

POS

Process Online Software

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What is POS?

POS (Process Online Software) is a PC based software which automates the process of measuring heavy metals. The software has basically two parts; one part for control and measurement, and another to process measured data.

Requirements

- IBM PC/AT or similar, running Windows 98/2000/XP
- .NET framework 1.1 or higher
- Approximately 10 Mb of free space on installation drive

POS

By double-clicking on the POS icon on your desktop, POS will startup.

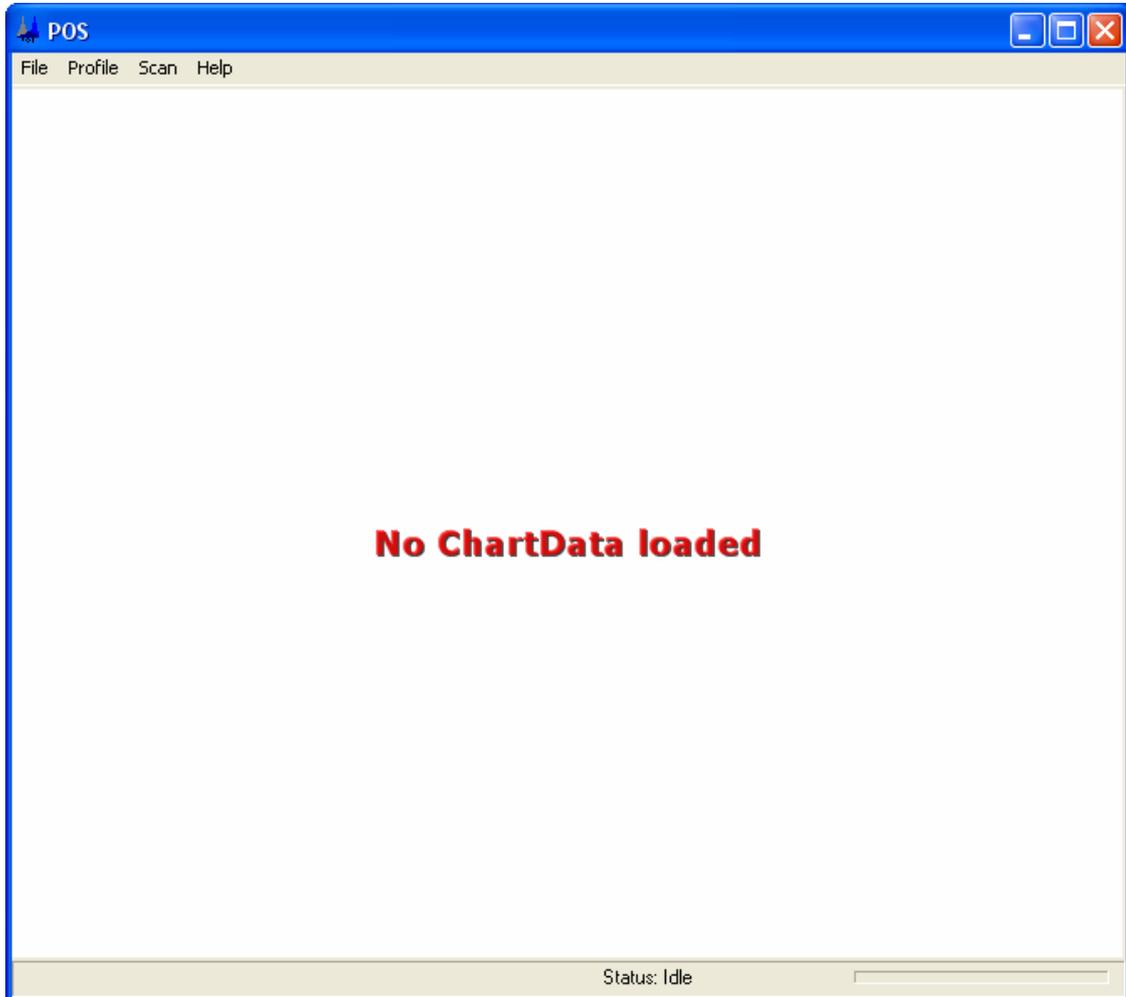
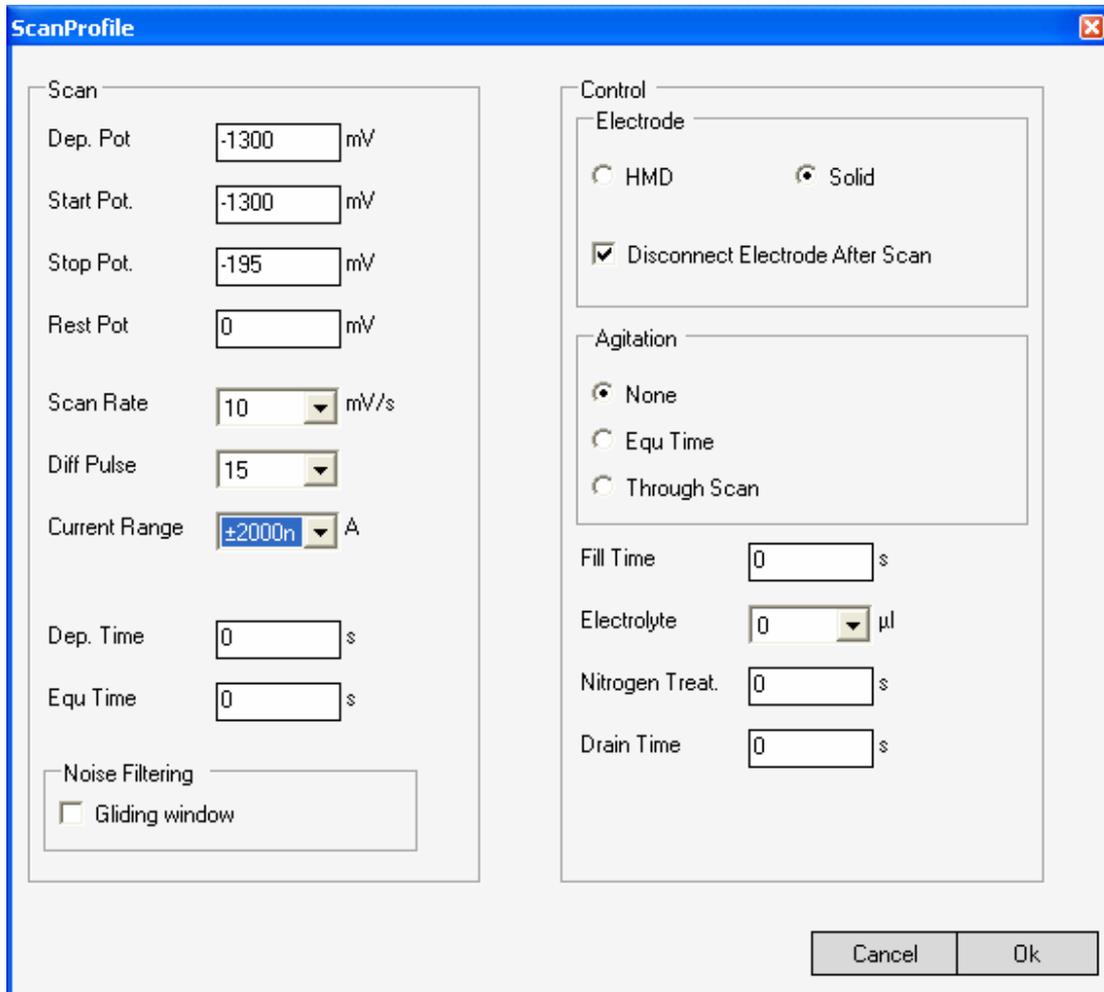


