Vikasonic - The Schleibinger Ultrasonic Data Logger

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Figure 1: The Schleibinger Vikasonic

1 Introduction

1.1 Measurement of the Setting with the Vikasonic Schleibinger Ultrasonic Data Logger

The time of setting is measured using the Vicat penetration method in Europe and with the penetrometer in the USA. These methods contain some inherent disadvantages. The first proposals to measure the ultrasound transmission time appeared in the early sixties of the 20th century. In collaboration with the building material manufacturer "Hasit", Schleibinger has developed a Ultrasonic data logger, which can record the transmission time through fresh mortar over a long period.

The Vikasonic is also the ideal instrument for measuring the inner damage of concrete cubes during the CDF/CIF freeze thaw test

The instrument may also be used as a portable Ultrasonic tester for measuring the structural health of building structures.

1.2 Measuring Principle

Fresh mortar is setting between two ultrasonic transducers (transmitter and receiver, 54 kHz) supplied with 6..120 impulses per minute. The transmission time through fresh mortar changes according to the material setting. At the first point of contact of the forming binder stone in the mortar the ultrasonic speed begins to increase. If the structural conditions in the mortar are reached, the changes in speed are smaller and run almost horizontal to the time axis until the compaction of the structure begins to increase again. At the

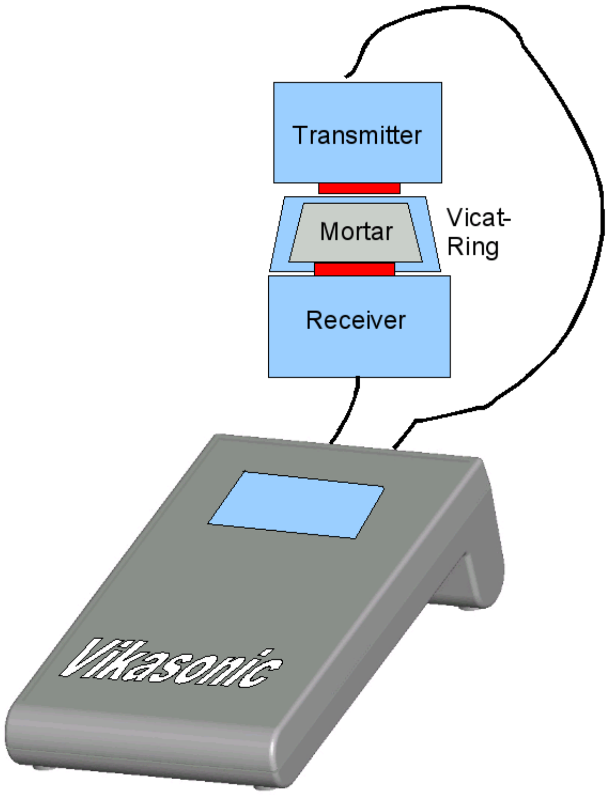

Figure 2: Measuring Setup

same time the amplitude of the sonic signal is measured by the receiver. The amplitude increases with the hardening of the material, the damping of the signal (reciprocal of the amplitude) decreases.

1.3 Measuring Setup

Every measuring cell is equipped with an ultrasonic transmitter/receiver pair. The Vikasonic continuously measures the transmission time, the signal attenuation and the temperature and records these data on a the USB flash drive. For the test there is no PC required.

On the USB flash drive there is a small program for a graphical display of the data on the PC. The data can also be directly read into your Excel Worksheet. The software was developed by our own engineers and can be adapted to your application if required. The Vikasonic can of course also be used for other measuring tasks, for example for the analysis of the Youngs's-modulus of concrete structures.

2 An Application Example

At the company hasit Dr. B. Gerstner and Dipl. Min. F. Richartz made some measurement comparisons between the ultrasonic and

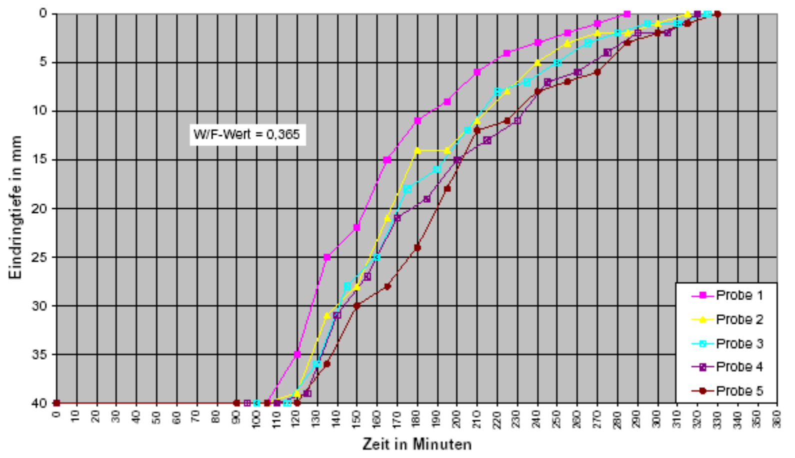

Bild 1: Reproduzierbarkeitsuntersuchungen zum Abbinden von Kalk-Gips-Putz 150 (Kissing) mit dem Abbindekonus

Figure 3: Reproducibility of the measuring with the vicat device

the vicat method. The reproducibility of both methods and the relationship ultrasonic method vs.vicat method were examined.

2.1 Measurement with the Vicat device

With the Vicat device the percentage anomaly (percentage mistake) depends on the depth of intrusion and is between 27% and 40% for setting time of plaster. The cause is the flattening gradient

2.2 Measurement with the Ultrasonic Method

For the ultrasonic speed the percentage anomaly is 18 % (the cause is the linearity of the gradient of the ultrasonic speed in the period of the final setting of the plaster.)

2.3 Comparison of Both Methods

The relationship between the Vicat test and the ultrasonic method is different for the various materials and recipes. For every recipe and consistency, you have to make a replication of the measuring with the Vicat-ring(depth of intrusion) for the interpretation of the measuring data, which you receive with the ultrasonic measuring cell. If you have done this, the ultrasonic measurement can replace the Vicat test. The ultrasonic method of measuring is more precise than the measurement of the depth of intrusion with the Vicat-ring. The cost of the device of the ultrasonic method of measuring is a bit higher, but the effort of the measuring is smaller than the measurement with the ultrasonic cell and the results are more impartial.

3 Basic principles of ultrasonic measurement.

The following text is a short introduction the the basic principles of US measurement in the field of building materials.

