

Analyzer program: BMW-specific features

Introduction

The following data channels can be used and viewed in Anna-Liza:

Speed [km/h]	Vehicle speed
V_Front [km/h]	Front-wheel speed
V_Rear [km/h]	Rear-wheel speed
RPM [1/min]	Engine speed
Bank_dtc [°]	Bank angle from bank-angle sensor
Grip_pos [%]	Driver input at throttle twistgrip
Throttle [%]	Throttle-valve position
T_eng [°C]	Engine coolant temperature
Gear [#]	Current gear
Brake_f	Front brake actuated
Brake_r	Rear brake actuated
Brake_pres_f[%]	Braking pressure, front wheel cylinder
Brake_pres_r[%]	Braking pressure, rear wheel cylinder
Slip [%]	Slip between front and rear wheels
Re_dtc_spn	Relative DTC torque reduction from traction control
Re_dtc_tot	Relative DTC torque reduction from traction control, precontrol and other limiting functions
ABS_Status	Channel computed from Brake_f, Brake_r, ABS_stat and ABS_act
ABS_stat	1 = ABS activated, 0= ABS deactivated
ABS_act	ABS intervention
V_Sat [km/h]	Vehicle speed from GPS signal
V_GPS [km/h]	Corrected vehicle speed from GPS signal
Banking_GPS [°]	Bank angle from GPS signal
A_Lon_GPS [m/s²]	Longitudinal acceleration from GPS signal
A_Lat_GPS [m/s²]	Lateral acceleration from GPS signal
GPS_Yaw [°/s]	Rate of yaw from GPS signal
GPSValid	GPS signal present 0= no GPS signal present 1= GPS signal present
ValidSat	Number of GPS satellites available
Course [°]	Vehicle heading from GPS signal
Altitude [m]	Altitude above sea level
Longitude [°]	Geographical GPS coordinate of longitude
Latitude [°]	Geographical GPS coordinate of latitude
HHMM	Time in hours and minutes relative to Greenwich Mean Time
SSHH	Seconds and hundredths of second
Time_diff [sec]	Time difference between measurements per lap

Bear in mind that individual channels such as ABS for example are available only in combination with the Race ABS optional extra. The value of a channel that is not available is always 0.

As part of the BMW HP Race Datalogger software, the following predefined settings and templates will be available in Anna-Liza:

Templates:	Various predefined views
Track mode:	Various track plots
XY diagrams:	Two channels plotted as XY value pairs
Min/max tables:	Minimum and maximum tables for the measured values of a measurement
Histogram:	Statistical analysis of the vehicle data

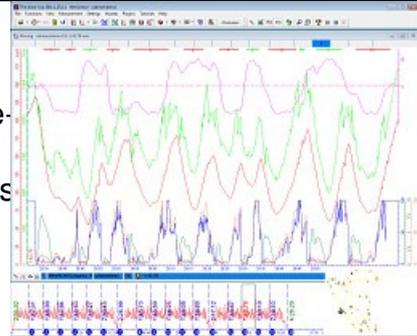
Outline of the templates and settings

Templates

The following predefined templates can be used for analysis of the measured data.

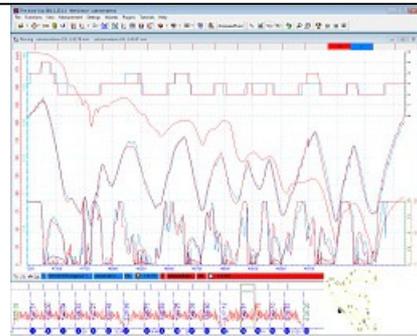
OverView

- Analysis and evaluation of lap information
- Contains information on rpm, speed, throttle-valve position, braking and bank angle
- Analysis of riding style and cornering speeds
- The position of the vehicle is shown in the Track window



