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Symbols used in the text

These paragraphs contain tips and practical advice for working with the 2D system



In the paragraphs highlighted with this symbol, you will find additional information and it is very important that you follow the instructions given.



Documentation reference

> A user manual reference number is provided so the user can seek further assistance



1 Desktop appearance

A typical Analyzer desktop mainly consists of 5 windows:

• On top of the screen is the header bar with the main menu & toolbar.



• At bottom of the screen is the Overview window in which certain signals (channels) of the complete measurement are shown.



• The biggest window centered on the screen is the Moving window. This window contains a selected range of the signals.



• The small Circuit window shows the track and the position on the track for the section currently displayed in the Moving window.



 The Quick bar at the right of the screen is helpful for fast access to common functions. These functions are user defined as any main menu item may be selected to be shown here. This window may be closed to gain space on the screen.





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1.1 Main menu items

- The File menu contains functions (analysis tools) to load and modify 2D measurement files
- The Functions menu allows access to basic and advanced analysis tools
- The <u>View</u> menu controls the layout of the Analyzer desktop
- The <u>Measurement</u> menu contains commands to view the measurement(s) in different ways
- The <u>Settings</u> menu contains functions to administrate both Analyzer and measurement settings
- From the <u>Wizards</u> menu several Wizards may be run to achieve common tasks
- Inside the <u>Help</u> menu, online help for the Analyzer software is available

1.1.1 The "File" item of the main menu

| File | Functions View Measurement | Settings Wizards |
|------------|-----------------------------------|------------------|
| Â, | Load measurement of event | Alt+O |
| Z | Load measurement | Ctrl+O |
| L. | Load measurement by plugin | + |
| Þ | Overlay lap | • |
| 1/A | Remove active measurement | Ctrl+R |
| 8 | Exchange measurement | Ctrl+E |
| U | Reload | Shift+R |
| 2 | Desktops | • |
| 3 | GoogleEarth link | Ctrl+M |
| R | Load Reference lap | |
| F R | Save as Reference lap | |
| | Store GAP table of current lap | |
| | Export (Alt+E) | ٠ |
| | Live export | |
| P | Screen export | |
| 1/A | Cut measurement | • |
| V/A | Restore original lap times | |
| 8::- | Restore original section triggers | |
| | Comment | Alt+Q |
| | View Spec | Alt+V |
| | 0 C:\RaceData\Jerez.14\2DLK03 | |
| | Exit | Alt+X |

- **Load measurement of event:** Shows a browser of measurements inside the current event
- Load measurement: Shows a browser of measurements together with a directory tree
- Load measurement by plugin: Loads a measurement through an import plugin
- **Overlay lap:** List of lap times of current measurement to overlay another lap
- **Remove active measurement:** Unloads the currently active measurement
- Exchange measurement: Replaces the active measurement with another one which can be selected in a browser
- **Reload:** Forces reloading of the active measurement to re-initialize it
- **Desktops:** Save/load/delete desktop settings
- **GoogleEarth link:** Creates a KLM file to use with GoogleEarth
- Load Reference lap: Load a previously saved reference lap
- Save as Reference lap: Save the current lap of the active measurement as reference lap
- Export: Exports measurement data partially or completely in different formats
- **Live export:** Create compressed .exe file containing Analyzer together with measurement
- **Screen export:** Exports visible channels inside the current selection and compress them in a zip
- Cut measurement: Trim off parts of the measurement
- Restore original lap times: restores recorded lap times
- Restore original section triggers: restores recorded section triggers
- Comment: Editor to quote (enter a comment of) the active measurement
- View Spec: shows the measurement's SpecSheet
- 0-9: History list of previously loaded measurement files
- **Exit:** Terminates the Analyzer program



1.1.2 The "Functions" item of the main menu



- Laps: Shows a window containing the lap times of the current loaded measurements
- Section times: List of section times of the current loaded measurements
- User defined markers: Shows a list of the measurement's user defined markers
- **Circuit:** Small track map window with current selection highlighted
- **Multi circuit:** Starts a window with the GPS map on a Google Earth background
- **Track mode:** Detailed track map with inscription of channel values
- **XY Plot:** 2-dimensional representation of the relation between two channels
- **Min/max table:** List of minimum, maximum and average values of channels lap by lap
- **Histogram:** Statistics of a channel with various split conditions
- Spectral analysis / FFT: Fast Fourier transformation analysis of a channel
- Data window: Define an additional data window
- Status bits: function to "decode" status bits of channels
- DIAG Bit Maps: Indicates a map of the used bits for diagnosis
- Dynamic test: Start a dynamic test
- **Rainflow:** The rainflow-counting algorithm (also known as the "rain-flow counting method") is used in the analysis of fatigue data in order to reduce a spectrum of varying stress into a set of simple stress reversals. Its importance is that it allows the application of Miner's rule in order to assess the fatigue life of a structure subject to complex loading.
- Merge 2 measurements: combine two measurements to one
- Video: Additional module for playing video
- **GPS:** several functions for GPS lap and section triggers
- Print report manager: Management and usage of printing reports
- Measurements: Channel settings editor
- Active measurement: Set one of the loaded measurements the active one
- Swap measurements: Swaps the loaded measurements
- **Measurements visible:** Toggle visibility of the channels of a measurement inside the Moving window
- **Calculation files:** Manage cal-files in different folders to run the 2D CalcTool on
- Run cal file (software folder): Show list of cal-files in Race folder to run 2D CalcTool on
- Run AutoCalc: Calculates all cal-files listed in the AutoCalc Configurator
- Math files: Call the MatLab interface
- Scripts: Starts a window to create/edit scripts
- Run script: Shows a list of available scripts
- Spec sheet: Run the SpecView program to show the spec sheets of the loaded measurements
- Formula editor: Starts the formula editor
- Screen shot: Takes a shot of the actual screen



1.1.3 The main menu item "View"



- **Dark background scheme:** Apply colors to currently opened Analyzer windows with a dark background color
- Use template colors: Apply a color template to currently opened Analyzer windows

1.1.4 The main menu item "Measurement"

- Measurement Settings Wizards Plugins Se Linked V N Measure Space Measure (active run) Enter Measure (active special) Shift+Enter S V(s) Distance plot V(t) Time plot Т 9 Previous selection BkSp D Zoom Alt+Z 💮 Zoom full lap Shift+Home Doom full section Shift+Ctrl+Home Jump to lap start Home Ξ Previous lap PgUp + Next lap PgDn P Jump to fastest lap Ctrl+Home N/A Synchronize Ctrl+S N/A Synchronize lap triggers N/A Shift lap triggers by distance ##: Phases definition Shift+P 896) -Show phases Ρ 675 Go to previous phase Alt+Left Go to next phase Alt+Right
- Linked: Several loaded measurements are moved together in the Moving window
- **Measure:** Activate the measuring mode and show the channel values at the mouse cursor position
- **Measure (active run):** Special measuring mode which shows only the active measurement in channel colors
- **Measure (active special):** Very special measuring mode which shows the active measurement in channel colors and the other measurement in measurement colors
- **Distance plot:** Show channel values curves over distance in meters
- **Time plot:** Show channel values curves over time in seconds
- **Previous selection:** Return to previous range selected in the Moving window
- **Zoom:** Editor to zoom in/out the selection visible in the Moving window
- **Zoom full lap:** Show the current complete lap in the Moving window
- **Zoom full section:** Show the current complete section in the Moving window
- Jump to lap start: Moves the selection to the start of the current lap
- Previous lap: Jump one lap back
- Next lap: Jump one lap forward
- Jump to fastest lap: moves the selection to the start of the fastest lap
- Synchronize: Align the other measurements to the active one to achieve the same lap position



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- **Synchronize lap triggers:** Temporarily adjust lap trigger offset to active measurement in case of different lap trigger sender positions
- Shift lap triggers by distance: Shifts the lap triggers by distance
- **Phases definition:** Phases are used to filter data before applying a data analysis function. A phase definition is a set of rules related to channel value, laps selection, distance or duration.
- **Show phases:** display on the overview window in red the locations where the rules that defines phases are fulfilled.
- **Go to previous phase:** A phase is an uninterrupted portion of signal where the rules that define phases are fulfilled. Go to the previous phase means going to the previous uninterrupted portion of signal where the rules that define phases are fulfilled.
- Go to next phase: see go to previous phase

1.1.5 The main menu item "Settings"

| Setti | ngs Wizards Plugins Tuti | Language: Select language from German, English, French, Italian Spain and Japanese |
|---|--|--|
| 1 1 | Language User management Switch user | User management: Administration of separate user settings with individual options and channel settings Switch user: Option to switch the user, if you have the Multi-User functionality |
| Q | Change password | Change password: Each user can supply a password which will be prompted for at login |
| ÷. | Special channels Shift+S | Special channels: Assignment of measured channels to predefined functionalities |
| Ľ | Track | • Track: Administration tools for the track of the current event |
| | Video time shift | Video time shift: Offset of the video file to the start of the measurement |
| ø | Templates | Templates: Administration of the available templates Track mode settings: Administration of the existing Track |
| 2 | Track mode settings | mode setting files |
| | XY-Plot settings | XY-Plot settings: Administration of the existing XY-Plot setting files |
| | Min/max table settings | Min/max table settings: Administration of the existing Min/max table setting files |
| | Histogram settings | Histogram settings: Administration of the existing Histogram |
| 1 | FFT settings | setting files |
| | Export settings | FFI settings: Administration of the existing Spectral analysis/FFT setting files |
| 5 | Print manager settings | Export settings: Administration of the existing Export setting files |
| Ĩ | Printer setup | Print manager settings: Administration of the existing Print manager setting files |
| | Export of settings | Printer setup: Options of the currently active printer |
| È | Import of settings | Export of settings: Function to export settings of the current user to import them somewhere else |
| 1 | Options F9 | Import of settings: Function to import user settings |



1.1.5.1 Special channels



Special channels are defined by assigning special meaning to recorded channels. There are fixed and user defined special channels. Fixed channels are needed by Analyzer whilst both types may be used in cal-files by typing the @ identifier.

| V Front | | | |
|---------------|-----------|---------|------|
| Temp BB | | | ~ |
| Throttle | | | 1923 |
| T_Air | | | |
| T_eng | | | |
| T_eng_V | | | |
| T_Water | | | |
| T_WaterDA | | | |
| T_wheel | | | |
| used_Gas | | | |
| ValidSat | | | |
| Vext | | | |
| V_DRV | | | |
| V_Front | | | |
| V_GPS | | | |
| V_Rear | | | |
| V_Sat | | | ~ |
| Speed search: | Tune to f | ilter l | |

Fixed special channels: Analyzer needs information about certain channels for example to calculate the distance from speed or feed the chassis module.

| Fixed User defined | |
|--------------------|-------------------|
| Special channel | Your channel name |
| Int_Speed | V_Front |
| Drive_RPM | RPM |
| Drive_Speed | V_Rear |
| Slip | < |
| Gear_Nr | \diamond |
| Throttle | Throttle |
| E_Throttle | \diamond |
| Front_Susp | Susp_F |
| Rear_Susp | Susp_R |
| Front_SuspRight | < |
| Rear_SuspRight | \diamond |
| Acc_Lat | \diamond |
| Acc_Lon | A_Lon_GPS |
| Banking | \diamond |
| GPS_Longitude | Longitude |
| GPS_Latitude | Latitude |
| GPS_Altitude | \diamond |
| GPSValid | GPSValid |
| Brake_Front | \diamond |
| Brake_Rear | \diamond |
| Steering_Angle | < |
| Yaw_Rate | \diamond |
| Mileage_Speed | V_Front |
| | Close 💡 |



User defined special channels: Assignment of recorded channel to a free defined special channel.

| | | Special chann | els | | |
|-------|--------------|-------------------|-----|-------|---|
| ixed | User defined | | | | |
| Speci | al channel | Your channel name | | | 1 |
| MyCh | annel | Spin | | | |
| | | | | | |
| | | | | | |
| | | | | | |
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| | | | | | |
| | | | | | |
| 1 | + Insert | The Remove | | | |
| | | | | Close | 6 |
| | | | | | |

1.1.5.2 Track

| M Track | 🔰 🖄 Assign track map |
|---------|------------------------|
| | Yrack settings Shift+1 |
| | B:: Sections |
| | M Track segments |

Assign track map



Choose the correct track map to your event.



Track settings

| 1 | Track settings |
|--------------------------------|-------------------|
| | Jerez.14 |
| Track | |
| ✓ Calculate GPS map if availab | le |
| Event measured on a closed | circuit |
| Track length [m] | 4488 🏒 |
| Tolerance [%] | 3,0 🛃 |
| | 4353m - 4623m |
| | |
| Track mode markers | |
| Marker meter range [m] | 5 🏒 |
| Min segment distance [scans] | 20 🏂 |
| | 0.0125 sec |
| | |
| | |
| | 🥒 Ok 🛛 🖌 Cancel 🖉 |

Dialog to manage event specific track settings

Calculate GPS map if available: If checked the software will look for channels named "Longitude" and "Latitude", and -if available- generate the track map from them. To filter out invalid GPS data a channel named "GPSValid" will be used to mark the valid data (0=invalid, 1=valid).

Event measured on a closed circuit: If checked all lap-specific logic will be applied like LapChecker wizard, offset detection, segment detection.

Track length & tolerance: Laps whose lap length (= integrated speed) differs more than the |Tolerance| are treated as invalid or incomplete laps.

Track mode markers: Settings for markers

Markers whose position differs at most from the "Marker meter range" value are placed at the same position than the driver.

The "Min segment distance" determines whatever marker are created or not. Min/max markers which are closer to the segment edge than the "Min segment distance" value are not created.

Sections

Overview of the section times of each loaded measurement lap by lap. The sum of the best section times gives an idea of a possible ideal lap time.

• Track segments

Editor to manage the track segments (straights and corners) of the current event. Track segments normally are detected and inserted automatically. Segment names may be edited by the user.





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• Detect track segments

Track segments are detected and saved automatically each time when the fastest lap time of a loaded measurement is more than 3 seconds faster than the previous one on which segments have been detected. This feature shall ensure correct straight and corner detection when track conditions like weather have changed substantially.

Running this function manually will cause re-detecting segments. This is useful if the segments list obtained automatically is not valid or inaccurate. If the detection did not find all desired segments the user can insert or modify them manually in the track segments editor or in the Moving window.

• User defined markers

User defined marker can be set by a left click on the Details windows (Moving window)



Select the menu item Add to Add a user defined marker.

User define markers can be managed (deleted or their name changed) from the main menu Function \Rightarrow User defined markers

| 🔏 User defined marker | s | _ | | × |
|-----------------------|---------|-----------|---------------|-----|
| 🛛 🗖 🖾 😭 🦻 | | | | |
| User defined marker | Lap | s Lap | Time | Г |
| User marker1 (aj) | 2 | 28.615 se | 12:33.227 min | |
| User marker2 (aj) | 2 | 1:05.486 | 13:10.098 min | |
| User marker3 (aj) | 2 | 1:22.061 | 13:26.673 min | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| ļ | | | | |
| KIT_SBK_Demo S | BK_Demo |) | | 11. |

1.1.6 The main menu item "Wizards"

| Wiza | rds | Plugins | Tutorials | Help | | |
|-------|-----|----------------------|------------|------|--|--|
| | Gea | ar calculat | ion | | | |
| 8 | Cre | ate track r | map | | | |
| SZ De | | etect track segments | | | | |
| 🙆 Tir | | re perimeter | | | | |
| 82 | Lap | checker (| auto mode |) | | |
| 82 | Lap | checker (| expert mod | e) | | |

- Gear calculation: Calculates a gear channel out of RPM and speed or using a gear box sensor channel
- Create track map: Generates track map out of either speed + lateral acceleration or GPS coordinates
- Detect track segments: Automatic track segment detection
- **Tire perimeter:** Wizard to recalculate speed by changing tire perimeter and/or impulses
- Lap checker: Wizard to check track length and lap triggers



1.1.7 The main menu item "Plugins"



2D External Functions

🖳 2D Video Functions

- 2D Utilities
- 😤 2D Track channels

Save current desktop layout

Show measured data over distance

Perform grouping of channels

Show phases in Moving window

Show Time Diff (win or loss)

Display a Track mode

Tutorials Help

?

?

?

?

?

?

- 2D Text reader: ASCII/CSV import •
- 2D Excel reader: Excel import •
- 2D RPC III reader: RPC 3 import
- 2D Filters (#selectedChannel): filter function for the selected channel
- 2D External Functions: online mathematical channel calculation •
- 2D Utilities: additional tools
- 2D Video Functions: function to link a video to the measurement
- 2D Track channels: creation of segments by channel data

1.1.8 The main menu item "Tutorials"

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- Save current desktop layout: Shows how to store a template containing the current windows Show measured data over distance: Shows how to switch to distance plot
 - Perform grouping of channels: Guide to managing and showing channel groups
 - Show Time Diff (win or loss): Explanation how to display • win/loss channel
 - Display a Track mode: Guide for displaying a detailed track • map
 - Show phases in Moving window: Explanation how to setup and highlight logical phases

1.1.9 The main menu item "Help"



- Help: Show online help about the 2D software modules
- Shortcut keys: List of available keys in the Analyzer •
- Show hints: Show Tips close to mouse cursor in certain windows
- What's new ?: List of changes since the last software version
- Glossary: Index of common used terms •
- FAQ: List of frequently asked questions with answers and tips
- 2D-Datarecording Homepage: Opens Internet browser with the 2D homepage
- Mail to 2D-Datarecording: Opens the mail client with an • empty mail to 2D
- About: Shows a version and system info window

Toolbar buttons 1.2

- File functions are functions to load and modify 2D measurement files •
- Basic analysis functions include Moving and Overview windows and lap times
- Advanced analysis functions include Track mode, XY-Plot and Min/max table
- Visibility of channels in the Moving window can be switched individually, group wise or via areas
- Other functions accessible via toolbar buttons are Window list, Options Dialog and Templates
- The measurement functions include commands to view the measurement(s) in different ways



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1.2.1 File functions



- ➢ Load measurement: Shows browser of measurements together with a directory tree
- Overlay lap: List of lap times of current measurement to overlay another lap
- Remove active measurement: Unloads the currently active measurement
- 3 Exchange measurement: Replaces the active measurement with another that can be selected in a browser
- **U** Reload: Forces reloading of the active measurement to re-initialize it

1.2.2 Basic analysis



- E Overview: Shows the Overview window of the active measurement
- Moving: Shows and activates the Moving window
- Laps: Shows a window containing the lap times of the current loaded measurements
- MultiCircuit:

1.2.3 Advanced analysis



- Track mode: Detailed track map with a graphical display of channel values through color variations
- XY-Plot: 2-dimensional representation of the relationship of two channels
- Min/max table: List of minimum, maximum and average values of channel lap by lap
- Histogram management
- FFT management

1.2.4 Channel visibility



- Channel settings editor / Switching of the visibility of channels in the Moving window
- Schannel group editor / Switching of the visibility of channel groups in the Moving window
- Switching of the visibility of areas containing channel groups in the Moving window

1.2.5 Other functions

| 🥪 • 😵 | - ≡ - 🚰 🚯 <0verview> 🛛 🗞 🕍 V(s) V(t) 匀 🔎 💬 🖳 🖃 ≡ |
|------------|--|
| 5 | Window list: Toggle visibility of the Window list which offers access to common functions |
| 13 | Options: User defined options of the current user |
| <0verview> | Templates: List of available Analyzer desktop schemes with a function to save the current desktop |



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1.2.6 Measurement Functions

| 📚 • 🐵 • \॑ • \ | 🗞 🕍 V(s) V(t) | 5 | PD | P = | • |
|----------------|---------------|---|----|------------|---|
|----------------|---------------|---|----|------------|---|

- Several loaded measurements are moved together in the Moving window Several loaded measurements are moved together in the Moving window
- Measure: Start/stop measuring mode to show the channel values at the mouse cursor position
- V(s) Distance plot: Show channel values curves over distance in meters
- V(t) Time plot: Show channel values curves over time in seconds
- Previous selection: Show previous selection in Moving window
- Zoom: Editor to zoom in/out the selection of the time/distance range for which the signals are displayed in the Moving window
- Discrete Show the current complete lap in the Moving window
- Iump to fastest lap: Move the selection into the fastest lap of the measurement
- Previous lap: Jump one lap back
- Next lap: Jump one lap forward
- Synchronize: Align the other measurements to the active one to achieve the same lap position



2 Program modules

2.1 Overview window

Quick overview of complete measurement

Each loaded measurement in Analyzer is displayed in a separate Overview window. In the Overview window the measured values of certain channels are shown. The position of the lap triggers (vertical lines) are also displayed. Below the lines slightly at the right, the lap numbers are indicated. The lap trigger is the position where the lap start.

