

AiM Infotech

Rotary potentiometer for
car/bike/kart

Release 1.03



1

Introduction

This datasheet explains how to install and set up the rotary potentiometer for car, bike and kart installation and shows its electrical and mechanical characteristics.

AiM loggers can measure the displacement between two points using a sensor (rotary potentiometer) directly connected to the two measure points. This potentiometer can measure the angular displacement like those of the steering wheel.

2

The kit

AiM designed and developed two different potentiometers and thereby two installation kits:

- 10G potentiometer 10 giri for car/bike installations
- 5G potentiometer 10 giri for car/bike but also kart installations

10G potentiometer installation kit includes:

- 10G steering potentiometer (1)
- 1 toothed belt (2)
- 2 toothed pulleys (3)
- 1 Allen key (4)
- 1 bracket kit (5)

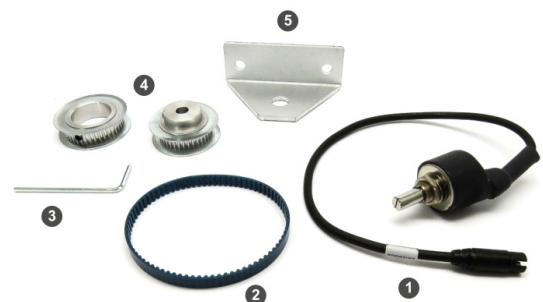


This kit part number is: **X05SNST10G**

5G potentiometer installation kit includes:

- 5G steering potentiometer (1)
- 1 toothed belt (2)
- 1 Allen key (3)
- 2 toothed pulleys (4)
- 1 bracket (5)

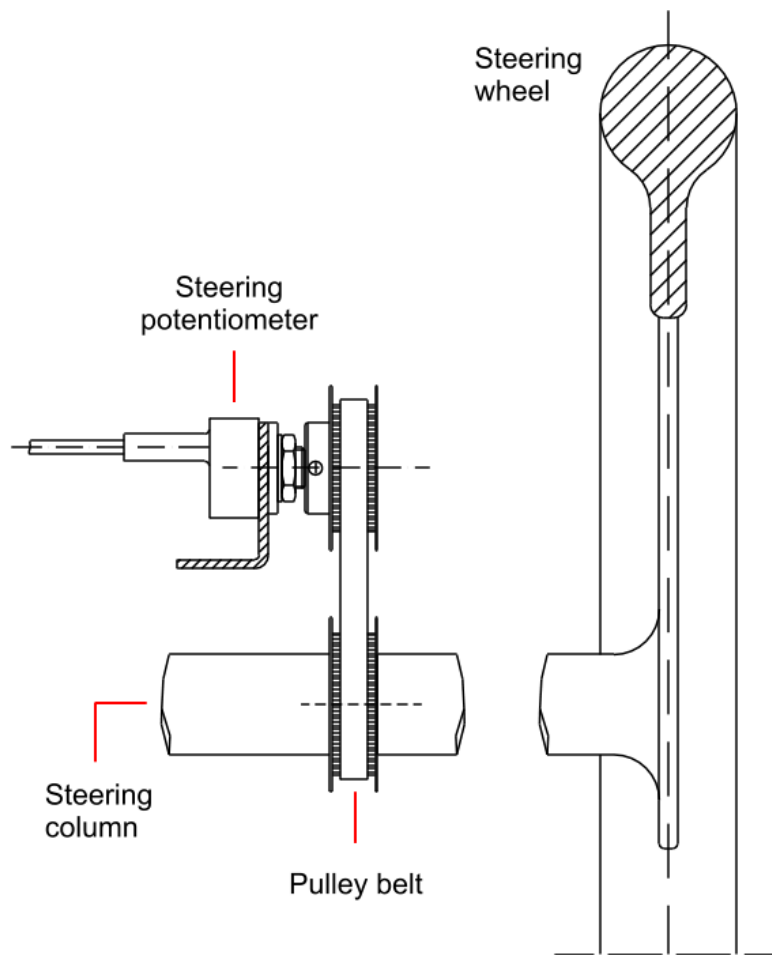
This kit part number is: **X05SNST05G**



3

Installation

The steering potentiometer can be connected to any analog channel of AiM loggers. The drawing here below shows the potentiometer correctly installed.



