Applications of Laser Process Monitor (LPM)

Operation in Remote Mode

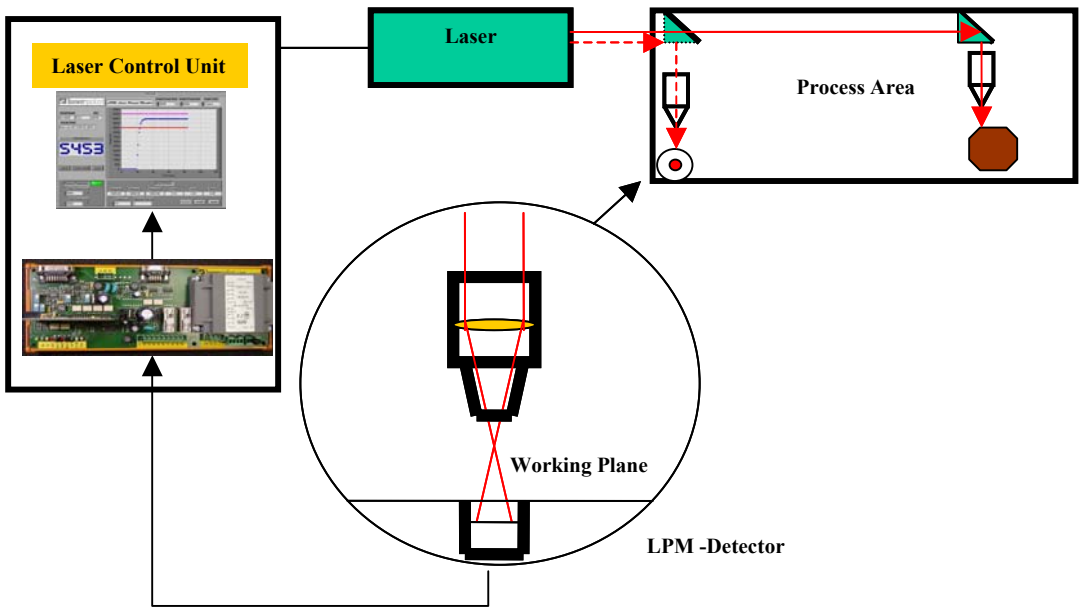
The **LPM** detector head (1) may be located as permanent unit in a non used corner within the process area or any other spot, within the laser system or machine , where monitoring is necessary. It is important that the beam be large enough not to damage the detector absorbers (the detector can be fixed a few centimeters underneath the focal plane so that it will be sheltered from moving carriages and is of no disturb to the process).

The acquisition and processing board is housed in MR9 slim card case (2) plugged on standard DIN rails, available on any industrial cabinet or rack. It interfaces with the laser PLC or an external PC with a protocol Mod-BUS through the serial interface RS232. A powerful, yet friendly, software interface (3) allows to read the power or energy values delivered at the process area , set the alarms, carry out statistical evaluations, etc in the Power, Energy, Probe configurations.

Whenever preset alarm thresholds are overtaken, visual messages are displayed on the screen or alarm signals can be custom used e.g. to stop the process.

During the phase of machine validations, beam delivery alignments or whenever measurements of long term stability are made, the software of LaserPoint **LPM** can show on a large graphical screen, the time evolution of power in measurement sessions which may last many hours. Should a high resolution be needed to look at events occurred in a short period (e.g. a sudden power drop), a zoom function can be used to observe on a tighter time scale. The Statistical Functions screen is an even more powerful tool during long term monitoring since it provides all relevant data like *Min* and *Max* values reached during the measurement period, the *Average* value of measurement, the *Standard Deviation* and the ***Root Mean Square*** values.

Data can then be saved, with day and hour of measurement, to be used as a documentation for final reports or for the customer.



