

# RPCommander

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# 1 Introduction

The program "RPCommander" is the PC software for the RP-30 radar device manufactured by the company Sommer GmbH to perform measurements of the surface velocity profile to determine the discharge.

The following application can be performed:

- Performing of Profiler measurements and the determination of the discharge with RP-30 radar devices
- Entering cross section profiles to determine areas and k-factors
- Parametrization of RP-30 radar devices
- Terminal to parametrize RP-30 radar devices by menus
- Recording and displaying of radar spectra

## 2 Basic Principles

The procedure of the velocity profile method determines the discharge from a profile of the surface flow velocities. The flow velocities at the water surface are measured with the contact free radar device RP-30 at defined positions along the cross section of channels. Every position corresponds to a sector of the cross section for which the discharge is individually calculated. The total discharge is the sum of the partial discharges of the sectors.

### 2.1 Device RP-30

The RP-30 is a contact free measurement device for surface velocities and is based on the principle of frequency shifts due to the Doppler-effect.

The velocity sensor is oriented in a specific angle to the water surface, whereby the vertical angle is internally measured and accounted for.

During a measurement a signal with a constant frequency of 24 GHz sent. The signal is partly reflected at the water surface and is shifted in frequency due to the Doppler-effect. The reflected signal is received and recorded. With digital signal analysis and filtering the surface velocity is determined. The measured velocity is related to the measurement area the radar device is pointed to.

A necessary precondition for the measurements is that small roughnesses or waves are present at the water surface. Only then the signal is reflected back to the sensors and the velocity can be determined. The minimal height of the waves is about 3 mm but higher waves increase the quality of the measurement.

### 2.2 Base equation

The base of the discharge calculation is the general equation for discharge measurements:

$$(1) \quad Q = A \cdot v_m$$

Q = discharge [m<sup>3</sup>/s]

A = cross section area [m<sup>2</sup>]

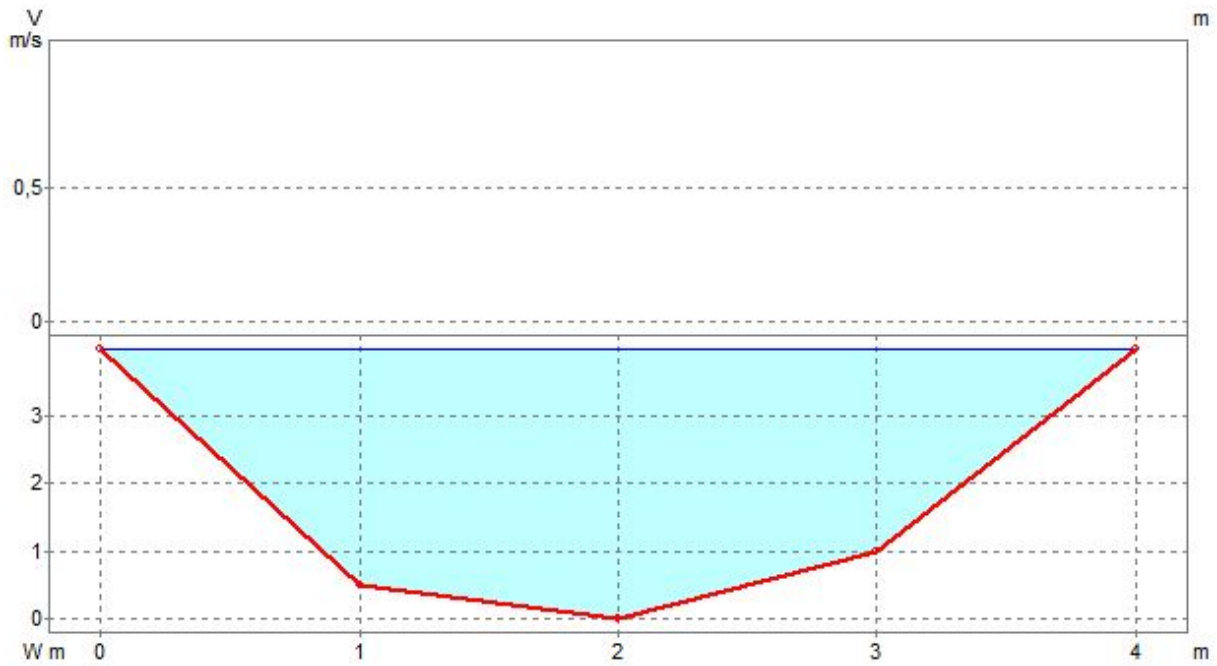
v<sub>m</sub> = mean flow velocity [m/s]

### 2.3 Cross section

#### Cross section profile

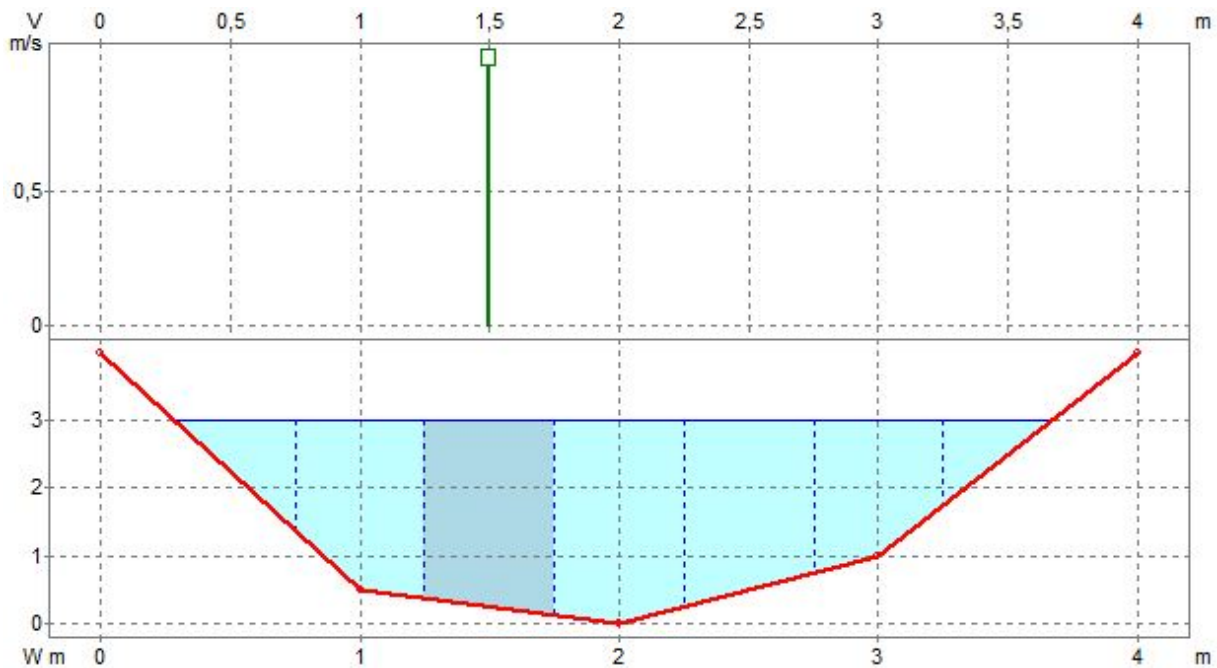
The precondition for the determination of the discharge is the cross section profile. Either the cross section is known due to topographical survey or it has to be determined in advance. This can be performed with staging in different verticals or by measurements with an ADCP boat.

The cross section profile is entered prior to the measurement in the [profile mode](#).



**Sectors and positions**

Before the measurement the cross section is divided in different sectors. The individual sectors are defined by a position, where the measurement of the surface velocity is performed. The margins of the sectors to each other are set to the middle to the adjoining positions.



In the figure a sector is marked which is defined by the position 1.5 m. The margins of the sector are 1.25 and 1.75 m.

**2.4 Discharge Calculation**

The discharge is determined for every sector individually.

$$(2) \quad Q_i = A_i \cdot v_{m,i}$$

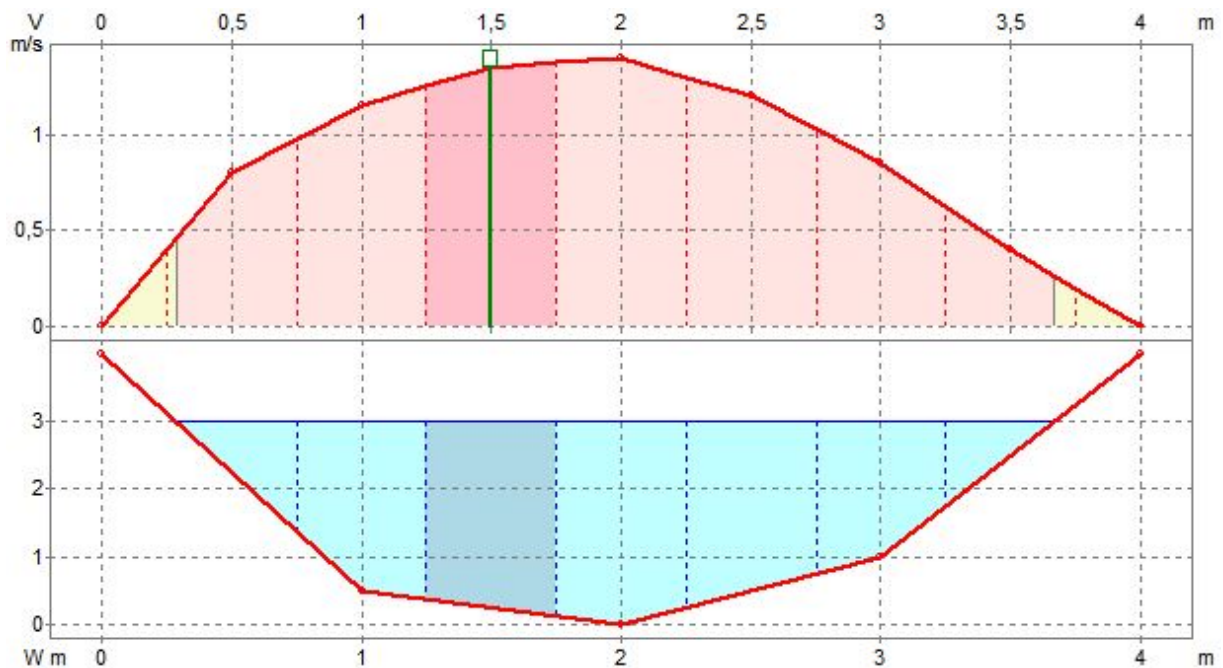
- $Q_i$  = discharge of sectors  $i$  [ $\text{m}^3/\text{s}$ ]  
 $A_i$  = cross section area of the sector  $i$  [ $\text{m}^2$ ]  
 $v_{m,i}$  = mean flow velocity of sector  $i$  [ $\text{m}/\text{s}$ ]

### Cross section area

The cross section area of a sector is determined from the cross section and the water level. In the example the cross section area is  $1.375 \text{ m}^2$  for a water level of  $3 \text{ m}$ .

### Flow velocity

In the next step at every position a flow velocity measurement is performed and so the velocity profile is determined.



### k-factor

In the sectors the flow velocity at the water surface is measured. This velocity is not the mean velocity. Therefore a correction factor has to be implemented to calculate the surface velocity into the mean velocity.

$$(3) \quad v_m = k \cdot v_l$$

- $k$  = k-factor, dimensionless correction factor  
 $v_m$  = mean flow velocity [ $\text{m}/\text{s}$ ]  
 $v_l$  = local flow velocity at the water surface [ $\text{m}/\text{s}$ ]

The k-factor is either in fix percent value (i.e. 85 %) or it is modeled from the cross section profile.

### Calculation

The calculation of the partial discharge with k-factor is determines from equations (2) and (3):

$$(4) \quad Q_i = A_i \cdot k_i \cdot v_{l,i}$$

- $Q_i$  = discharge of sectors  $i$  [ $\text{m}^3/\text{s}$ ]



- $A_i$  = cross section area of sector i [m<sup>2</sup>]  
 $k_i$  = k-factor of sectors i  
 $v_{l,i}$  = local velocity at the water surface of sector i [m/s]

In the example the cross section area of 1.375 m<sup>2</sup> the k-factor of 85 % and the velocity of 1.35 m/s result in a discharge for the sector of 1.578 m<sup>3</sup>/s.