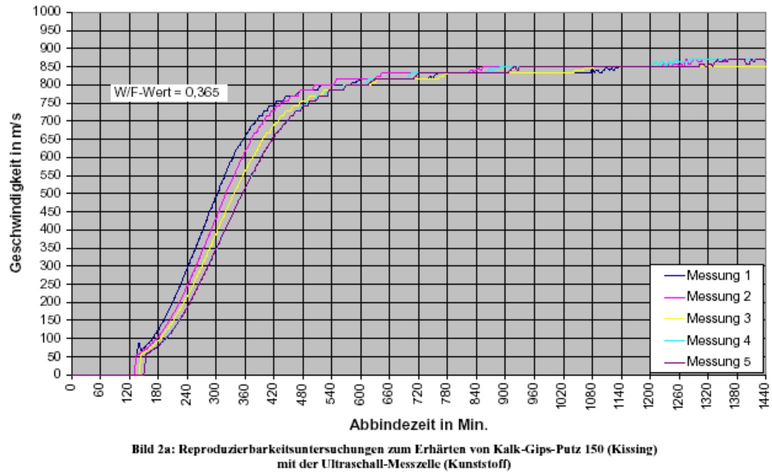

Figure 4: Reproducibility of the measuring with the ultrasonic measurement

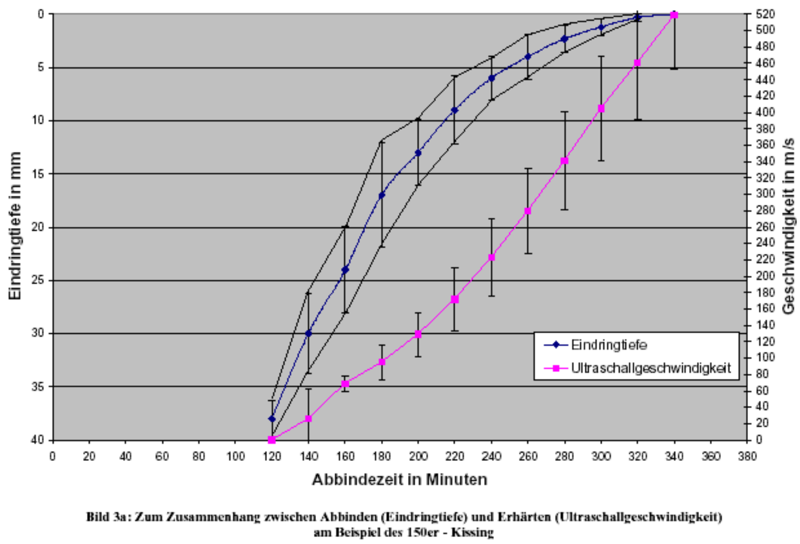

Figure 5: Vicat vs. Ultrasonic

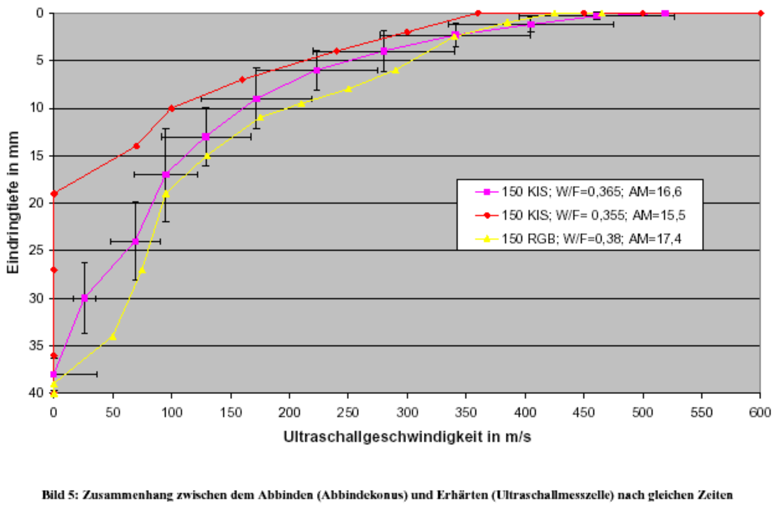

Figure 6: Vicat vs. Ultrasonic II

3.1 Introduction

The velocity of ultrasonic pulses traveling in a solid material depends on the density and elastic properties of that material. The quality of some materials is sometimes related to their elastic stiffness so that measurement of ultrasonic pulse velocity in such materials can often be used to indicate their quality as well as to determine their elastic properties. Materials which can be assessed in this way include, in particular, concrete and timber but exclude metals. When ultrasonic testing is applied to metals its object is to detect internal flaws which send echoes back in the direction of the incident beam and these are picked up by a receiving transducer. The measurement of the time taken for the pulse to travel from a surface to a flaw and back again enables the position of the flaw to be located. Such a technique cannot be applied to heterogeneous materials like concrete or timber since echoes are generated at the numerous boundaries of the different phases within these materials resulting in a general scattering of pulse energy in all directions.

3.2 Velocity of Longitudinal Pulses in Elastic solids

It can be shown that the velocity of a pulse of longitudinal ultrasonic vibrations traveling in an elastic solid is given by (see also section 8.3.2):

$E_{mod} = \varrho v^2$

with E : tensile or Young's Modulus, ϱ : density, v speed of sound

Another way to measure the Youngs modulus is the resonance frequency method. The E-modulus or Youngs-modulus is slightly different between the US and the resonance frequency method. You may find in the literature some comments that the E_S (ultra sound) values are mostly higher then the E_R (resonance frequency).

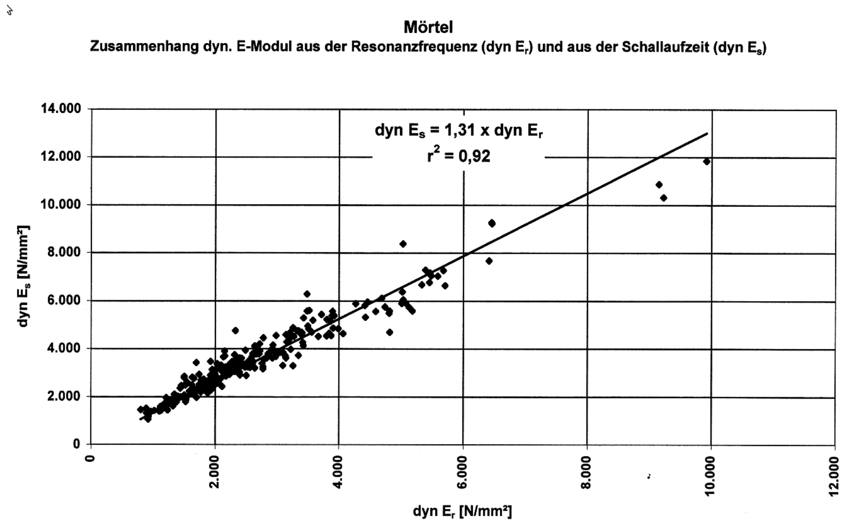

Figure 7: Young's modulus measured with the US method vs. the Resonance Frequency method, published by Iffert-Schier

Iffert-Schier ("Einsatz von Festigungsmitteln zur Konsolidierung der Tragfhigkeit von bestehendem Mauerwerk", PhD Thesis, Univ. of Hannover, 2000, d-nb.info/959242139/34) made a comparison for building materials.

In figure 7 you may see the correlation for mortar specimen.

For sand stone: $E_S = 1.05 * E_R$

for mortar: $E_S = 1.31 * E_R$

and nearly linear correlation wit $r^2 > 0.97$ for sand stone or 0.92 for mortar.

3.3 The Influence of Form and Size of the Specimen

The above equation may be considered to apply to the transmission of longitudinal pulses through a solid of any shape or size provided the least lateral dimension (i.e. the dimension measured perpendicular to the path travelled by the pulse) is not less than the wavelength of the pulse vibrations. The pulse velocity is not affected by the frequency of the pulse so that the wavelength of the pulse vibrations is inversely proportional to this frequency. Thus the pulse velocity will generally depend only on the properties of the materials and the measurement of this velocity enables an assessment to be made of the condition of the material.

