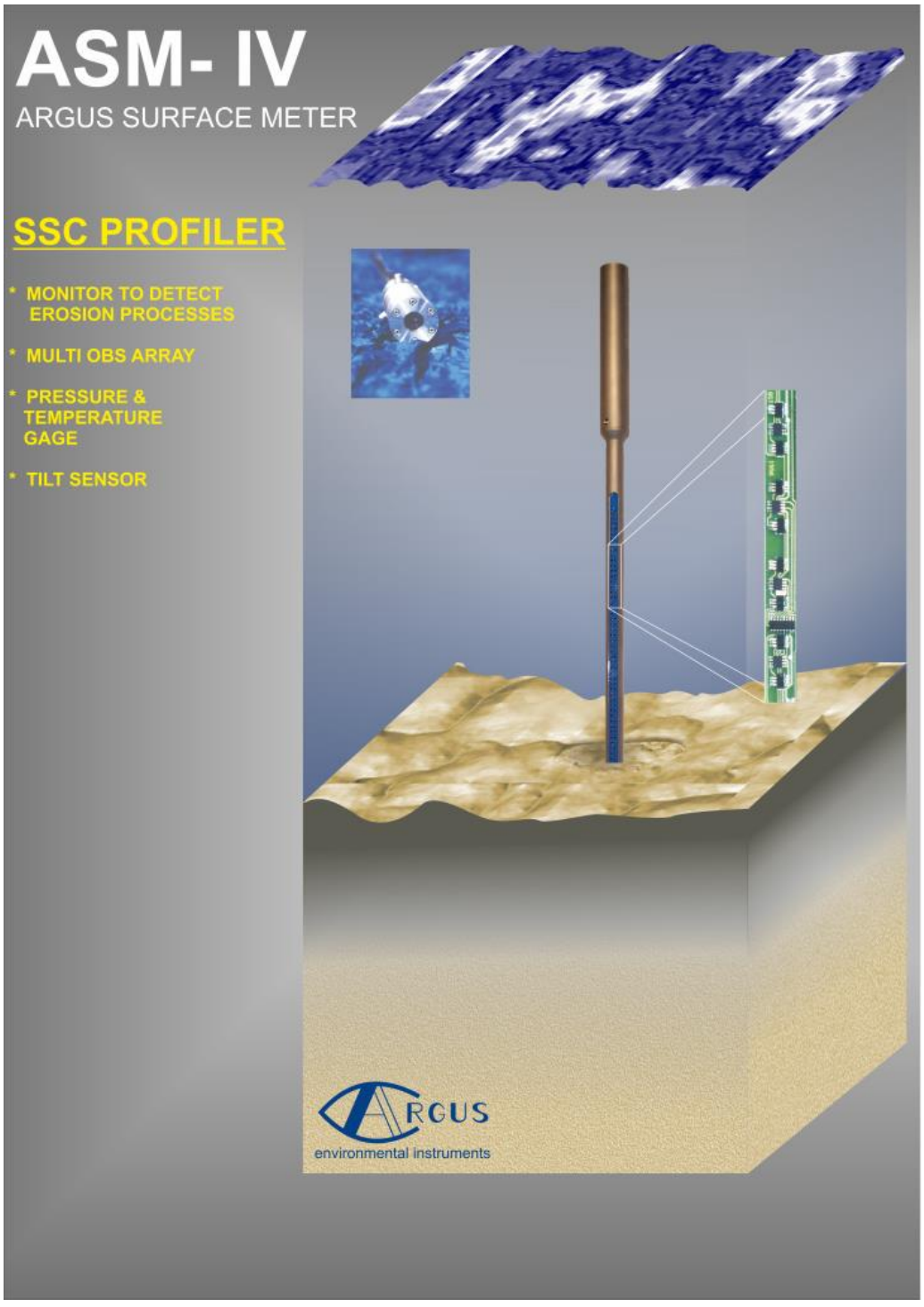
ASM-IV

ARGUS SURFACE METER



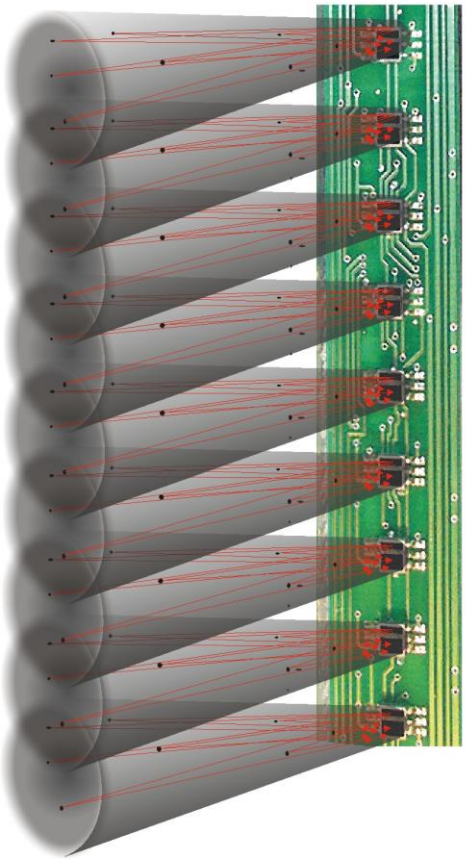
The ASM IV instrument was primarily developed to detect erosion and re-sedimentation processes at the bottom of marine environments (ocean/river locations). It is not recommend to be used with concentrations below 100NTU or 250mg/l SPM. It records the reflections and the dynamic parameters for high concentrations that are created in the measuring plane by solid particles moving in a multiphase current. It provides an independent contribution to the complex questions which arise from the context of transport of solids in the connecting layer between the bottom, the mud layer and the main body of water. Internal filters in the ASMA software shall be used below 100 NTU. Below 100NTU the data quality is limited.