### Total discharge

The total discharge is the sum of the partial discharges of the individual sectors.

$$(5) \quad Q = \sum Q_i$$

- $Q$  = discharge [m<sup>3</sup>/s]  
 $Q_i$  = discharge of the individual sectors i [m<sup>3</sup>/s]

## 2.5 Modeling of the k-factor

The k-factor is a dimensionless correction factor to calculate the mean velocity from the measured surface velocity. Usually the k-factor is in the range of 70 to 90 % but can deviate strongly due to geometrical influences.

The modeling of the k-factor is performed for each sector individually.

### Determination of the mean velocity

The mean velocity is determined theoretically using the flow formula by Darcy-Weisbach. The necessary geometrical information and the roughnesses are extracted from the cross section [profile](#) in combination with the water level.

### Determination of the surface velocity

The velocity at the water surface is calculated using the logarithmic law for the velocity distribution and the mean velocity.

### Calculation of the k-factor

The k-factor is calculated from the two determined velocities using equation (3).

$$(6) \quad k = v_m / v_l$$

- $k$  = k-factor  
 $v_m$  = mean velocity [m/s]  
 $v_l$  = local flow velocity at the water surface [m/s]

## 3 Start-up of the RP-30

During the start-up of the RP-30 the following steps have to be performed:

- [Switch-on the RP-30](#)

The RP-30 has to be switched-on.

- [Establish Bluetooth connection to the RP-30](#)

The Bluetooth connection to the RP-30 has to be established.

- [Load schema from the RP-30](#)

When connection to a RP-30 for the first time the schema of the menu structure has to be transferred from the device to the PC or laptop.

### 3.1 Switching-on of the RP-30

The RP-30 has to be switched on for communication with the button at the bottom of the device. After switch-on the Bluetooth connection of the RP-30 is active for 15 minutes. Every communication with the RP-30 resets this time range.

### 3.2 Connecting with the RP-30

The communication with a RP-30 is via Bluetooth. In the menu "Connection" functions to support the establishing of the Bluetooth connection are available.

- **Check Bluetooth**

With the menu item "Check Bluetooth" a check is performed, if a Bluetooth connection is possible with the PC or laptop. This demands that either a Bluetooth adapter is connected or an internal Bluetooth device is activated. After the check information about the used device and Bluetooth stack are displayed. The RPCommander only supports searching for and installing Bluetooth devices, if the Microsoft-Bluetooth-Stack is used. Only then the menu item "Search RP-30" and the button "RP-30" in the window "Connection" are activated.

- **Search and installation of RP-30**

If the Microsoft-Bluetooth-Stack is used, the menu item "Search RP-30" or the button "RP-30" in the window "Connection" searches for new or already known RP-30 devices. First all detectable Bluetooth devices are searched. Then they are checked, if they are RP-30. A new RP-30 is automatically installed as Bluetooth device and is assigned to a COM port. This COM port is reserved for the specific RP-30. Known RP-30 are already installed as Bluetooth devices and are therefore assigned to specific COM ports.

The searching for RP-30 may take a few minutes. During the installation as Bluetooth device additional information is shown in the task bar. By selecting a RP-30 and confirming the selection, the COM port is set and the connection to the RP-30 is possible.

If an alternative Bluetooth-Stack is used, the RP-30 has to be installed manually and the corresponding COM port has to be selected.

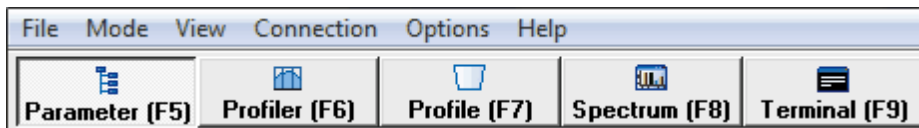
### 3.3 Loading the schema from the RP-30

When first connecting to a RP-30 or when connecting to a RP-30 with an unknown software version, the schema of the menu structure of the RP-30 has to be transferred. This is done with the button "Load Parameter" in Parameter Mode or is performed automatically during the first measurement. the transfer of

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the schema may take some time and should therefore be performed prior to the first measurement.

## 4 Main



The program has different modes. Modes can be switched with the main bar, the menu "[Mode](#)" or the short-cuts "F5" to "F9".

-  [Parameter](#)

In parameter mode RP-30 radar devices can be parametrized.

-  [Profiler](#)

In Profiler mode measurements of the surface velocity profile with the RP-30 are performed.

-  [Profile](#)

The profile mode supports you to enter cross section profiles of river and channels.

-  [Spectrum](#)

In spectrum mode radar spectra are displayed and recorded.

-  [Terminal](#)

In the terminal mode radar devices are parametrized by menus.

### 4.1 Main menu

The sub menus depend on the selected program mode.

- [Menu File](#)

Functions to open files, save files and print reports are provided.

- [Menu Mode](#)

The program mode can be switched.

- [Menu View](#)

The windows of the main page can be shown or hidden.

- [Menu Commands](#)

Commands to perform Profiler measurements are displayed.

- [Menu Connection](#)

Functions to check and select connections can be performed.

- [Menu Options](#)

The global program settings are opened.

- [Menu Help](#)

The help file or an information dialog is opened.

#### 4.1.1 Menu File

New	Strg+N
Open Profile	Strg+O
Save Profile	Strg+S
Print	Strg+P
Exit	Strg+X

The appearance of the menu "File" depends on the selected mode.

- **New...**

Open objects are closed and opened empty.

- **Open...**

A specified object is loaded from a file.

- **Save...**

The open object is saved to a file.

- **Print**

A report of the specified object is printed.

- **Exit**

The program is closed.

#### 4.1.2 Menu Mode

	Parameter	F5
<input checked="" type="radio"/>	Profiler	F6
	Profile	F7
	Spectrum	F8
	Terminal	F9

The program mode can be changed:

- [Parameter](#)

In "Parameter mode" RP-30 radar devices can be parametrized.

- [Profiler](#)

In "Profiler mode" measurements of the surface velocity profile with the RP-30 are performed.

- [Profile](#)

The "Profile mode" supports you to enter and edit cross section profiles of river and channels.

- [Spectrum](#)

In "Spectrum mode" radar spectra are displayed and recorded.

- [Terminal](#)

In the "Terminal mode" radar devices are parametrized by menus.

### 4.1.3 Menu View

	All	Strg+A
<input checked="" type="checkbox"/>	Sensor Parameters	
<input checked="" type="checkbox"/>	Sensor Parameters Information	
<input checked="" type="checkbox"/>	Sensor Parameters Jobs	
<input checked="" type="checkbox"/>	Connection	
<input checked="" type="checkbox"/>	Terminal	

The different windows depending on the program mode are listed and can be individually shown or hidden.

- **All**

All windows depending on the program mode are shown.

### 4.1.4 Menu Commands

Start Measurement	F4
Position Forward	F2
Position Back	Umsch+F2
Velocity Forward	F3
Velocity Back	Umsch+F3
Add Measurement	

The menu "Commands" lists the commands for Profiler measurements in the "Profiler Mode".

- **Start Measurement**

The measurement procedure of the velocity at the selected position and for the selected velocity is started.

- **Position Forward**

The next position is selected.

- **Position Back**

The previous position is selected.

- **Velocity Forward**

The next velocity is selected.

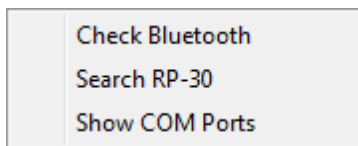
- **Velocity Back**

The previous velocity is selected.

- **Add Measurement**

A new measurement is added to the Profiler measurement. So for example an additional measurement with reversed position order can be performed.

#### 4.1.5 Menu Connection



In the menu "Connection" functions to check and select connections can be performed.

- **Check Bluetooth**

The function checks, if Bluetooth connections are possible, and shows information to the active Bluetooth device.

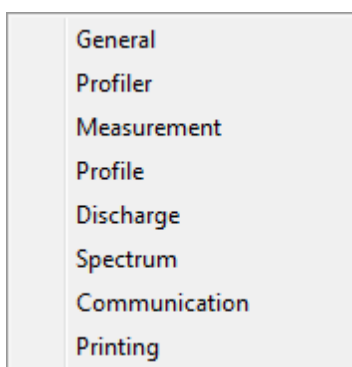
- **Search RP-30**

The function searches for known and new RP-30 and is described in the "[Dialog RP-30](#)" in detail.

- **Show COM Ports**

All available COM ports are displayed and can be selected. Known Bluetooth devices (as RP-30) are displayed, but new ones cannot be connected.

#### 4.1.6 Menu Options



The single windows of the dialog "Options" are opened.

- [General](#)

A window to change the language and font size of the program is opened.

- [Profiler](#)

Settings to Profiler measurements and their display are opened.

- [Measurement](#)

Settings to perform measurements with RP-30 radar devices are opened.

- [Profile](#)

The unit and settings for the display of profiles are opened in a dialog.

- [Discharge](#)

The units of the discharge, area and velocity are set and the type of roughness is selected.

- [Spectrum](#)

Settings for the display of spectra are opened in a dialog.

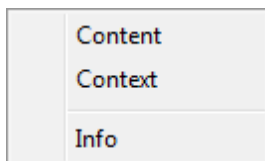
- [Communication](#)

Settings for the communication for the parametrization of sensors are opened.

- [Printing](#)

The printer settings are opened in a dialog.

#### 4.1.7 Menu Help



- **Context**

The help file is opened.

- **Content**

The index dialog of the help file is opened.

- **Info**

A window with program information is opened.



## 5 Parameter Mode

The "Parameter Mode" supports the parametrization of RP-30 radar devices. Parameter can be transferred from radar devices, saved in files and sent to sensors.

The program generates a local copy of the menu structure of the device. Thereby parameter and schema are distinguished:

- **Parameter**

Parameters are the actual numbers, texts or selections of the single menu items.

- **Schema**

The schema is the complete menu structure with all the information to the menu items. This includes the labeling, unit, format but also the command. Every device has its own schema depending on the device type, the version and the configuration.

Therefore the schema of a device has always to be known. An unknown schema is automatically transferred from the device on the first command and is saved. Now the schema is known and does not have to be transferred in the future.

### 5.1 Main window Parameter

Following windows are arranged in the main window:

- [Sensor Parameter](#)

In this window the parameter are displayed in a menu structure that is exactly the structure of the sensor menu. Parameter can be edited and jobs can be performed.

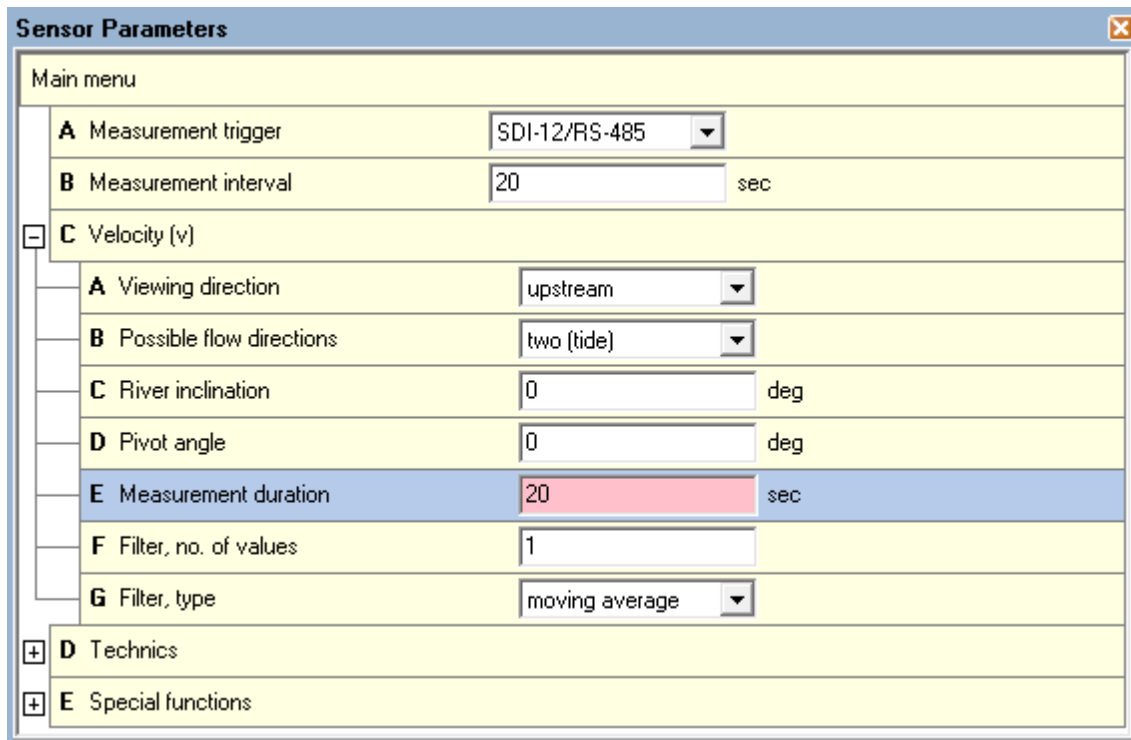
- [Sensor Parameter Information](#)

Information of the active parameter set and the schema is listed.