The position of the time interval selection in the Overview window of the signals visible in the Moving window is marked inside the Overview window by a rectangle. You can move this rectangle with the mouse easily. If you press the <Ctrl> key simultaneously you can change the size of the rectangle - so will see a higher fragment inside the moving window of the current measurement.

2.1.1 Functions accessible by right clicking

2.1.1.1 *Print*

- The standard Print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data from SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager open a windows with additional printing options.



Before printing the background color of the window changes to white color to save printer ink. This option can be changed in the Analyzer Options Dialog.

| | riope | | | | | | | | | |
|---|-------|--|--|--|--|--|--|--|--|--|
| Layout Colors | | | | | | | | | | |
| Display | | Iptions | | | | | | | | |
| <u> S</u> lider ✓ Sta <u>t</u> us bar | E | ✓ Lap triggers | | | | | | | | |
| ✓ Status bar Header panel | E | Sections | Segments Segments Corner numbers Corner names Vertical lines | | | | | | | |
| | E | 🗹 Lap time | | | | | | | | |
| | E | Lap times vertical Lap starts in measurement color | | | | | | | | |
| | l I | | | | | | | | | |
| | 6 | 🗹 User defined marke | ers | | | | | | | |
| | | User defined marke | er names | | | | | | | |
| | / Ok | Y Cancel | ri≫ Applu | | | | | | | |

2.1.2 Properties

The properties editor includes options for changing how the Lap triggers, Segments, Sections and the Color scheme of the window look like.

The properties are stored in the current Template which may be saved to disk to make the modifications permanent.

The color page in the properties editor is only available when template colors are used.



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2.1.3 Keys

| Shortcut / Mouse | Action |
|---|-------------------------------|
| Mouse: Left button | Offset moving |
| Mouse: Double click | Activate moving window |
| <1> - <9> | Activate measurement |
| <alt> + <1> - <alt> + <9></alt></alt> | Show overview |
| <ctrl> + <home></home></ctrl> | Fastest lap |
| <shift> + <home></home></shift> | Entire lap |
| <f11></f11> | Maximum / Restore window size |

2.2 Moving window

Precise comparison of several measurements including measuring functions

All loaded measurements in Analyzer are displayed together in the Moving window. In contrast to the Overview windows, the Moving window is able to show a zoomed in part of the measurement. This allows precise overlaying of measurements for comparison purposes.



The interval for which the signals are displayed in the Moving window is visualized through a rectangle in the Overview windows.

2.2.1 Functions accessible by right clicking

2.2.1.1 Add area

The Moving window can be split vertically to display additional sub windows (areas) which each contains channels of another group. The sub window can be suppressed by right clicking and selecting the Edit area menu item.

The visible areas are stored inside the current Template.

2.2.1.2 *Measuring mode*

A functionality of the Analyzer which shows physical values of channels at the mouse position in a small extra window.

| | Ŧ | Demo |
|-----------|--------|---------|
| Lap | Δ | 2 |
| 8 | Ξ | 1:42.60 |
| Time tot. | | 3:56.48 |
| m total | | 7957 |
| Time Lap | | 0:05.44 |
| m Lap | | 313 |
| V_front | [Km/h] | 182.55 |
| RPM | [rpm] | 9705.00 |
| V_rear | [km/h] | 162.7 |
| Throttle | [%] | 0.2 |

Available are 3 fundamental different measuring modes:

- Channel local measuring mode <Measure> menu item
 A click on <Measure> menu item displays the channel data at a given time in the same colors
 as in normal Moving mode.
 It is started with mouse double click in the Moving window or <Space> key. It is stopped with
 mouse double click in the Moving window or <Space> key.
- Local values determination of active measurement < Measure (active run)> menu item A click on < Measure (active run)> displays only the channel values of the active measurement in the individual channel colors.



It is started with <Enter> key and is stopped with mouse double click in the Moving window or <Enter> key or <Esc> key.

• Extended local value determination of the active measurement <Measure (active run)> menu item

A click on <Measure (active run)> displays the channel curves of the active measurement in the individual channel colors along with the other measurement channels values in their colors. It is started with <Shift> + <Enter> key. It is stopped with mouse double click in the Moving window or <Shift> + <Enter> key or <Esc> key.

During the local measuring mode all Analyzer functions are available, i.e. it is possible to change the selection, to load or remove a measurement.

The local values window shows the measured value of each channel at the mouse position.

Either the values of the visible channels or the values of all channels are shown. You can toggle both modes by clicking on the black double arrow in the upper left cell.

With more than one measurement loaded there is a function to show not only the absolute physical channel values but the relative channel values of the other measurements compared to the first measurement. You can toggle both modes by clicking on the black triangle symbol on the left in the second row.



Clicking on a channel name as well as double clicking a measured value toggles the visibility of the channel. Clicking a measured value makes this channel active. Holding down the mouse button lets the channel's curve blink inside the Moving window to help identification.

2.2.1.3 **Print**

The standard print function simply prints the content of the selected window.

The Print via Excel function embedded the selected window into a chosen Excel sheet together with data from the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.

Print via print manager starts a window with additional printing options.



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer Options Dialog.

2.2.1.4 Visibility of measurements

A loaded measurement can be made invisible. This helps focusing on another, visible measurement in the Moving window. Measurement m is made invisible by pressing <Ctrl> + <M> where "M" stands for the measurement number.

Example:

2 measurements are loaded. In the Moving window all channels of measurement 1 are red, all channels of measurement 2 are blue. Now measurement 2 is made invisible (<Ctrl> + <2>). The channels of the remaining visible measurement 1 are displayed in their individual channel colors. Pressing <Ctrl> + <2> once again makes measurement 2 visible again to show both measurements in their measurement colors.

2.2.2 Properties editor

The properties editor (<Ctrl> + <P>) includes options for changing how the lap triggers, segments, sections and the color scheme of the window look like.



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The properties are stored in the current Template which may be saved to disk to make the modifications permanent.

The tab "Colors" in the properties editor is only available when template colors are used.

| <u>a</u> | Prope | erties of Mov | ring | | × |
|----------------------|---------------|---------------|---------|----------|-----|
| Layout Colors | | | | | |
| Colors | | | Preview | , | 1 |
| <u>C</u> olor scheme | Standard dark | | | | |
| Background | | | | | |
| Scaling | | | | | |
| Lap start | | | | | |
| Sections | | | 1.55 | 1:35.37 | .84 |
| Lap time | | | | | |
| Standard | | | | | |
| Fastest | | | | | |
| In/out lap | | | 6 | 100 | ş |
| | 4 71 | | | | |
| | V UK | 👗 Cancel | | IS Apply | |

2.2.3 Channel colors

The color editors of measurement can be accessed by pressing $\langle F9 \rangle$ or from the main menu (Settings \Rightarrow Options).

| | | | | Options |
|-------------|-----------------|-----------|--------|--|
| General F | Program start | File load | Colors | Key assignment Effects |
| Measurem | nents | | | |
| | | | | Rider colors |
| Measureme | ent 2 | | | Colors, if .MES name contains character: |
| Measureme | ent 3 | | | |
| Measureme | ent 4 | | | |
| Measureme | ent 5 | | | |
| Measureme | ent 6 | | | |
| Measureme | ent 7 | | | |
| Measureme | ent 8 | | | |
| Measureme | ent 9 | | | |
| Print | | | | |
| 🔽 Overvi | ew: white back | ground s | cheme | |
| Moving | g: white backgr | ound sch | eme | |
| Color of wh | nite channels | | | |
| ▼ XY-Plo | t: use white ba | ckground | | |
| ▼ Track | mode: use whit | e backgr | ound | |
| Circuit: | use white bac | kground | | |
| FFT: u | se white backg | round | | |
| | olors | | | |
| Channel c | | | | |



With one measurement visible, the channel curves are displayed in their individual channel colors. When several measurements are visible in the Moving window then each measurement's channels are displayed in the measurement's color, e.g. measurement 1 is red, 2 is blue and so on.

2.2.4 Keys

| Shortcut / Mouse | Action |
|--|-----------------------------------|
| Mouse: Left button | Offset moving |
| Mouse: Double click | Start measuring mode |
| <\$> | Change to Distance plot |
| <t></t> | Change to Time plot |
| <1> - <9> | Activate a measurement |
| <alt> + <1> - <alt> + <9></alt></alt> | Show overview |
| <ctrl> + <home></home></ctrl> | Fastest lap |
| <shift> + <home></home></shift> | Entire lap |
| <f11></f11> | Maximum / Restore window size |
| - MOVING MODE - | |
| <space></space> | Start measuring mode (all) |
| <enter></enter> | Start measuring mode (active run) |
| <shift> + <enter></enter></shift> | Start special measuring mode |
| - MEASURING MODE - | |
| Mouse: Left button | Set marker |
| Mouse: <ctrl> + left button</ctrl> | Choose active channel |
| Mouse: Left button in measuring values | Choose active channel |
| Mouse: Left button on channel name in measuring values | Toggle channel' s visibility |
| Cursor left / right | Scroll through time or position |
| <ctrl> + cursor left</ctrl> | Set left marker |
| <ctrl> + cursor right</ctrl> | Set right marker |
| <space></space> | Stop measuring mode |
| <esc></esc> | Stop measuring mode |
| < 10 > | Toggle active channel |

2.2.5 Examples

The following are some 'step-by-step' instructions to help new 2D users to master some common operations in the Analyzer software. Most of these can also be found in the context-sensitive help files, but here we can go into a little more detail.

Rate of Change Measurement – to individually check the amount of change in a channel over a specific time.

This function is often used to check deceleration rate on braking (V_Front over time), front or rear suspension piston speed (F_Sus or R_Sus over time). In this example, we will check the rear shock piston speed, so we can determine the piston speed range to make the appropriate damping adjustments:

- Load the rear suspension channel in Analyzer screen; Main menu *item "Functions / Measurement / Channel"* or "Channels" icon in toolbar or shortcut "Alt + U", and then Left-click on the channel name to select the rear suspension channel (called Rear Shock, in this example using the Bike.97 demo data).
- In Moving Mode (the default mode when you first open Analyzer), move the Analyzer screen view to the point on the track you are interested in (move it with Up Down or Left Right arrow keys or L-click-and-drag with the mouse). In the example we have chosen the first chicane after the start-finish on the fastest lap (choose fastest lap by clicking on the "Trophy" icon on the toolbar).



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- Start the Measuring Mode by pressing the "Space bar" or main menu item "Measurement / Measure" or "Measure" icon in toolbar. The screen has gridlines and a cursor now, and remember that the last channel you loaded (in this case, Rear Shock) is the one that the cursor will follow. If you want the cursor to follow another channel, Left-click once on the numerical value displayed for that channel in the small pop-up Measuring Values window (careful! L-click on the channel name removes that channel from the screen).
- Choose the area you are interested in and use the mouse or Left Right arrow keys to place the cursor on the appropriate point of the graph and L-click. In the example we are concerned about the rear rebound speed as the bike changes direction. So the cursor is positioned on the peak just before the rear suspension becomes almost fully extended, and then L-click once which will display a vertical line through that point, with the Rear Shock channel value written near the bottom (in this case, 21.9 mm). See the next figure below.



Rate of change measurement: Selection of the starting point.

Move the cursor to the next minimum peak and L-click again. The two points you clicked are displayed with vertical lines through them and their values noted on the bottom of the screen (in this case 21.9 mm and 0.2 mm). See the next figure below.



Rate of change measurement: Selection of the ending point.



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Along the top of the screen is displayed the channel name, the time interval between the two points, the distance between the two points, and d/dt which is the average speed over that distance, in mm/sec. That is, Rear Shock speed at that point. So, in our example the channel Rear Shock has moved a distance of -21.69 mm over 0.403 sec, giving an average shock piston speed of -53.89 mm/sec for that movement. Note that the Shock distance and speed are negative numbers because we are measuring in the rebound direction.

Maybe the original problem we were looking at was the difficulty in changing direction at this chicane, and from this data we conclude that this rebound speed is too slow, making the bike pitch too slowly. So we want to adjust the rear rebound damping, and now we can refer to the damping charts knowing which speed range to make the adjustments in.

Please ensure that you are dealing with the same units when referring to your suspension damping charts; many damping charts are in m/sec, whereas the Analyzer measure mode numbers above are in mm/sec; the rebound speed shown here of -53.89 mm/sec will often be shown on a damping chart as 0.054 m/sec.

Also understand that this is one specific measurement only, you should be checking many points on many laps before coming to a conclusion about adjustments.

2.3 Circuit

Map of track with information about current selection

The circuit window shows the track map with the current selection of the active measurement highlighted. The circuit window is displayed or hidden by pressing <C> or from the main menu (Functions \Rightarrow Circuit).



2.3.1 Functions related to the circuit window

i

You can start all functions from the context menu. To show this menu, click with the right mouse button at the small circuit window (default: right bottom corner)

| Ľ | Assign track map | |
|----|-------------------------------|---------|
| 26 | Create track map | |
| 8 | Track settings | Shift+T |
| Q | Rotation | |
| | Save into MyCircuits | |
| | Clipboard | Ctrl+C |
| R | Export as Enhanced Meta File | |
| 8 | Print | |
| 8 | Print via Print manager | + |
| \$ | Properties | Ctrl+P |
| | Opacity | |
| Þ | Switch border style | Ctrl+B |
| | Save properties of this windo | w to 🕨 |
| 8 | Help | F1 |
| | Close | |

• Assignment of track map to the current event

Choose the track map for your event.



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• Create track map

Generates a new track map out of either speed + lateral acceleration information or the GPS coordinates

• Track settings

| | Track | settings | × |
|-----------------------|---------------------|----------|---|
| | B | like | |
| Track | | | |
| Calculate GPS ma | ap if available | | |
| I Event measured of | on a closed circuit | | |
| Track length [m] | | 3822 | |
| Tolerance [%] | | 3.0 | |
| | 3707m | - 3937m | |
| Track mode markers | | | |
| Marker meter range [r | n] | 20 🍾 | |
| | | | |
| Min segment distance | ·[scans] | 20 74 | |

Dialog to manage event specific track settings

Calculate GPS map if available: If checked the software will look for channels named "Longitude" and "Latitude", and if they are available generate the track map from them. To filter out invalid GPS data a channel named "GPSValid" is used (0=invalid, 1=valid).

Event measured on a closed circuit: If checked all lap-specific logic will be applied such as LapChecker wizard, offset detection, segment detection.

Track length & tolerance: Laps whose lap length (= integrated speed) differ more than |Tolerance| compare to the Track length are treated as invalid or incomplete laps.

Track mode markers: Control the position of markers in the track map

Marker meter range: Markers whose position differs at most this value from user position are placed to the same position

Min segment distance: Min/max markers which are closer than this value to the segment edge are not created



• Export and printout

The Circuit map graphic may be exported and printed in several ways:

- Clipboard: Circuit is copied in Windows Clipboard using EMF vector format
- Export as Enhanced Meta File: Circuit is saved to disk in EMF vector format
- Print: High-quality print fitting the print page with circuit inner/outer line
- Print via Print manager: Fully-featured print layout module

2.3.2 Properties

The Circuit window's editable properties include selecting the color of the background, track, selection, sections, etc.

The size of the position circles inside the Circuit window can be adjusted in addition.

| | Circuit properties |
|--------|---|
| Layout | Options Positions circle size ✓ Show Ilag ✓ Segments ✓ Corner numbers |
| | Ok Cancel IDP Apply 9 |



Options for displaying start/finish flag, segment, borders and corner numbers are also set in this windows.

2.4 Channels

Editor of channel settings

The channel editor is accessible from the main menu under Function \Rightarrow Measurement \Rightarrow Channels. Each sensor whose data have been downloaded results in a channel in the current measurement.

Additional channels can be calculated by using calculation files (*.cal).



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| deas | irement | | | | | | | | | | | | | | | | |
|-------|---------------------|---------|--------|---------|--------|--------|-------|-------|--------|-----|------|----------|--------------|-------|----------|-------|----|
| 82 | 1 Demo | | | | • | 400 | Hz | V3 | Demo. | MES | | | | | | | |
| Chanr | iel names | | - Ch | annel t | vpes - | | | | | | | | | | | | |
| peed | search: | | Di | gital | Γ N | Analo | Г | M. | Can Ir | Гf | H | Calc 🗆 🔳 | Virtual [| - 🖌 | | | |
| hann | els Groups | | | | | | | | | | | | | | | | |
| Chan | nels | | | | | | | | | | | | | | | | |
| le JL | Channel | Visible | Scalin | Overs | Lower | Unner | Color | Reduc | All | Kau | Har | Start | Buler/Alarr | Color | Arranged | Prio | 1 |
| | TILV front [Km/h] | VISIDIC | V | V | 0.00 | 300.00 | | AVG | | Noy | 25 | - Curr | Traicivisium | COIO | Left | 1 110 | ·ľ |
| - | 10 BPM (rpm) | 5 | 1 | 1 | 0.00 | 14000 | | AVG | | | 100 | - | | | Left | | |
| | ¶∏ V rear [km/h] | 1 | | 1 | 0.0 | 300.0 | | AVG | Ē | - | 25 | | | | Left | | |
| - | קה Throttle [%] | 1 | 1 | 1 | -10.0 | 110.0 | | MIN | Ē | | 25 | • | | | Left | | 1 |
| | TIL Front Fork [mm] | 101 | | | 0.0 | 140.0 | | AVG | | 1 | 100 | | | - | Left | | |
| - 10 | TI Rear Shock [mm] | 1 | | | -3.0 | 35.0 | | AVG | | | 100 | | | | Left | | |
| | ղը Deto#1 [%] | | | | 0.0 | 40.0 | | AVG | | | 100 | | | | Left | | |
| | AA, Deto#2 [%] | | | | 0.0 | 40.0 | | AVG | | | 100 | | | | Left | | |
| L. |]] ExTemp#1 (°C) | | | | 70.0 | 850.0 | | AVG | | | 25 | | | | Left | | |
| - 21 | ¶][ExTemp#2[*C] | | | | 70.0 | 850.0 | | AVG | | | 25 | | | | Left | | |
|) | ባቢ Press#1 (%) | | 1 | | 0.0 | 100.0 | | AVG | | | 100 | | | | Left | | |
| Ê. j | 1, Press#2 [%] | | 1 | | 0.0 | 100.0 | | AVG | | | 100 | | | | Left | | |
| 2 | ¶Л Head#3 [°C] | | 1 | | 50.0 | 67.0 | | AVG | | | 12.5 | | | | Left | | |
| 3 | Speed_lo [Km/h] | | 1 | | 55.0 | 300.0 | | AVG | | | 25 | | | | Left | | |
| | Bike_Acc [m/s²] | | 1 | | -18.0 | 13.0 | | AVG | | | 25 | | | | Left | | |
| 5 | RPM_SFT (rpm) | | 1 | | 0.0 | 14000 | | AVG | | | 100 | | | | Left | | |
| 5 | GearSpeed [KMH] | | 1 | | 100.0 | 340.0 | | AVG | | | 25 | | | | Left | | |
| 7 | Gear' [KMH/s] | | 1 | | -1.2 | 10.0 | - | AVG | | | 25 | | | | Left | | |
| 3 | Gear_Hamm' [KMH/: | | 1 | | -900.0 | 1100.0 | | AVG | | | 25 | | | | Left | | |
|) | MAX_G_rpm [KMH/s | | 1 | | 7000 | 15500 | | AVG | | | 25 | | | | Left | | |
|) | ACC_RPM [%] | | 1 | | 0.0 | 14000 | | AVG | | | 25 | | | | Left | | |
| | Gear_Nr (KMH) | | | | 0 | 6.3 | | AVG | | | 25 | | | | Left | | |
| 2 | Gear2Nr [KMH] | | 1 | | 0.0 | 7.0 | | AVG | | | 25 | | | | Left | | |
| 3 | FSus_lo (mm) | | - | | -1.0 | 135.0 | | AVG | | | 100 | | | | Left | | |
| 1 | RSus_lo [mm] | | 1 | | -2.5 | 65.0 | | AVG | | | 100 | | | | Left | | |
| ō | 📰 FSus_hi (mm) | | 1 | | -1.0 | 135.0 | | AVG | | | 100 | | | | Left | | |
| 0 | DC.n hilmml | | 1 | | 36 | CE O | - | AV/C | | | 100 | | | | 4~1 | | |
| | | | | | | | | | | | | | | | | , | U |

1

The Analyzer adds virtual channels which are calculated from channel containing measured values. Each channel has its own settings which can be edited. Channels can be grouped. For example a group of channels can be assigned to the engine, or the suspensions.

| 2.4.1 | Editable settings in the table of the channel editor |
|-------|--|
| | |

| Table column | Function |
|------------------------------|--|
| Visibility | Switch channels on/off |
| Scaling | Show scaling beside the channel curves |
| Color | Individual channel color |
| Limits | Lower and upper limits for physical channel values |
| Autoscale for limit | Automatic calculation of suitable limits |
| Dynamic autoscale for limits | Limits are calculated depending on selection in Moving window |
| Format | Number of digits after decimal separator |
| Reduce in Overview | Type of data reduction of several measured values into one value |
| All in Moving | All measured values are displayed graphically |
| Кеу | Short key to switch a channel's visibility |
| Zero ruler | Horizontal line at physical 0 position |
| Color scale | Mapping of physical values onto colors in defined steps |
| Group assignment | Collection of channels in topics |

Additional channel dependent settings found by double clicking in the tab "Ruler/Alarm".