Figure 1 POS' main window, after startup

The software is now ready to start measurements.

Scan profile

The scan profile contains various parameters to control, and perform a scan. Before a scan can be run a scan profile has either to be setup, or loaded from disk.



The image shows a software dialog box titled "ScanProfile" with a blue title bar and a close button in the top right corner. The dialog is divided into two main sections: "Scan" and "Control".

Scan Section:

- Dep. Pot: mV
- Start Pot.: mV
- Stop Pot.: mV
- Rest Pot: mV
- Scan Rate: mV/s
- Diff Pulse:
- Current Range: A
- Dep. Time: s
- Equ Time: s
- Noise Filtering: Gliding window

Control Section:

- Electrode: HMD, Solid
- Disconnect Electrode After Scan
- Agitation: None, Equ Time, Through Scan
- Fill Time: s
- Electrolyte: µl
- Nitrogen Treat.: s
- Drain Time: s

At the bottom right of the dialog are two buttons: "Cancel" and "Ok".

Figure 2 The Scan profile dialog

The dialog box shown in Figure 2 shows a typical scan profile. The scan profile has two parts, these and their parameters will explained in detail below.

Scan

- Dep. Pot:** Deposition potential usually set to a potential which is 250-300 mV more negative than the first expected metal.
- Start Pot:** The start potential for the scan, can be set in the range of $\pm 5V$
- Stop Pot:** The stop potential of the scan. Can be set in the range $\pm 5V$. The stop potential is given as a guideline to the software, and will be recalculated to maintain the given scan rate.
- Rest Pot:** This parameter allows for the working electrode to be set at a given potential. This is true only if “Disconnect the electrode after scan” in the Control section is not enabled.
- Scan Rate:** Scan rates of 1,2,5,10,15,25,50,75 mV/s can be selected. The stop potential of the scan will be recalculated to maintain the scan rate.
- Diff. Pulse:** This parameter sets the height of the modulation pulse in the differential pulse technique. The following values can be set: 5,10,15,25,50,75,100. The higher the diff pulse is the higher the sensitivity is, but at the same time the resolution decreases with higher diff pulse.
- Current range:** Three different current range settings can be selected to maintain the highest possible resolution/range. These are $\pm 2000nA$, $\pm 20uA$, $\pm 200uA$.
- Dep. Time:** Deposition time in seconds. Range from 0-65535.
- Equ Time:** An equilibration time can be added between deposition time and the scan. The deposition process will continue during the Equ time.
- Noise Filtering:** If selected a 5 point gliding window filter is used on the data after the scan is finished. This filter can be used to remove induced noise.

Control

- Electrode:** Two different types of electrodes can be used:
- HMD Hanging Metal Drop (e.g. mercury drop)
 - Solid electrode (e.g. amalgam electrode)
- One can also choose to disconnect the working electrode after the scan.
- Agitation:** Three different modes can be selected:
- None, no agitation will be used
 - Equ Time, agitation from the deposition time until the eq time.
 - Through Scan, agitation from the deposition time until the scan is finished.
- Fill Time:** Time used to fill a sample into the cell. Range from 0-65535 seconds.
- Electrolyte:** Used to control the amount of electrolyte used in the sample.
- Nitrogen Treat.:** The time used to treat a sample with nitrogen. Range from 0-65535 seconds.
- Drain Time:** Time used to drain the cell. Range from 0-65535 seconds.

Metal definitions

POS can find the concentrations of up to four metals. Select “Profile”->”Metal definitions”. The dialog box in Figure 3 will now appear.

	Metal	Low Limit	High Limit	Current 1	Cons 1	Current 2	Cons 2
1.	Cu	-200	-50	120	51	240	70
2.		0	0	0	0	0	0
3.		0	0	0	0	0	0
4.		0	0	0	0	0	0

All concentrations are given in:

Cancel

Figure 3 Metal definitions dialog box

To enable POS to search for a metal the user have to give the following parameters:

- Metal name
- Lower search border
- Higher search border
- Two currents with corresponding concentration.

Calibration

POS needs two calibration points in order to determine the concentration of a metal in the sample. These two points can be found by scanning two samples with different (and known) concentrations and record the current of the desired metal (standard addition).

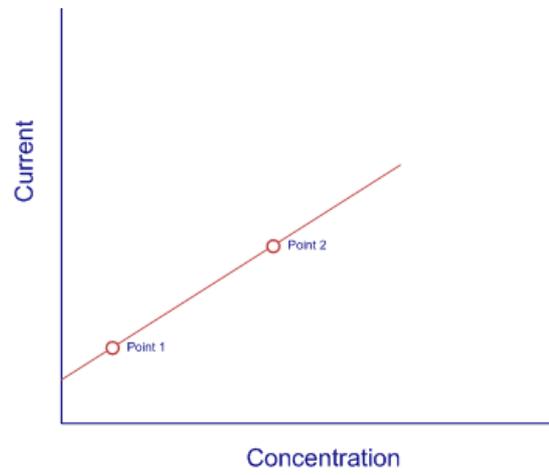


Figure 4 The software's two point calibration

As can be seen from Figure 4 the software uses a straight line to convert current to concentration.

Starting a scan

Before starting a scan, scan file should be loaded. Or a new scan profile should be set up.

To start the scan simply press “Scan->Start”.

Analyzing a scan

There are two ways to analyze a scan:

- Visual analyze: One can visually inspect the voltammogram, and determine the types of metals in the sample. The concentration is represented by the height of the peak.
- Automatic analyzes: if metal definitions are set, POS will automatically calculate the concentrations of the metals, and show the in the voltammogram.