1 Principle of measuring

The instrument operates with backscatter infrared sensors (920 nm) embedded in a stainless steel rod. The sensors are placed on an active board at a distance of 10 mm. This means that approx. 100 sensors are mounted per meter.

Each sensor consists of an infrared laser transmitter and a detector. The maximal sample volume can be 10 cm^3. The volume depends on the density of the suspension. The measuring distance range is 0...100 mm in front of each individual sensor..

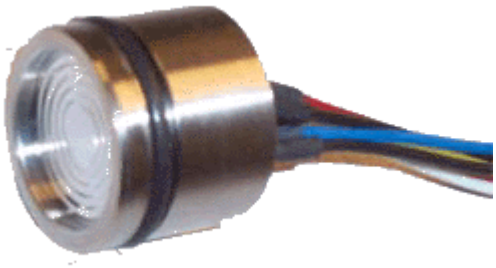
Optical day light filters and a non visual laser light transmitting source prevent interference by other light sources. This makes the instrument suitable for locations like tidal areas with dry periods



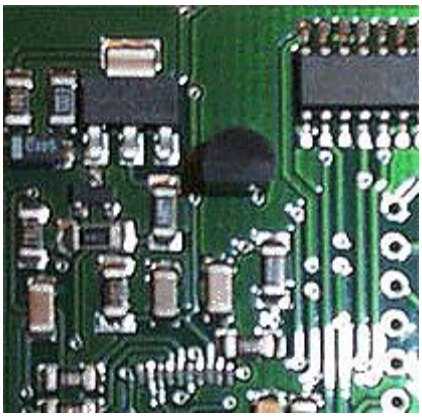
1.1 Additional sensors

The instrument contains three additional sensors.

An inclinometer for two directions will give the actual angle between ground and instrument. The maximum range is 60° in all directions. The calculation is processed on board by the internal processor.



A pressure gauge senses the actual depth of the location of the instrument and it gives information about sedimentation's during the turn of the tide.



A on board temperature sensor detects the temperature of the steel housing which is related to the water temperature.

Activation and power supply of the sensors as well as the transmission of the signals are controlled by a battery powered central unit in the head of the instrument. The sealed in unit consists of a microprocessor, a data memory, the additional sensors and the energy supply. The energy consumption is only < 6mAs. That means one 9V block alkaline battery will

provide the necessary energy for 2 months, assuming a sample rate of 10 measurements every 5 minutes, or the energy for a standby status of approx. 6 months.

The microprocessor carries out all of the tasks necessary for control. Incoming data is processed by the microprocessor and stored in memory. The capacity of 8 MB will provide a measuring time of approx. 4 weeks in total, without weakening the battery (10min sampling time).

2 Configuration

To communicate with the instrument an optical IRDA- serial port and a hard wire connector (subconn) is integrated in the head housing. All communications can be done without opening the instrument.

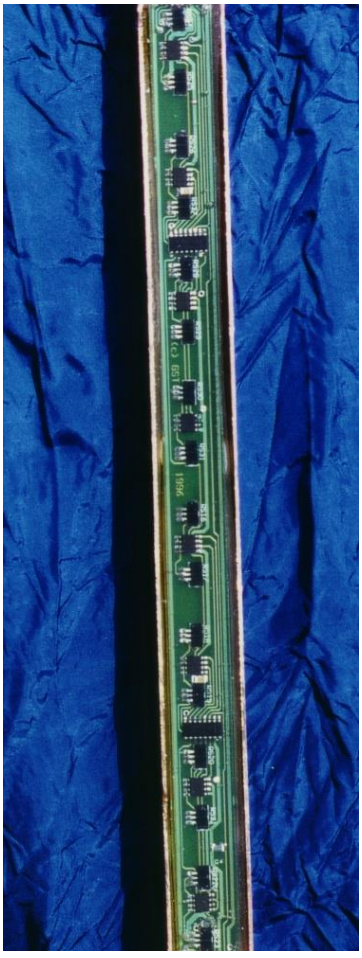
ASMA works on XP…W10 Pc's. Once the communication unit is plugged into the serial port (USB) of the PC and is placed on top of the instrument, com port can be selected form a table. It can take up to 40 seconds before the port table is visible.

3 The instrument

- **Head unit**

The stainless steel (titanium) head contains the inclinometer, the temperature sensor and the pressure sensor as well as the microcontroller, the memory and the energy supply. On the top end of the housing the optical communication window is visible. The diameter of the head is 60 mm. The rod part with the embedded sensor electronics is 30 mm in diameter. These dimensions make the instrument suitable for the most measuring sites specially in fast running rivers.

- **Sensor rod**



The sensor electronic board is only 15 mm wide and 5 mm high and is fitted in the stainless steel rod. The optical sensors and the additional electronics needed, are mounted on divided boards and are embedded in a special polyurethane casting resin. This prevents the board from breaking, if the rod gets bent e.g. fast running rivers. The high evacuated resin contains no air and makes the instrument suitable for offshore deployments.