3.4 The Frequency of Ultrasound

The pulse frequency used for testing concrete is much lower than that used in metal testing. The higher the frequency, the narrower the beam of pulse propagation but the greater the attenuation (or damping out) of the pulse vibrations The frequencies suitable for these materials range from about 20 kHz to 250kHz, with 54 kHz being appropriate for the field testing of concrete. These frequencies correspond to wavelengths ranging from about 200 mm (for the lower frequency) to about 16 mm at the higher frequency.

3.5 The method of testing

For assessing the quality of materials from ultrasonic pulse velocity measurement, it is necessary for this measurement to be of a high order of accuracy. This is done using an apparatus which generates suitable pulses and accurately measures the time of their transmission (i.e. transit time) through the material tested. The distance which the pulses travel in the material (i.e. the path length) must also be measured to enable the velocity to be determined from:

$v = \frac{s}{t}$

Pulse velocity v = Path length s / Transit time t

Path lengths and transit times should each be measured to an accuracy of about 1% The instrument indicates the time taken for the earliest part of the pulse to reach the receiving transducer measured from the time it leaves the transmitting transducer when these transducers are placed at suitable points on the surface of the material.

3.6 Signal Strength or Attenuation

Beneath the speed also the the strength of the received signal is measured. The reciprocal signal strength the so called attenuation α is depending on the sound frequency ω, the materials density ρ the speed of sound V that we are measuring and the viscosity of the material η.

Stokes' law of sound attenuation:

$\alpha = \frac{2\eta\omega^2}{3\rho V^3}$

The signal strength of the received signal is low at low materials density and high viscosity and high signal frequency. Therefore we are using a relative low ultrasound frequency, see section 3.4.

If you are measuring high viscous or low density materials, it may last some time until the first sound pulses will be detected by the receiver.

3.7 The Accessories of the Vikasonic

The pundit will be delivered with this equipment:

- The Vikasonic
- The wall mount 5V DC power supply.
- Two probes mounted into the Vikasonic test cell.
- Two probe cables

- Two type K thermocouple
- Two USB flash drives for recording the data and containing the PC software for data visualisation.
- Couplant grease (1 liter)
- This user manual

As an option a footswich may be ordered.

3.8 Description

The Vikasonic shows an ultrasonic impulse between a transmission-probe and a receiver-probe. The measurement range is selected automatically, from 0.5μs till 3999.9μs in 0.01μs steps. If no impulse is received or the probes aren't putt against the sample, the display shows —.-. You can calibrate the device in an interval of 0.0 till 500μs on various probes and cables.

For a mains-independent operation 3 standard AA batteries, or Ni/Mh batteries provides the electrical power supply for several hours. If the battery is completely discharged, the device can still be used with the power supply system.

3.9 Measuring Heads and Cables

The probes are made of stainless steel and contain a pieco chip made of zircon and titanium. To ensure good acoustic transmission, the ceramic is fixed to the base. The impulse generator activates the probe to oscillate with its own resonance, which depends on the size and the form of the ceramic and of the probe. This allows probes to be made for the corresponding frequencies. Every probe has a BNC-connector that's why cables with various lengths can be connected to the Vikasonic. Short coaxial cables are provided. Longer cables can be used if longer distances are required. Longer cables reduce the amplitude of the signals and shouldn't be longer than 3 m.

3.10 Front Panel

Jog wheel	press to turn on the instrument, turn to highlight a menu item, press to select an item

3.11 The rear panel connectors

Receiver	BNC connector for the connection with the received probe
Transmitter	BNC connector the connection with the transmitting probe. Don't start the Vikasonic without a transmitter connected!

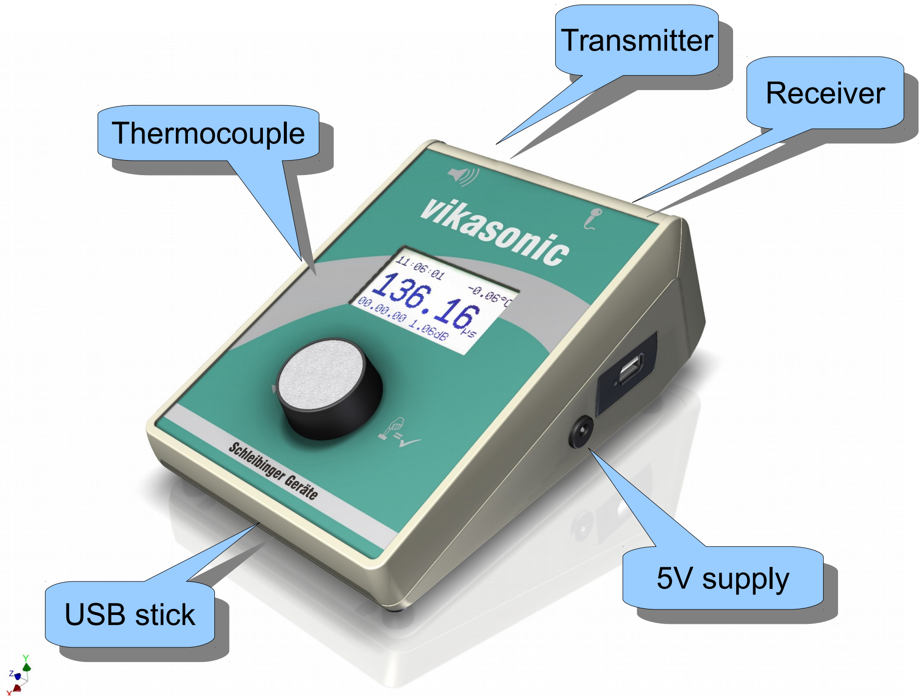

Figure 8: Front panel Vikasonic

3.12 The right side panel connectors

Important for Vikasonics before 2014: Turn the 5V connector 90 degrees to unlock!

5V supply	5V, less then 500mA DC from the plug wall power supply. To unlock pull the gray jacket.
Footswitch (option)	Connect here the vikasonic footswitch. This switch starts recording of one data set to the USB memory. Its a simple push and pull connector. Don't turn it for locking or unlocking.

3.13 The left side panel connectors

Thermocouple	Connect here a type K thermocouple for temperature measurement

3.14 The lower side panel connectors

USB flash drive	Please connect here the Schleibinger Vikasonic USB flash drive delivered with the instrument. Don't connect any other USB device here, no printer, no PC.

3.15 Battery compartment on the bottom

The battery compartment is saved by a small screw. Open this screw, but don't remove it. Then press the splice bar down to open

Figure 9: Opened battery compartment of the Vikasonic

the compartment. Please insert the batteries in the shown direction. Remove the batteries for longer mains operation.

3.16 Mains operation

Connect the device to the mains wall power supply with the cable provided. Switch the device on, by pressing the jog wheel longer then 3 seconds.

3.17 Portable use

If the device isn't connected to the mains supply, it can still run with the 3 AA cells. If they arre fully charged up, a continuous operation of up to several hours is possible.

3.18 Battery Charging

If the device is connected to the mains supply, the batteries will *not* be charged! Please use standard zinc carbon batteries.