4

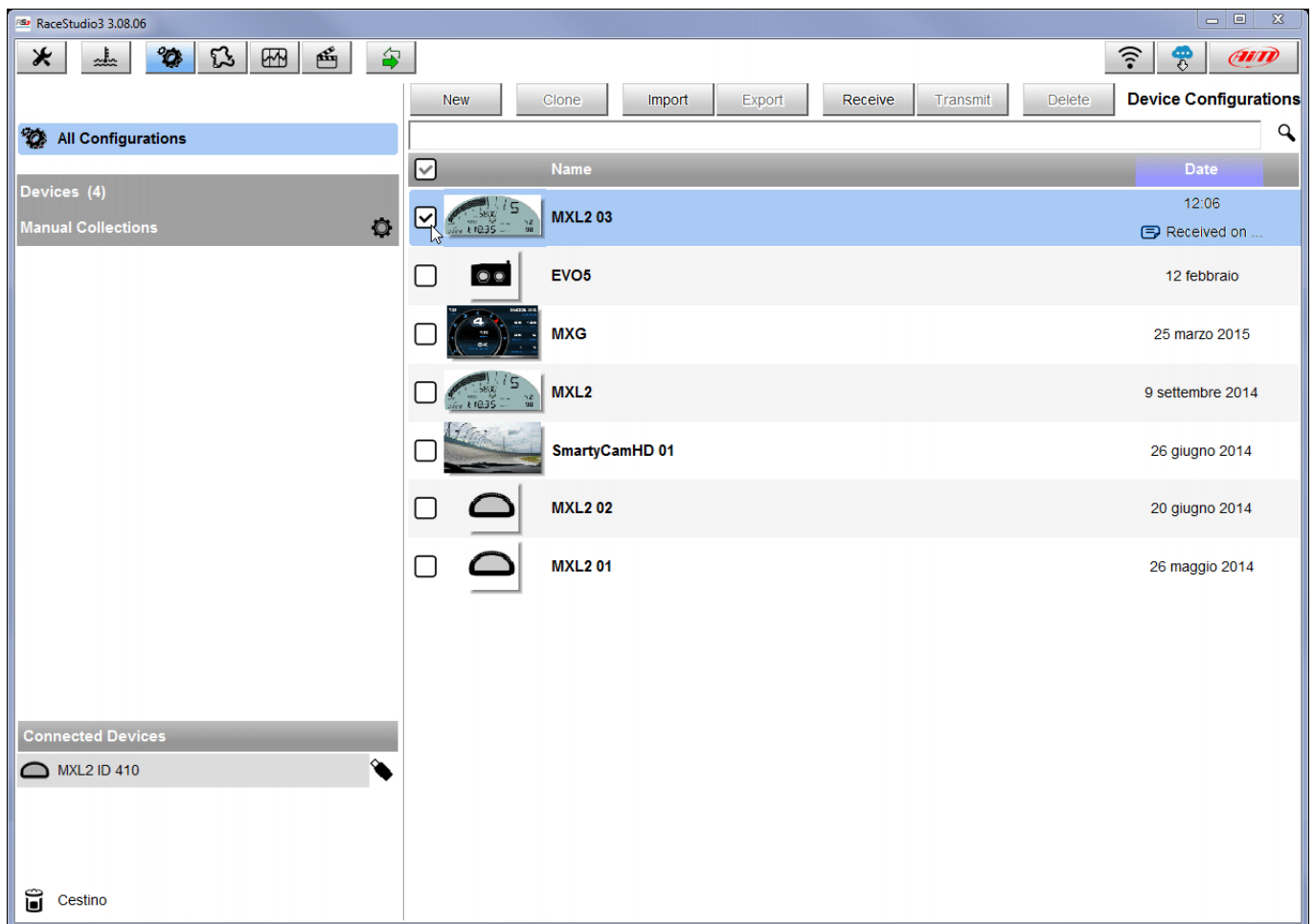
Software setup

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

4.1

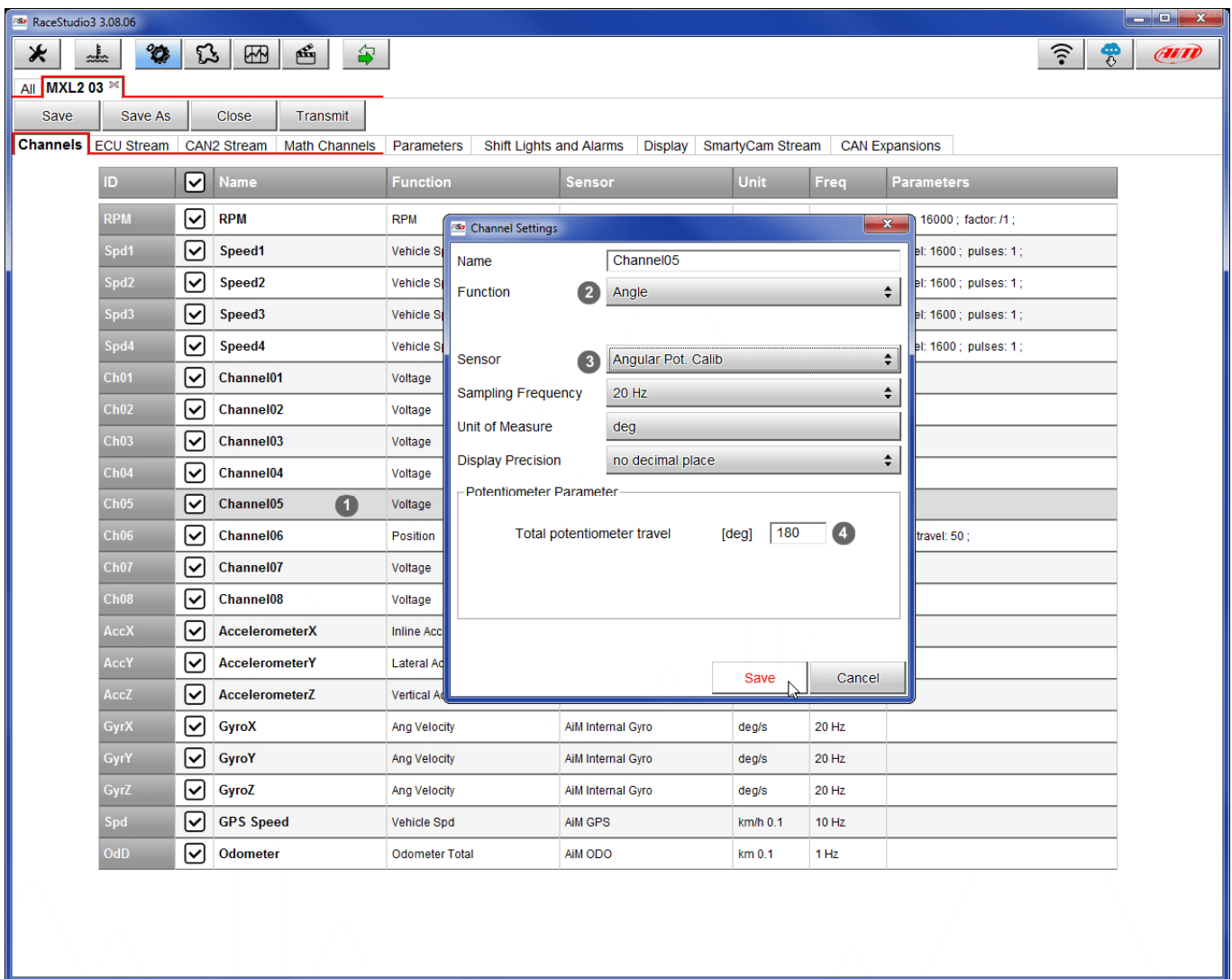
Setup with Race Studio 3

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 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"