4 Specifications

General

- Measuring section: 0.96 m (Type S), 1.44 m (Type N), 1.92 m (Type L)
- Measuring intervals: 1 sec. ....no limit
- Sampling rate: 1 ... 255 samples per burst
- Memory capacity: 8 MB standard
- Energy supply:
  - Main supply: one alkaline 9V block battery minimum
two lithium 9 V block battery for maximum energy source
  - Memory backup: CR 1220 lithium 3 V battery
- Standard lengths of the instrument: 1.9 m (Type S), 2.4 m (Type N), 2.9 m (Type L)
- Dimension of the instrument:
  - Sensor area: 30 mm (Type –S, -N), 35mm (Type –L) diameter
  - Head: 60mm (diameter)
- Weight: 8 kg (Type -S), 9.5 kg (Type -N), 15 kg (Type –L)
- Ambient temperature: -15...+45°C
- Installation depth: 40 m water depth max.
- Distances:
  - First OBS sensor up: 190 mm
=> Pressure sensor

OBS

- Measuring method: optical
- Sensors: back scatter infrared sensors (920nm)
sectral bandwith 35nm
- Sensor distance: 10 mm
- Number of sensors: 100 per meter
- Measuring range: 500..50,000 mg/l sand (d50=250µm
100...5,000 mg/l mud (d50=20µm)
50…2000 NTU (standard formazin)
- Resolution: 5%
- Accuracy: +/-10%
- Linearity sensor to sensor 5%

Inclination

- Measuring method: gravimetric
- Sensors: 2-D integrated circuit
- Measuring range: 0...60° all directions
- Resolution: 1°
- Accuracy: +/- 1°

Water depth

- Measuring method: piezoelectric
- Sensor: stainless steel pressure housing & membrane
- Measuring range: 0...5,000 hPa abs. other ranges on request
- Resolution: 0.5%
- Accuracy +/- 0.3% (full range)

Temperature

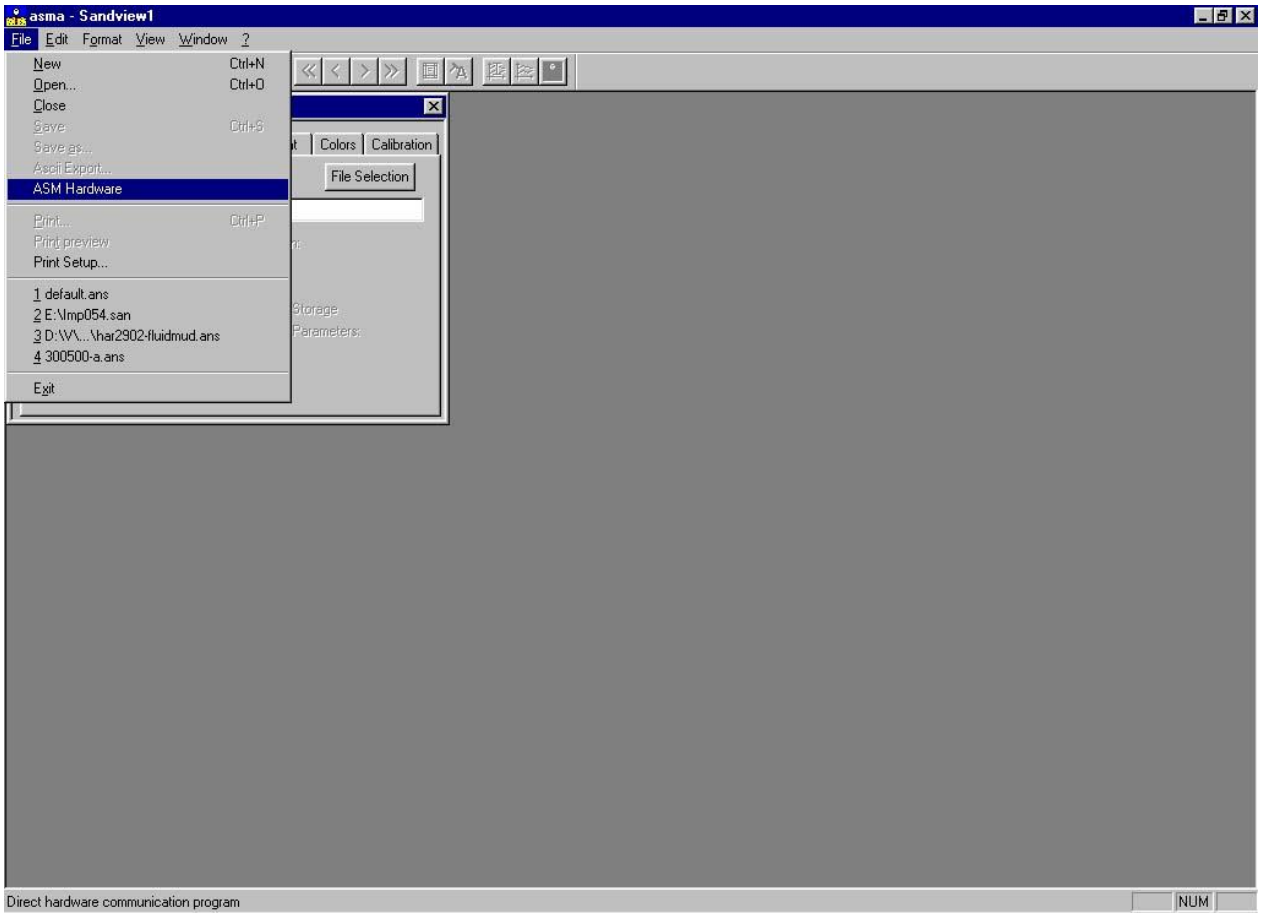
- Measuring method resitive
- Sensor: silicon integrated circuit
- Measuring range: -10...45 °C
- Resolution: 0.5°C
- Accuracy: +/- 0.5°

5 Hardware Link

5.1 Hardware communication

Getting started

The ASSM communication program is an interior part of the ASMA software. To run the software a Windows based PC is necessary. The minimum computer specification is a Pentium 3 with 400MHz, a 64 MB ram and a serial 232 port (or usb port with serial adapter). The software is running under WIN 9X, 2000 and XP.