3.19 Probes

Pieco ceramic made of zircon and titanium has a low dissipation loss and can resist high voltages for quite a long time. When being transported the vibration can build up a high voltage so be careful when handling the BNC-connectors, before they are connected to the device to avoid electric shocks from the charged probes.

3.20 Zeroing and Calibration

To eliminate the influence of various cables and probes on the measuring result, it is possible to make a nullification of the Vikasonic. See chapter 9.

3.21 Couplant

It is essential in all ultrasonic pulse tests to use some form of couplant between the faces of the transducers and the material under test. Failure to do so will result in a loss of signal due to inadequate acoustic coupling. The ultrasound couplant provided by Schleibinger provides good coupling when used on concrete or other materials having smooth surfaces. Silicone grease, medium bearing grease or liquid soap may also be used to good effect. For rougher surfaces, a thick grease or petroleum jelly is recommended.

3.22 Pulse Repetition Rate / PRF selection

The transducers supplied with the Vikasonic instrument are not damped and, therefore, on being energized by the transmitter pulse generator they have a long ring-down time. The ring-down time may exceed the 0.5 s pulse interval when the pulse repeating frequency is set to values close to 0.5 s. This effect may cause errors when testing short path length specimens having low internal damping.

4 Hardware Installation

4.1 Introduction

The Vikasonic ultrasonic measuring system is delivered with an integrated data logger. This logger records the measuring data autonomously on an USB flash drive. The measuring data can be saved locally for more than 4 weeks. The data will be stored without risk of loss. Please use the USB flash drive supplied by Schleibinger. There is no warranty for proper use with another USB flash drive. The USB flash drive should be formatted in the FAT16 format.

4.2 The installation of the Vikasonic data logger

- The Vikasonic is supplied with a wall power supply. This supply is suitable for 100V-240V ˜, 50..60Hz. Plug the power supply in the Vikasonic on the top on the right hand side with the coaxconnector (voltage 5V =).
- Connect the temperature sensor to the left side of the logger. The connector has two flat pins with different width. You must see the silver label of the connector, then the connector fits right.
- connect the USB flash drive before you switch on the Vikasonic.
- If you don't like to record the measurement values , no USB flash drive is required.

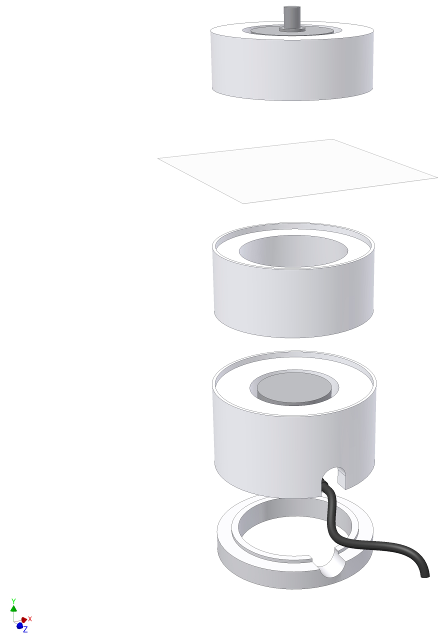

Figure 10: Measurement cell or formwork (Design 2013)

4.3 Connection Vikasonic - Measuring Cell

The ultrasound transducers are connected with the Vikasonic using the BNC cables provided. Both probes are identical and can work as a receiver as well as a sender. We recommend to use the lower transducer as receiver. Don't start the Vikasonic without transducers connected!

In figure: 10) you see the setup of the measurement formwork.

4.4 Connection Vikasonic - Measuring Bath

With the Schleibinger Measuring Bath you may measure the transition time through a rigid probe without the influence of the coupling gel. See figure 12. Hrer water is used as coupling agent. The bath is made of PMMA. On each side there is a 80 kHz US transducer mounted. This transducers are connected with a special 0.5 m BNC cable with the Vikasonic.

At the receiver BNC port an 6 dB attenuation element must be mounted. Sie figure 11.

Please set the voltage here to 200 V and the pulse rate to 1/s.

5 Measurement procedure

Position the measuring cell in an air-conditioned room, if possible. Try to hold the temperature as constant as possible during the measurement. The coefficient of linear expansion of the used plastic of

Figure 11: Connect the Measuring Bath with a 6dB attenuation element to the receiver port.

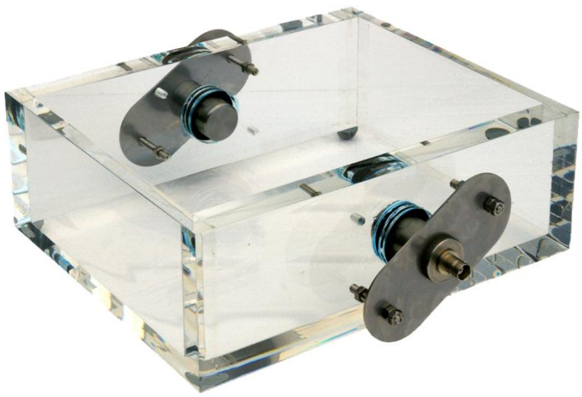

Figure 12: The Schleibinger Ultrasonic Measurmenet bath.

the vicat ring is ca. $110 * 10^{-6}\ K^{-1}$. The coefficient for concrete is ca. $12 * 10^{-6}\ K^{-1}$.

5.1 Filling the formwork

Put the vicat ring on the base of the measuring cell. Then fill up the vicat ring. In case of doubt please use a bit more material so it is guaranteed that if the mortar is shrinking, the upper head stays in direct contact with the material, and no air gap can appear. You can spread grease on the surface of the probes and on the ring as a separating agent. It is also recommended to use a thin kitchen foil as a separating agent.

5.2 Measurement Start

We recommend calibrating the Vikasonic device before measuring samples. This is described in chapter 9.

Now press the option `Start`. Then `Record` if you like to record the data, or `Measuring` if you like to see the measurement data on the screen, without recording it.

5.3 Clearing and care of the system

After measuring samples the test material should be removed. The plastic parts are made of polypropylene, the measuring heads are made of stainless steel. Use suitable purifiers/cleaners for both materials. The measurement with the data logger doesn't have to be stopped. When you start a new measurement the data will be appended to the old measurement file. If you don't like this, please erase the file `\daten\data0.txt` on the USB flash drive on the PC, before you start a new measurement task. deleted.

6 The Software

The Vikasonic has only one button to handle everything. The jog dial can be turned left and right to scroll trough the menu and can be pressed to select an item. To switch the Vikasonic on, simply press the jog wheel more the 3 seconds. The backlight of the display is switched off after some seconds. It will be switched on again if you turn or press the jog wheel.

Then the main menu will appear see figure 13.

The figure 14 shows the structure of the menus. Each number in the picture is a reference to the according chapter in this user manual.

7 Start

There are two measurement modes.

Figure 13: Start Screen

7.1 Record

The Record Mode will first search for a USB flash drive on the USB port. This can last up to 20s. If the USB flash drive is found the Vikasonic will suddenly start the measurement. The measured values are shown on the LC display and stored on the USB flash drive in a file with the name `data0.txt` in the sundirectory `daten`. If there is no file with this file name a new file will be created. If there is already one, the new data will be appended. If the data are recorded a small inverted U is shown in the lower right corner of the screen as in figure 15.

