

Q: What is the accuracy specification for positioning on my LM sensor?

There is no specified accuracy for the position measurements on our LM-series thermopiles. The position measurement is just a secondary feature and is not something that is truly calibrated. That feature is tested during calibration of these. But since it is not physically calibrated, there is no accuracy spec on it.

Based on our own experience with these products a resolution of around 0.1 mm seems to be the achievable limit on this position measurement feature. The FieldMaster-GS, LabMaster, and LaserPAD all display a resolution of 0.01 mm, however a resolution of 0.01 mm is not very realistic. If you try to measure something with a positional resolution of 0.01 mm with these products, you will get a lot of variations from measurement to measurement. So the real resolution should be on the order of about 0.1 mm. The LabMax meters and the new PowerMax PC software limits the positional measurements to a resolution of 0.1 mm since that is a fairly realistic resolution on these.

Additional note: One thing to know though is that typically the position measurements will get a little bit noisier if you are working towards the bottom end of the power range of a product. With a sensor like the LM-3, it may not be able to accurately pick up the position measurement if the power level is down around the minimum spec of 10 mW. At 100 mW, it should display position, but it will be a little noisy, like ± 0.1 mm noise. As you get up towards 0.5 W to 1 W, the position measurement becomes more stable and should only have a noise level of something like ± 0.01 mm for this type of measurement. So the advice from that, is just to try and pick a sensor where you won't be working right near the low end of its power range if position measurements are important. The higher the power level on the sensor, the more stable the position measurements will be.

Q: Can I zero a position on my LM sensor?

There is not a way to zero out the position measurement on any of our current products. The older LabMaster meters did have a "relative" and "absolute" setting on them that could be used to zero out the position measurement for relative readings. But that feature was not carried over into any of our newer products.

Q: My LM sensor has a positioning feature on my meter. How does it work?

The position measurements on the LM-series sensors is done using a solid aluminum disk as the absorber. On the back side of that absorbing disk, we have a radial thermocouple pattern that is split into four quadrants. So you're getting four separate signals off the quadrants of the sensor. If those signals are all balanced, the sensor assumes that the beam is in the middle of the disk. If one quadrant has a higher output signal than the others, then the beam is pulled in that direction when it is displayed on the meter.

Q: I want to use my LM sensor for positioning, can I do this?

Yes, you can use the LM sensor for positioning a beam there are limitations on the measurement resolution for the LM quad sensors. The resolution of the displays with, older LabMaster and FieldMaster-GS products displayed resolution down to 0.01 mm for the position display. The LabMax meters have a resolution of 0.1 mm for those same position measurements. And the PowerMax-USB/RS products display 0.01 mm for position measurements. Aside from the display being used, all of the LM-series quad sensors will display the same position measurement resolution. So if this customer is looking at a lower power sensor, like the LM-3, that should be able to display position resolution to 0.01 mm as long as it is used in any configuration aside from the LabMax meter. There is no tolerance on exactly where the sensor disk is mounted inside the sensor housing, and there is no way in which zero the beam with the software. Customers have employed centering the meter in a fixture to zero out the physical mounting offset.

The specs on the position sensing capability on these sensors are fairly limited. The position measurement on these sensors is just a secondary feature and is not something that is truly calibrated. For that reason, we don't list an accuracy or uncertainty on the position measurement feature. We test it during the calibration process to make sure it is working properly. But there isn't any physical standard that it is compared to during calibration. The idea behind the position measurement feature is that it is designed to help align the sensor in the beam path when you are working with invisible laser beams. This helps align the sensor in the beam so that the most accurate power measurement can be taken. This helps avoid having to use IR targets or burn sticks or things like that to align the sensor in the beam path. This feature can also be used to generally track the position of the beam if there is a large amount of movement or if there are some optics being moved around in the beam path. But for high accuracy position measurements, we typically recommend using a camera system like the LaserCam-HR11 or a knife-edge profiler like our BeamMaster systems.

Q: I'm using my LM sensor for positioning, what are the limitations of its performance?

There is no way to zero out the position measurement on any of our current products. The position measurements on these LM-series sensors are done using a solid aluminum disk as the absorber. On the back side of that absorbing disk, we have a radial thermocouple pattern that is split into four quadrants. So you're getting four separate signals off the quadrants of the sensor. If those signals are all balanced, the sensor assumes that the beam is in the middle of the disk. If one quadrant has a higher output signal than the others, then the beam is pulled in that direction when it is displayed on the meter as if there were four separate elements to the disk. The single absorbing disk creates a bit of an averaged effect since it can't tell exactly where the beam is on the surface of the sensor. Creating a thermopile out of four actual separate quadrants would end up not working out because

of how a thermopile works...but putting the thermocouple pattern on the back in four separate quadrants gives these a good general idea of where the beam is positioned.

Q: How do you test that my LM sensor is positioning accurately?

We do not have an accuracy spec for the position measurements on the LM-series sensor. The sensors are tested to make sure the position measurement is functioning during calibration. But there is no physical standard that is used to “calibrate” that feature. Also, there is no tolerance on exactly where the sensor disk is mounted inside the sensor housing.