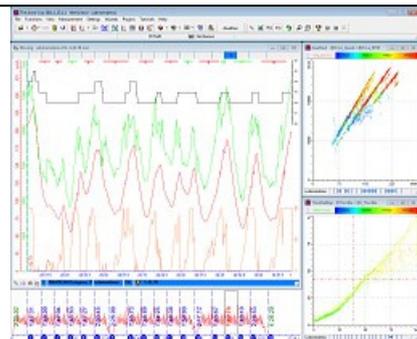
Compare2Runs

- Comparison between two laps
- Riding-style analysis of two riders
- Time-difference comparison between two laps
- Speed, throttle-valve angle, braking and gear information



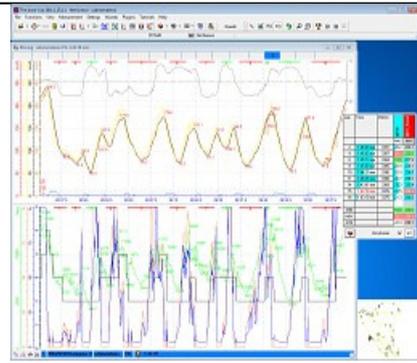
Gearbox

- Gear selection analysis of a measurement
- Analysis of shift rpm and shifting pattern
- Engine rpm, speed, throttle-valve position and gear
- XY plot of gear vs. speed
- XY plot of throttle-valve mapping



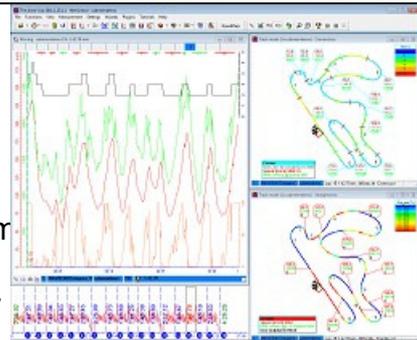
Speed

- Detailed analysis of vehicle speeds
- Split-screen view
- The top window contains four speed channels and the bank angles
- The bottom window shows engine rpm, throttle-valve position and gear
- Tabular view of wheel slip and speed



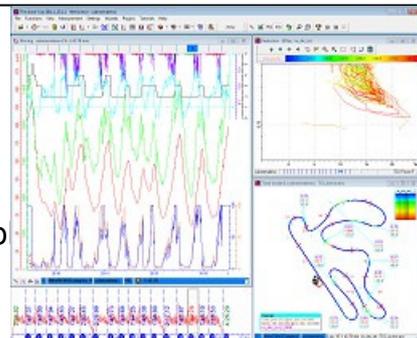
SpeedMap

- Track mode window for quick analysis of riding style and speed of a lap
- Plots of engine rpm, speed, throttle-valve position and gear
- Track mode 1 shows **cornering speed**, rpm, bank angle and gear
- Track mode 2 shows **top speed**, rpm, gear and throttle-valve position



TCS

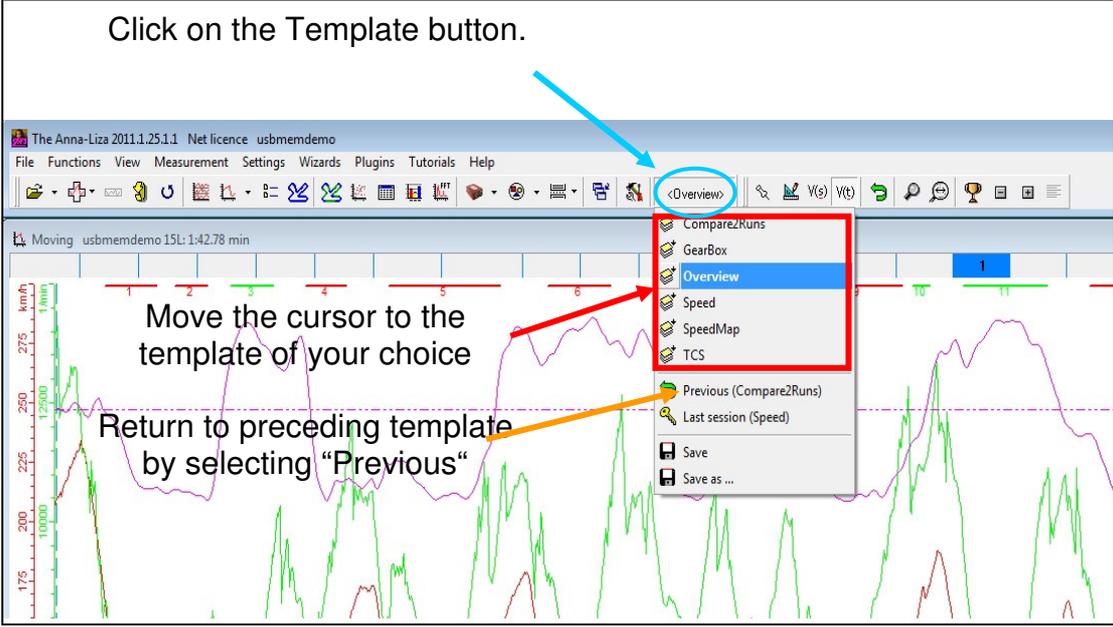
- Detailed analysis of traction control
- Analysis of where traction control cuts in
- Engine rpm, speed, throttle valves
- XY plot for a clear impression of DTC control intervention
- Track mode shows where DTC intervenes