7.1.1 File format

The file format is as followes:

```
28.01.12␣17:10:18 40936.715481 52 6.00 13333.30 159920.01 6.42 22.66
28.01.12␣17:10:33 40936.715655 66 6.00 13333.30 159920.01 6.43 22.65
28.01.12␣17:10:45 40936.715794 79 6.98 11461.30 118198.44 6.45 22.70
28.01.12␣17:11:00 40936.715967 92 6.93 11544.00 119854.44 6.44 22.56
28.01.12␣17:11:12 40936.716106 106 6.07 13179.50 156104.01 6.45 22.46
28.01.12␣17:11:27 40936.716280 119 6.94 11527.30 119439.36 6.48 22.42
28.01.12␣17:11:39 40936.716419 133 6.92 11560.60 120270.24 6.48 22.36
28.01.12␣17:11:54 40936.716592 146 6.90 11594.20 120895.29 6.46 22.32
28.01.12␣17:12:06 40936.716731 159 6.87 11644.80 121940.64 6.48 22.22
28.01.12␣17:12:22 40936.716916 173 6.87 11644.80 121940.64 6.47 22.32
28.01.12␣17:12:34 40936.717055 186 6.95 11510.70 119232.09 6.48 22.27
```

The columns are:

```
␣Date␣and␣Time Exceltime MTime TOF SS EModulus Signal Temperature
```

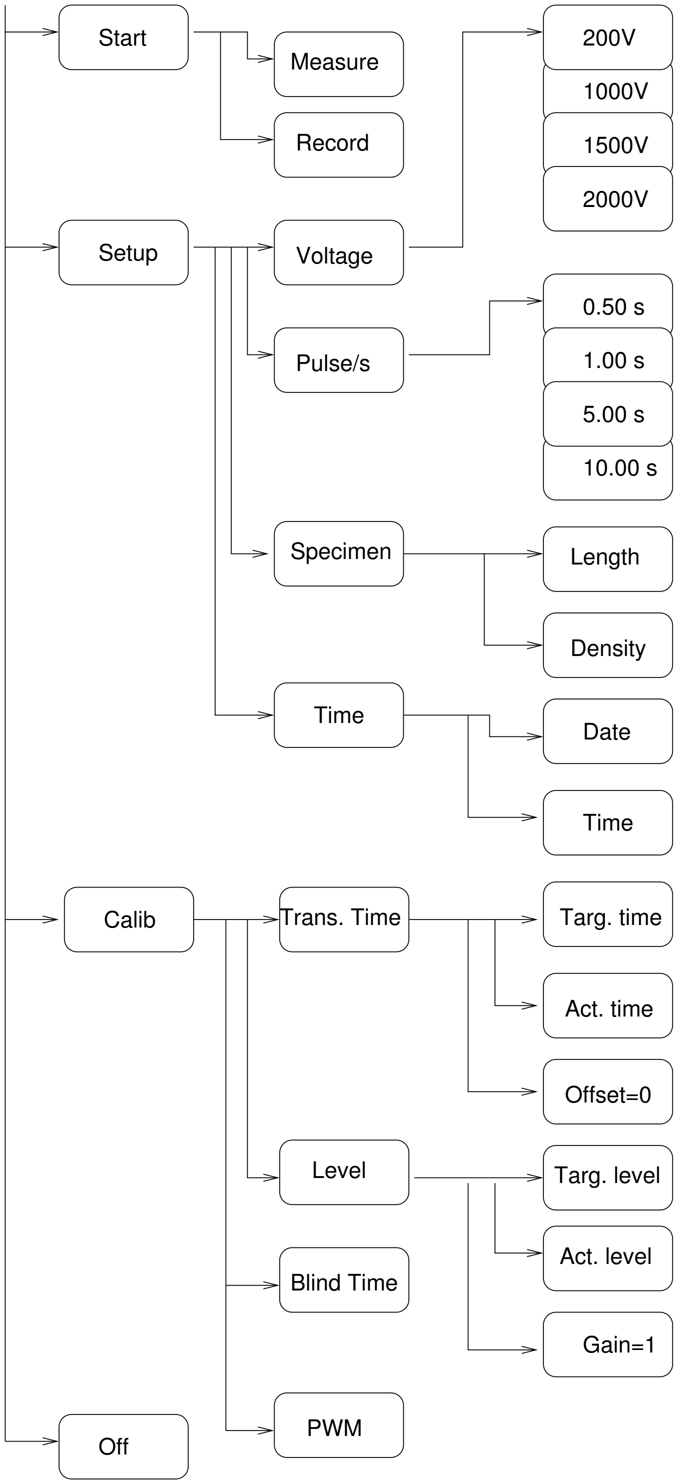

Figure 14: Menu structure

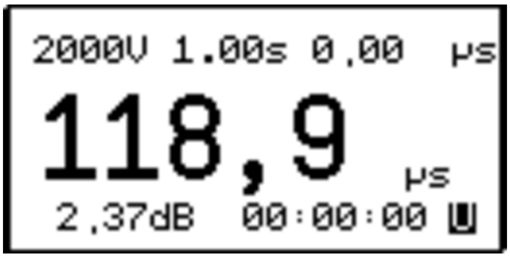

Figure 15: Recording the data to the USB stick. A small inverted symbol U is shown in the lower right corner of the screen

Column	Description
Date and Time	Date and Time in the format day.month.year hour:minute:seconds
Exceltime	Excel is using a special date and time format. The number left of the dot is the number of days since January, 1st 1900. The number right of the dot is the fraction of one day. If you format this number as date and time the right date and time will be shown by MS Excel.
MTime	The number of seconds since you have start the measurement.
TOF	The Time of flight of the ultrasound pulse in in micro seconds.
SS	The speed of sound. Calculated the specimen length (defined at `Setup Specimen Length`) and the time of flight. The unit is meter per second.
EModulus	Lord Rayleigh has shown in the late 19th century that square of the sound speed multiplied by the density of the material is proportional to the materials Young's or tensile modulus. $E_{mod} \sim \rho v_{sound}^2$. The density ρ is put in menu `Setup Specimen Density`
Signal	The strength ($1/attenuation$)of the received pulse in a logarithmic scale
Temperature	Temperature at the thermocouple sensor in degrees Celsius.

7.1.2 Sampling rate

The sampling rate i.e. the interval between two datasets written to the USB file depends on the pulse rate.

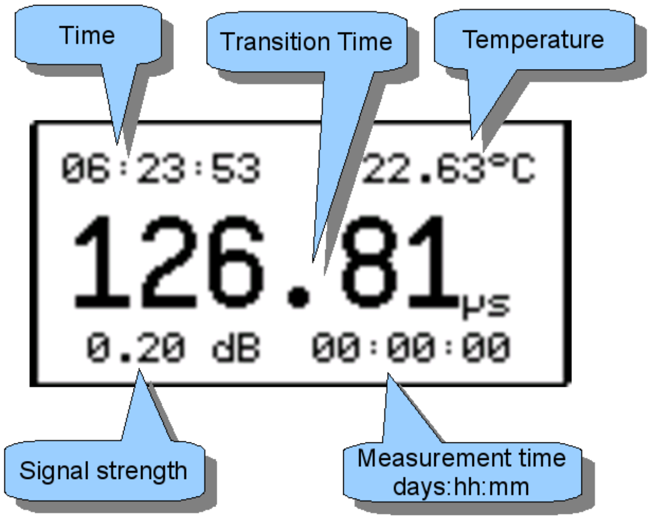

Figure 16: Screen with the measurement values

Pulse Rate	Sampling Rate
0.5 s	20 s
1.00 s	30 s
5.00 s	120 s
10.0 s	300 s

7.1.3 Main Screen

The main screen (figure 16) shows the running period or time delay of the sound pulse in the middle of the screen. In the upper left corner the actual time, in the upper right corner the temperature in degrees Celsius. In the lower left corner logarithmic value of the received signal strength is shown. In the lower right corner you may see the total measurement time since measurement start.