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2.4.2 Groups



Channels can be organized (collected) in groups which each represent one topic.

The group names may be edited freely. The channels inside the first group will be shown at Analyzer program start.

Examples:

- A channel "Speed" may be assigned to many groups like "Start", "Engine", "Suspension" and "Time Diff".
- A channel "Spring" may be assigned to group "Suspension" only.
- A group "Engine" may contain channels like "Speed", "RPM", "Throttle" etc.
- A group "Temperature" may contain "RPM", "OilTemp", "WaterTemp" etc.

By switching on/off a group all channels assigned to this group are switched on/off.

Each group may be assigned a short key to switch its visibility in the details windows fast.

By in the tab Groups of the Channel Editor, the visibility of a group of channels can be turned on/off by clicking in the column with the name Visible.

| Measurement | | | | |
|--------------------------|-------|---|---------------------|---|
| No. 1 Demo | | 400 Hz V3 Demo.MES | | |
| Channel names | | Channel types | | |
| Speed search: | | Digital 🥅 🕅 Analog 🥅 🚺 Can In 🥅 🚟 🖸 | alc 🗆 🖩 Virtual 🗖 闍 | |
| Channels Groups | | | | |
| Granites arrange | | | | |
| Circuit In Circuit | | Channels | | |
| 1 Sheet | sidie | unanneis M. frent Threttle, SpeedBase | Ney | |
| 2 Engine | × | V_Hond, Findule, Speeubase | | |
| 2 Engine 3 Suspension | | Front Fork Bear Shock Fork | | |
| A Timediff | | Throttle Time diff | | |
| 5 Temperature | | rinoue, rine an | | |
| 6 Pressure | | BWB FWB | | |
| 7 ACC | | | | |
| 8 Brake-Press | | | | |
| 9 Group 9 | | GearSpeed | | |
| 0 Group 10 | | 27.5168.202 | | |
| 1 Telemetry | | | | |
| 2 TeleScope | | | | |
| 3 TeleSave | | | | |
| 4 Group 14 | | Trail, Wheelbase, Theta, ICx, RWTravel | | |
| 5 Group 15 | | MAX G rpm | | |
| 6 Group 16 | | | | |
| 7 Group 17 | | | | |
| 8 Group 18 | | | | |
| 9 Group 19 | | | | |
| 20 Group 20 | | | | |
| 21 Group 21 | | | | |
| 22 Group 22 | | | | |
| 23 Group 23 | | | | |
| 24 Group 24 | | | | |
| 25 Group 25 | | | | |
| 26 Group 26 | | | | |
| 27 Group 27 | | | | • |
| 0. ∳8 Rename gi | roup | 1 | | |
| | | - | | |
| | | | | |



2.4.3 Functions

There are several functions to manage the channels list conveniently:

The Speed search edit field allows searching for channels with a defined name mask. For example, typing "V_" finds all channels with names starting with "V_". Typing "*susp" or "?susp" finds all channels which names contain the string "susp".

To display all channels with a certain channel type like "Digital" select the appropriate channel type.

A click on the title of a column sorts the channels in ascending/descending order using field this column. This works for the columns where sorting makes sense, e.g. number, name or frequency etc.

By clicking on the button "Sort group" on the bottom right of the channel editor, it is possible to insert a column containing the name of a group. By sorting this column it is possible to change the settings of the channels belonging to this group very easily.

2.5 Lap times

These information are accessible from the Main menu Function \Rightarrow Laps (first menu item).

Table with lap times of all loaded measurements.

The first tab of the Laps window shows a list of the lap times of each loaded measurement.

Every loaded measurement has also its own tab with detail information about the lap length in meters and start/end of the laps (in meters).

| | | Laps | - 0 | × |
|----------|-----------------|---------|-----|---|
| All meas | urements | Demo | | |
| Lap | Demo | | | |
| 0 | 2:08.04 min / | ' 3729m | | |
| 1 | 1:43.00 min / | ' 3821m | | |
| 2 | 🔶 1:42.60 min / | 3822m 🔶 | | |
| 3 | 1:44.90 min / | 3826m | | |
| 4 | 1:57.46 min / | 926m | | |

A lap which appears to be invalid is light greyed to set it apart from valid laps in which the lap length fits the defined track length.



Manually inserted laps are underlined

| | | | | Laps | | | |
|-----|---------|----------------------|----------------|-------------|-------------|-------|-------|
| All | measure | ments | lemo | | | | |
| Laj | p | Time | from | to | Meters | from | to |
| 0 | Θ | 2:08.04 mi | r 0.00 sec | 2:08.04 min | 3822 (3729) | 0 | 3821 |
| 1 | Θ | 1:43.00 mi | ir 2:08.04 min | 3:51.04 min | 3822 (3821) | 3822 | 7643 |
| 2 | 9.4 | - <u>1:42.60 m</u> i | 3:51.04 min | 5:33.64 min | 3822 | 7644 | 11465 |
| 3 | Ø | 1:44.90 mi | 1 5:33.64 min | 7:18.54 min | 3822 (3826) | 11466 | 15287 |
| 4 | Θ | 1:57.46 mi | 7:18.54 min | 9:16.00 min | 926 | 15288 | 16213 |

2.5.1 Functions



By clicking on a table entry the selection of the clicked measurement is set to the corresponding lap.

A not-wanted lap may be removed via context menu or with "Del" key. Be careful with that function as the chosen lap trigger will disappear.



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| | | Laps | |
|-----------|-------------------------|---------------------------------------|----------------|
| All measu | urements Demo | | |
| Lap | Demo | A Pemana lan | Del |
| 0 | 2:08.04 min / 3729m | · · · · · · · · · · · · · · · · · · · | Dei |
| 1 | 1:43.00 min / 3821m | Save properties of th | is window to 🕨 |
| 2 | 🔶 1:42.60 min / 3822m 🔶 | 9 Help | F1 |
| 3 | 1:44.90 min / 3826m | 8 1100 | |
| 4 | 1-57.46 min / 926m | Close | |

2.6 Section times

Table with section times of a measurement

The sum of the best section times gives an idea of a possible ideal lap time.

| Lap | Laptime m Lap m Track | 1: Section1 149-1423m 1274m | 2: Section2 1423-2697m 2548m | 2697-149m 3822m |
|------------|-----------------------------|-----------------------------------|------------------------------------|--------------------|
| 0 | 2:08.040 min | 0:42.120 | 0:37.572 | 0:32.013 |
| 1 | 1:43.000 min | 0:34.173 | 0:36.833 | 0:31.994 |
| 2 🛛 | 1:42.600 min | 0.33.820 | 0:36.500 | 0:32.303 |
| 3 | 1:44.900 min | 0:34.007 | 0:37.243 | 0:33.727 |
| 4 | 1:57.460 min | 1:58.800 | | |
| Ideal time | 1:42:314 min | 0.33.820 | 0.36.500 | 0:31.994 |

By using the delta button, you'll get the section time's delta (and, if available, distance delta) compared to the best section time.

| Lap | Laptime m m Tr | 1: Section1 Lap 149-1423m ack 1274m | 2: Section2 1423-2697m 2548m | 2697-149m 3822m |
|------------|----------------------|---|------------------------------------|--------------------|
| 0 | 2:08.040 min | △ +8.300 sec | △ +1.072 sec | △ +0.019 sec |
| 1 | 1:43.000 min | △ +0.353 sec | △ +0.333 sec | 0.31.994 |
| 2 | 👎 1:42:600 min | 0.33.820 | 0:36.500 | △ +0.309 sec |
| 3 | 1:44.900 min | △ +0.187 sec | △ +0.743 sec | △ +1.733 sec |
| 4 | 1:57.460 min | △ +76.980 sec | | |
| Ideal time | A -0.286 sec | 0.33.820 | 0.36.500 | 0:31.994 |

2.6.1 Definition of Sections

This function is accessible by clicking on the button on the bottom right of the section times window.



The track may be divided into up to 6 sections which are defined by a distance from start/finish line. Each section can be named.

| Section | Meters |
|----------|------------|
| ٢1 | 1200 |
| ۲2 ۲2 | 2700 |



2.6.2 Functions

Print

This function is accessible by right clicking on the panel.

The print function simply prints the content of the current section times window. *The "Print all section tables"* function opens one section times window for each loaded measurement and prints their content using Notepad.

2.7 Min-/Max tables

Overview of lower, upper and average values of channels

A Min/max table serves as a quick overview of minimum, maximum and average values of some channels of a measurement lap by lap.

This function is accessible from the main menu Function \Rightarrow Min/Max table.

2.7.1 Creation and setup

A Min/max table setting can be created and saved to disk to be reused later.

You can create a new Min/max table or edit an existing setting via the shortcut <Alt> + <M>



Phases

Without using phases the min/max/avg values of each channel are displayed lap by lap. With the use of phases, the channel values are calculated per lap where the phases apply. Phases are filters with many options.

Channels

Each channel may be selected to be analyzed inside a Min/max table. For each chosen channel it is possible to select minimum, maximum and/or average value. Additionally a filter value can be provided to apply an average filter to the channel.



You will get detailed information about the creation of a new Min/Max tables in the examples below.

2.7.2 Management

The saved Min/max table settings can be overridden from inside the Min/Max window by clicking on the channels button. The phases condition can also be edited by clicking on the phases button.

2.7.3 Functions

Exports

The contents of the table may be exported in ASCII or Microsoft Excel readable format.



Find position

By clicking on a minimum or maximum value of a channel the corresponding position in the measurement is selected and centered inside the Moving window. If the channel was not visible it will be switched on and activated in the Moving window.

Print

The print function simply prints the content of the current Min/max table.

2.7.4 Properties

The only property of a Min/max table is the choice to hide the button bar. This option is accessed through the context menu (right click).



2.7.5 Examples

2.7.5.1 Example 1

A Min/max table called "Speeds" containing minimum, maximum and average values of channels "V_Front" and "V_Rear" and minimum and maximum values of channel "RPM" will be created.

| Availat | ble channels | | | Chy | annel | MIN | MAX (abs) | AVG | Delta | Filter | LanEnd | |
|---|--|---|---|--|--|---|--|---|--|--|-------------------------------|---|
| hrottle | 1 | | ^ | V | tont | 1 | V (0.00) | 1 | D ONG | Titter | caperio | - |
| ront F | ork book | | | BP | ы | 1 | | | | | | 1 |
| eto#1 | l | | | | 997 | | | | | | | |
| eto#2 | 2 | | | | eai | | × 🗉 | | | | | |
| xTem | p#1 p#2 | | | | | | | | | | | |
| ress# | 1 | | | | | | | | | | | |
| lead# | 3 | | | 4 | | | | | | | | |
| peed_ ike A | _lo .cc | | ~ | Lange and the second | | | | | | | | |
| peed | I search: Ty | oe to filter ! | | | | | | | | | | |
| | | | | | | | | | 1 | nu | ~ | Cancel |
| | | | | | | | | | · · | UK | ~ | cancer |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 0 | | | М | in/max <mark>t</mark> a | ble (1=De | mo) Spe | eds.mms | | | | | × |
| ар | Time | Meters | M V_front | in/max ta | ble (1=De | mo) Spe RPM | eds.mms | V_real | | | | |
| эр | Time | Meters | M V_front MIN | in/max ta MAX | ble (1=De | mo) Spe RPM MIN | eds.mms MAX | V_real M | IN | МА | | AVG |
| ap 0 | Time 2:08.040 min | Meters 3729 | M V_front MIN 0.00 | in/max ta MAX 213.35 | ble (1=De AVG 104.87 | mo) Spe BPM MIN 0.00 | eds.mms MAX 11869.00 | V_rea M | IN 0 | MA 230 | | AVG 110.2 |
| ар 0 | Time 2:08.040 min 1:43.000 min | Meters 3729 3821 | M V_front MIN 0.00 69.30 | in/max ta MAX 213.35 227.00 | ble (1=De AVG 104.87 133.54 | mo) Spe RFM MIN 0.00 6189.00 | eds.mms MAX 11869.00 11837.00 | V_real M 0, 73 | IN 0 | MA 230 236 | | AVG 110.2 140.6 |
| ap 0 1 2 | Time 2:08.040 min 1:43.000 min 1:42.600 min | Meters 3729 3821 3822 | M V_front MIN 0.00 69.30 71.20 | in/max ta MAX 213.35 227.00 226.45 | ble (1=De AVG 104.87 133.54 134.12 | mo) Spe RPM MIN 0.00 6189.00 5541.00 | eds.mms MAX 11869.00 11837.00 12565.00 | V_rea M 0. 73 | IN 0 1.8 | MA 230 236 236 | | AVG 110.2 140.6 141.2 |
| ap 0 1 2 3 | Time 2:08.040 min 1:43.000 min 1:42.600 min 1:44.900 min | Meters 3729 3821 3822 3826 | M V_front MIN 0.00 69.30 71.20 51.60 | in/max ta MAX 213.35 227.00 226.45 225.55 | ble (1=De AVG 104.87 133.54 134.12 131.29 | mo) Spe RPM MIN 0.00 6189.00 5541.00 4133.00 | eds.mms MAX 11869.00 11837.00 12565.00 12075.00 | V_real M 0, 73 75 | IN 0 1.8 1.4 | MA 230 236 236 234 | □ × 1 3 3 8 | AVG 110.2 140.6 141.2 138.5 |
| ap 0 1 2 3 4 | Time 2:08.040 min 1:43.000 min 1:42.600 min 1:44.900 min 1:57.460 min | Meters 3729 3821 3822 3826 326 | M V_front MIN 0.00 69.30 71.20 51.60 0.35 | in/max ta MAX 213.35 227.00 226.45 225.55 210.00 | AVG 104.87 133.54 134.12 131.29 28.44 | mo) Spe <u>BPM</u> MIN 0.00 6199.00 5541.00 4133.00 0.00 | eds.mms MAX 11869.00 11837.00 12565.00 12075.00 12013.00 | V_rea M 0, 73 75 54 0, | IN 0 1.8 .4 .3 0 | MA 230 236 236 234 219 | - □ 1 9 3 3 8 8 3 | AVG 110.2 140.6 141.2 138.5 29.0 |
| ap 0 1 2 3 4 | Time 2:08:040 min 1:43:000 min 1:42:600 min 1:44:900 min 1:57:460 min | Meters 3729 3821 3822 3826 926 | M V_front MIN 0.00 69.30 71.20 51.60 0.35 0.00 | in/max ta MAX 213.35 227.00 226.45 225.55 210.00 | AVG 104.87 133.54 134.12 131.29 28.44 | mo) Spe <u>FPM</u> MIN 0.00 6189.00 5541.00 4133.00 0.00 | eds.mms MAX 11869.00 11837.00 12565.00 12075.00 12013.00 | V_reat M 0. 73 75 54 0. | IN 0 18 18 13 0 | MA 230 236 234 219 | | AVG 110.2 140.6 141.2 138.5 29.0 |
| 0 1 2 3 4 MIN | Time 2:08.040 min 1:43.000 min 1:42.600 min 1:42.600 min 1:57.460 min | Meters 3729 3821 3822 3826 926 | M V_front MIN 0.00 69.30 71.20 51.60 0.35 0.00 | in/max ta MAX 213.35 227.00 226.45 225.55 210.00 210.00 | ble (1=De AVG 104.87 133.54 134.12 131.29 28.44 28.44 | mo) Spe <u>APM</u> MIN 0.00 6189.00 5541.00 4133.00 0.00 0.00 | eds.mms MAX 11869.00 11837.00 12075.00 12075.00 12013.00 | V_real M 0, 73 75 54 0, | IN 0 18 4 13 0 | MA 230 236 234 219 219 | | AVG 110.2 140.6 141.2 138.5 29.0 |
| ap 0 1 2 3 4 MIN MAX | Time 2:08.040 min 1:43.000 min 1:44.500 min 1:44.900 min 1:57.460 min | Meters 3729 3821 3822 3826 926 | M V_front MIN 0.00 63.30 71.20 51.60 0.35 0.00 71.20 | in/max ta MAX 213.35 227.00 226.45 225.55 210.00 210.00 227.00 | ble (1=De AVG 104.87 133.54 134.12 131.29 28.44 28.44 134.12 | mo) Spe RPM MIN 0.00 6189.00 5541.00 4133.00 0.00 0.00 6189.00 | eds.mms MAX 11869.00 11837.00 12555.00 12075.00 12013.00 11837.00 12555.00 | V_rear M 0, 73 75 54 0, 0, 75 | IN 0 18 4 3 0 | MA 230 236 234 219 219 235 | | AVG 110.2 140.6 141.2 138.5 29.0 29.0 141.2 |
| ap 0 1 2 3 4 MIN 4AX | Time 2:08.040 min 1:43.000 min 1:42.600 min 1:44.900 min 1:57.460 min | Meters 3729 3821 3822 3826 926 | M MIN 0.00 63.30 71.20 51.60 0.35 0.00 71.20 38.49 | in/max ta MAX 213.35 227.00 226.45 225.55 210.00 210.00 220.47 | ble (1=De AVG 104.87 133.54 134.12 131.29 28.44 28.44 134.12 106.45 | mo) Spe PPM MIN 0.00 6189.00 65541.00 4133.00 0.00 6189.00 3172.60 | eds.mms MAX 11869.00 11837.00 12565.00 12075.00 12073.00 11837.00 12565.00 12071.80 | V_rear M 0, 73 75 54 0, 75 40 | IN 0 18 4 13 0 0 14 | MA 230 236 234 219 219 219 236 231 | | AVG 110.2 140.6 141.2 138.5 29.0 29.0 141.2 111.9 |



2.7.5.2 Example 2

A min/max table called "Deto" containing maximum and average values of detonation channel associated with a 2-stroke engine will be created.

Additionally a phase condition will be set which defines phases where the throttle channel has values of at least 30 %.

| | | | 1 | Min/Max sett | ings Deto.mn | ns | | | | | |
|---|----------------------------------|-----------------|------|-----------------------------|---------------|-----------|-------|-------|--------|------------|-------|
| Available channels /_front aPM /_froattle &ear_Nr /_rear front Fork Rear Shock. :xTemp#1 Press#1 Press#1 Press#2 Head#3 | | Ŷ | \$ | Channel Deto#1 Deto#2 | MIN | MAX (abs) | AVG | Delta | Filter | LapEnd | 4 |
| Speed search: | Type to filter ! | | | | | | | 1 | Ok | X C | ancel |
| | | | | Phases | - Deto.pct | | | | | × | |
| Ava | ailable conditions /Selection | | | | | Channel d | epend | ent | | | |
| Rang | ge nnel dependent | | | | Phase channel | Throttle | e | | | ~ | |
| Act | ive conditions | (Throttle: 30 - | 110) | | Lower limit | 30 | | | % | | |
| Char | inter dependent | | | | | | | | | | |

Delete phases

ett: <u>S</u>how

<= 0

¼ scans

👘 Remove

🗸 Ok

0.000 sec

8

🗙 Cancel

if

0.000 sec

| Lap | Time | Meters | Deto#1 | | Deto#2 | |
|-----|--------------|--------|--------|------|--------------------|------|
| | | | MAX | AVG | MAX | AVG |
| 0 | 2:08.040 min | 3729 | 20.2 | 9.4 | 35.7 | 9.8 |
| 1 | 1:43.000 min | 3821 | 19.6 | 9.7 | <mark>2</mark> 5.7 | 10.1 |
| 2 | 1:42.600 min | 3822 | 20.6 | 10.1 | 22.2 | 10.5 |
| 3 | 1:44.900 min | 3826 | 27.6 | 10.3 | <mark>2</mark> 5.5 | 10.8 |
| 4 | 1:57.460 min | | 12.3 | 10.8 | 19.1 | 11.3 |
| MIN | | | 12.3 | 9.4 | 19.1 | 9.8 |
| MAX | | | 27.6 | 10.8 | 35.7 | 11.3 |
| AVG | | | 20.1 | 10.1 | 25.7 | 10.5 |

2.8 Track mode

Graphical presentation of track with channel values at defined positions

A window with a graphical representation of the track with channel values at defined positions. A 3rd dimension is achieved by using a so-called color channel.