Switch templates

To switch between templates, proceed as follows.

Click on the Template button.



The screenshot shows the software interface with a menu open. A blue arrow points to the '<<Overview' button in the toolbar. A red box highlights the menu items: Compare2Runs, GearBox, Overview, Speed, SpeedMap, and TCS. An orange arrow points to the 'Previous (Compare2Runs)' option. The background shows a speed graph with a purple line and a green line.

Move the cursor to the template of your choice

Return to preceding template by selecting "Previous"

Selecting a track mode

Click on the button to view the track modes available

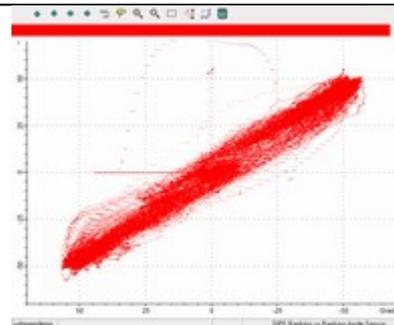
The screenshot shows the software interface with a menu open. The menu items are: Create new, Manage settings, Load with preview thumbnails, Temporary, Braking.tms <Brake Usage - Straights>, Corners.tms <Corner speeds>, Straights.tms <Top speeds / top RPM>, and TCS_Active.tms <Grip Position / Banking Ar...>. A red box highlights the track mode options. An arrow points to the 'Braking.tms' option with the text 'Track mode: select'. Another arrow points to a track preview window with the text 'Here: preview'.

XY diagrams

The following predefined XY plots are available.

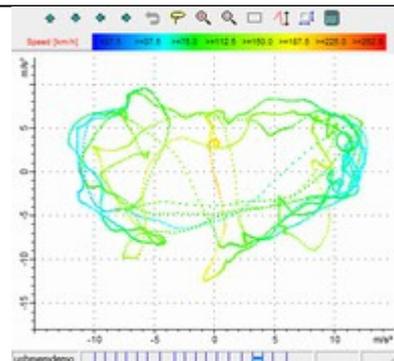
Bank Comparison

- GPS bank angle vs. bank angles registered by sensor
- Deviation between GPS bank angle and internal on-board sensor
- Information for all laps



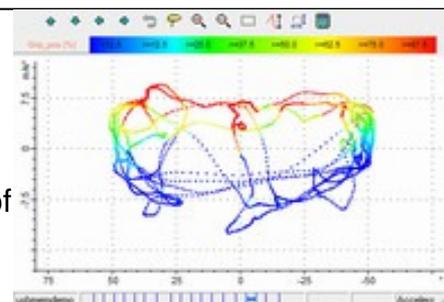
Acc Camm by GPS Current Lap

- Lateral acceleration vs. longitudinal acceleration
- Colour-coded speed channel
- Lap-based view
- Shape and size of the plot are indicative of the rider's skill



