



LapMonitor
Lap by lap monitoring

LapMonitor

(V2.10.0)

User Guide



TrackSide
Software

Summary

1. Prerequisites	4
2. License	5
2.1. Activate a license online	5
2.1.1. Enter licence key	5
2.1.2. Proxy	5
2.1.3. Firewall whitelisting	5
2.2. Offline license	6
2.2.1. Activation	6
2.2.2. Deactivation	7
3. LapMonitor user's interface	9
3.1. Upper menu overview	10
3.2. Toolbars overview	11
3.3. Bottom bar overview	11
3.4. Status bar	11
4. Setting up an Auto-Export in WinTAX4	12
4.1. Requirements of the WinTAX Lap Report	14
4.1.1. Mandatory channels	14
4.1.2. Other requirements	14
4.2. Exporting a Lap Report from WinTAX manually	15
4.3. Absolute lap number	15
5. Setting up an Auto-Export in ATLAS	15
6. Setting up an Export in PI Toolbox	15
7. Setting up an Export in Motec i2	17
8. Creating a new project	20
9. Creating a layout and arranging windows	21
10. Channels	23
10.1. Adding channels	23
10.2. Channel properties	24
10.3. Popup window alarm	25
10.4. XY Channels	26
10.5. Channel sets	27
10.6. Search channels	27
10.7. Channels summary	28
10.8. Monitoring	29
11. Laps selection	29
12. Graphs	30
12.1. Graph display	30
12.2. Horizontal axis	32
12.3. Set "time of the day" horizontal axis	34

12.4. Tags.....	35
13. Automatic filters	36
14. Ignore laps	37
15. Project browser.....	38
16. Reports	41
17. Sharing projects	42
18. Project properties	43
19. Options	44
20. Web API	45
20.1. Configuration	45
20.2. Inline documentation	45
20.3. Code generation	45

1. Prerequisites

LapMonitor requires the following to be libraries installed. You can download them from the Microsoft website:

NET 8.0 Desktop runtime & NET 8.0 ASP.NET Core

<https://dotnet.microsoft.com/en-us/download/dotnet/8.0>

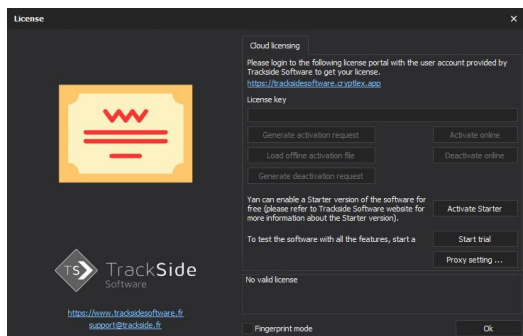
Visual C++ Redistributable for Visual Studio 2015.

<https://www.microsoft.com/en-us/download/details.aspx?id=48145>

2. License

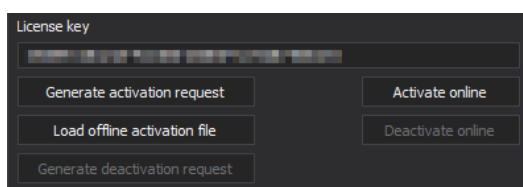
2.1. Activate a license online

2.1.1. Enter licence key

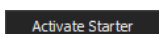


If you have no license yet, the first time you will launch LapMonitor, this window will appear.

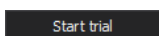
You can get a license from Trackside Software and activate it here.



Enter a valid license key and click on “Activate online”.



You can use a Starter license by clicking on “Activate Starter”.



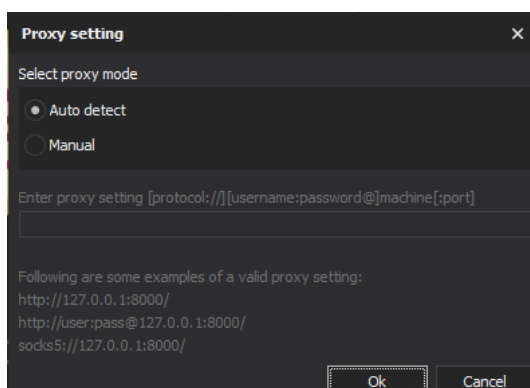
You can also start a trial period with “Start trial” (30 days).



LapMonitor need an internet access to check the license frequently. But after a successful validation, it can work for 30 days without internet.

Notice than a trial license always requires an internet access to start

2.1.2. Proxy



LapMonitor requires to access internet to activate the License. It uses the default proxy configuration of the system, but in some cases, you may need to specify another proxy server. This could be done from this window available by clicking on the button “Proxy setting ...” of the License window.

2.1.3. Firewall whitelisting

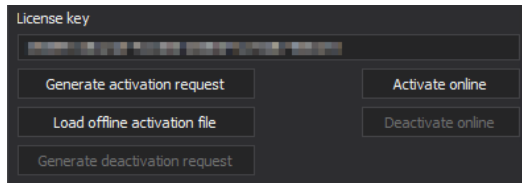
If your policy denies access to external websites, you will need to whitelist the URL below. A whitelist provides access to designated sites that would otherwise be prevented by your security policy.

<https://api.cryptlex.com:443>

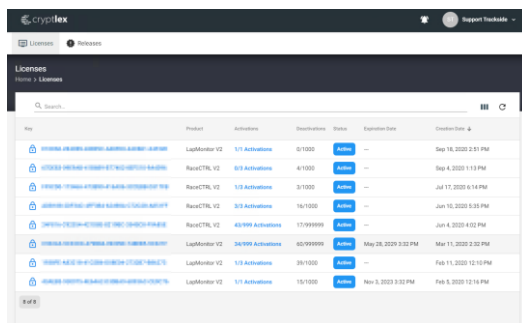
2.2. Offline license

2.2.1. Activation

If the software is not allowed to access to internet, it is possible to activate the license in offline mode.



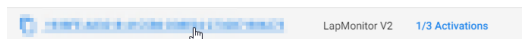
Enter a valid license key and click on “Generate activation request”. This will generate a file containing an activation request. Copy this file to a computer with an internet connection.



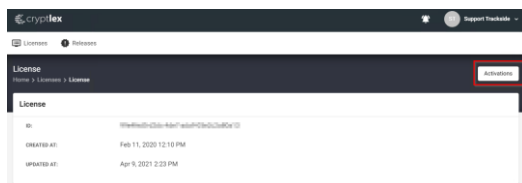
On a computer with an internet connection, navigate to the license portal.

<https://tracksidesoftware.customer.cryptlex.com>

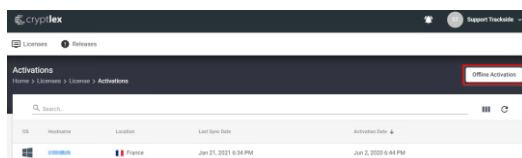
Use the credential provided by Trackside Software to open a session.



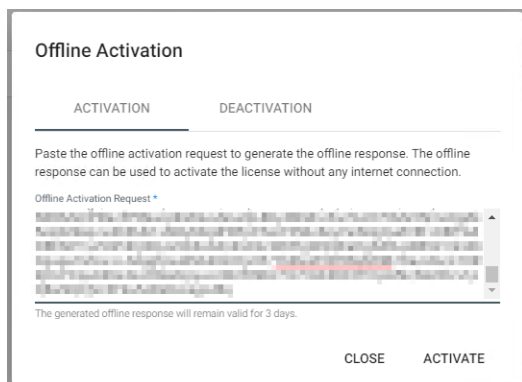
Click on the license you want to activate.



Click on the “Activation” button.



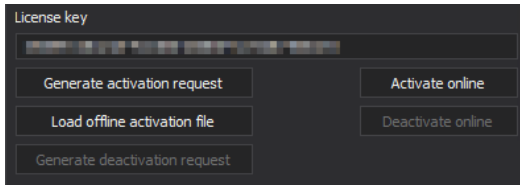
Click on the “Offline Activation” button.



Copy the content of the activation file request and click on “Activate”.

Download Response

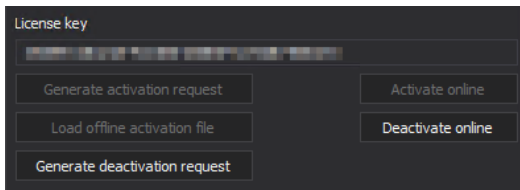
Click on “Download Response” to get the activation file. Then copy this file on the computer you want to activate the license.



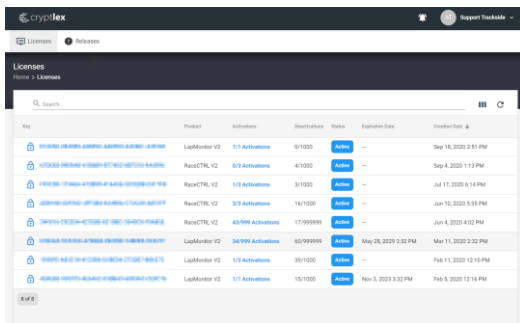
Click on “Load offline activation file” to activate the license on the computer without internet connection.

2.2.2. Deactivation

If you want to use license on another computer, it is possible to deactivate the license without internet connection on the computer using the software.



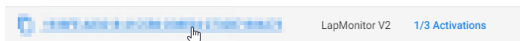
Click on “Generate deactivation request” to deactivate the license on the computer. Then copy the file generate on another computer with an internet connection.



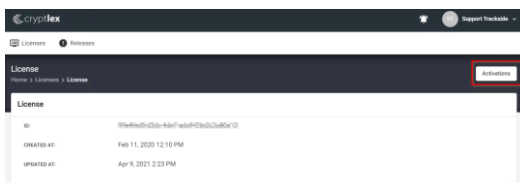
On a computer with an internet connection, navigate to the license portal.

<https://tracksidesoftware.customer.cryptalex.com>

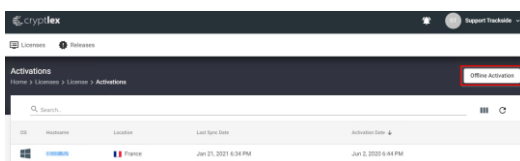
Use the credential provided by Trackside Software to open a session.



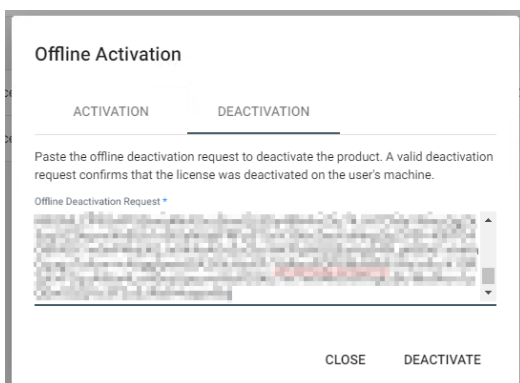
Click on the license you want to deactivate.



Click on the “Activation” button.



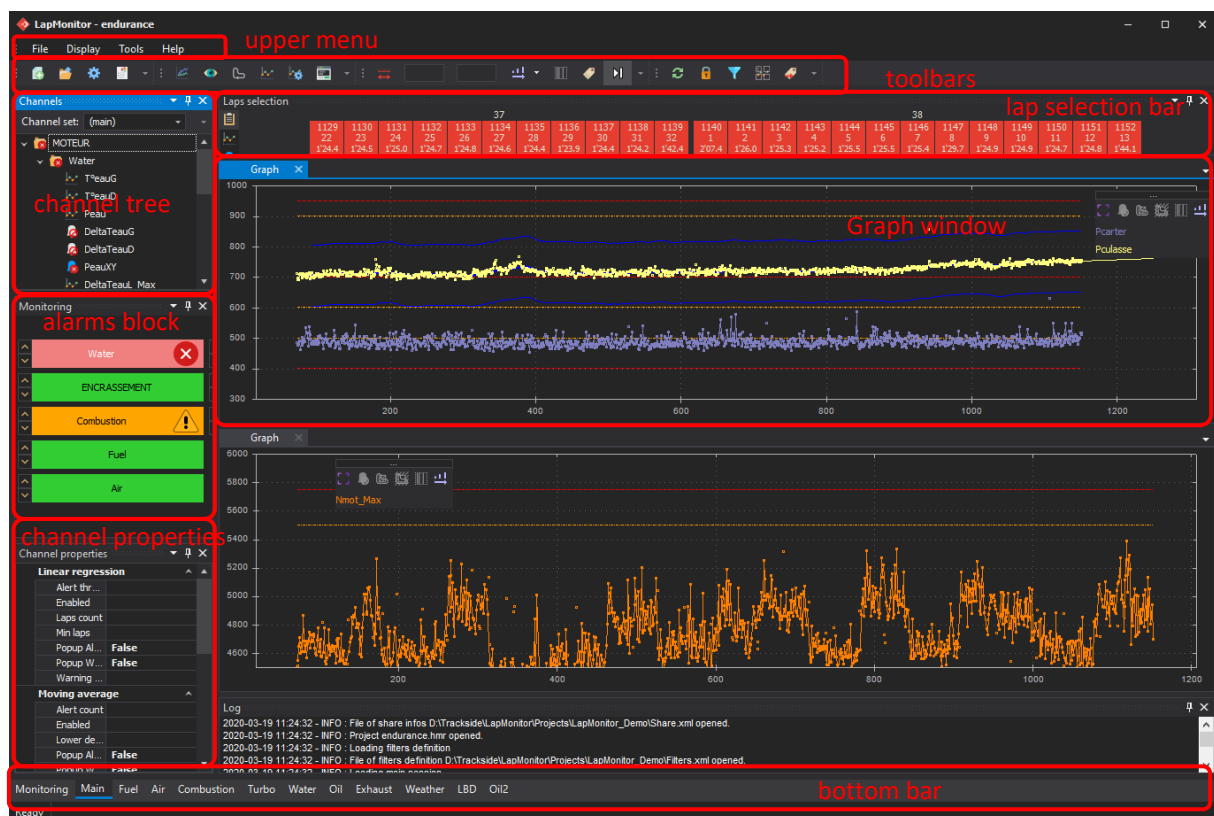
Click on the “Offline Activation” button.



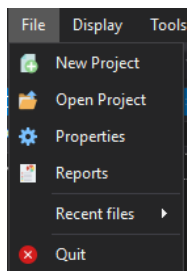
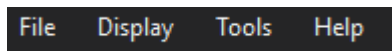
Copy the content of the deactivation file request in the deactivation file and click on “Deactivate”.

The license can now be use again on another computer.