If the USB memeory is detected and working right an inverse U sign is shown in the lower right corner.

If the footswitch is connected instead of the inverse U an inverse T is shown.

The footswitch (option) must be connected before you start the measurement. If the footswitch is pressed one data set is stored on the USB memory and in the display you the message SAVE. There is no automatic sampling pf data when the footswitch is connected. If you disconnect the footswitch you have to restart the measurement again, to return to the normal automatc sampling mode.

The shown measurement values are the moving average of the last 4 actual values. So if the pulse rate is quite low it may last 4 times the pulse rate to see the correct measurement value on the display.

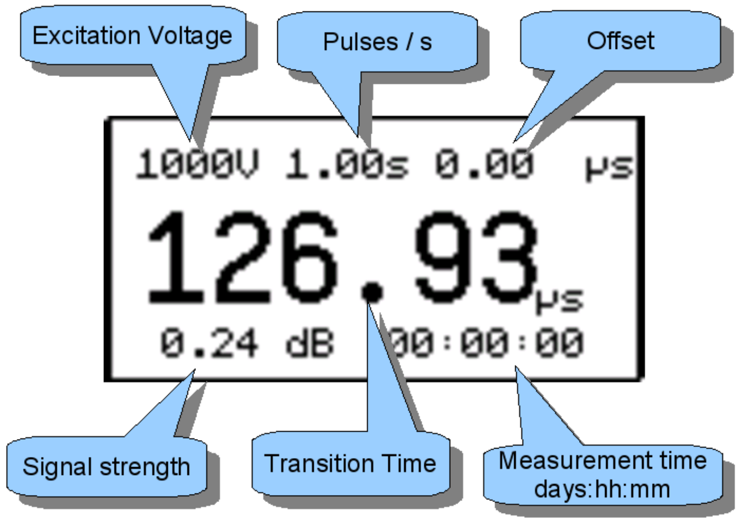

Figure 17: Screen with the measurement values, the setup values are shown in the first line each 50s

Each 50 seconds the values in the upper area are changing for 10s to the actual excitation voltage, the pulse rate and the actual offset. See figure 17

If you turn the jog wheel the main number is alternated from running period to the speed of sound to the tensile modulus and back to the running period etc.

If the measured values are bigger the three digits the units are switched automatically from micro- seconds to Milli - seconds, from meters per second to kilo - meters per second and from Mega - Pascal to Giga - Pascal.

The symbol —.– is shown if no input signal is detected.

7.2 Measure

In this mode NO data are recorded to the USB flash drive. The measurement values are written only on the screen. The total measurement time is not shown in the lower right corner.

8 Setup

For proper operation you may setup some parameters of the Vikasonic. The instrument also must learn some information about the your specimen size and density. Below (figure 18) you may see the setup screen.

8.1 Voltage

The ultrasound is generated with a very short (1 μs) high voltage pulse. As higher the voltage as stronger or louder the sound pulse

Figure 18: Setup Screen

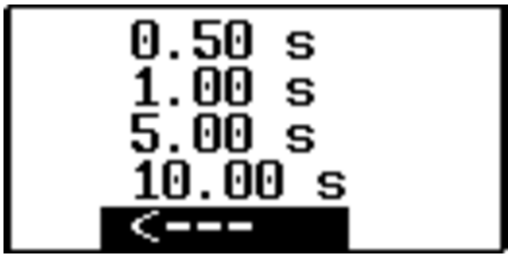

Figure 19: Setup screen for the sampling rate

is. If the pulse is to weak no signal will be detected in the receiving transducer. If the signal is to strong there may be echos in the tested material and the receiver can't detect the time of flight anymore, because echos of the last pulse will overlay the the signal of the actual pulse.

If you are running the Vikasonic from the battery, a stronger signal increase the power consumption and so reduce the batteries lifetime.

We recommend to start tests with 1000 V or 1500 V. The signal strength may be calibrated. Please see chapter 9.4.

8.2 Pulse/s

The Vikasonic generates maximum 2 pulses per second. So two times a second a new measurement value e will be shown. For long time measurements this is not necessary. The slowest repetition period is one pulse each 10 s. The menu is shown in figure 19. Please keep in mind that the sampling or recording period depends on the pulse period. Please see chapter 7.1.2

8.3 Specimen

8.3.1 Length

To calculate the sound speed the distance between sender and transducer must be known. Because the speed is the distance divided by the pulse transition time. You may put in the length here in a range from 0.0 to 500.00 mm (see figure 20). Simply turn the jog wheel until you see the right value on the screen. If you turn the wheel

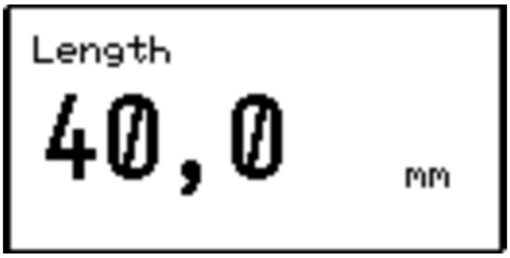

Figure 20: Setup screen for the specimen length.

faster the values willalso change faster. Turn the wheel slower for fine adjustment. Press the wheel to store the value.

8.3.2 Density

Lord John William Strutt Rayleigh, based on the work of Euler, has described in his book "The Theory Of Sound" (London, McMillan and Co. 1877, page 189 ff.) a method to calculate the speed of sound in a rigid material from the tensile or Young's modulus and vice verse. He said

$v^2 = E_{mod}/\rho$

so

$E_{mod} = \rho \frac{L^2}{T_p{}^2}$

So for calculation the the Young's modulus from the pulse transition time T_p, the length L and the density ρ is required.

A small calculation example:

Density:$\rho = 2290 kg/m$

Length:$L = 40mm$

Runtime:$T_p = 13.2\mu s$

$\rightarrow v = \frac{s}{t} = \frac{40.0\,10^{-3}m}{13.2\,10^{-6}s} = 3.030\,10^3[\frac{m}{s}] = 3030[\frac{m}{s}]$

$E_{mod} = \rho v \rightarrow E_{mod} = 2290\,(3030)^2[\frac{mkg}{m^3 s^2}] = 24.94\,10^9[\frac{kg}{ms^2}]$

$= 24.94\,10^9[\frac{kgm}{m^2 s^2}] = 24.94[G\frac{N}{m^2}] = 24.94[GPa]$

Choose the density by turning the jog wheel and select it by pressing the wheel. All values are stored permanently, also if the Vikasonic is off.