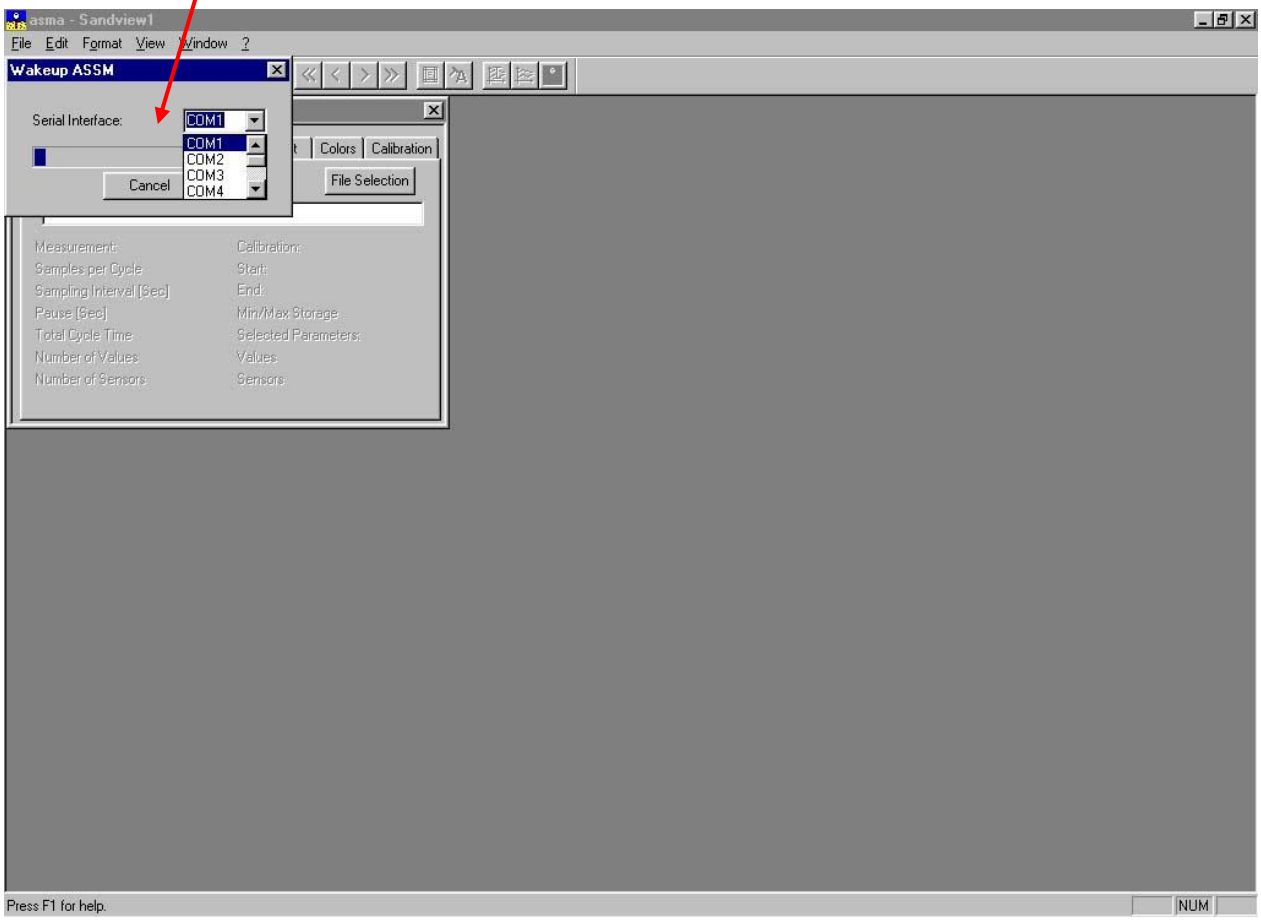
Procedure

1. Place the OCU (optical communication unit) on top of the ASM, or connect to the subconn using the special OC adapter

2. Insert the plug into the computer port (or via adapter into the usb socket) and start the computer.

3. Start the program ASMA-E and select the “ASM Hardware” command from the “File” menu and wait until the information “ASSM wake up” appears. The progress is shown by the progress bar and after a successful connection the red LED at the instrument in line with the sensor array will flash.

4. The communication table should appear in a couple of seconds. If not, check interface and port selection.



Data read

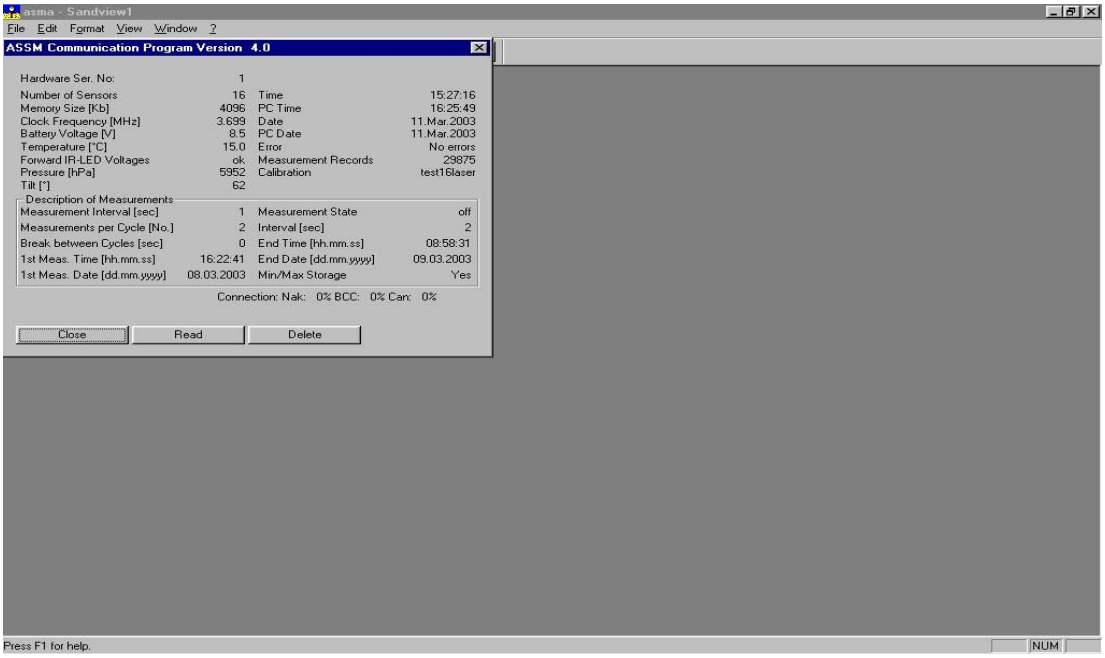
After the connection had been made the window below will appear.
The HARDWARE Ser. no. indicate the instrument serial number and gives all the relevant current information from the instrument. The ***number of sensors*** show how many optics are in use. The second line tells about the present ***memory size*** of the instrument. The ***clock frequency*** says that the instrument works with the right time set (range: 3.5 – 3.8MHz). The ***battery voltage*** * is the present value from the internal power supply (reg. 9V). The line ***forward voltage*** gives information about the proper functioning of sensors. If one sensor fails a number combination appears. In this case the instrument needs to be taken in for service. The ***temperature, pressure*** and ***tilt*** line are showing the values taken during the last measurement. These values need to be calibrated. When choosing the calibration function the bottom line pops up, allowing for separate calibration of each internal sensor (authorized person only, pg. 22).

