AiM Infotech

Car/bike linear potentiometer diameter 13

Release 1.00

This datasheet explains how to install and configure the car/bike linear potentiometer 13 mm diameter and shows its technical characteristics.

1 Introduction

AiM loggers can measure the displacement between two points using a sensor (linear potentiometer) directly connected to the points of measure. This potentiometer can measure linear displacements like:

- dampers compression or extension
- steering rotation measured through the rack displacement

Different use implies different software management as explained in chapters 4 and 5.

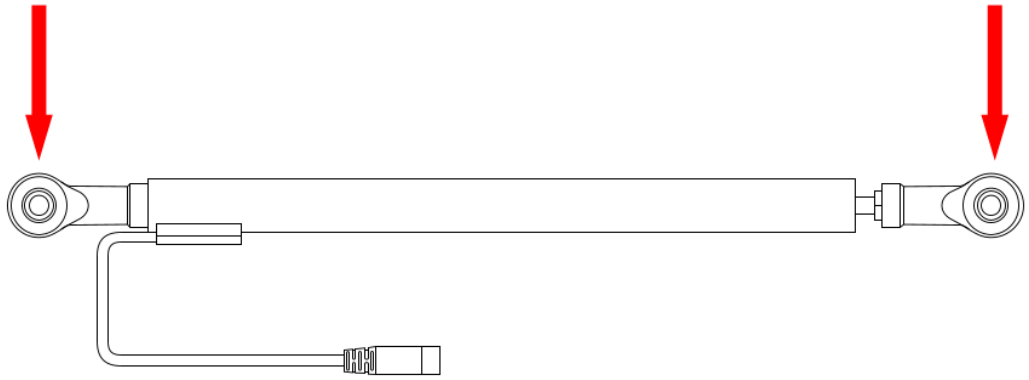
2 Part numbers

Car/bike linear potentiometer part numbers depends on its travel:

- 50 mm travel potentiometer **X05LPAIM050**
- 75 mm travel potentiometer **X05LPAIM075**
- 100 mm travel potentiometer **X05LPAIM100**
- 150 mm travel potentiometer **X05LPAIM150**

3 Installation

To fix the potentiometer use the two fixing points highlighted here below.



When installing the sensor:

- be very careful avoiding possible bending of the internal cylinder; these bendings, occurring when over tightening the screws or in case of incorrect mounting, can seriously damage the sensor
- extract the internal cylinder for about 5 mm (0.2 inches) from the sensor lower boundary position.

Please note: do not use this sensor to measure distances beyond the potentiometer maximum travel.

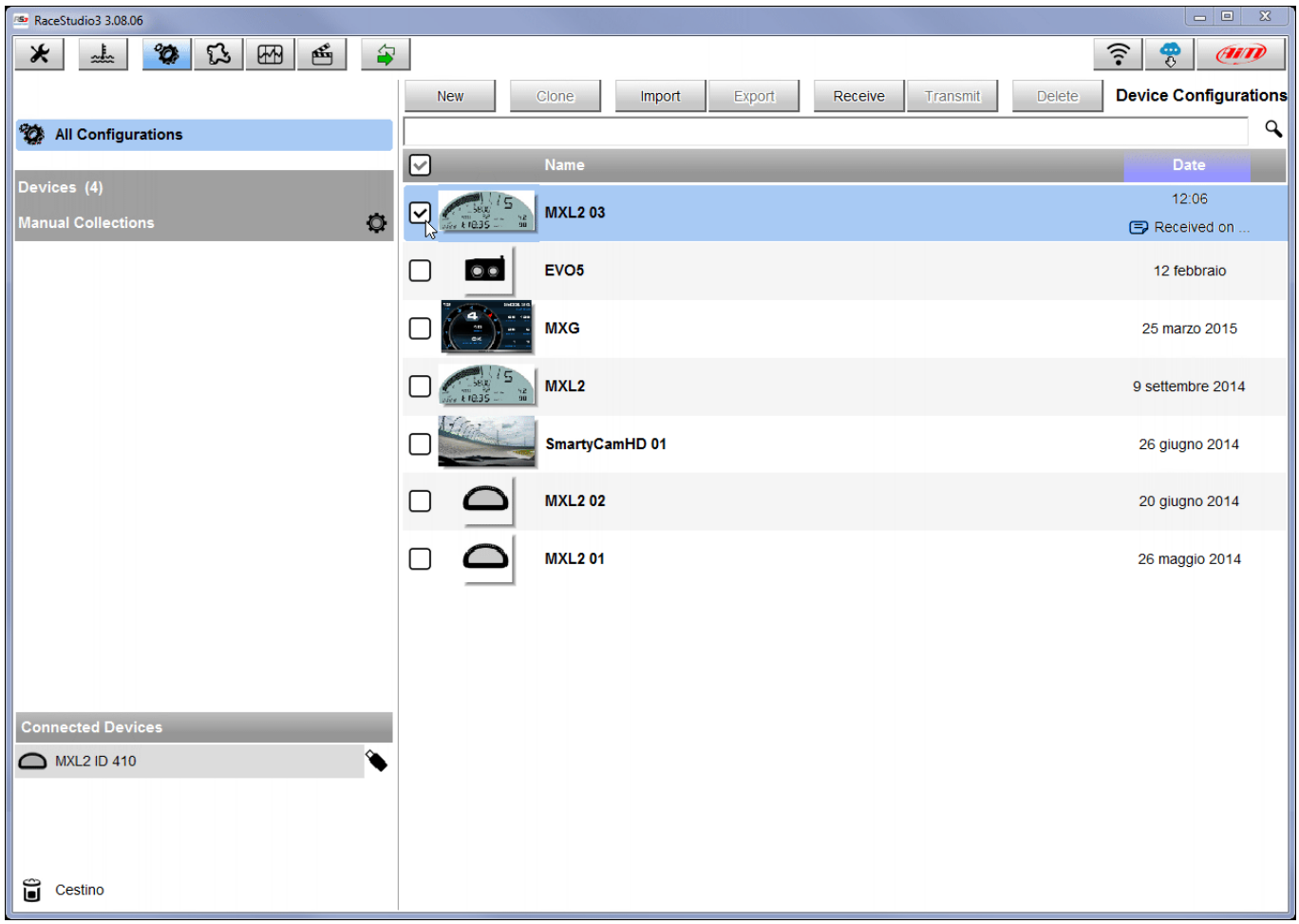
The car/bike linear potentiometer can be connected to any analog channel of AiM loggers.

4
Software setup – suspensions

Once the potentiometer installed it is necessary to load it in the configuration of its logger and then calibrate/auto calibrate it.

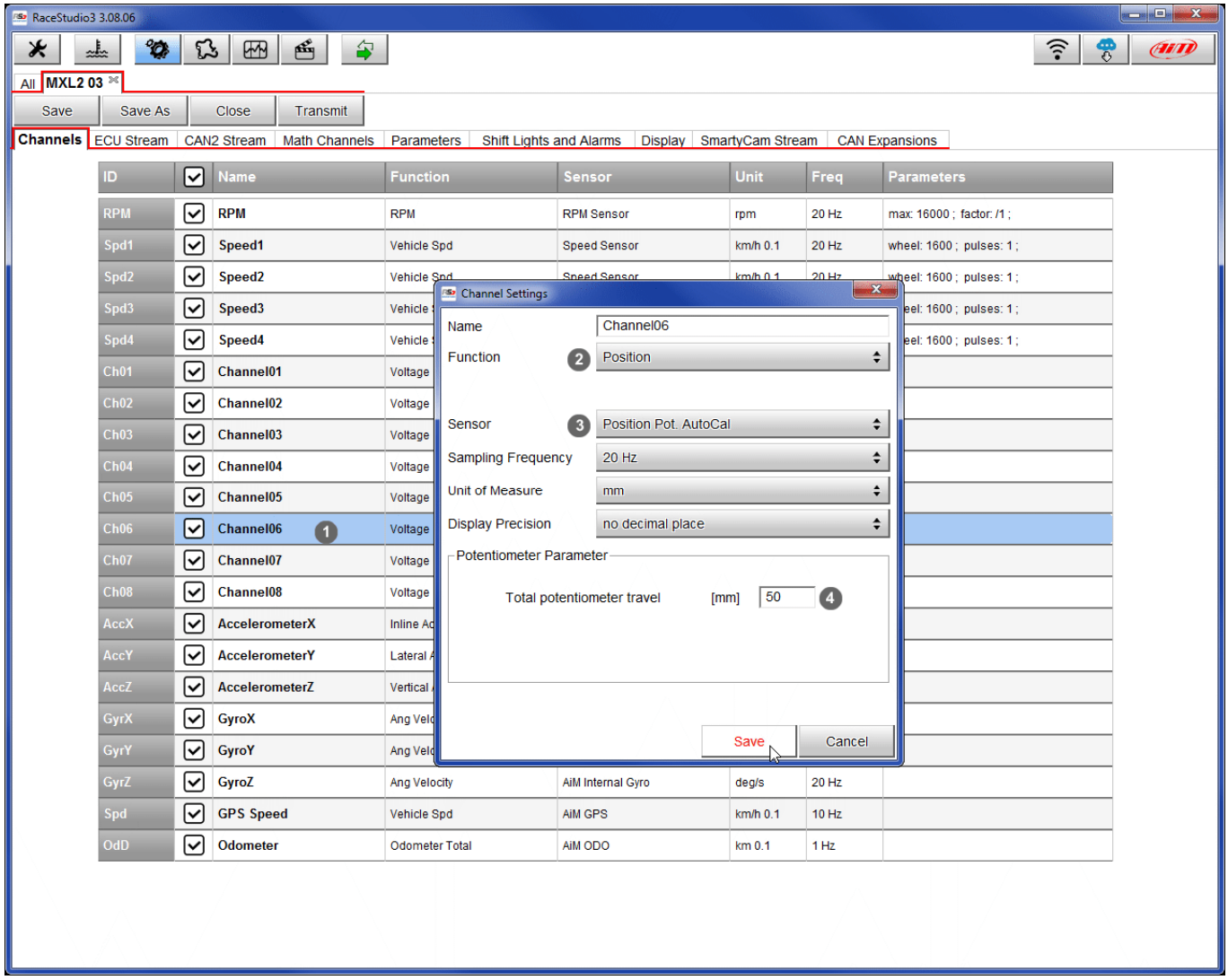
4.1
Setup with Race Studio 3

To load the potentiometer in the logger configuration run the software and select the configuration you are going to load it on.



