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Symbols used in the text



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



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

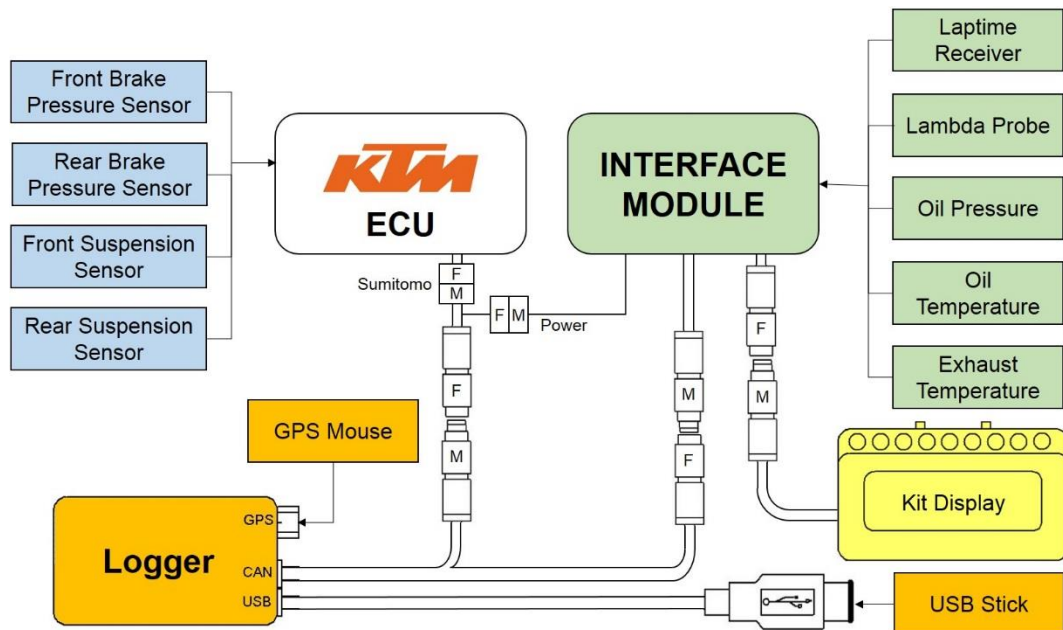


Documentation reference

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

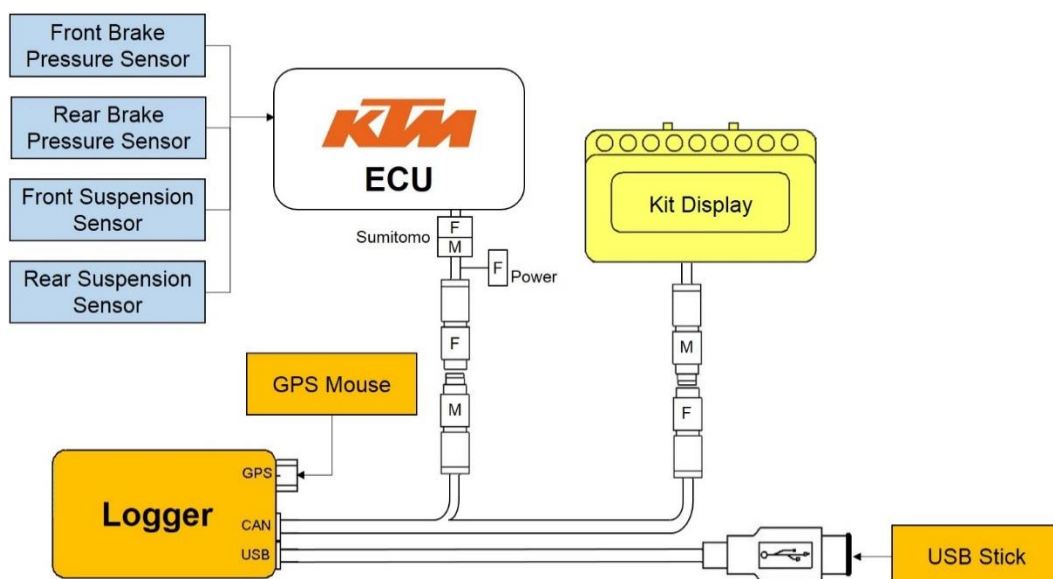
1 KTM Moto3 kit system

1.1 System overview



(orange)	⇒ "Basic" kit system
(blue)	⇒ Sensors which can be connected to the ECU (optional)
(green)	⇒ Interface module and sensors which can be connected to it (optional)
(yellow)	⇒ The kit display can be connected to the interface module or to the logger (optional)
(white)	⇒ The ECU is part of your bike

If you want to connect without the interface module:



1.2 Possible content of your KTM Moto3 kit system

USB CAN Stick Logger Kit (SY-Kit_CANStick-330)

- Stick Logger LG-CANStickGPS2C-330
- USB stick AC-Stick-000
- GPS mouse AC_GPS_Mouse-330
- Connection cable CAN to KTM
- USB type A to USB type A cable
- Cover for USB stick and CAN connector
- Software CD + single user license
- Mounting material (Velcro®)

Kit System MiniDash (DI-KIT_MD12-330)

- Kit System MiniDash, 32 channels from CAN on 6 pages, CAN-Monitor, connector Binder 712 5PM, cable length 600 mm, factory setting KTM Moto3

Potentiometer 75 mm (SA-LP075S-330)

- Linear potentiometer slim body 75 mm, connector JST JWPF 3PM, cable length 200 mm

Potentiometer 150 mm (SA-LP150S-330)

- Linear potentiometer slim body 150 mm, connector JST JWPF 3PM, cable length 200 mm

Pressure sensor 100 bar (SA-PK100M10-330)

- Pressure sensor 100 bar, 0-5 V, thread M10, 5 V power supply, connector JST JWPF 3PM, cable length 350 mm, including adaptor for pressure sensors SA-PKxxxM10 to brake system and gaskets

Interface module/Lambda Kit (SY-KIT_Int_LSU_-330)

- Interface module IN_LSU_KTM-330
- Lambda probe BOSCH SA-LSU4.2-000
- Scratch band and mounting parts

Lap time Kit (SY-KIT_LT05-330)

- Lap time receiver SD-LR02C-330
- Lap time transmitter AC-KITLT05-000
- Scratch pads

Pressure sensor 10 bar (SA-PK010M10HT-330)

- Pressure sensor 10 bar, thread M10, connector JST JWPF 4PM, cable length 800 mm, temperature range up to 120°C including adaptor for oil-pressure sensor to oil circuit

Temperature sensor (SA-NTCM06-330)

- Temperature sensor, M6, stainless steel, cable length 800 mm incl. connector JST JWPF 2PM

Temperature amplifier (IN-ATK01_100-330)

- Temperature amplifier (type K) 0-1000°C, connector JST JWPF 4PM for the amplifier output and C9019 2PF for the type K sensors, cable length 200 mm for the amplifier output and 600 mm for the type K sensors

Thermocouple sensor type K (SA-TK01-000)

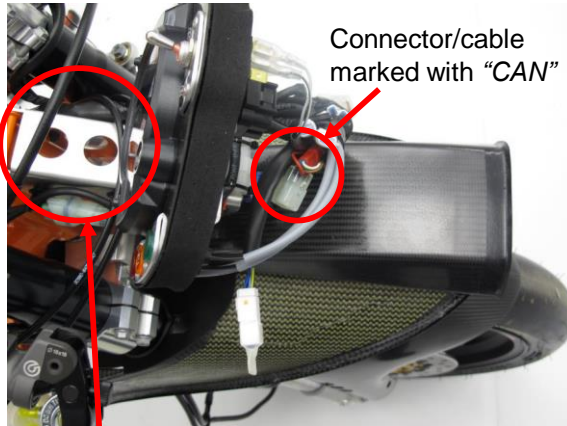
- Thermocouple sensor type K, cable length 300 mm, miniature type K connector

2 Installation of system

2.1 Mounting the KTM Moto3 kit logger to the bike

It is recommended to mount the data logger with adhesive Velcro® (scratch tape) that can strongly fix it to the bike, but also be removed quickly for bike maintenance.

Connect your logger to the cable loom of your bike at the connector/cable marked with "CAN".



Connector/cable marked with "CAN"

Not perfect, but possible position for GPS; better behind rear seat (pillion).

Mounted logger and interface module



Temperature amplifier (Type K)

2.2 Mounting the GPS mouse

For optimal signal quality the GPS mouse must have a **free visibility towards the GPS satellites**. Therefore it should not be covered by any bike parts or by the rider. Mounting the antenna on the rear tail of the bike would be a useful solution for example. To get better signals use aluminum foil as a ground plane underneath the GPS mouse.



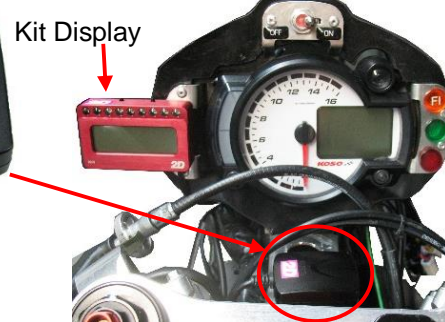
Double-sided "scratch tape" or Velcro® works very well to fix the GPS module. It keeps the GPS receiver fixed on its place but can be removed easily as well.