This function is accessible from the main menu Function \Rightarrow Track mode

Phase condition logic

Create events Delete phases

All conditions (AND)

O At least one condition (OR)

<= 0

eet: Pre⊻iew

¼ scans





2.8.1 Creation and setup

A colorized track can be created and saved to disk to re-use it later. The creation of a colorized track is parametrized through two main option groups: The settings concerning the graphical layout of the track and the type of the visible markers.

You can create a new colorized track or edit an existing setting via the shortcut <X>

| Functions View Measureme | ent Settin | gs W | lizards | Plu | igins | Tut | torials | Help | | | |
|---|----------------|-------------------------|-------------------------------|---------------|---------------|------------|---------|-------------|---|---|--|
| B= Laps B=: Section times R User defined markers | Alt+L Alt+S | 2 | 25 | 1× | | H | 14 T | > | ۲ | • | |
| ∑ Circuit ∑ Multi circuit | C M | | | | | | | | | | |
| Track mode (X) XY-Plot (Alt+F5) Min/max table (Alt+M) |) | C) Gr C Mi Cag Lo | eate ne anage : ad with | settin pre | igs view 1 | () thum | bnails | 2 | | | |

2.8.1.1 *Marker settings*

The settings window is accessed by right clicking on the colorized map and select the first menu item (Settings) in the context menu.

| 📢 General | 8= 1 | Lap | 8:: | Sections | Corners | Straights | ۲ |) Layout |
|--------------------|----------|---------------|--------|----------|----------|-----------------|------|----------|
| Comment | - | | | | | | | |
| Color channe | - | | | | | Visible marker: | | |
| Color channel | l type | Sea | ment | • • | Sections | 🖌 Lap | | |
| | | <i>, 16</i> 9 | meric | • • | Dectoria | Sections | | |
| hrottle V front | | | | | | Straights | | |
| RPM Throttle | | | | | | _ | | |
| Gear_Nr V_rear | | | | | | User defin | ed | |
| Front Fork | | | | | | Start of ph | ases | |
| Deto#1 | | | | | ~ | | 1969 | |
| E Color | scale | | | | | | | |
| Brother laps/ | channe | els | | | | | | |
| 🗹 Display b | rother I | aps | | | | | | |
| 🗌 Display le | ft broth | ner cha | annel | | | | | |
| | | | | | ~ | | | |
| E Colo | r scale | E | | | | | | |
| Display | abt brai | ther - | hanr | | | | | |
| Ursplay n | yrit Dfo | uner Cr | rianne | 51 | ~ | | | |
| E Colo | | | | | | | | |
| | scale | H | | | | | | |
| | | | | | | | | |



At certain positions on the track markers are placed containing channel values at these positions. The calculation of the channel values depends on the marker type which can be:

- lap
- sections
- corners
- straights
- user defined
- start of phases
- end of phases

| | Tr | ack r | node | e marl | ker | - | | × |
|----------------|---------|---------|--------|----------|---------|----------|---|-------|
| | | | | Corne | ers | | | |
| | | | | RPN | И | | | |
| Chan | nel val | ue type | | | | | | |
| См | in | | | | | | | |
| СМ | ax | | | | | | | |
| 100 C 100 P 10 | | | | | | | | |
| CA | /a | | | | | | | |
| С A • A | /g | @In | L_Spee | ed -> V_ | front 💌 | +/· 0 | 2 | 🖌 sec |
| C A A | /g | @In | L Spee | •d -> V_ | front 🔻 |] +/· [0 | 2 | sec |

This window is accessed by clicking on the tab "Corner" of the settings window in track mode.

All markers of a certain type have options like text font, additional inscription of channel's dimensions, display of a legend etc. These settings can be changed on the tab "Corners" below.

| 😽 General | 52 | Lap | B | Section | ons 4 | 50 | Corners | Straig مظلم | hts | ۲ | Layout | | |
|---------------|----------|---------------|----------|----------|-------|----|---------|--------------|----------------------|-------|-------------|--------|------|
| Layout | | South Control | | | | | Channel | s | | | 0000000000 | | |
| Font | | 4 | Arial (1 | 41 | | 1 | Channel | | T, | уре | | Filter | |
| | | 000000 | | 10 10 | - | | @Int_Sp | eed -> V_fro | on <mark>i</mark> Mi | N | | 1 | |
| Inscript cl | hannel | Idimei | nsions | | | | @Drive_ | RPM > RPI | M @ | +/-0. | 1@Int_Speed | > 1 | |
| 🗌 Inscript la | p mete | ers | | | | | | | | | | | |
| Inscript tr | ack me | eters | | | | | | | | | | | |
| Connectio | on line: | • | | | | | | | | | | | |
| | | × | | | | | | | | | | | |
| Snow leg | end | | | | - | | | | | | | | |
| Frame color | | | | | | | | | | | | | |
| Inscript c | orner n | name | | | | | | | | | | | |
| Corner name | color | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | Sel | ect | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

By clicking on the name of the channel in the table of the tab "Corner" the following window is shown:

| Available channels | | | Channel | Туре | Filter |
|--|------------------|---|-----------------------|------------------------|--------|
| V_front | | ^ | @Int_Speed -> V_front | MIN | 1 |
| Throttle | | | @Drive_RPM -> RPM | @+/-0.1@Int_Speed -> " | 1 |
| v_rear Front Fork Rear Shock Deto#1 Deto#2 ExTemp#1 ExTemp#2 | | | • | | |
| Speed search: | Type to filter ! | | | | |



Additional channel that will become markers on the track can be added to this table at the right of the window.

A marker of type lap/sections/corners or straights may contain the minimum, maximum or average value of channels or the value at the minimum/maximum of another displayed channel.

The function (minimum, maximum, average...) which value is display at the location of the marker on the track is selected by clicking on the type of the channel. The following window appears and enables to change the function to apply to the value at the marker position.

| | | | Corners | | | | |
|--------|------------|----------|----------|--------|--------|-----|-----|
| | | @Driv | /e_RPM | -> RPM | | | |
| Channe | I value tj | ре | | | | | |
| () Min | | | | | | | |
| () Max | | | | | | | |
| | | | | | | | |
|) At | 0 | Int_Spee | d → V_fr | ont 🗸 | +/- 0. | 1 2 | sec |

A marker of type user defined/start of phases or end of phases contains channel values at this defined point.

| 😽 General | 8= Lap 🔗 Corners | 😨 Layout | | |
|--|----------------------------|---|----------------------------------|--------|
| Layout | | Channels | | |
| Font | Stop (24) | Channel | Туре | Filter |
| 🔽 Inscript cl | hannel dimensions | @Int_Speed -> V RPM | front MIN @+/-0.2@Int_Speed - | 1 > 1 |
| Inscript la | ip meters | | | |
| Inscript tr | ack meters | | | |
| 🔽 Connectio | on lines | | | |
| | 2014 C | | | |
| Show leg | ena | and the second se | | |
| Frame color | end E | | | |
| Frame color | ena omer name | | | |
| Frame color Inscript color Corner name | end orner name color | | | |
| Show leg Frame color Inscript color Corner name | end orner name color | Select | 1 | |
| ✓ Show leg Frame color ☐ Inscript co Corner name | orner name color | Select |] | |

2.8.1.2 Graphic settings

The graphic settings are accessed by selecting the tab General and Layout. These tabs control the appearance of the track map. The color channel may apply to the existing sections, the segments or a measured channel. When a real measured color channel is selected, its color scale defines the mapping of the measured values to colors.

The visibility of the graphic symbols for the lap trigger, the sections, the segments etc. can be selected on the panel of the Layout tab. The drawing type of the track (pixels, lines, circles or crosses) is selected on the window shown by clicking on the button Draw type. The track width is also adjustable on this panel.

| 🚊 Tra | ack mode settings (TM_Corners.tms) |
|-----------------------------|------------------------------------|
| 🚮 General 🗄 Lap 😽 Corners | 😕 Straights 🐵 Layout |
| Options | |
| 🔽 Show track start | |
| Show lap trigger | |
| Show track direction | |
| Show sections | |
| Show segments | |
| Segment names Font | Rockwell (20) |
| Auto position segment names | |
| Corner numbers | |
| Show color scale | All texts monochrome |
| 200300 | |
| 🙄 Draw type | |
| | |
| | 🗸 Ok 🛛 🗶 Cancel 🛛 💡 |
| | |

| Draw | type | > |
|---|-----------------------------------|--------|
| Graphics type C Pixel C Line Threshold 100 12 % | Style Solid | • 5 |
| C Circle | Circles Fill circles Radius | 2 |
| | Cross Badius — | 2 |



2.8.2 Functions

2.8.2.1 *Print*

- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager opens a window with additional printing options.



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer options dialog.

2.8.2.2 Lap report

This function is accessed by right clicking on the colorized track map.

The lap report creates a table out of the Track mode settings which contain the channel values of each marker of the Track mode (colorized track map) lap by lap.

The content of the lap report window can be printed by the print function.

The "Print via Notepad" function embeds the complete lap report table into a text file and prints it.

The lap report table may be exported to a Microsoft Excel (*.xls) file.

| 8::- | Sections | Corr | iers 🧏 | Straights | | | | | | | |
|------|-------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|
| | | | S 1 (9-1) | S 2 (1-2) | S 3 (2-3) | S 4 (3-4) | S 5 (4-5) | S 6 (5-6) | S 7 (6-7) | S 8 (7-8) | S 9 (8-9 |
| V_fi | ront [Km/h] | MAX | | | | | | | | | |
| Θ | Lap 0: 2:0 | 8.040 min | 135.30 | 156.40 | | 203.20 | 165.65 | 186.80 | | 213.35 | 141.30 |
| Θ | Lap 1: 1:4 | 3.000 min | 227.00 | 182.30 | 111.60 | 209.90 | 171.70 | 189.10 | 120.80 | 215.05 | 142.3 |
| Θ | Lap 2: 1:4 | 2.600 min | 226.45 | 183.35 | 113.95 | 211.65 | 175.55 | 189.20 | 120.35 | 214.00 | 144.5 |
| Θ | Lap 3: 1:4 | 4.900 min | 225.55 | 183.00 | 113.00 | 211.50 | 173.30 | 192.20 | 121.75 | 210.40 | 129.90 |
| RP | √@ [rpm] √ | _front MA> | | | | | | | | | |
| Θ | Lap 0: 2:0 | 18.040 min | 9621.00 | 9513.00 | | 10539.00 | 10041.00 | 10191.00 | | 10429.00 | 11409.00 |
| Θ | Lap 1: 1:4 | 3.000 min | 11138.00 | 11836.00 | 8210.00 | 11744.00 | 10393.00 | 11391.00 | 8453.00 | 10917.00 | 11829.00 |
| Θ | Lap 2: 1:4 | 2.600 min | 11113.00 | 11680.00 | 8530.00 | 11767.00 | 10733.00 | 11647.00 | 9761.00 | 10425.00 | 11798.00 |
| Ō | Lap 3: 1:4 | 4.900 min | 11056.00 | 11856.00 | 8407.00 | 11808.00 | 10519.00 | 11947.00 | 8654.00 | 10878.00 | 9053.00 |

2.8.3 Management

The name of the file containing the settings of the colorized track may be renamed or deleted inside the management editor that is accessed from the main menu Functions \Rightarrow Track mode \Rightarrow manage settings. The editor shows also the name of the used Phase settings files.

| | Settings man | agement 🗕 🗆 | × | | | | | |
|--|---------------------------|-----------------------------|---|--|--|--|--|--|
| File Functions | | | | | | | | |
| 📲 🖬 😘 🖻 | \$ | | | | | | | |
| O All users | Current user | | | | | | | |
| | lk | | | | | | | |
| C:\Users\ | Public\Documents\Race2 | 016\Users\User0=lk\Settings | | | | | | |
| Track mode settings | | Phases | ^ | | | | | |
| 2D GearChange.tms | | 2D GearChange.pct | | | | | | |
| 2D GPS Cornerspeed.tr | ns | 2D GPS Cornerspeed.pct | | | | | | |
| 2D Rider Map.tms | | 2D Rider Map.pct | | | | | | |
| Braking.tms <brake td="" us<=""><td>age - Straights></td><td>Braking.pct</td><td></td></brake> | age - Straights> | Braking.pct | | | | | | |
| Corners.tms <corner sp<="" td=""><td>needs></td><td colspan="7">Corners.pct</td></corner> | needs> | Corners.pct | | | | | | |
| GearChange.tms | | GearChange.pct | | | | | | |
| RPM_usage.tms | | RPM_usage.pct | | | | | | |
| Straights.tms <top spe<="" td=""><td>eds / top RPM></td><td colspan="6">Straights.pct</td></top> | eds / top RPM> | Straights.pct | | | | | | |
| Susp Positions.tms | | Susp Positions.pct | | | | | | |
| tm Brake.tms <brake o<="" td=""><td>n></td><td>tm Brake.pct</td><td></td></brake> | n> | tm Brake.pct | | | | | | |
| tm Full Track.tms <con< td=""><td>ner + top speeds, gear sh</td><td>tm Full Track.pct</td><td></td></con<> | ner + top speeds, gear sh | tm Full Track.pct | | | | | | |
| WheelSpin.tms | | WheelSpin.pct | | | | | | |
| | | | ~ | | | | | |
| Speed search: T | ype to filter ! | | | | | | | |


2.8.4 Examples

2.8.4.1 *Example 1*

The objective is to build a track which the settings file name is "Segments" that does not contain markers and uses the sections as color channel.

Go in the Main menu, select Track mode \Rightarrow Create new.

Enter the name of the file that will contains the settings of the track.

In the settings windows add "Segments only" in the entry field Comment.



2.8.4.2 Example 2

The objective is to build a track colorized using the values of the "Speed" channel. The markers will be of type corners with the minimum value of channel "Speed".

Go in the Main menu, select Track mode \Rightarrow Create new.

Enter the name of the file that will contains the settings of the track.

In the settings windows add "Speed only" in the entry field Comment.

In the panel area labelled visible markers, check lap and corners and click <OK>.



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| Track mode set | tinas (TM Corners.tms) |
|--|---|
| 😽 General 🗄 Lap 💞 Corners 👻 Layout | |
| Comment Speed only | |
| Color channel Color channel type © Channel C Segments C Sections | -Visible markers I⊄ Lap I⊂ Sections |
| @Int_Speed > V_tront Meter diff ^ MDII words ^ @One Speed > V_treat @ @One Speed > V_treat @ @Thottle > Throttle @ @FrontSup > Front Fork @ | Comers Straights User defined Start of phases End of phases |
| (effear_Supp > Hear Shock V Brother laps/channels Brother laps Display left brother channel Display left brother channel Display light brother channel Display light brother channel | |
| TM Comerc pot | → Dk ★ Cancel 💡 |
| - M_Contestpor | |
| Track mode (1 Corner V_Tront [Rmh] MM(11) (99.86) (194.85) (1 | =Demo) Corners.tms × |
| (73.39) (77.75) 1 2866 (2000 min | V_front Corners.pct Corner speeds |

2.8.4.3 Example 3

The objective is to build a track colorized with the value of the channel "Throttle". The name of the file containing settings will be *"Top speed"*. The markers will be of type straights with the maximum value of channel "Speed" and the RPM value at top speed.

| K 1 0 1 | 0 | 1x1 | 6 | |
|---|---|------------|----------|--|
| Lieneral | 6 Lap | Straights | 🕲 Layout | |
| Comment | Speed | | | |
| Color channe | 1 | | | Visible markers |
| Channel | C Se | gments 🔿 S | Sections | ✓ Lap |
| @Throttle -> T | hrottle | | | Corners |
| TD iff window Win change Meter diff MD iff window @Int_Speed - @Drive_RPM @Drive_Spee @Throttle -> 1 | >V_front -> RPM d-> V_rear hrottle | | ^ • | ✓ Straights User defined Start of phases End of phases |
| Brother laps/ | scale | | | |
| 🗌 Display le | eft brother ch | nannel | | |
| | | | ~ | |
| E Colo | r scale | 8 | | |
| 🗌 Display ri | ght brother o | hannel | ~ | |
| E Colo | r scale | 8 | | |
| | | | | A Dk Y Cancel @ |



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2.9 XY-Plot

2-dimensional presentation of relationship of 2 channels

Function to display a 2-dimensional graphical presentation of the relationship of 2 channels. A 3rd dimension is achieved by selecting a color channel.

2.9.1 Creation and Setup

An XY-Plot setting can be created and saved to disk for later re-use.

You can create a new XY-Plot or edit an existing setting via the shortcut $\langle Alt \rangle + \langle F5 \rangle$ or from the main menu:

| Functions View Measu | rement Settin | gs W | izards | Plug | gins | Tut | orials | He | lp | | | | |
|------------------------|---------------|------|---------|------|------|-----|--------|----|----|---|------|---|---|
| 8 Laps | Alt+L | 2 | 23 | | | | 14th | - | • | 1 | · ■· | 5 | 1 |
| BII Section times | Alt+S | | | | | | | _ | | | | | |
| 🖏 User defined markers | | | | | | | | | | | | | |
| 🖄 Circuit | С | | | | | | | | | | | | |
| 🖄 Multi circuit | м | | | | | | | | | | | | |
| Yrack mode (X) | • | | | | | ~ | ~ | ~ | _ | ~ | ~~~ | | ~ |
| XY-Plot (Alt+F5) | Þ | Cre | eate ne | w | | R | | | | | | | |

You simply enter a name for the XY plot settings file and afterwards you select the plot's settings.





2.9.1.1 Settings



A XY Plot can graphically show the relationship of one selectable channel (X) to several other (Y) selectable channels. In this case several XY-Plot are created. The data for the XY plot can come from one or more measurements.

With the use of phases the displayed data can be filtered to a data subset. The color channel defines the mapping of the measured values to colors. Alternatively, the color of the plot may be controlled/sort out by measurements or by laps. Points (pixels), lines, circles or crosses can be selected to create the XY plot (draw type). Thickness of the drawing elements are adjustable. Phases and draw types can be changed through the context menu (right click) in the XY plot.

2.9.2 Functions

2.9.2.1 *Limits*

The lower and upper limits of X and Y channel in an XY plot window can be set in different ways. Limits can be set manually via context menu.

With the toolbar at the top of the XY plot panel, the plot can be moved or zoomed in and out.



The catch function calculates suitable limits to display all graphic items in the window. The dynamic auto-position function performs catching automatically when the XY plot data are continuously changing, for example the selection windows is moved. The data of the XY plot will be actualized continuously, by selecting the option current selection in the group laps/selection of the phases window.

2.9.2.2 Grid

The grid consists of regular horizontal and vertical lines. This helps for reading the values.

2.9.2.3 **Print**

- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a chosen Excel sheet together with data out of the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager opens a window with additional printing options.



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer options dialog.

2.9.3 Management

The name of the file containing the settings of the XY plot may be renamed or deleted inside the management editor that is accessed from the main menu Functions \Rightarrow XY-Plot \Rightarrow manage settings. The editor shows also the name of the used phase settings files. The quickest way to open the editor is to use the shortcut key <**ALT**> + <**F5**>.



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2.9.4 Properties

This panel is accessed by selecting "Properties" in the context menu (right click on the XY plot). The option "*Highlight phases with mouse*" affects the reaction of a XY plot window when moving the mouse over it. If several phases are defined in the Phase condition panel, then all graphic items belonging to the same phase as the item under the mouse are highlighted.



2.9.5 Examples

2.9.5.1 *Example 1*

A XY plot named "Gear ratio" will be created, which shows the channel "RPM" vs. channels "V_Front" and "V_Rear".