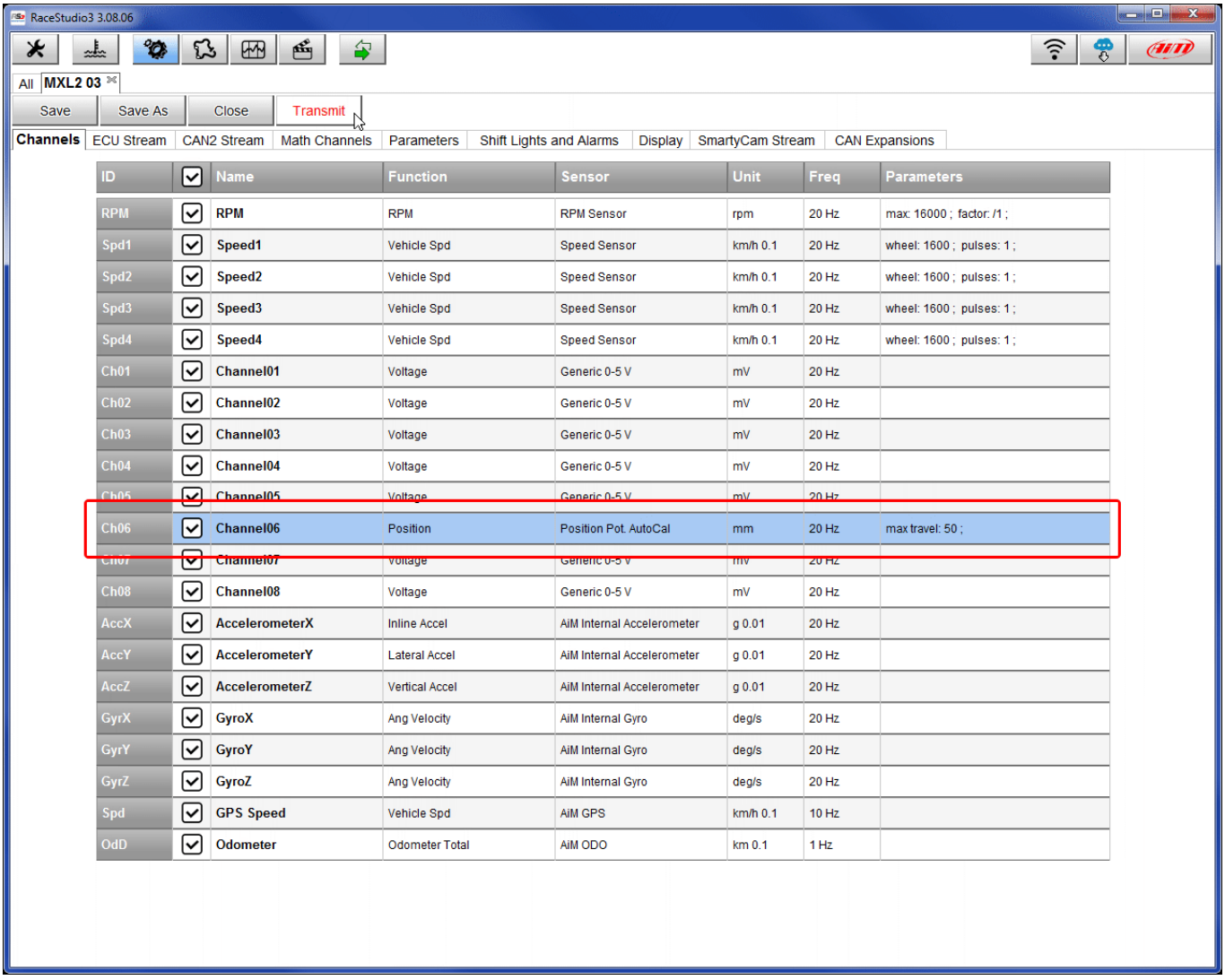
Enter the configuration (in the example MXL2 03) and the related "Channels" layer.

- Select the channel where to set the potentiometer on – in the example channel 6 (**1**) and fill in the panel that shows up
- Function: "Position" (**2**)
- Sensor: "Position Pot. AutoCal" (**3** – this implies that the potentiometer will be auto-calibrated as shown in the following pages)
- Fill in the other fields
- Fill "Total Potentiometer travel" box with the potentiometer travel in mm – in the example we used a 50mm travel potentiometer (**4**)
- Click "Save"



When the software comes back to "Channels" layer the potentiometer has been set on the desired channel as shown here below.

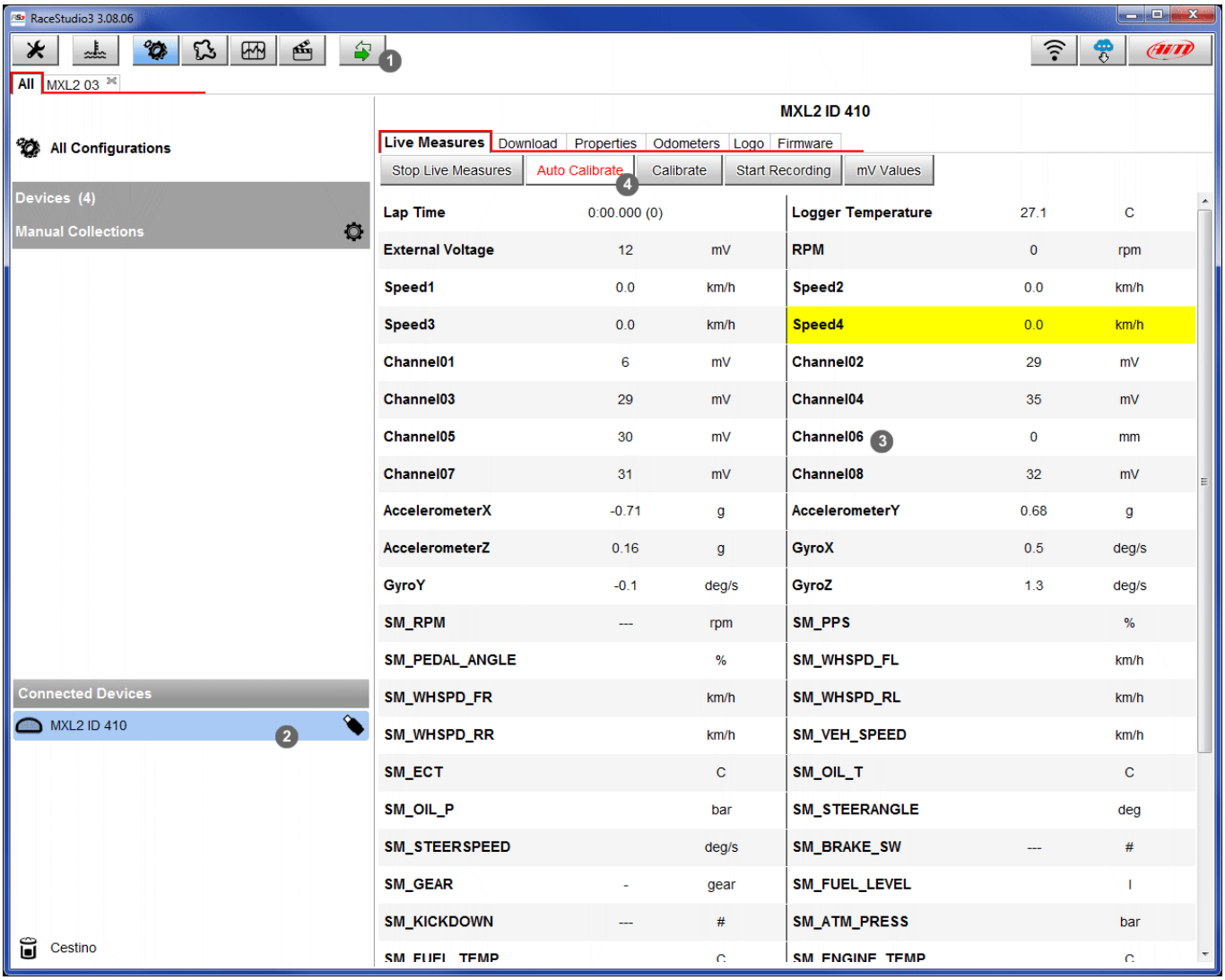
- Transmit the configuration to the logger pressing "Transmit" on the top keyboard.



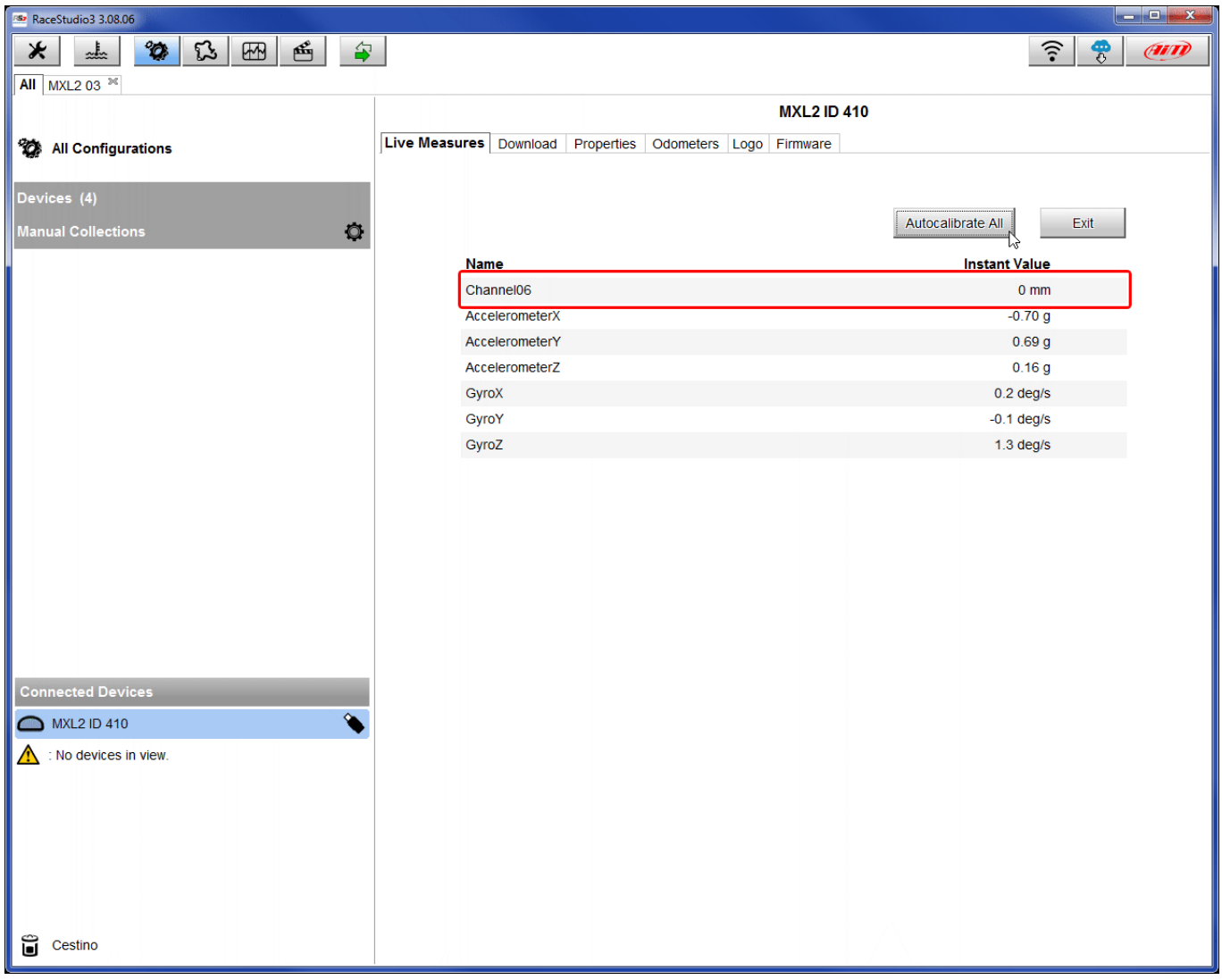
ID	Name	Function	Sensor	Unit	Freq	Parameters
RPM	RPM	RPM	RPM Sensor	rpm	20 Hz	max: 16000 ; factor: /1 ;
Spd1	Speed1	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd2	Speed2	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd3	Speed3	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd4	Speed4	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Ch01	Channel01	Voltage	Generic 0-5 V	mV	20 Hz	
Ch02	Channel02	Voltage	Generic 0-5 V	mV	20 Hz	
Ch03	Channel03	Voltage	Generic 0-5 V	mV	20 Hz	
Ch04	Channel04	Voltage	Generic 0-5 V	mV	20 Hz	
Ch05	Channel05	Voltage	Generic 0-5 V	mV	20 Hz	
Ch06	Channel06	Position	Position Pot. AutoCal	mm	20 Hz	max travel: 50 ;
Ch07	Channel07	Voltage	Generic 0-5 V	mV	20 Hz	
Ch08	Channel08	Voltage	Generic 0-5 V	mV	20 Hz	
AccX	AccelerometerX	Inline Accel	AiM Internal Accelerometer	g 0.01	20 Hz	
AccY	AccelerometerY	Lateral Accel	AiM Internal Accelerometer	g 0.01	20 Hz	
AccZ	AccelerometerZ	Vertical Accel	AiM Internal Accelerometer	g 0.01	20 Hz	
GyrX	GyroX	Ang Velocity	AiM Internal Gyro	deg/s	20 Hz	
GyrY	GyroY	Ang Velocity	AiM Internal Gyro	deg/s	20 Hz	
GyrZ	GyroZ	Ang Velocity	AiM Internal Gyro	deg/s	20 Hz	
Spd	GPS Speed	Vehicle Spd	AiM GPS	km/h 0.1	10 Hz	
OdD	Odometer	Odometer Total	AiM ODO	km 0.1	1 Hz	