There is a more elaborated formula defined for example in the ASTM C592

$E_{mod} = \frac{v^2 \rho (1+\mu)(1-2\mu)}{(1-\mu)}$

where μ is the dynamic Poisson's ratio. For concrete is μ about 0.2 so.

$E_{mod} = 0.9 v^2 \rho$

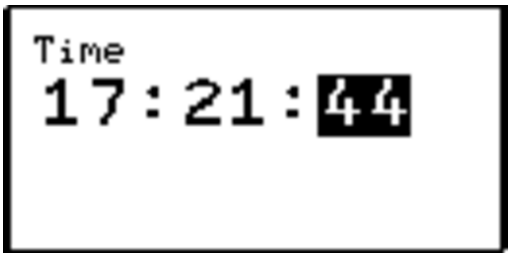

Figure 21: Setup time

So the value calculated in the Vikasonic is about 10% higher then the Young's modulus, calculated with the formula according the ASTM C592.

8.4 Time

The Vikasonic has a built in real time clock. You may adjust it here.

8.4.1 Date

The date format is day:month:year

8.4.2 Time

The time format is hour:minute:seconds. The time format is the continental format withe the range of hours from 0..23. See figure 21

9 Calib

Calibratio is normally done by Schleibinger. Please call us before you may change any settings in this part of the menu.

Calibration or adjusting the instrument to a calibrated reference. Such a reference is a rigid with a well know ultrasonic transition time delivered by Schleibinger. The calibration value is labelled on the reference. For calibration with the calibration bar we recommend a excitation voltage of 200V.

Select the `Calib` menu item in the main menu. The menu is shown in figure 22.

9.1 Trans.Time

9.1.1 Targ. Timel

Select in the next menu the item `Targ. time.` = Target Time.

Using the jog wheel adjust the displayed value to that of the calibrated reference bar. When the required value is obtained, press the jog wheel a second time to store the new reference values

Figure 22: Calibration menu.

Figure 23: Measuring the actual runtime, compared to the target time which is shown in the lower right corner of this screen (here 0 us)

9.1.2 Act. Time

No use the jog wheel to move the cursors next to the `Act. time` (Actual Value) option. Press the jog wheel a second time, the instrument will start and measured values will appear on the display.

Press the jog wheel again. Now the actual value is stored.

If you start now the measurement the difference of the target time and the actual time, the so called offset is subtracted from the measured value. This offset is shown for 10s each minute in the upper right corner of the display during the standard measurement task. See figure 23.

9.1.3 Offset=0

To erase any offset select the `Offset=0` option in the `Calib` menu.

9.2 Level

The Vikasonic is not only recording the signal runtime but also the strength of the received signal in deziBel. This is a logarithmic unit.

9.2.1 Targ. level

Select in the next menu the item `Targ. level`. = Target Signal Level.

Using the jog wheel adjust the displayed value to that of the calibrated reference bar. When the required value is obtained, press the jog wheel a second time to store the new reference values See figure 24.

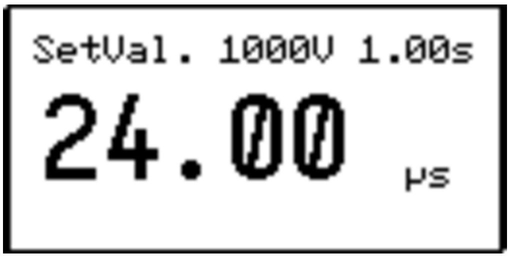

Figure 24: Setup the set value

9.2.2 Act. level

No use the jog wheel to move the cursors next to the `Act. level` (Actual Signal Level) option. Press the jog wheel a second time, the instrument will start and measured values will appear on the display.

Press the jog wheel again. Now the actual value is stored.

If you start now the measurement the difference of the target level and the actual level, the so called level offset is subtracted from the measured value. This offset is shown for 10s each minute in the upper right corner of the display during the standard measurement task.

9.2.3 Offset=0

To erase any level offset select the `Offset=0` option in the `Calib` menu.

9.3 Blind Time

The vikasonic is measuring the time from the transmitting pulse to detection of a pulse at the receiver. The pulse sent may have an amplitude up to 2000V the receiving pulse is often less then 2 mV so 1 Million smaller then the excitation pulse. It may happen that an electrical echo from the transmission pulse or a so called acoustic shortcut will trigger the receiving electronic to early. To avoid this you may define a minimum time or blind time when the receiving electronic will not be triggered. We recommend to set this time to 10 μs. If you have very small samples you may reduce this value.

9.4 PWM

This setting is normally done by Schleibinger. Please call us before you may change this values. Hre you may calibrate the excitation signal pulse voltage. For each target voltage which you may selct in the Setup Voltage menu (see section 8.1) you can claibrate here the pulse with factor or duty cycle of the high voltage generator of the Vicasonic. As higher the pwm factor is as higher is the signal voltage. Please select first the required target voltage level, as described in chapter 8.1. The select this menu point. With the jog wheel you

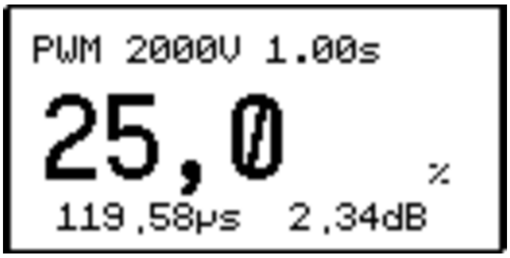

Figure 25: Calibration of the Excitation voltage. In the upper line the actual voltage, sampling rate and offset is shown, In the middle you see the actual PWM duty cycle in percent. In the lower line the actual US runtime and the receiving signal strength is shown.

may tune the duty cycle between 2% and 29%. In the lower part of the screen you may see the the US runtime in μs on the left side and the signal strength in dB on the right side. We recommend to place the transducers in a distance of 40 mm against each other with air as measurement medium. See the according screen shot in figure 25.

10 Off

Select this item in the main menu to switch the Vikasonic off. The system says goodby... and will be swiched off.

11 Showing and transferring the data to your PC

As described in section 7.1.1 the measured data's are stored in a file `data0.txt` ind the subdirectory `daten`. You may open this file directly with MS Excel or OpenOffice Calc or similar programs.

11.1 Software Requirements

On the Schleibinger USB flash drive delivered with the Vikasonic there is a small software installed for a graphical plot of the measurement data. Its not necessary to install a special software on your PC. The only requirement is a Web Browser software like The Firefox, MS Internetexplorer (version 9 or higher), Opera (version 11 or higher) or Google Chrome.

11.2 Starting the Software

Insert the USB flash drive in your PC and double click on the file index.htm in the root directory. The browser will be opened and you may see the screen shown in figure 26.

By pressing the flag symbol you may select the language of the software.

On the left side you will see a small menu.

