

# Specification of Hercules® Master

The Hercules® Master is the standard Graphical User Interface (GUI) of Hercules® systems for configuration and data visualization. It can run on any PC with network connection to the Hercules® systems and can provide also additional features as a process data base.

The standard communication protocol between Master and Hercules® systems (data producer) is Modbus/TCP according to SEMI E54.9. The function codes for reading and writing registers are also supported.

## Main Applications

- Process control through plasma parameters
- Chamber matching
- Fault detection by plasma parameters
- Optimization of conditioning
- Process development

## Standard Functions

The Master is the GUI for

- The configuration of Hercules®, with configuration data base including the configuration data sets for all mainstream tools,
- The visualization of plasma parameters of connected Hercules® systems.

The Master can be installed on the Hercules® system or any PC, connected with the Hercules® system via LAN (TCP/IP).

## Optional Extensions

### HSMS/SECS interface

The HSMS/SECSII interface enables the data exchange with the fab host. It provides logistical data (Lot Id, Wafer Id, recipe etc.) from the host to Hercules® and sensor data (plasma parameter) to the host. This option can be also used for the connection of Hercules® with a fab-wide FDC/SPC or APC solution.

- Plasma data to SECS/HSMS host
  - Tracing via S2F23 (trace definition) and S6F1 (trace data)
  - Polling via S1F3
- Logistical data to sensor system
  - Writing equipment constants via S2F15 (Lot\_ID, Wafer\_ID, Recipe, Step, Recipe\_end)

One HSMS/SECS interface serves up to 6 chambers of one tool (mainframe).

### Process Data Base (storage module)

The storage module can be installed on Hercules® or on a separate PC connected to Hercules® via TCP.

The process data base stores plasma data in a file based data base. The memory size for one lot can be calculated by:

$$\text{parameters} \times 4 \text{ byte} \times \text{process length [s]} \times \text{temporal [1/s] resolution} \times \text{number of wafers / lot}$$

Example:

6 parameters, 200 s process length, 1 measurement per second (1 Hz), 25 wafers → 125 kByte per lot

The sensor data can be selected by the logistical data (if available). This option includes licenses for HercViewer and HercLotViewer.

HercViewer is designed for detailed lot analysis. It is a high performance tool for visualization and analysis of plasma process data and can handle data of hundreds of lots. Both viewers can be installed on Hercules® or any other PC.

HercViewer shows process stability within a lot and enables quick and easy access to plasma process parameters of a single lot. It is used for step-wise and time-resolved analysis and detects:

- First wafer effects
- Process instabilities
- Tool faults.

HercLotViewer shows and compares plasma and tool parameters from different chambers and tools up to thousands of wafers. It shows long term process stability by using logistical data:

- Lot\_ID
- Tools\_ID
- Chamber\_ID
- Wafer\_ID
- Process length
- Recipe
- Recipe step

HercLotViewer is an efficient tool for:

- Long term process analysis
- Product mix issues
- Impact of maintenance measures.

Special features are:

- Chamber and recipe comparison
- Statistical values: mean, median, standard deviation
- Product and quotient of plasma process parameters
- Time-resolved plasma parameters.

## Multi Chamber Operation

If the Process Data Base (storage module) is installed on the Hercules® system, it handles only one chamber. If the Hercules® Master extension should be used for more than one chamber, the Hercules® Hardware Extension (HWM) or a separate PC is necessary.