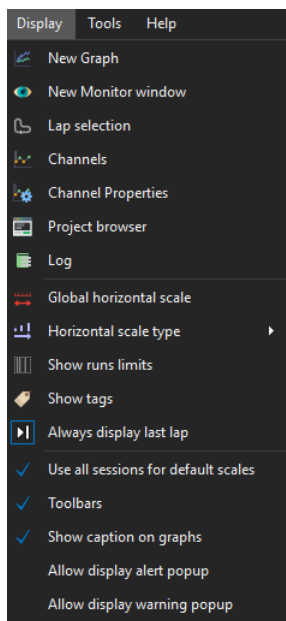
3. LapMonitor user's interface



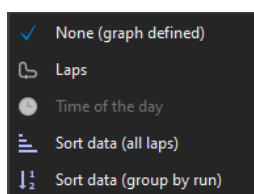
3.1. Upper menu overview



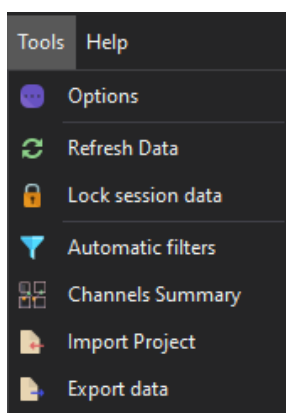
Create a new project
Open an existing project
Open the project properties window
Open the reports window
Shows the recent files list
Quit the application



Add a new graph window
Add a new monitor window
Show the lap selection window
Show the channels window
Show the channel properties window
Show the project browser window
Show the log window
Enable the global horizontal scale
Change the horizontal scale type (see below)
Show/hide the runs limits on the graphs
Show/hide the tags on the graphs
Always display the last lap in the “*Lap selection*” window
Calculate the scales from all points in all sessions/projects
Show/hide the toolbars
Show/hide the caption on all graphs (use CTRL+L as a shortcut)
Allow alert popup windows
Allow warning popup windows



The horizontal scale type is defined for each graph
Force all graphs to use laps as the horizontal scale
Force all graphs to use “time of the day” as the horizontal scale
Force all graphs to sort data (all laps)
Force all graphs to sort data (grouped by run)

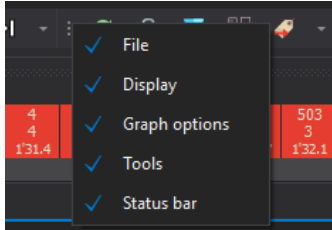


Open the options window
Refresh the data from the lap report
Lock the project (data aren’t refreshed)
Open the automatic filters window
Open the channels summary window
Import project (import channels, filters, tags, ... from another project)
Export the main session data, see the option window to configure the export path.

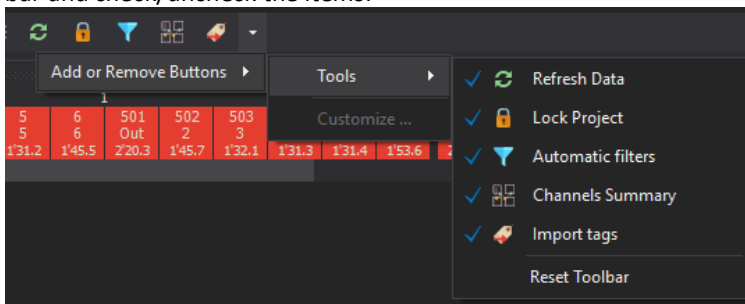
3.2. Toolbars overview

The toolbars can be shown (check “Toolbars” in the “Display” menu) to allow a quick access to the menu functions.

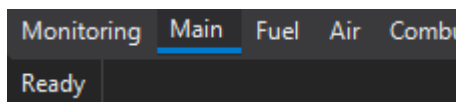
The toolbars show most menu actions by default. You can customize which toolbars you want to show or hide with a right-click on the toolbars space:



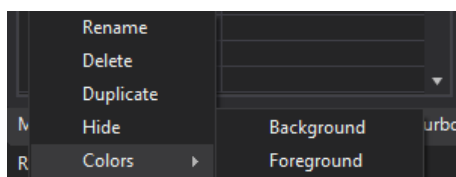
For each toolbar, you can choose which buttons you want. Click on the down arrow at the right edge of the toolbar and check/uncheck the items:



3.3. Bottom bar overview



Views can be arranged in different layouts which are displayed in the bottom bar.



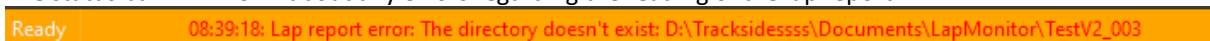
It works like an Excel tab. A right click in the bottom bar allows adding, duplicating, renaming and deleting a layout.

You can also choose the background and foreground colors of each tabs.

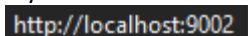
You can hide a layout tab: click on the “Hide” option in the contextual menu of a tab. To show it again, click on the “Unhide” option in the contextual menu of the tab bar (right click anywhere on the bar where there is no tab).

3.4. Status bar

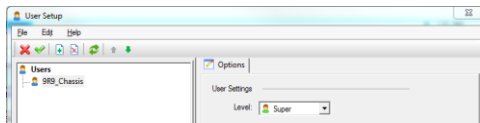
The status bar will inform about any errors regarding the reading of the lap report.



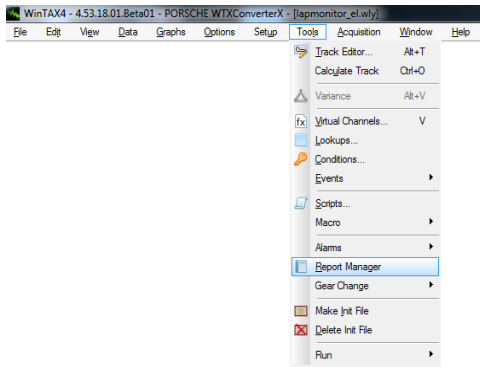
If you enable the Web API, a link is available on the right to open it in a browser.



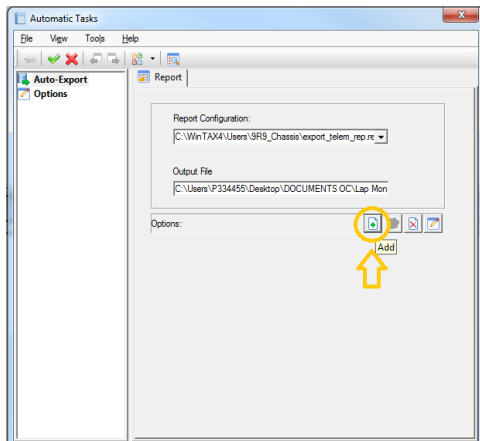
4. Setting up an Auto-Export in WinTAX4



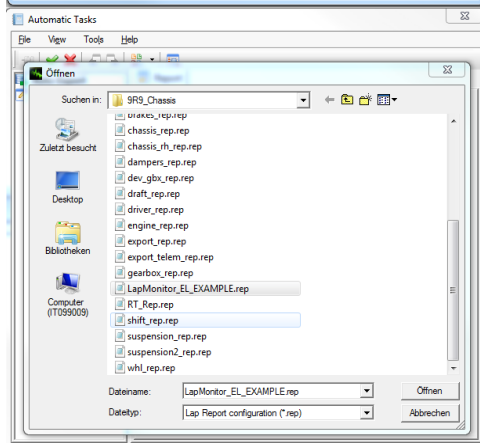
Check that your User is set to 'Super'.



In WinTAX4 :
Tools>Report Manager



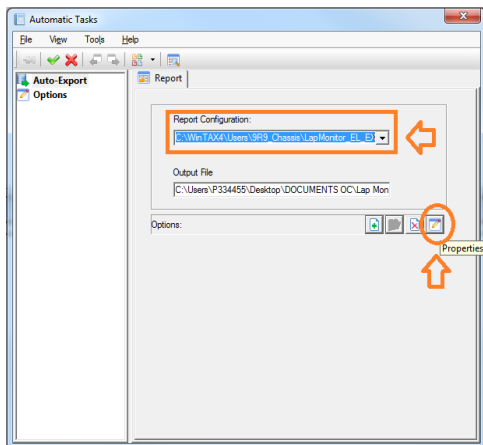
In *Auto-Export>Report* :
Press the *Add* button (+)



A dialog box opens, select a previously configured Lap Report configuration file (.rep) you want to export and press *Open*.

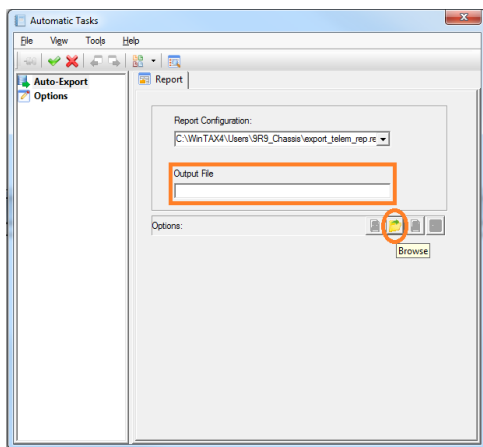
Example : *LapMonitor_EL_EXAMPLE.rep*

Make sure the right Lap Report configuration file is selected in the

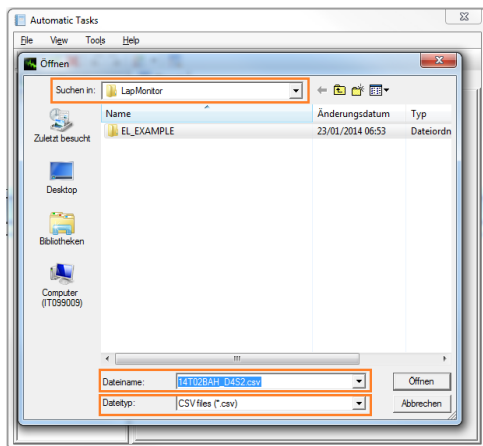


Report Configuration field.

Properties of the currently selected Lap Report configuration file can be directly edited by pressing on the *Properties* button.



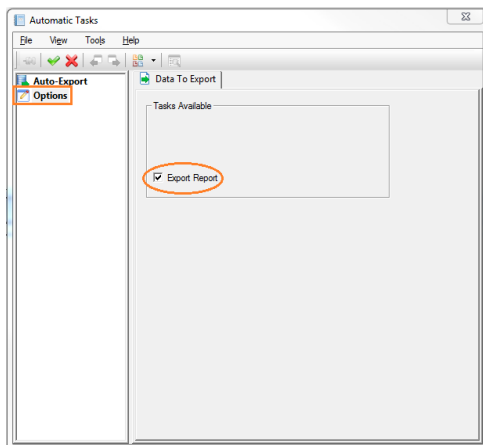
Click in the *Output File* field and click on the *Browse* button.




A dialog box opens, select .csv as Data type, select a location where you want to export the file and give it a name.

Example : 14T02BAH_D4S2.csv

Press *Open*.



Go to *Options* and make sure Export Report is selected.

Click on .

When using the Telemetry, the Report Manager will export automatically the data of the Lap Report into the csv file at the end of every lap.

This csv file will then be read automatically by LapMonitor.

4.1. Requirements of the WinTAX Lap Report

4.1.1. Mandatory channels



Some info channels have to be included in the lap report that you want to export to LapMonitor:

<u>WinTAX Info</u>	<u>description</u>	<u>names</u>
• Track Lap	absolute session lap number	tracklap, track_lap, tl
• Track Run	absolute session run number	trackrun, track_run, tr
• Lap	relative lap number in the current run	lap
• Lap Time	laptime	laptime, lap_time
• Lap Marker	marker of the lap	lapmarker, lap_marker, mrk

4.1.2. Other requirements

In the WinTAX Lap Report, selecting more than one statistic option per channel should be avoided.

- Example of what to do:

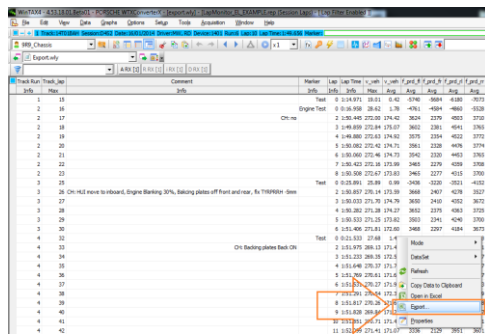
 v_veh	<input type="checkbox"/>	Tahoma 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-
 v_veh	<input type="checkbox"/>	Tahoma 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-

- Example of what to avoid:

 v_veh	<input type="checkbox"/>	Tahoma 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-
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The goal of this method is to have a header in all columns of the exported csv file.

4.2. Exporting a Lap Report from WinTAX manually



Lap	Time	Min	Max	Avg	Std	Min	Max	Avg	Std
1	15	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
2	16	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
3	17	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
4	18	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
5	19	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
6	20	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
7	21	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
8	22	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
9	23	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
10	24	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
11	25	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
12	26	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
13	27	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
14	28	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
15	29	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
16	30	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
17	31	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
18	32	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
19	33	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
20	34	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
21	35	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
22	36	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
23	37	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
24	38	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
25	39	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
26	40	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
27	41	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000
28	42	0:15.850	0:16.00	0:15.925	0.000	0:15.850	0:16.00	0:15.925	0.000

In order to test the functionality of your Lap Report configuration while not connected to the Real Time server or after the end of a session, a manual export function of Lap Report (.rep) is available in WinTAX4.

Right-click in the middle of the displayed Lap Report in WinTAX4, select *Export* and follow the same instructions as described above.

4.3. Absolute lap number

LapMonitor needs an absolute lap number from the WinTAX data Lap Report (which does not necessarily have to start from 1 but which cannot be negative).

5. Setting up an Auto-Export in ATLAS

Please refer to the ATLAS user manual.

By default, the 5 specifics channels used to read an ATLAS file are :

- cnt_lap_abs : absolute lap number
- cnt_outing (-) : run number
- Lap : comments
- cnt_lap (-) : relative lap number
- Lap Time : the lap time

You can override these values from “File>Properties” then select “Project” tab.

6. Setting up an Export in PI Toolbox

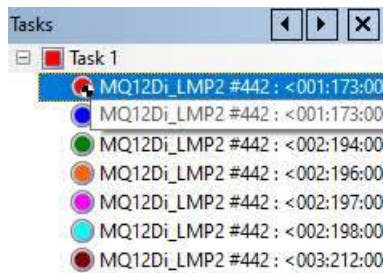
The following channels are mandatory for LapMonitor:

- Lap: the lap number (always included by PI Toolbox)
- Lap time (sec): the lap time in seconds (always included by PI Toolbox)
- Outing: the run number(always included by PI Toolbox when you check the options, see below)
- Absolute lap: the absolute lap number (not included by PI Toolbox, LapMonitor calculates it)

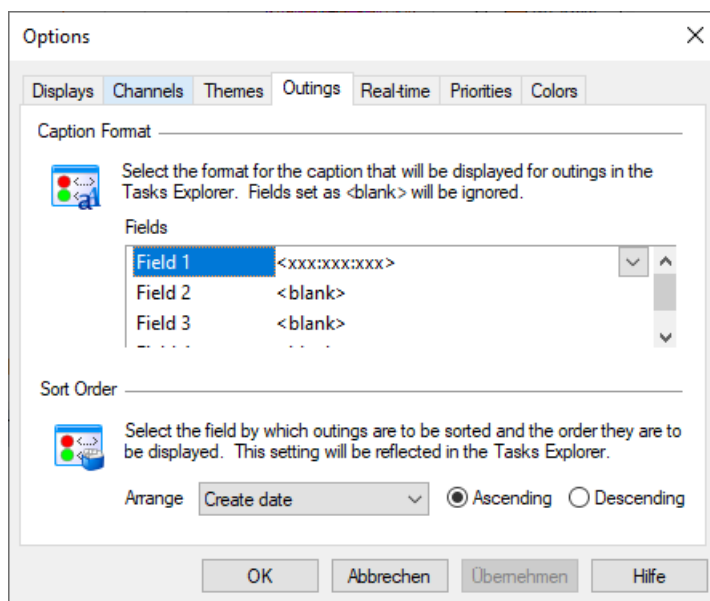
Please refer to the PI Toolbox user manual to learn how to create an Excel report.