"Throttle" will be used as color channel. A phase condition (L) of type "Laps/selection" \Rightarrow "Current selection" with option "Follow selection" will be defined to show the gear ratio of the current selection in the moving window.

| Comment Gear ratio | | |
|---|--|---|
| X channel | Y channel | Measurement files |
| @Drive_RPM -> RPM | @Int_Speed -> V_front | Active measurement Demo |
| PWB A | @Drive_Speed -> V_rear | All visible measurements Dynamic follow measurements |
| E_ges Stenhteight Rearteight SRC E_Voot A_Ram A_Ram A_Ram ApdRase ApdRase ApdRase Tobif window Win change Meter diff Molif window Qahra, Speed > V_front Qahra, Speed > V_front | Joined in 1 plot AccBase Time dif Toilf window Win change Meter dif MDif window Wint_Speed > V_front @Orive_SPM > BPM @Orive_SPM > BPM @Orive_SPned > V_rear @Front_Sup > Front Fork @Pront_Sup > Front Fork @Pront_Sup > Spent Fork @Pront_Sup > Spent Fork | Demo Downsampling to slower channel Colors C Urri Color channel @Throttle > Throttle Throttle > Throttle Demonsampling C By laps C Brancemannel |





2.9.5.2 *Example 2*

Examine 2-stroke detonation by showing channels "RPM" vs. "Deto" with color channel "Throttle".

| Comment | | | | | |
|---|--|---|---|-------------------------|----------------------------|
| X channel | Y channel | | - Measurement files - | | |
| ⊉Drive_RPM -> RPM | Deto#1 | | C Active measurem | nent | Demo |
| 3WB WB 3WF | | | All visible measure Dynamic follow n | rements neasurements | |
| WH _ges temHeight learHeight RC FC _Pivot _Rarm apMeter peedBase | Joined in 1 plot V_front RPM V_rear Throttle Front Fork Bear Shock | ^ | Downsampling to Colors C Uni | slower chann | el |
| ccbase ime diff Diff window √in change feter diff Diff window Dit Coode a M. Soot | ✓ Deto#1 | | Color channel By laps | @Throttle @Throttle | -> Throttle -> Throttle |
| ©Inve_RPM → RPM | Press#2 | ~ | C By measurement | files | 🔽 auto |



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2.9.5.3 Example 3

Examine 2-stroke detonation for two different engine settings or laps. The XY plot shows "RPM" vs. "Deto" of two loaded measurements. The colors option "by measurement files" is selected to distinguish both measurements.



2.10 Histogram

Distribution for channel values.

A histogram is a graphical representation of the distribution of numerical data of a channel. It is an estimate of the probability distribution of a channel data considered as a continuous variable. To construct a histogram, the first step performed by 2D software is to "bin" the range of values of the selected channel - that is, divide the entire range of values into a series of intervals - and then count how many values fall into each interval. The bins are usually specified as consecutive, non-overlapping intervals of a variable. The result is a frequency of occurrence (~ a probability) for the instantaneous value of a channel to fall in one specific bin.



2.10.1 Creation and setup

A Histogram setting can be created and saved to disk for later re-use.

You can create a new Histogram or edit an existing setting via the shortcut $\langle Alt \rangle + \langle F1 \rangle$ or from the main menu:

| Functions View Measureme | ent Settin | gs Wiza | rds Plug | jins Tut | torials | Help | |
|---|----------------|---------|----------|----------|---------|--------------|---------|
| 8= Laps 8:: Section times \$ User defined markers | Alt+L Alt+S | 8 | ⊻ ⊮ | | K. | ≫ • € |) • = • |
| 😢 Circuit 😢 Multi circuit | C M | | | | | | |
| Track mode (X) | • | ~~~ | ~ | ~~~ | 7 | | |
| Histogram (Alt+F1) | • | Creat | e new | ને | 1 | | |

You simply enter a name for the Histogram settings file and afterwards you define the Histogram's settings.



2.10.1.1 Settings

The Analyzer software provides two ways to filter the data that makes histograms. The first is using the concept of phases. The second is using the concept of "split channel". The concept of phases is specific to 2D Datarecording and used thoroughly for almost all analysis function of the Analyzer. Phases are applied to a single channel, the one used to create the bins of the Histogram. Phases reduce the amount of data of the channel entering in the creation of the Histogram to a subset. Options from the data filtering are for example by lap/selection, time or distance range, or channel value range. The concept of "split channel" is also particular to 2D Datarecording. The splitting channel can be considered as the channel used to create the bins for the second dimension of a 3 dimensional histogram. Nevertheless, in the histogram module the histogram will be "split" into as many histogram as the number of bin created by the "split channel". Take note that true 3 dimensional histograms can be created from the main menu Plugins \Rightarrow 2D External Function \Rightarrow XYZ-Plot. An alternative to the creation of multiples histogram are stacked histogram. Creation of stacked histogram is also possible with 2D software within the histogram module.

The window showing options for creating histogram is shown just after having entered the name of the histogram or by right clicking on an existing histogram.



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| | Histogr | am settings - Hg_RI | PM.sts | | × |
|--|-------------------------------------|---|--------------------------|--|---|
| Comment [| RPM by laps | | | | |
| Data s Channel | election | - Measurement files | Split set | tings | |
| @Drive_RPM -> RF | м | Active measure | ement | Demo | |
| Time diff TDiff window Win change | ^ | C All visible meas ✓ Dynamic follow | urements measureme | ints | |
| Meter diff MDiff window @Int_Speed -> V_f @Drive_RPM -> Ri @Drive_Speed -> N | ront PM | I Demo | | | |
| Horizontal scaling Use channel lin Lower limit Upper limit | nits 5000.00 rpm 15000.00 rpm | Split channel Channel | @Thro @Thro -10.00 | ttle -> Throttle ottle -> Throttle | • |
| Steps | 100 😼 | Upper limit Steps | 110.00 | - z 14 | |
| Vertical scaling — Auto limits | 10 12 2 | Split phase conditie | ons | | |
| Upper limit values Upper limit time Upper limit meter | 10000 X sec 10000 M m | Split diagrams by Files C Split channel | n) | Split data by None (1 series) Files Split channel | |
| Phase conditions Use phases | Z ≝≋: Phases | C Phase condition | ns i | Phase conditions Laps | |
| | | | Ok | 🗶 Cancel | 8 |

Options are grouped by functionality. A list of these groups and a short description of the groups functionality is shown below:

| Expression | Meaning |
|--------------------|--|
| Channel | Choose your histogram channel |
| Horizontal scaling | Choose channel value range and number of subdivision for creating the bins |
| Vertical scaling | Select auto limits or choose manual scaling |
| Phases | Restrict the data amount by phases |
| Files | Select the files you want to display |
| Split channel | Create multiple histograms using the split channel |
| Split phases | Divide diagrams or series by single phase conditions |

2.10.2 Functions

2.10.2.1 *Export*

The contents of the table may be exported in ASCII or Microsoft Excel format.

2.10.2.2 Print

The print function prints the content of one or all Histogram windows. When printing several windows, the layout of the printout can be managed.

Print via Print manager opens a window with additional printing options.

2.10.3 Management

The name of the file containing the settings of the histogram may be renamed or deleted inside the management editor that is accessed from the main menu Functions \Rightarrow Histogram \Rightarrow manage settings. The editor shows also the name of the used Phase settings files.



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| hg Front_Susp.sts <front.susp.(no.gas front_susp.pet<br="" hg="" on.gas);="">hg Bear, Susp.sts <th></th></front.susp.(no.gas> | |
|---|--|
| ha Bear Sush sts. (Bear such (no das/on das)) ha Bear Such oct | |
| ng nod_odep.ete kinda edep (no gder on gder) ing nod_odep.pet | |
| hg RPM.sts <rpm (low="" full="" gas)="" medium=""> hg RPM.pct</rpm> | |
| hg Throttle laps.sts <gas by="" laps="" usage=""> hg Throttle laps.pct</gas> | |
| hg Throttle.sts <gas laps="" over="" usage="" valid=""> hg Throttle.pct</gas> | |
| Hg_Custom.sts <rpm> Hg_Custom.pct</rpm> | |
| Hg_RPM.sts <rpm by="" laps=""> Hg_RPM.pct</rpm> | |
| Hg_Throttle.sts <throttle> Hg_Throttle.pct</throttle> | |
| Hg_RPM.sts <rpm by="" laps=""> Hg_RPM.pct Hg_Throttle.sts <throttle.pct< td=""></throttle.pct<></rpm> | |

The quickest way to open the editor is to use the shortcut key <**Alt**> + <**F1**>. Afterwards select the menu item "Manage settings"

2.10.4 Properties

The histogram properties include many graphical options for tuning the visual appearance of the histogram.

The presentation may be 2- or 3-dimensional, where various geometric options may be set.



To access the histogram properties dialog use the context menu (right mouse click) in an opened histogram. The histogram appearance is controlled using "Graphics settings". The View3D options on the diagram tab and area series type on the series tab can be selected to create 3 dimensional histograms.

| <u>8</u> | Graphic sett | ings - Statist.sg | js 🔍 🗡 |
|--------------|-----------------------|-------------------|--------------|
| 🔢 Diagram | 🗄 Series 🖪 Colors | | |
| 🖵 Use image | Background image | [| à |
| ▼ View3D | 3D Percent | 50 🏂 % - | |
| 🦵 Orthogonal | Elevation Rotation | 345 1 · - | j |
| | Zoom | 74 🔀 % - | _J |
| Show markers | 1 | 🔽 Show×value | in markers |
| | | 🔽 AutoSave | |
| 🔒 Save | 🕒 Load | ✓ <u>0</u> k | 🗙 Cancel 🛛 🢡 |

The type of the series can be Lines, Areas, Points, Bars or Pie

| Series type | Options (Bars) | |
|-------------|--|-----------------------|
| C Lines | Bar style Rectangle C. Durarid | Bar width 70 🔩 % |
| C Points | C Inverted pyramid | Bararrangement |
| 🕶 Bars | Cylinder | C Beside C Stacked |
| C Pie | C Arrow | C Stacked 100% |



2.10.5 Examples

2.10.5.1 Example1

Simply show the overall distribution of RPM: channel "RPM" is selected, no phases are used, and active measurement is selected. No splitting of diagrams nor data.

- Start the analysis tool and enter the menu item Functions ⇒ Histogram ⇒ Create new. You can also use the shortcut key <**ALT**> + <**F1**>.
- Enter a name for the new Histogram, for example "RPM"
- Select the following options as shown in the settings panel below:

| Comment F | RPM overall | | | |
|---|---|--|---|---|
| Data s | election | Measurement files Active measure | Split setti | ngs |
| ©Drive_RPM -> RPI Time diff TDiff window Win change Meter diff MDiff window @Int_Speed -> V_fr | ont | C All visible measure Dynamic follow 1 Demo | urements measuremer | its |
| ©Drive Speed → V Horizontal scaling Use channel lim Lower limit Upper limit Steps Vertical scaling | rear ➤ its 5000.00 rpm 15000.00 rpm 100 ∑ | Split channel Channel Lower limit Upper limit Steps Split phase condition | @Thrott @Throt -10.00 110.00 10 | le -> Throttle itle -> Throttle % % |
| Auto limits Upper limit percent Upper limit values Upper limit time Upper limit meter Phase conditions – Use phases | 10 🔀 % 10000 🔀 60 🗶 sec 10000 🏖 m | | | iplit data by ⁵ None (1 series) ⁶ Files ⁶ Split channel ⁶ Phase conditions ⁷ Laps |

• Select the button <**OK**>. Afterwards you will see the following result





2.10.5.2 Example 2

In this example you will make a comparison of throttle usage of two riders. Channel "Throttle" will be selected, the phases cover the fastest lap, both measurements will be selected. The diagrams or alternatively the data will be split by measurements.

Additionally a split channel (e.g. "Speed") or split phase conditions will be used to examine throttle usage in certain ranges of speed.

- Start the analysis tool and click on the menu item Functions ⇒ Histogram ⇒ Create new. You can also use the shortcut key <**ALT**> + <**F1**>.
- Enter a name for the new Histogram, for example "Throttle_Hist".
- Select the following options in the settings panel.

| Comment | Throttle | | | |
|---|-------------------------------|---|---------------------------|--|
| Data | a selection | Measurement files | Split sett | ings |
| @Throttle -> Thro | ittle | C Active measur | rement | Demo |
| Winchange A Meter diff MDiff window | | All visible mea Dynamic follow | isurements w measureme | nts |
| @Int_Speed -> V @Drive_RPM -> @Drive_Speed -: @Throttle -> Thr | /_front RPM > V_rear | ✓ 1 Demo ✓ 2 Demo | | |
| @Front_Susp -> Horizontal scalir Use channel | Front Fork Y Ig Ilimits | Split channel Channel | V front | |
| Lower limit | 0.00 % | | V_front | |
| Upper limit Steps | 100.00 % | Lower limit Upper limit | 70.00 | Km/h Km/h |
| | | Steps | 8 | * |
| Vertical scaling Auto limits | | Split phase condit | tions | |
| Upper limit value | | Split diagrams by C None (1 diagrams) | | Split data by None (1 series) |
| Upper limit time Upper limit meter | 60 🔀 sec 10000 🔀 m | © Files © Split channel | | Files Split channel |
| Phase condition Use phases | is I ∰ ∰t: Phases | C Phase conditio | ons (| Phase conditions Laps |

• Select the button <OK>. Afterwards you will see the following result.





2.11 FFT (Fast Fourier Transformation)

Graphical output of the spectral analysis of a channel.

A fast Fourier transform (FFT) algorithm computes the discrete Fourier transform (DFT) of a sequence, or its inverse. Fourier analysis converts a signal from its original domain (often time or space) to a representation in the frequency domain and vice versa.

2.11.1 Creation and setup

A FFT setting can be created and saved to disk to be re-used later. This function is accessible from the main menu Functions \Rightarrow Spectral analysis/FFT (Alt+F3) \Rightarrow Create new

2.11.1.1 Settings

After having entered a name for the new chart (see creation of a new FFT analysis above), the following panel will be displayed:

| e | | | | | | |
|--|-----------------|------------------|--------------|----------|---------------|-------|
| Lomment | | | | | | |
| Channel | Data sel | ection | | | | |
| | ✓ Single | e at cursor po | s | | | |
| V front | | | | | | |
| RPM | | | | | | |
| V_rear Throttle | <u>E</u> FT Dep | th | | | Source | |
| Throttle Front Fork Rear Shock Deto#1 | 0 64 | | 0 1024 | | Single | • |
| | 0 128 | | 0 2048 | | OSum | |
| Deto#1 Deto#2 | 0 256 | | 0 4096 | | ⊖ Wate | rfall |
| ExTemp#1 | 0 500 | | 0 0000 | | 0.001 | |
| ExTemp#2 | • 512 | | 0 8192 | | Color | strip |
| Press#1 Press#2 | LabelDa | ataRange | | | | |
| Head#3 | - Window | ina | | | | |
| Speed_lo | Window | a tuno | Hamming | | ~ | |
| BIKE_ACC BPM_SET | Windov | , abc | righting | - A | | |
| GearSpeed | Average | 3 | 3 7 | ł | | |
| Gear' Caas Hammi | Туре | | | | | |
| MAX G rom | 🔘 Magr | nitude | | O Power | spectrum | |
| ACC_RPM | Display | | | | | |
| Gear_Nr Gaar2Nr | | index (ref. 1) (| , | | | |
| FSus lo | | ispidy (rei, 1v | J | | | |
| RSus_lo | Frequer | юу | | Amplitud | e | |
| FSus_hi BSus hi | Limits | s automatically | 2 | ✓ Limits | automatically | |
| FSus' | from | 0,00 | 1 | from | 0,00 | 1/1 |
| RSus' | to | 100.00 | t/1 | to | 1000.00 | 1/ |
| FSus_25 BSus_25 | | 100,00 | ∠ + | 10 | 1000,00 | ∠+ |
| Trail | 🗸 🗹 Only | show data be | tween limits | | | |
| | | 4 | | - | | |
| | | | 🗸 Ok | X | Cancel | 8 |

Most of the options presented in this panel do need explanation. We will give only explanation for these that need a background knowledge.

The data source can be single, sum or waterfall:

- Single: One series of measured values
- Sum: Average of several series of measured values
- Waterfall: Several series of measured values displayed as a waterfall diagram

The FFT Depth controls the number of measured values to be analyzed. Higher bit depth means narrower bins.

The Window type (windowing) controls the handling of each data series prior to calculation



You can minimize the effects of performing an FFT over a non-integer number of cycles by using a technique called windowing. Windowing reduces the amplitude of the discontinuities at the boundaries of each finite sequence acquired by the digitizer. Windowing consists of multiplying the time record by a finite-length window with an



amplitude that varies smoothly and gradually toward zero at the edges. This makes the endpoints of the waveform meet and, therefore, results in a continuous waveform without sharp transitions. This technique is also referred to as applying a window.

The Average function and Magnitude/Power spectrum apply to the calculated FFT data

dB display affects how the spectral analysis is scaled on the Y-axis

The amplitude and frequency range can be calculated automatically or set manually

2.11.2 Functions

2.11.2.1 *Export*

The FFT diagram may be exported in *Windows Meta File* format which can be imported e.g. in Microsoft Word.

2.11.2.2 Print

- The standard print function simply prints the content of the selected window.
- The Print via Excel function embedded the selected window into a selected Excel sheet together with data from the SpecSheet. This updated Excel sheet may be printed out directly or with a preview before.
- Print via Print manager opens a window with additional printing options.



Before printing the background color of the window changes to white color to save printer ink. This option can be controlled in the Analyzer options dialog.

2.11.3 Management

The name of the file containing the FFT settings may be renamed or deleted inside the management editor that is accessed from the main menu Functions \Rightarrow Spectral analysis \Rightarrow manage settings. The editor shows also the name of the used phase settings files.

2.11.4 Properties

The FFT properties include options to control FFT window and graphics handling. This panel is accessed by selecting "Properties" in the context menu (right click on the FFT plot).

| | FFT properties |
|------------------|--|
| ayout | |
| Background | Options Paint immediately |
| Chart background | Color scale position None Top left Dop right Bottom left Bottom right |

2.11.5 Examples

2.11.5.1 Example 1

In this example you will learn to show the bike front suspension chattering through a FFT analysis. For this the front suspension channel is selected. One single data series of 512 measured values will be analyzed.



In the main menu select Functions \Rightarrow Spectral analysis \Rightarrow Create new.

Enter a name for the spectral analysis and click on <OK>.

On the panel settings select the channel "@Front_Susp -> Front Fork", a FFT depth of 512, the Single source option (...) as shown on the figure below.

| Channel | Data selection | |
|---|--|--|
| @Front_Susp -> Front Fork | Single at cursor pos | |
| Four_25 RSus_25 Trail UTrail UCx Fork RWT RWT RWT RWT RWT FWR FWR FWR FWR FWR FWR FWR FWR FWR FWR | FFT Depth FFT Depth C 64 (0.64 sec) C 1024 (10 C 128 (1.28 sec) C 2046 (20 C 256 (2.56 sec) C 4096 (40 G 512 (5.12 sec) Stans: 8192 Time: 6:37.22 - 6: Windowing Window type Hamming Average Type G Magnitude C Display G display (ref. 1V) Frequency Limits automatically from | Source Source Source Single Sum Susce Color strip Colo |

The FFT chart is created as shown below.



2.11.5.2 *Example 2*

In this example you learn how to show bike front suspension chattering. All visible data inside the moving window of the front suspension channel are analyzed. The FFT depth is 512. The result is displayed in a waterfall chart.

In the main menu select Functions \Rightarrow Spectral analysis \Rightarrow Create new.

Enter a name for the spectral analysis and click on <OK>.

On the panel settings select the channel "@Front_Susp -> Front Fork", a FFT depth of 512, the waterfall source option as shown on the next figure.



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| teme GmbH | Alte Karl | sruhe | r Straße 8 | • | D-76227 | Karlsruh | ۱e |
|------------------|-----------|-------|------------|-------|------------|-----------|----|
| Fax: +49 (0) 721 | 944 85-29 | • | E-Mail: ma | il@20 | d-datareco | ording.co | m |

| | settings (Front_ | Jusp.m.) | | |
|---|---|---|---|---|
| Comment | | | | |
| Channel | Data selection | | | |
| @Front_Susp -> Front Fork | 🗹 Single at cursor po | 20 | | |
| FSus_25 FSus_25 Trail Wheelboase Theta ICx Fork RWT Favel RWF RWF FWF FWF FWF FWF Furst StertHeight StertHeight SFC F_Prot A_Rarm LapMeter SpeedBase AccBase Time diff TD/If window Win change Meter diff MD/If window @Int_Speed > V_front @Drive_Speed > V_front @Drive Speed > V_front @Drive Speed > N_front @Drive Speed > N_front > N_front @Drive Speed > N_f | EFT Depth 64 (0.64 sec) 128 (1.28 sec) 226 (2.26 sec) 512 (5.12 sec) Scans: 889600 T Windowing Windowing Windowing Magnitude Display dB display (ref. 11 Frequency Limits automatical from 1.00 to 30.00 | 0 1024 (0 2048 (0 4096 (0 8192 (ime: 0 - 9:1 Hamming 1 24 | 10.24 sec) 20.48 sec) 40.96 sec) 81.92 sec) 5.999 (->64 | Source Single Sum Waterfall Color strip 35) V Dectrum |

The waterfall chart is created right away.



2.12 Acceleration table / Dynamic test system (DTS)

This function is accessed through the main menu Functions \Rightarrow Dynamic tests or directly through the keyboard short cut $\langle Alt \rangle + \langle B \rangle$.

Dynamic test system software module generates report from:



- ELX "Elk test", slalom and lap times
- ELA elasticity test
- MFDD (mean fully developed deceleration) braking test
- ACC acceleration test

You will get detailed information in the manual dedicated to this topic. This topic is also well covered on the Help that can be accessed by right clicking on the main DTS panel.