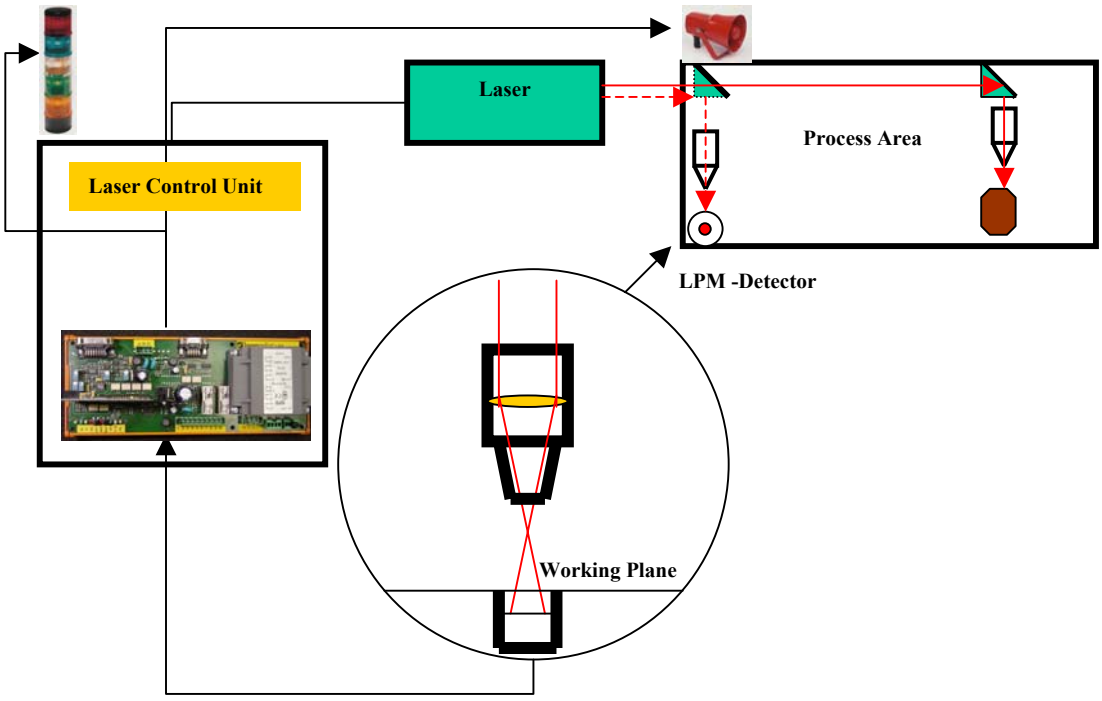
Operation in Local Mode

The **LPM** detector head (1) can be placed in a remote area close to the process or in any other spot, within the laser system or machine , where monitoring may be necessary.

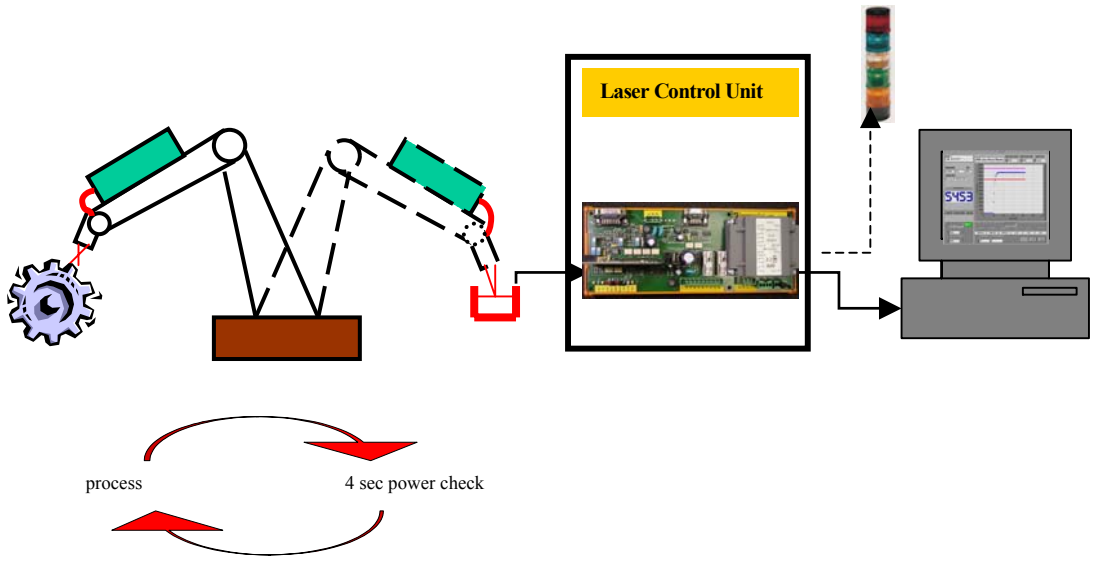
The acquisition and processing board is housed in MR9 slim card case (2) plugged on any standard DIN rail, within the control unit or any other place where it may be useful. LPM can monitor the laser power (or energy) and checks whether it is within two preset threshold values. Measured values can be read via a 0-10V/4-20mA analog output and trigger alarms via a potential free contact. Those signals can be used to switch alarm lamps or acoustic signals (3).

Alarm thresholds are set by a self learning algorithm while exposing the sensor to the laser beam tuned at the MIN-MAX power or energy alarm levels.

Operating in Local Mode is particularly useful in case of **retrofitting** the **LPM** set-up on older machines, where the integration of its SW is not possible.