LapMonitor reads “.XLSX” Excel files, not “.XLS” so please choose the right file extension. The following steps have to be checked to be sure that the data will be read by LapMonitor.

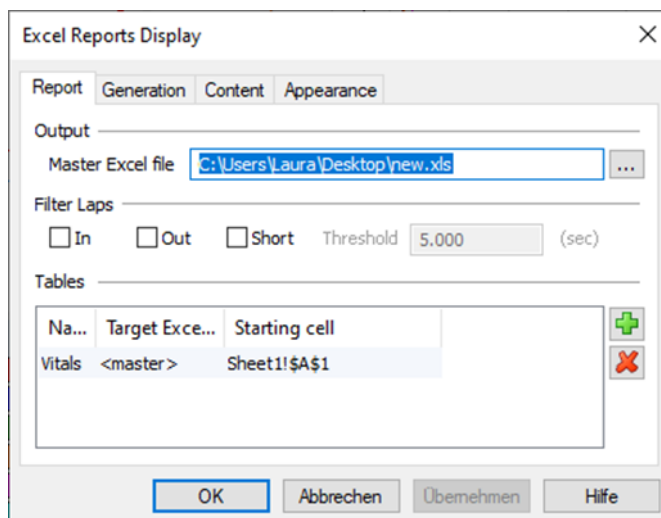
- Load all outings you want to export into one task:



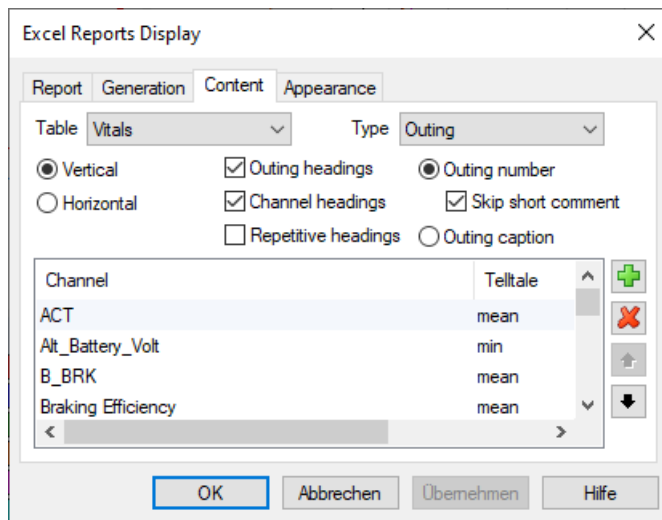
- Make sure in Tools→Options you have chosen the order to be ascending. Depending on your data offload procedure you have to sort by create date or outing number in the dropdown:



- In the Excel reports dialog uncheck the “In” and “Out” boxes:



- In the content page you have to choose the options “Vertical” and type “Outing” and tick the boxes “Outing headings”, “Channel headings” and “Skip short comment”. Uncheck the box “Repetitive headings”:



- **Important:** when you run the Excel report to export the data, the Excel file is opened and filled with data. **Don't forget to save it and close it so LapMonitor can read it.**

7. Setting up an Export in Motec i2

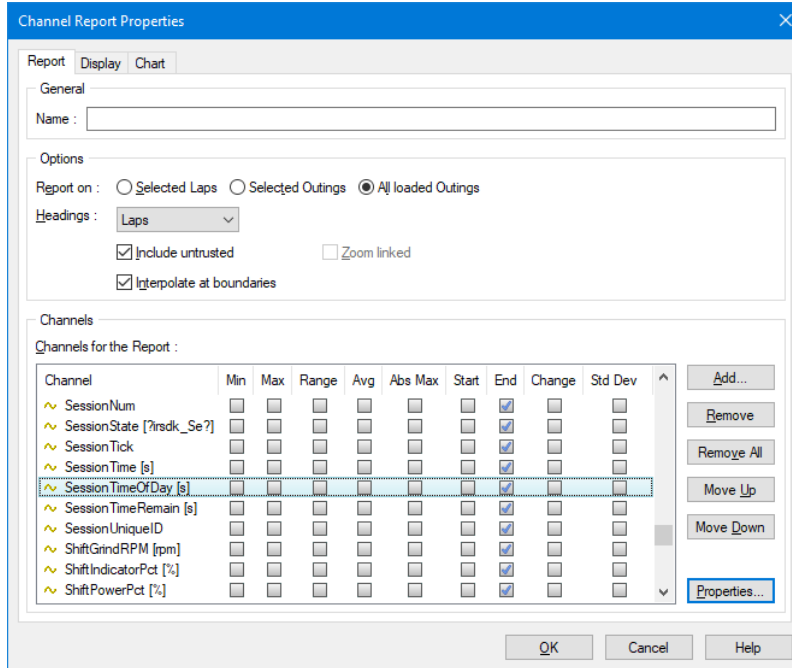
The following channels are mandatory for LapMonitor:

- Lap In Run: the lap number (always included by Motec i2)
- Laptime: the lap time in seconds or minutes:seconds (always included by Motec i2)
- Run Name: the run number is calculated by LapMonitor
- Absolute lap: the absolute lap number (not included by Motec i2, LapMonitor calculates it)
- Comment: the “In” or “Out” lap marker from the Motec i2 lap name
- TimeOfDay: calculated from the “Session TimeOfDay [s]” channel if included into the report

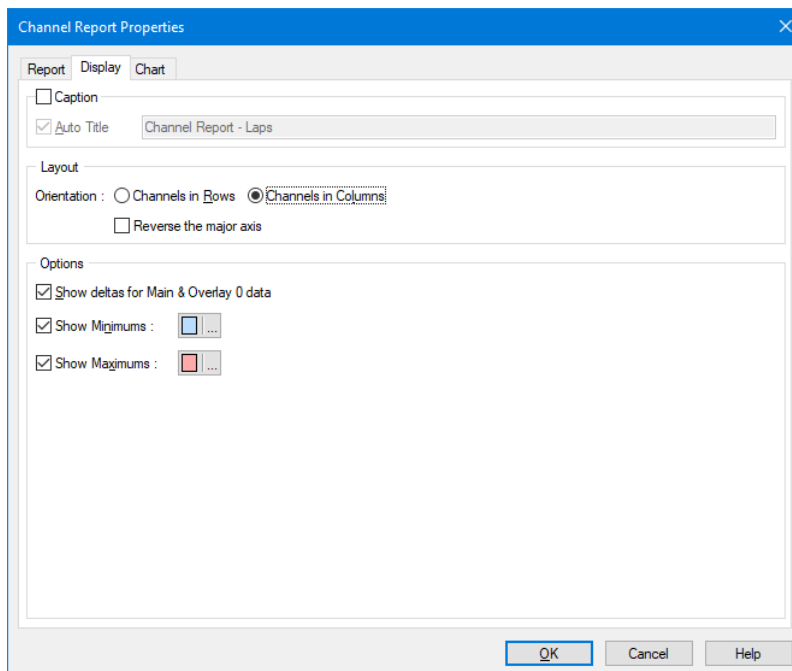
Please refer to the Motec i2 user manual to learn how to create a Channel report.

- In the Channel report properties window, check “All loaded outings”, select “Headings: Laps” and check “Include untrusted”. Include the channel “Session TimeOfDay [s]” to allow to use it in

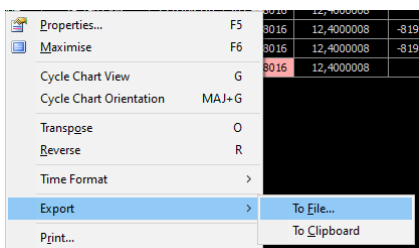
LapMonitor as the “TimeOfDay” channel:



- Check “Channels in columns”:

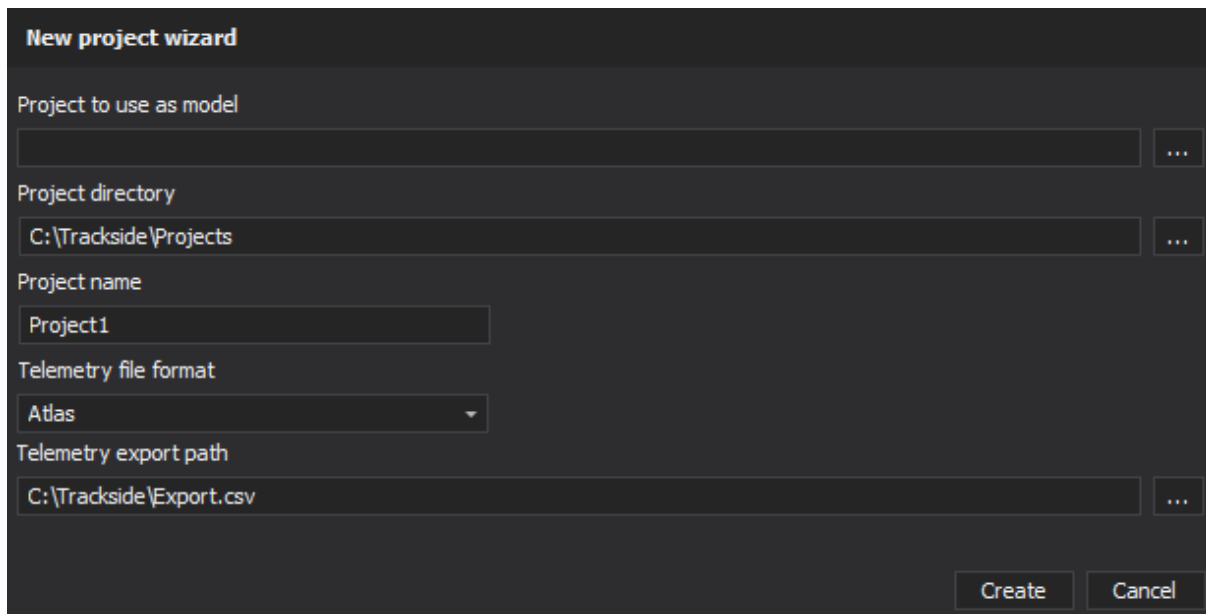


- To create the file use the “Export→To File” context menu option:



8. Creating a new project

Use “File>New project” menu to open the new project wizard :



The screenshot shows the 'New project wizard' dialog box with the following fields and values:

- Project to use as model: (empty field)
- Project directory: C:\Trackside\Projects
- Project name: Project1
- Telemetry file format: Atlas
- Telemetry export path: C:\Trackside\Export.csv

Buttons: Create, Cancel

Important note : a LapMonitor **project** contains 2 separate things :

- A **layout** including Graphs, Channels windows, Monitor windows, etc.
- **Data** that was imported from a csv report file.

By defining a “*Project to use as a model*”, you will re-use the layout of a previous project as a base to start with your new project.

“*Project directory*” = Where the project will be stored.

We use usually use : C:\Users\your user\Documents\LapMonitor

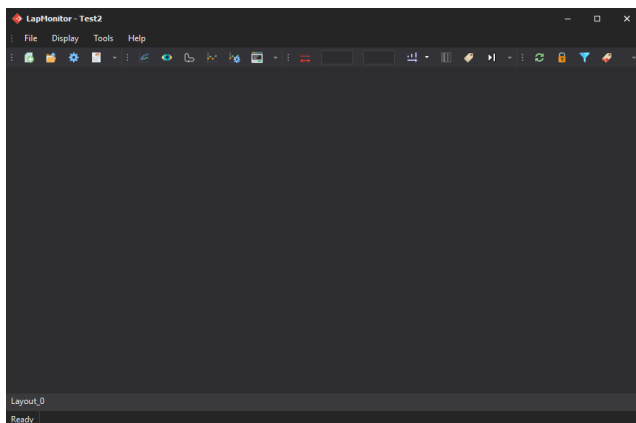
“*Project name*” = Name of the project.

LapMonitor will create a directory with this name in the project directory. We usually use the session name.

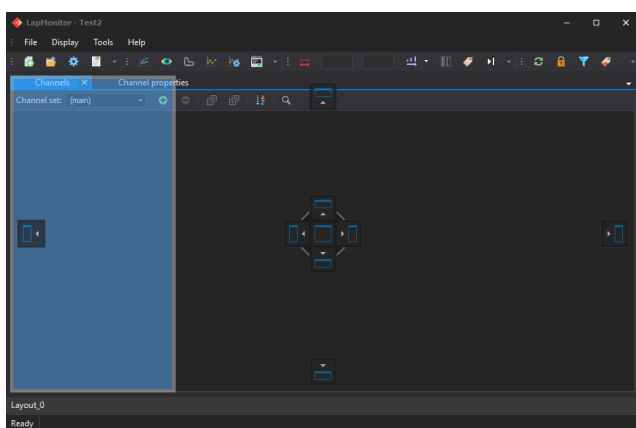
“*Lap report path*” = Path and name of the lap report LapMonitor will use for this project

We usually save the lap report in the projects directory: C:\Users\your user\Documents\LapMonitor, and name it export.csv. The best is to make WinTAX/Atlas create the file before starting a new project (easier to not make a mistake while setting the path and name). You can always use the same name as the data are stored inside the project by LapMonitor or use a different name of the csv file every session for example if you want to keep the exported data of each session in csv format too.

9. Creating a layout and arranging windows



You can use the first layout if it is empty or create a new one with a right click on the bottom bar.



Add the Channels window

"Display>Channels"

Add the Channel properties window

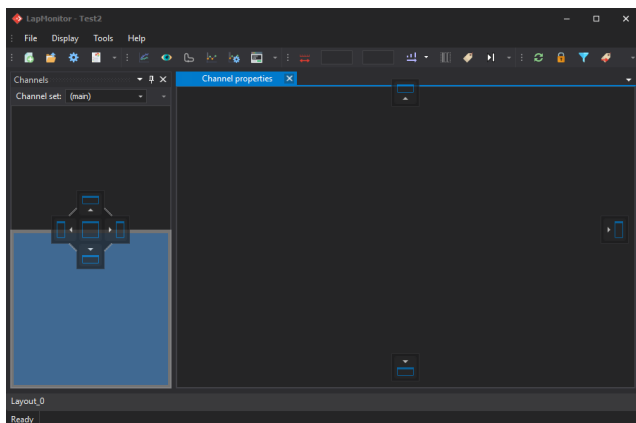
"Display>Channel properties"

It is possible to move the windows to another area with a left click on the title of the window.