3 General functions and topics related to Analyzer

3.1 Function related to the (user defined) Quick bar

The Quick bar is on the right side of the screen. If the window is not visible, it can be made visible through the keyboard short cut $\langle Alt \rangle + \langle W \rangle$ or from the main menu View \Rightarrow Quick bar.



Procedure for adding user defined items from the menu to the Quick bar:

Select an item from the menu. Right-click on the item and confirm the question "Add to user defined menus?" with **<OK>**. A link to the selected menu item will be added in the Quick bar.

Sorting and deleting items of the Quick bar

To modify the Quick bar, click on an entry with the right mouse button. You then have the options to move the entry up or down, remove the entry or remove all entries.

| 4 | Move up |
|---|------------|
| ŧ | Move down |
| 亦 | Remove |
| 衝 | Remove all |
| 8 | Help |

3.2 User management

The user management window is accessed from the main menu Settings \Rightarrow User management.

Working as different users may be interesting, if the computer is used by different people or if you are working in various racing series or have different vehicles to support.

A "user" (user profile) includes all user settings, for example channel lists, channel groups, templates, etc. An unlimited number of users may be created and managed by the supervisor user.

Users can be deleted, renamed and their settings exchanged with other users.



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3.3 Phases

Subset of measured data defined by Phase conditions.



Phases are used to filter the data. For example you are only interested in the data of the fastest lap. Or you want to have a look at the current selection, but only while braking or on full gas. This functionality is very helpful to filter the data for min/max tables or other analyzing modules.

A data subset (= phases) is defined by the combination of one or more phase conditions.

3.3.1 Definition

Phases reduce the amount of data analyzed. Options from the data filtering are for example by lap/selection, time or distance range, or channel value range (see panel below).

By using phases the data are filtered and only the filtered data will be taken into account for other analyzing modules such as Min/Max table, histogram...

Phase conditions can also be applied to signals in the Analyzer without being related to a specific analysis module. To set the phases for the "general" Analyzer select from the main menu Measurement \Rightarrow Phases definition (Shift + P). In this case the sections, when the conditions are fulfilled, are indicated on the top side of the overview window:



To define the phases, select "Lap/Selection", "Range" or "Channel dependent" with a double-click and set the filter as needed.



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| Available conditions | | | |
|--|---|-------------------|--------------|
| aps/Selection | | Laps/Selection | |
| lange | Laps/Selection | to the second | |
| Channel dependent | Current lap | ✓ Follow s | election |
| Active conditions | All laps without in | /out | |
| .aps/Selection (Current selection) | Selection in all lap | os without in/out | |
| Channel dependent - (Throttle: 90 - 110) | ◯ Fastest lap | | |
| | Definition of in/out la | aps I and a | |
| | if time% longer | 4 1/2 % | 1:46.704 min |
| | than best lap time | 1 Demo 🗸 🗸 | 1:42.600 min |
| | or meters differ | 4 🕺 % | 3669 · 3974m |
| | from lap length | 1 Demo 🗸 | 3822m |
| | | | |
| Phase condition logic | Delete phases | | |
| All conditions (AND) | if <= 0 | 🍾 scans | 0.000 sec |
| At least one condition (OR) | | | |
| 🔿 Create events | #≋ <u>S</u> how | TRemove | |
| Delete phases | | | |
| if <= 0 🛃 scans 0.000 | sec | | |

3.3.1.1 *Preview*

The phases defined by a single phase condition can be shown via button **<Show**>.

The phases defined by the combination of all chosen phase conditions can be shown via button <**Preview**>.

| Preview: All condition | | | nditions (AND) | |
|------------------------|------------------|------------------------|----------------|-------|
| Current sele | ction | | | |
| Throttle: 90 | - 110 | | | |
| Altogether | | | | |
| Distance | plot | | 1 Demo 🗸 | Close |
| 5 Phases | Current selectio | n / Throttle: 90 - 110 | | |

3.3.1.2 Deletion of small phases

Deletion of small phases or small gaps makes sense, especially when a phase condition of type "Channel dependent" is used. A very noisy signal which is varying around the chosen limits could create many very short phases until finally its values are constant between the limits. Those short phases may disturb the analysis, therefore optionally they may be ignored.

| Available conditions Laps/Selection | | Channel dependen | t |
|--|--|------------------|------------|
| Range Channel dependent | Phase channel | Throttle | |
| Active conditions | | Throttle | ۷. |
| Channel dependent (Throttle: 90 - 110) Laps/Selection (Current selection) | Lower limit | 90 110 | * * |
| Phase condition logic | Delete phases if <= 0 €€€ <u>S</u> how | scans | 0.0000 sec |
| Delete phases if <= 0 1 scans 0.0 | 00 sec | | |



3.3.1.3 *Phase conditions*

Logic Type:

- "AND": Data is selected when all of the selected conditions are true.
- "OR": Data is selected when (at least) one of the selected conditions is true.
- "Create Events": Each condition creates several data points.

Available Conditions:

There are 3 different condition types:

- Lap/Selection
- Range
- Channel dependent

Several of them can be selected and combined via the logic type.

Active Conditions:

Those are the phase conditions you defined.

Delete Phases:

To reduce the number of resulting phases you can eliminate very short sections as well as small gaps inside of the sections.

Create Events:

Only selectable when logic type "Create Events".

Choose whether to accept starts or ends of the events created by this phase condition.

Show Remove:

- <Show>: Examine the resulting data selection (=phases) defined by this phase condition.
- **<Remove>**: Remove this single phase condition from your set of active conditions

Phase Laps:

- "Current lap": Selects from beginning to end of the current lap.
- *"Current selection":* Selects which is currently shown in Moving window.
- "All laps without in/out": Selects all laps which are not in/out laps.
- "Selection in all laps without in/out": Like "current selection", but applies to all laps without in/out.
- "Fastest lap": Like current lap, but uses fastest lap.

Follow selection:

Applies to min/max table and XY plot. The phases are updated immediately when:

- "Current selection" is used.
- Selection in moving window is changed.

Definition of in/out laps:

A lap which differs more than x% in time or distance from the best lap is treated as an in/out lap.

Phase Range:

- Define a range (in meters or time).
- Enter manually or get various input by clicking on arrow buttons.
- "Lap based" creates many ranges (one for each lap).



Phase Channel:

Choose a channel and its lower/upper limit.

The resulting phases cover all sections where this channel's values are between the chosen limits.

3.3.2 Usage

Phases are used in min/max tables, XY plots, track mode or histograms. Additionally phases can be displayed inside the moving window.

The phase conditions are saved and can be re-used later. It is possible to use the phase conditions which have been defined e.g. for an XY-Plot in another context, for example in a Histogram.

3.3.3 Examples

3.3.3.1 *Example 1*

You want to examine data of the fastest lap, where the RPM was higher than 10500 and the throttle was open. You have to select:

- Logic type "All conditions (AND)".
- A condition of type Laps and subtype "Fastest lap".
- A condition of type Channel dependent with channel "*RPM*" from 10500 to 20000 (should be enough).
- A condition of type Channel dependent with channel *"Throttle"* from 20% to 110%.

| Available conditions | | | | |
|---|--|--|--|--|
| Laps/Selection | Laps/Selection | | | |
| Range Channel dependent Active conditions Laps/Selection (Fastest Iap) Channel dependent (RPM: 10500 - 20000) | Laps/Selection Current lap Current selection All laps without in/out Selection in all laps without in/out Fastest lap | | | |
| unannei dependent (Throttie: 20 - 110) | Definition of in/out laps if time% longer 4 24 % 1:46.704 min than best lap time 1 Demo 1:42.600 min 1 or meters differ 4 24 % 3669 - 3974m from lap length 1 Demo 3822m | | | |
| Phase condition logic All conditions (AND) At least one condition (OR) Create events | Delete phases if <= 0 24 scans 0.000 sec ∺∴ Show ■ Remove | | | |
| Delete phases if <= 0 14 scans 0.000 |) sec | | | |

As a result, all phases are displayed that fulfilled the condition "fastest lap where RPM and throttle are within specifications".

| | Preview: All co | nditions (AND) | |
|--|---|-----------------------|---------|
| Fastest lap | | | |
| RPM: 10500 - 20000 | | | |
| Throttle: 20 - 110 | | | |
| Altogether | | and the second second | |
| ● <u>D</u> istance plot ○ <u>T</u> ime plot | | 1 Demo 🗸 | 🖌 Close |
| 32 Phases Fastest lap / | BPM: 10500 - 20000 / Throttle: 20 - 110 | | |



3.3.3.2 Example 2

You want to look at data of two certain corners. You have to select:

- Logic type "At least one condition (OR)".
- A condition of type Range where you enter the position of the first corner by selecting the position range in meter.
- A condition of type Range where you enter the position of the second corner by selecting its position range in meter.

| Pha | ses - Analyzer.pct |
|--|--|
| Available conditions | |
| aps/Selection | Hange |
| lange | Distance/Time |
| Channel dependent | Meters O Seconds O Scans |
| Active conditions | |
| Range | ☑ Lap based |
| Range | from |
| | 1702 🏒 🔶 |
| | to |
| | 1898 🎲 🔶 |
| Phase condition logic All conditions (AND) At least one condition (DR) | Delete phases if <= 0 1 scans 0.000 sec |
| | |
| Delete phases if <= 0 丸 scans 0.00 | O sec |

As a result, all phases are displayed that fulfilled the condition "Position of first and second corner".

| 2 | | Preview: At least | one condition (OR) | | _ 0 |
|--------------|---------------------|-------------------------|--------------------|----------|---------|
| Meters: 1702 | 2 - 1898 | | | | |
| Meters: 236 | 1 - 2527 | | | | |
| Altogether | | | | | |
| Distance | plot | | 1 Demo | v | V Close |
| 2 Phases | Meters: 1702 - 1898 | 3 / Meters: 2361 - 2527 | | | |

If you've selected "Lap based", it will use the first and second corner of each lap.

| 2 | | Preview: At le | east one cond | ition (OR) | | |
|-------------------------------|------------------------|----------------------------|---------------|------------|---|---------|
| Meters Lap b | ased: 1702 - 1898 | | | | | |
| Meters Lap based: 2361 - 2527 | | | | | | • - 1 |
| Altogether | | | | | | |
| Distance | plot | | | 1 Demo | ¥ | 🗸 Close |
| 8 Phases | Meters Lap based: 1702 | - 1898 / Meters Lap based: | 2361 - 2527 | | | |

3.4 Print (via Enhanced Meta File)

Vector format provides powerful features to utilize the high printer resolution.

The print function which is available in all Analyzer graphic windows uses EMF (Enhanced Meta File) techniques. EMF is a Windows vector format that takes advantage of the high printer resolution when printing lines. EMF exported as file may be scaled without loss in image quality to any size e.g. in Microsoft Word or Excel (see example).



Example: A Track mode graphic in EMF format in regular screen size



A zoomed section of the same window:



3.5 Print report manager

The Print report manager can be accessed via main menu as well by any graphic window (Functions \Rightarrow Print report manager $\langle Alt \rangle + \langle P \rangle$).

This print report manager allows the user to configure the page. All current Analyzer graphic windows may be selected and placed freely (in size and place) on the page. Additionally, SpecSheet entries and complete groups may be selected as well as measurement specific data, own free texts or images. In tab "Editor" you can define your page layout and in tab "Preview" you can have a look at the page.

The graphics are printed with high printer resolution instead of screen resolution.

The function "Get current Analyzer windows" retrieves the current screen from Analyzer and places the individual graphic windows on the print report page.

An image of the current print manager page may be saved to disk or clipboard.

Also the "Print via Excel" functionality is available.

The print manager setting can be saved to disk to re-use it later.



For detailed information you can open the context sensitive help module. To do so press the button <F1> in the opened print report manager window

3.6 Time Diff

Virtual channel which shows the time win/loss by lap

The Analyzer generates automatically some virtual channels, which are available at run time, as soon as more than one measurement is loaded. These channels are "Time diff", "TDiff window", "Meter diff", "MDiff window" and "Win change".



The virtual channels contain the time/distance difference of one measurement's lap compared to another measurement's lap¹. This difference is cumulative over the entire lap.

Changing the current lap of one of the two measurements will automatically update the Time diff channel.

Each measurement has its own Time diff channel which is relative to measurement 1. Therefore the Time diff channel of measurement 1 is always zero because it is relative to itself.

| Measuri | ng values | x |
|----------------------|-----------|----------|
| ÷ - | Demo | Demo |
| Lap 🛆 | 2 | 3 |
| 8 🛛 | 1:42.600 | 1:44.900 |
| Time tot. | 4:13.380 | 5:56.120 |
| im total | 8567 | 12389 |
| Time Lap | 0:22.340 | 0:22.480 |
| im Lap | 923 | 923 |
| Time diff [sec] | 0.00 | -0.19 |
| TDiff window [sec] | 0.00 | -0.07 |
| Win change [sec/sec] | 0.000 | -0.023 |
| Meter diff [m] | 0.00 | -5.81 |
| MDiff window [m] | 0.00 | -2.17 |

3.7 TDiff window

Virtual channel which shows the time win/loss on the time/distance range selected in the moving window.

The virtual TDiff window channel displays the time difference between two loaded measurements which are both currently visible in the Moving window. The time difference displayed refers to just that selection visible in the Moving window and is not cumulative over the full lap.

Changing the selection visible in the Moving window will automatically update the TDiff Window channel.

Each measurement has its own TDiff window channel which is relative to measurement 1. Therefore the TDiff window channel of measurement 1 is always zero because it is relative to itself.

3.8 Reference laps

A reference lap is a user defined lap which is extracted from the measured data. It is handled like a normal measurement, but has wrap-around functionality to allow comparison with regular laps. The reference lap can be loaded and saved from the main menu (File \Rightarrow Load Reference Lap and File Save as Reference lap)

3.8.1 Creation

Select a lap from the measurement and save this lap as reference lap.

3.8.2 Comparison of the reference lap with laps from a measurement

Load a measurement and a previously saved reference lap of the same event. The reference lap is converted into a reference measurement. That means that the reference lap is twice in that measurement and it is used in a loop. This allows to compare the reference lap with any lap of the loaded measurement.

3.9 Export

With the 2D software you are able to export any data in different data types (for example CSV, ASCII, 2D measurement, Excel, etc.). You can modify the setting to export only a selection of data. This

¹ It can also be another lap of the same measurement. 2D Analyzer



selection could be of length (for example fastest lap, current selection, defined conditions, etc.) or of channels or a combination of both.

To create a new export setting start the *Analyzer* and select File \Rightarrow Export (Alt + E) \Rightarrow Create new

| Ê | Load measurement of event Alt+O | = | 2 2 | | | H | 14th | - | • 😨 | • 🗏 | - 6 | 1 |
|-----|----------------------------------|---|----------|-------|-----|---|------|----|-----|-----|-----|---|
| È | Load measurement Ctrl+O | F | | | | | | | | | | |
| 4 | Load measurement by plugin | | | | | | | | | | | |
| 4 | Overlay lap | | | | | | | | | | | |
| N/A | Remove active measurement Ctrl+R | | | | | | | | | | | |
| 3 | Exchange measurement Ctrl+E | | | | | | | | | | | |
| U | Reload Shift+R | F | | • | | | | * | | | | - |
| | Desktops • | | | | | | | | | | | |
| ۲ | GoogleEarth link Ctrl+M | | | | | | | | | | | |
| | Load Reference lap | H | • • | • | • | • | • | • | • | • | • | • |
| N/A | Save as Reference lap | | | | | | | | | | | |
| | Store GAP table of current lap | L | | • | | | | • | | | | - |
| | Export (Alt+E) | B | Create r | iew | | | | Ν | | | | |
| A | Live export | | Manage | cetti | nar | | | NU | | | | |

Enter a name for the new export setting and confirm with **<OK>**:

| All users | Current user |
|-------------|-----------------------------------|
| | lk |
| C:\Users\Pu | ublic\Documents\Race2016\Settings |

In the next window you define your export settings.

You start with the export type: Select the format the data should be exported to from the drop-down list. Depending on this the options to define the export settings will differ.



By exporting the data to a new 2D measurement, you can modify your measurement to your needs. For example you can select only the "driver relevant" channels, such as RPM, speed, gear, throttle, brake, etc., and set the phases to use only the fastest lap.

This smaller measurement you could use for a live export to give to your driver.



Select the settings for your export:

| | | Export (Do | oku.exs) |) | | | × |
|---|--|---------------|------------|---|--|--------|---|
| Comment | Married Encol COV Gr. (| | | | - | |] |
| Туре | MICIOSOIT EXCELUS VIIIE (.CSV) | Y | 8 | 24 | Include t | base | |
| Use ever Folder | nt folder | | | Measurement | 0815-FZS-C | л | |
| <tempdir></tempdir> | | | | ا 🖨 🚘 | X_ <mesnar< td=""><td>me></td><td></td></mesnar<> | me> | |
| Separators List separa | tor , Decir | mal separator | <u>[]-</u> | S C | hange | | |
| Channels Channels to O Visible o O All chan O Selecte | o export channels in Moving window inels d channels | | | Spec sheet gro Spec sheet gro All Spec she Selected Sp | ups ups to export set groups sec sheet grou | ps | |
| Sampl. [Hz] | fastest channel | | ~ | | | | |
| ✓ Interpol | ate to sampling rate | | | | | | |
| Distanc | e export every 10 | 1∕↓ m | | | | | |
| Use Spe | ecial channel identifiers | | | | | | |
| Use phases | : 🖌 🎫 <u>P</u> hases | | | | | | |
| | | | | Export | × 0 | Cancel | 9 |
| | | 1 | | | | | |

- Export type: Select the export's type from the drop-down list
- Storage location: Set the folder, where your export will be saved. You can choose between "Use event folder" (then it will be saved in the current event folder) or select any folder. Please have a look at section 8.1 for available folder placeholders.
- Export's file name: Enter the naming elements (placeholders) to define the file name, for example "X_<MesName>". Please have a look at section 8.2 for available naming elements (placeholders).
- Separators: Depending on the export type you can select the separators.



The separators' settings are global. This means if you change them, they will be changed for all export settings.

- Channel settings: Select the channels you want to export and their sampling rate.
- SpecSheet groups: Select the SpecSheet groups you want to export.
- Phases: Set the used phases for the export. If you don't use phases, everything will be exported.
 If you want to use phases (for example the fastest lap), click on <Phases> and define your settings.
 At the bottom of the export defining window you can see which part of the measurement will be exported:

| Use phases | • | ett: <u>P</u> hases | | | | | | | | | | | | | | |
|------------|---|---------------------|---|---|---|---|---|---|-------|------|---|---|----|------|---|----|
| | | | | | | | | | 🔒 Exi | port | | × | Ca | ncel | | 8 |
| | | | 1 | Î | Î | Î | 1 | Ť | 1 | I | Ĩ | 1 | Ĩ | Η | Î | T. |



• Confirm the changes by saving the settings (**<Save Export settings**>) or exporting the data (**<Export**>).

3.10 Live Export

The live export function is accessed from main menu File \Rightarrow Live Export

It is a special export function that creates a stand-alone executable (.exe) containing the data and a data reader. This executable is named by appending "LiveExport_", the event and the measurement names. For example LiveExport_BIKE_DEMO.exe is an executable that contain the data of the measurement "Demo" of the event "Bike". This executable contains also a version of the Analyzer having only the functions necessary to process the data in the executable.

You can run this stand-alone .exe-file on any (Windows) PC even without a 2D Race version installed or licensed. After closing the Analyzer all temporary files are automatically removed.

3.11 Screen Export

This function is accessible from the main menu File \Rightarrow Screen export.

It is a special export function that creates a 2D measurement which contains the section of the channels of the active measurement as selected in the moving window.

When the screen export is done, the measurement is saved in the typical 2D measurement format: .MES-folder. The new .MES-folder is compressed (zip format). Therefore it can be sent easily per e-mail to another 2D user.

3.12 Cut measurement

This function is accessible from the main menu File \Rightarrow Cut measurement.

| | Export (Alt+E) | • 11 |
|-----|-----------------------------------|-----------------------|
| | Live export | annigener terreter |
| P | Screen export | |
| Ж | Cut measurement | Delete to marker |
| 0- | Restore original lap times | Delete from marker |
| N/A | Restore original section triggers | N/A Trim both markers |

There are 3 functions to cut a measurement:

- 1. Delete to marker
- 2. Delete from marker
- 3. Trim both markers

To use the two first functions (Delete to marker/Delete from marker), one marker² must be set in the moving window.

This kind of marker is set by clicking on the moving window while being in measuring mode.

² This marker is not a user defined marker.



