



The

M17 CMP

process monitoring

and control system is unique in its

speed and precision. It makes continuous

polishing possible, without any measurement interruptions. It measures in-situ,

in real-time and stops precisely at the right stack while being completely

independent of any kind of removal rate variations.

CMP process control for STI
CMP process control for BPSG
Development of new processes
CMP process control for ILD
with a polishing stop nitride-layer



What history tells us.

Existing methods to control CMP-processes are either based on simple timing, on frictional changes, on optical measurement of thickness or on measurement control in-line or off-line. All these methods need a relatively large process window. CMP processes depend on quite a large number of parameters such as downward pressure, rotational speed of the platen and the carrier, relative rotational directions, kind and condition of the pad, slurry, temperature and much more.

E.g. for STI CMP, all above parameters are changing. Such a process also has a very small window. Therefore, the methods mentioned above are poorly suited or very time consuming.

M17 – How simple a good solution can be.

The M17 system has been developed jointly by ECO PHYSICS and a leading edge semiconductor company in 1996. The systems were initially applied to monitor and control shallow trench isolation (STI) CMP which must be stopped at the interface containing silicon nitride film. The control requirement is to clear out the oxide on top of all nitride film.

The sensation: the analyzer's response and signal sensitivity.

Our approach simply detects the nitride-containing polishing product with sub-ppb detection sensitivity and one-second response time, in-situ, in real-time – currently the fastest CMP end-point detection at all times.

Robustness.

Many features have been designed-in to assure robust, safe operation in the production environment. The design of the system allows for continuous operation with minimum maintenance (few hours a year), user friendliness and guaranteed end-point capturing.

The multi-functional software.

The method measures the entire wafer, since the signal is averaged over the whole wafer surface. The slope of the signal is a function of the uniformity. The maximum signal depends on the N-containing area of the current layer. The M17 system has highly intelligent, flexible and user friendly process control software which provides reliable end-point detection for each and every kind of product wafers.

- CMP end-point detection in-situ and in real-time
- Entire wafer surface measurement
- Full system integration
- Virtually maintenance-free.

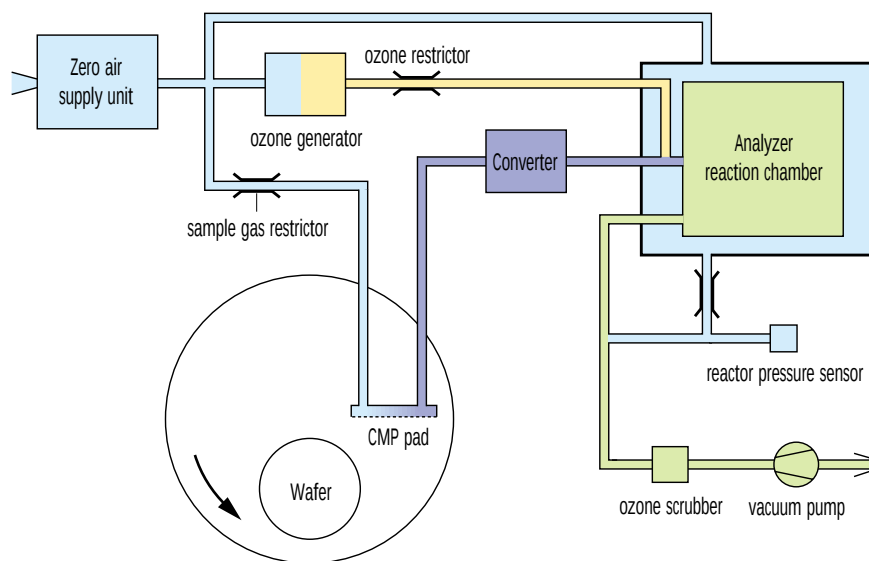


Sideway park position of the probe arm when maintenance work on the polishing table is done.

<i>Detection method</i>	Chemiluminescence	<i>Weight</i>	200 kg
<i>Detection limit</i>	10 ppt	<i>Supply voltage</i>	115 V/50–60 Hz 230 V/50 Hz
<i>Rise time (0–90%)</i>	0.5 sec	<i>Power required</i>	1.5 kVA maximum
<i>Probe modules</i>	several types, optimized to polisher-specific space situation	<i>Interface</i>	Direct interfacing to polisher RS 232
<i>Park position of probe arm</i>	vertical or sideways	<i>Temperature range</i>	5–35 °C
<i>Alarms</i>	optical and acoustic, with specific indicator LED's at the relevant modules	<i>Supply gases</i>	no external supply gas required
<i>Dimensions</i>	height: 185 cm width: 60 cm depth: 80 cm	<i>Maintenance required</i>	few hours per year

ECO PHYSICS reserves the right to change these specifications without notice.

Flow diagram



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