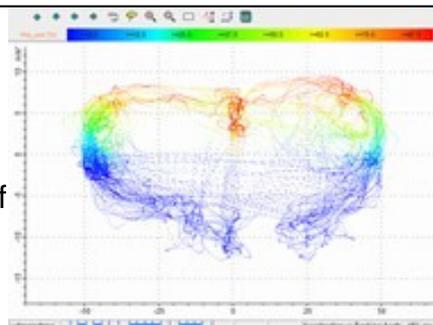
Camm by GPS Current Lap

- Bank angle vs. longitudinal acceleration
- Colour-coded throttle-twistgrip position
- Lap-based view
- Shape and size of the plot are indicative of the rider's skill
-



Camm by GPS All Laps

- Bank angle vs. longitudinal acceleration
- Colour-coded throttle-twistgrip position
- View for all laps
- Shape and size of the plot are indicative of the rider's skill
- A heart-shaped contour indicates a professional



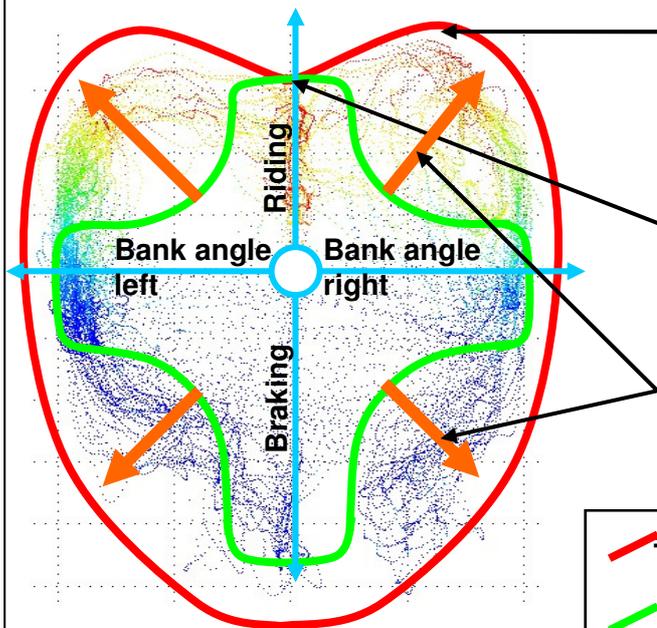
Bank angle assists acceleration

- Reduced tyre circumference improves ratio
- Lowering the centre of gravity counters tendency to wheelie

Acceleration limited by wheelie

- Centre of gravity is highest here

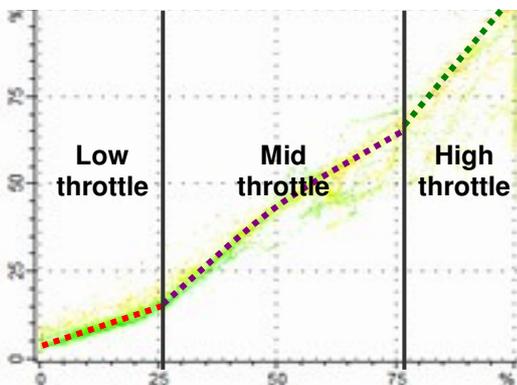
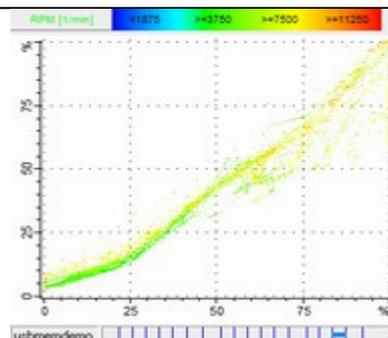
Time gained by expansion of the contour



- = professional rider
- = amateur rider

ThrottleMap

- Driver input at throttle twistgrip vs. throttle-valve position
- Colour-coded engine rpm
- Lap-based view
- Comparison of driver's input vs. electronically controlled throttle valve



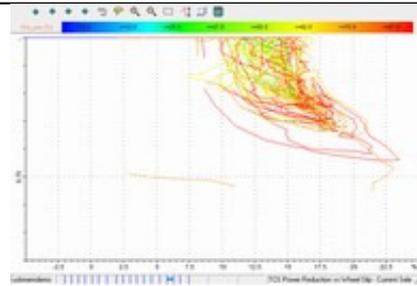
Low: DTC overrides driver input to stabilise the vehicle.