- [Sensor Parameter Jobs](#)

The buttons allow to perform different actions that either communicate with a radar sensor or save or load parameter sets.

## 5.2 Sensor Parameter



In the menu structure all parameters of the sensor are listed equivalent to the sensor menu. Single values can be edited. Changes are marked red. With the buttons different actions can be performed.

## 5.3 Parameter Information

Sensor Parameters Information		
Filename		
Description		
	Local	Remote
<b>Device</b>	RP-30	RP-30
<b>Setup Version</b>	2.07.02	2.07.02
<b>Software Version</b>	1.70.96	1.70.96
<b>Serial Number</b>	27130509	27130509
<b>Error Code</b>	0000	?

Information to the loaded parameter and schema are listed.

- **Filename**

The file name of the loaded file is displayed without its file path.

- **Description**

A description of the parameter set can be entered.

- **Local**

In the column information of the local parameter is displayed.

- **Remote**

In the column information of the remote sensor is displayed.

- **Device**

The type of the devices of the local parameter and the remote sensor are displayed.

- **Setup Version**

The version of the setup is shown.

- **Software Version**

The software version (firmware) is displayed.

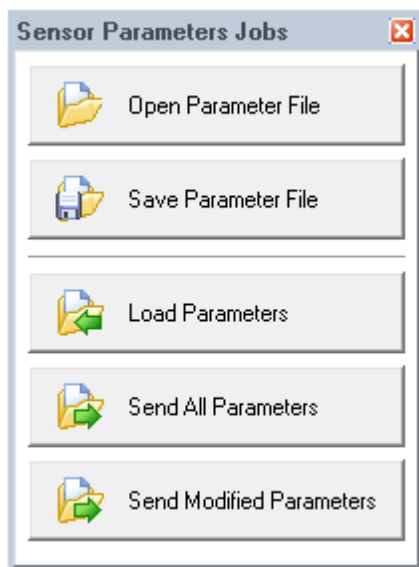
- **Serial Number**

The serial number of the sensor is shown.

- **Error Code**

An error code of the active parameters is listed. The button "?" opens information about the errors.

## 5.4 Parameter Jobs



The buttons allow to perform different actions.

- **Open Parameter File**

Parameters are loaded from a file.

- **Save Parameter File**

All parameter are saved in a file.

- **Load Parameter**

All parameter are loaded from a radar device.

- **Send All Parameter**

All parameters are sent to the radar device. Calibration information can be overwritten.

- **Send Modified Parameter**

All modified parameters marked with red are sent to the radar device.

### 5.4.1 Error Messages

Error messages that can occur during parameter jobs are described and solutions are suggested.

**-11 The sensor has an unknown version.**

No schema is present for the version information of the connected sensor or the loaded parameters. The schema is automatically transferred and saved with "Load Parameter" and is therefore available for the future.

**-12 The port could not be opened.**

The selected COM port (interface) cannot be opened. Check if the COM port is available in the device-manager and select eventually an available COM port.

**-13 The sensor does not answer.**

The COM port (interface) was opened but no connected sensor could be found. Make sure a sensor is connected and its power supply is provided. Otherwise the baud rate or another connection parameter of sensor and program could not be consistent.

**-14 The command is not valid.**

A command could not be interpreted by the sensor. Have differing sensors been connected without reloading the schema?

**-15 Protocol Error from sensor.**

The protocol address consisting out of complex key and device number is not correct. An error could have occurred during changing these parameters.

**-16 No modified parameters available.**

The message occurs during the command "Send Modified Parameter", if no parameters were changed and so no command has to be transmitted.

**-17 Protocol Message from sensor:**

The displayed error message was send by the sensor.

**-18 Timeout of the complete answer exceeded.**

Every single job has a time-out. Special jobs as loading lists may have a long duration especially for low baud rates and bad connections. If a timeout of a single command was exceeded the message is shown.

## 6 Profiler Mode

In "Profiler mode" measurements of the surface velocity profile with the RP-30 manufactured by Sommer GmbH are performed.

### 6.1 Main window Profiler

Following windows are arranged in the main window:

- [Profiler Graph](#)

In this window the Profiler measurements and its profile are displayed.

- [Profiler List](#)

An overview page and the pages for the individual measurements are displayed.

- [Information](#)

Information to the Profiler measurement is displayed.

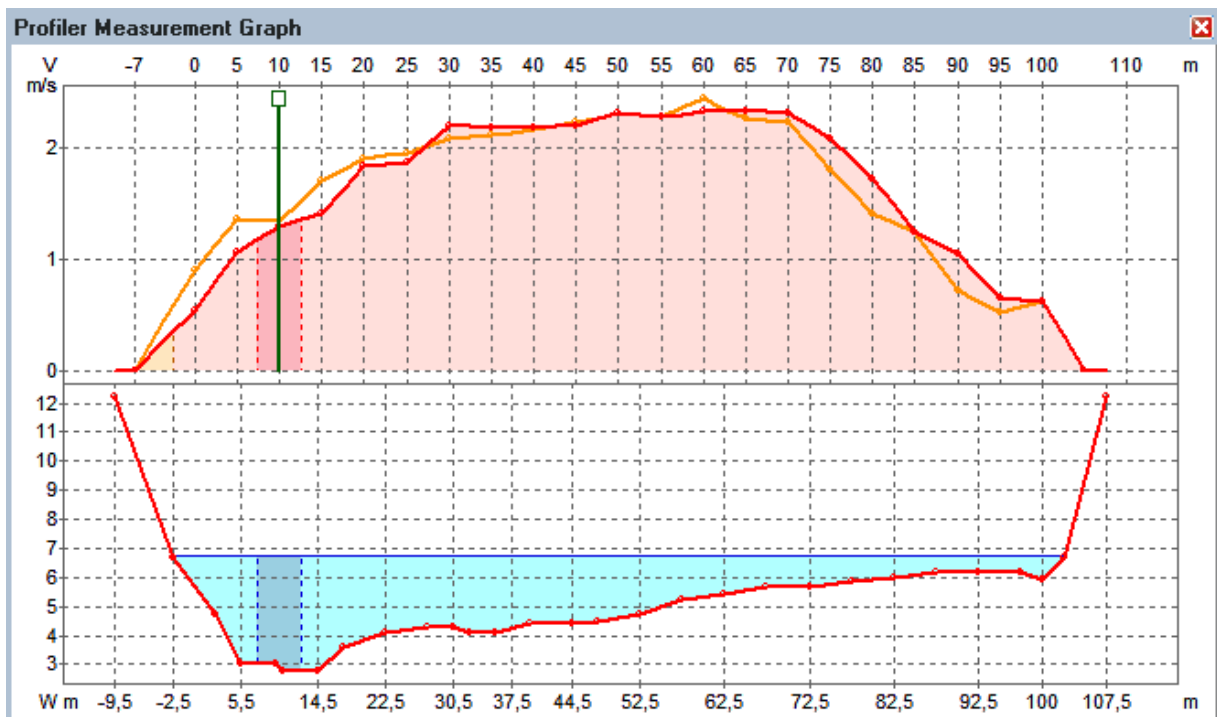
- [Measurement Information](#)

Information to the selected measurement is displayed.

- [Commands](#)

The commands to perform Profiler measurements are provided in buttons.

### 6.2 Profiler Graph



In the upper part of the graphic the measurements of the velocity profile are displayed. In the lower part the profile is shown.

### 6.3 Profiler List

In the Profiler List an overview page and pages to the single measurements are displayed.

- [Overview](#)

The overview page is displayed.

- [Measurement](#)

The ranges and values of the single measurements are displayed.

By clicking the right mouse button in the tab region the menu "[Profiler List](#)" is opened to add and delete measurements.

#### 6.3.1 Profiler List Overview

Measurement	Discharge [m³/s]	Area [m²]	Start	Level [m]	End	Level [m]
1	118,2	52,3	13:08:55	2,96	13:17:10	2,96
2	120,3	52,3	13:18:46	2,96	13:26:06	2,96
Mean	<b>119,3</b>					
Std. Dev.	1,5					
COV [%]	1,2					

An overview about the single measurements is displayed. The mean value of the discharge is calculated from the measurements.

#### 6.3.2 Profiler List Measurement

No.	Act.	Position [m]	Vel. [m/s]	Level [m]	Area [m²]	k-Factor [%]	Discharge [m³/s]
1	<input type="checkbox"/>	-7	0	6,75	0,0	100,0	0,0
2	<input checked="" type="checkbox"/>	0	0,54	6,75	1,4	93,1	0,7
3	<input checked="" type="checkbox"/>	5	1,06	6,75	10,8	83,9	9,6
4	<input checked="" type="checkbox"/>	10	1,3	6,75	18,7	85,2	20,7
5	<input checked="" type="checkbox"/>	15	1,41	6,75	19,7	85,4	23,7
6	<input checked="" type="checkbox"/>	20	1,84	6,75	16,3	85,1	25,5
7	<input checked="" type="checkbox"/>	25	1,86	6,75	13,4	84,6	21,2
8	<input checked="" type="checkbox"/>	30	2,2	6,75	12,4	84,4	23,0
9	<input checked="" type="checkbox"/>	35	2,19	6,75	13,0	84,4	23,9
10	<input checked="" type="checkbox"/>	40	2,18	6,75	12,5	84,4	23,0

In the Profiler List then pages of the individual measurements are listed. By clicking the right mouse button in the page the menu "[Profiler List Measurement](#)" is opened to add and delete sectors or

positions.

- **No.**

The number of the sector is displayed.

- **Act.**

The position or the sector is set active or inactive.

- **Position**

The position of the sector can be set.

- **Velocity**

The measured velocity of the sector at the position is displayed. If the number of velocities is higher than 1, the individual velocities and the mean velocity are listed.

- **Level**

The calculated water level of the sector is displayed.

- **Area**

The area of the sector is calculated according to the selected profile and water level.

- **k-Factor**

The k-factor of the sector is either a fixed percentage or it is modeled in the profile.

- **Discharge**

The discharge of the sector is displayed.

### 6.3.2.1 Profiler List Measurement Menu



The menu supports the adding and deleting of sectors or positions.

- **Add Position**

A new sector is added at the end of the list.

- **Insert Position**

A new sector is inserted at the selected position of the list.

- **Delete Position**

The selected sector is deleted from the list.

- **[Insert Multiple Positions](#)**

A dialog to insert multiple sectors or positions is opened.

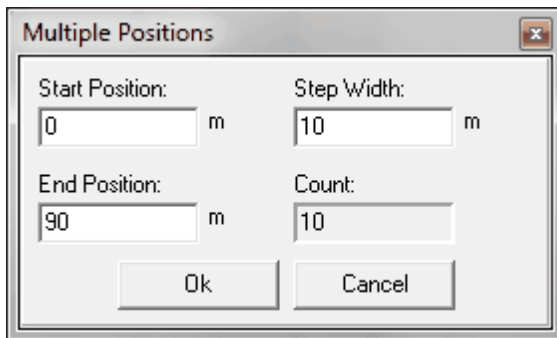
- **Delete All Positions**

All sectors are deleted from the list.