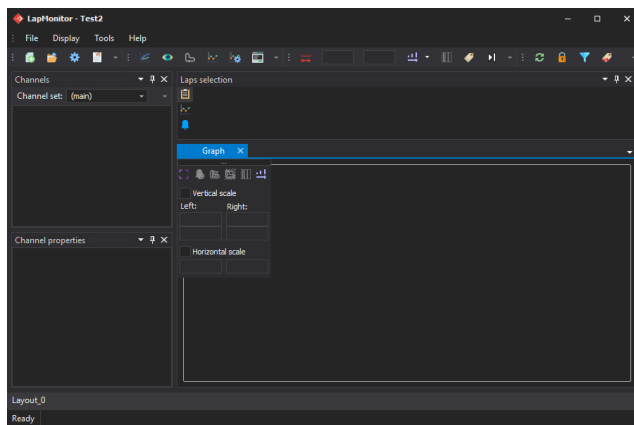
Releasing the left mouse button on one of the parts of this pictogram will divide the area where it is and place the view on the wanted side (left, up, right, down). If you release on the center, the view will be placed as a layer in the area.

You can also attach the view on one side of the layout using these pictograms (side view). It is possible to add an autohide function on a side view (see below).



For example, releasing the left button on the left pictogram will place the Channels window on the left side.

Then do the same with the Channel properties window and use the down pictogram to divide the left side in two equal parts and place this window below the other.



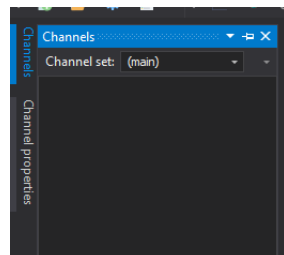
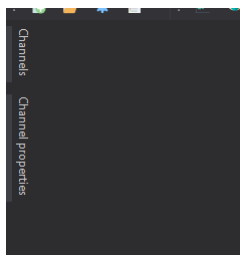
You can create a layout with as many windows as you need and arrange them as you want.

You can also add other windows the same way:

- Lap selection
- Graph
- Monitor
- Log (admin purpose)



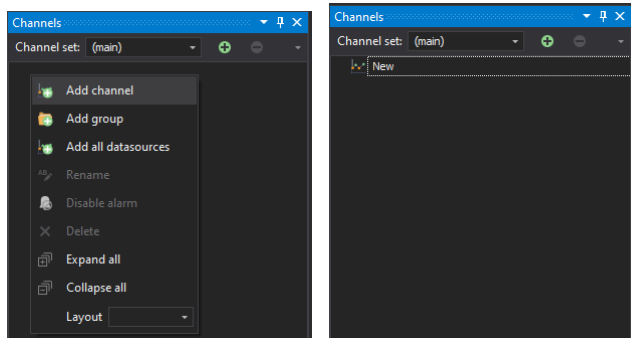
You can activate the autohide function with this icon on a side view.



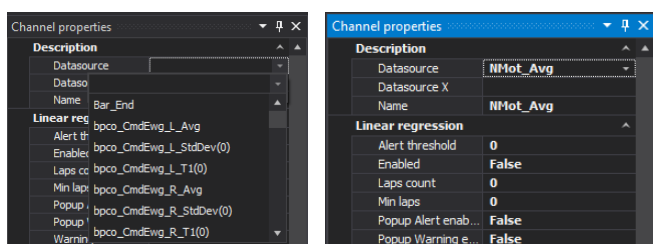
Once activated, the view is hidden and appears when the mouse pointer is over it.

10. Channels

10.1. Adding channels

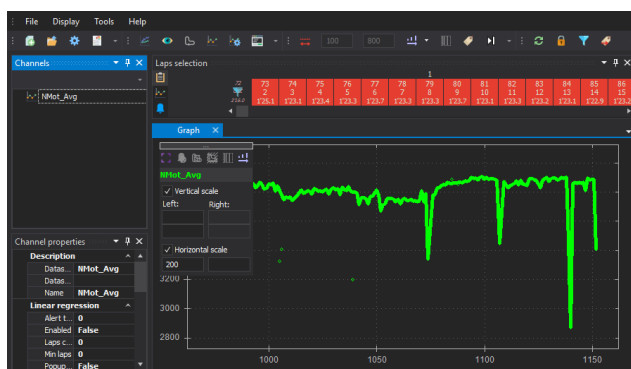


To add a channel to the project, use a right click on the channel window and choose “Add channel”. A new channel named “New” is added to the channel tree.

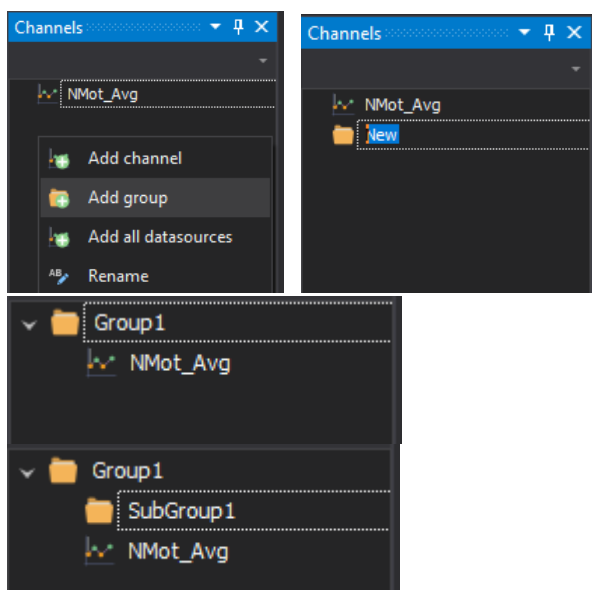


In the “Channel properties” window, choose the datasource associated to the new channel.

The channel name is changed to the same as the datasource name.



Then drag the channel from the channel tree to a graph window.



You can add groups of channels :

- Right-click in the channel tree
- Click “Add group”
- A group named “New” is added
- Click on the group to change its name

You can now drag the channels into the group.

You can create sub-groups and drag them into other groups.

10.2. Channel properties

Channel properties	
Channel description	
Name	NMot_Avg
Datasource	NMot_Avg
Datasource X	
Integrate value	True
Threshold alarm	
Enabled	True
Warning count	10
Warning threshold min	0
Warning threshold max	99
Alert count	15
Alert threshold min	0
Alert threshold max	120
Popup Warning enabled	False
Popup Alert enabled	False
Moving average alarm	
Enabled	False
Size	0
Lower deviation	0
Upper deviation	0
Warning count	1
Alert count	1
Popup Warning enabled	False
Popup Alert enabled	False
Linear regression alarm	
Enabled	False
Laps count	0
Min laps	0
Warning threshold	0
Alert threshold	0
Popup Warning enabled	False
Popup Alert enabled	False

When you select a channel, you can set its properties:

- The channel name
- The datasource name
- The datasource used as the X axis (see below)
- Use the computed integral instead of the raw data

Thresholds used to trigger simple warnings and alerts

- Enable/disable the thresholds
- Number of laps outside the range to trigger a warning
- Warning range min value
- Warning range max value
- Number of laps outside the range to trigger an alert
- Alert range min value
- Alert range max value
- Enable/disable the warning popup
- Enable/disable the alert popup

A moving average can be calculated

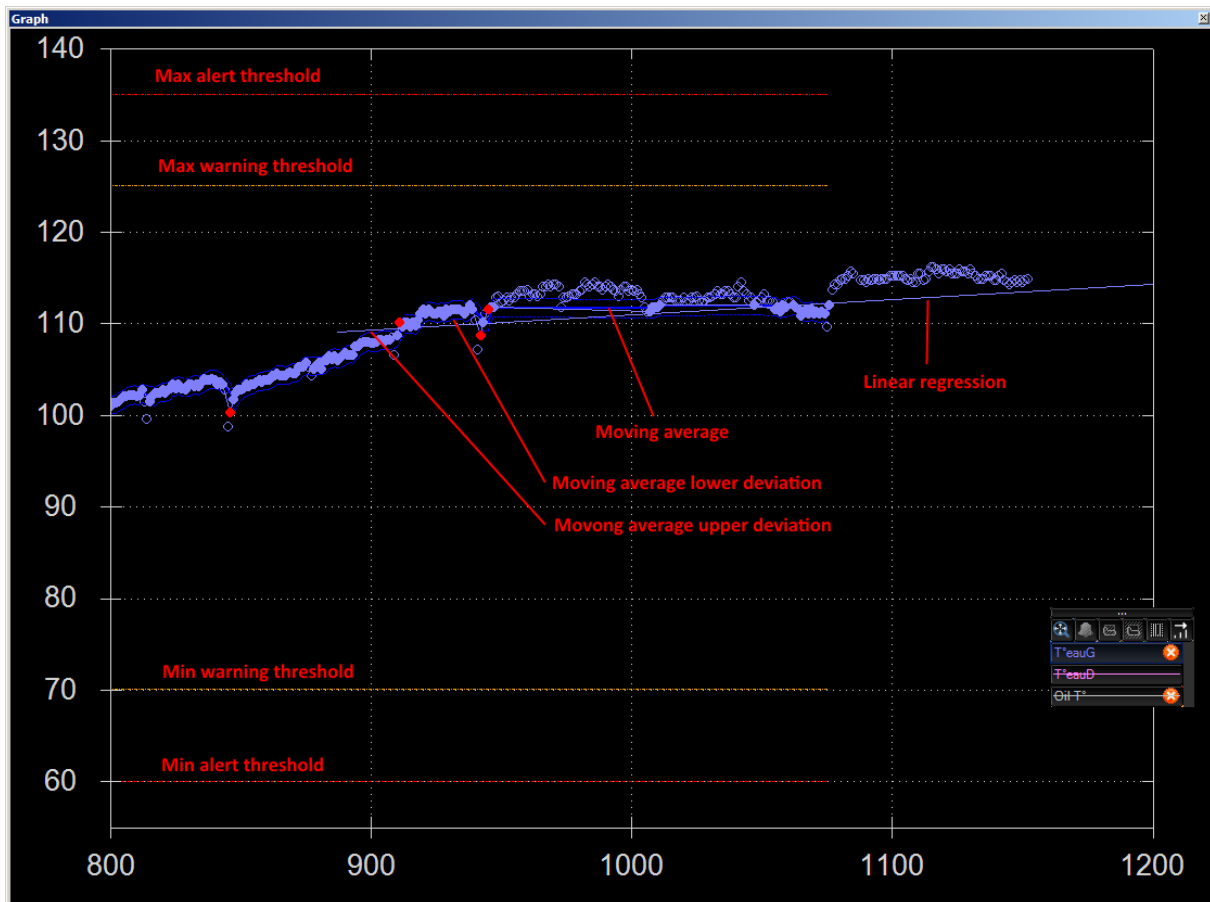
- Enable/disable the moving average
- Number of laps for the moving average
- Deviation allowed below the moving average
- Deviation allowed above the moving average
- Number of laps outside the moving average to trigger a warning
- Number of laps outside the moving average to trigger an alert
- Enable/disable the warning popup
- Enable/disable the alert popup

A linear regression can be calculated to extrapolate values

- Enable/disable the linear regression
- The last laps count use for linear regression
- The min laps count to calculate the linear regression
- The threshold for the “warning” part of the line
- The threshold for the “alert” part of the line
- Enable/disable the warning popup
- Enable/disable the alert popup

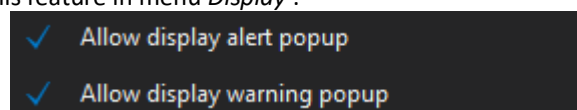
Notice: enable the *Integrate value* property in order to use the integral instead of the raw data in graphs and alarms. The filter will continue to use the raw data.

The alert and warning thresholds are shown on the graphs as additional lines. The channel points which trigger a warning are shown in orange and those which trigger an alert are shown in red :



10.3. Popup window alarm

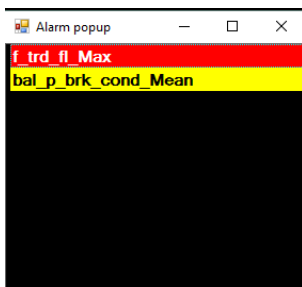
A popup window can be activated in order to display an alert or warning corresponding to a channel. First, you have to activate this feature in menu *Display* :



Then you have to activate the popup for each channel you want to monitor. To do that, you have 2 possibilities:

- Open the channel properties window and select a channel. You must enable the popup for each alarm type. In the following example, we enabled the popup only for the threshold.
- Or open the channel summary window and select the popups you want to enable.

When an alert or warning is triggered, a popup will be displayed on top of all windows.

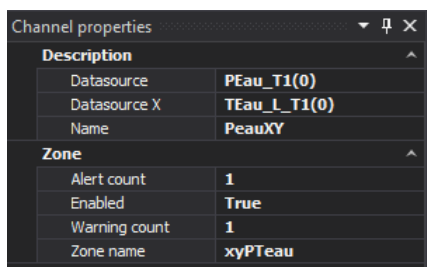


Alert are displayed in red and warning in yellow.

You can double click on an alarm in order to navigate to the attached layout.

Notice : The popup will be displayed while the project writer user doesn't double click on the alarm, and while the alarm is true for the current lap. When the alarm turns off the popup will not be displayed. But if the alarm turns on later, then the popup will appear again.

10.4. XY Channels



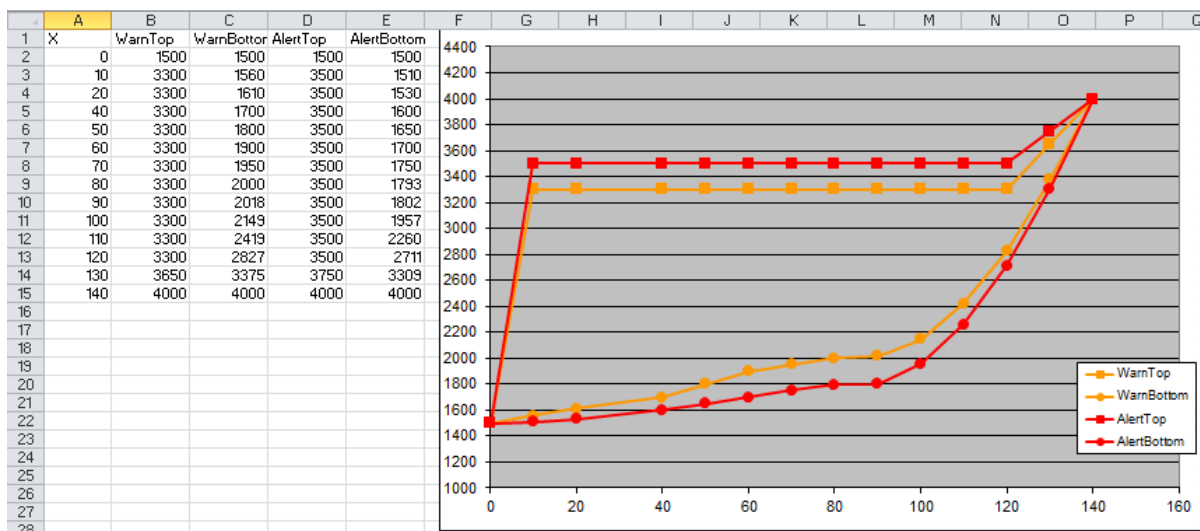
You can use a datasource as the X axis for a channel in place of laps or time of the day. The channel is then shown as distinct points on the graphs instead of a curve.