Mid: DTC allows more leeway

High: DTC intervention minimised so that the throttle valve can respond as rapidly as possible to rider input and the motorcycle can achieve maximum performance

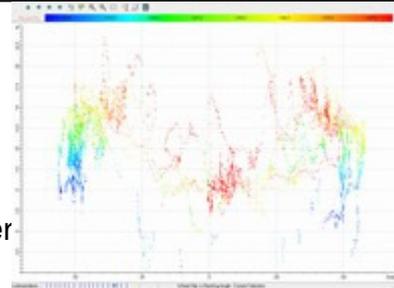
Reduction

- DTC torque reduction vs. wheel slip
- Colour-coded throttle-twistgrip position
- Dynamic view of the data in the selected window section
- Analysis of DTC control strategy



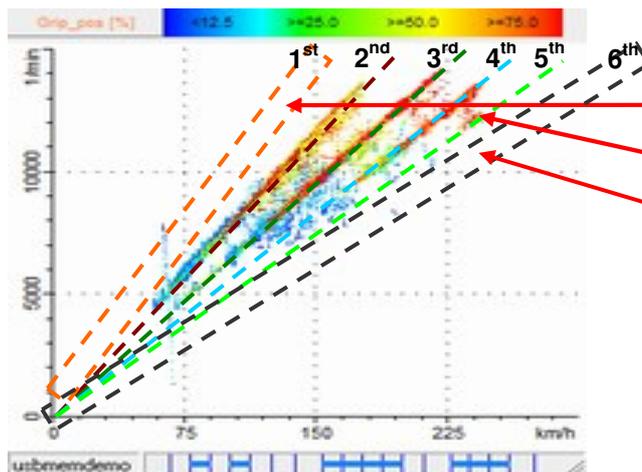
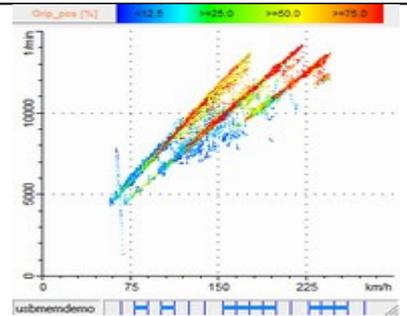
Slip

- Wheel slip vs. bank angle
- Colour-coded throttle-twistgrip position
- Dynamic view of the data in the selected window section
- Wheel slip at each bank angle for current rider input



GearBox1

- Engine rpm vs. speed
- Colour-coded throttle-twistgrip position
- All gears engaged during a measurement
- Max. engine rpm per gear
- Min./max. speeds



Analysis

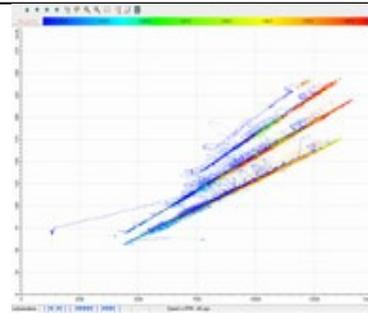
- 1st gear was not used
- 5th gear was used only briefly
- 6th gear was never used

Conclusions

- Rear sprocket is too small for this track
- Increasing sprocket size would make for better acceleration and allow full benefit to be extracted from 5th and 6th gears

GearBox2

- Speed vs. engine rpm
- Colour-coded throttle-twistgrip position
- All gears engaged during a measurement
- Max. engine rpm per gear
- Min./max. speeds



Selecting an XY plot

Click on the button for XY plots

Min/max tables

The following predefined min/max tables are available.

