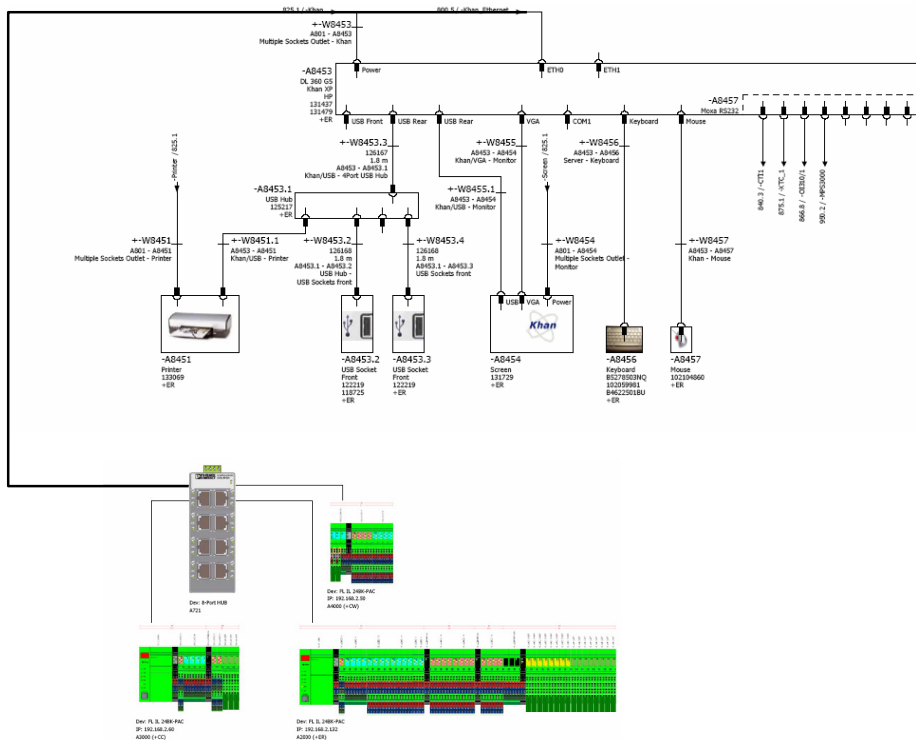


KHAN XP Control System

Hardware

The KHAN upgrade consists of a server based computing system, monitor, keyboard and mouse. The master computer is responsible for the control sequence for the pumping unit, the coating process and the pertinent visualization. Coating control units (e.g. thickness monitoring) and a host computer can be via serial line interfaces or direct I/Os. A host computer can be connected via serial interface or Ethernet using SECS II or GEM protocol. A standard server is used in the latest generation of system controller for the evaporation systems with the following configuration:

- Pentium IV with 1 GB memory RAM
- 17" Flat panel display with Touch screen
- 2 Mass storage devices: Harddisc >40 GB (RAID), Floppydrive, CD-Rewriter
- 8 RS 232 serial ports (Ethernet-RS232 Gateway)
- Distributed Digital input-/output modules
- Distributed Analog input-/output modules
- 2 USB ports
- 2 Ethernet ports