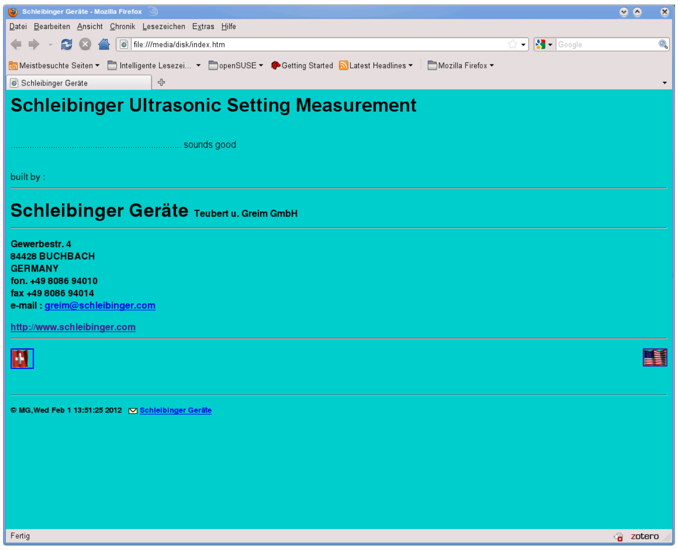

Figure 26: Start Screen

11.2.1 Data Text

With this item you can view the data file in your browser. With the cut and paste function of your browser you may transfer the data to any other software. Figure 27 show this.

11.3 Graphic Plot Data

You can view the measured values graphically as shown in figure 28.

The software is using the new features offered by HTML5 Therefore you need a new browser software version like the Internet Explorer 9+, Firefox 2.x+, Safari 3.0+, Opera 9.5+ or Konqueror 4.x+. The software tool we are using is called FLOT and is running under the open MIT license.

11.4 Channel Selection

In the upper area you may see check boxes where you may select the channels that should be shown. The color of the curves are the same then the background color of the channel names.

After selecting the required channels, you have to click on the icon with the two green arrows to reload and draw the data.

11.5 Zooming the Y-axis

The FLOT software is trying to find an optimal y-range for the data. You can select the range by putting in valid numbers in the min: and max: input fields.

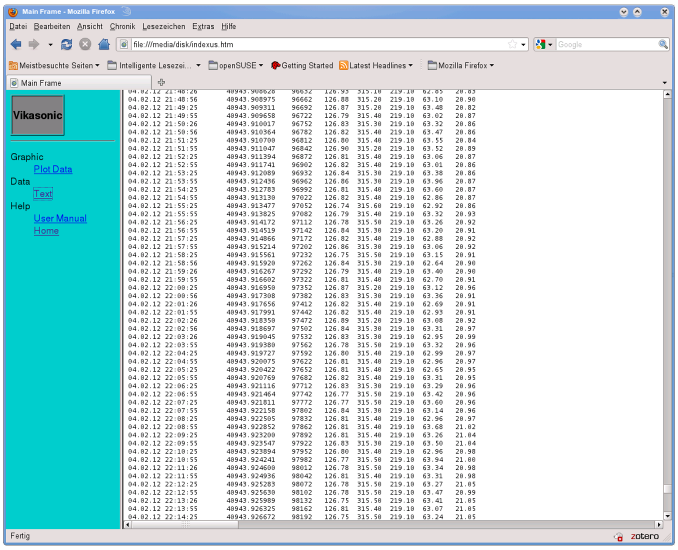

Figure 27: Measurement Values in the browser

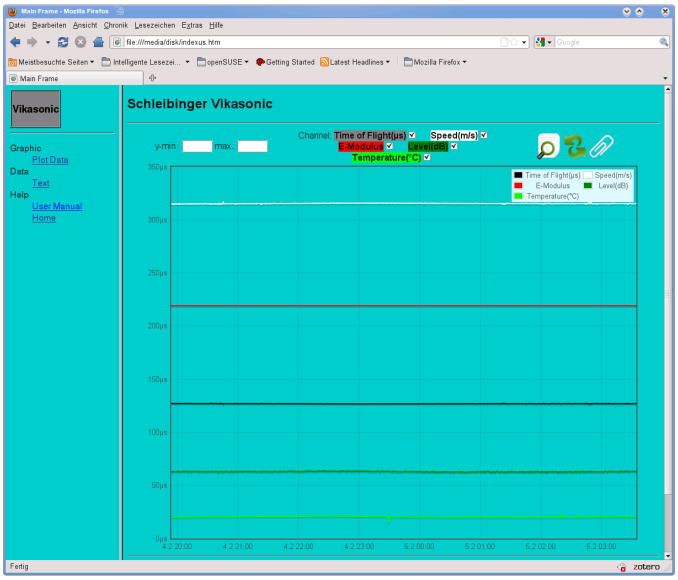

Figure 28: A graphical plot of the measurement data

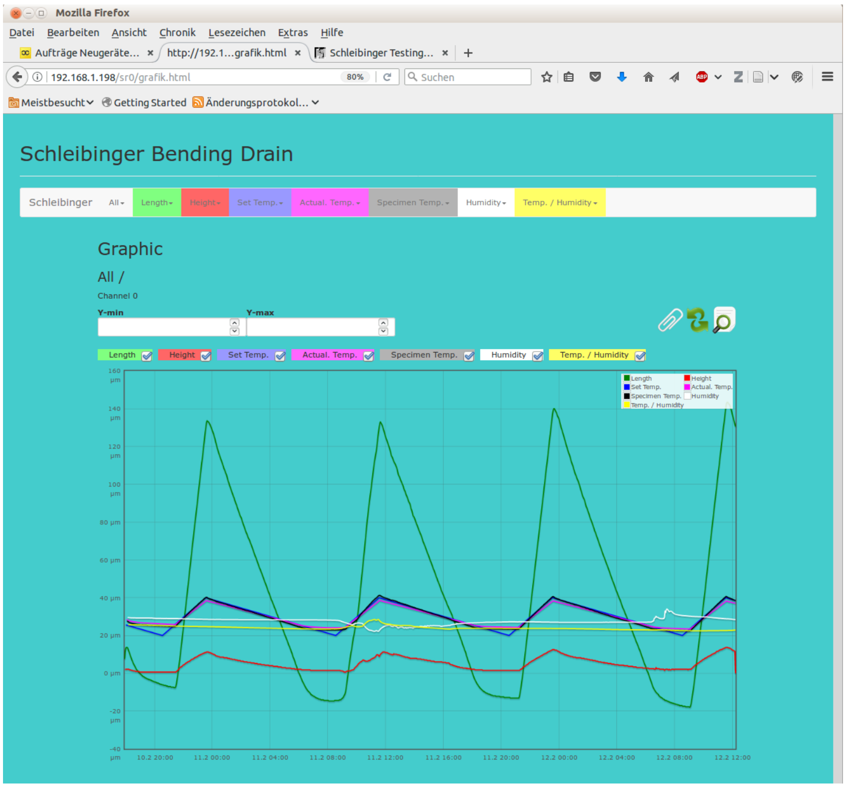

Figure 29: plotting a measurement curve in the Internet-Browser

11.6 Zooming the Time Axis

Please press the left mouse button and move the mouse over the region of interest in the time range. The background will change to light yellow. If you If release the mouse button again the plot will be refreshed. If you click on the magnifyer icon the whole time range will be shown again.

11.7 Insert a Legend

Clicking on the paper-clip icon will open an input field for a text legend, shown in the graph.

11.8 Printing the Graph

Firefox: please use the print function of the browser. Select actual frame in the in the printing options dialog of the browser to print the graph without the menus around.

List of Figures