Bike

- Quick overview of rider and vehicle performance
- Overview of all lap times
- Overview of all min./max. speeds
- Rider input, throttle twistgrip maximum & average
- Max. bank angle (GPS & sensor)

Lap	Time	Max Speed	Avg Speed	Max Acc	Avg Acc	Max Bank	Avg Bank
1	00:01:12.34	120.5	85.2	1.2	0.8	15.1	10.5
2	00:01:15.67	118.3	83.1	1.1	0.7	14.8	10.2
3	00:01:18.90	122.1	86.4	1.3	0.9	15.5	10.8
4	00:01:21.23	119.8	84.5	1.2	0.8	15.0	10.5
5	00:01:24.56	121.5	85.8	1.2	0.8	15.2	10.6
6	00:01:27.89	117.9	82.9	1.1	0.7	14.7	10.3
7	00:01:31.12	123.4	87.1	1.3	0.9	15.6	10.9
8	00:01:34.45	120.2	85.0	1.2	0.8	15.1	10.5
9	00:01:37.78	118.7	83.8	1.1	0.7	14.9	10.4
10	00:01:41.01	122.8	86.6	1.3	0.9	15.4	10.8
11	00:01:44.34	119.5	84.2	1.2	0.8	15.0	10.5
12	00:01:47.67	121.0	85.5	1.2	0.8	15.2	10.6
13	00:01:51.00	117.6	83.5	1.1	0.7	14.8	10.4
14	00:01:54.33	123.1	86.9	1.3	0.9	15.5	10.9
15	00:01:57.66	120.0	85.1	1.2	0.8	15.1	10.5
16	00:02:01.00	118.4	83.9	1.1	0.7	14.9	10.4
17	00:02:04.33	122.6	86.5	1.3	0.9	15.4	10.8
18	00:02:07.66	119.3	84.3	1.2	0.8	15.0	10.5
19	00:02:11.00	121.8	85.7	1.2	0.8	15.2	10.6
20	00:02:14.33	117.2	83.6	1.1	0.7	14.8	10.4
21	00:02:17.66	123.3	87.0	1.3	0.9	15.5	10.9
22	00:02:21.00	120.1	85.2	1.2	0.8	15.1	10.5
23	00:02:24.33	118.6	84.0	1.1	0.7	14.9	10.4
24	00:02:27.66	122.9	86.7	1.3	0.9	15.4	10.8
25	00:02:31.00	119.4	84.4	1.2	0.8	15.0	10.5
26	00:02:34.33	121.3	85.6	1.2	0.8	15.2	10.6
27	00:02:37.66	117.0	83.7	1.1	0.7	14.8	10.4
28	00:02:41.00	123.0	86.8	1.3	0.9	15.5	10.9
29	00:02:44.33	120.3	85.3	1.2	0.8	15.1	10.5
30	00:02:47.66	118.1	83.8	1.1	0.7	14.9	10.4
31	00:02:51.00	122.5	86.4	1.3	0.9	15.4	10.8
32	00:02:54.33	119.6	84.1	1.2	0.8	15.0	10.5
33	00:02:57.66	121.6	85.4	1.2	0.8	15.2	10.6
34	00:03:01.00	117.5	83.4	1.1	0.7	14.8	10.4
35	00:03:04.33	123.2	86.9	1.3	0.9	15.5	10.9
36	00:03:07.66	120.4	85.1	1.2	0.8	15.1	10.5
37	00:03:11.00	118.3	83.9	1.1	0.7	14.9	10.4
38	00:03:14.33	122.7	86.6	1.3	0.9	15.4	10.8
39	00:03:17.66	119.7	84.2	1.2	0.8	15.0	10.5
40	00:03:21.00	121.9	85.5	1.2	0.8	15.2	10.6
41	00:03:24.33	117.1	83.5	1.1	0.7	14.8	10.4
42	00:03:27.66	123.1	86.8	1.3	0.9	15.5	10.9
43	00:03:31.00	120.2	85.0	1.2	0.8	15.1	10.5
44	00:03:34.33	118.5	83.7	1.1	0.7	14.9	10.4
45	00:03:37.66	122.8	86.5	1.3	0.9	15.4	10.8
46	00:03:41.00	119.8	84.3	1.2	0.8	15.0	10.5
47	00:03:44.33	121.7	85.4	1.2	0.8	15.2	10.6
48	00:03:47.66	117.3	83.6	1.1	0.7	14.8	10.4
49	00:03:51.00	123.0	86.7	1.3	0.9	15.5	10.9
50	00:03:54.33	120.5	85.2	1.2	0.8	15.1	10.5

Tip

- If you click on a value in the table, say speed for example, the point at which this speed was reached is shown automatically in the Overview window. This makes it all the easier to evaluate the min/max values.