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1. Delete to marker

The data between the marker and the end of the measurement is saved. Optionally the first part of the measurement can be saved under another name.

| | Trim measurer | nent |
|-----------------------|--------------------|--------------|
| Trim from start to ma | arker | 童 浅 |
| Clip or divide | | Print. |
| 🔿 Clip | | |
| Sa • Divide | ve divided part as | B_Demo |
| Create backup | Size | 5 MB |
| | K. Tri | m 🕺 🗶 Cancel |
| emo | | |

2. Delete from marker

The data between the start of the measurement and the marker is saved. Optionally the last part of the measurement can be saved under another name.

| | Trim measure | ment |
|---------------------|---------------------|--------------|
| Trim from marker to | o end | |
| Clip or divide | | |
| 🔿 Clip | | |
| S. O Divide | ave divided part as | E_Demo |
| Create backup | Siz | e 5 MB |
| | <u>У</u> т | rim X Cancel |
| | | |

3. Trim both markers

This function is only available, if two markers are set.

The data between those two markers is saved. The data outside the markers are lost.



3.13 Calculation file manager

The calculation file manager is accessible from the main menu Function \Rightarrow Calculation files, or by keyboard shortcut $\langle Alt \rangle + \langle N \rangle$.

| | | | Calcula | tion Fil | e Manager | | × |
|----------------|----------------|----------------------------|----------|------------|--------------|----------------|-----|
| Bike | | Dem | 10 | | | | |
| Data | Event | Measurement | Software | \diamond | | | |
| Date 2016- | 09-12 | Name Test.CAL | | | 4 | | ^ |
| 2012- 2015- | 07-04 06-24 | Track_by_YAV TRQSTS.CAL | /.CAL | | | | Ļ |
| UserD | ata>\Cali | Files | | | | | |
| - | | | | AutoCalc | | | |
| | Calculat | e [| Edit | - | Configurator | Special channe | els |
| [| New | · dir D | elete | - | Run AutoCalc | Protocol | 8 |



Administration of calculation files for the 2D program *CalcTool*. The program CalcTool is documented in a separate user manual³. Please refer to this manual for more information about cal-files.

CalcTool is part of the 2D software. It is used to create calculated channels from channels measured and recorded by a 2D data acquisition system. *CalcTool* is called automatically from the communication software *Winlt* to linearize non-linear channel data. You can define the channels to be calculated by writing a so called cal-file, which is a simple text file containing the instructions for the calculation.

Cal-files may be found/saved in different folders:

- Data root folder: The folder containing your event folders, i.e. RaceData
- Event folder: The folder of your currently selected event, i.e. Jerez.16
- Measurement folder: Your currently selected measurement folder, i.e. FP1-MK36-01.MES
- Software folder: Folder "CalFiles" inside your Race software

Click on "New" and "Edit" to respectively create or modify a cal-file. The cal-file editor incorporates features like syntax checking and code completion. Code completion is a functionality that helps the user when they are developing a cal-file. Functions and channel names are proposed to the user, exactly when they have to be set.

To run a selected cal-file click on "Calculate". After successful execution, the measurement will be reloaded.

The button **<Configurator**> starts the AutoCalc-configurator, where you can modify the list of automatically executed cal-files directly after the download. To execute all cal-files selected in the AutoCalc-configurator, click on button **<Run AutoCalc**>.

If you are working with special channels in your cal-files, you can check and define those by clicking on button **Special channels**>.

3.14 Real time player (signal value to audio signal and force feedback converter)

The real time player allows the playback of up to three recorded channels. It converts their values into a sound that can be played on the PC's speakers, the soundcard or a force feedback controller such as a special joystick. This function is accessible by right clicking on the moving window.



³ The manual can be downloaded from: <u>2d-datarecording.com/en/downloads/manuals</u> \Rightarrow CalcTool 2D Analyzer



If the option "Loop" is enabled, the playback will be repeated when the end has been reached.

If the option "Stay in selection" is disabled, the content of the moving window will follow the section of the signals played back. A dotted vertical line visualizes exactly the position of the signals being played.

The position at which the playback starts is selected among the following options:

- Start of measurement
- Start of current lap
- Start of current selection
- Center of the current selection

The playback speed can be the normal speed, i.e. the speed at which the signals have been recorded, the half or the double of this speed.

3.15 Video playback

With the video playback function it is possible to play a video that has been recorded along with the signals. The accepted video formats are .avi and .mpeg. The video is imported either from the main menu Function \Rightarrow Video or Plugins \Rightarrow 2D Video Functions.

3.16 Templates

Storage of desktop layouts of the Analyzer windows.

A template contains the position and size of all Analyzer windows visible on the desktop. This desktop layout can be saved under a unique name to disk in a so called template. Templates are used to restore the windows positions and sizes of the Analyzer.

Save your current Analyzer windows layout into a template by clicking on the template button in the main toolbar. Select "Save as" and accept the name or enter an own name.





Restore a previous saved template by clicking on the template button in the main toolbar and selecting the desired template.



Alternatively, you can save and manage templates from the main menu Settings \Rightarrow Templates:

| | Template management | | | | | | |
|------------------------|-------------------------|-----------------|-----------|---|--|--|--|
| File Functions Repos | itory Help | | | | | | |
| 📔 🗉 🕼 🔶 | * 🔦 🤋 | | | | | | |
| All users | Current user | | | | | | |
| | k | | | | | | |
| C:\Users\Pub | ic\Documents\Race2016\L | Jsers\User0=lk\ | l'emplate | | | | |
| Template | | Key | Favorite | 1 | | | |
| 2D Suspension | | | × | | | | |
| 2D Suspension Damping | | | × | | | | |
| 2D Suspension Position | | | X | | | | |
| Overview | | | X | | | | |
| | | | | | | | |
| Speed search: Type | e to hiter ! | | | | | | |
| Start Apply | Previous | 🔍 Last | session | | | | |
| 🕞 Save | Save as | | | | | | |
| Dynamic template bar | | | | | | | |
| Position at top | Expand/shrink mode: | : A | iuto | ~ | | | |

3.17 Quick Key

Structured list of keyboard shortcuts assembled into macro functions

The quick key function allows execution of common functions via keyboard shortcuts. Items like channels or groups can be added, removed or replaced quickly.

| R | = | Runs |
|---|---|--------------|
| G | = | Groups |
| С | = | Channels |
| A | = | Areas |
| L | = | Laps |
| 0 | = | Overlay laps |
| Т | = | Templates |
| Ζ | = | Zoom |

The quick key window is opened by pressing the key < + >, < - > or < # >. The progress indicator indicates how long the quick key window is open and therefore how long the macro keyboard shortcut can be entered.

For example: Press < + > followed by < C > and <**Enter**> to open the list of channels.

| 1. The type: Add, remove or exchange |
|--|
| a) Key < + > or < Ins > adds something |
| b) Key < - > or < Del > removes something |
| c) Key < # > exchanges something |
| 2. The category (what to handle) |
| a) Key < R > means a run (measurement) |
| b) Key < G > means a group |
| c) Key < C > means a channel |
| d) Key < A > means an area |
| e) Key < L > means a lap |
| f) Key < O > means the overlay of another lap |
| g) Key < T > means a template |
| h) Key < Z > means zooming of the selection in the Moving window |
| T) Rey < Z > means zooning of the selection in the Moving window |



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3. The item to work with

- a) Run (measurement): the item key represents the measurement to remove or exchange
- b) Group: the item key represents the short key of a group
- c) Channel: the item key represents the short key of a channel
- d) Area: the item key represents the short key of a group to handle in an area
- e) Lap: the item key represents the lap number to jump into, "F" means fastest lap
- f) Overlay lap: the item key represents the lap number to load and overlay, "F" means fastest lap
- g) Template: the item key represents the short key of a template to apply
- h) Zoom: the item key represents the factor to zoom in or out, "L" means whole lap



After pressing the type key the quick key window opens. After a short period, if there is no keyboard input, it will close automatically.

3.17.1 Examples

| Action | combination |
|---|-------------|
| Switch off channel "V_Front" (assumed V_Front has short key "F"): | - c f |
| Switch on group "Engine" (assumed Engine has short key "E"): | + g e |
| Switch off group "Engine" and replace by group "Suspension" (assumed Suspension has short key "S"): | #gs |
| Compare current lap with fastest lap by overlaying it: | + 0 f |
| Zoom in twice: | + z 2 |
| Zoom out whole lap: | - z l |

3.18 Quick Channels

Open the quick channels window by clicking on the arrow right of the logger icon in the tool bar, then select "Channels".



The quick channels window lists all channels of the active measurement.

The channels may be shown either listed one after the other or grouped by channel types (digital, analog, CAN, calculated or virtual).



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| | | Q | uick channels | - 🗆 🗙 | | | (| Quick channels | | × |
|------------|---|-----------|---------------|-------|------------|---|---------|----------------|------------|-----|
| V_front | - | MAX_G_rpm | FWF | | Digital | | Analog | Can In | Calc | 10 |
| RPM | - | ACC_RPM | F_ges | | V_front | - | Deto#2 | | Gear_Nr | 🗸 T |
| Throttle | 1 | Gear2Nr | StemHeight | | BPM | 1 | Press#2 | | Speed_lo | T |
| Gear_Nr | 1 | FSus_lo | RearHeight | | Throttle | 1 | | | Bike_Acc | V |
| V_rear | | RSus_lo | SRC | | V_rear | | | | RPM_SFT | N |
| Front Fork | | FSus_hi | SFC | | Front Fork | | | | GearSpeed | N. |
| Rear Shock | | RSus_hi | F_Pivot | | Rear Shock | | | | Gear' | |
| Deto#1 | | FSus' | A_Rarm | | Deto#1 | | | | Gear_Hamm' | |
| Deto#2 | | RSus' | LapMeter | | ExTemp#1 | | | | MAX_G_rpm | |
| ExTemp#1 | | FSus_25 | SpeedBase | | ExTemp#2 | | | | ACC_RPM | |
| ExTemp#2 | | RSus_25 | AccBase | | Press#1 | | | | Gear2Nr | |
| Press#1 | | Trail | Time diff | | Head#3 | | | | FSus_lo | |
| Press#2 | | Wheelbase | TDiff window | | Trail | | | | RSus_lo | |
| Head#3 | | Theta | Win change | | Wheelbase | | | | FSus_hi | |
| Speed_lo | | ICx | Meter diff | | Theta | | | | RSus_hi | |
| Bike_Acc | | Fork | MDiff window | | ICx | | | | FSus' | |
| RPM_SFT | | RWTravel | | | Fork | | | | RSus' | |
| GearSpeed | | BWB | | | RWTravel | | | | FSus_25 | |
| Gear' | | FWR | | | RWR | | | | RSus_25 | |
| Gear_Hamm' | | BWF | | | 20 | | | | | |

The visibility of a channel may be switched on or off by clicking on it. Nevertheless, a mouse click will not only toggle the visibility but it will also close the window. To toggle the visibility of channels without closing the window, press <CTRL> while clicking on the channels with the mouse. The window will stay open thus allowing to switch several channels one after the other.



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4 **Tutorials**

Available tutorials:

- Save current desktop layout
- Show measured data over distance
- Perform grouping of channels
- Show Time Diff (win or loss)
- Display a Track mode
- Show phases in Moving window



For detailed information start the *2D Analyzer* and select from the main menu *"Tutorials"*. Tutorials are only available for 2D software licensed at the level "System" or higher.



Select a tutorial and perform it step by step





5 Options specific to the Analyzer

Each user of the Analyzer has his own options set.

The settings of the Analyzer are accessible from the main menu Settings \Rightarrow Options or with the keyboard shortcut < F9 >.

In the settings window there are several tabs. The tabs group options. The options found in each group are explained below.

5.1 General

| General Program start File load Colors Key assignment Effects Settings Meters lap relative X-axis scaling starting with 0 X axis scaling in time format Xetivate scaling in time format Measuring values window jumps when under cursor Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements Activate overview when toggling active measurement Reload measurements without confirmation Fix markers to data Grid in Moving window | | | | | Options | | × |
|--|---------------------------|---------------------|--------------|------------|---------------------------|-------------|---|
| Settings Meters lap relative X-axis scaling starting with 0 X-axis scaling in time format Measuring values window jumps when under cursor Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements Activate overview when toggling active measurement Activate overview when toggling active measurement Reload measurements without confirmation Fix markers to data Grid in Moving window First scaling Clip channels in Moving window Clip inside context No clipping None None Show additional Replace Template contents Distance/time plot status | General | Program start | File load | Colors | Key assignment Effe | cts | |
| Meters lap relative X-axis scaling starting with 0 ✓ × axis scaling in time format Measuring values window jumps when under cursor Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements ✓ Activate overview when toggling active measurement ✓ Activate overview when toggling active measurement ✓ Reload measurements without confirmation Fix markers to data Grid in Moving window ✓ First scaling Clip channels in Moving window ✓ Clip inside context ✓ No clipping ✓ Draw line Show window functions when toggling linked measurement ✓ None ✓ Show additional ✓ Replace Template contents ✓ Distance/time plot status | Settings | - | C () | | | | |
| Meters lap relative ∴ xais scaling starting with 0 ✓ X axis scaling in time format Measuring values window jumps when under cursor Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements ✓ Activate overview when toggling active measurement ✓ Reload measurements without confirmation Fix markers to data Grid in Moving window ● Elip channels in Moving window ● Clip inside context No clipping Show window functions when toggling linked measurement ● None Show additional Template contents | | | | | | | |
| Axis scaling starting with 0 ✓ X axis scaling in time format Measuring values window jumps when under cursor Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements Automatically convert old measurements Activate overview when togging active measurement Activate overview when togging active measurement Reload measurements without confirmation Fix markers to data Grid in Moving window First scaling | Met | ers lap relative | | | | | |
| | ∐X-a× | kis scaling startir | ng with 0 | | | | |
| Measuring values window jumps when under cursor Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements Activate overview when togging active measurement Reload measurements without confirmation Fix markers to data Grid in Moving window First scaling All scalings Clip channels in Moving window Otip inside context No clipping Draw line Show window functions when toggling linked measurement None Show additional Replace Template contents Distance/time plot status | √ Xax | is scaling in tim | e format | | | | |
| Center by cursor (Shift+C) moves cursor to center position also Automatically convert old measurements Activate overview when toggling active measurement Activate overview when toggling inked measurement All scalings Clip inside context None Anote Anote | 🗌 Mea | asuring values w | indow jum; | os when | under cursor | | |
| Automatically convert old measurements Activate overview when toggling active measurement All scalings Clip channels in Moving window Olip inside context ONo clipping Oraw line Show window functions when toggling linked measurement None Show additional Replace Template contents Distance/time plot status | 🗌 Cen | ter by cursor (SI | nift+C) mov | es curso | r to center position also | | |
| Activate overview when toggling active measurement All scalings Clip channels in Moving window Orlipping Oraw line Show window functions when toggling linked measurement None Show additional Replace Template contents Distance/time plot status | Auto | omatically conve | ert old meas | surement | s | | |
| | 🖌 Acti | vate overview v | vhen toggli | ng active | e measurement | | |
| □ Fix markers to data Grid in Moving window ● First scaling | ✓ Relation | oad measureme | nts without | confirma | ition | | |
| Grid in Moving window First scaling Clip channels in Moving window Clip channels in Moving window Clip inside context No clipping Draw line Draw line Show window functions when toggling linked measurement None Show additional Replace Template contents Distance/time plot status | 🗌 Fix r | narkers to data | | | | | |
| All scalings All scalings All scalings Clip channels in Moving window Olip inside context O No clipping Draw line Show window functions when toggling linked measurement None Show additional Replace Template contents Distance/time plot status | Cridin k | Acuina window | | | | | |
| Clip channels in Moving window Clip inside context Clip inside context No clipping Draw line Draw line Draw lin | First | scaling | | | | alings | |
| Clip inside context | Clip cha | nnels in Movinc | window | | | | |
| Show window functions when toggling linked measurement None Show additional Replace Template contents Distance/time plot status | 🖲 Clip i | - inside context | | 0 | No clipping | 🔿 Draw line | |
| None Show additional Replace Template contents Distance/time plot status | Show w | indow functions | when tog | gling link | ed measurement | | |
| Template contents | None | e | | 09 | Show additional | ⊖ Replace | |
| Distance/time plot status | Templa | te contents | | | | | |
| | 🗌 Dista | ance/time plot s | tatus | | | | |
| Measurements linked status | Mea | surements linke | d status | | | | |
| | | | | | | | |

• Meters lap relative

X axis scaling in distance plot starts at 0 at the current lap's start.

- X-axis scaling starting with 0 X axis scaling starts at 0 at the start of the selection in the Moving window.
- X-axis scaling in time format Set X axis to be a time scale.
- Measuring values window jumps when under cursor With this option enabled a movement of the cursor in Measuring mode near the measuring values window causes the window to jump out of the way to the other side of the screen.

• Center by cursor (Shift+C) moves cursor to center position also If you use the shortcut <Shift> + <C>, the position where the cursor is located at that time will be put in the center of the moving window.

Automatically convert old measurements
 A measurement which is saved in the old data format version V1 (*.par) will be converted into current
 2D measurement format (V3). The current format handles all files of a measurement together in one
 folder with .MES extension.

Activate overview when toggling active measurement

When a measurement is activated its corresponding overview window will be shown and made active.



• Reload measurements without confirmation

Skip query when reloading a measurement after fundamental changes made to the data, for example through the execution of cal-files.

• Grid in Moving window

Controls whether a scaling is shown for the first displayed scaling only or for all visible scales.

5.2 Program start

| o [| Dragram start | - | 0.1 | | [] |
|----------------|-------------------|--------------|------------------|---------------------|------------|
| General | Filogram start | File load | Lolors | Key assignment | Effects |
| Templa | te Overview | Ę | v v i | Jse last session de | isktop |
| Selectio | on | C | Start of | measurement | |
| Zoo | m full lap | C | First lap | | |
| | | ۲ | Fastest | lap | |
| Plot (if a | status not define | ed in templa | ite) | | |
| ◯ <u>D</u> ist | ance plot | ۲ | <u>T</u> ime pla | ot | |
| | | | | | |
| | | | 120 | | |
| | | | | 🗸 Ok | 🗙 Cancel 💡 |

• Template

The template selected will be applied to the desktop layout when the Analyzer is started.

Use last session desktop

The desktop layout of the last Analyzer session is applied.

• Selection/Zoom full lap

Choice whether to show a complete lap at Analyzer start, together with the option about which lap to display.

• Plot

Selection of the default setting of the moving window's x axis: distance or time plot.

5.3 File load

| | | | | Optior | IS | |
|---------|------------------|---------------|------------|-------------------|----------|---|
| General | Program start | File load | Colors | Key assignment | Effects | |
| When c | verlaying anoth | er measure | ment | | | |
| 🖌 Syn | chronize new lo | aded meas | urement | s | | |
| 🗌 Swit | ch to distance j | olot | | | | |
| 🗌 Sho | w channel "Tim | e diff'' whe | n secon | d file loaded | | |
| 🗌 Sho | w channel "TDi | iff window'' | when se | econd file loaded | | |
| When lo | bading a measu | rement the | first time | | | |
| 🖌 Run | lap checker if (| event on cl | osed trai | ok. | | |
| When n | neasurement's f | astest lap is | significa | antly faster | | |
| ✔ Dete | ect track segme | nts if even | on clos | ed track | | |
| | | | | | | |
| | | | 4 | | <u> </u> | - |
| | | | | 🖌 Ok | X Cancel | 8 |

• Synchronize new loaded measurements

If a measurement is already loaded, each subsequently loaded measurement is placed at the same position on the track.

• Switch to distance plot

When loading another measurement, the Analyzer plots the signals as a function of the distance to make comparison with other measurements easier.

• Show channel "Time Diff" when second file loaded

After loading a second measurement, the virtual Time Diff channel is created and assigned to the first measurement's channels.


Show channel "Time Diff window" when second file loaded
 After loading a second measurement, the virtual TDiff Window channel is created

After loading a second measurement, the virtual TDiff Window channel is created and assigned to the first measurement's channels.

Run lap checker if event on closed track

Depending on the track settings (closed track or not), each time a measurement is loaded that has not been checked before, the lap checker wizard will check track length and lap triggers.