- **Set All Positions Active**

All sectors of the list are set active.

#### 6.3.2.1.1 Dialog "Multiple Positions"



The dialog "Multiple Positions" supports you, to generate multiple positions or sectors.

- **Start Position**

The start position for the new positions is entered.

- **End Position**

The end position for the new positions is entered.

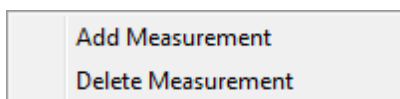
- **Step Width**

The step width defines the distance between the new positions. The first position is at the start position. For every following position the step width is added until the end position is reached.

- **Count**

The number of positions that are generated with the step width between start and end position is displayed.

### 6.3.3 Profiler List Menu



The menu is opened with a click of the right mouse button in the tab region of the window "[Profiler List](#)".

- **Add Measurement**

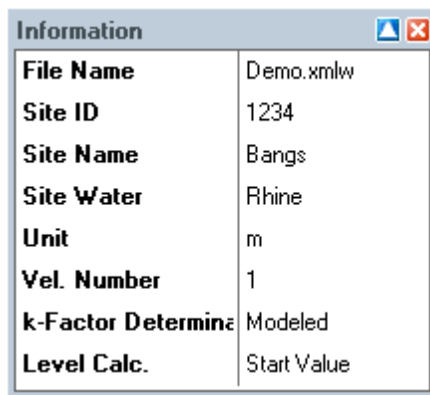
A new measurement is added.



- **Delete Measurement**

The selected measurement is deleted.

## 6.4 Information



Information	
<b>File Name</b>	Demo.xmlw
<b>Site ID</b>	1234
<b>Site Name</b>	Bangs
<b>Site Water</b>	Rhine
<b>Unit</b>	m
<b>Vel. Number</b>	1
<b>k-Factor Determination</b>	Modeled
<b>Level Calc.</b>	Start Value

Information to Profiler measurements is displayed and can be edited.

- **Filename**

The filename of the loaded Profiler measurement is displayed without its file path.

- **Site ID**

An ID for the measurement site of the Profiler measurement can be set.

- **Site Name**

An name for the measurement site of the Profiler measurement can be set.

- **Site Water**

A description of the water at the measurement site of the Profiler measurement can be set.

- **Unit**

The unit of the water level and the position of the Profiler measurement and the profile can be changed.

- **Vel. Number**

The value defines the number of velocities that can be measured for every range position in the measurements.

- **k-Factor Determination**

The type for the determination of the k-factor is selected.

- **Modeled**

The k-factor is modeled according to the selected profile.

- **Percent**

The k-factor has a fixed percentage.

- **k-Factor Percent**

The fix percentage for the k-factor is set.

- **Level Calc.**

The type for the calculation of the water level for the measurements is selected.

- **Interpolation**

The water level is interpolated linear between the "Meas Start" and "Meas End" time using the "Level Start" and "Level End" values of the measurement.

- **Mean**

The water level is the mean of the "Level Start" and "Level End" values of the measurement.

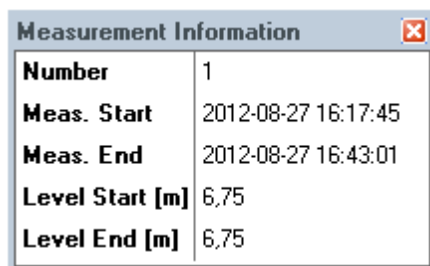
- **Start Value**

The water level is always the "Level Start" value of the measurement.

- **End Value**

The water level is always the "Level End" value of the measurement.

## 6.5 Measurement Information



Measurement Information	
<b>Number</b>	1
<b>Meas. Start</b>	2012-08-27 16:17:45
<b>Meas. End</b>	2012-08-27 16:43:01
<b>Level Start [m]</b>	6,75
<b>Level End [m]</b>	6,75

Information to the selected measurement is displayed:

- **Number**

The number of the selected measurement is displayed.

- **Meas. Start**

The time of the measurement begin is displayed. For every velocity measurement the point in time is saved. The value corresponds to the first point in time of a velocity measurement.

- **Meas. End**

The time of the end of the measurement is displayed. For every velocity measurement the point in time is saved. The value corresponds to the last point in time of a velocity measurement.

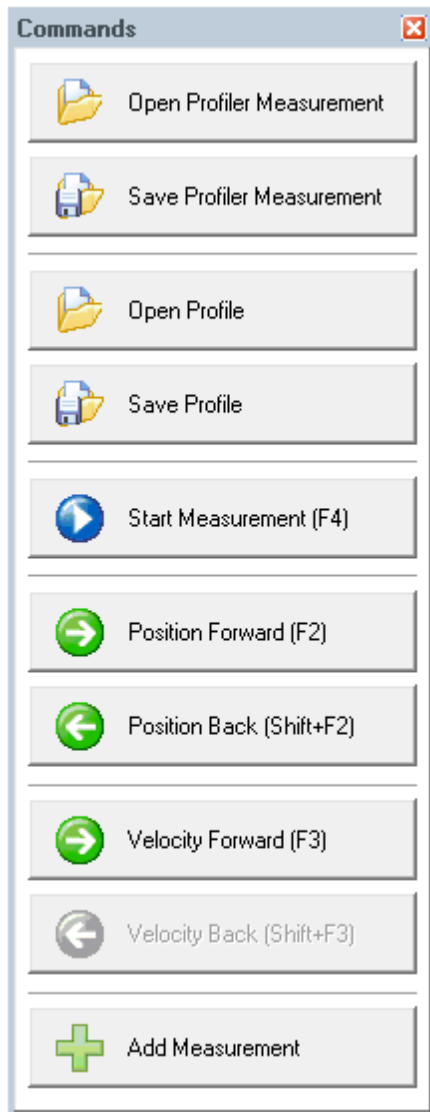
- **Level Start**

The water level at the measurement begin is entered.

- **Level End**

The water level at the end of the last measurement can be entered.

## 6.6 Commands



The buttons are used to perform Profiler measurements.

- **Open Profiler Measurement**

A Profiler measurement is opened from a file.

- **Save Profiler Measurement**

The Profiler measurement is saved to a file.

- **Open Profile**

The profile is loaded from a file.

- **Save Profile**

Only the profile is saved to a file.

- **Start Measurement**

The measurement procedure of the velocity at the selected position and for the selected velocity is started.

- **Position Forward**

The next position is selected.

- **Position Back**

The previous position is selected.

- **Velocity Forward**

The next velocity is selected.

- **Velocity Back**

The previous velocity is selected.

- **Add Measurement**

A new measurement is added to the Profiler measurement. So for example an additional measurement with reversed position order can be performed.

## 6.6.1 Start Measurement

When starting a measurement different dialogs are opened.

- **Load Schema**

On the first connection with a RP-30 radar device it is checked, if the schema of the radar device is already known and stored locally. If the schema is not known, it has to be transferred from the RP-30.

- **Transfer Parameter**

On the first connection all parameters are transferred from the RP-30.

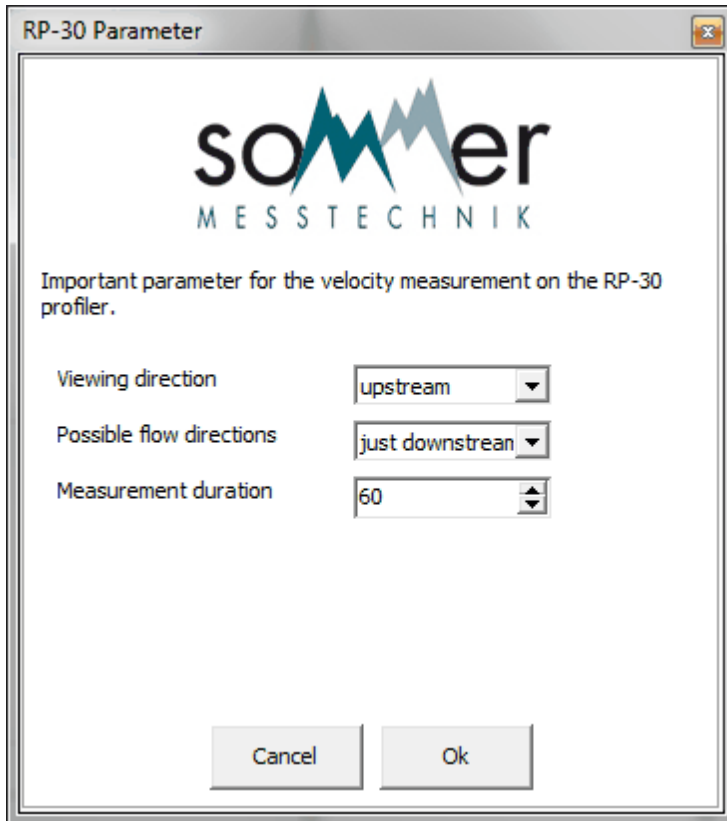
- **[RP-30 Parameter](#)**

On every new Profiler measurement the most important parameter are transferred from the RP-30. They are displayed in a dialog to ensure the correct setting of these parameters.

- **[Measurement](#)**

Every velocity measurement is displayed in a dialog. Thereby the time used for the measurement has to be waited. Finally the measurement results are displayed.

6.6.1.1 Dialog "RP-30 Parameter"



In the dialog the most important parameters for the velocity measurement are displayed. The labels and parameters correspond to the settings in the RP-30 and are displayed in the language of the RP-30. Changed parameters are sent to the RP-30.

- **Viewing direction**

The viewing direction describes the installation direction of the RP-30 in relation to the flow direction.

- downstream** The radar sensor is looking in the flow direction.
- upstream** The radar sensor is looking against the flow direction.

- **Possible flow direction**

For Profiler measurements only one flow direction is considered.

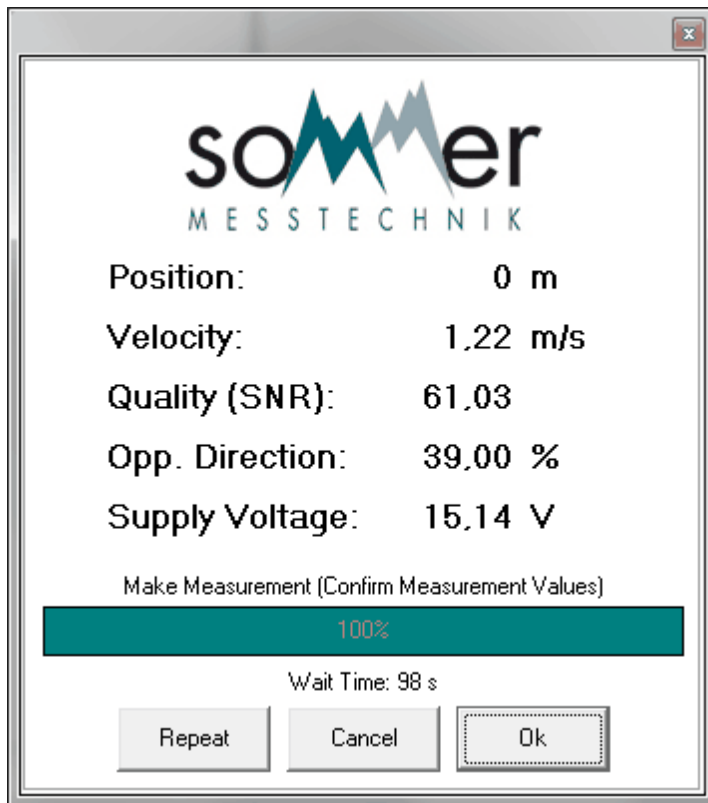
- just downstream** Only velocities in flow direction downstream are respected.
- two (tide) Velocities in both flow directions are respected.