The screenshot shows the RaceStudio3 3.08.06 software interface. The 'Channels' tab is selected, displaying a list of channels. Channel05 is highlighted with a red circle (1). The 'Channel Settings' dialog box is open for Channel05, showing the following configuration:

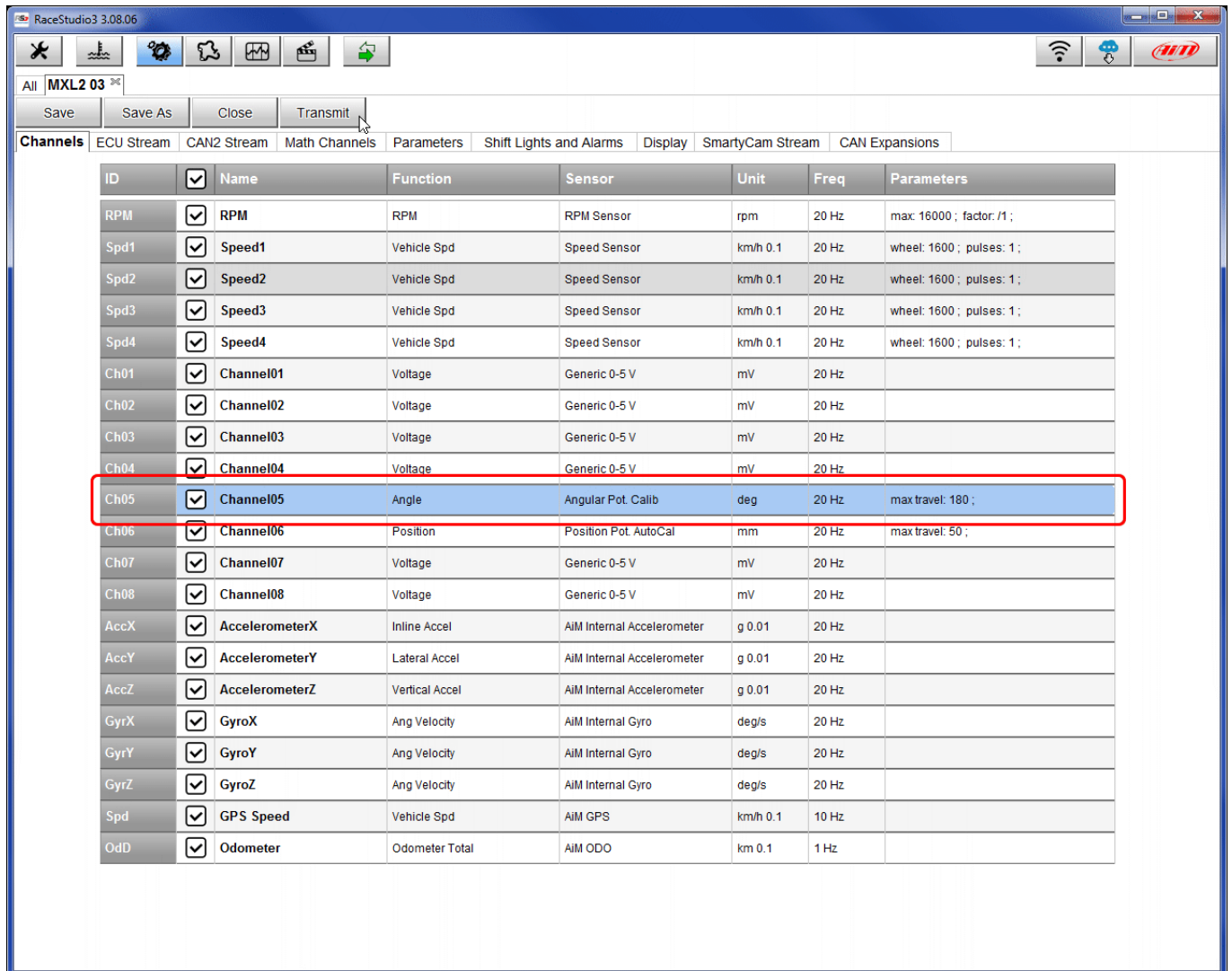
- Name: Channel05
- Function: Angle (2)
- Sensor: Angular Pot. Calib (3)
- Sampling Frequency: 20 Hz
- Unit of Measure: deg
- Display Precision: no decimal place
- Potentiometer Parameter: Total potentiometer travel [deg] 180 (4)