Schematic overview of the 2D stick logger



2D GPS mouse



Kit Display



Using the GPS mouse does not require any further action. After connection it is ready for use and will be powered by the kit logger.



The power supply of the complete system **must be switched on** before testing the GPS mouse. Incoming GPS data can be displayed online in the 2D software *WinIt*.

2.3 First communication with the logger

1. Install the 2D software and license it

Refer to the manual "Software installation guide". You can find it in 3 places:



1. Your software CD
2. Linked as one of the PDFs in the *WinARace* toolbar
3. On the 2D homepage 2d-datarecording.com
➤ <SUPPORT> - <downloads> - <manuals> - <Software installation>

2. Power your logger
3. Connect your logger via USB cable (type A to type A) to your PC
4. Start the program *WinARace*

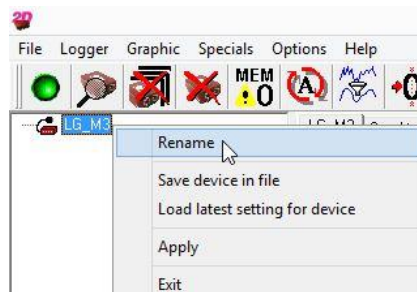


5. Click the button <Communication (F2)> or press the key <F2> to start *WinIt*

2.3.1 How to change the logger name

The logger name is part of the measurement's file name. Therefore it is very useful to change the logger name.

1. Power your logger
2. Connect your logger to your PC
3. Start *WinIt*
4. Select your logger from the system tree
5. Right click and choose "Rename"



6. The last 4 characters of your logger name are part of the measurement's file name!

2.3.2 Setting the suspension channels to zero

Before using the suspension channels the suspension sensors have to be set to zero. In the channel mask you see “**Sus_F**” and “**Sus_R**”, which are recorded and used for analyzing. These channels contain the suspension data in “mm”. Setting these channels to zero has to be done via the channels “**SUSF_O**” and “**SUSR_O**”.

To correctly zero the measurement of your bike’s suspension carefully follow these instructions step by step:

- First make sure your bike is on a pit stand that will allow the front suspension to be fully extended
- Power your logger, connect it via USB cable to your PC and start *WinIt*
- Within the zone “**SUSF_O**” in the simplified kit user interface click the button **<Zero>**

The screenshot shows the WinIt software interface with three columns of sensor channels. The first column contains SPEED_F, Sus_F, **SUSF_O** (highlighted with a red box), BP_F, BPF_O, LapTime, and Laps. The second column contains RPM, LAF, TPS, BARO, TAIR, T_Oil, P_Oil, TH2O, and GEAR INDEX. The third column contains SPEED_R, Sus_R, SUSR_O, BP_R, ValidSat, HHMM, and SSHH. Each channel has a numerical value and a unit, with some channels having a 'Zero' button next to them.

- You will be prompted with the screen as shown below. To correctly zero the front suspension you must click the button **<Set Zero Automatically>**

The dialog box titled 'Set Channel Value to Zero: SUSF_O' contains two buttons: 'Set Zero Manually' and 'Set Zero Automatically' (highlighted with a red box). The 'Set Zero Automatically' button is described as: 'Clicking this button will start the sampling of the channel to find the minimum and maximum value for this channel. Dependig on the formula either the minimum or the maximum is taken to set the channel to zero.'

- Next you must click the button **<Sample average>** from the screen below

The 'Channel zero-setting' dialog box shows a table with columns: Minimum, Maximum, Delta, and Change. The row for '11 SUSF_O [digit]' shows 'Scanning' for both Minimum and Maximum, with values '0,00 / 0'. The 'Sample average' button is highlighted with a red box. At the bottom are 'OK', 'Cancel', and 'Reset' buttons.

- After the 2.5 second average value is determined, click **<OK>**



You can set your rear suspension (*SusR_O*), oil pressure (*P_Oil*) and brake pressure channels (*BPF_O*, *BPR_O*) to zero in the same way.

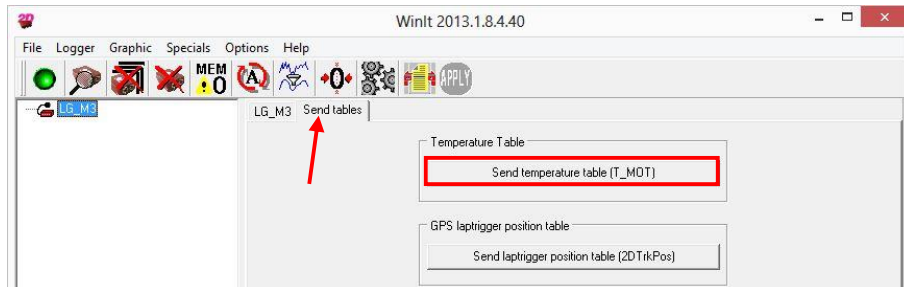


If your data logger contains recorded data you will be shown a warning to explain that applying the new calibration setting will erase the memory of your data logger. Only continue if you are certain the data inside the logger is not useful!

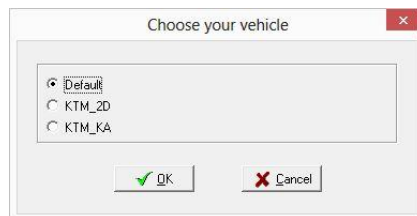
2.3.3 How to change the table "T_MOT"

Table *T_MOT* is preset to 2D sensor *SA-NTCM06-330*. For using a different sensor you have to change the calibration table.

To change the table "*T_MOT*" go to the tab "Send tables" in the *WinIt* simplified kit user interface and press the button <Send temperature table (*T_MOT*)>



It opens the window "Choose your vehicle". There you can select which *T_MOT*-table you want to use.



KTM_2D ⇒ for usage with 2D sensor *SA-NTCM06-330*

KTM_KA ⇒ for usage with a KTM temperature sensor

Confirm your decision with <OK>.



If you change the *T_MOT*-table via full user interface and the table name changes, you'll lose the possibility to change the *T_MOT*-table via simplified user kit interface!

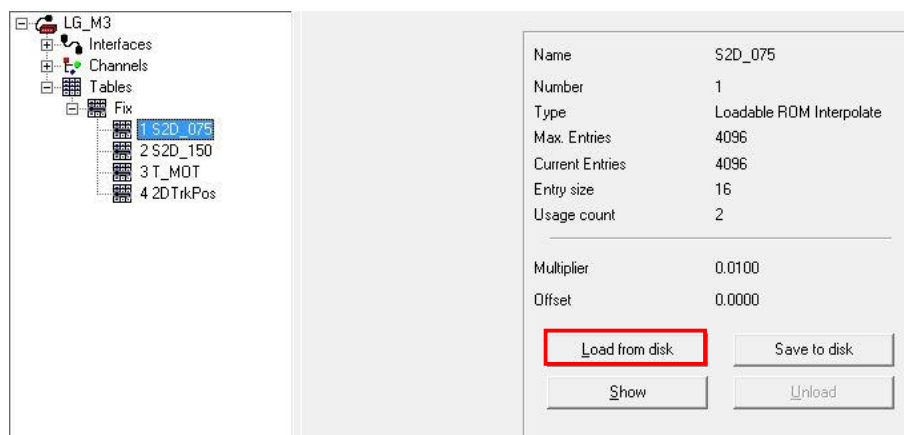
2.3.4 How to change the suspension tables

The suspension tables are preset to 2D sensors *SA-LP075S-330* and *SA-LP150S-330*. For using different sensors you have to change the calibration tables.

To change the suspension tables you have to switch from the simplified kit user interface to the full user interface in *WinIt*. You can switch between those user interfaces with the hotkey **<Ctrl> + <Alt> + <K>**. Confirm the popping up window with **<Yes>**.



In the full user interface select the logger from the system tree. Go to **"Tables"** ⇒ **"Fix"** and select the table you want to change.



Press the button **<Load from disk>** to select the new table-file.

- Table 1 is for the 75 mm potentiometer (rear suspension). You can choose between the files *S2D_075.tbl* and *KTM_075.TBL*.
- Table 2 is for the 150 mm potentiometer (front suspension). You can choose between the files *S2D_150.tbl* and *KTM_150.TBL*.