The warning and alert thresholds are defined by a "Zone" which is an Excel file located in the "Zones" subfolder into the project folder.

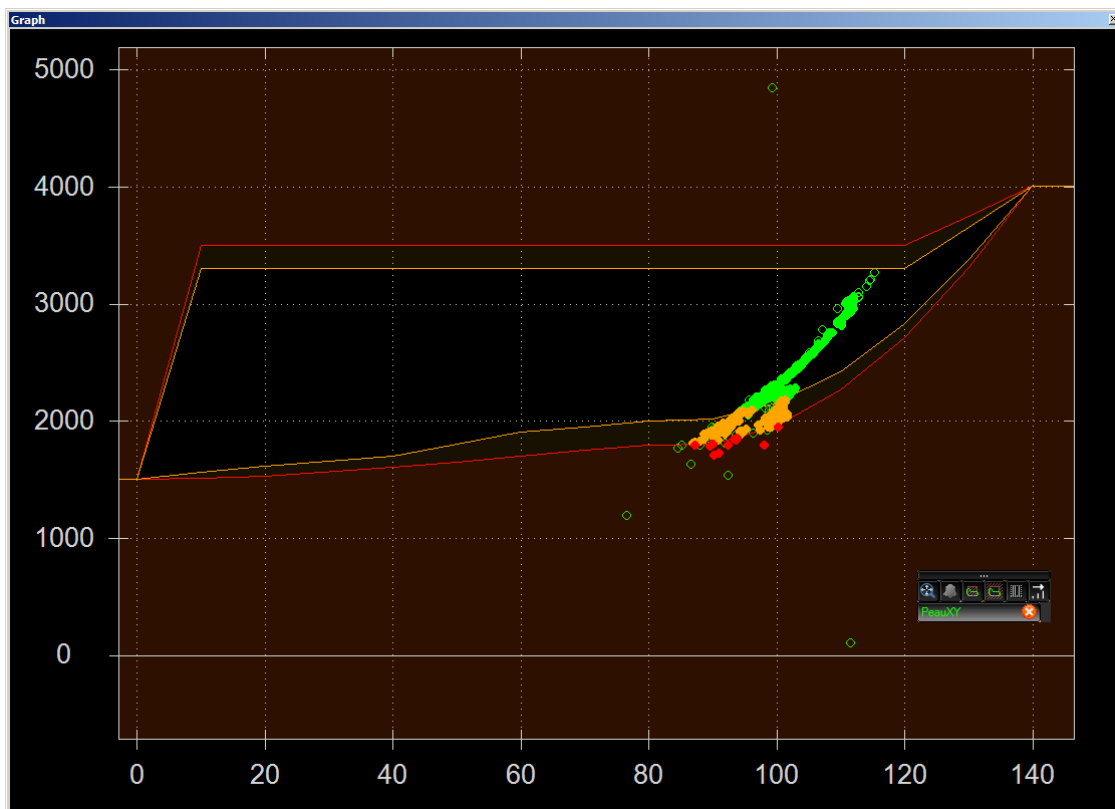
The Excel files must have 5 columns :

- X : the X value
- WarnTop : the top warning value
- WarnBottom : the bottom warning value
- AlertTop : the top alert value
- AlertBottom : the bottom alert value

Example Excel file :



The selected zone is shown with red and orange backgrounds :



10.5. Channel sets

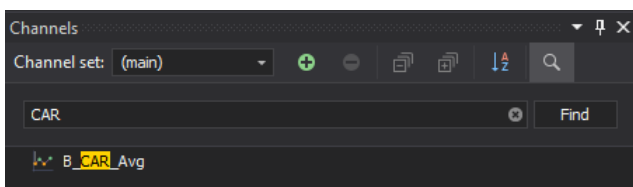
Several sets of channels can be created with different threshold values. Then switch between them with the dropdown list in the “Channels” window :



The “(main)” channel set is the default one, it can’t be deleted. Use the “+” button to add a new set (duplicated from the current one). Use the “-” button to delete the current set.

10.6. Search channels

You can search channels into the tree with the “Find” function:



10.7. Channels summary

The menu *Tools>Channels summary* opens a window to display and edit all channels (and channel sets) in the same grid :

Channels summary																	
Folder	Channel	Datasource	Enabled	Linear regression								(main)					
				Enabled	Range warning	Range alert	Laps count	Min laps	AlertPop up Enabled	Warning PopUp Enabled	Enabled	Size	Lower deviation	Upper deviation	Warning count	Alert count	AlertPop up Enabled
MOTEUR/Air	DeltaP2LR_Avg	DeltaP2LR_Avg				0	0	0	0					0	0	0	1
MOTEUR/Air	DeltaT1p_Avg	DeltaT1p_Avg				0	0	0	0					0	0	0	1
MOTEUR/Air	DeltaT2pAvg	DeltaT2pLR_Avg				0	0	0	0					0	0	0	1
MOTEUR/Air	Delta_T2_Avg	DeltaT2LR_Avg				0	0	0	0					0	0	0	1
MOTEUR/Air	P2Dmax	P2_R_Max				0	0	0	0					0	0	0	1
MOTEUR/Air	P2Gmax	P2_L_Max				0	0	0	0					0	0	0	1
MOTEUR/Air	P2MoyL	P2_L_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Air	P2moyR	P2_R_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Air	T1pL	T1p_L_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Air	T1pR	T1p_R_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Air	T2L	T2_L_T1(0)				0	0	100	50					0	0	0	1
MOTEUR/Air	T2R	T2_R_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Air	T2pL	T2p_L_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Air	T2pR	T2p_R_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Combustion	DeltaMainFuelQtyG/D	DeltaMainFuel_Avg				0	0	0	0				20	1	1	2	2
MOTEUR/Combustion	LambdaCtrlGainD	lctrl_Gain_R_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Combustion	LambdaCtrlGainG	lctrl_Gain_L_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Combustion	LambdaD	Lambda_R_T1(0)				0	0	0	0					0	0	0	1
MOTEUR/Combustion	LambdaG	Lambda_L_T1(0)				0	0	0	0					0	0	0	1

Ok

Apply

Cancel

The grid can be filtered : each column has a dropdown arrow that opens the list of values. You can select only the values you want to keep to restrict the display of the rows :

Enabled	warning	alert	count	min laps	up	Ena
DeltaP2LR_Avg	✓	✓	0		✓	
DeltaT1p_Avg	✓	✓	0		✓	
DeltaT2pLR_Avg	✓	✓	0		✓	
DeltaT2LR_Avg	✓	✓	0		✓	
P2_R_Max	✓	✓	20		✓	
P2_L_Max	✓	✓	80		✓	
P2_L_T1(0)	✓	✓	100		✓	
P2_R_T1(0)	✓	✓	200		✓	
P2_L_T1(0)	✓	✓	600		✓	
P2_R_T1(0)	✓	✓			✓	
P2_L_T1(0)	✓	✓			✓	
P2_R_T1(0)	✓	✓			✓	
P2_L_T1(0)	✓	✓			✓	
P2_R_T1(0)	✓	✓			✓	
DeltaMainFuel_Avg	✓	✓	0		✓	
Gain_R_T1(0)	✓	✓	0		✓	

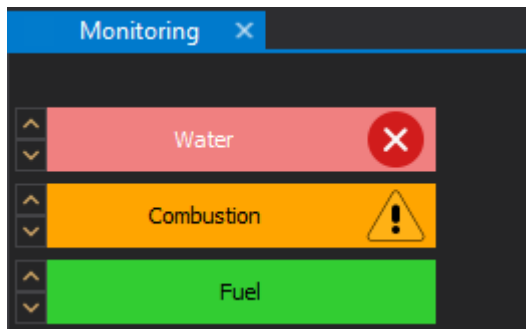
When a filter is active, the list of values is displayed in the header, with an italic font :

Enabled	Enabled	Range warning	Range alert	Laps count	Min laps	AlertPop up Enabled
	✓	0	0	<i>100,20</i>	50	✓
(0)	✓	105	110	100	30	✓
(0)	✓	105	110	100	30	✓

Click on the “Clear filter” button to remove the filter on the column.

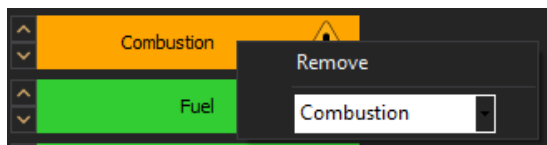
10.8. Monitoring

The Monitoring window shows warnings and alerts :



Drag and drop a channel or a channel group to the Monitoring window to add it.

Use the up and down arrows to reorder the channels.



Open the contextual menu with a right-click and choose “Remove” to remove the channel from the window.




Use the dropdown list to link a monitoring to a layout. A double-click on the item will select this layout.

11. Laps selection

The “Laps selection” window shows all laps grouped by run.

Run	Lap	Time
72	2	2'16.0
73	2	1'25.1
74	3	1'23.1
75	4	1'23.4
76	5	1'23.3
77	6	1'23.7
78	7	1'23.3
79	8	1'23.3
80	9	1'23.7
81	10	1'23.1
82	11	1'23.3
83	12	1'23.2
84	13	1'23.1
85	14	1'22.9
86	15	1'23.2
87	16	1'22.9
88	17	1'22.8

The 3 icons on the left allow to change the selection type :

-  : enable/disable the laps for all channels in the session
-  : enable/disable the laps for the currently selected channel
-  : enable/disable the laps for the currently selected alarm

Laps can be selected/deselected manually by clicking on it. The selected laps are red/green/blue (depending on the selection type), unselected ones are black. All laps belonging to a run can be selected/deselected by clicking on the run number above them.

Some laps may be filtered out automatically (see the automatic filters section), they're shown with a black background, a filter icon and italic text :

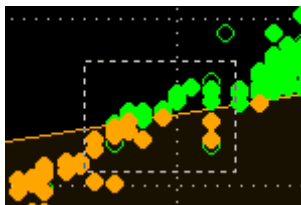


12. Graphs

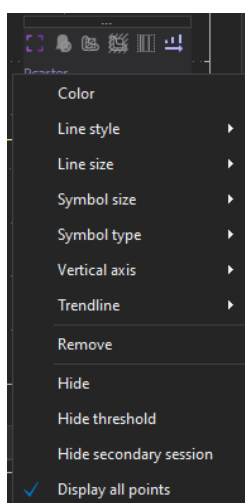
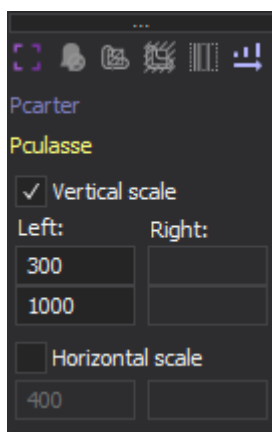
12.1. Graph display







Each graph window shows one or more channels. Use drag and drop to add a channel from the “*Channel*” window to any graph window.

You can zoom on the graph by selecting a region with the mouse :



Each graph window has a caption box which shows the channels list and several controls :

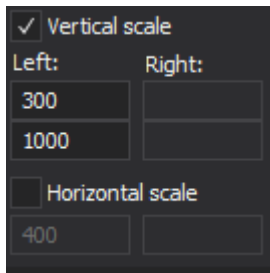


-  Reset the view to the default zoom.
-  With the “*Lap selection*” window in “*Alarm*” mode, use this button to cancel all alarms in the visible area.
-  With the “*Lap selection*” window in “*Channel*” mode, use this button to cancel all laps of the channel inside of the visible area.
-  With the “*Lap selection*” window in “*Channel*” mode, use this button to cancel all laps of the channel outside of the visible area.
-  Enable/disable the display of the runs limits for this graph.
-  Shows the “*Horizontal scale*” submenu for this graph (see below).

Click on the channel name to select/unselect it. The corresponding curve will be shown with a thick line.

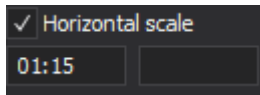
A right-click on the channel name opens a contextual menu :

- Change the curve color
- Change the line style (none, solid, dashes, dots)
- Change the line size
- Change the symbol type (none, circle, square, diamond, triangle)
- Change the symbol size
- Choose the vertical axis (left or right)
- Choose the trendline (none, linear or polynomial)
- Remove the channel from the graph
- Hide the channel
- Hide the thresholds
- Hide the secondary session(s)
- Show all points (including the filtered out points)

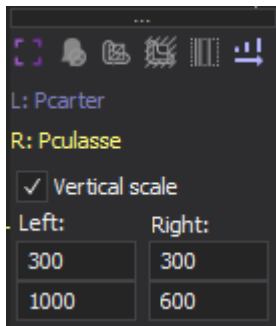


Click on “*Vertical scale*” and “*Horizontal scale*” checkboxes to enable/disable the fixed vertical or horizontal scales for this graph.

The first value is the “min” value and the second is the “max” value. If a value is empty for the “*Vertical scale*”, the scale will be calculated automatically to show the lowest or highest value. If a value is empty for the “*Horizontal scale*”, the graph will show only the indicated last laps (the 400 last laps in the example).



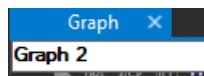
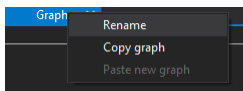
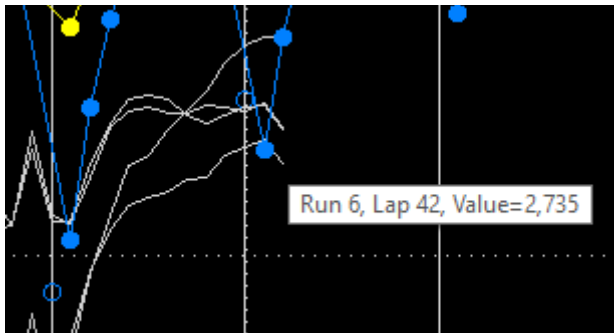
In the “*Time of the day*” mode, the “*Horizontal scale*” is shown as hours:minutes.