To auto-calibrate the potentiometer:

- enter "All" layer and press "Device" (**1**)
- select the logger – in the example MXL2 ID 410 (**2**)
- in "Live Measures" layer, keeping the potentiometer in its zero position, select the channel where the potentiometer has been set – in the example channel 6 (**3**)
- press "Auto Calibrate" (**4**)



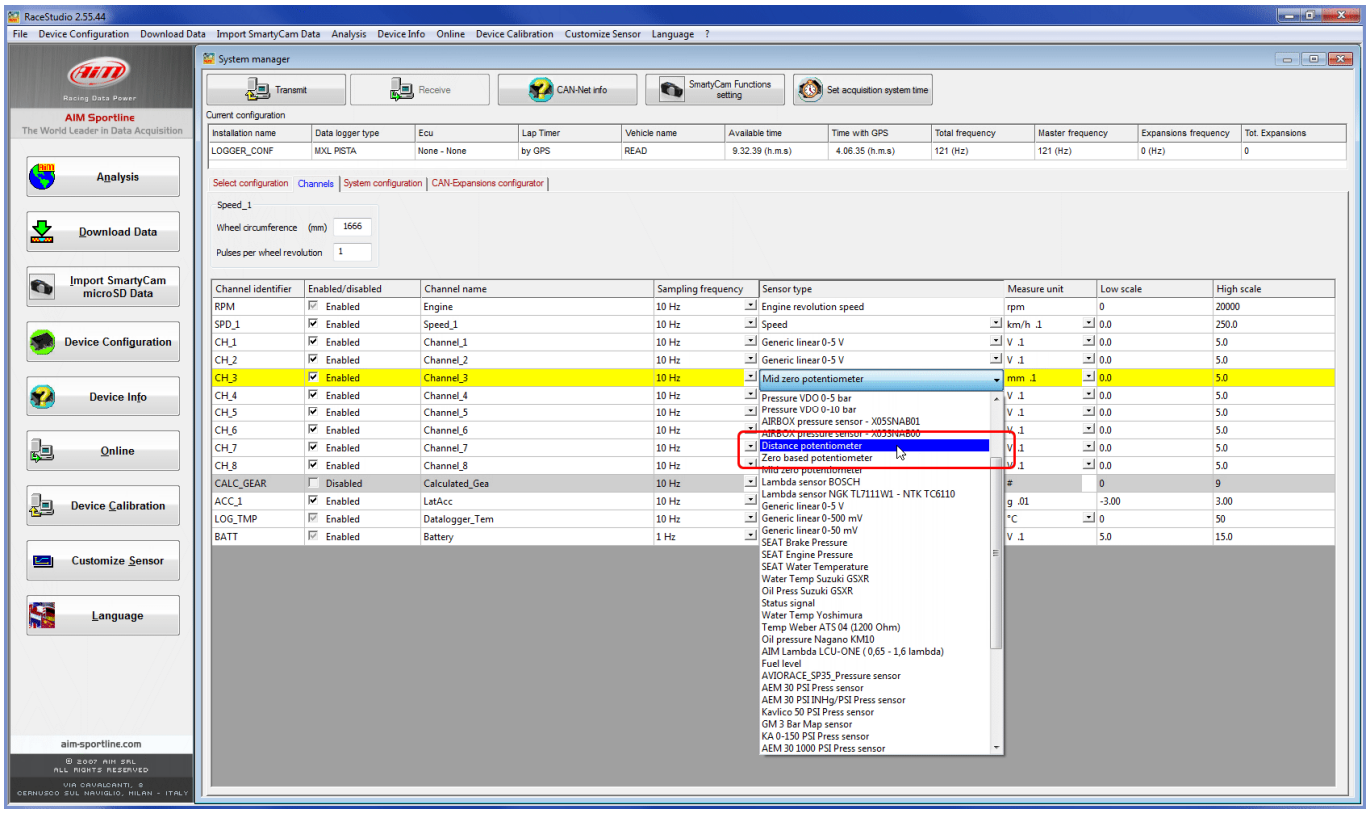
- Keep the potentiometer in its zero position as shown here below
- Press "Auto calibrate All".



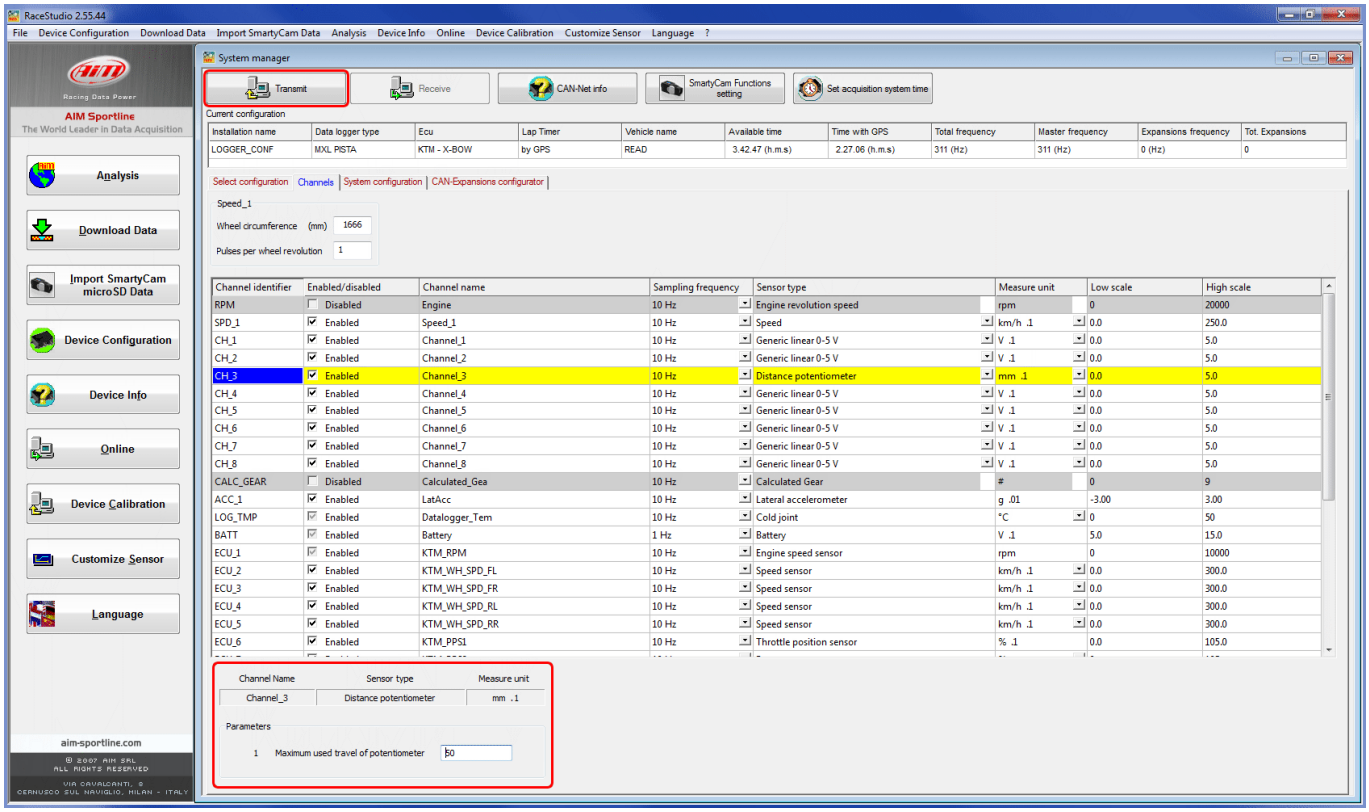
4.2
Setup with Race Studio 2

To load the potentiometer in AiM logger configuration:

- run the software
- select the logger in use and the configuration to set the potentiometer on
- enter "Channels" layer
- Select the channel where to set the potentiometer on (in the example channel 3) and select "Distance potentiometer" in "Sensor type" column as shown here below.