S2D_XXX.tbl ⇒ for usage with 2D potentiometers

KTM_XXX.TBL ⇒ for usage with KTM potentiometers

2.3.5 Selecting the trigger channel for LAPTIME

There are two valid channels that can be used for the trigger channel:

- **LAP_IF** - The optional 2D infrared receiver
- **LapGps** - See manual *GPS Laptiming* for information on configuration of *LapGps*

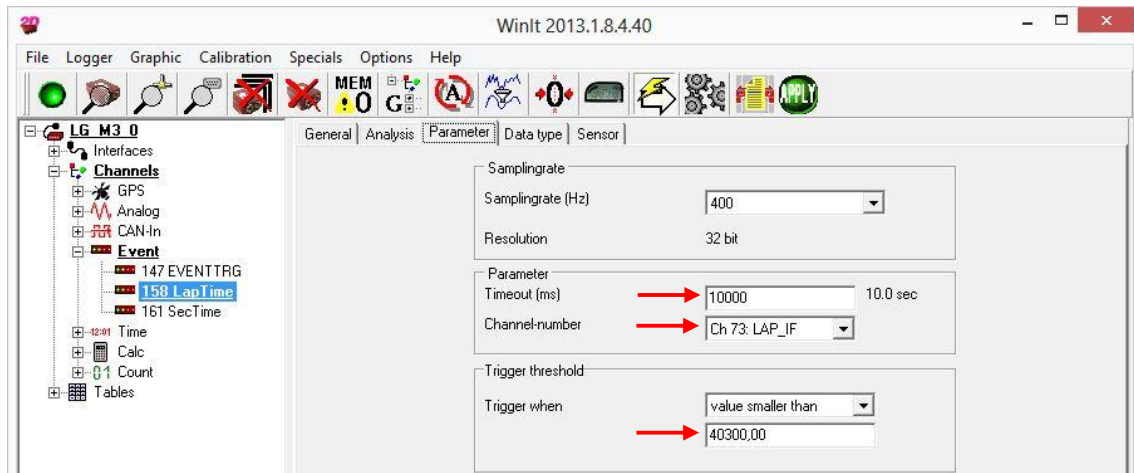


You can find the manual *GPS Laptiming* on the 2D homepage 2d-datarecording.com

➤ **<SUPPORT>** - **<downloads>** - **<manuals>** - **<Generate laptimes with GPS>**

It is recommended that you use *LAP_IF* for making lap times. If there's no lap time kit available, *"LapGPS"* can be used instead as the trigger channel.

To define the trigger channel you want to use, start *WinIt* and switch to the full user interface (shortcut: **<Ctrl> + <Alt> + <K>**, described in section 2.3.4). Select the logger in the system tree and go to **Channels** ⇒ **Event** ⇒ **LAPTIME**. Open the tab **<Parameter>** and choose from the drop down menu of **"Channel-number"**. For *LAPTIME* you must choose either *LAP_IF* or *LapGps*!



You must also define the “*Timeout*” parameter to be less than the expected lap time. This setting defines the minimum lap time that will be accepted as valid by the data logger.



The timeout setting helps prevent “false” lap times being generated by interaction with the wrong lap trigger. For example, if you expect laptimes of 1 min 32 secs, set “*Timeout*” as 90000= 90 seconds = 1 min 30 secs!

When using *LAP_IF* it is necessary to make sure the “*Trigger threshold*” is correctly defined. If not it can result with your data logger not generating lap times correctly! Therefore enter the value “40300” in the corresponding field (see figure above).

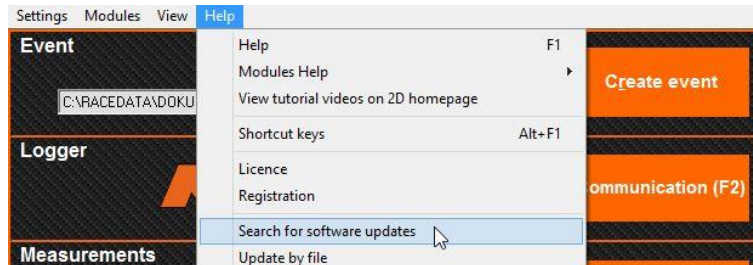
Confirm your changes with **<Apply>**.

2.4 How to update your logger firmware

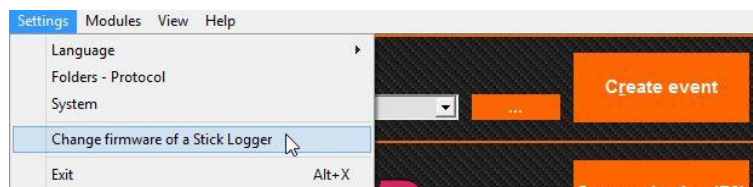
The “Change firmware of a Stick Logger” menu item only exists if there is a firmware update available.

To search for firmware updates please use the “Search for software updates” item.

(WinARace ⇒ Help ⇒ Search for software updates)



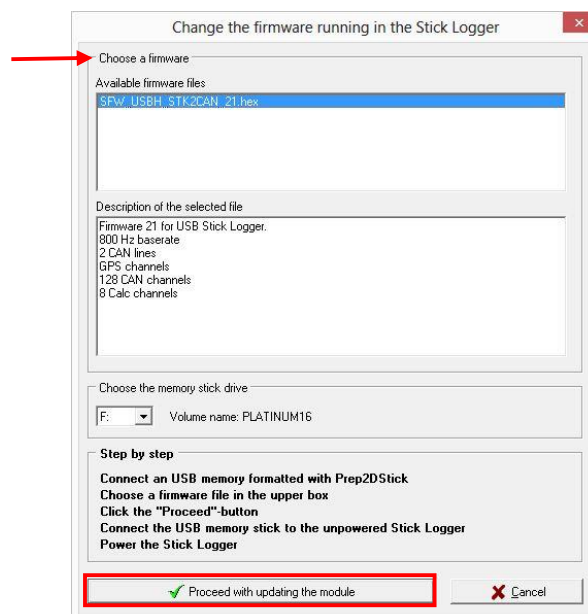
You can update the stick logger firmware in the program WinARace. Choose “Change firmware of a Stick Logger” in the Settings-menu.



1. Connect an USB memory formatted with *Prep2DStick*
2. Choose a firmware file
3. Click **<Proceed with updating the module>**
4. Connect the USB memory stick to the **unpowered** stick logger
5. Power the stick logger



Do not disconnect the logger until the blue LED starts blinking continuously for a while!



3 “My first measurement”

3.1 Preparation

Your logger is fully configured and can be used without further setup. It is delivered with a fixed setting, which contains all channels you can measure with the system offered by 2D for your KTM Moto3 bike. You only have to connect your logger to all system-parts (zero the relevant channels) and insert the USB stick which is delivered with your system. This USB stick is prepared to be used with your logger.

3.2 Measurement

The starting condition is set to “RPM>500” by default. That means the logger starts recording when the RPM-signal is greater than 500 and stops recording when the power supply for the logger is turned off.



Please keep in mind, that the logger uses a new file on the USB stick for each new measurement. Please refer to the document “USB stick logger and software settings” for a description how to prepare USB sticks for measurements.

3.3 Data download

3.3.1 General information on the data organization

WinARace, the front-end program started on the desktop, shows the following four levels:



a.) Event/measurement administration

b.) Logger communication

c.) Measurement naming

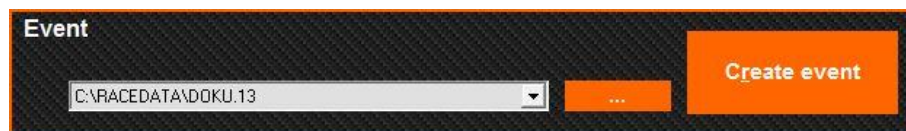
d.) Measurement selection & analysis

3.3.1.1 Create a new event directory



The first and most important step **before** downloading the first measurement is to create an “event”. Always start with this step, so that you always know where your data has been saved!

From the diagram below, the current directory is shown on the left hand side. This defines where data will be saved or from where measurements are read.



On the right side there are two options:

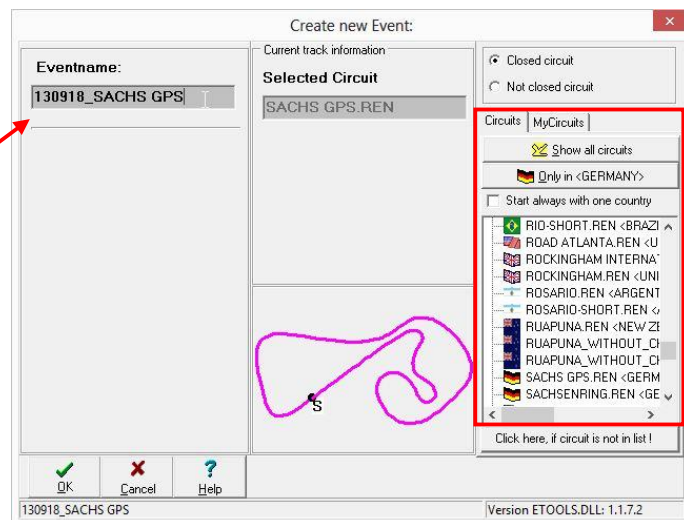
1. You can switch to the “event module” by clicking on the button < ... >.
2. <Create event> will set up a new directory with the option to select the track used at that event.

- Your measured data should be stored inside your computer according to the following directory structure:



To create new event directories use the button **<Create event>** in the front-end tool *WinARace*. The following window will appear:

Here you can change the naming!



- Select a circuit from the list on the right hand side. The name of the selected track combined with the current date will become the default name of the event.
- To change the name to your preferences edit the field “Eventname”.
- Confirm your selection with the button **<OK>**.