When the right axis is used, the names in the caption have a prefix to tell which axis is used (L: left axis, R: right axis).

The manual vertical axes min/max values can be defined per axis.

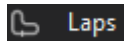
A tooltip displays some information about points when the mouse cursor is hovering them. This works also for the secondary projects :



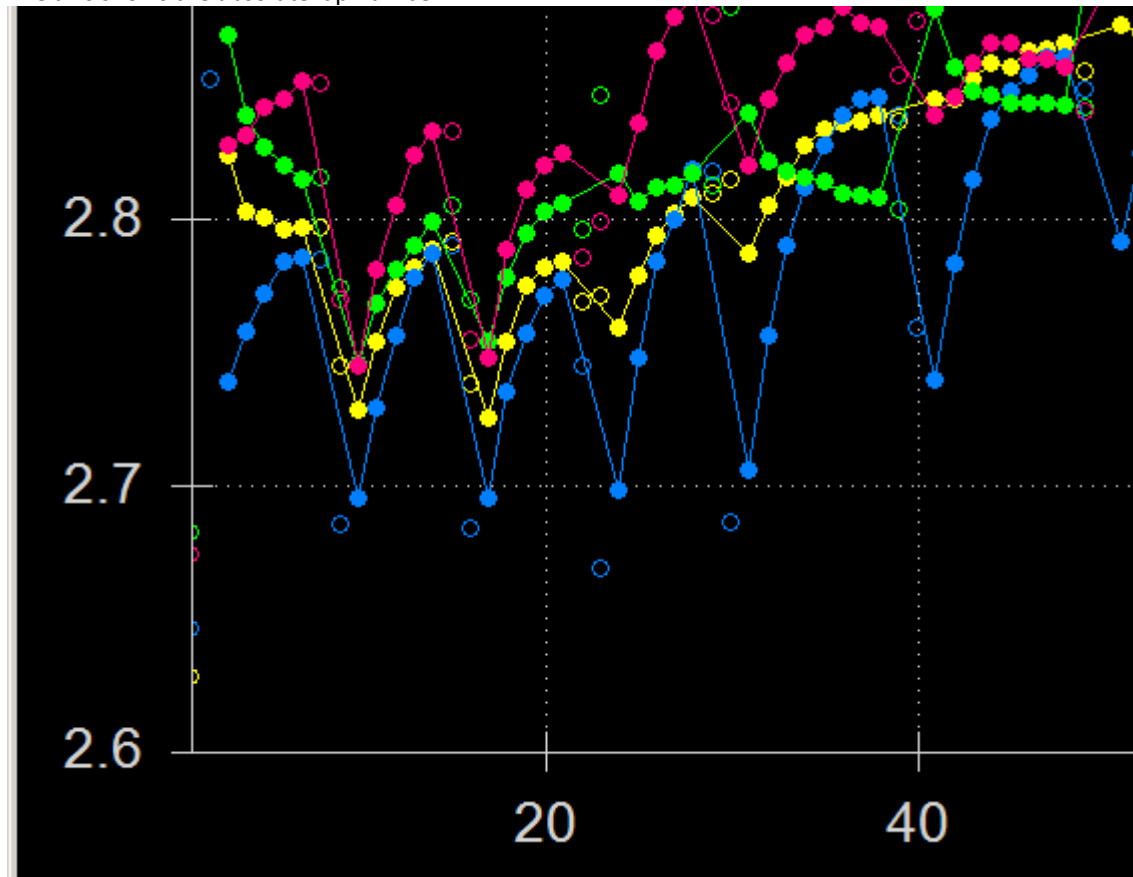
To rename a graph window, right-click on its title and choose “Rename”. Enter the new name and press “enter”.

12.2. Horizontal axis

The horizontal axis can be set for each graph or globally. You can choose 4 axis types :

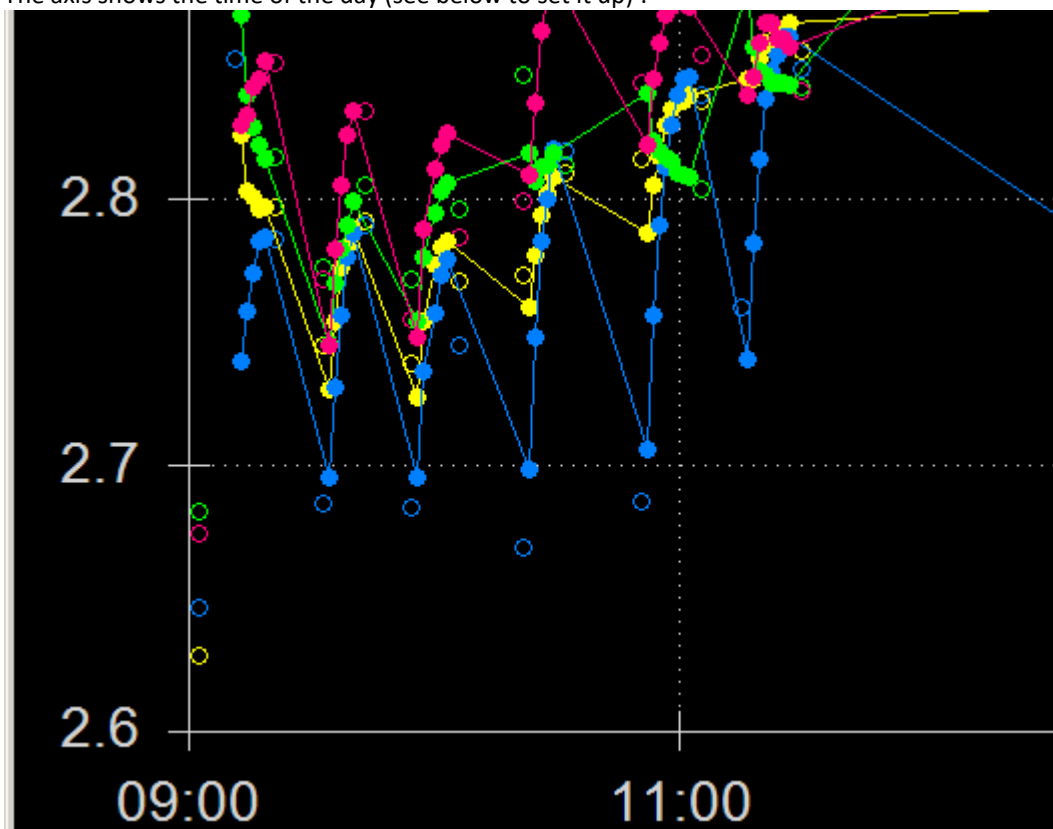


The axis shows the absolute lap number



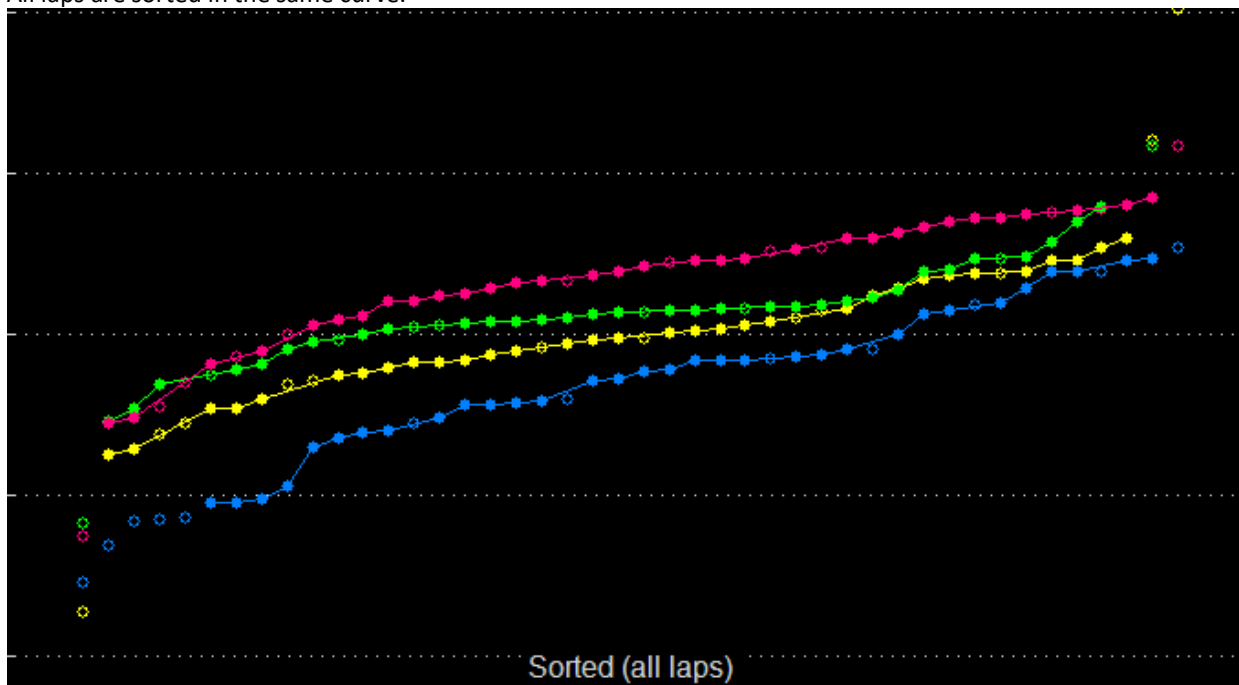
Time of the day

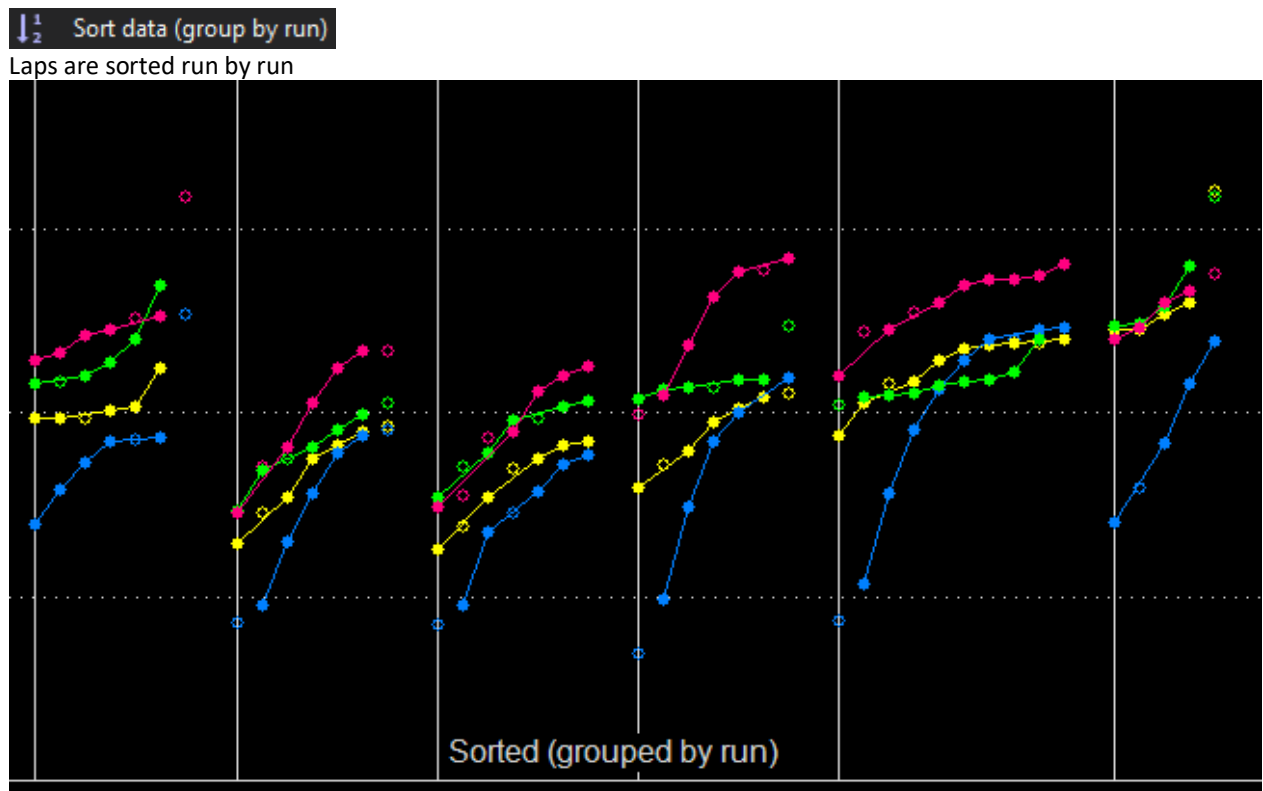
The axis shows the time of the day (see below to set it up) :



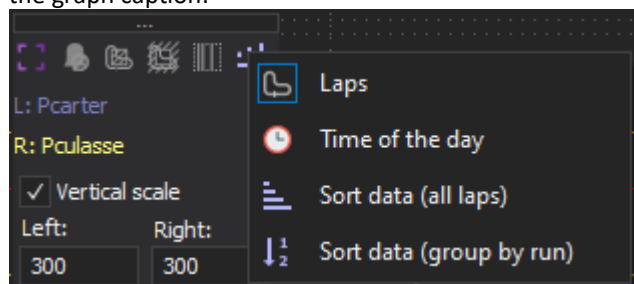
Sort data (all laps)

All laps are sorted in the same curve.