- **Measurement duration**

The measurement duration defines the duration of one single measurement. During this time the radar signal is recorded continuously and a mean spectrum is calculated. Usually a duration of about 60 s is recommended. For very regularly flowing rivers a lower measurement duration can be chosen.

- Measurement duration** 20 to 100 s

## 6.6.1.2 Dialog "Measurement Result"



The measurement results are displayed in a dialog.

- **Parameter**

- **Position**

The position in the Profiler measurement is displayed.

- **Velocity**

The measured velocity is displayed. If the threshold for the quality (SNR) or for the opposite direction content is violated, the value is marked red.

- **Quality (SNR)**

The measured quality (SNR) is displayed. The part in front of the decimal character is the Signal-To-Noise Ratio in dB. If the threshold for the quality (SNR) is violated, the value is marked red.

- **Opp. Direction**

The measured opposite direction content is displayed. It is the content in percent of the velocities in the opposite direction related to the measured direction. If the threshold for the opposite direction content is violated, the value is marked red.

- **Supply Voltage**

The measured supply voltage is displayed. If the threshold for the supply voltage is violated, the value is marked red.

- **Buttons**

With the buttons the velocity can be accepted or discarded and the measurement can be repeated.

- **Repeat**

The velocity measurement is repeated.

- **Cancel**

The dialog is closed but the velocity is not accepted.

- **Ok**

The dialog is closed and the velocity is accepted.

# 7 Profile Mode

The program mode "Profile" supports you to enter and in edit cross-section profiles of rivers and channels by using either points or geometric forms.

- **Cross-section**

A cross-section profile of rivers and channels is entered in the following formats:

- **Points**

The cross-section profile is only defined with points (width and height).

- **Geometric forms**

The cross-section profile is approximated with geometric forms (circles, rectangles and trapezes).

- **Roughness**

To determine the k-factors the roughness is needed. The roughness of the wetted perimeter is either entered as overall in the "[Profile information](#)" or more roughnesses are entered in the "[Roughness list](#)". The type of the roughness coefficient is defined in the "[Options Discharge](#)".

- **Height**

The height in the discharge list has to correlate exactly with the measured water level. To adjust the height information between profile and water level parameters are available in the "[Profile information](#)":

- **Height input**

The height input defines whether the information is entered as height, sea level or distance to ground.

- **Zero point**

The zero point is the relation between sea level or distance to ground and the local height.

- **Height correction**

Additional a height correction can be applied to i.e. perform a little offset.

## 7.1 Main window Profile

Following windows are arranged in the main window:

- [Profile Graph](#)

The graph of the profile is displayed in this window.

- [Profile Information](#)

Profile information is listed and can be edited.

- [Profile Item](#)

The settings of the marked profile item are displayed.

- [Profile List](#)



All profile items are listed.

## 7.2 Menu File

New	Strg+N
Open Profile	Strg+O
Save Profile	Strg+S
Import Profile	
Reduce Profile	
Print	Strg+P
Exit	Strg+X

- **New**

The actual profile is closed and an empty profile is opened.

- **Open Profile**

A profile is loaded from a file.

- **Save Profile**

The actual profile is saved to a file.

- **[Import Profile](#)**

A dialog to import a profile from a CSV-file is opened.

- **Reduce Profile**

The points of the open profile are reduced according to the settings in "[Options Profile](#)".

- **Print**

A report of the actual profile is printed.

- **Exit**

The program is closed.

## 7.2.1 Import Profile Points

		1	2	3	4	5
			Width	Height		
1		Profile				
2		Nbr.	Width [m]	Depth [m]	[m/s]	[m³/s]
3	<b>Start</b>	linkes Ufer	0	0	0	0
4		2	1	0.57	0.33	0.19
5		3	2	1.12	0.63	0.71

Start Line: 3      Height Position: 3

End Line: 169      Width Position: 2       Sort

Separator: Semicolon ;      Unit: m

Decimal Separator: Point .      Height Input: Distance To Ground

Ok      Cancel

In the dialog "Import Profile Points" the settings to import a profile from a CSV-file are defined.

- **Start Line**

The start line defines the line from which on the data is imported.

- **End Line**

The end line defines the line up to which the data is imported.

- **Height Position**

The column with the height information is selected and displayed in the table.

- **Width Position**

The column with the width information is selected and displayed in the table.

- **Sort**

The lines are sorted according to the width position.

- **Separator**

The separator of the columns in the CSV-file is defined.

- **Decimal Separator**

The decimal separator is set.

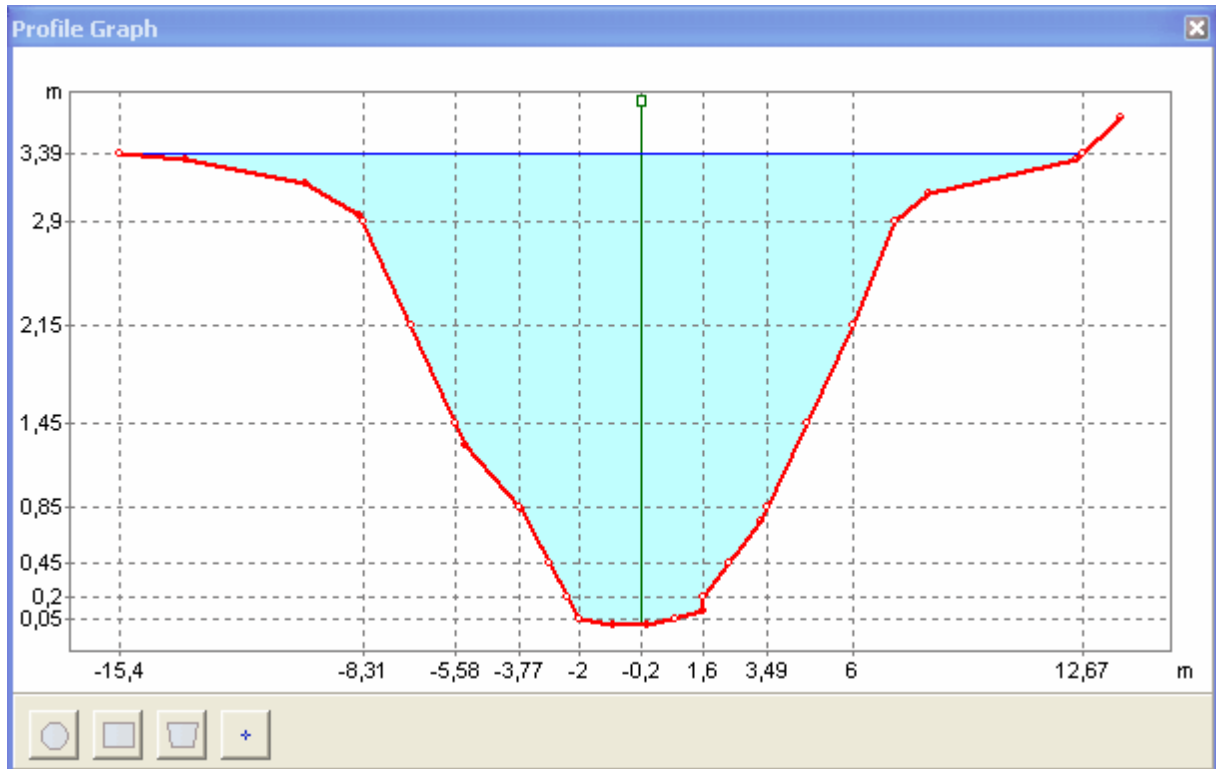
- **Unit**

The unit of the height and width information is selected.





- **Height Input**

The settings defines the type of the height information of the imported profile.

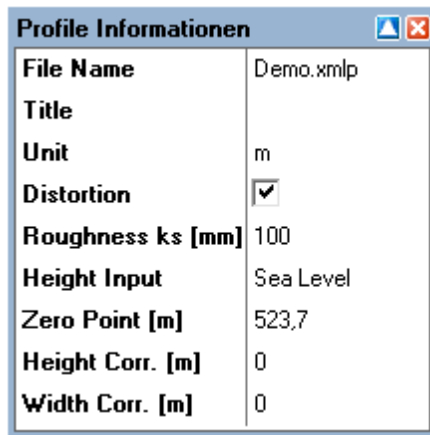
## 7.3 Profile Graph



The profile graph shows the profile. In the lower bar switches to add new profile items are arranged.

-  [Add Circle](#)  
A circle or circle segment is added at the top of the profile item list.
-  [Add Rectangle](#)  
A rectangle is added at the top of the profile item list.
-  [Add Trapeze](#)  
A trapeze is added at the top of the profile item list.
-  [Add Point](#)  
A point is added at the right of the profile.

## 7.4 Profile Information



Profile Informationen	
File Name	Demo.xmlp
Title	
Unit	m
Distortion	<input checked="" type="checkbox"/>
Roughness ks [mm]	100
Height Input	Sea Level
Zero Point [m]	523,7
Height Corr. [m]	0
Width Corr. [m]	0

Information of profile is listed and can be entered.

- **Filename**

The filename of the loaded profile file is displayed without its file path.

- **Title**

A title for the profile can be set. It is displayed on printouts.

- **Unit**

The unit for the profile is displayed.

- **Distortion**

The profile can be drawn distorted or not.

- **Roughness**

The roughness is necessary to calculate the k-factors of the profile. Either an overall value is entered directly entered for this parameter or composite roughnesses are defined in the "[Roughness List](#)". The type of the roughness parameter is set in the "[Options Discharge](#)".

- **Height Input**

The parameter defines how the height information of the profile is edited. The Input is either a relative height, an absolute height (sea level) or a distance to ground (downwards).

- **Zero Point**

A value for the zero point of the profile can be set. A second height axis is displayed in the graphics. For example values in "Sea levels" or "Distance to ground" can be adjusted to a local level. A button opens the dialog "[Zero point](#)" that supports you to calculate a zero point.

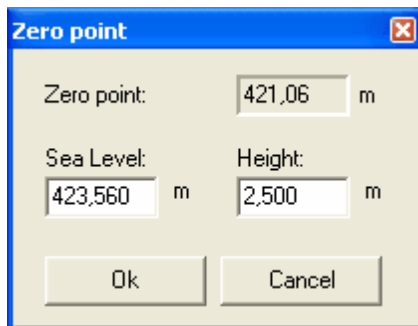
- **Height Correction**

An offset to shift the height values in the graphic and discharge list can be edited. No second axis is displayed in the graphics.

- **Width Correction**

A width correction is entered as an offset to correct the width. This allows profiles to be shifted to adjust them to the positions of Profiler measurements.

### 7.4.1 Dialog "Zero point"



The dialog supports you to adjust the profile to water level measurement of the radar. The inputs are "Height", "Sea level" or "Distance to ground" depending on the settings in the window "[Profile Information](#)".

- **Zero Point**

The actual zero point is displayed.

- **Height, Sea Level or Distance to ground**

The information from the profile in "Height", "Sea level" or "Distance to ground" is entered.

- **Height**

The corresponding height of the water level of the radar sensor is set.

- **OK**

The zero point is calculated from the two inputs depending on the settings. The dialog is closed.

- **Cancel**

The dialog is closed without setting a new zero point.

## 7.5 Profile Items

In the window "Profile Item" all settings of a profile item are displayed and can be edited. The individual parameters depend on the type of the item:

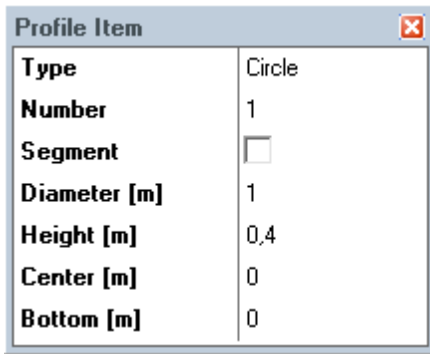
- [Circle](#)
- [Circle Segment](#)
- [Rectangle](#)
- [Trapeze](#)
- [Point](#)

A profile is either generated with points or with geometric items (circle, circle segment, rectangle and trapeze). Mixing of points and geometric items is not possible.

Additionally roughness ranges for composite roughnesses can be edited in a roughness item.

- [Roughness](#)

### 7.5.1 Profile Item Circle



The profile item "Circle" displays the settings for a circle.

