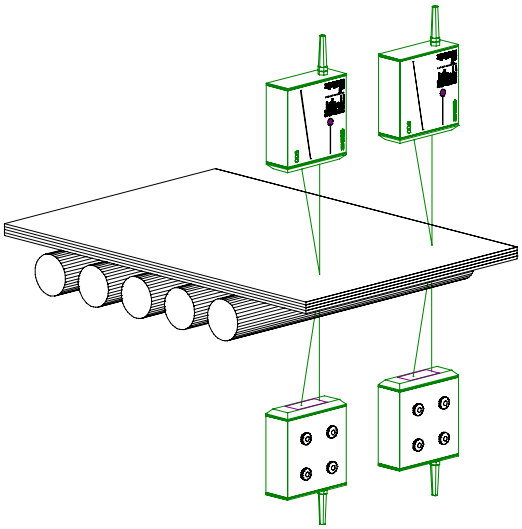
MLC & MLS LASER TRIANGULATION METERS - THICKNESS MEASUREMENT

Many applications in industry can benefit from a universal applicable thickness, width and difference measuring system.

All MLC & MLS Triangulation Meters will automatically turn themselves into being either the Master or the Slave portion of a thickness measuring system when connected to a compatible MLC & MLS Triangulation meter.

The Master sensor reads the digital distance data send from the Slave sensor over the RS232 serial interface, and after taking its own distance information into account, it will output the change in thickness in its calculated digital form as well as one or two converted analog signals.

A pair of MLC & MLS sensors will thus measure thickness, width or difference without any control box or special calibration from the factory. This unique characteristic are available in the MLC & MLS triangulation meters.



HOW THICKNESS DATA IS DETERMINED IN AN MLC & MLS THICKNESS SET-UP

The MLC or MLS sensor chosen to be the Master sensor will utilize the digital distance data received from the Slave sensor together with its own distance data in a formula that looks as follows:

"Output value from Master = 3 • Centre-distance – Distance value from Slave – Distance value in the Master"

This means, that two MLC & MLS sensors connected to measure thickness, will give the correct digital thickness value when they are mounted with a distance between them of exactly 3 times the centre distance of the sensor type in question. In most applications one would chose to mount the sensors with a distance between them that differs from the above mentioned. As a result, the digital output will then not be the actual thickness, but relative value, in the same manner as the analog signals always are. In order to calculate the actual thickness in this situation it is necessary to correct the output value from the Master sensor by adding the following constant value:

"Correction constant = Distance between Slave sensor and Master sensor – 3 • Centre-distance "

In most practical circumstances the easiest way, and the most precise way, is to let the sensors determine the mentioned *Correction constant* by measuring on any object of known thickness, a kind of "Calibration cube":

"Correction constant = Calibration cube – Thickness value from the Master sensor"

In this way thickness measurement can always be performed as long as the surfaces of both sides of the object are within the measurement range of the relevant MLC & MLS sensor, the thickness of the actual object being the sum of output value from the Master sensor and the Correction constant. The Correction constant is an offset value that can be negative as well as positive. The MLC & MLS demonstration software can display the actual thickness data, irrespective of mounting positions of the sensors, with the relevant offset value entered, determined in the above fashion.

When two MLC & MLS sensors are connected for thickness measurement the variation in thickness values are restricted to be within the numerical domain of the MLC & MLS sensor used (for an MLC 200 the domain is 10000 to 30000 catering for a thickness variation of 200 mm in hundreds of a mm. The reason for restricting the output in this way is to keep the same high resolution on the analog output canals for thickness measurement as when the sensors are used for measuring distance.

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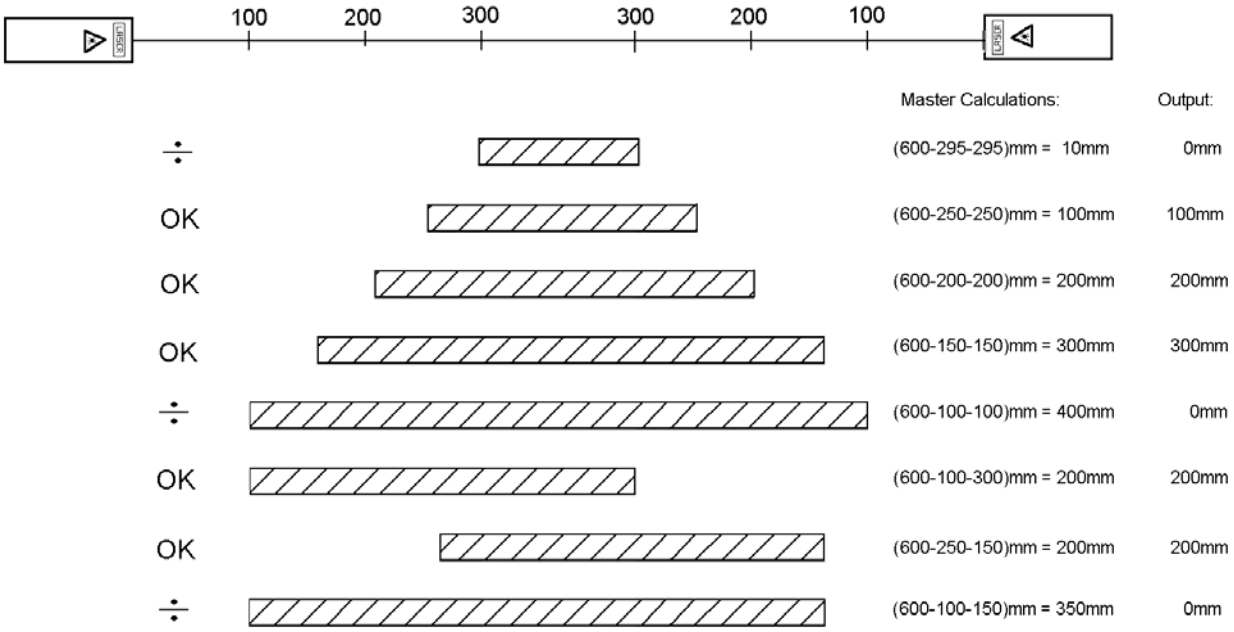
The above-mentioned restrictions can be illustrated with a couple of MLC200 sensors as an example. Again it has to be remembered that not only do the target surfaces have to be within the measurement ranges of the sensors on either side, this is the shaded area in the illustration below, but the digital output has to be within the numerical range of 100 mm to 300 mm, in the case of the MLS 200 and actually measured in hundredths of a mm.



The first zero output is caused by a measurement/thickness value of less than 100 mm. The last two zero outputs are caused by measurement/thickness values of more than 300 mm.

HOW THICKNESS DATA IS DISPLAYED WITH THE MLC & MLS SOFTWARE

As mentioned above the master output is always thickness data, but it is only the actual thickness when the sensors are mounted with a distance between them of 3 • Center-distance of the meter in question. When it is necessary to add a correction constant in order to display the actual thickness value, it can be achieved by inputting the relevant figure in the Offset-field on the Data Display. By typing Alt ^F1 the measurements stops and it is allowed to edit the field. After a Carriage Return the measurement activity resumes with the actual/adjusted thickness value displayed.