5.4 Colors

| | | | | Option | IS | × |
|----------|------------------|-------------|----------|------------------|---------|---|
| General | Program start | File load | Colors | Key assignment | Effects | |
| Measur | ements | | | | di da | |
| Measure | ement 1 | | | | | |
| Measure | ement 2 | | | | | |
| Measure | ement 3 | | | | | |
| Measure | ement 4 | | | | | |
| Measure | ement 5 | | _ | 1 | | |
| Measure | ement 6 | | | | | |
| Measure | ement 7 | | | | | |
| Measure | ement 8 | | | | | |
| Measure | ement 9 | | | | | |
| Print | | | | | | |
| ✔ Over | view: white bac | kground so | heme | | | |
| 🖌 Movi | ng: white backg | ground sch | eme | | | |
| Color of | white channels | | | | | |
| ✓XY-P | lot: use white b | ackground | | | | |
| ✓ Track | k mode: use wh | ite backgro | ound | | | |
| 🗸 Circu | it: use white ba | ckground | | | | |
| ✔ FFT: | use white back | .ground | | | | |
| Channe | l colors | | | | | |
| 🗌 Satur | ated channel c | olors when | multiple | measurements loa | ded | |
| 51 - FB1 | | | 31 | | | |
| | | | ľ | . / Ok | Campad | Ø |
| | | | | V UK | | ¥ |

• Each measurement has its unique color by which it can be identified. The color selected is applied to all channels of the measurement in the Moving window. This is very useful when more than one measurement is visible.

• Print/White background

Before printing a window its background color or complete color scheme will be switched to a more suitable white background to save the amount of printer ink.

Channel colors/Saturated channel colors

Instead of displaying all channels in their measurement colors this option causes a slight color saturation to help separating the channels.

5.5 Key assignment

| A | | | | Optior | is 💌 |
|----------------------------|--|------------|----------|----------------|----------|
| General | Program start | File load | Colors | Key assignment | Effects |
| Cursor k the r the s | eys move neasure graph (l election (new) | DOS) | | | |
| 🗌 Track | ball mode | | | | |
| ✔ Vertic | al mouse zoom tion move with r | mouse in m | easuring | mode | |
| | | | | 🗸 Ok | X Cancel |



Cursor keys move...

Choose whether pressing the cursor keys move the curves or the selection window.

• Trackball mode

An option to reposition the mouse cursor after moving the selection. This makes the use of a notebook's trackball easier in Moving window.

• Delayed drawing

This option controls drawing of channels in Moving window: moving the selection with cursor keys left/right will just draw the active channel until key released, after that the full graphics will be drawn. This helps fine tuning of the selection on slower computers.

5.6 Effects

| General | ral Program start File load Colors Key assignment Effects | | | | | |
|---------|---|-------------|-------------|-----------------------|-----------------------------|--|
| | | | | | | |
| Alan | m highlighting in | Moving wi | ndow: D | raw the circles fille | 1 | |
| Sho Sho | w channel valu | es thumbha | ill in chai | nnel selection dialo | gs r- L - | |
| Sno | w channel valu | es thumbha | ali in chai | nnei setup (Ait+U) | lalog | |
| Drai | wXY-Plots buffe | ered | | | | |
| ✓ Drai | wXY-Plots inter | ruptable | | | | |
| 🖌 Igno | ore "Local extrem | ma'' mode (| when > 1 | 6K samples on scr | een | |
| 🖌 Igno | ore "All" drawing | mode whe | en > 2001 | < samples on scree | n | |
| 🖌 Drai | w Circles at sam | ple time in | rectangle | e mode when > 10 | pixels per sample on screen | |
| | | | | | | |
| | | | | | | |



6 Help for controlling the Analyzer with the keyboard

6.1 Complete list of shortcuts

| Shortcut | Action |
|--------------------------------------|---|
| <1-9> | Activate the measurement in the "Moving window" |
| <alt +="" 1-9=""></alt> | Show the "Overview window" for the measurement <1-9> |
| <ctrl +="" 1-9=""></ctrl> | Show or hide the measurement <1-9> in the "Moving window" |
| < A > | Show the "Overview window" of the active measurement |
| < C > | Show / hide the "Circuit window" |
| < M > | Show / hide the "MultiCircuit window" |
| < P > | Shows the phases in the "Moving window" |
| < SHIFT + P > | Edit the phase conditions for the "Moving window" |
| < S > | Change the x-axis unit to distance |
| < T > | Change the x-axis unit to time |
| < V > | Link measurements, when more than one loaded |
| < SHIFT > | Invert "link status" when moving several measurements |
| < CTRL + S > | Synchronization of measurements |
| | Start measuring mode |
| | Start measuring mode for the active measurement only |
| | Start measuring mode for the active measurement in channel colors |
| | Show measured values in bey mode |
| | Show measured values in his mode |
| | Terminate the "Measuring mode" |
| | Activates the "OLICK KEY" key function |
| < +/-/#> | Activates the QOICK KET Key function |
| | Show nove to the beginning of the current lap |
| < Page Op > | Show hext tap |
| < Page Down > | Show the previous lap |
| < CTRL + Home > | Nove to the lastest lap |
| < SHIFT + Home > | Select the entire lap |
| <shift +="" ctrl="" home=""></shift> | Select the entire section |
| | Drido last selection |
| < ALI + Z > | Define the zoom factor |
| | Activates the context sensitive help |
| < CIRL + F1 > | Show / hide hint window |
| < F9 > | Show the Options window |
| < F10 > | Access the main menu of the analysis tool |
| < F11 > | I oggie the active window's state between hormal and maximized size |
| < ALT + L > | Show the lap times of the loaded measurements |
| < ALT + 5 > | Show the section times of the active measurement |
| < ALT + E > | Export the measurement data |
| < ALI + M > | Show the list of available "Min/max table" settings |
| < X > | Show the list of available "I rack mode" settings |
| < ALI + F1 > | Show the list of available "Histogram" settings |
| < ALT + F3 > | Show the list of available "FFI" settings |
| < ALI + F5 > | Show the list of available "XY-plot" settings |
| < Alt + P > | Start print report manager |
| < ALT + U > | Show a list of all available channels |
| < ALI + N > | Start the "Calculation file manager" – Administrate your cal-files |
| < ALI +1> | Start the SpecSheet module (=2D data management tool) |
| < ALI + B > | Show dynamic test module "DIS" |
| < ALI + Q > | Enter a comment for the active measurement |
| < ALT + V > | Show a complete current active windows list |
| < ALT + W > | Show / hide "Quick bar" for access to common used functions |



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| Shortcut | Action |
|--------------------|--|
| < CTRL + ALT + Q > | Save a screen shot of the desktop |
| < CTRL + C > | Copy active form into clipboard |
| < CTRL + E > | Exchange the active measurement with another one |
| < CTRL + R > | Remove the active measurement |
| < CTRL + G > | Show the channel list with the "Groups" tab selected |
| < SHIFT + S > | Edit special channels |
| < SHIFT + T > | Edit track settings |
| < ALT + O > | Load another measurement of the current event |
| < CTRL + O > | Load another measurement |
| < CTRL + M > | Link to Google Earth |
| < CTRL + ALT + S > | Swap (interchange) 2 loaded measurements |
| < CTRL + P > | Show properties of the currently active window |
| < ALT + R > | Restore window positions using the current template |
| < CTRL + ALT + D > | Display measurements in moving window vertically separated |
| < CTRL + W > | White background |
| < CTRL + L > | Light (grey) background |
| < CTRL + D > | Dark (black) background |
| < CTRL + T > | Use individual (template) color scheme |
| < ALT + X > | Terminate the program Analyzer |

6.2 Keys active in the "Moving window"

| Shortcut / Mouse | Action |
|-----------------------|--|
| Mouse: Left button | Offset moving |
| Mouse: Double click | Start measuring mode |
| < S > | Change to Distance plot (x-axis unit = distance) |
| < t > | Change to Time plot (x-axis unit = time) |
| < 1 > - < 9 > | Activate measurement 1-9 |
| < ALT 1 > - < ALT 9 > | Show overview |
| < CTRL + HOME> | Fastest lap |
| < SHIFT + HOME > | Entire lap |
| < CTRL + ALT + F > | Open filter options for the currently active channel |
| < ALT + Z > | Define the zoom factor |
| < CTRL + ALT + M > | Show magnifier window |
| < F11 > | Maximum / Restore window size |
| < CTRL + C > | Copy the graphic content of the moving window to clipboard |
| < g > | Show / hide grid lines |
| < CTRL + ALT + D > | Display measurements vertically separated |
| < CTRL + P > | Show properties of the currently active window |



6.3 Keys active in the "Moving mode" & "Measuring mode"

| Shortcut / Mouse | Action | |
|--------------------------------|---|--|
| Moving mode | | |
| < SPACE > | Start measuring mode | |
| < ENTER > | Start measuring mode for the active measurement only | |
| < SHIFT + ENTER > | Start measuring mode for the active measurement in channel colors | |
| < Mouse left button > On | Arrange the channel displayed vertically | |
| vertical channel scaling | | |
| Measuring mode | | |
| Mouse: Left button | Set left or right marker | |
| Mouse: < CTRL > + left | Select the active channel | |
| button | | |
| Mouse: Left button in | Select the active channel | |
| measuring values number | | |
| Mouse: Left button on | | |
| channel name in | Toggle channel's visibility | |
| measuring values | | |
| Cursor left / right | Move the cursor that is anchored on the active channel. The cursor is at | |
| | the crossing of two dotted lines. | |
| < CTRL > + cursor left | Set left marker | |
| < CTRL > + cursor right | Set right marker | |
| < SPACE > | Stop measuring mode | |
| < ESC > | Stop measuring mode | |
| < "<" or ">" > | Toggle between channel to set the active one | |
| < Z > | If 2 markers have been placed : Zoom by markers | |
| <ctrl +="" alt="" i=""></ctrl> | If 2 markers have been placed: Interpolate values for the visible channel | |
| < CTRL + Z > | If 1 marker has been placed: Redefine offset of the active channel | |
| < CTRL + V > | If 2 markers have been placed: Redefine the formula the of active | |
| | channel | |
| < SHIFT + L > | Add lap trigger at mouse cross position | |
| < ALT + Y > | Add section at mouse cross position | |



7 Glossary

| Expression | Explanation |
|------------------------|---|
| Acceleration table | A table with acceleration, deceleration and elasticity data. This table is |
| | calculated from the measured data and displayed in an extra window. |
| Active channel | The channel in which the two dotted lines are crossing when the mouse |
| | is moved in the measuring mode. Some special measuring can be |
| | performed on this channel. The active channel can be set separately for |
| | each loaded measurement. |
| Active measurement | The measurement in foreground on which most functions are applied. |
| | Every measurement loaded can be activated. |
| Area | Sub window in the moving window which contains channels of a group. |
| | More than one area may be displayed. |
| Calculation file | A file (*.cal) with calculation formulas for channels. If selected in the |
| | AutoCalc configurator, the cal-files can be executed automatically after a |
| | download. |
| Channel | Each (sensor-) signal whose data is downloaded results in a channel of |
| | the measurement. |
| Channel sampling rate | The recording frequency of a single channel. |
| Chassis | External module to show the chassis geometry. Chassis geometry can be |
| | outputted either graphically or in text form depending on the software |
| | |
| Circuit window | A window which shows the track map with the current selection of the |
| | active measurement highlighted. The circuit window may be turned off or |
| Oliphoord | On. |
| Clipboard | A Microsoft Windows data container which allows exchange of text of |
| Color obconcol | graphic between programs. |
| Color channel | dimension. The physical values of the chapped are mapped to colors |
| Color schomo | A bundle of suitable colors for one window. The color scheme is applied |
| | when the Analyzer is restarted |
| Comment of measurement | Δ free editable text stored together with the measurement. This text may |
| | consist of several lines and can be printed along with any window |
| Distance plot | The plotting of the measured values over distance (X-axis in dimension |
| | "meter"). The distance is calculated internally by integration of a speed |
| | channel. |
| Export | Function to extract parts of a measurement. Selection criteria are time |
| | range and the channels list. Different formats are supported such as |
| | Microsoft Excel or CSV. |
| Export of settings | A function to save Analyzer settings into a specific folder. This allows |
| | interchange of settings with another 2D software user. |
| Grid | A graphical aid with horizontal and vertical lines. It is available for each |
| | visible window where signals are shown. |
| Group | Definition of a group of channels which are handled together. This |
| | grouping of channels allows a fast topic related analysis. A topic may be |
| | something like "engine" or "suspension". |
| Histogram | A histogram is a graphical representation of the distribution of numerical |
| | data. It is an estimate of the probability distribution of a continuous |
| | |
| Ideal lap time | I ne sum of best section times. |
| Joined switching of | Option to switch a channel's visibility together in the moving and overview |
| | WITIQUW. |
| Lap trigger | A marker which shows the position of the lap time signals. Information of |
| | hap mygers are downloaded together with channel data. Lap mggers may |
| | be mouned manually. |



| Expression | Explanation |
|--------------------|--|
| Link measurements | A function to move all loaded measurements together in the moving |
| | window. |
| Main sampling rate | The recording frequency of the data logger from which the measurement |
| | was downloaded. The channel sampling rate is equal or lower than the |
| | main sampling rate (factor 2, 4, 8, 16, 32, 64, 128). |
| Measuring cross | In measuring mode, the measuring cross is built by two dotted lines |
| | defined by the active channel's value and the position of the cursor. |
| Measuring mode | An analyzing mode which shows numerical values of the visible channels |
| 3 | at the position of the measuring cross inside the Moving window. |
| | Alternative state to the moving mode |
| Min-/Max table | A table with the minimum/maximum/average values of channels per lap |
| | A subset of the data analyzed may be defined using phases |
| Moving mode | The selection inside Moving window can be moved with the mouse |
| | Alternative state to the measuring mode |
| | The main analyzing window with channel value (signal) curves of the |
| | The main analyzing window with channel value (signal) curves of the |
| | selected part of the measurement. The selected part of the measurement |
| Overlay, of lar | Can be zoomed in and out of moved. |
| Overlay of lap | A function to compare several laps of one measurement or with another |
| | measurement. Up to 9 measurements can be loaded and overlaid. |
| Overview | A window which displays some signals (channel values) of the whole |
| | measurement range with a reduced resolution. Each measurement |
| | loaded has its own overview window. |
| Phase condition | A logical condition to define a subset (Phases) of the measured data. |
| | Several Phase conditions can be combined with "AND" or "OR" operator. |
| Phases | Phases are a combination of phase conditions combined by the operator |
| | "AND" or "OR". They are used to filter the data before being used for |
| | different purposes like Export, Histogram, XY-plot etc. |
| Quick key window | When this window is open, it is possible to achieve common tasks with a |
| | series of keyboard shortcuts. For example, channels or groups can be |
| | added, removed or exchanged. |
| Real Time player | The real time player reads signals data, converts the data in a sound |
| | and/or a feedback force. Playback output may be the PC-speaker, the |
| | sound card or a force feedback joystick. |
| Reference lap | A user defined lap which is extracted and saved from the measured data. |
| | It is handled like a normal measurement but has wrap-around functionality |
| | to allow comparison with regular laps. |
| Route | 2-dimensional data which contains driven position. This allows to draw a |
| | XY-plot which shows the geographical path on which the measurement |
| | has been made. |
| Saturated color | Saturation is used to create a 3 rd dimension by changing locally the color |
| | as a function of the channel values. For this purpose a color channel is |
| | used that defines how the channel values are converted into a color. |
| Scaling | Text area besides graphics to give information about physical values at |
| | certain steps. One of the most important scales is the time resp. distance |
| | scaling for the x-axis in moving and overview windows |
| Section | A track can be divided into different sections. Most of the time this is done |
| | by GPS coordinates or other recorded section triggers. It can also be |
| | divided by the driven meters while analyzing the data. The definition of |
| | the sections is used for the section times table |
| Segment | A track is separated in two kinds of segmente: etraighte and corpore. This |
| | is used for the Track mode window, where you can display the minimum |
| | maximum or average values of a selected channel for each cogment |
| Chart kay | maximum or average values or a selected challer for each segment. |
| эпон кеу | A Short key is a (user-defined) keyboard shortcut. This enables fast |
| | access to different functions of the quick key window and its functions. |



| Expression | Explanation |
|---------------------------|--|
| SpecSheet | The database with additional information about each measurement. SpecSheets are used for cross-analysis. Normally it is opened by the 2D program SpecView. |
| Special channel | A channel with defined intention which is used for internal functions. Each channel of a measurement can be assigned to any one of the special channels. The list of special channels applies to all measurements of the Event. |
| Synchronize | Function to place the other measurement's selection close to the active measurement's selection in their respective laps. |
| Template | The definition of desktop layout of several windows. The desktop layout may be saved inside a template and restored later by choosing this template once again. |
| Time plot | The display of the measured values over time (X-axis in dimension "time"). Always on in Overview windows, but selectable in the Moving window. |
| Time diff | A virtual channel which shows the time win/loss of one measurement's lap compared to another one's lap. The Time diff channel is available only for the measurement 1. The second measurement to compare is selectable. |
| TDiff window | A virtual channel which shows the time win/loss of one measurement's selection compared to another one's selection. The TDiff window channel is available only for the measurement 1. The second measurement to compare is selectable. |
| Trackball mode | An option to reposition the mouse cursor after moving the selection. This helps the use of a notebook's trackball in Moving window. |
| Track length | The length in meters for one lap of a track. All laps of a measurement whose lap length differs from the Track length not more than Track tolerance are treated as Valid laps. |
| Track mode window | A graphical display of one lap with the inscription of defined channel values at certain points. The inscription of the channel values is organized in rectangled markers which may be placed freely. |
| Track offset | The distance in meters between lap trigger position and start/finish line of the track. This value has to be defined precisely to create a correct relationship between the measured data and the track map. |
| Track tolerance | The percentage of the lap length to Track length deviation which defines a Valid lap. |
| User defined markers | A set of markers placed by the user to highlight some user defined positions in a measurement. It may be used to show defined channel values at certain points at the Track mode window. |
| User management | The management of several Analyzer users with individual channel, group and options settings. The creation of more than one user causes a login prompt at program start. |
| Valid lap | A lap whose calculated lap length differs from the Track length not more than Track tolerance. If a lap is not valid several functions and displays are not available for this lap. |
| Video link | An external module to play and synchronize a video footage along with the measured data. The video link function is available depending on the licence level. |
| Visible windows | A list of all Analyzer windows which are currently open. Each entry represents one window and may be closed or forced to foreground. |
| Visibility of measurement | A function to temporary hide the data of a loaded measurement. This is helpful to focus on another loaded measurement by reducing visual information. |



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| Expression | Explanation |
|-------------|--|
| Window list | A window with buttons linked to the most common functions. It may be |
| | closed permanently to gain screen space. |
| Wizard | An "intelligent" external module with an extra specialized purpose. |
| | Wizards are used mainly to create additional calculated channels. |
| XY-Plot | A function to show the relationship of 2 channels graphically. XY-Plots |
| | may include several measurements and use a Color channel as 3rd |
| | dimension. |
| Zoom | A function to enlarge or reduce the data selection in the Moving window. |
| | Zoom functionality can be achieved via the Quick key window, keyboard |
| | or mouse. |



8 Appendix

8.1 Storage location placeholders

To save the exports in the correct place, there are some defined placeholders to use for different storage locations:

- o <DriveName=volume>
- <TempDir> temporary directory
- <DataDir>
 current data directory, which is selected in WinARace
- <EventDir> current event folder
- <MesDir>
 current measurement folder
- <RaceDir> Race program data

8.2 Naming element placeholders

To create a systematic name for the export, there are different naming element placeholders available. This enables you to create different names without changing the settings.

<EventName> name of event
 <MesName> name of measurement
 <LapNr> number of current lap
 <HED=section.ident> entry of the SpecSheet, for example: <HED=BIKE.Chassis>

With the last naming element (<HED=section.ident>) you can call every information stored inside the SpecSheet.

Examples:

 You want to do an Excel export of the data of a min/max table and you defined the name to export as "MM-<EventName>-<MesName>".
 Your event is named "Aragon 16" and the corresponding measurement is named "Test VK48.

Your event is named "Aragon.16" and the corresponding measurement is named "Test-VK48-05". Your Excel export file will be named as MM-Aragon.16-Test-VK48-05.xlsx.

If you use the same export setting with a measurement named "Race-NA31-01" of event "Assen.15", then the export file will be named MM-Assen.15-Race-NA31-01.xlsx.

You want to export the data of the fastest lap into CSV format and you defined the name to export as "<EventName>-<MesName>-<HED=Info.Driver>-Lap_<LapNr>".
 Your event is named "N24h.16", the measurement's name is "Race-4711L-01", your SpecSheet has the entry Driver=KRO in group "Info" and the fastest lap is lap 36. Your CSV export will then be named N24h.16-Race-4711L-01-KRO-Lap_36.csv.

If you use the same export setting and your event is named "Hockenheim.16", the measurement's name is "QP-B1-#99-03", the SpecSheet has the group "Info" with the entry Driver=DC and the fastest lap is lap 3, then the created CSV export file will be named Hockenheim.16-QP-B1-#99-03-DC-Lap_3.csv.