- **Type**

The type of the profile item is displayed.

- **Number**

The number of the profile item in the "[Profile List](#)" is displayed.

- **Segment**

The check box switches between the profile items "Circle" and "Circle Segment".

- **Diameter**

The diameter of the circle can be edited.

- **Height**

The height value for the circle item is displayed.

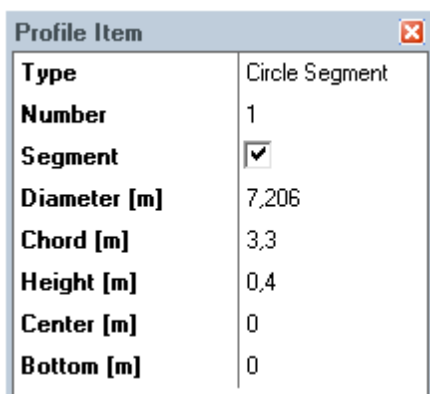
- **Center**

The width position of the center of the circle is displayed.

- **Bottom**

The height position of the circle is displayed. For a circle at the bottom the base point is displayed, for an item at the top the crest is displayed.

### 7.5.2 Profile Item Circle Segment



The profile item "Circle Segment" displays the settings for a circle segment.

- **Type**

The type of the profile item is displayed.

- **Number**

The number of the profile item in the "[Profile List](#)" is displayed.

- **Segment**

The check box switches between the profile items "Circle" and "Circle Segment".

- **Diameter**

The diameter of the circle is displayed, but cannot be edited.

- **Chord**

The width of the chord of the circle segment is set.

- **Height**

The height value for the circle segment is displayed.

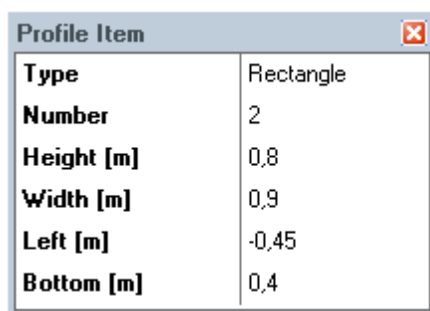
- **Center**

The width position of the center of the circle is displayed.

- **Bottom**

The height position of the circle segment is displayed. For a segment at the bottom the base point is displayed, for an item at the top the crest is displayed.

### 7.5.3 Profile Item Rectangle



Profile Item	
Type	Rectangle
Number	2
Height [m]	0,8
Width [m]	0,9
Left [m]	-0,45
Bottom [m]	0,4

The profile item "Rectangle" displays the settings for a rectangle.

- **Type**

The type of the profile item is displayed.

- **Number**

The number of the profile item in the "[Profile List](#)" is displayed.

- **Height**

The height of the rectangle is displayed.

- **Width**

The width of the rectangle is displayed.

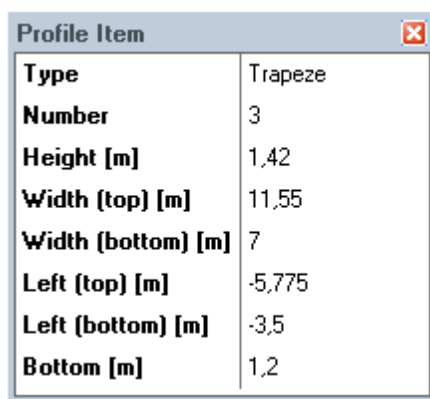
- **Left**

The position of the left side of the rectangle is displayed.

- **Bottom**

The height position of the bottom is displayed.

## 7.5.4 Profile Item Trapeze



Profile Item	
Type	Trapeze
Number	3
Height [m]	1,42
Width (top) [m]	11,55
Width (bottom) [m]	7
Left (top) [m]	-5,775
Left (bottom) [m]	-3,5
Bottom [m]	1,2

The profile item "Trapeze" displays the settings for a trapeze.

- **Type**

The type of the profile item is displayed.

- **Number**

The number of the profile item in the "[Profile List](#)" is displayed.

- **Height**

The height of the trapeze is displayed.

- **Width (top)**

The width of the upper trapeze side is displayed.

- **Width (bottom)**

The width of the lower trapeze side is displayed.

- **Left (top)**

The width position of the upper left edge is displayed.

- **Left (bottom)**

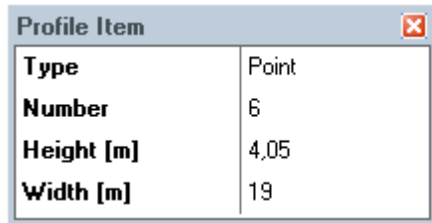
The width position of the lower left edge is displayed.



- **Bottom**

The height position of the bottom is displayed.

## 7.5.5 Profile Item Point



Profile Item	
Type	Point
Number	6
Height [m]	4,05
Width [m]	19

The profile item "Point" displays the settings for a point.

- **Type**

The type of the profile item is displayed.

- **Number**

The number of the profile item in the "[Profile List](#)" is displayed.

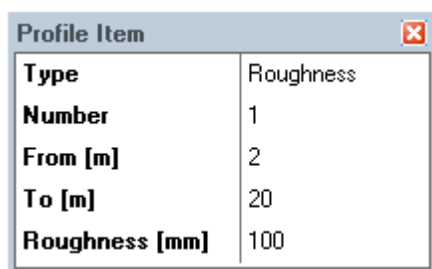
- **Height**

The height position of the point is displayed.

- **Width**

The width position of the point is displayed.

## 7.5.6 Profile Item Roughness



Profile Item	
Type	Roughness
Number	1
From [m]	2
To [m]	20
Roughness [mm]	100

The roughness of a cross section profile can be expressed as composite roughnesses of horizontal ranges. The profile item "Roughness" defines a single roughness range.

- **Type**

The type of the profile item is "Roughness".

- **Number**

The number of the roughness item in the "[Roughness List](#)" is displayed.

- **From**

The left margin of a roughness range is set.

- **To**

The right margin of a roughness range is set.

- **Roughness**

The roughness is edited according to the selected coefficient in "[Options Discharge](#)". A button at the right side of the field opens a dialog to select predefined roughnesses.

## 7.6 Profile Lists

With the tabs at the bottom different lists can be displayed.

- [Profile](#)

The profile list is displayed.

- [Roughness](#)

The roughness list is displayed.

### 7.6.1 Profile List

No.	Type	Heigh	Width [cm]	
1	Point	103	0	<input type="checkbox"/>
2	Point	157	50	
3	Point	181	100	
4	Point	214	150	
5	Point	255	200	
6	Point	304	300	
7	Point	323	350	

The profile list displays all items of a profile. Marking a profile item causes the settings to be displayed in the window "[Profile Item](#)". Clicking the right mouse button opens the menu "[Profile List](#)" to add and delete profile items.

- **No**

The number of the profile item is displayed.

- **Type**

The type of the profile item is displayed.

- **Height**

The height of the profile item is displayed. For the profile item "Point" the height position is displayed.

- **Width**

For the profile item "Point" the width position is displayed.

- **Width (top)**

The width of the profile item is displayed. For the profile item "Trapeze" the upper width is displayed.

- **Width (bottom)**

For the profile item "Trapeze" the lower width is displayed.

### 7.6.1.1 Profile List Menu



The menu is opened by clicking the right mouse button in the window "[Profile list](#)".

- **Insert Circle**

A circle or circle segment is inserted above the marked item.

- **Insert Rectangle**

A rectangle item is inserted above the marked item.

- **Insert Trapeze**

A trapeze item is inserted above the marked item.

- **Insert Point**

A point is inserted at the position of the marked item.

- **Delete Item**

The marked profile item is deleted.

## 7.6.2 Roughness List

No.	From [m]	To [m]	Roughness [mm]
1	0,6	7,8	100
2	7,8	16,4	150
3	16,4	24,3	100

The roughness list displays all roughness items of a profile. Marking a roughness item displays the settings in the window "[Profile Item](#)". Clicking the right mouse button opens the menu "[Roughness List](#)" to add, insert and delete roughness items.

- **No**

The number of the roughness item is displayed.

- **From**

A roughness item is defined for a width section. "From" is the left side of the roughness section.

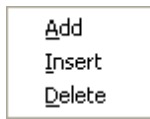
- **To**

"To" is the right side of the roughness section.

- **Roughness**

The roughness of the roughness item is displayed.

#### 7.6.2.1 Roughness List Menu



The menu is opened by clicking the right mouse button on the "[Roughness list](#)".

- **Add**

A new roughness item is added at the end of the list.

- **Insert**

A new roughness item is inserted above the marked item.

- **Delete**

The selected roughness item is deleted.

## 8 Spectrum Mode

In the "Spectrum Mode" radar spectra are graphically displayed. The spectra can either be recorded directly via a terminal or opened from files. Multiple spectra can be compared with each other and details can be zoomed out. Important information about the spectra and the determination of the dominant velocity is displayed.

### 8.1 Main window Spectrum

In the main window the following windows are arranged:

- [Spectrum Graph](#)

The spectra are displayed graphically.

- [Measurement Graph](#)

The velocities of the spectra are displayed graphically as time series.

- [File Information](#)

Information of the opened file is listed.

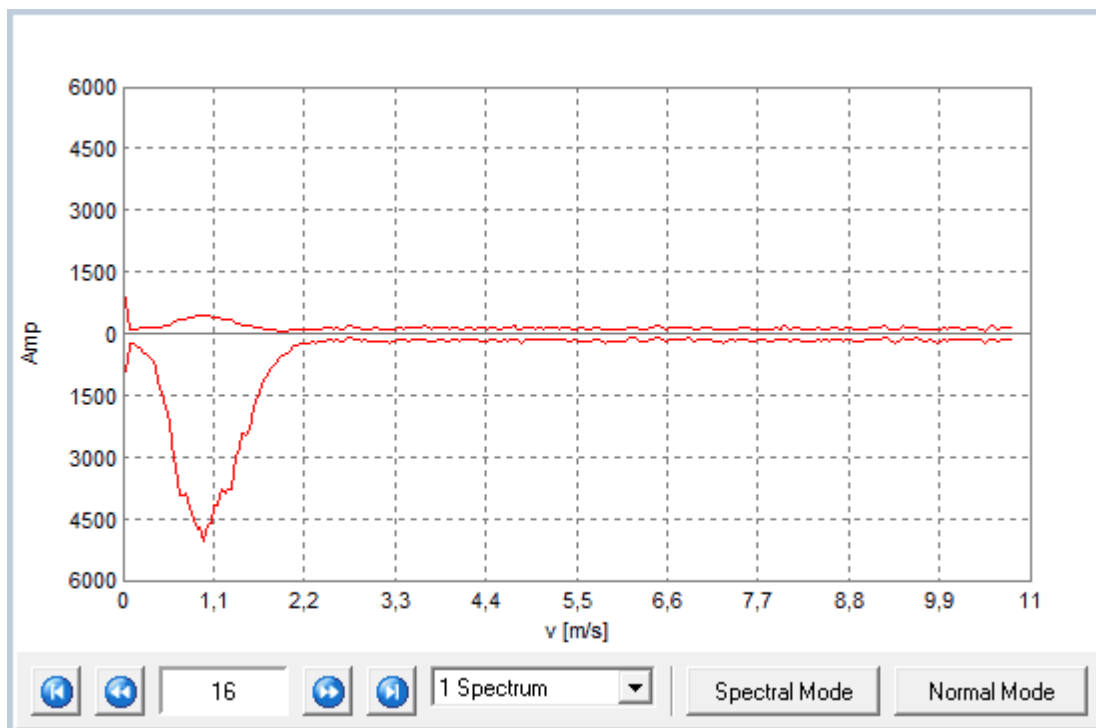
- [Measurement Values](#)

The measurement values of the selected spectrum are displayed.

- [Spectrum Information](#)

Information about the selected spectrum is listed.

### 8.2 Spectrum Graph



In this window spectra are displayed. The settings for the graphic are edited in the dialog "[Options](#)"

[Spectrum](#)".

With the mouse the zoom of the graphic can be changed and the axis can be set.