Engine

- Quick overview of top speed, gear and engine rpm
- Speed maximum & average
- Rear-wheel speed, maximum & average
- Engine rpm, min., max. & average
- Rider throttle - max. & average



Control

- Quick overview of ABS and DTC interventions
- ABS status – min. & max.
- Wheel slip - max. & average
- Wheel slip with DTC intervention - min.
- Absolute torque reduction - min.



Spin

- Quick overview of wheel slip
- Lap times of all valid laps
- Wheel slip - max.
- Speed - max.

Lap	Time	Meters	Wheel Slip	Speed
			MAX	MAX
2	1:46.00 min	3391	20.2	223.1
4	1:45.63 min	3387	23.3	222.6
8	1:45.73 min	3384	18.0	227.9
9	1:45.69 min	3395	20.9	228.1
10	1:44.25 min	3390	20.9	234.7
11	1:45.38 min	3386	22.7	230.6
14	1:43.67 min	3388	28.3	233.4
15	1:42.78 min	3276	22.5	232.3
16	1:43.10 min	3375	21.3	234.3
MIN			18.0	222.6
MAX			29.3	236.3
AVG			22.4	230.1

Selecting a min-max table

Click on the button for min-max tables

Min-max table: select

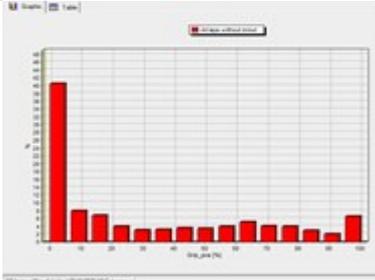
Preview

Histogram

The following predefined histograms are available.

GripPos

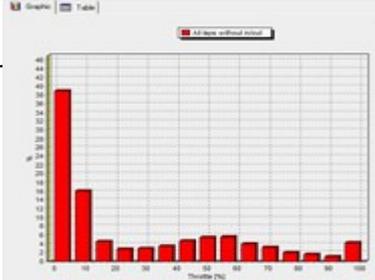
- Quick overview of throttle twistgrip position use
- Statistical overview of throttle twistgrip position
- Throttle twistgrip position percentages per lap



The histogram shows the distribution of throttle twistgrip positions. The x-axis is labeled 'Throttle (%)' and ranges from 0 to 100. The y-axis represents percentage. The distribution is heavily skewed towards the lower throttle positions, with a very high peak at 0-5% and much smaller bars for higher throttle positions.

Throttle

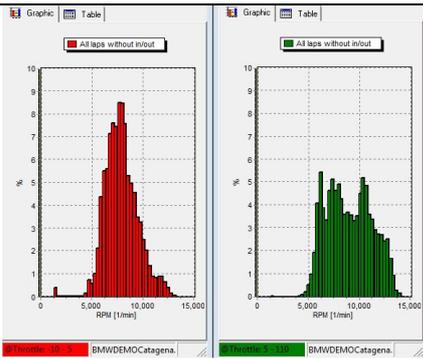
- Statistical overview of throttle twistgrip position
- Percentages for each position
- Lap times of all valid laps
- Comparison with GripPos histogram



The histogram shows the distribution of throttle twistgrip positions. The x-axis is labeled 'Throttle (%)' and ranges from 0 to 100. The y-axis represents percentage. The distribution is heavily skewed towards the lower throttle positions, with a very high peak at 0-5% and much smaller bars for higher throttle positions.