***Attention!** On a new instrument or after changing batteries a new measurement has to be carried out to get meaningful information on battery voltage, temperature, forward voltages, pressure and tilt.

The DESCRIPTION OF MEASUREMENTS section can be modified by the user after reading data or deleting (**chapter Measurement**) . It is a time setting table and a possibility for disable or enable the storage of min/max data.

The SOFTWARE section (right part of the table) is a status table. It gives information about:

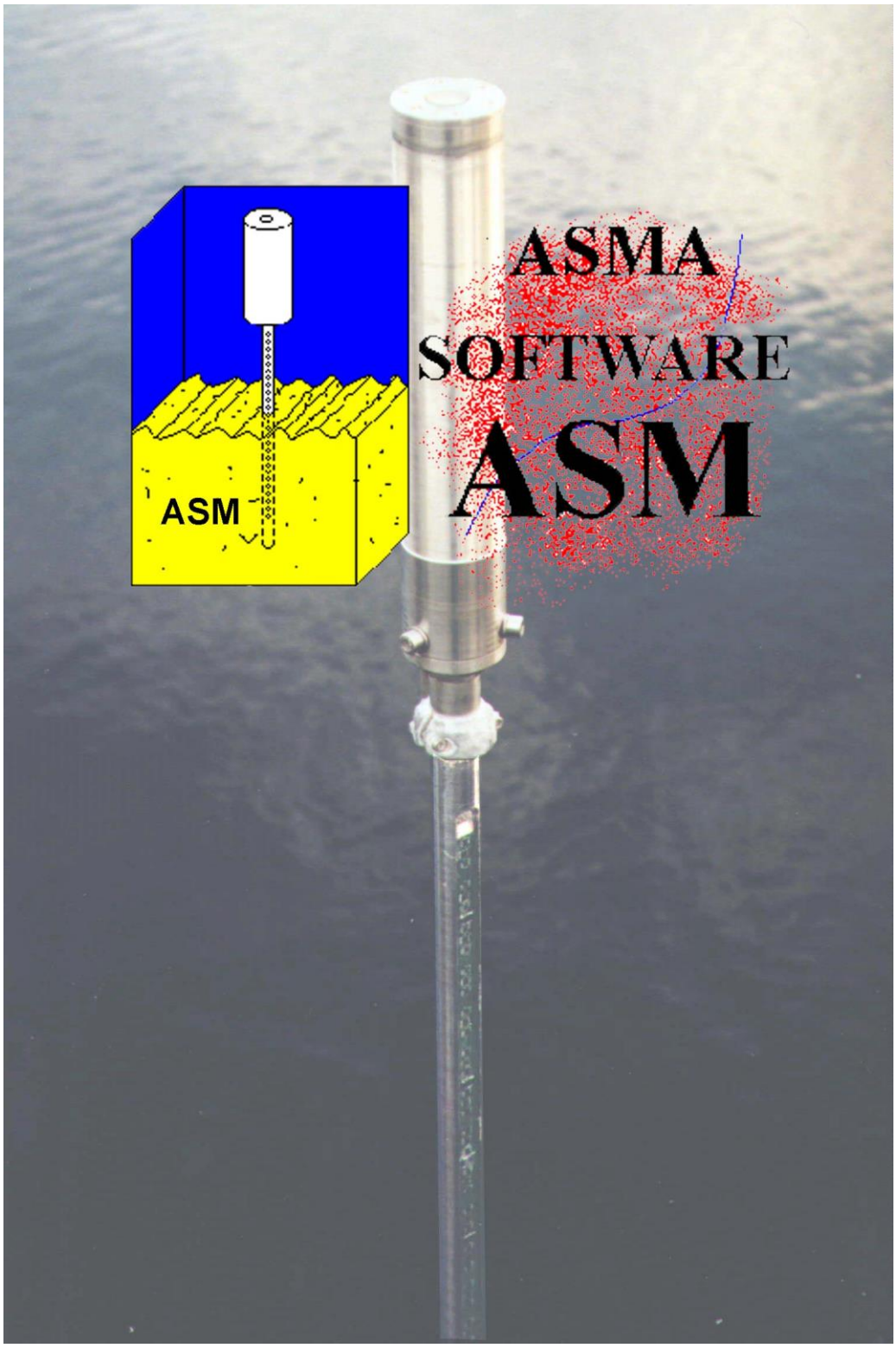
- present time and date
- errors which may have occurred during the measurements
- the value of records the instrument had taken
- the status of measurement (running, or off)
- the chosen measuring interval
- the date and time the measurement will be shutoff.
- The calibration file



Close	will end the communication
Read	read the stored data from the instrument
Delete	will delete the data without storing in a file. The data will remain stored in the memory if no new measurement will be started.