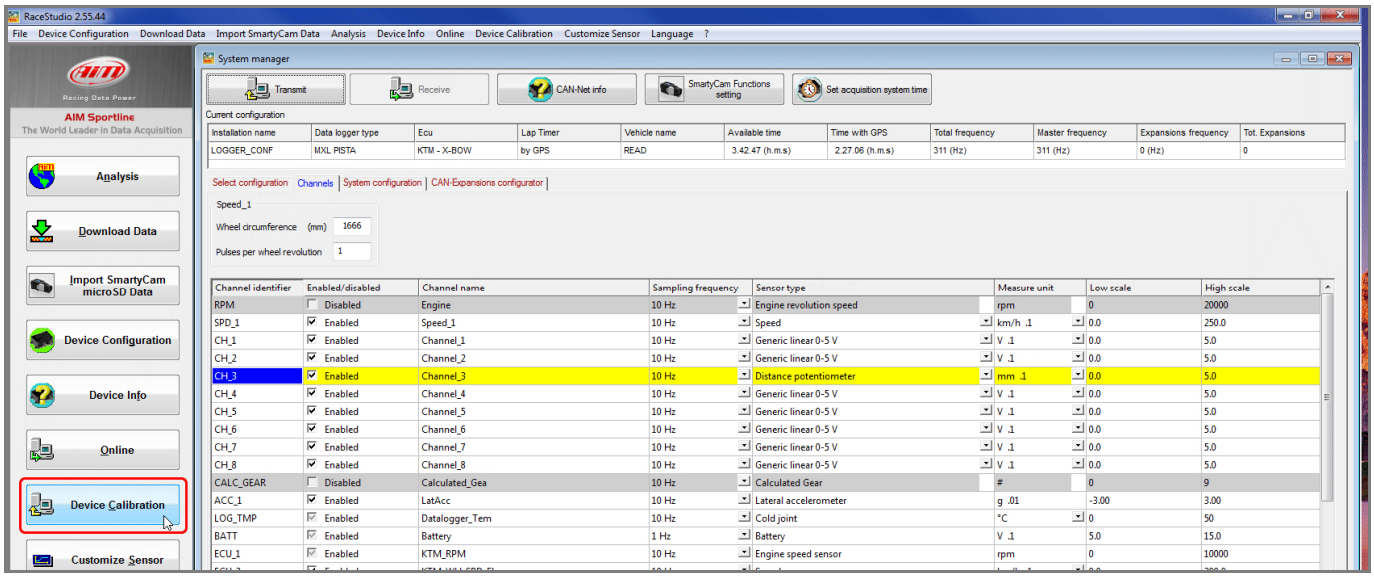


- click out of the cell
- a panel appears bottom left of the layer as below
- insert potentiometer maximum travel (in the example 50 mm)
- transmit the configuration to the logger pressing "Transmit" in the software top keyboard.



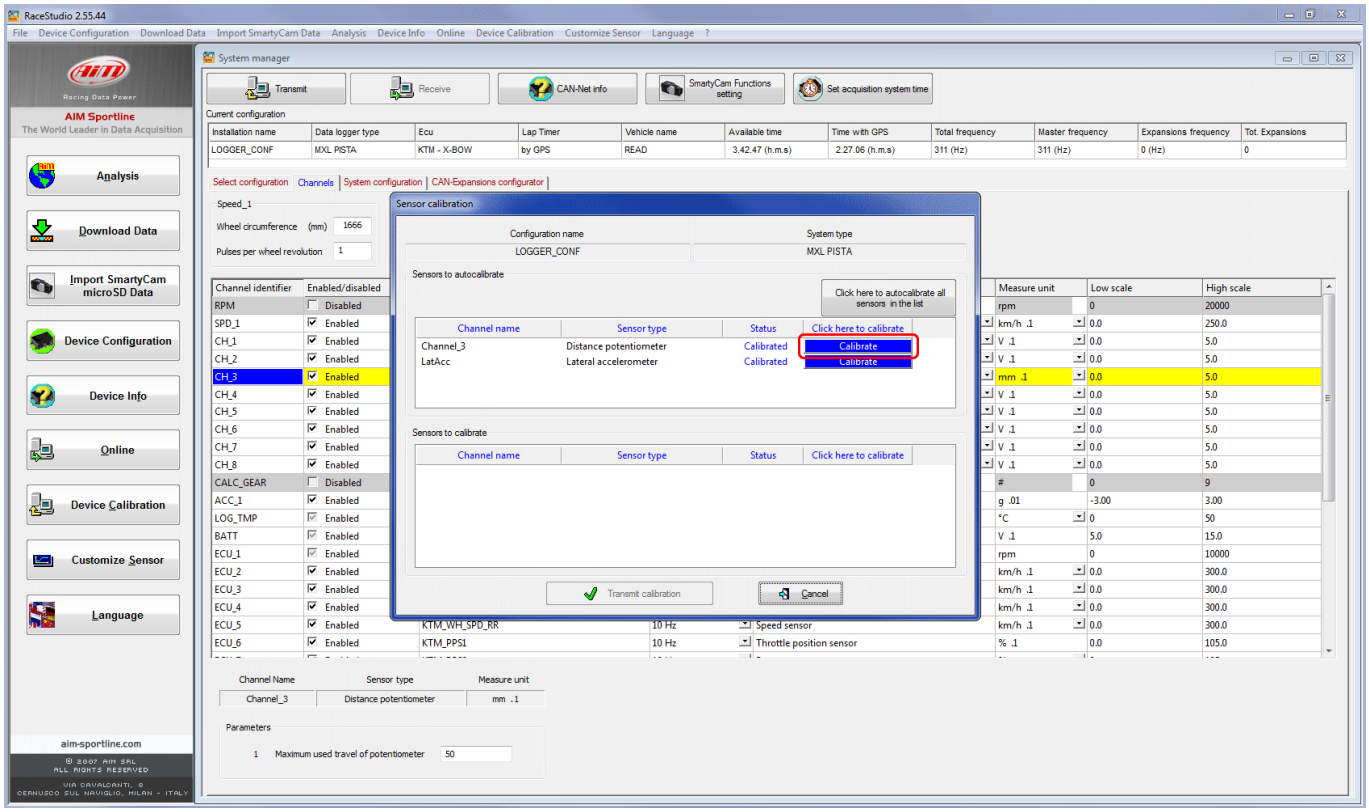
To calibrate the potentiometer:

- Press "Device calibration"



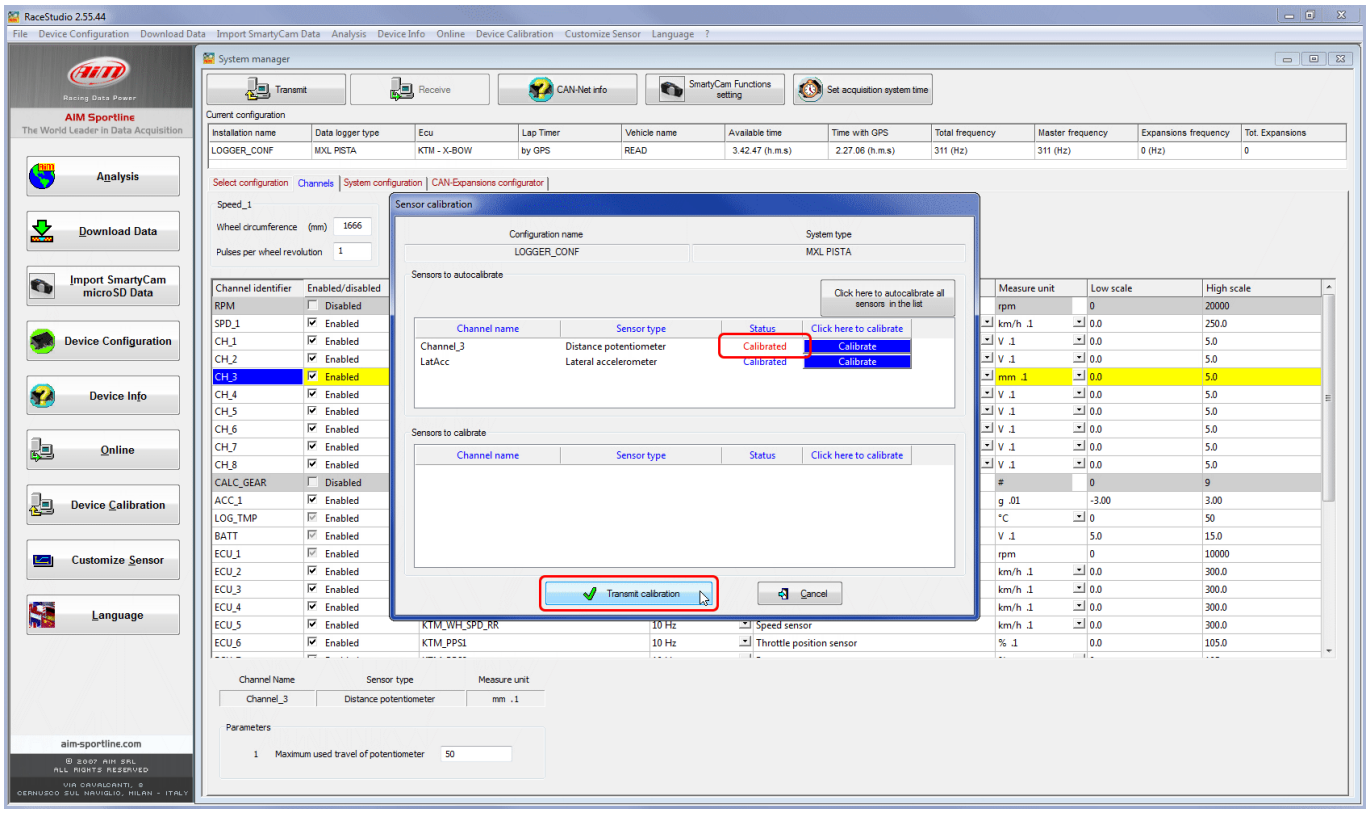
Calibration panel shows up:

- Press "Calibrate" button of distance potentiometer



Once the calibration over potentiometer status will be red and turn to "Calibrated":

- Transmit the calibration to the logger pressing "Transmit Calibration"