- **Left mouse button**

By clicking the left mouse button a range can be selected and zoomed.

- **Right mouse button**

The zoom is undone by the right mouse button. If the scale has been changed in the dialog "Scale", the zoom is reset to these settings, otherwise the zoom is optimized to the actual selected spectra.

- **Double click on axis**

With a double click on one of the two axes the dialog "Scale" is opened to set the scale of the axis.

The switches and selection in the lower bar change the display of the spectra.

-  **First**

The display switches to the first loaded spectrum.

-  **Last**

The display switches to the last loaded spectrum.

-  **Next**

The display switches to the next loaded spectrum.

-  **End**

The display switches to the end of the loaded spectra.

-  **Number of spectra**

The number of the displayed spectra can be selected.

- 1 Spectrum      One spectrum is displayed.
- 2 Spectra        Two spectra are displayed.
- 5 Spectra        Five spectra are displayed.
- 10 Spectra       Ten spectra are displayed.
- All Spectra       All loaded spectra are displayed.

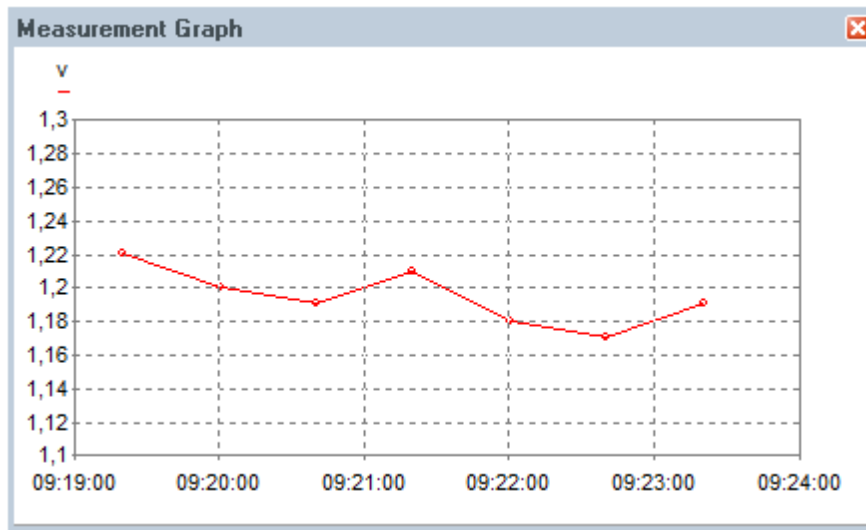
- **Spectral Mode**

The spectral mode is switched on. The radar device now sends spectra that are automatically displayed in the spectrum graph.

- **Normal Mode**

The spectral mode is switched off.

## 8.3 Measurement Graph



The measured velocities of the spectra are displayed as time series.

## 8.4 File Information

File Information	
<b>File Name</b>	Rhine.xmls
<b>File Size</b>	109,5 KB
<b>File Date</b>	2013.02.07 08:59:26
<b>Count</b>	4
<b>Description</b>	Bridge

Information to the loaded file is listed.

- **File Name**

The filename of the loaded file is displayed without its file path.

- **File Size**

The size of the loaded file is displayed in KBytes.

- **File Date**

The file date identifies the last change of the loaded file.

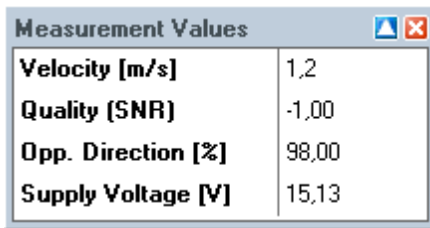
- **Count**

The number of the loaded spectra is displayed.

- **Description**

A description to the spectrum file can be inserted.

## 8.5 Measurement Values

A screenshot of a software dialog box titled "Measurement Values". It contains a table with four rows of data: Velocity [m/s] with value 1,2; Quality (SNR) with value -1,00; Opp. Direction [%] with value 98,00; and Supply Voltage [V] with value 15,13. The dialog box has standard window controls (minimize, maximize, close) in the top right corner.

Measurement Value	Value
Velocity [m/s]	1,2
Quality (SNR)	-1,00
Opp. Direction [%]	98,00
Supply Voltage [V]	15,13

The measurement values of the spectrum are displayed.

- **Velocity**

The measured surface velocity is displayed.

- **Quality (SNR)**

The quality of the velocity measurement is displayed.

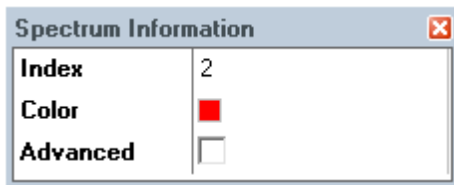
- **Opp. Direction**


The opposite direction content of the velocity measurement is displayed in percent.

- **Supply Voltage**

The supply voltage of the RP-30 is displayed.

## 8.6 Spectrum Information

A screenshot of a software dialog box titled "Spectrum Information". It contains a table with three rows: Index with value 2; Color with a red square icon; and Advanced with an unchecked checkbox. The dialog box has a close button in the top right corner.

Index	2
Color	
Advanced	<input type="checkbox"/>

Information of the selected spectrum is listed.

- **Index**

The index of the spectrum is displayed.

- **Color**

The color of the selected spectrum is displayed and can be changed.

- **Advanced**

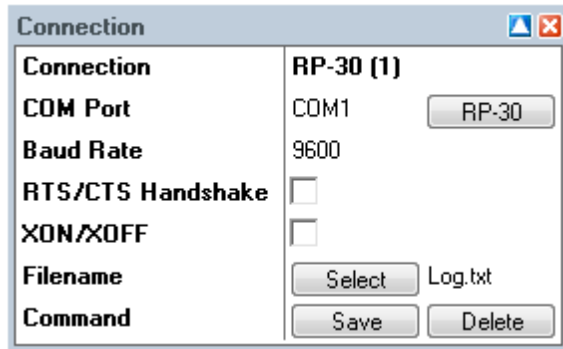
Additional information to the spectrum and the determination of the velocity can be listed. This technical information helps experts to evaluate radar measurements.



## 9 Terminal Mode

The program mode "Terminal" enables the establishment of a connection to a device. The device can be parametrized by the sensor menu or the serial output of the measurement values can be checked.

### 9.1 Connection



Settings for the communication are set. The communications does always use a COM port.

- **Connection**

The settings of the COM port can be labeled with a name for saving and deleting. A selection list supports switching between connection settings.

- **COM Port**

The COM port is selected.

- **RP-30**

A dialog is opened to find existing RP-30, connect them and supply the related COM ports. The button is only enabled, if the searching for and the connecting of RP-30 is possible (see menu "[Connection](#)").

- **Baud rate**

The baud rate is set.

- **RTS/CTS Handshake**

The RTS/CTS control line is switched. This is necessary if a connection via modem is established.

- **XON/XOFF**

The XON/XOFF Software-Handshake is activated or deactivated.

- **Filename**

The communication can be logged in a file. The name of the log file is defined.

- **Select**

A dialog to select the log file is opened.

- **Command**

The individual settings can be saved and deleted.

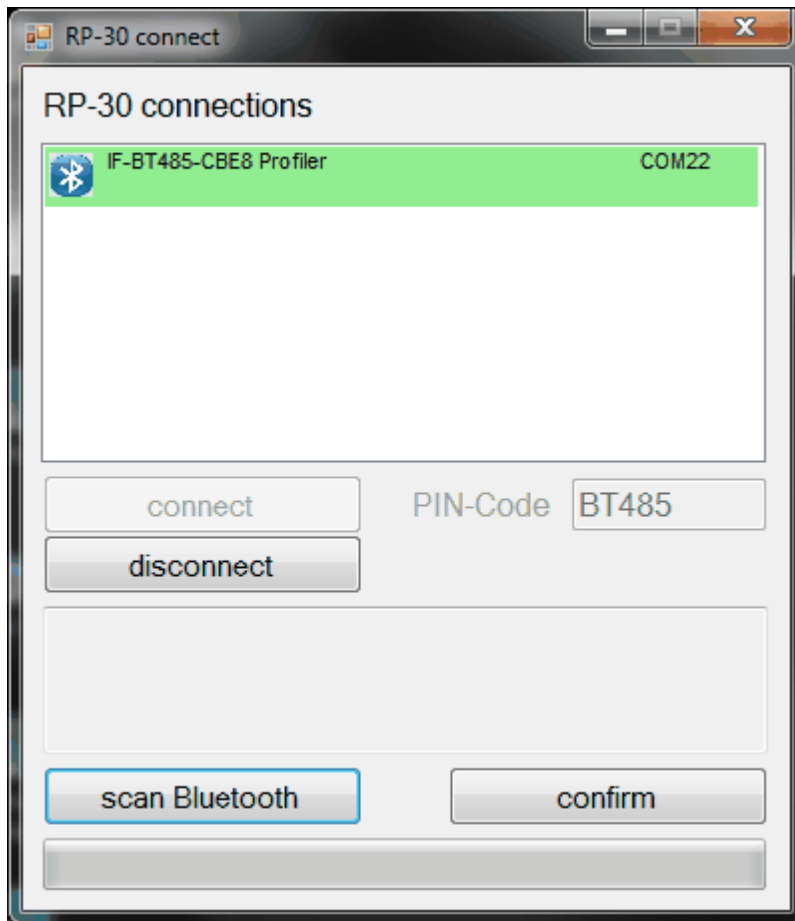
- **Save**

The selected connection is saved with all its settings into the selection list or the settings of existing connections are overwritten.

- **Delete**

The selected connection is deleted from the selection list.

### 9.1.1 Dialog "RP-30"



The dialog supports you to establish connections to RP-30 devices per Bluetooth. On the start-up of the dialog an automatic search for RP-30 devices is started.

- **List**

In the list all available devices are listed. If a device is connected the COM port is given and the item is identified with the color green.

- **Connect**

A connection to the selected device is established. A COM port for the Bluetooth connection has to be generated for the device. This may last a couple of minutes especially for the first time. Please consider the information in the system line and do not close the dialog too early.

- **Disconnect**

The connection to the selected device is disconnected.

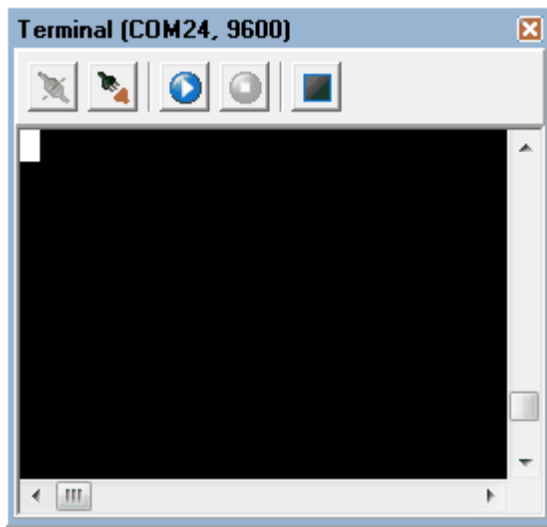
- **Scan Bluetooth**

A scan is performed to search for all RP-30 devices available by Bluetooth. If only one device is found the connection is automatically established.

- **Confirm**

The selected and connected RP-30 device is confirmed with its COM port and the dialog is closed.

## 9.2 Terminal



The terminal supports you to establish a communication with a radar device. The settings for the communication are edited in the window "[Connection](#)".

-  **Connected**

The program performs a connection. An opened connection is identified by the COM port and the baud rate in the header of the window.

-  **Disconnect**

The connection is closed.

-  **Start file recording**

The communication is written to a log file.

-  **Stop file recording**

The logging of the communication in a file is stopped.

-  **Clear terminal**

The terminal is cleared.

# 10 Options

The global settings of the program can be set in the dialog "Options".

- **General**

A window to change the language and font size of the program is opened.

- **Profiler**

Settings to Profiler measurements and their display are opened.

- **Measurement**

Settings to perform measurements with RP-30 radar devices are opened.

- **Profile**

The unit and settings for the display of profiles are opened in a dialog.