6 ASMA 4.17

Software Part



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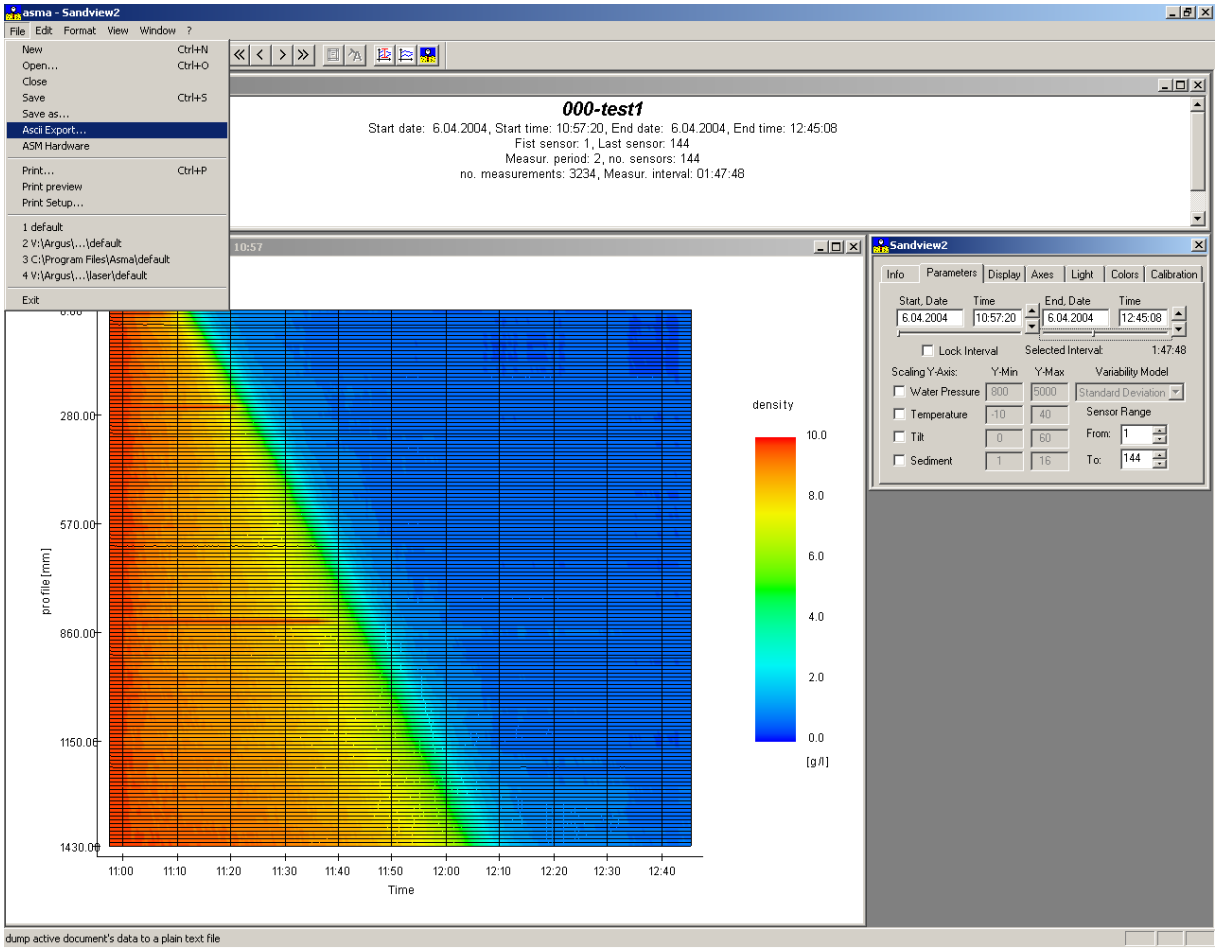
6.1 Description

The program ASMA is used for the analysis of data files from the ASM-IV instrument. The stored ASM data files (*.SAN) extracted from the measuring data files can be processed graphically and displayed on the screen. The freely by the user defined displays include all relevant adjustments and can be managed comfortably.
The second part of the reference provides common information of the ASMA software and the default application and can be skipped by the experienced user. In case of doubt the summed information is available as online **Help** as well.