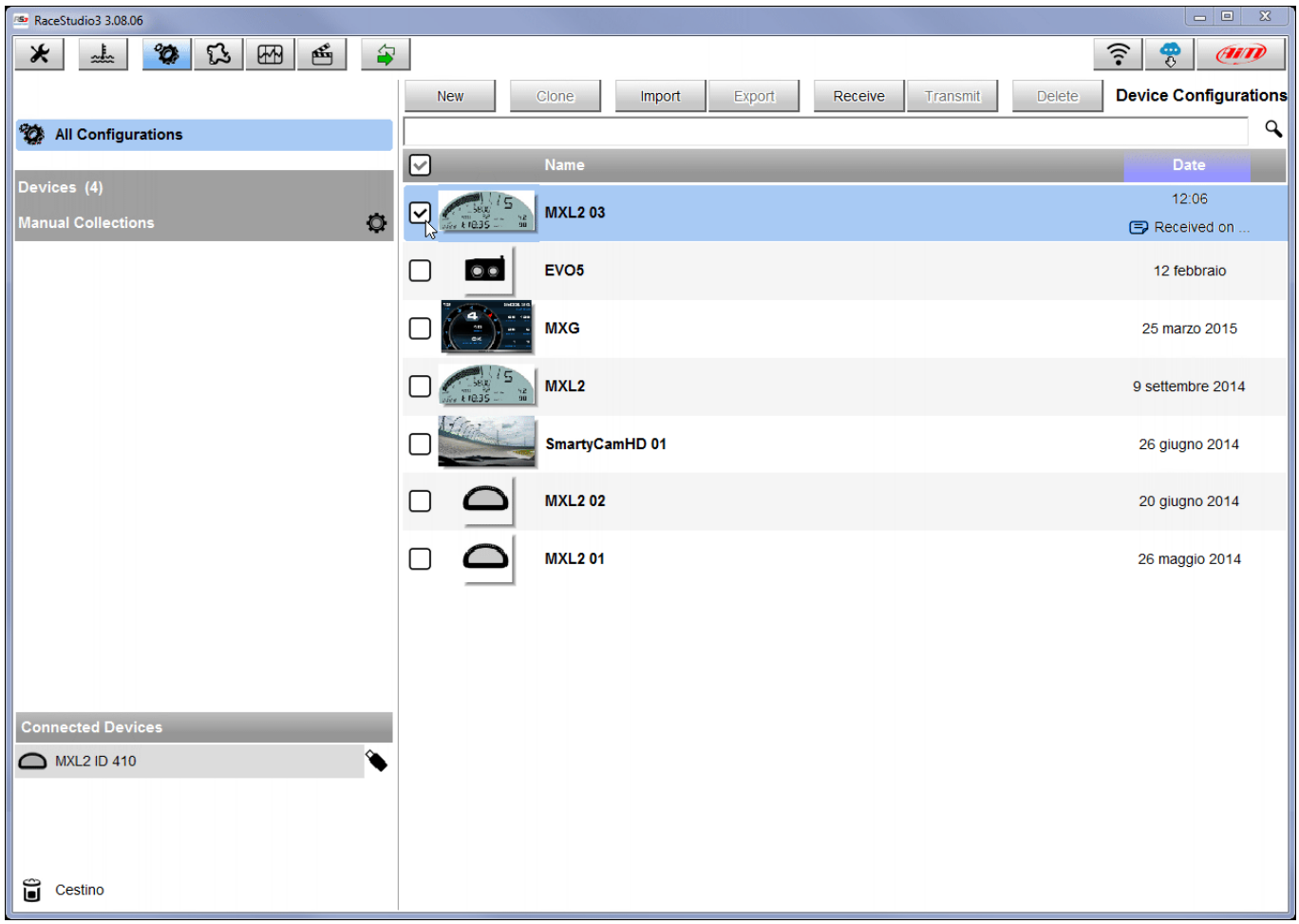


5
Software setup – steering angle

Once the potentiometer installed it is necessary to load it in the configuration of its logger and then calibrate/auto calibrate it.

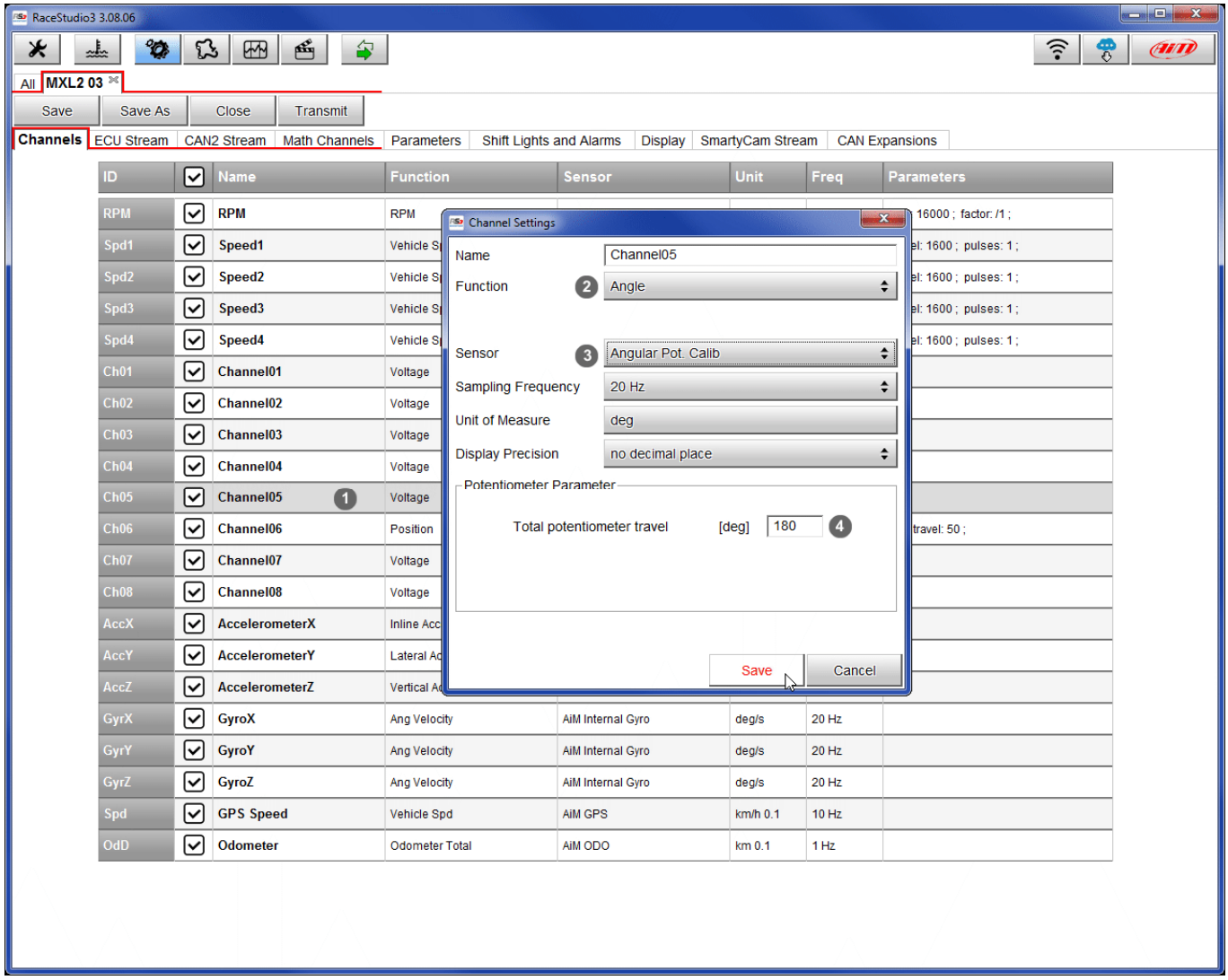
5.1
Setup with Race Studio 3

To load the potentiometer in the logger configuration run the software and select the configuration you are going to load it on.



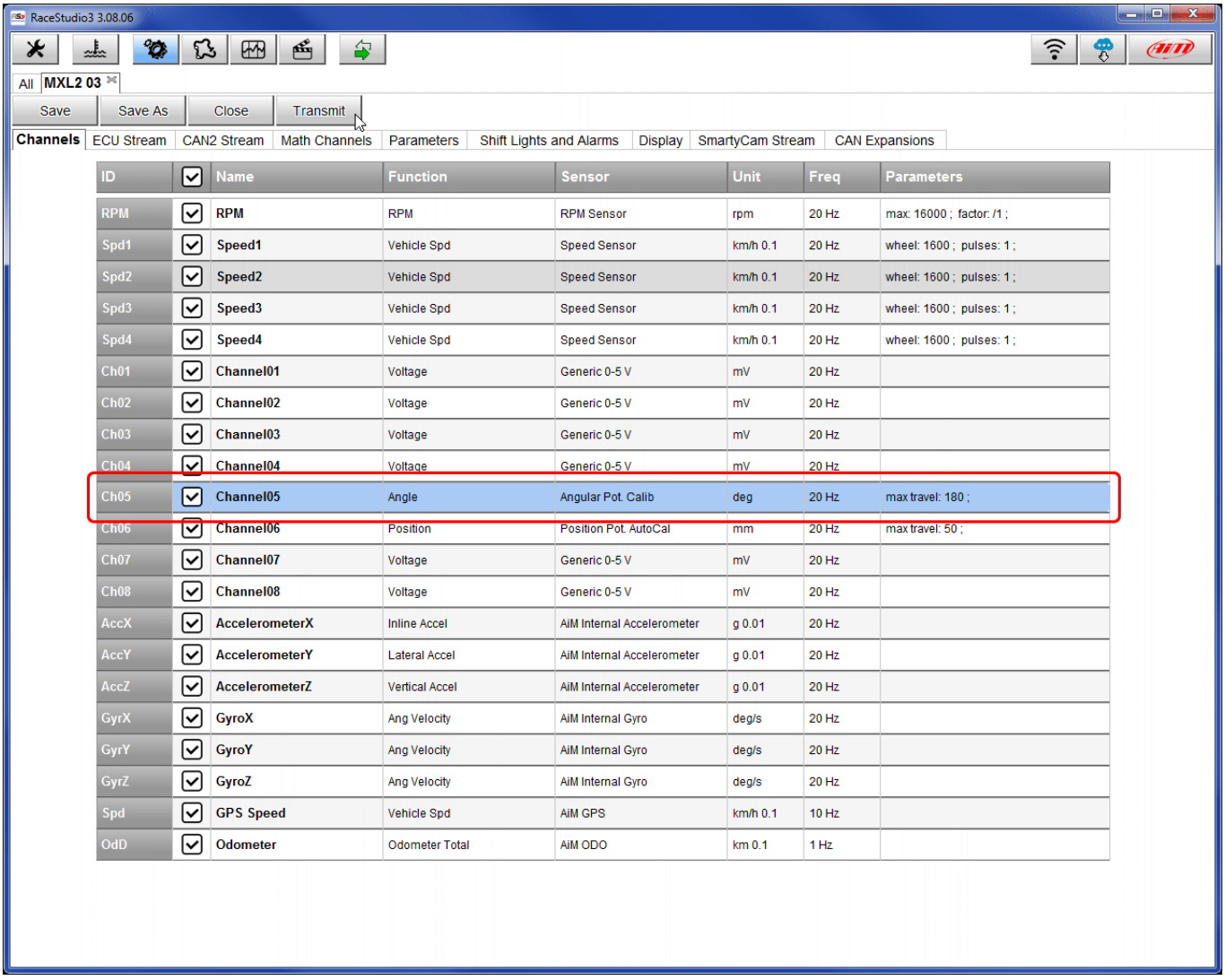
Enter the configuration (in the example MXL2 03) and the related "Channels" layer.