There are two different circuit sub-directories:



1. The sub-directory “\Circuits”: Includes a list of **pre-defined** tracks delivered with the 2D race software.
2. The sub-directory “\MyCircuits”: Contains track maps which have been **created by the user** via the analysis tool *2D Analyzer*.



If a track is not listed, select **<Click here if circuit is not in list>** and a basic circuit will be selected (*Base.ren*). Rename the *Eventname* according to the track that the data are from.

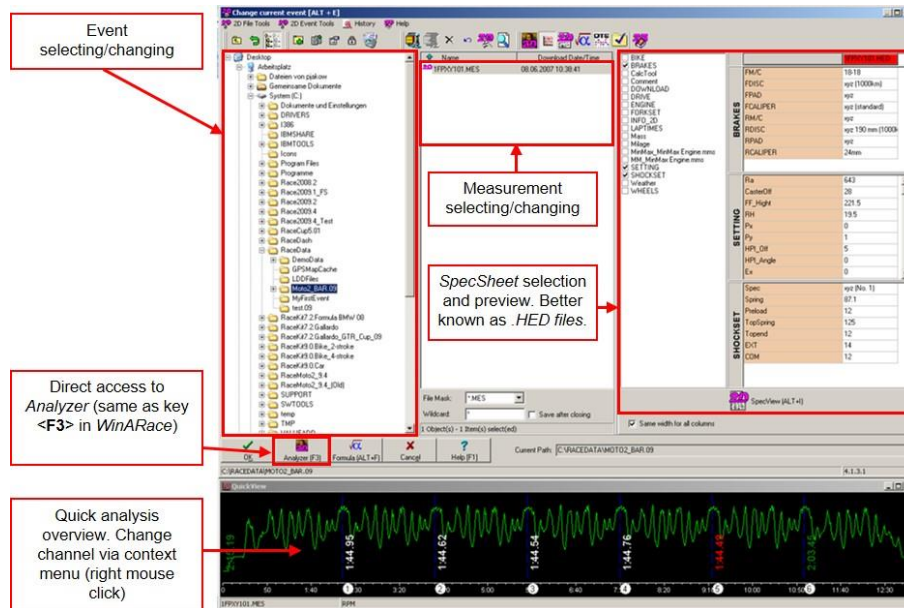
3.3.1.2 Change event directory



You have the possibility to change the current event by selecting the button **< ... >**. The figure on next page shows you the start-window of the “event module”

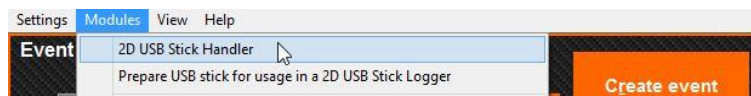
Inside the change event screen you can perform many administrative tasks including:

- Select a previous event from your computer directory
- Review *SpecSheet* info (lap times/bike settings/rider comments)
- Rename a measurement (this is the only recommended way to rename!)
- Delete a measurement



3.3.2 Download your data

- To download your data select an event and a master name in the measurements area, connect your 2D USB stick to your PC.
- At the time of download, the program *WinIt* generates a new folder inside the current **event directory**. The new folder contains all data files coming from the data logger during download. All measurement files have got the extension *.MES
- *2D USB Stick Handler* checks if the folder *2D-Datarecording* is on the memory stick and contains measurement files and settings. If such files are found they are copied into the temporary folder of the computer. *Decompress2D* decompresses the files into the 2D format and starts the analysis software *2D Analyzer* for further processing. Once the data are available for analysis, *Clear_2D_Stick* is started automatically, which prepares the memory stick for the next use.
- The name given to the measurement is a combination of the current logger name (last 4 characters) and master name.
- If the download doesn't start automatically, you can download your data manually from the USB stick by using *2D USB Stick Handler* (*WinARace* ⇒ *Modules* ⇒ *2D USB Stick Handler*) or change the operation mode of the software (section 3.3.3).



If you need further assistance concerning the stick handling, have a look at the tutorial video or the stick handling manual

Video:



- On the 2D homepage 2d-datarecording.com
 - <SUPPORT> - <demo/tutorial videos>
- On [youtube.com](https://www.youtube.com)
 - Search "2D datarecording USB stick handling"

Manual:

- In the *WinARace* toolbar as one of the linked PDF-files
- On the 2D homepage 2d-datarecording.com
 - <PRODUCTS> - <hardware> - <data logger> - <CAN-Memory> - <USB-Stick Logger> - <Sticklogger specific manual>

3.3.3 Configuring the operation mode of the software

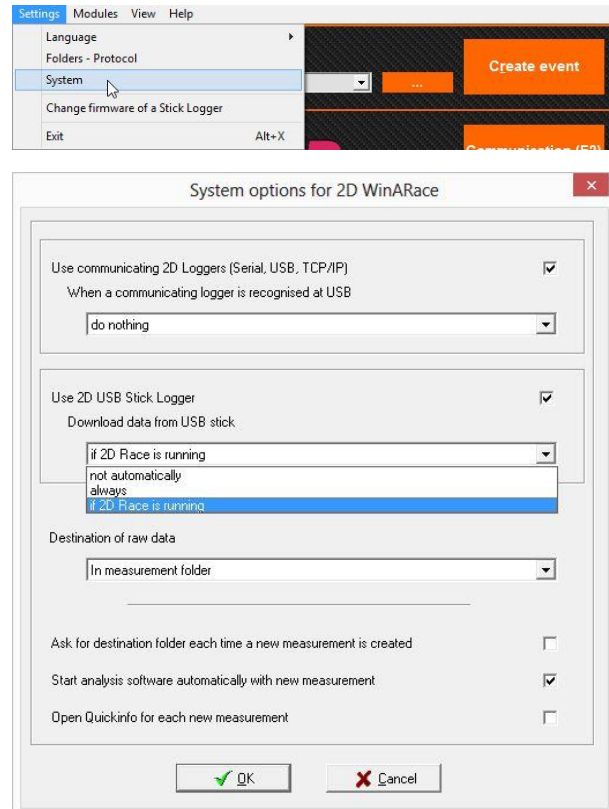
The operating mode of the 2D software depends on the type of connection you are using. In the menu shown below you can configure which actions the software performs automatically when a logger is connected to the PC using a USB cable and when you insert a USB stick with measurement data.

Start the program *WinARace*. For setting up the operating mode, open the menu **<Settings> - <System>**.

In this form you can select the type of logger/connection you are using. Please note that you have to use both types of connections – the USB cable (e.g. for setting channels to zero) and the USB stick (e.g. for data transfer). You do not have to switch between the two modes. In addition you can specify whether *WinARace* shall perform an action if a logger or stick is detected.

By default both types are selected.

If you select the stick logger operating mode you can tell the software when measurement data shall be downloaded: only if the program *WinARace* is running or always if a 2D stick is detected. Downloading is handled by the program *Handle2DStick*. You can check the system tray of your PC whether this program is running.



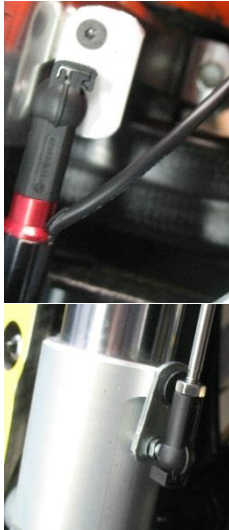
4 Appendix

4.1 Mounting the front and rear suspension sensors

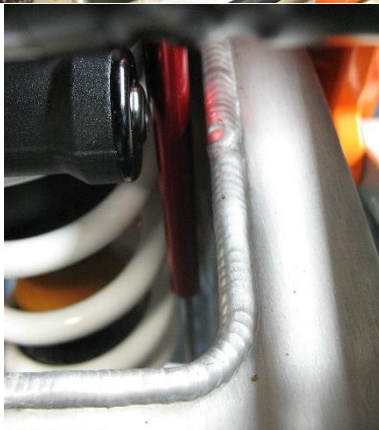


The potentiometers have to be fitted parallel to the tubes of the fork or the spring to give correct values. The maximum measure range of the used sensor must be equal or even longer than your maximum suspension travel (150 mm range is normal for front fork measurement, 75 mm range is normal for rear suspension measurement).