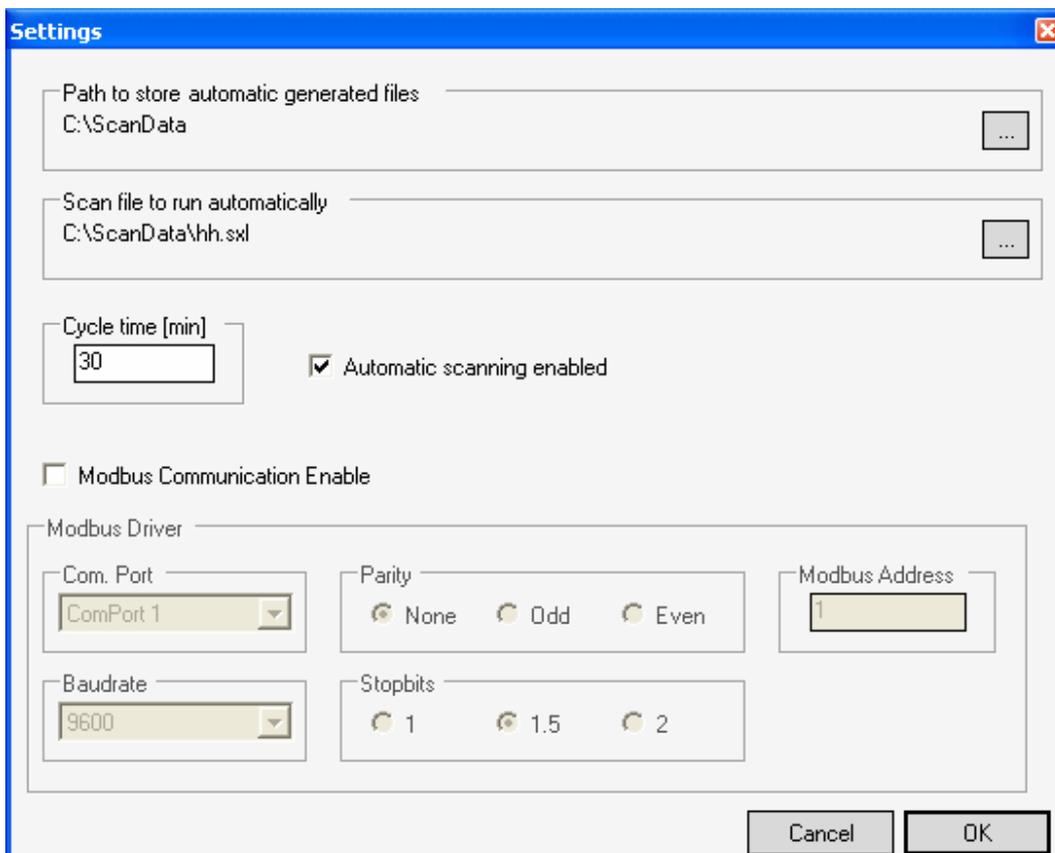
Automatic measurement

POS can do automatic measurements. This can be done it several ways:

- timed measurements
- As a Modbus slave
- Or as an combination of both.

Timed measurement

POS can be setup to start a measurement using a timer.



The screenshot shows a 'Settings' dialog box with the following fields and controls:

- Path to store automatic generated files:** A text box containing 'C:\ScanData' and a browse button (...).
- Scan file to run automatically:** A text box containing 'C:\ScanData\hh.xml' and a browse button (...).
- Cycle time [min]:** A text box containing '30'.
- Automatic scanning enabled:** A checked checkbox.
- Modbus Communication Enable:** An unchecked checkbox.
- Modbus Driver section:**
 - Com. Port:** A dropdown menu showing 'ComPort 1'.
 - Parity:** Radio buttons for 'None', 'Odd', and 'Even', with 'None' selected.
 - Modbus Address:** A text box containing '1'.
 - Baudrate:** A dropdown menu showing '9600'.
 - Stopbits:** Radio buttons for '1', '1.5', and '2', with '1.5' selected.
- Buttons:** 'Cancel' and 'OK' buttons at the bottom right.