- **Discharge**

The units of the discharge, area and velocity are set and the type of roughness is selected.

- **Spectrum**

Settings for the display of spectra are opened in a dialog.

- **Communication**

Settings for the communication for the parametrization of sensors are opened.

- **Printing**

The printer settings are opened in a dialog.

## 10.1 Options General

General | Profiler | Measurement | Profile | Discharge | Spectrum | Communication | Printing

Language Selection

Language: English

Font Sizes

Windows and Tables: 8

Terminal: 10

Bluetooth

Check On Start-up:

- **Language**

The language of the program can be selected. New language settings are loaded when confirming the dialog "Options" with "Ok".

- **Font Sizes**

The font size of windows and tables as well as the terminal are set.

- **Bluetooth**

- **Check on Start-up**

During the start-up the program checks, if a Bluetooth connection is possible and adjusts the button "RP-30" in the window "[Connection](#)" and the menu "[Connection](#)".

## 10.2 Options Profiler

General	Profiler	Measurement	Profile	Discharge	Spectrum	Communication	Printing
<b>Common</b>							
Number of Velocities:		2					
Level Calculation:		Start Value					
Show Info in List:		<input checked="" type="checkbox"/>					
<b>k-Factor</b>							
Determination:		Modeled					
Percent:		90 %					
<b>Graphic</b>							
Discrete V-Graphic:		<input type="checkbox"/>		Draw All Measurements:		<input checked="" type="checkbox"/>	
Optimize V-Axis:		<input checked="" type="checkbox"/>		Draw Sectors:		<input checked="" type="checkbox"/>	
Optimize W-Axis:		<input checked="" type="checkbox"/>		Show Mouse Value:		<input checked="" type="checkbox"/>	

The default settings for the Profiler measurements can be edited.

- **Common**

- **Number of Velocities**

The value defines the number of velocities that can be measured for every range position in the measurements.

- **Level Calculation**

The type for the calculation of the water level for the measurements is selected.

- **Interpolation**

The water level is interpolated linear between the "Meas Start" and "Meas End" time using the "Level Start" and "Level End" values of the measurement.

- **Mean**

The water level is the mean of the "Level Start" and "Level End" values of the measurement.

- **Start Value**

The water level is always the "Level Start" value of the measurement.

- **End Value**

The water level is always the "Level End" value of the measurement.

- **Show Info in List**

In the Profiler List information to the velocity measurement (velocity, quality (SNR), opposite direction content, time) are displayed.

- **k-Factor**

- **Determination**

The type for the determination of the k-factor is selected.

- **Modeled**

The k-factor is modeled according to the selected profile.

- **Percent**

The k-factor has a fixed percentage.

- **Percent**

The fix percentage for the k-factor is set.

- **Graphic**

- **Discrete V-Graphic**

The velocity profiles are drawn as discrete step functions.

- **Optimize V-Axis**

The axis of the velocity is optimized, fixed separations are used.

- **Optimize W-Axis**

The axis of the water level is optimized, fixed separations are used.

- **Draw All Measurements**

All measurements are shown in the graphic. The selected measurement is displayed with filled area.

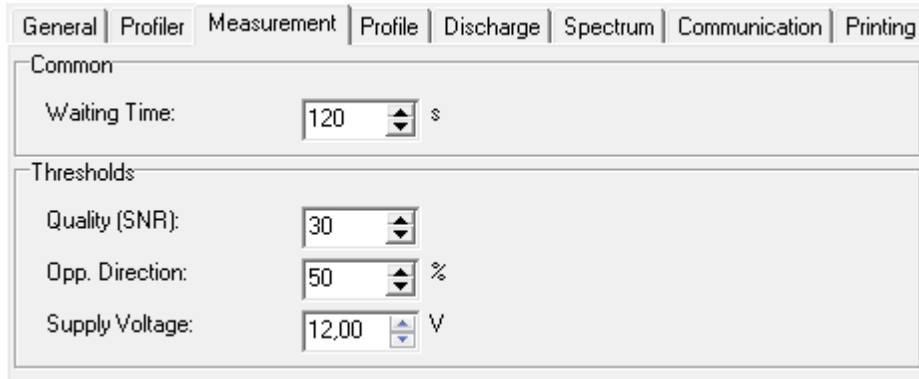
- **Draw Sectors**

The margins of the sectors are displayed in the graphic.

- **Show Mouse Value**

A box with the values is displayed at the mouse position.

## 10.3 Options Measurement



The screenshot shows the 'Measurement' tab of the RPCommander options dialog. It is divided into two sections: 'Common' and 'Thresholds'. The 'Common' section contains a 'Waiting Time' field set to 120 seconds. The 'Thresholds' section contains three fields: 'Quality (SNR)' set to 30, 'Opp. Direction' set to 50 percent, and 'Supply Voltage' set to 12.00 Volts.

Section	Parameter	Value	Unit
Common	Waiting Time	120	s
Thresholds	Quality (SNR)	30	
	Opp. Direction	50	%
	Supply Voltage	12,00	V

- **Common**

- **Waiting Time**

The waiting time for the measurement of the surface velocities is displayed. After this wait time the measurement procedure is aborted.

- **Thresholds**

The measurement values are marked in the dialog "[Measurements Results](#)" according to these thresholds.

- **Quality (SNR)**

The threshold is a lower limit for the quality (SNR). Measurements with a quality (SNR) below this threshold are marked red.

- **Opp. direction**

The threshold is an upper limit for the opposite direction content. Measurements with an opposite direction content above this threshold are marked red.

- **Supply Voltage**

If the supply voltage is below the threshold, the measured supply voltage is marked red.

## 10.4 Options Profile

General	Profiler	Measurement	Profile	Discharge	Spectrum	Communication	Printing
<b>Common</b>							
Unit:	m						
Font Size:	8						
<b>Graphic</b>							
Draw Distorted:	<input checked="" type="checkbox"/>	Second Axis Right:	<input type="checkbox"/>				
Fill Area:	<input checked="" type="checkbox"/>	Show Selected Point:	<input checked="" type="checkbox"/>				
Show Radar:	<input checked="" type="checkbox"/>						
Show Mouse Value:	<input checked="" type="checkbox"/>						
<b>Reducing</b>							
Number:	5						
Correlation:	0,9990						

The default settings for the appearance of profile graphs are displayed.

- **Common**

- **Unit**

- The unit of the profiles can be selected.

- **Font Size**

- The font size for the labeling of the axis can be set.

- **Graphic**

- **Distortion**

- The profile graph is either painted optimized or with distortion.

- **Fill Area**

- The profile area below the marked height line is filled.

- **Show Radar**

- The position of the radar device is displayed in the profile graph.

- **Show Mouse Value**

- A box with the values at the mouse position is displayed.

- **Second axis right**

- The second axis is displayed right of the profile graph.

- **Show Selected Point**



The selected point of the profile list is drawn marked.

- **Reducing**

The parameters in this section control the reducing of profiles. Thereby a linear interpolation is calculated with a defined number of neighboring measurement points. The correlation defines when points lie on a straight line and the points in between can be eliminated.

- **Number**

The number of measurement points is set for the stepwise calculation of the linear interpolation.

- **Correlation**

The correlation is a threshold. If the correlation of a linear interpolation is above this threshold, the points describe a straight line and the points in between can be eliminated.

## 10.5 Options Discharge

General	Profiler	Measurement	Profile	Discharge	Spectrum	Communication	Printing
Units							
Area:		m <sup>2</sup>					
Discharge:		m <sup>3</sup> /s					
Velocity:		m/s					
Roughness							
Coefficient:		Roughness k <sub>s</sub>					

Setting for the discharge can be set.

- **Units**

- **Area**

The unit of the area can be selected.

- **Discharge**

The unit of the discharge can be selected.

- **Velocity**

The unit of the velocity can be selected.

- **Roughness Coefficient**

A parameter is selected to define the input parameter for the wall roughness. The wall roughness is essential to calculate the k-factors.

- **Sand Roughness  $k_s$**

The parameter defines the equivalent sand roughness used in the formulas of Colebrook-White and Darcy-Weisbach. The parameter is entered in mm.

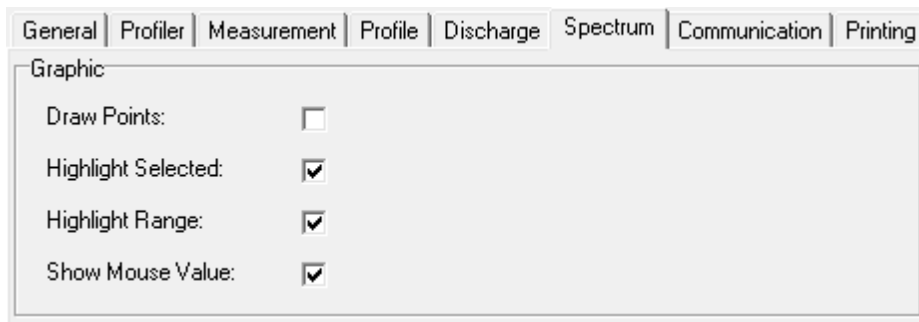
- **Strickler Coefficient  $k_{st}$**

The roughness is expressed with the Strickler coefficient as it is used in the Gauckler-Manning-Strickler formula. The parameter is entered in  $1/m^3s$ .

- **Manning Coefficient  $n$**

The roughness is expressed with the Manning coefficient, the reciprocal value of the Strickler-Coefficient. The parameter is entered in  $m^3s$ .

## 10.6 Options Spectrum



Settings for the appearance of the spectrum graph can be changed.

- **Graphic**

- **Draw Points**

The graphs of the spectra are painted with points.

- **Highlight Selected**

The selected spectrum is highlighted in the graph. If only one spectrum is present, no marking is performed.

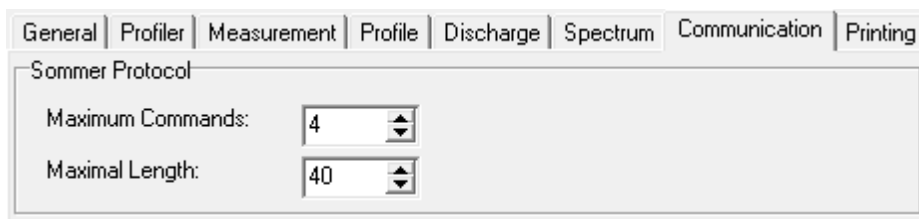
- **Highlight Range**

The range used for velocity calculation is highlighted in the graph.

- **Show Mouse Value**

If the mouse is moved in the spectrum graphic, a box with the actual mouse position is displayed.

## 10.7 Options Communication



The settings for the communication can be edited.

- **Sommer Protocol**

The area contains information related to the parameter transfer by Sommer protocol. Especially with slow communications (i.e. via internet) the duration of the complete transfer can be reduced significantly by stacking the commands.

- **Maximum Commands:**

The parameter defines the number of commands stacked in one transfer string.

- **Maximum Length:**

The parameter is the maximum length of transfer strings by the Sommer protocol. This setting dominates the setting for the maximum commands. Be aware that the answer can be longer than the request but never must exceed 80 characters. Therefore the maximum length usually should not be set higher than 40.

## 10.8 Options Print

General	Profiler	Measurement	Profile	Discharge	Spectrum	Communication	Printing
Common							
Font Size:		8					
Line Width:		8					
Thin Line Width:		1					
Profiler							
Only Active Positions:		<input checked="" type="checkbox"/>					
Fill Velocity:		<input type="checkbox"/>					

Printer settings for the reports can be edited.

- **Common**

- **Font Size**

The font size for the printout can be edited.

- **Line Width**

The line width is defined.

- **Thin Line Width**

The line width for auxiliary lines is set.

- **Profiler**

- **Only active positions**

Only the active positions are listed.

- **Fill Velocity**

The area below the velocities is displayed in color.

## 11 FAQ

- **In the measurement results no values for the "Opposite Direction" and "Supply voltage" are displayed.**

These values are only available since version 1.70 of the radar device. As these values are located in the "Special Values", the output of the special values has to be activated in the menu "Technics" and "RS-485 protocol" with the parameter "MO information".

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