Fixing of the front suspension sensor



Fixing of the rear suspension sensor



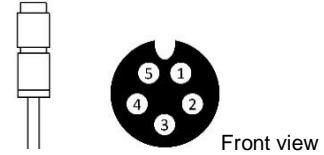
Please check **very** carefully that neither the sensor nor the mountings will limit the steering angle. Also be sure that no cables or brake lines can get caught in the sensor or get damaged by it. **On rear suspension take care that the sensor is not touching any part of the swingarm in any position!**

4.2 Pinning

4.2.1 Connection cable CAN to KTM

CAN line, Binder 712, 5PF

Pin	Name	Description	Color
1	CAN Hi	CAN High	White
2	CAN Lo	CAN Low	Green
3	GND	Ground	Black
4	n.c.	Not connected	
5	Vext	Power supply 8- 14V	Red



Power supply, AMP Super Seal, 2PF

Pin	Name	Description	Color
1	12 V	12 V power supply	Red
2	GND	Ground	Black



KTM ECU, Sumitomo 6189-6171, 6PM

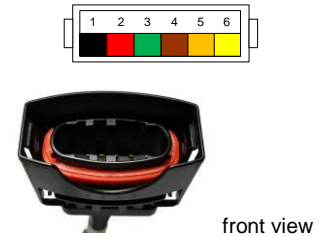
Pin	Name	Description	Color
1	CAN Hi	CAN High	White
2	CAN Lo	CAN Low	Green
3	GND	Ground	Black
4	n.c.	Not connected	
5	12 V	12 V power supply	Red
6	n.c.	Not connected	



4.2.2 Interface module

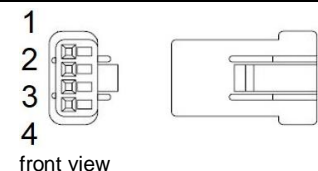
LSU Probe, Bosch, 6PF

Pin	Name	Description	Color
1	IP	Inverting input current amplifier	Black
2	UN	Inverting input current control	Red
3	VM	Virtual ground current control	Green
4	Heater-	Ground heater	Brown
5	Heater+	Power heater	Orange
6	IA	Non inverting input of pump current amplifier	Yellow
	Shield	Shield	Grey



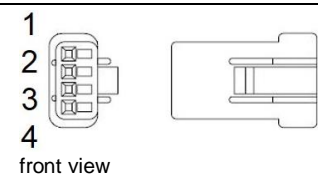
Analog input (LAP), JST JWPF, 4PF

Pin	Name	Description	Color
1	GND	Ground	Black
2	A2 LAP	Signal LAP	White
3	n.c.	Not connected	
4	12 V	12 V power supply	Red



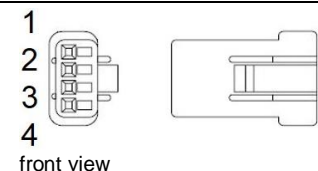
Analog input (P_Oil), JST JWPF, 4PF

Pin	Name	Description	Color
1	GND	Ground	Brown
2	A5 P_Oil	Signal oil pressure	White/Brown
3	n.c.	Not connected	
4	12 V	12 V power supply	Orange



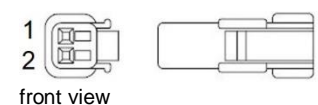
Analog input (TK_EX1), JST JWPF, 4PF

Pin	Name	Description	Color
1	GND	Ground	Blue
2	A6 TK_EX1	Signal exhaust temperature	White/Black
3	5 V	5 V power supply	Green
4	12 V	12 V power supply	Yellow



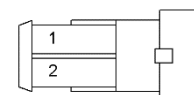
Analog input (T_Oil), JST JWPF, 2PF

Pin	Name	Description	Color
1	GND	Ground	Purple
2	A1 T_Oil NTC	Signal oil temperature, NTC	Grey



External power supply, AMP Super Seal, 2PM

Pin	Name	Description	Color
1	12 V	12 V power supply	Red
2	GND	Ground	Black



4.3 Datasheets

4.3.1 Stick logger

LG-CANStickGPS2C-330

USB Stick CAN Memory



Key Features:

- Stores CAN Bus data directly to USB Stick
- Supports Hot swap!
- Developed for ultimate Data access speed
- GPS input**

** 12 Hz GPS mouse optional available

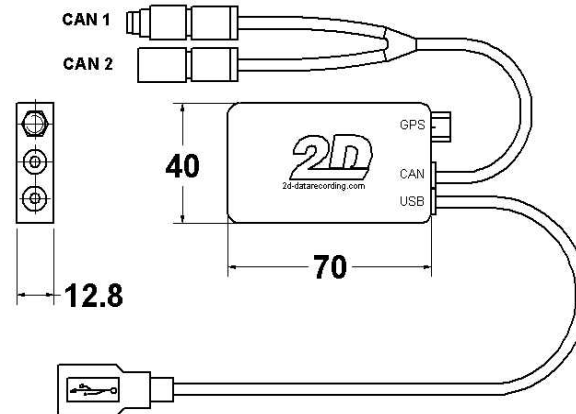
Technical specifications

CAN characteristics				Mechanical characteristics	
CAN channels (fixed)		39		Aluminum housing	
CAN Lines		2		Dimensions	mm 70x 40x 13
CAN powered		yes		Weight	g 90
Baud rate		Fixed		Cable CAN line	
Sampling rate CAN channels		Fixed		Wire cross section	10 x AWG26
Storage characteristics				Type	Raychem DR25
Max USB Stick size	GB	32		Length	mm 250
format		FAT32		Connector type CAN-1 (EXT)	Binder 712, 5PM
Max block size	GB	2		Connector type CAN-2 (2D)	Binder 712, 5PF
Environmental data				Cable USB line	
Ambient operating range	°C	-20 to +60		Length	mm 500
Protection class		IP67		Connector type	USB Typ A, socket
Humidity	%	5 to 95		Connection GPS/serial	
Operational status indicator				Connector type	Binder 712, 4PF
LED blue blinking				Electrical characteristics	
				Supply voltage	V 8 - 14
				Current consumption w/o. GPS	mA <140
				Current consumption with GPS	mA <180
Ordering information					
Art.No. LG-CANStickGPS2C-330					

LG-CANStickGPS2C-330

USB Stick CAN Memory

Dimensions

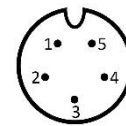


Connector layout

Connector type

CAN-1 line, Binder 712, 5PM

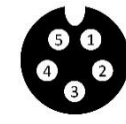
Pin	Name	Description	Color
1	CAN Hi	CAN High	White
2	CAN Lo	CAN Low	Green
3	GND	Ground	Black
4	KL15	Switched power	Blue
5	Vext	Power supply 8- 14V	Red



Front view

CAN-2 line, Binder 712, 5PF

Pin	Name	Description	Color
1	CAN Hi	CAN High	White
2	CAN Lo	CAN Low	Green
3	GND	Ground	Black
4	n.c.	Not connected	
5	Vext	Power supply 8- 14V	Red



Front view

USB, Type A socket

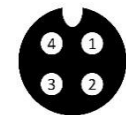
Pin	Name	Description	Color
1	VCC	Power supply +5V	Red
2	GND	Ground	Black
3	Data +	Data line +	Green
4	Data -	Data line -	White



Front view

GPS/Serial, Binder 712, 4PF

Pin	Name	Description	Color
1	Data	Data line	White
2	Data	Data line	Green
3	GND	Ground	Black
4	VCC	Power supply +5V	Red



Front view

4.3.2 GPS mouse

AC-GPS_Mouse -330

GPS receiver



* The red LED is an indicator of GPS positioning status. In continuous power mode, it flashes when the GPS signal is valid. Otherwise it is off.

Key Features:

- GPS receiver and antenna in a single housing. The GPS mouse will track up to 16 satellites at a time.
- Incoming GPS- data can be displayed on-line in the 2D software *WinIt*.

Characteristics

- Easy handling. Direct connection to the logger (Plug & Play)
- No external power supply necessary.
- LED indicator for GPS signal
- An integrated magnet allows simple assembly of all magnetic surfaces
- Low power consumption
- Compact and light weight housing
- Water-/vibration proof
- In combination with 2D logger automatic lap time calculation for more than 200 racetracks

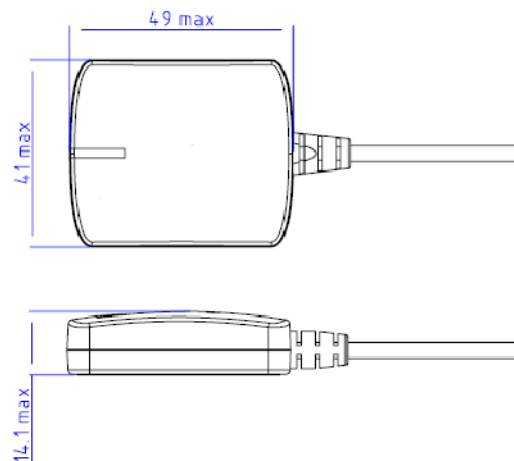
AC-GPS_Mouse -330

GPS receiver

Technical specifications

Electrical characteristics		Mechanical characteristics	
Powered by connected logger Easy interfacing (Plug & Play)		Dimensions	mm³ 49x41x14.1
		Weight (with cable)	g 81
		Housing material	PVC
		Cable	
		Type	PUR
		Wire cross section	4x AWG28
		Length	mm 500
Environmental data		Ordering information	
Operating temperature	°C -30 to 85	Art.No. AC-GPS_Mouse-330	
Storage temperature (range)	°C -40 to 85		
Storage temperature (typical)	°C 25		
Humidity	% 5 to 95		
Sealing class	IP67 (waterproof)		
Connections			
Connector type	Binder 712, 4PM		

Dimensions

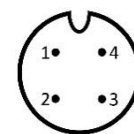


Connector layout

Connector type

Binder 712, 4PM

Pin	Name	Description	Color
1	Data +	Data line +	green
2	Data -	Data line -	white
3	GND	Ground	black
4	Power	Power input	red