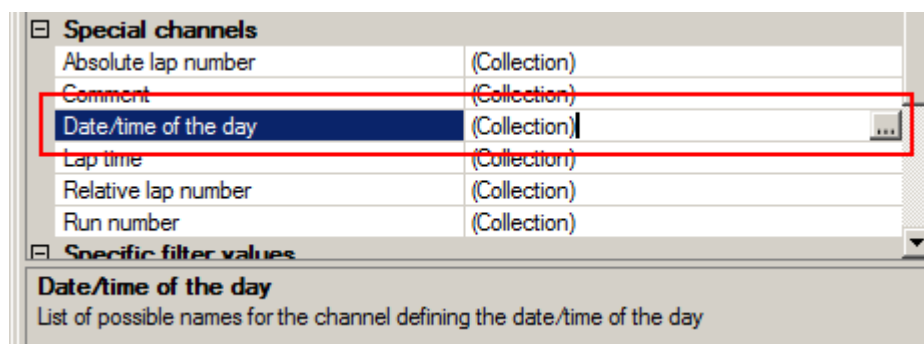


You can use the “Display” menu to define the horizontal scale type for all graphs or the corresponding icon on the graph caption:



12.3. Set “time of the day” horizontal axis

To use the “time of the day” horizontal axis, you must have a channel with time data. In project properties, set the name of the time channel in “*Special channels>Date/time of the day*” :

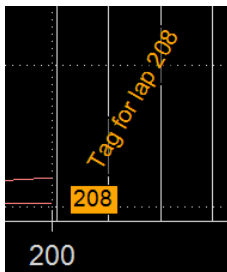
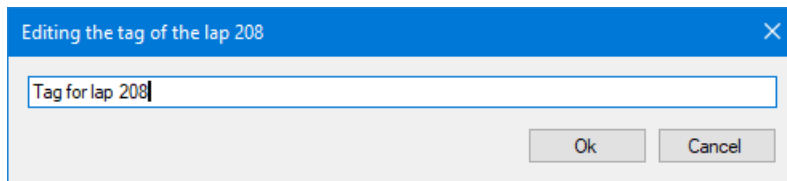
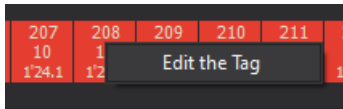


The value contains in this channel must be a decimal number (expressed in number of days).
0.000 = 00h00 of the day 0

1.000 = 24h00 of the day 0, or 00h00 of the day 1
2.500 = 12H00 the day 3

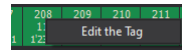
12.4. Tags

Some text can be attached to a lap: right-click on the lap in the “Laps selection” window and click on “Edit the Tag”:

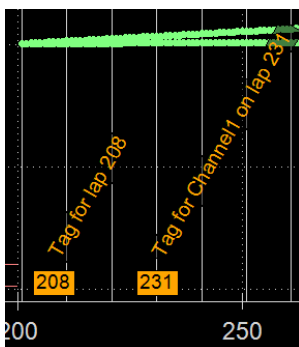


Tags can be attached to a specific channel:

- Select the channel in the “Channels” window
- Switch the “Laps selection” window to “channel” mode (green color)
- Right-click on the desired lap and “Edit the Tag”:



The channel tags are shown on the graphs where the channel appears:



The tags can be imported from another project with the “Tools > Import project”. The imported tags are added to the existing ones in the current project.

13. Automatic filters

The automatic filters allow to exclude some laps automatically on various criteria :

- In/Out/Test laps
- Lap time outside the time range
- Channel min/max values
- Relative lap numbers (a list separated by commas)

Open the automatic filters window with the menu *Tools>Automatic filters* :

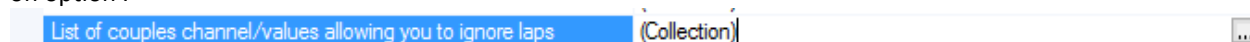
The first row “Select all” allows to apply a setting to all channels.

The “opposite” check box inverts the filter :

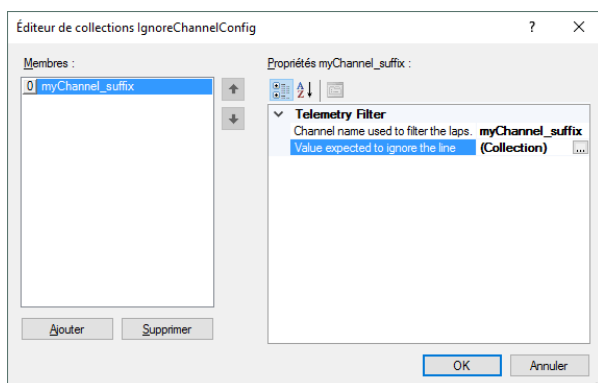
Filter	“Opposite” unchecked	“Opposite” checked
In	Exclude all “In” laps	Exclude all laps except “In” laps
Out	Exclude all “Out” laps	Exclude all laps except “Out” laps
Test	Exclude all “Test” laps	Exclude all laps except “Test” laps
Time	Exclude all laps with laptime outside the “Time range”	Exclude all laps with laptime inside the “Time range”
Value	Exclude all channel values less than “Min” or greater than “Max”	Exclude all channel values between “Min” and “Max”
Rel laps	Exclude all relative laps in the number list	Exclude all relative laps except those in the number list

14. Ignore laps

It's possible to ignore laps, based on a list of channel/value pair. Open the project properties window and click on option :



Then you will have to add channels and for each channels a list of values. If any values associated to a channel is encountered during the data loading, then the lap will be ignored.

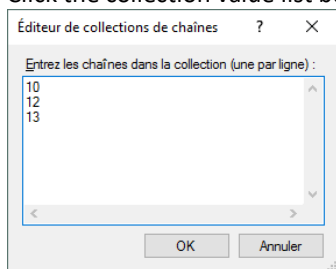


Enter the channel full name. For instance :
r_brk_blank_vane_fr_end.

Don't forget the suffix (in this example _end)

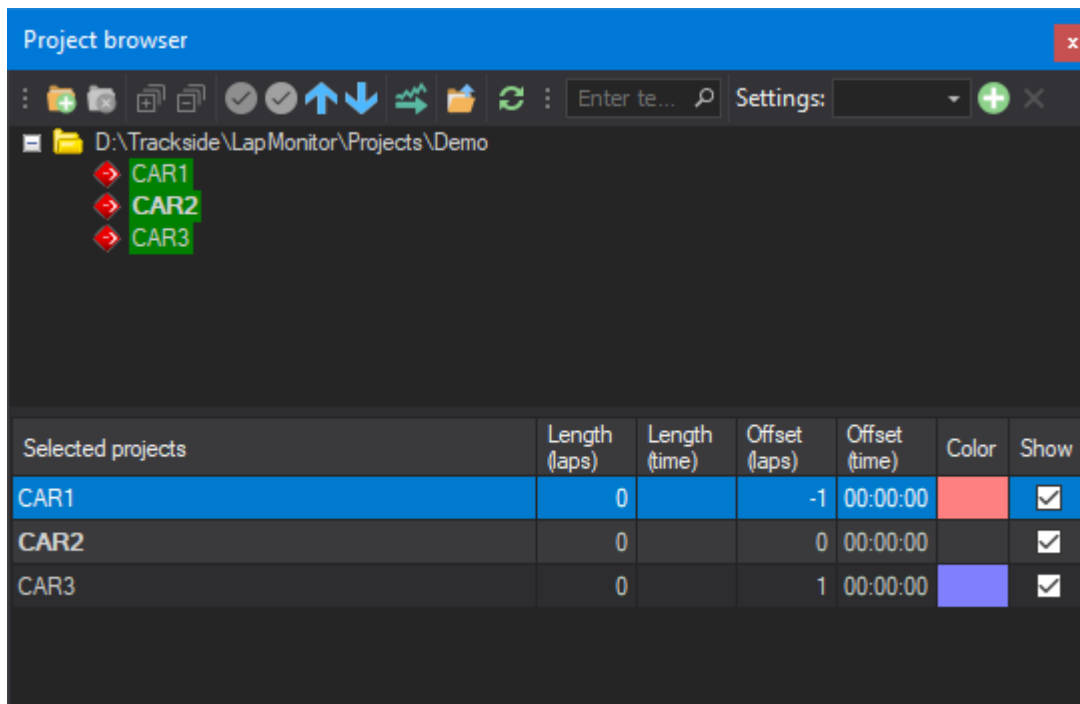
If you want to use a special channel, you don't have to enter the suffix. For instance :
Cnt_lap_abs. (corresponding to the absolute lap number)

Click the collection value list button to add values. Add one value by line.



15. Project browser

LapMonitor can display multiple projects at the same time. The “Project browser” window is used to choose the projects, order them, choose their color, etc.

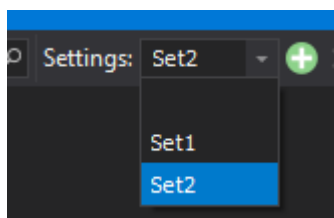


The window is split in two parts :

- The upper part contains the folders where to search for projects. You can add as much folders as you need. The projects are searched in all sub-folders.
- The lower part contains the list of selected (secondary) projects with some informations and properties :
 - Length (laps and time) shows the project length in laps and in time (for the “time of the day” axis mode).
 - Offset (laps and time) defines the secondary project offset relative to the current project, in laps and time (for the “time of the day” axis mode).
 - Color defines the secondary project color for the graphs.
 - Show can be used to show/hide a secondary project graphs without unloading it.

The “Filter” text box can be used to show only the projects which name contains the entered text.

The “Settings” dropdown list is used to save and recall multiple settings:

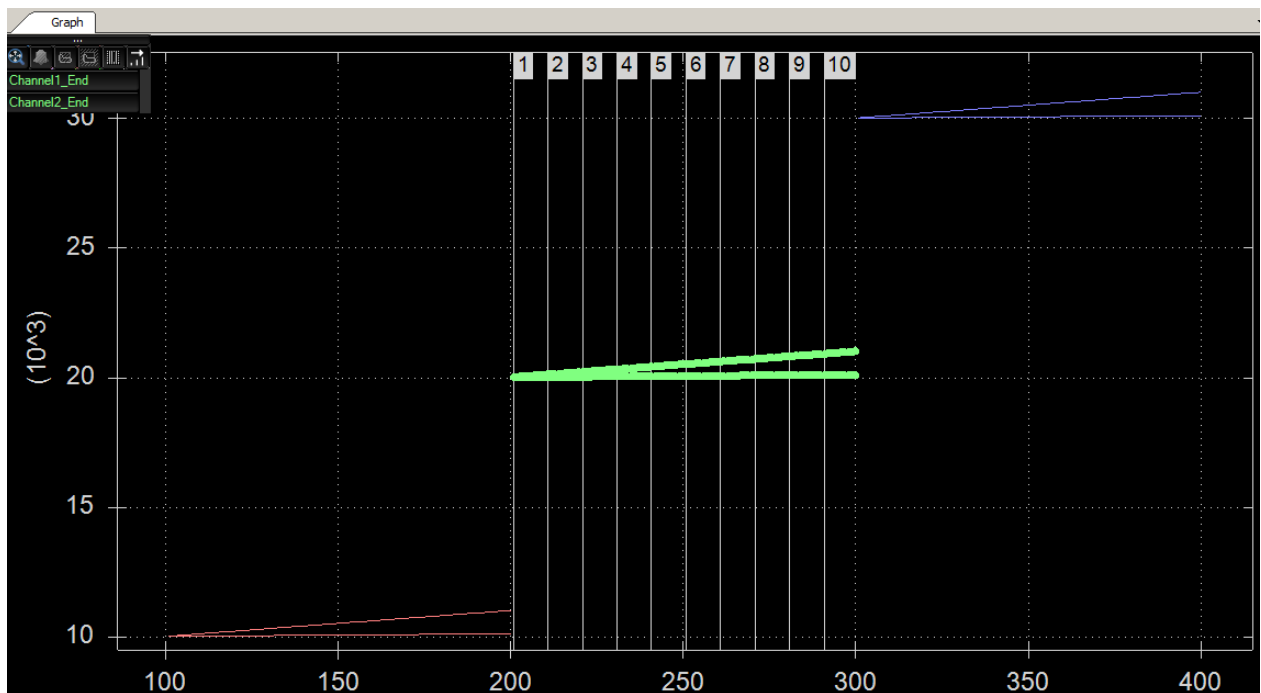


Use the “+” button to add new settings, use the “-” button to remove the settings.

Select the settings to recall in the dropdown list. All parameters are saved (folders, selected projects, colors, offsets, etc.).

The secondary projects are displayed on the graphs before of after the current one, depending on the order in the project list. Only the current project can be edited, filtered, etc. the others are shown as “read only”.

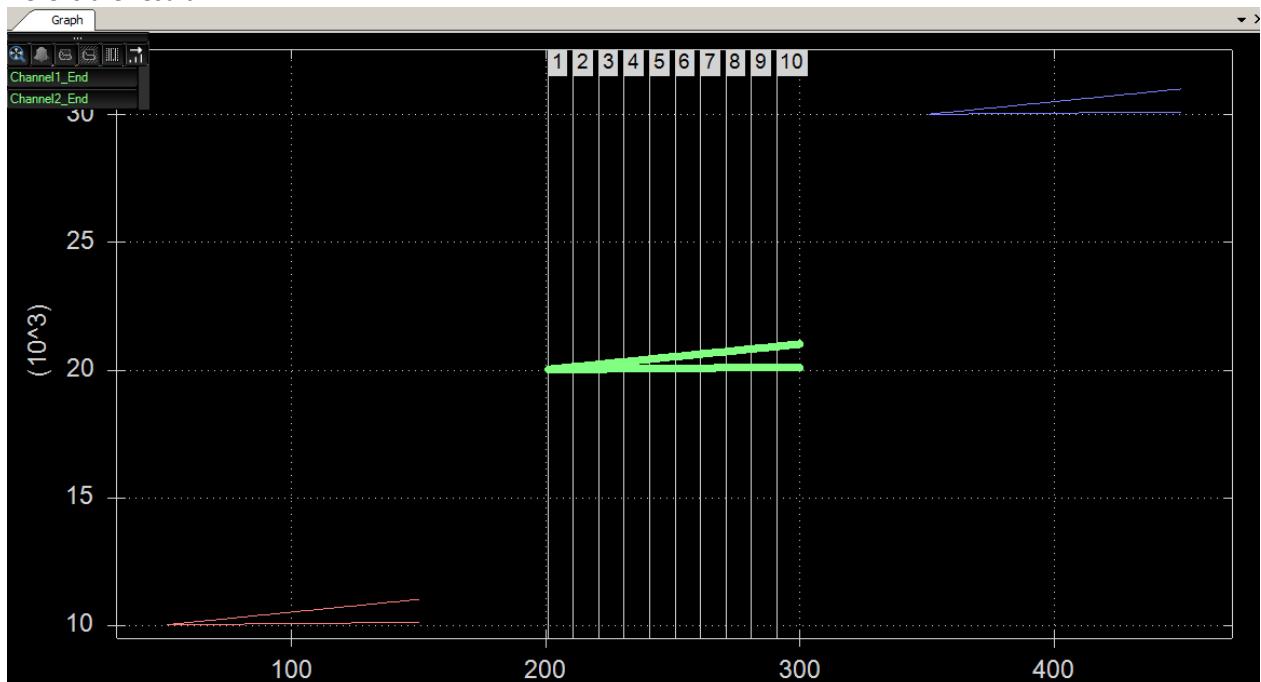
Below, the green project is the current on, the red and blue ones are secondary projects :



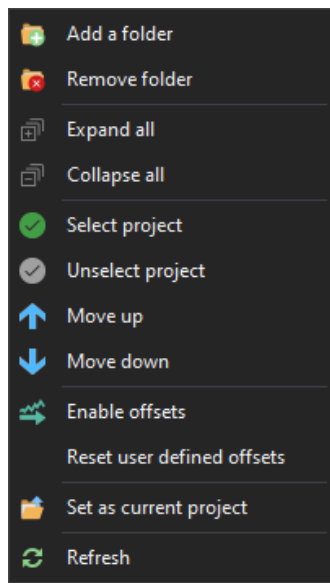
The offsets can be changed manually to move the secondary projects more on the left or on the right. When the offsets are changed manually, they're shown with an italic font :

Selected projects	Length (laps)	Length (time)	Offset (laps)	Offset (time)	Color	Show
CAR1	100	21:48:57	<i>-50</i>	<i>02:11:02</i>	Red	<input checked="" type="checkbox"/>
CAR2	100	21:48:57	0	00:00:00	Green	<input checked="" type="checkbox"/>
CAR3	100	21:48:57	<i>50</i>	<i>-02:11:02</i>	Blue	<input checked="" type="checkbox"/>

Here is the result :



Use the toolbar icons or the context menu to :



Add and remove folders to search for projects.