The 'Save' button is highlighted with a mouse cursor.

ID	Name	Function	Sensor	Unit	Freq	Parameters
RPM	RPM	RPM				
Spd1	Speed1	Vehicle Spd				
Spd2	Speed2	Vehicle Spd				
Spd3	Speed3	Vehicle Spd				
Spd4	Speed4	Vehicle Spd				
Ch01	Channel01	Voltage				
Ch02	Channel02	Voltage				
Ch03	Channel03	Voltage				
Ch04	Channel04	Voltage				
Ch05	Channel05	Voltage				
Ch06	Channel06	Position				
Ch07	Channel07	Voltage				
Ch08	Channel08	Voltage				
AccX	AccelerometerX	Inline Acc				
AccY	AccelerometerY	Lateral Acc				
AccZ	AccelerometerZ	Vertical Acc				
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	

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.

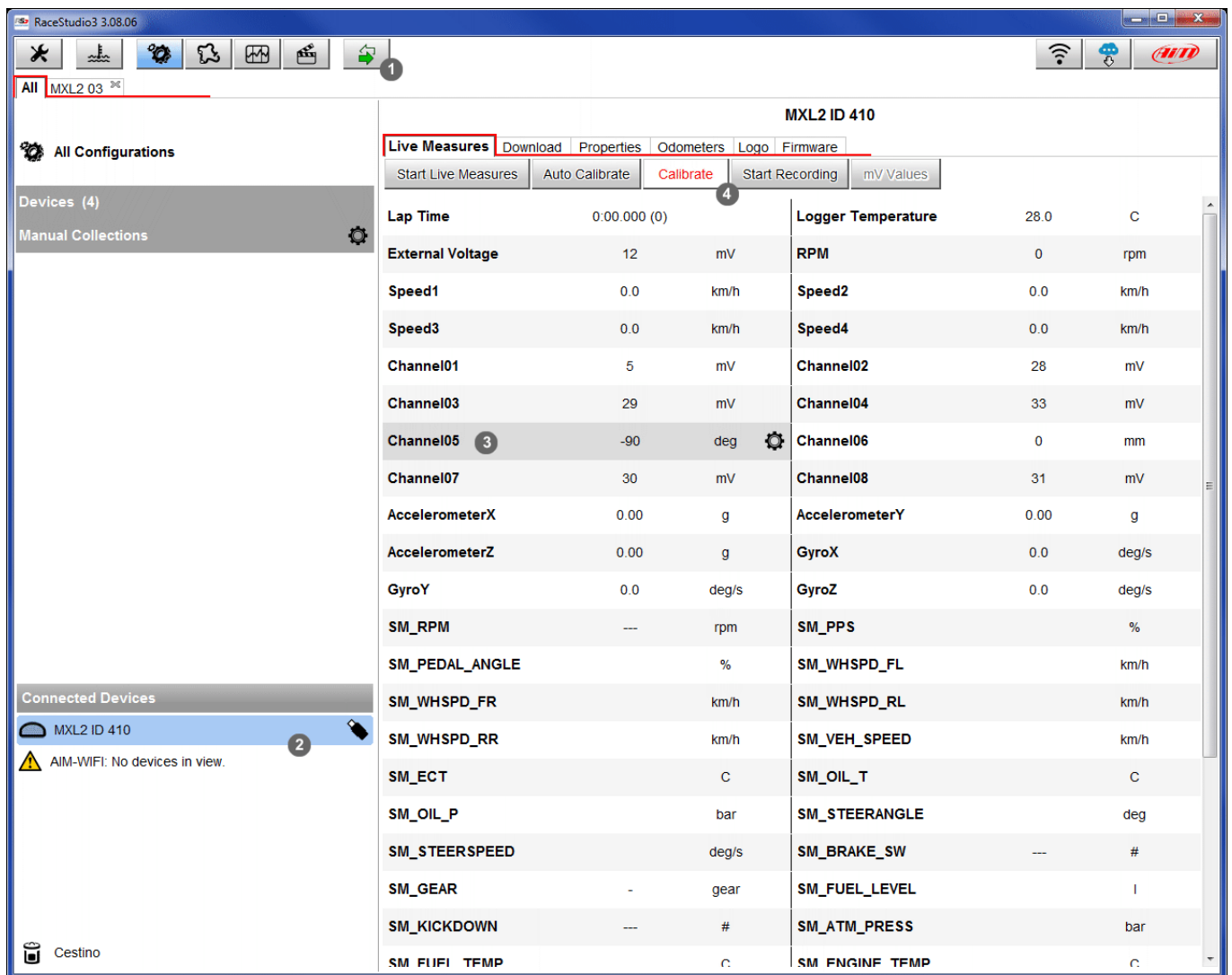


The screenshot shows the RaceStudio3 3.08.06 software interface. The top toolbar includes buttons for Save, Save As, Close, and Transmit. The 'Channels' tab is selected, displaying a table of configured channels. The table has columns for ID, Name, Function, Sensor, Unit, Freq, and Parameters. Channel05 is highlighted in blue and enclosed in a red box, indicating it is the selected channel for the potentiometer.