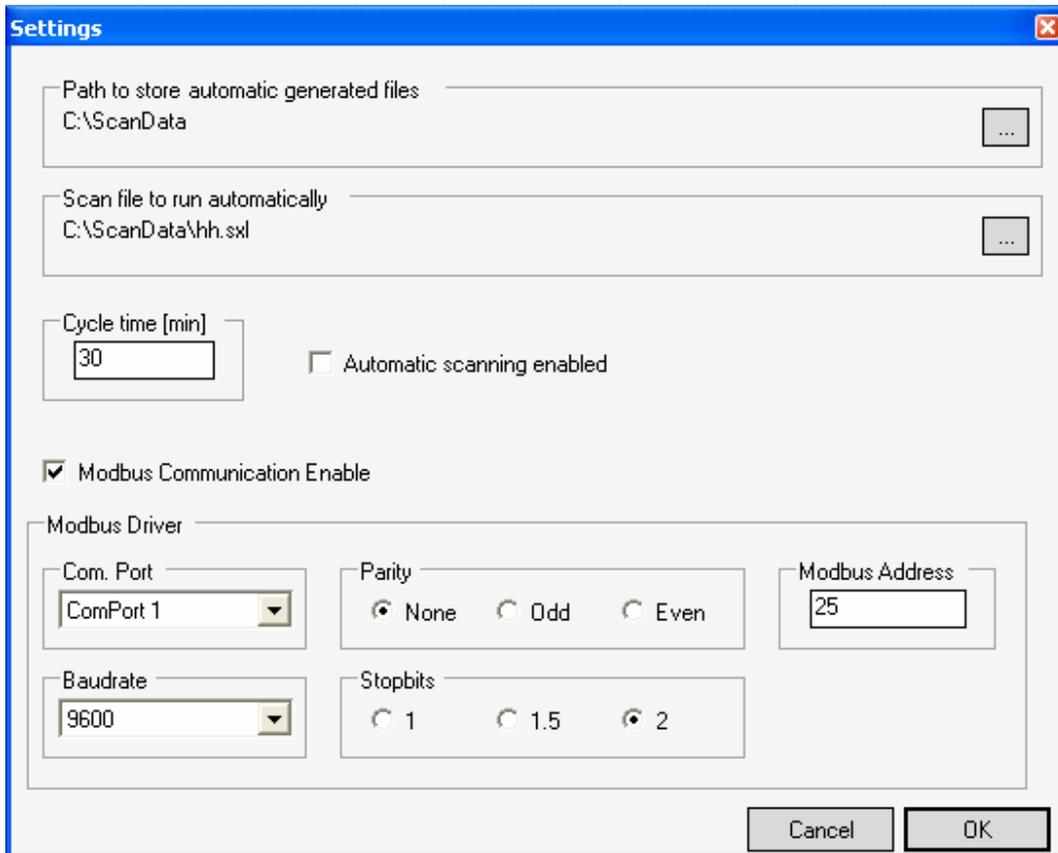
Figure 5 Settings dialog, setup for timed measurement

Figure 5 shows an example setup for timed measurements. The following parameters has to be given to run timed measurements:

- A path to store automatic generated files
- A template scan file, which POS will run each time.
- Cycle time, a measurement will be started each cycle time
- Check the “Automatic Scanning enabled” box.

Modbus controlled measurement

POS can also be setup as a Modbus slave.



The screenshot shows a 'Settings' dialog box with the following fields and controls:

- Path to store automatic generated files:** C:\ScanData
- Scan file to run automatically:** C:\ScanData\hh.sxl
- Cycle time [min]:** 30
- Automatic scanning enabled:**
- Modbus Communication Enable:**
- Modbus Driver settings:**
 - Com. Port:** ComPort 1
 - Parity:** None, Odd, Even
 - Modbus Address:** 25
 - Baudrate:** 9600
 - Stopbits:** 1, 1.5, 2

Buttons: Cancel, OK

Figure 6 Settings dialog, setup for Modbus controlled measurement

To use Modbus controlled measurement, the following parameters has to be set:

- A path to store automatic generated files
- A template scan file, which POS will run each time.
- Check the “Modbus Communication Enable” box

Also the desired communication settings and Modbus address has to be set.

Modbus implementation

The POS software implements basically two main functions. These functions will enable POS to communicate with a SCADA system as a Modbus slave.

POS only supports Modbus serial communication in RTU mode.

The format for each byte (11 bits) in RTU mode:

Coding: 8-bit binary

Bit definition:

- 1 start bit
- 8 data bits
- 1 bit parity
- 1 stop bit

POS supports odd, even and no parity. However when no parity is used it is required to use 2 stop bit

The following baud rates are supported:

- 4800
- 9600
- 19200

04 (0x04) Read input registers

This function is used to read 1-11 registers in POS. The registers contain data concerning measured metals.

Register	Description
0	Analyzer status
1	Year (of last measurement)
2	Month (of last measurement)
3	Day of month (of last measurement)
4	Hour (of last measurement)
5	Minute (of last measurement)
6	Second (of last measurement)
7	Metal 1 concentration (concentration x 100)
8	Metal 2 concentration (concentration x 100)
9	Metal 3 concentration (concentration x 100)
10	Metal 4 concentration (concentration x 100)

All registers contains a 16 bit integer.

05 (0x05) Write single coil

This function code is used to set an output ON or OFF. The only supported output address for POS is 1296 (0x0510). This output is used to either start or stop¹ a measurement.

¹Stop of a measurement is not yet implemented.