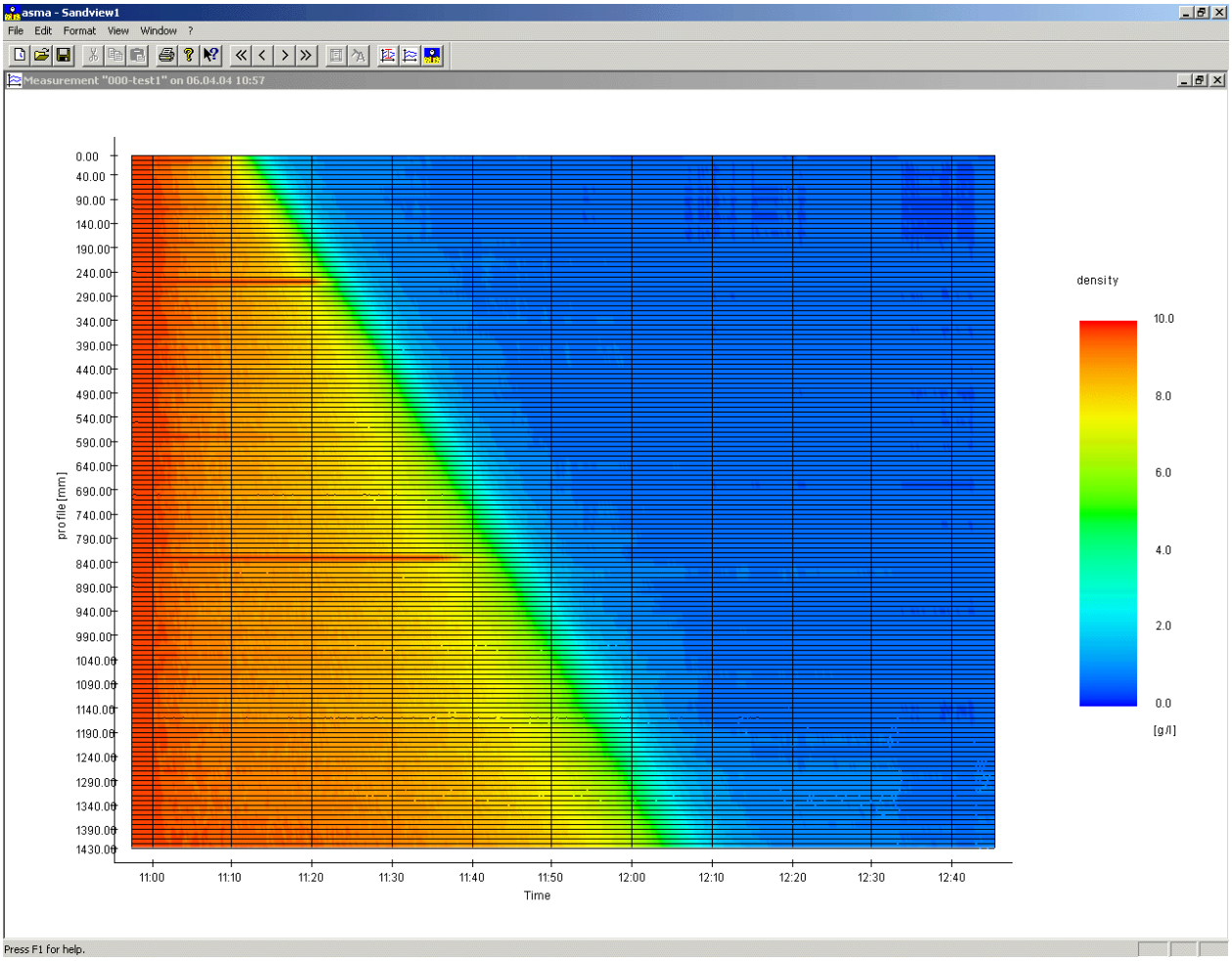
6.2 ASCII conversion

An ASCII export filter is included in the ASMA program and allows the selection of different data created from the raw data file (OBS raw data can be extracted as WYSIWYG).