- Select the channel where to set the potentiometer on – in the example channel 5 (**1**) and fill in the panel that shows up
- Function: "Angle" (**2**)
- Sensor: " Angular Pot. Calib" (**3** – this implies that the potentiometer will be calibrated as shown in the following pages)
- Fill in the other fields
- Fill "Total Potentiometer travel" box with the potentiometer travel in degrees: 180° (**4**)
- Click "Save"



When the software comes back to "Channels" layer the potentiometer has been set on the desired channel as shown here below.

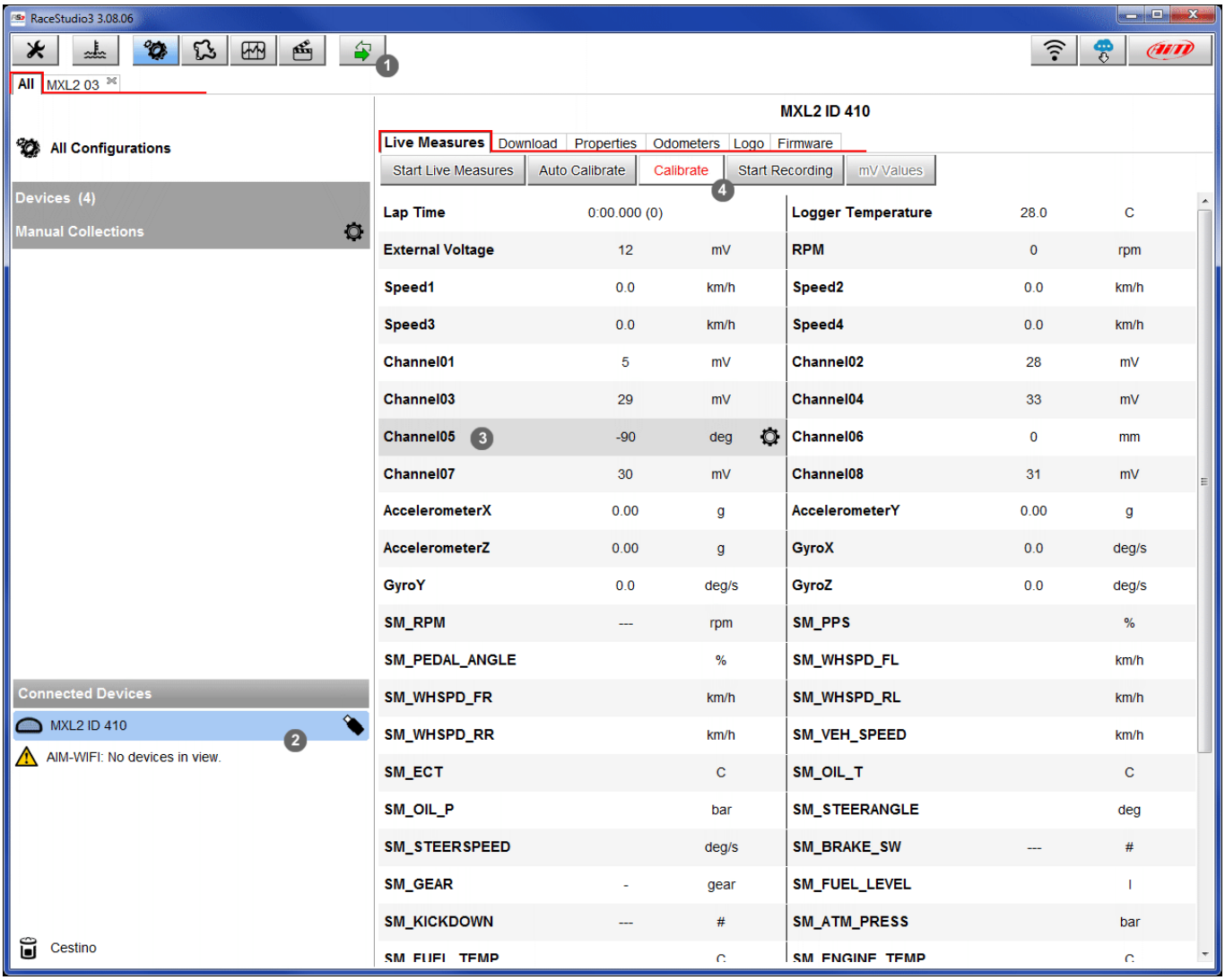
- Transmit the configuration to the logger pressing "Transmit" on the top keyboard.



ID		Name	Function	Sensor	Unit	Freq	Parameters
RPM	☑	RPM	RPM	RPM Sensor	rpm	20 Hz	max: 16000 ; factor: /1 ;
Spd1	☑	Speed1	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd2	☑	Speed2	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd3	☑	Speed3	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd4	☑	Speed4	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Ch01	☑	Channel01	Voltage	Generic 0-5 V	mV	20 Hz	
Ch02	☑	Channel02	Voltage	Generic 0-5 V	mV	20 Hz	
Ch03	☑	Channel03	Voltage	Generic 0-5 V	mV	20 Hz	
Ch04	☑	Channel04	Voltage	Generic 0-5 V	mV	20 Hz	
Ch05	☑	Channel05	Angle	Angular Pot. Calib	deg	20 Hz	max travel: 180 ;
Ch06	☑	Channel06	Position	Position Pot. AutoCal	mm	20 Hz	max travel: 50 ;
Ch07	☑	Channel07	Voltage	Generic 0-5 V	mV	20 Hz	
Ch08	☑	Channel08	Voltage	Generic 0-5 V	mV	20 Hz	
AccX	☑	AccelerometerX	Inline Accel	AiM Internal Accelerometer	g 0.01	20 Hz	
AccY	☑	AccelerometerY	Lateral Accel	AiM Internal Accelerometer	g 0.01	20 Hz	
AccZ	☑	AccelerometerZ	Vertical Accel	AiM Internal Accelerometer	g 0.01	20 Hz	
GyrX	☑	GyroX	Ang Velocity	AiM Internal Gyro	deg/s	20 Hz	
GyrY	☑	GyroY	Ang Velocity	AiM Internal Gyro	deg/s	20 Hz	
GyrZ	☑	GyroZ	Ang Velocity	AiM Internal Gyro	deg/s	20 Hz	
Spd	☑	GPS Speed	Vehicle Spd	AiM GPS	km/h 0.1	10 Hz	
OdD	☑	Odometer	Odometer Total	AiM ODO	km 0.1	1 Hz	

To calibrate the potentiometer:

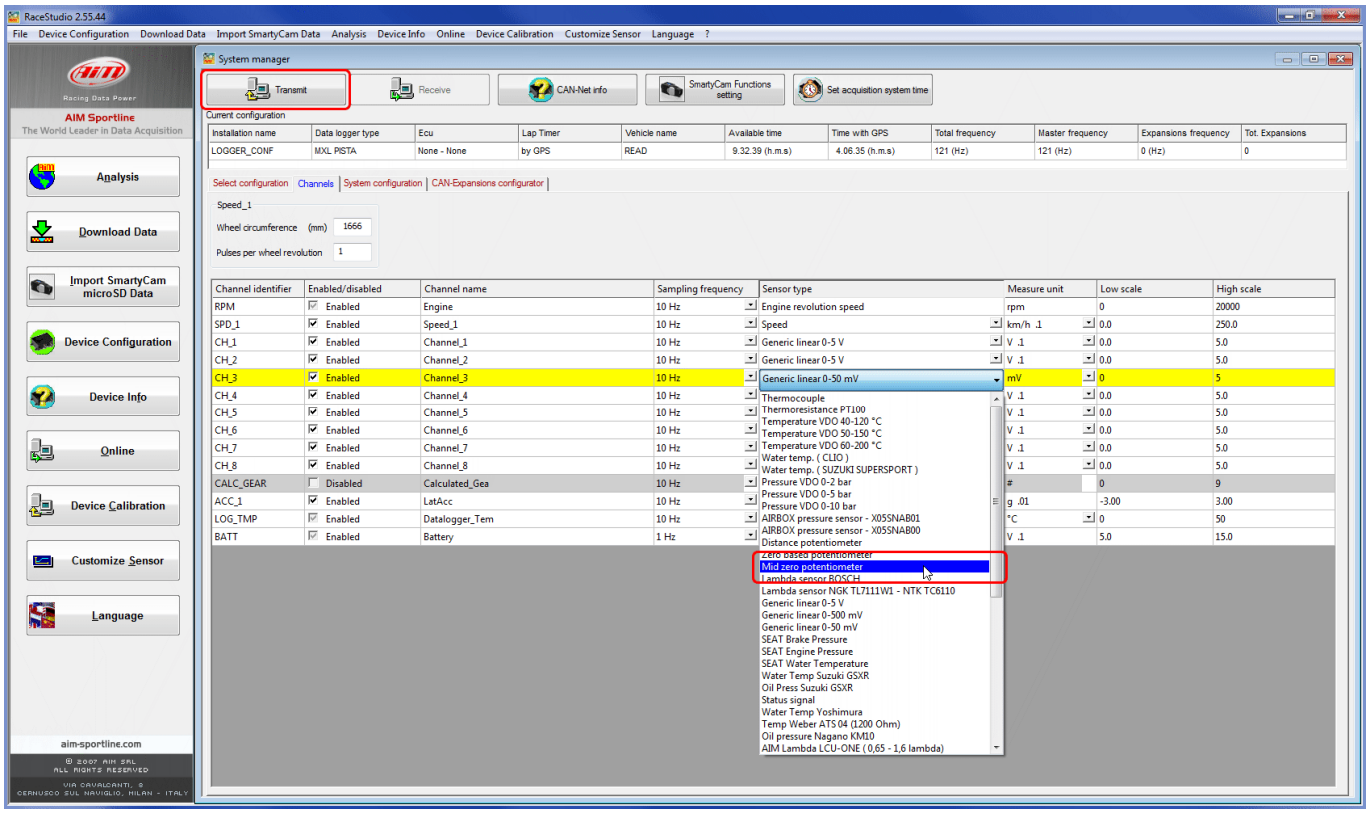
- enter "All" layer and press "Device" (**1**)
- select the logger – in the example MXL2 ID 410 (**2**)
- in "Live Measures" layer, keeping the potentiometer in its zero position, select the channel where the potentiometer has been set – in the example channel 5 (**3**)
- press "Calibrate" (**4**)



5.2
Setup with Race Studio 2

To load the potentiometer in AiM logger configuration:

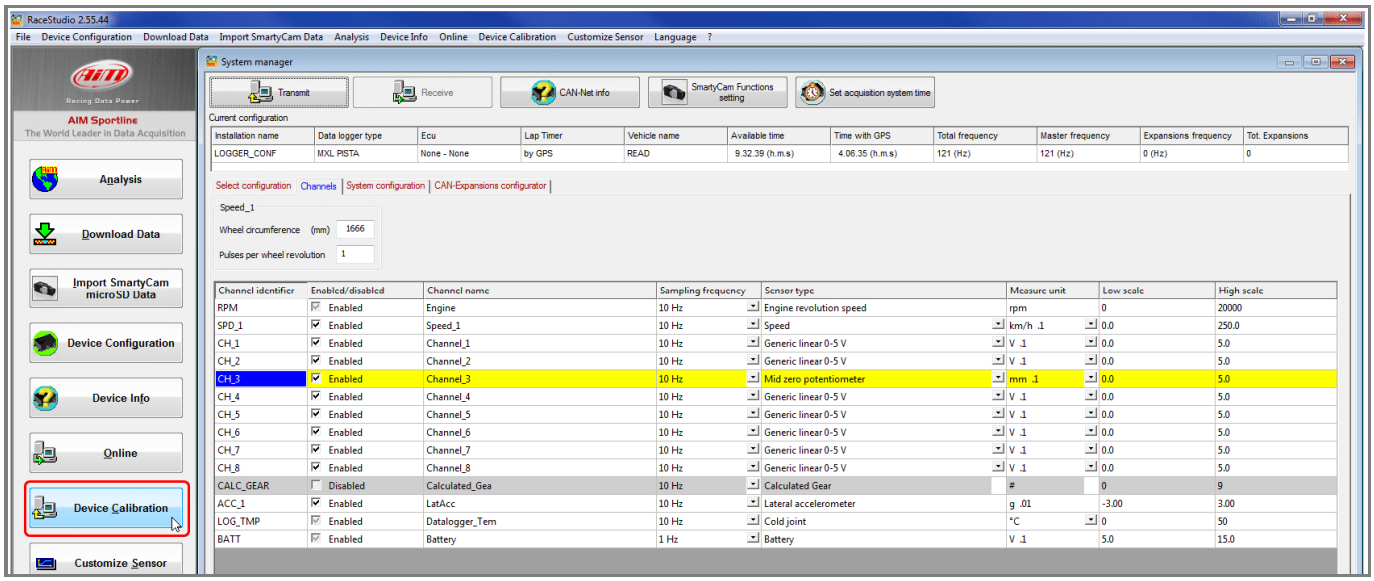
- run the software
- select the logger in use and the configuration to set the potentiometer on
- enter "Channels" layer
- Select the channel where to set the potentiometer on (in the example channel 3) and select "Mid zero potentiometer" in "Sensor type" column as shown here below.



- click out of the cell
- transmit the configuration to the logger pressing "Transmit" on the software top keyboard.

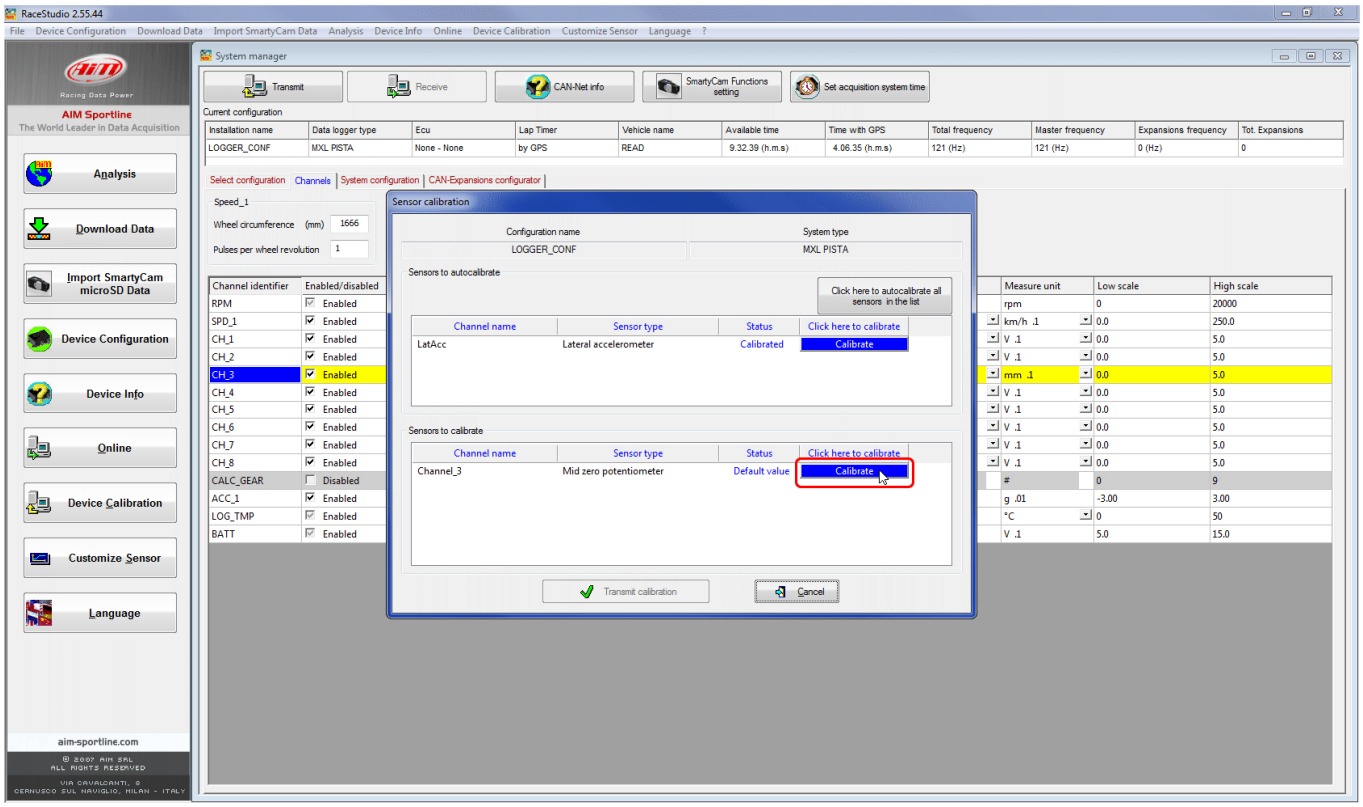
To calibrate the potentiometer:

- Press "Device Calibration"



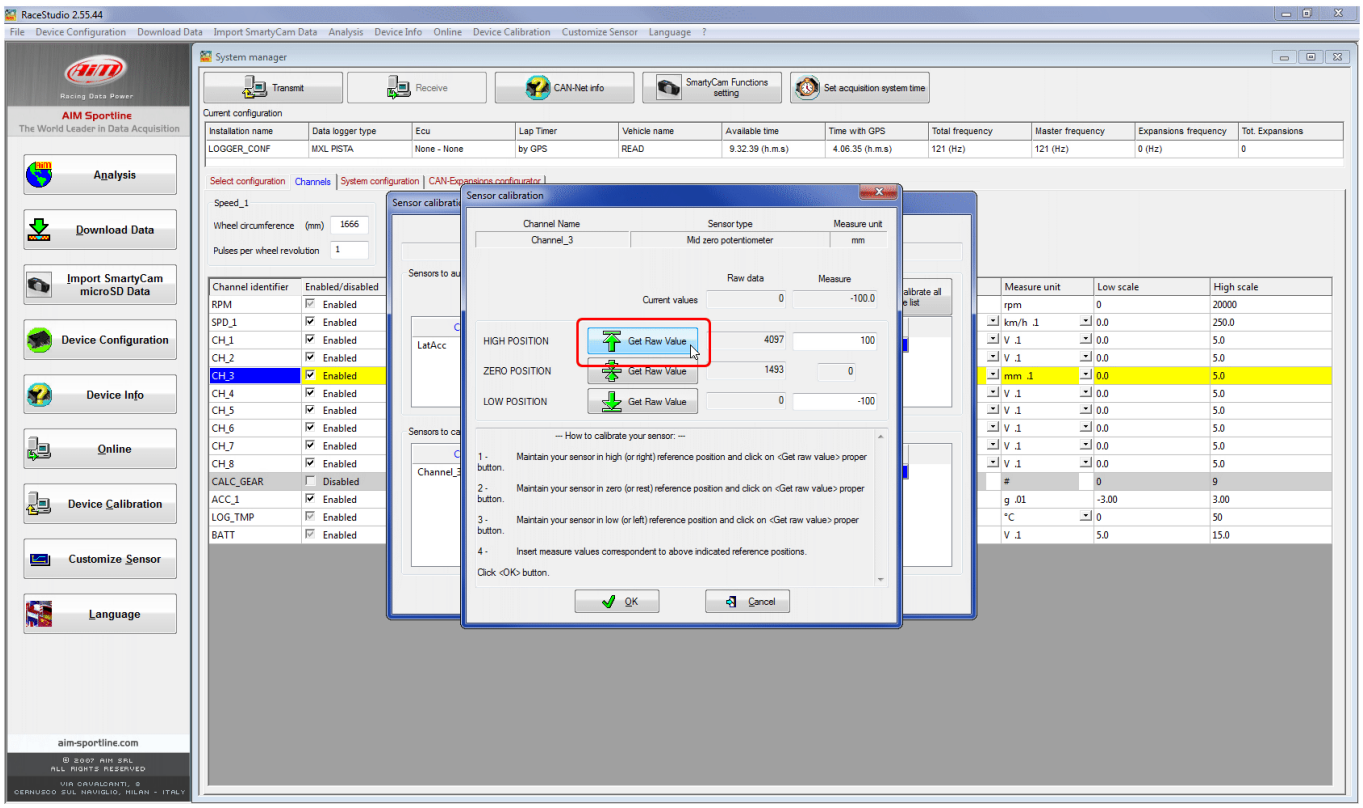
Calibration panel shows up:

- Press "Calibrate" of "Mid zero potentiometer"

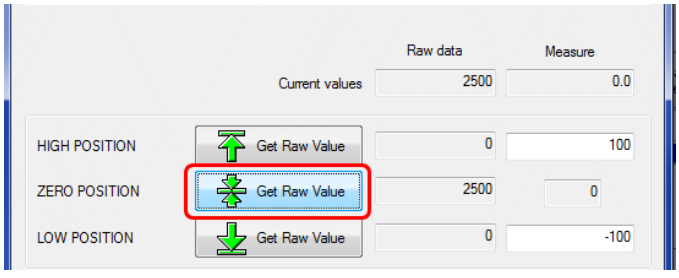


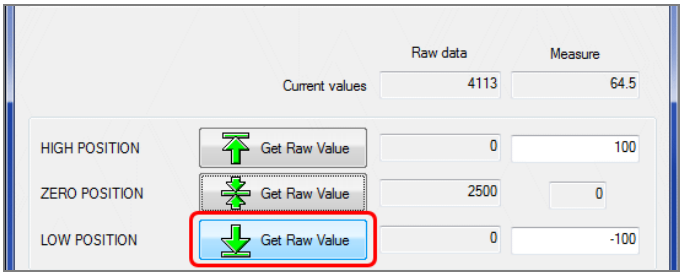
The software shows "Calibration panel" to learn the three calibration points; it shown also the related instructions:

- swerve to the left stop and press "Get raw value" corresponding to "High position"