Front view

4.3.3 MiniDash Kit System

DI-KIT_MD12-330

MiniDash display



Features

- Fixed setting: factory setting KTM Moto3
- Shift light with nine LEDs
- Formatted indication of the fastest lap time
- CAN monitor function
- Adjustable contrast, brightness, backlight

Technical specifications

Type differences

Channels	
CAN channels	32
Switchable pages	6
Channels per page	Up to 8
CAN monitor	✓
8 LEDs free programmable	✓
Auto-Zero function	✓

Mechanical characteristics

Dimensions	mm³	70x40x16.5
Weight	g	80
Housing material		Aluminum
Cable length	mm	600

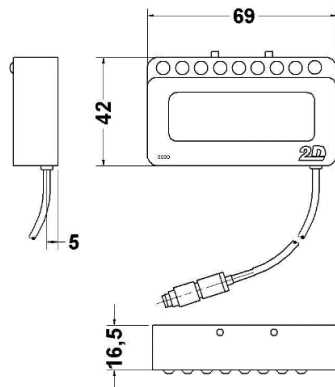
Electrical characteristics

Power supply	V	9-15
Current consumption @ 12 V	mA	150

Ordering information

Art.No. DI-KIT_MD12-330

Dimensions

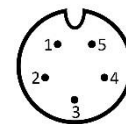


Connector layout

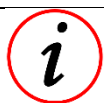
Connector type

CAN line, Binder 712, 5PM

Pin	Name	Description	Color
1	CAN H	CAN Bus High	White
2	CAN L	CAN Bus Low	Green
3	BGND	Board Ground	Black
4	n.c.	Not connected	
5	Vext	Power IN	Red



Front view



Although the MiniDash is delivered with a fixed setting, you can modify the following settings: backlight, brightness LED, "shift light" (setting of LEDs), start page and the channel which switches pages



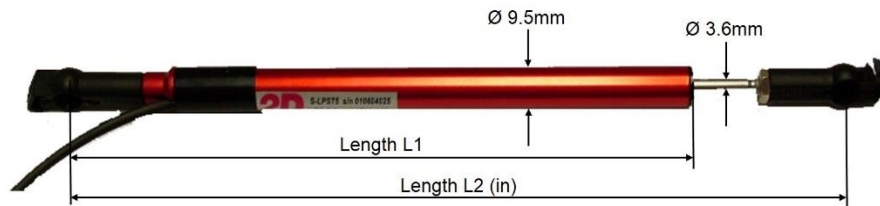
A documentation about operating + setting for 2D displays is available at 2d-datarecording.com.

➤ <SUPPORT> - <downloads> - <manuals> - <general dashboard manual>

4.3.4 Potentiometer 75 mm

SA-LP075S-330

Linear potentiometer slim body, 75 mm



Electrical stroke	Length L1	Length L2 (in)	Length L2 (out)
75	151	175	250

All values in [mm]; tolerance ± 1 mm

Features:

- Linear potentiometers are designed to convert linear movement into a proportional voltage output using a simple 3-wire, low current operating circuit
- Particularly developed for motorcycling
- Very good relationship between size, weight and stroke:
 - Very small body ($\varnothing=9.5$ mm)
 - Small weight
- Vibration-resistant by using absorbed sliders
- Suitably for rough environment

Technical specifications

Electrical characteristics			Mechanical characteristics		
Possible mechanical strokes	mm	75	Dimensions		
Impedance	k Ω	7.5	Diameter \varnothing	mm	9.5
Supply voltage	V DC	5	Length L2 (in)	mm	175
Maximum supply voltage	V DC	42	Weight	g	20
Linear output voltage		Yes	Cable & Connector		
Linearity	%	± 0.5	Type		Raychem 55M
Isolation (500 V DC)	M Ω	>100	Wire cross section		3x AWG24
Recommended "slider current"	μ A	<10	Length		200
			Connector		JST JWPF 3PM
Vibration resistance			Operation life	Cycles	>25 millions
Shock	G	40	Maximum moving speed	m/s	10
during a time period of	ms	10			
Vibration tested @	G	12	Environmental		
with	Hz	1000	Sealing class		IP67
			Operating temperature	$^{\circ}$ C	-30 to +140
			Humidity	%	

Ordering information

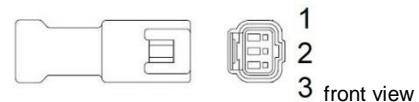
Art.No. SA-LP075S-330

Connector layout

Connector type

JST JWPF, 3PM

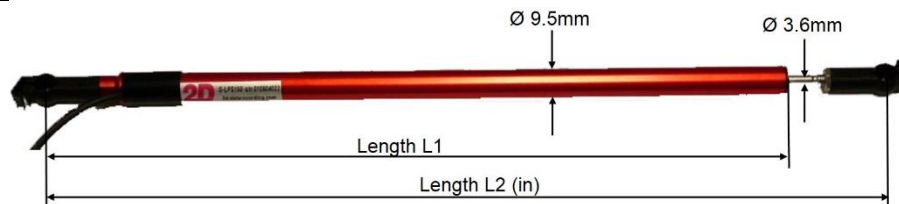
Pin	Name	Description	Color
1	AGND	Analog Ground	Black
2	+5 V	Power supply	Green
3	Signal	Analog signal	White



4.3.5 Potentiometer 150 mm

SA-LP150S-330

Linear potentiometer slim body, 150 mm



Electrical stroke	Length L1	Length L2 (in)	Length L2 (out)
150	236	260	410

All values in [mm]; tolerance ± 1 mm

Features:

- Linear potentiometers are designed to convert linear movement into a proportional voltage output using a simple 3-wire, low current operating circuit
- Particularly developed for motorcycling
- Very good relationship between size, weight and stroke:
 - Very small body ($\varnothing=9.5$ mm)
 - Small weight
- Vibration-resistant by using absorbed sliders
- Suitably for rough environment

Technical specifications

Electrical characteristics			Mechanical characteristics		
Possible mechanical strokes	mm	150	Dimensions		
Impedance	k Ω	10	Diameter \varnothing	mm	9.5
Supply voltage	V DC	5	Length L2 (in)	mm	260
Maximum supply voltage	V DC	42	Weight	g	44
Linear output voltage		Yes	Cable & Connector		
Linearity	%	± 0.5	Type		Raychem 55M
Isolation (500 V DC)	M Ω	>100	Wire cross section		3x AWG24
Recommended "slider current"	μ A	<10	Length		200
			Connector		JST JWPF 3PM
Vibration resistance			Operation life	Cycles	>25 millions
Shock	G	40	Maximum moving speed	m/s	10
during a time period of	ms	10			
Vibration tested @	G	12			
with	Hz	1000			
			Environmental		
			Sealing class		IP67
			Operating temperature	$^{\circ}$ C	-30 to +140
			Humidity	%	

Ordering information

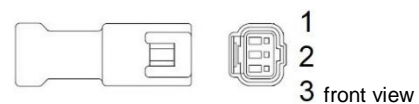
Art.No. SA-LP150S-330

Connector layout

Connector type

JST JWPF, 3PM

Pin	Name	Description	Color
1	AGND	Analog Ground	Black
2	+5 V	Power supply	Green
3	Signal	Analog signal	White



4.3.6 Pressure sensor 100 bar

SA-PK100M10-330

Pressure sensor



+ adapter for pressure sensors SA-PKxxxM10 to brake system and gaskets

Key Features

- Pressure measurement 0 to 100 bar
- Signal output 0.5 to 4.5 V
- Typical application: brake pressure

Technical specifications

Electrical characteristics			Mechanical characteristics		
Range	bar	0-100	Sensor length	mm	51.5
Supply voltage	V	5	Wrench size	mm	17
Supply current (maximum)	mA	0-20	Weight	g	42
Output	VDC fixed	0.5-4.5	Pressure port		M10x1
Accuracy (combined linearity, hysteresis and repeatability)			Cable		
0...+50°C	%°FS	±1	Type		Raychem, EPD
-10...+80°C	%°FS	±1.5	Wire cross section		3x AWG24
Error free pressure overload	1.5x related pressure		Length	mm	350
Environmental data			Vibration resistance		
Sealing class		IP65	Shock	G	40
Long term stability (1 year)	% FS	±0.3	During a time period of	ms	10
Storage temperature range	°C	-40...+100	Vibration tested at	G	12
Calibrated operating temp. range	°C	-10...+80	Measured with	Hz	1000

Ordering information

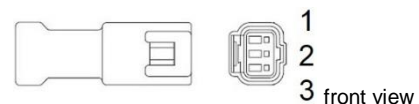
Art.No. SA-PK100M10-330

Connector layout

Connector type

JST JWPF 3PM

Pin	Name	Description	Color
1	AGND	Analog Ground	Black
2	+5 V	Power supply	Green
3	Signal	Analog signal	White



4.3.7 Interface module

IN_LSU_KTM-330

Interface module



Key Features:

- To work in combination with LG-CANStickGPS2C-330
- 1 A/F input for use with 4.2 probe
- 2 CAN lines
- 1 input for external power supply
- 4 analog input channels

Technical specifications

Electrical characteristics			Mechanical characteristics		
Supply voltage	V	5-20	Housing material		Aluminum
Current consumption @12 V	mA	50	Dimensions	mm ³	57x50x14
Ratio metric sensor supply	mA	40	Weight (module)	g	140
Sensor supply +12 V	mA	250			
Channels			Connector		
Analog channels		4	CAN-1 line		Binder 712, 5PM
Without pull up		2	Length	mm	250
With 4k7 pull up		2	CAN-2 line		Binder 712, 5PF
Input voltage range	V	12	Length	mm	250
A/F input channel			Lambda		Bosch 1 928 404 016, 6PF
Resolution	A/F	0.01	Length	mm	400
Sampling rate	Hz	100	3x Analog input		JST JWPF, 4PF
			Length	mm	200
			1x Analog input		JST JWPF, 2PF
			Length	mm	200
			External power supply		AMP Super Seal, 2PM
			Length	mm	200
Environmental data			Vibration resistance		
Protection class		IP 66	Shock	G	40
Ambient operating range	°C	0 to +70	During time period of	ms	10
humidity	%	5 to 95	Vibration tested @	G	12
			Measured with	Hz	1000
			Ordering information		
			Art.No. IN_LSU_KTM-330		

IN_LSU_KTM-330

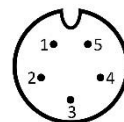
Interface module

Connector layout

Connector type

CAN-1 line, Binder 712 5PM

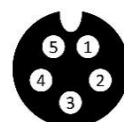
Pin	Name	Description	Color
1	CAN Hi	CAN High	White
2	CAN Lo	CAN Low	Green
3	GND	Ground	Black
4	n.c.	Not connected	
5	Vext/KL30	Power supply 8- 16V	Red



Front view

CAN-2 line, Binder 712 5PF

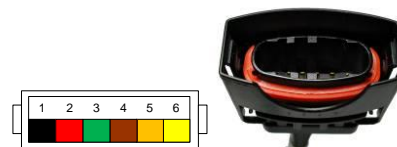
Pin	Name	Description	Color
1	CAN Hi	CAN High	White
2	CAN Lo	CAN Low	Green
3	GND	Ground	Black
4	n.c.	Not connected	
5	Vext	Power supply 8- 16V	Red



Front view

LSU Probe, Bosch 6PF

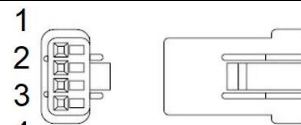
Pin	Name	Description	Color
1	IP	Inverting input current amplifier	Black
2	UN	Inverting input current control	Red
3	VM	Virtual ground current control	Green
4	Heater-	Ground heater	Brown
5	Heater+	Power heater	Orange
6	IA	Non inverting input of pump current amplifier	Yellow
	Shield	Shield	Grey



front view

Analog input (LAP), JST JWPF 4PF

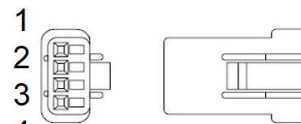
Pin	Name	Description	Color
1	GND	Ground	Black
2	A2 LAP	Signal LAP	White
3	n.c.	Not connected	
4	12 V	12 V power supply	Red



front view

Analog input (P_Oil), JST JWPF 4PF

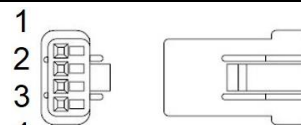
Pin	Name	Description	Color
1	GND	Ground	Brown
2	A5 P_Oil	Signal oil pressure	White/Brown
3	n.c.	Not connected	
4	12 V	12 V power supply	Orange



front view

Analog input (TK_EX1), JST JWPF 4PF

Pin	Name	Description	Color
1	GND	Ground	Blue
2	A6 TK_EX1	Signal exhaust temperature	White/Black
3	5 V	5 V power supply	Green
4	12 V	12 V power supply	Yellow



front view

Analog input (T_Oil), JST JWPF 2PF

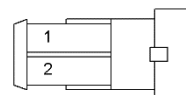
Pin	Name	Description	Color
1	GND	Ground	Purple
2	A1 T_Oil NTC	Signal oil temperature, NTC	Grey



front view

External power supply, AMP Super Seal, 2PM

Pin	Name	Description	Color
1	12 V	12 V power supply	Red
2	GND	Ground	Black



4.3.8 Lambda probe

SA-LSU4.2-000

Bosch LSU 4.2 lambda probe



Key Features

- High signal resolution and accuracy because of linear probe range
- Quick response time ≈ 50 Hz
- No temperature drift because of heater control
- Long operating life
- Measuring range λ 0.65 to ∞ (air) or 6 to 16 A/F
- Fast heating (ready for control ~ 30 s)

Technical specifications

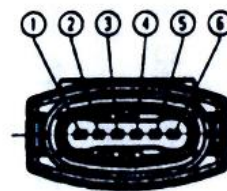
Electrical characteristics			Mechanical characteristics		
Probe supply voltage	V	12	Probe weight (w/o cable)	g	120
Operating exhaust gas temperature	°C	930	Probe length	mm	84
Maximum exhaust gas temperature	°C	<1030	Thread		M18x1.5
A/F ration in combination with BC-LSU2CAN	A/F	6 to 16	Cable length (excl. probe)	mm	520
Heating power in combination with BC-LSU2CAN	A	Max. 2	Wrench size	mm	22
Linear output (A/F ratio) from		6:1 to 16:1	Tightening torque	Nm	40...60
Heater control frequency	Hz	<2	Ordering information Art.No. SA-LSU4.2-000		
Nominal resistance of Nernst cell	Ω	80			
Environmental data					
Storage temperature	°C	-40 to +100			
Max. vibration (stochastic peak)	G	100			

Connector layout

Connector type

Bosch connector

Pin	Name	Description	Color
1	IP	Inverting input current amplifier	Red
2	UN	Inverting input current control	Black
3	VM	Virtual ground current control	Yellow
4	Heater -	Ground for heater	White
5	Heater +	Power for heater	Grey
6	RT	Trim resistance	Green



Connector probe



Inside each probe connector is a specific trim resistor. Cutting off the connector without replacing this resistor will cause wrong measuring results. DO NOT FORGET to connect the resistor again if you have to replace the connector and/or keep the original plug in case of contacting 2D support.

4.3.9 Lap time receiver

SD-LR02C-330

Lap time Receiver

Avoid direct sunlight to
the lens!
(Without integrated filter)



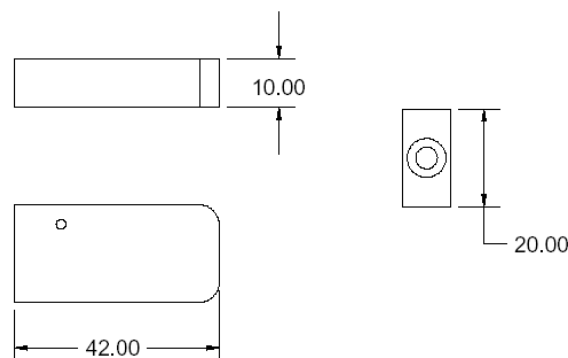
Function

- The 2D lap time system is based on an infrared link with a code to suppress the effect of other light sources like sun or other lap time systems.
- The receiver should be mounted to a position where a good alignment to the transmitter is guaranteed.
- **Note:** There is an automatic dead time of 500 ms after active pulse to avoid double trigger.

Technical specifications

Electrical characteristics			Mechanical characteristics		
Power supply	V	5-12	Housing material		Aluminum
Pulse timing active	ms	20	Weight (with cable)	g	43
Dead time	ms	500	Dimensions	mm³	42x20x10
Output level active	V	0	Cable		
Not active	V	5	Type		Raychem EPD
Pulse offset		No offset	Wire cross section		3x AWG24
Channel code		Fixed	Length	mm	1200
Environmental data			Ordering information		
Ambient operating range	°C	-25 to +70	Art.No.	SD-LR02C-330	

Dimensions

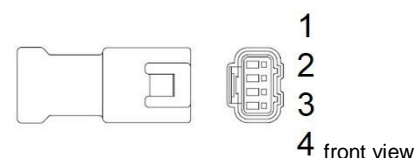


Connector layout

Connector type

JST JWPF 4PM

Pin	Name	Description	Color
1	GND	Ground	Black
2	Signal	Signal	White
3	n.c.	Not connected	
4	+12 V	Power supply	Red



4.3.10 Lap time transmitter

AC-KIT_LT05-000

Lap time transmitter KIT System fixed code



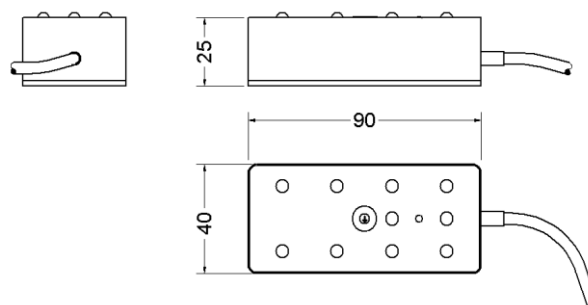
Function:

- The 2D lap trigger system is based on an infrared link with a code to suppress the effect of other light sources like sun or other lap trigger systems.
- **Note:** The address cannot be changed in this kit version!