Expand and collapse all tree nodes.

Select a secondary project to load.

Unselect a secondary project.

Move the project up in the project list.

Move the project down in the project list.

Enable/disable the offsets for all secondary projects.

Remove the user defined offsets and return to calculated ones.

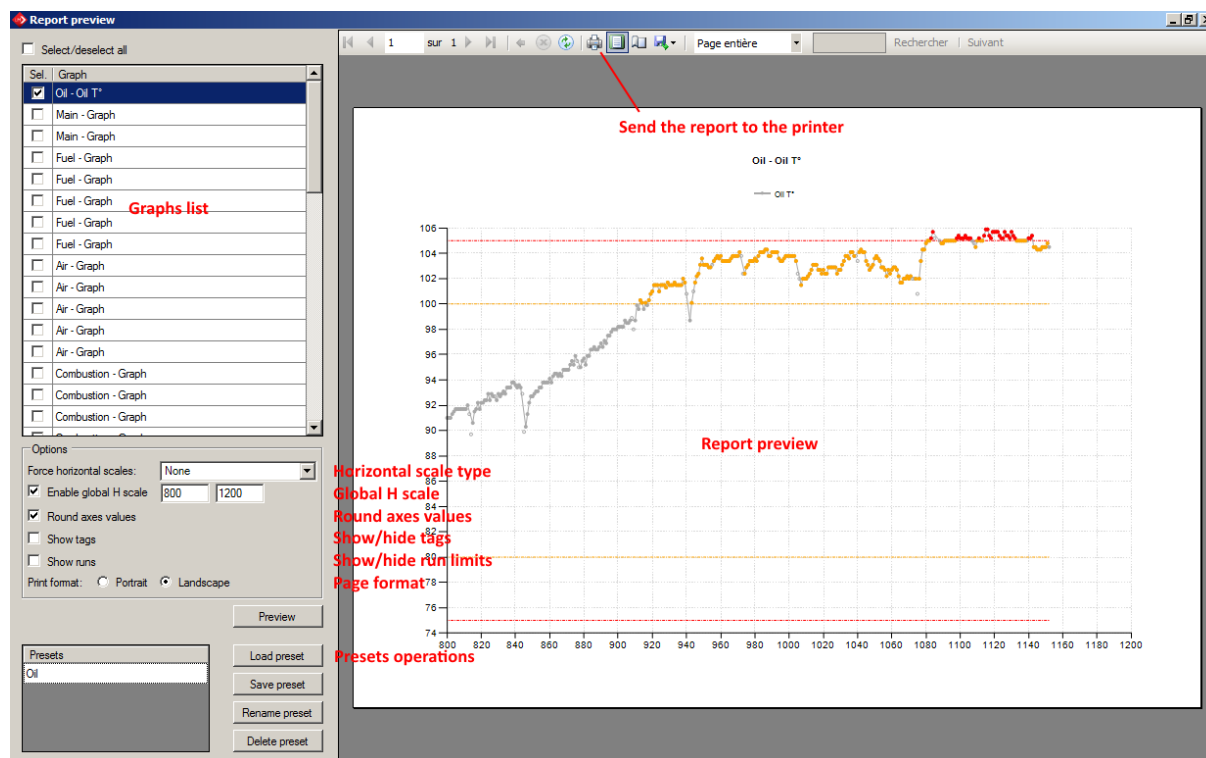
Set the project as the current one and load it.

Refresh the project folders and content.

Note that the current project (the one you can work on) is shown with a bold font into the tree and into the grid. The selected projects are shown with a green background into the tree (all projects into the grid are selected ones).

16. Reports

When you open the reports window, all graphs in all layouts are shown in a list at the left. You can select/deselect them.



You can set global options for the whole report :

- Horizontal scale can be set to laps, time of the day, sorted (all laps) or sorted by run.
- The global H scale can be enabled/disabled and the min/max values changed.
- Axes values can be rounded to get more readable scales.
- Tags and runs limits can be enabled/disabled.
- You can choose 2 page formats : landscape with 1 graph per page or portrait with 2 graphs per page.

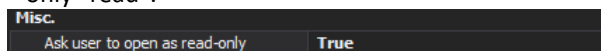
Click on "Preview" to show the report. Click on the printer icon on the toolbar to send it to the printer.

You can save the current settings into presets which are saved with the project.

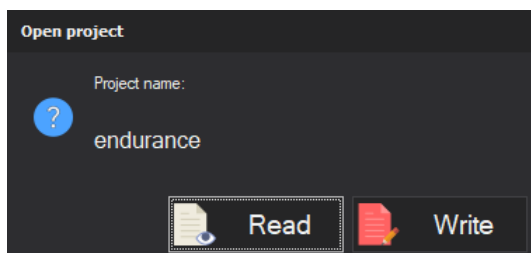
17. Sharing projects

Several users can open a project at once, however only the first one will be able to open it in “write” mode and be allowed to make changes. The other users will be prompted to open it in “read” mode and won’t be allowed to make changes. In “read” mode, any changes done on the project will trigger a refresh to reflect the changes.

An option can be set in the project properties to ask each user who opens it if he wants to get “write” access or only “read”.

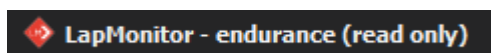


Set the option to “true”



When opening the project, you’ll be prompted to choose between “read” and “write” mode.

Note that if the project is already opened in “write” mode, you’ll have to switch to “read”.



The title bar will show “read only” in read mode.

When in read-only mode, all changes you do won’t be saved and will be lost when you close the project. If any change is done by the user who opened the project in write mode, all read-only projects will be reloaded automatically with several seconds of delay.

18. Project properties

Project properties are saved within the project file :

The screenshot shows the 'Properties' dialog box with the 'Project' tab selected. It contains two sections: 'Description' with a 'Total laps number' field set to 1250, and 'Report' with a 'File' field set to C:\Users\moteur\Desktop\Data\import data2.csv. At the bottom, there is a description of 'Total laps number' and 'OK'/'Cancel' buttons.

Properties	
Main session Project	
Description	
Total laps number	1250
Report	
File	C:\Users\moteur\Desktop\Data\import data2.csv
Total laps number Total number of laps for the session.	
OK Cancel	

The total number of laps of the session, used for the linear regression.
The lap report file path.

The screenshot shows the 'Properties' dialog box with the 'Project' tab selected. It contains several sections: 'Global horizontal scale' (Enable, Max value (laps), Max value (time), Min value (laps), Min value (time)), 'Misc.' (Ask user to open as read-only), 'Project type' (Project type), 'Special channels' (Absolute lap number, Comment, Date/time of the day, Lap time, Relative lap number, Run number), 'Specific filter values' (Comment box, Comment IN, Comment OUT, Comment Test, List of couples datasource/values allowing you to ignore laps), and 'Min value (time)'. At the bottom, there are 'OK'/'Cancel' buttons.

Properties	
Main session Project	
Global horizontal scale	
Enable	False
Max value (laps)	1000
Max value (time)	:
Min value (laps)	300
Min value (time)	:
Misc.	
Ask user to open as read-only	True
Project type	
Project type	Wintax
Special channels	
Absolute lap number	(Collection)
Comment	(Collection)
Date/time of the day	(Collection)
Lap time	(Collection)
Relative lap number	(Collection)
Run number	(Collection)
Specific filter values	
Comment box	(Collection)
Comment IN	(Collection)
Comment OUT	(Collection)
Comment Test	(Collection)
List of couples datasource/values allowing you to ignore laps	(Collection)
Min value (time) Min value for the global horizontal scale in time mode	
OK Cancel	

Global horizontal scale settings

Set this option to “true” to ask the user to open the project in “read-only” mode
Project type (Wintax, Atlas or SessionResume)
Special channels settings

Values used by filters to detect “box”, “IN”, “OUT” and “test” laps.

19. Options

The options are saved on the local computer and are used for all projects :

Options		
Config		
Graphic		
Warning color	255; 165; 0	The color used on graphs for warnings
Alert color	255; 0; 0	The color used on graphs for alerts
Moving average color	0; 0; 255	The color used on graphs for the moving average
Default color	0; 255; 0	The default color of a curve on a graph
Display all points	True	Show all points including the filtered out ones
Show runs limits	False	Show the runs limits on all graphs
Show tags	False	Show the tags on the graphs
Show captions	True	Show the caption on all graphs
Horizontal axis type	None	The horizontal scale type for all graphs
Use all sessions for default scales	False	Display all the secondary projects with default scale
Secondary projects		
Display points	False	Display line on secondary project curves
Display lines	True	Display points on secondary project curves
Misc.		
Auto load lap report	True	Auto load the lap report file when it's modified
Always display last lap	False	Always display the last lap in "Lap selection" window
Current project	C:\Users\Arnaud\Downloads\Test_L...	The current project path
Ignore runs number	False	Merge all laps without using the run number
Enabled alert popup	True	Enable the popup on alert level
Enabled warning popup	True	Enable the popup on warning level
Enabled lap report data update ano...	True	
Lap report data update anomaly det...	60	
Main session data export path	C:\Users\Arnaud\Downloads\Export...	The export path of the main session data
Web API		
Enabled web API	True	Enable the Web API
Web API host address	localhost	The Web API host address
Web API host port	9002	The Web API host port

OK Cancel

20. Web API

20.1. Configuration

A Web API is available to access LapMonitor data. The API must be enabled in the LapMonitor options:

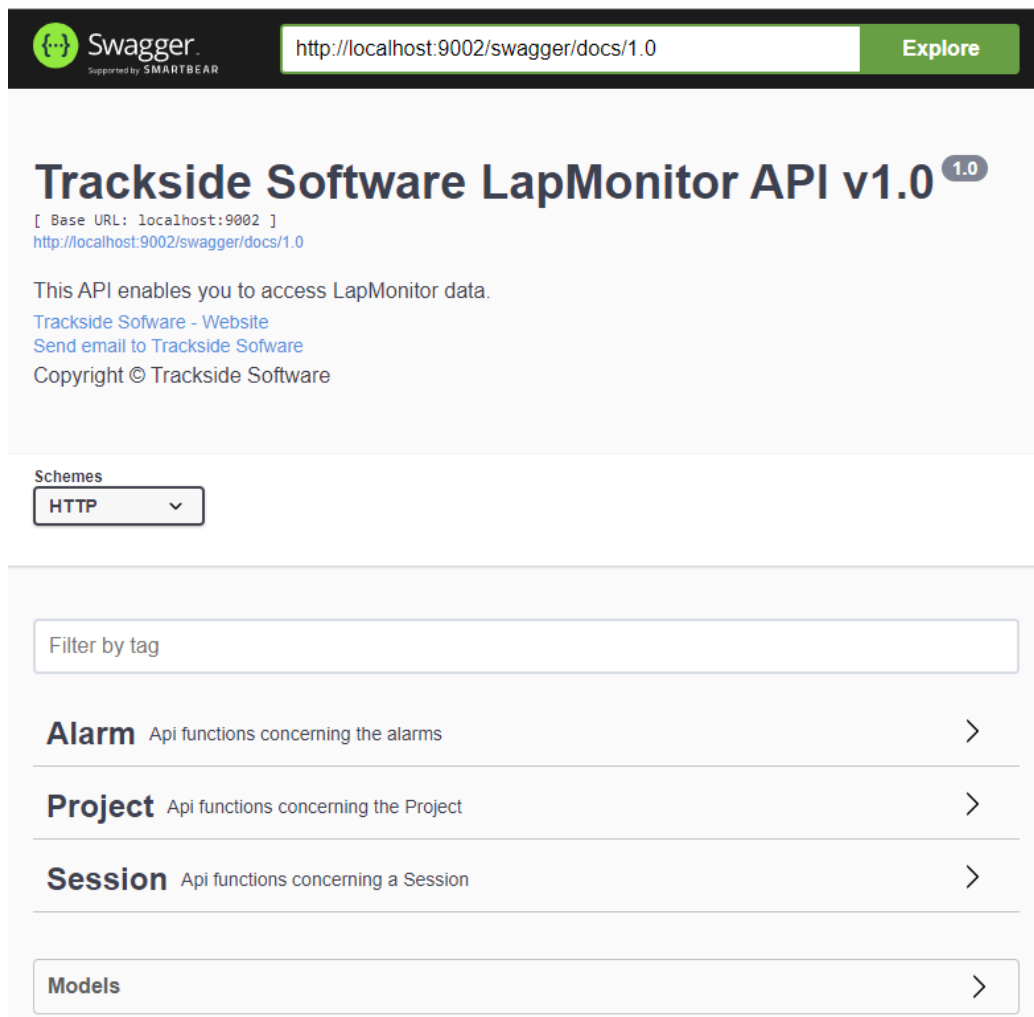
Web API	
Enabled web API	True
Web API host address	localhost
Web API host port	9002

20.2. Inline documentation

You can access the API documentation at the URL below (assuming default config is used):

<http://localhost:9002/swagger>

You can use the Swagger UI to look at the API functions and parameters, look at the object model and test the API calls.



The screenshot displays the Swagger UI for the Trackside Software LapMonitor API v1.0. At the top, there's a header with the Swagger logo and the URL `http://localhost:9002/swagger/docs/1.0` next to an 'Explore' button. Below this, the API title 'Trackside Software LapMonitor API v1.0' is shown with a version badge '1.0'. The base URL is listed as `localhost:9002` and the full URL as `http://localhost:9002/swagger/docs/1.0`. A description states: 'This API enables you to access LapMonitor data.' Links for 'Trackside Software - Website' and 'Send email to Trackside Software' are provided, along with a copyright notice for Trackside Software. A 'Schemes' dropdown menu is set to 'HTTP'. Below this, there's a 'Filter by tag' input field. The API endpoints are listed under three tags: 'Alarm' (Api functions concerning the alarms), 'Project' (Api functions concerning the Project), and 'Session' (Api functions concerning a Session). Each tag has a right-pointing chevron. At the bottom, there's a 'Models' section with a right-pointing chevron.

20.3. Code generation

You can use the URL of the documentation for various OpenAPI compatible code generation tools like Swagger CodeGen, AutoRest, or others... These tools can help generate some code in many

languages to simplify the access to the API but you can of course use code written from scratch. If you decide to use CodeGen, we recommend to download the 2.4.x version of Swagger CodeGen for a better result.

Swagger CodeGen documentation is available here :

<https://github.com/swagger-api/swagger-codegen>



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