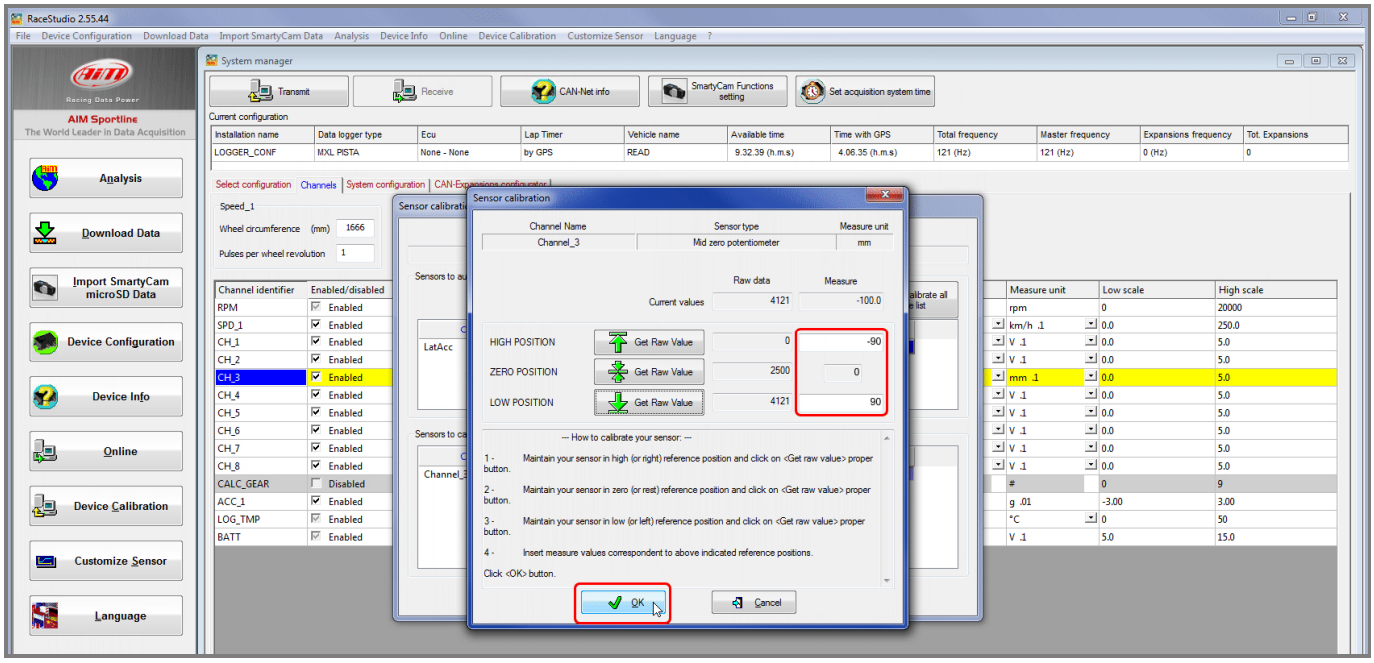
- place the steering in its zero position and press "Get raw value" corresponding to "Zero position" (image below on the left)
- swerve to the right stop and press "Get raw value " corresponding to "Low position" (image below on the right)





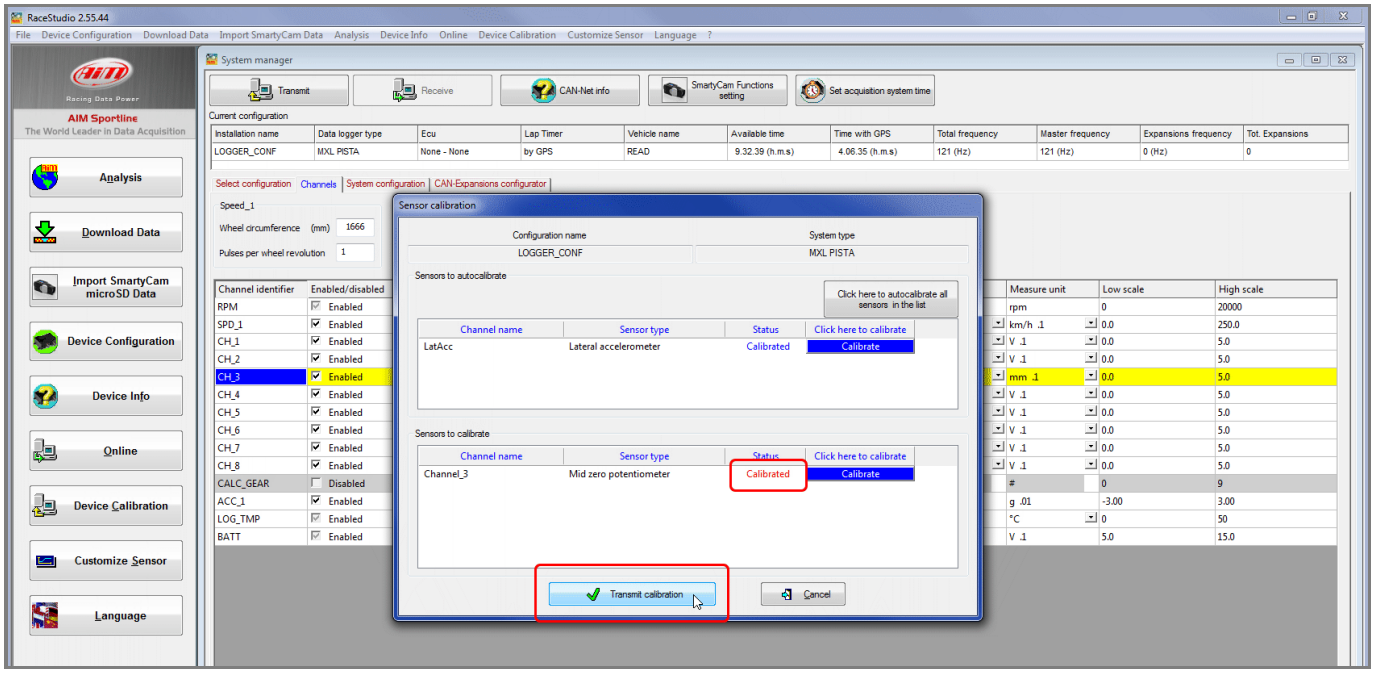
When calibration points have been learnt:

- manually fill in values corresponding to the three angular position: -90, 0 and 90.
- press OK



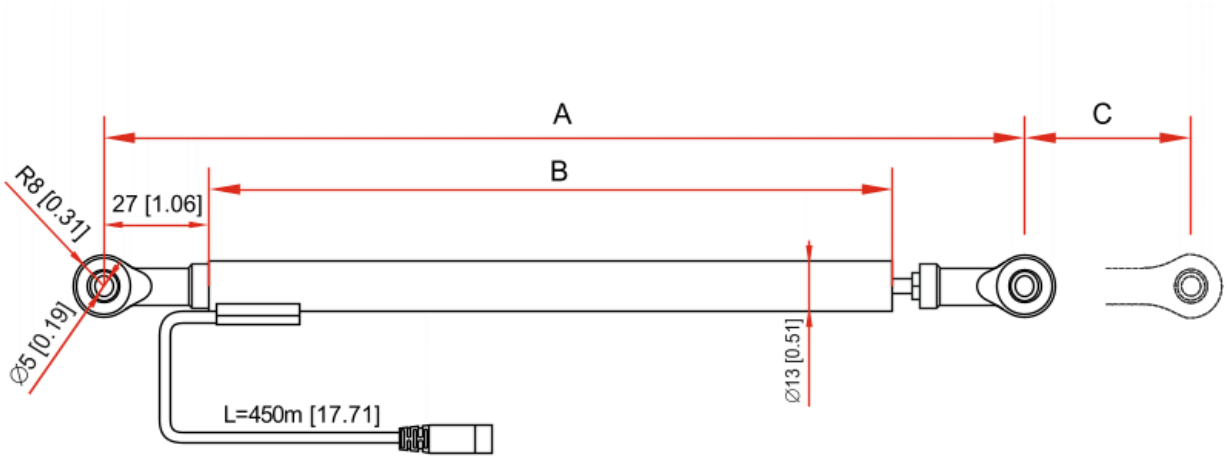
When calibration is over potentiometer status will turn to "Calibrated" and become red:

- Transmit the calibration to the logger pressing "Transmit Calibration"



6
Dimensions, pinout and technical characteristics

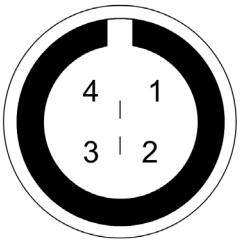
The drawing below shows sensors dimensions in millimetres [inches].



With reference to the drawing above the table here below shows the proportional growth of “A”, “B” and “C” dimensions.

Potentiometer travel (C)	“A” – Retracted mounting distance	“B” Sensor body length
50 mm (1.97”)	198 mm (7.79”)	132 mm (5.19”)
75 mm (2.95”)	223 mm (8.77”)	157 mm (6,18”)
100 mm (3.93”)	248 mm (9.76”)	182 mm (7.16”)
150 mm (5.91”)	298 mm (11.73”)	232 mm (9.13”)

The potentiometer ends with a 4 pins Binder 719 male connector. The image below shows the connector from solder termination side.



Binder connector pin	Function
1	Analog signal 0-5 V
2	GND
3	Not connected
4	Vreference (4.5V)

Car/Bike linear potentiometer **technical characteristics** are:

- Maximum supply voltage: 40 Vdc
- Resolution: essentially infinite
- Repeatability: ≤ 0.01 mm
- Operational speed: 10 m/s max
- Mechanical life: >25 millions cycles
- Temperature range: from -40° to +125°
- Environmental sealing: IP65
- Independent linearity: ≤±0.5%
- Cable type: Raychem 55A 24 AWG
- Cable length: 450 mm
- Housing: Aluminium
- Spherical bearing: Ø5 mm

7
Extension cables

The potentiometer is sold with a 45 cm cable and standard lengths extension cables are available as optional; it is also possible to ask for specific length extension cables.

Extension cables part numbers change according to their length and to the device the sensor is to be connected to.

Extension cable for connection with:
- MGS
- MXS
- MXL2
- EVO5
- EVO4
- Channel Expansion
- MyChron Expansion

Part numbers:
V02PCB05BTXG – cable length: 500 mm
V02PCB10BTXG – cable length: 1000 mm
V02PCB15BTXG – cable length: 1500 mm
V02PCB20BTXG – cable length: 2000 mm
V02PCB25BTXG – cable length: 2500 mm
V02PCB30BTXG – cable length: 3000 mm

Extension cable for connection with:
- MXL Strada
- MXL Pista
- MXL Pro05

Part numbers:
V02PCB05B – cable length: 500mm
V02PCB10B – cable length: 1000mm
V02PCB15B – cable length: 1500mm
V02PCB20B – cable length: 2000mm
V02PCB25B – cable length: 2500mm
V02PCB30B – cable length: 3000mm