Technical specifications

Electrical characteristics			Mechanical characteristics		
Power supply	V	8-18	Ambient operating range	°C	-25..+70
Measure distance	m	about 15	Housing material		PVC
Adjustable channel codes		fixed code	Weight	g	140
			Dimensions	mm	90 x 40 x 25
			Cable		
			Type		Metrofunk, PVC
			Wire cross section		3 x AWG 22
			Length	mm	1250
Ordering information					
Art.No. AC-Kit_LT05-000					

Dimensions



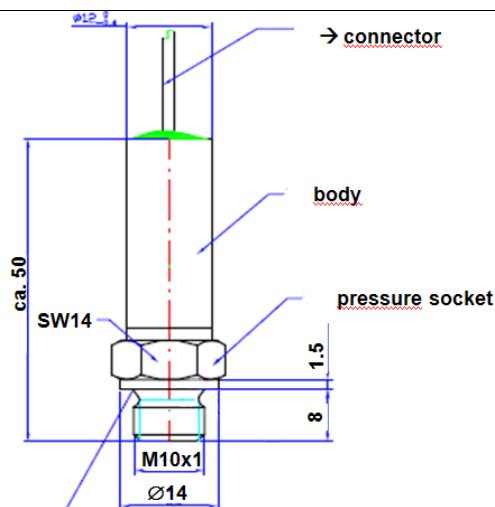
Connector layout

	Pin	Name	Color	Remark
	1	+12V	Red	Cigarette lighter connector
	2	GND	Black	

4.3.11 Pressure sensor 10 bar

SA-PK010M10HT-330

Pressure sensor high temperature



screwed end
DIN 3852-FormA

+ adapter for oil pressure sensor to oil circuit

Key Features:

- Pressure measurement 0 to 10 bar
- Signal output 0 to 5 V
- Calibrated operating temperature 20-125°C
- Typical application: oil pressure measurement

Technical specifications

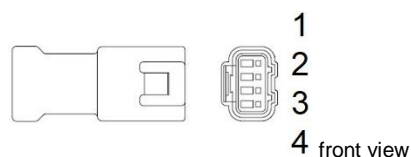
Electrical characteristics			Mechanical characteristics		
Range	bar	0-10	Dimensions	Refer figure	
Supply voltage (range)	V	12-30	Weight	g	42.5
Supply current (maximum)	mA	0-20	Pressure port	M10x1	
Output	VDC fixed		Cable		
Accuracy (combined linearity, hysteresis and repeatability)			Type	Raychem, EPD	
0...+50°C	%/FS	±1	Wire cross section	3x AWG24	
-10...+80°C	%/FS	±1.5	Length	mm	200
Error free pressure overload	2x related pressure				
			Vibration resistance		
Environmental data			Shock	G	40
Sealing class		IP67	During a time period of	ms	10
Long term stability (1 year)	% FS	±0.3	Vibration tested at	G	12
Storage temperature range	°C	-40...+125	Measured with	Hz	1000
Calibrated operating temp. range	°C	20...125	Ordering information		
			Art.No. SA-PK010M10HT-330		

Connector layout

Connector type

JST JWPF 4PM

Pin	Name	Description	Color
1	AGND	Analog ground	Black
2	Signal	Analog signal	White
3	n.c.	Not connected	
4	+12 V	Power supply	Red



4.3.12 Temperature sensor

SA-NTCM06-330

NTC temperature sensor



Function

- Temperature dependent resistor

Usage

- To measure water/oil temperature
- Engine housing temperature
- Gearbox temperature

Technical specifications

Electrical characteristics

Measurement range
Accuracy (40°C-80°C)
Mounting screw

°C 0-150
°C ±0.5
M6

Mechanical characteristics

Weight	g	5
Cable		
Type		PUR
Wire cross section	mm²	4x0.14
length	mm	800

Ordering information

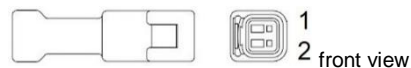
Art.No. SA-NTCM06-330

Connector layout

Connector type

JST JWPF 2PM

Pin	Name	Description	Color
1	GND	Ground	Black
2	Signal	Analog signal	White



4.3.13 Temperature amplifier

IN-ATK01_100-330

Temperature amplifier (Type K)



Function

- Temperature amplifier for Type K sensors, 0-1000°C

Technical specifications

Electrical characteristics			Connections		
Supply voltage	V	12	Cable (=output)		
Measurement range	°C	0-1000	Type		PUR
Nominal gain	mV/°C	5	Wire cross section		4x AWG26
Absolute accuracy	%	±1	Length	mm	200
Calibration error @ 25°C	°C	±1	Cable (=temp. cable)		
Cut-off frequency	Hz	20	Type		Type K
			Wire cross section		2x AWG24
			Length	mm	600
Mechanical characteristics			Ordering information		
Dimensions	mm³	35x10x15	Art.No. IN-ATK01_100-330		
Weight	g	30			
Cable					
Amplifier output					
Wire cross section	mm²	4x 0.14			
Type		PUR			
Length	mm	1200			
Sensor input					
Type		Type K special			
length	m	max 1			

Calibration data

For high precision measurements you have to take care of the non-linearity of Type K elements. Use the following table to compensate the non-linearity of the elements.

[°C]	Type 100 (1000°C) output voltage [mV]
0	1.35
25	125
100	507.5
200	1007.5
300	1511
400	2028.5
500	2553.5
600	3080.5
700	3603
800	4116
900	4616.5
1000	5104.5

Connector layout

Connector type

Amplifier input, temperature cable

Pin	Name	Description	Color
+			Green
-			White



Amplifier output, JST JWPF 4PM

Pin	Name	Description	Color
1	GND	Ground	Black
2	TK_EX1	Signal	White
3	n.c.	Not connected	
4	12 V	Power supply	Red

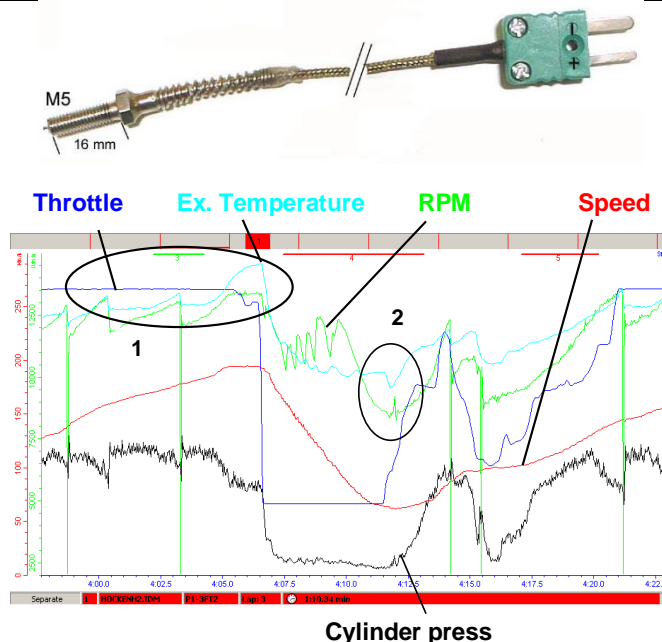


1
2
3
4 front view

4.3.14 Thermocouple sensor Type K

SA-TK01-000

Exhaust gas temperature sensor (Ni-CrNi)



1 = too rich while gear change

2 = Exhaust temperature down, hard throttle reaction

Function

- Temperature sensitive thermocouple measures exhaust gas temperature. Because of the low mass of the Type K sensor the incoming signal is an exact and fast reacting measurement.
- To measure the temperature you need an amplifier for each temperature sensor.

Advice:

- Mount the sensor to the first part of the exhaust system (100 mm to 150 mm away from piston)
- The sensor is screwed inside until ca. 1 mm is looking inside the gas flow.
- More the sensor is screwed inside, the better is the resolution. But the sensor will break earlier.

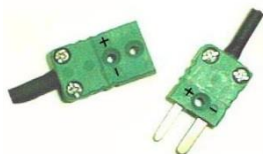
Notice:

- For more cylinders it is better to use a special temperature box including 2 or 4 amplifiers.

Technical specifications

Connector

Temperature cable:



[+]	[-]
Red	Green
Yellow	Red
Green	White
Brown	Blue
Red	White
Yellow	pink

Electrical characteristics

Voltage for amplifier	V	12
Measurement range	°C	0 – 1000
Sensitivity	°C	0.25
Absolute accuracy	%	±1

Mechanical characteristics

Weight (incl. cable)	g	15
Cable length	mm	300

Calibration

Choose the formula from sensor list
SA-TK01

Ordering information

	Art.No.
Amplifier (1 channel/analog)	IN-ATK01_xxx-000
Amplifier (4 channels)	BC-TK4iso-000
Amplifier (8 channels)	BC-TK8iso-000