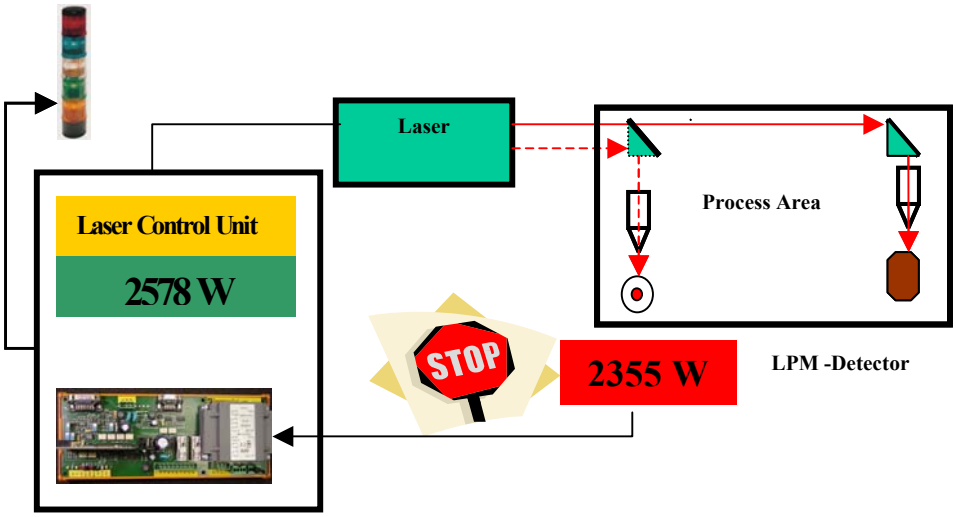


Operation in the Probe Mode (periodic power check) Measurements runs can be planned to accomplish short controls of beam power during working cycles, after laser parameter resetting, optics realignment, etc. The use of special FIT (Fast Integrating Thermopile) heads (1) that do not require any water cooling , even a many kW , is of great help in many industrial environments where having water at the application area is a problem. The acquisition and processing board is housed in MR9 slim card case (2) plugged on any standard DIN rail and housed in industrial cabinet or rack. Data can be analysed (3) by the specific SW for the Probe Mode or, should immediate warnings be needed, visible/ acoustic alarms can be triggered.



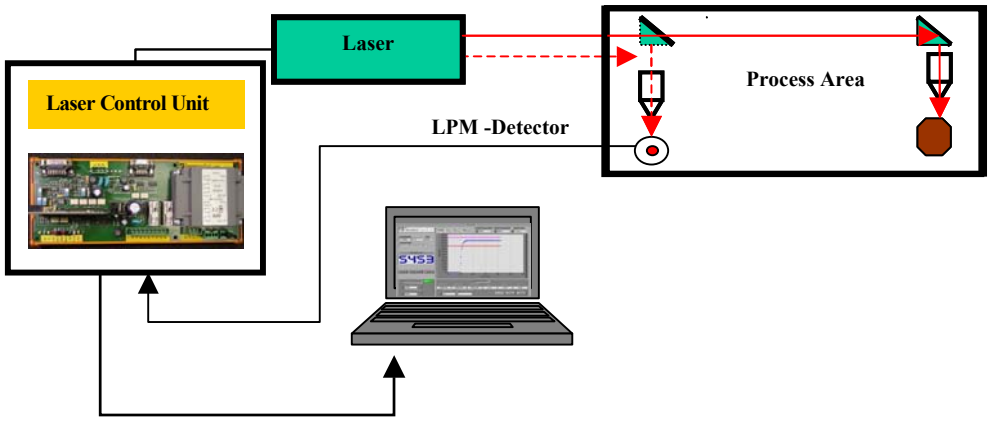
Predictive Maintenance

Prediction of incoming failures ,e.g. at optical components, can be easily done by cross checking the power/energy delivered by the laser source and what is effectively delivered to the work piece. A too high difference between the two values may indicate that damages already occurred.



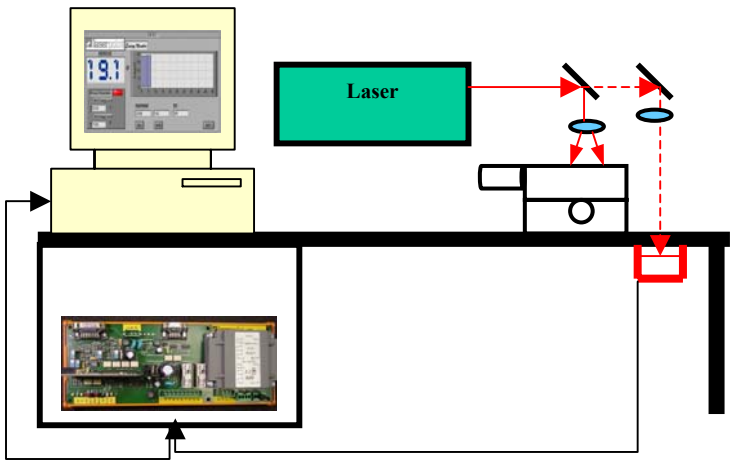
Beam Delivery System: Alignment & Stability

The complete beam path can be aligned and verification that the max yield at the work piece has been reached can be done with **LPM** working in the power/energy mode. Successive measurements of system stability can be done and visualized with the most relevant statistical information on the beam behaviour.



Monitoring of Marking, Micro-welding, and Micro-Machining Systems

Monitoring of energy or power as they are delivered after the focusing lens, providing a fast and direct control of the correct values for the process, of the optical system or optical fiber integrity can be done with LPM simply displacing the optics or the translation stages.



Control of Working Cycles

Setting of working cycles with measurement of the power really delivered to the work piece can be done with **LPM** , operating in power mode. It can be done as a simulation before working, to verify the correctness of process parameters, or in certain phases decided by the operator, e.g. during the dead times between welds, to check that preset parameters did not change for reasons like optics damage, dirt, etc.