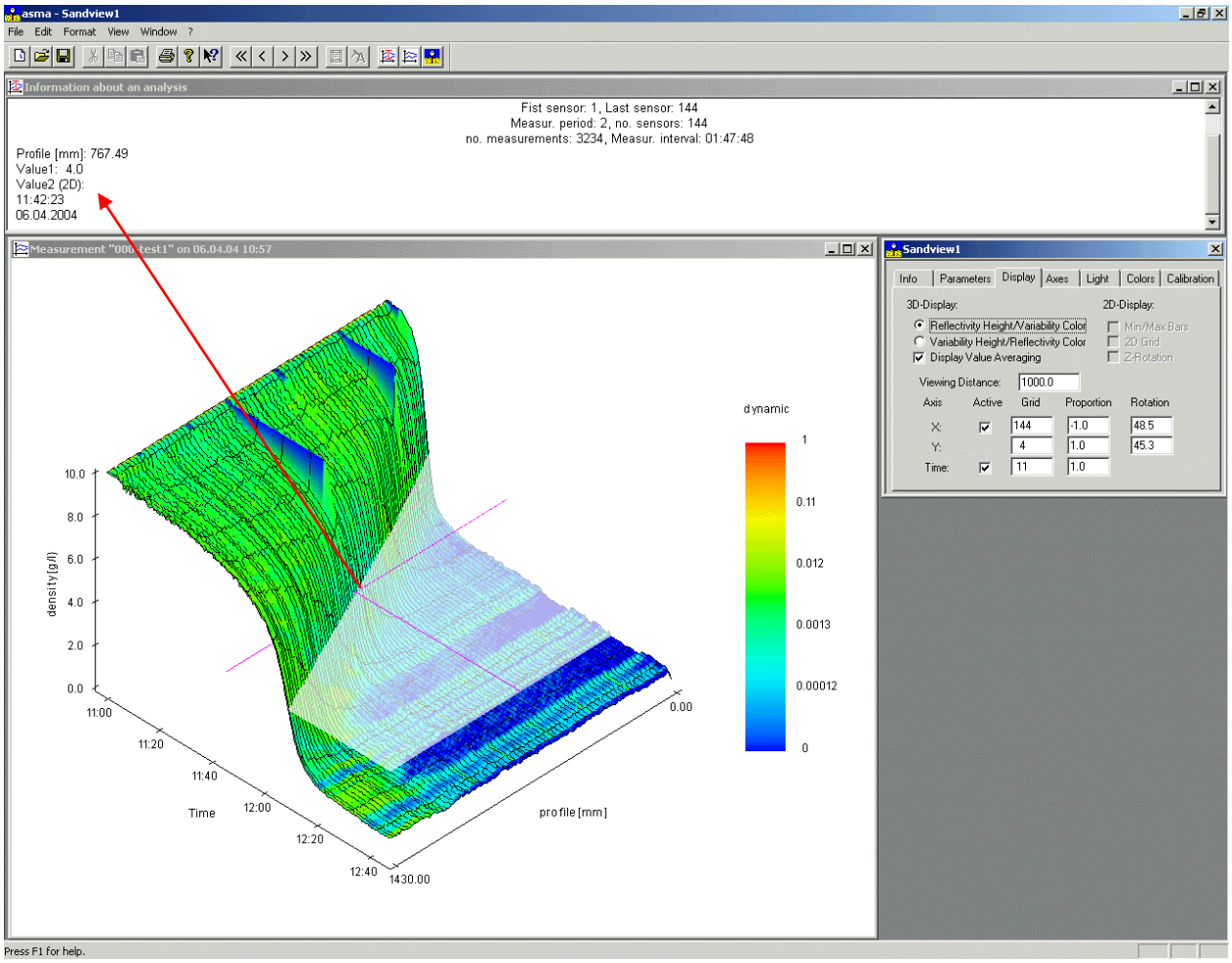
Example

The 2-d graphic is showing a data file taken at the laboratory. The probe was located in a clear fiber glass tank with kaolin sediment (10g/l at its maximum). The diameter of the tank is 20 cm and the height 2,50 m. Each horizontal line means 1 cm vertical measuring range (distance between each OBS sensor). The sample rate is 2 seconds. The average was taken from two samples, one per sec. This is the smallest setting to measure the variability process. The profile shows that it only took three approx. an hour for re- sedimentation. The settling process is linear due to the homogeneous particle size distribution.

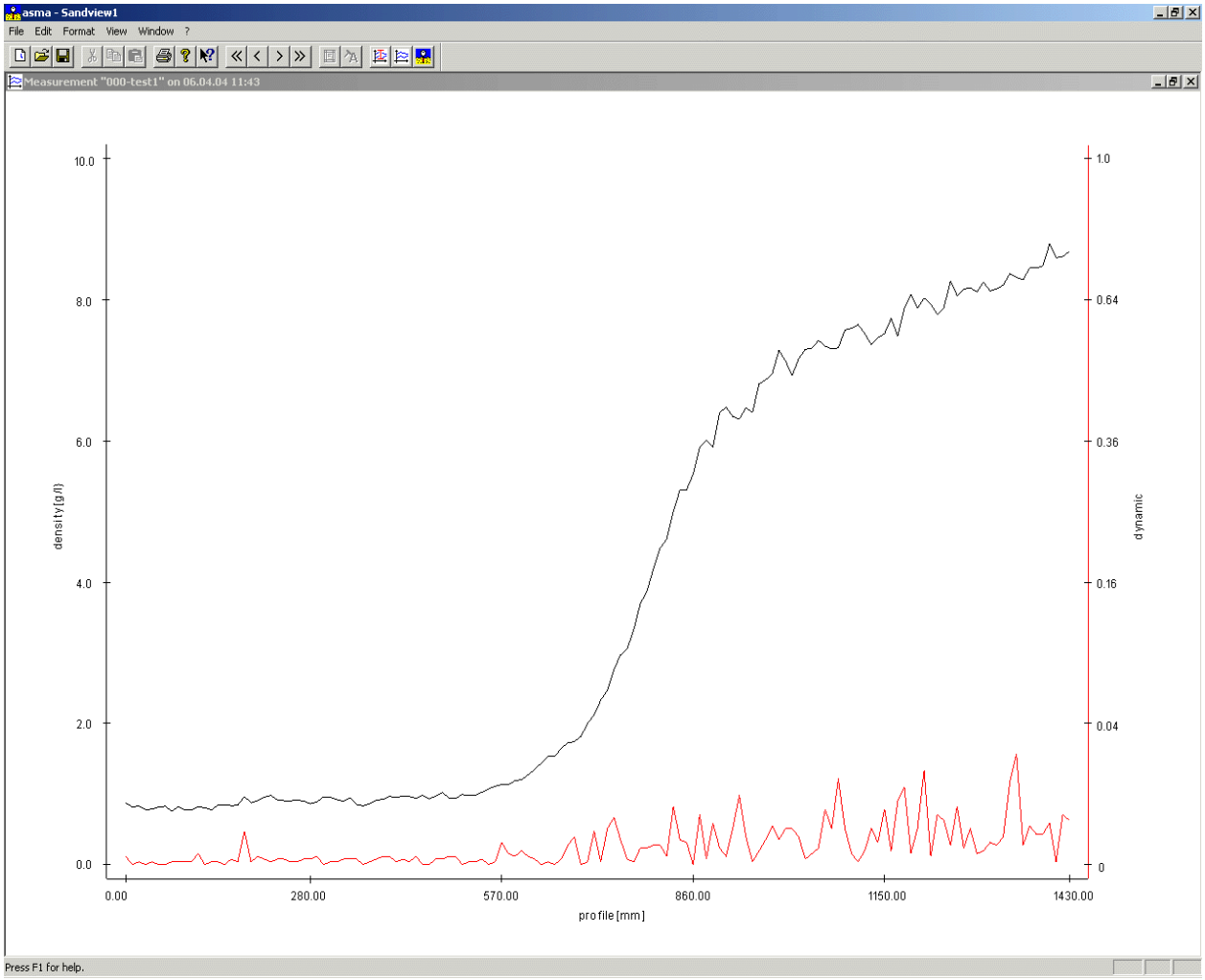


At this test measurement, different coloration is visible. High concentration here is colored red (10gr/l). The orange to yellow and the green to blue area as well indicate lower concentrations during the settling process. The settling time can also be evaluated at the time axes. At 12:00 hours the sedimentation process is finished.

This diagram is showing the same sample as before but as a 3D version and different visualization. The sedimentation process can be followed through the complete pre selected time range. The cursor show the exact range of the profile were 4 g/l (kaolin) at what time is expected.



This digram is showing the 2D reflection, at the left y-axis the SSC (suspended sediment concentration) is visible (0-10 g/l kaolin). The right y-axis is showing the varability (standard deviation) of the reflection of materials.



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