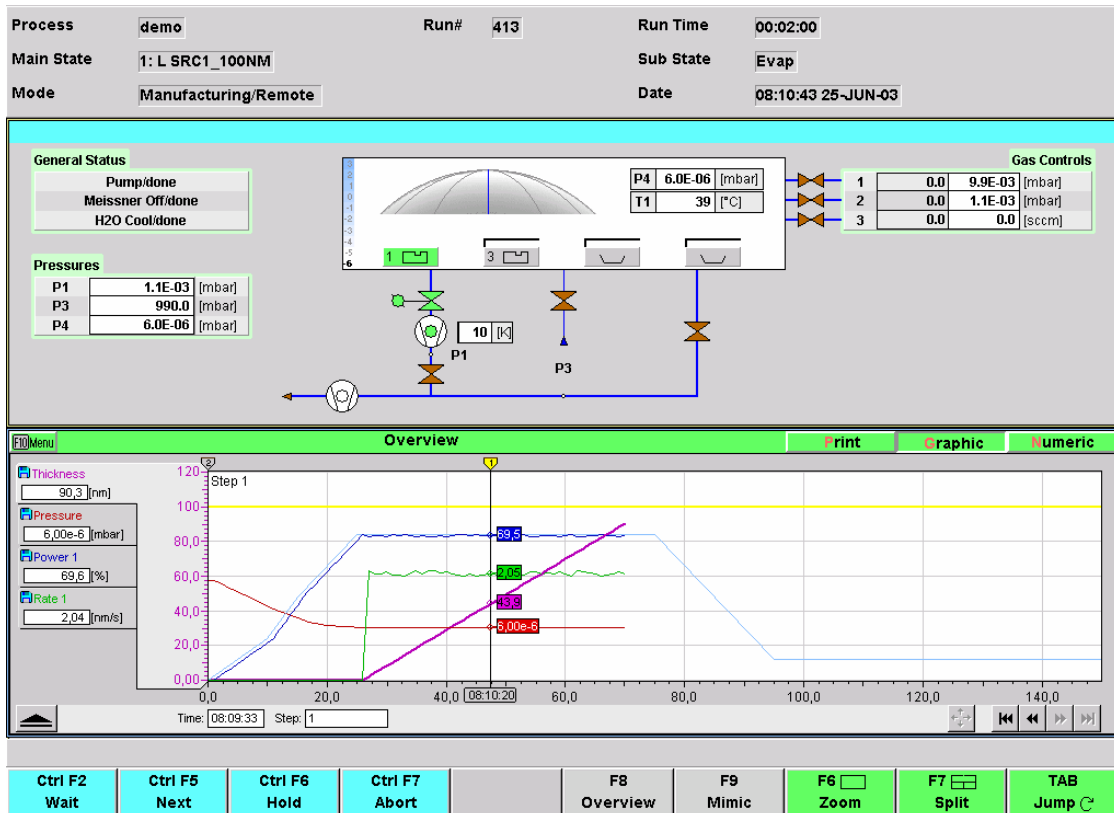


Software

The software is based on Windows XP. Therefore it is simple to transfer all important data (e.g. statistics, historical trends) to a common desktop PC. By this concept it is also possible to provide a simulation version of the control system software which runs on a MS-Windows based desktop PC. Such a version may be of interest for the purpose of training or recipe editing and process data analyzing.

Special care is taken on the User Interface to provide easy and save operating. This results in a surface with windows, tailored to the needs of manufacturing users. For this reason guidelines and considerations stated in the SEMATECH User-Interface Style Guide are taken into consideration. According to this Style Guide windows are not movable and therefore the ordering and appearance of windows is predictable, and therefore operating is safer. The number of windows is selectable from 1 to 4.

Increasing or decreasing the number of windows is achieved by simply pressing a single button or a single mouse click. The window content is automatically adjusted to the new window size, when a new window is added or a window is eliminated.



Operating with two windows. Example: Mimic and trend chart is used

General Features

- Graphical User Interface with up to 4 windows
- Five Operating Levels with password protection
- Automatic Process Control (Start, Stop, Hold, Abort, Retry Step, Next Step)
- Manual Control for vacuum system and process equipment
- Process Definition and Management for actual and background recipes
- Alarm Management (up to 300 alarms are stored, alarms with 3 different categories)
- Service Functions (every single I/O channel directly accessible)
- Timer functions to program periodic activities (e.g. cryo regeneration)
- Logbook
- Online Help
- Versatile Printouts

Data Monitoring

- Process Run Statistic
- Real Time trending (up to 25 user-selected values can be monitored and analyzed in a comfortable way by using e.g. zooming or panning)
- Historical Trending (based on real time trending data can be archived on a run by run base and analyzed by the identical features available for Real Time Trending)
- Maintenance Statistic (user-specific definition of maintenance intervals based on user-selected components)

Options

- Host connection: Software and Hardware Interface based on SECS-II standard or alternatively on GEM standard to a host computer

Process Recipe

The recipe is consisting of a basic structure with Pretreatment, Process Steps and Post treatment. With combining of various parameter modules a very flexible structuring is possible. Controls various process equipment, from single layer to multilayer comprising several hundred layers composed of different materials, including simultaneous and overlapped coating. Unlimited number of recipes can be stored on hard drive. Integration of supplementary equipment via used-specific process modules is designed for versatile application in research and development.

Parameter Modules

- Heating Modules
- Cleaning Modules (glow discharge, etching)
- Vacuum Control Modules (pumping and gas inlet control)
- Partial Pressure Modules (up to 8 different partial pressure can be supervised in a process step)
- Limit Check Modules (up to 10 user-selected items can be supervised in a process step)
- Layer Modules (Evaporation, up to 6 sources simultaneous, sputtering, use of up to 3 Gas Inlet module, Heating module, Partial Pressure module and Limit Check Module)
- Extended Layer Modules for Ion plating
- Optical Monitoring Modules
- Ion source Modules
- User defined Modules

Process Equipment

The KHAN upgrade is 100% downwards compatible and therefore supports a variety of equipment configurations.

Vacuum System

- Pumps: Cryo-, Diffusion-, Turbopump
- Valves
- Gauges
- Flow and Pressure Controller (up to 10)

Process Chamber Equipment

- Up to 6 Evaporation Sources : (Boats, E-Gun, Inductive sources)
- Ion plating
- Ion and Plasma sources
- Sputter Sources
- Cleaning (glow discharge, etching)
- Heating
- Feeding
- Shutters
- Quartz Crystal for Rate and Film Thickness monitoring
- Partial pressure measuring

Fully automatic production process sequence. Process sequence programmable with very flexible process recipes. Controls various process equipment, from single layer to multilayer systems comprising several hundred layers composed of different materials, including simultaneous and overlapped coating.

Unlimited number of process recipes can be stored on hard drive. Integration of supplementary equipment via user-specific process modules is designed for versatile application in research and development.

Support of five operating levels with different passwords:

- *Manufacturing mode for production*
- *Process mode for defining and changing process recipes*
- *Service mode for maintenance and repair work*
- *Configuration mode to support different plant configurations*
- *Privileged mode for defining user specific process modules.*

Various supervision and data collection functions as e.g. Alarm management, Process Statistics, Real Time Trending, Historical Trending.

Additional options

- **Host connection:** Software and Hardware Interface based on SECS-II standard or alternatively on GEM standard to a host computer. The software for the host computer is not included in the package.
- **Maintenance statistic:** User-specific definition of maintenance intervals and monitoring of user-selected system components is possible with the software extension of monitoring the operating hours and cycles of system components.
- **Integration of Partial Pressure Measurement:** Software extension to collect measurements from a Pfeiffer Vacuum mass spectrometer (PRISMA) for process monitoring and control.
- **Integration of barcode reader;** information read from a barcode reader is displayed on a dedicated screen and is stored in the process run statistics.