RPM

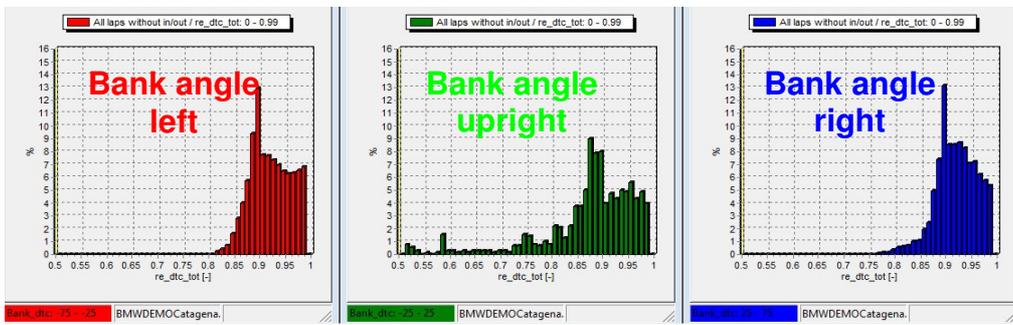
- Statistical overview of the engine speeds achieved
- Percentages for each engine rpm
- Lap times of all valid laps



The two histograms show the distribution of engine speeds. The x-axis is labeled 'RPM [1/min]' and ranges from 0 to 15,000. The y-axis represents percentage. The left histogram (red) shows a distribution peaking around 10,000 RPM. The right histogram (green) shows a similar distribution peaking around 10,000 RPM.

TCS

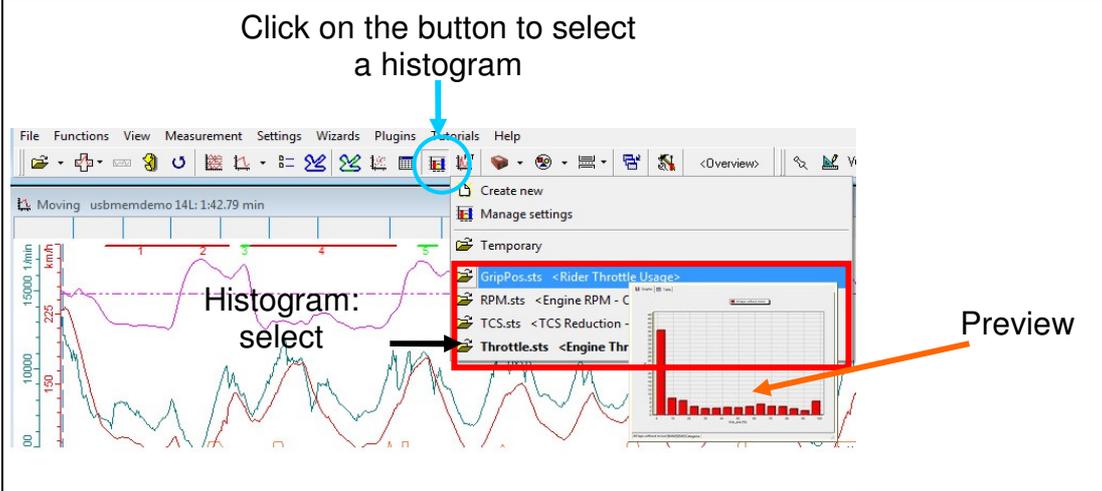
- Statistical overview of DTC interventions
- Lap times of all valid laps
- Relationship to bank angle – **left, upright, right**
- Lower values indicate TCS is working harder.



The three histograms show the distribution of DTC interventions (re_dtc_tot) for different bank angles. The x-axis is labeled 're_dtc_tot [-]' and ranges from 0.5 to 1. The y-axis represents percentage. The left histogram (red) is for 'Bank angle left', the middle (green) is for 'Bank angle upright', and the right (blue) is for 'Bank angle right'. The distributions show that DTC interventions are more frequent at higher re_dtc_tot values, particularly for the right bank angle.

Selecting a histogram:

Click on the button to select a histogram



The screenshot shows a software interface with a menu bar (File, Functions, View, Measurement, Settings, Wizards, Plugins, Materials, Help) and a toolbar. A blue circle highlights a histogram icon in the toolbar. Below the toolbar, a list of histograms is displayed, including GripPos.sts, RPM.sts, TCS.sts, and Throttle.sts. A red box highlights this list. To the right, a preview window shows a histogram for the selected item. An orange arrow points from the text 'Preview' to this window. A black arrow points from the text 'Histogram: select' to the list of histograms.

Histogram: select

Preview