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)



1

All MXL2 03

MXL2 ID 410

Live Measures Download Properties Odometers Logo Firmware

Start Live Measures Auto Calibrate Calibrate Start Recording mV Values

2

3

4

Lap Time	0.00.000 (0)	Logger Temperature	28.0	C
External Voltage	12	mV	RPM	0
Speed1	0.0	km/h	Speed2	0.0
Speed3	0.0	km/h	Speed4	0.0
Channel01	5	mV	Channel02	28
Channel03	29	mV	Channel04	33
Channel05	-90	deg	Channel06	0
Channel07	30	mV	Channel08	31
AccelerometerX	0.00	g	AccelerometerY	0.00
AccelerometerZ	0.00	g	GyroX	0.0
GyroY	0.0	deg/s	GyroZ	0.0
SM_RPM	---	rpm	SM_PPS	%
SM_PEDAL_ANGLE		%	SM_WHSPD_FL	km/h
SM_WHSPD_FR	km/h		SM_WHSPD_RL	km/h
SM_WHSPD_RR	km/h		SM_VEH_SPEED	km/h
SM_ECT	C		SM_OIL_T	C
SM_OIL_P	bar		SM_STEERANGLE	deg
SM_STEERSPEED	deg/s		SM_BRAKE_SW	---
SM_GEAR	-	gear	SM_FUEL_LEVEL	l
SM_KICKDOWN	---	#	SM_ATM_PRESS	bar
SM_FUEL_TEMP	C		SM_ENGINE_TEMP	C

Connected Devices

MXL2 ID 410

AIM-WiFi: No devices in view.

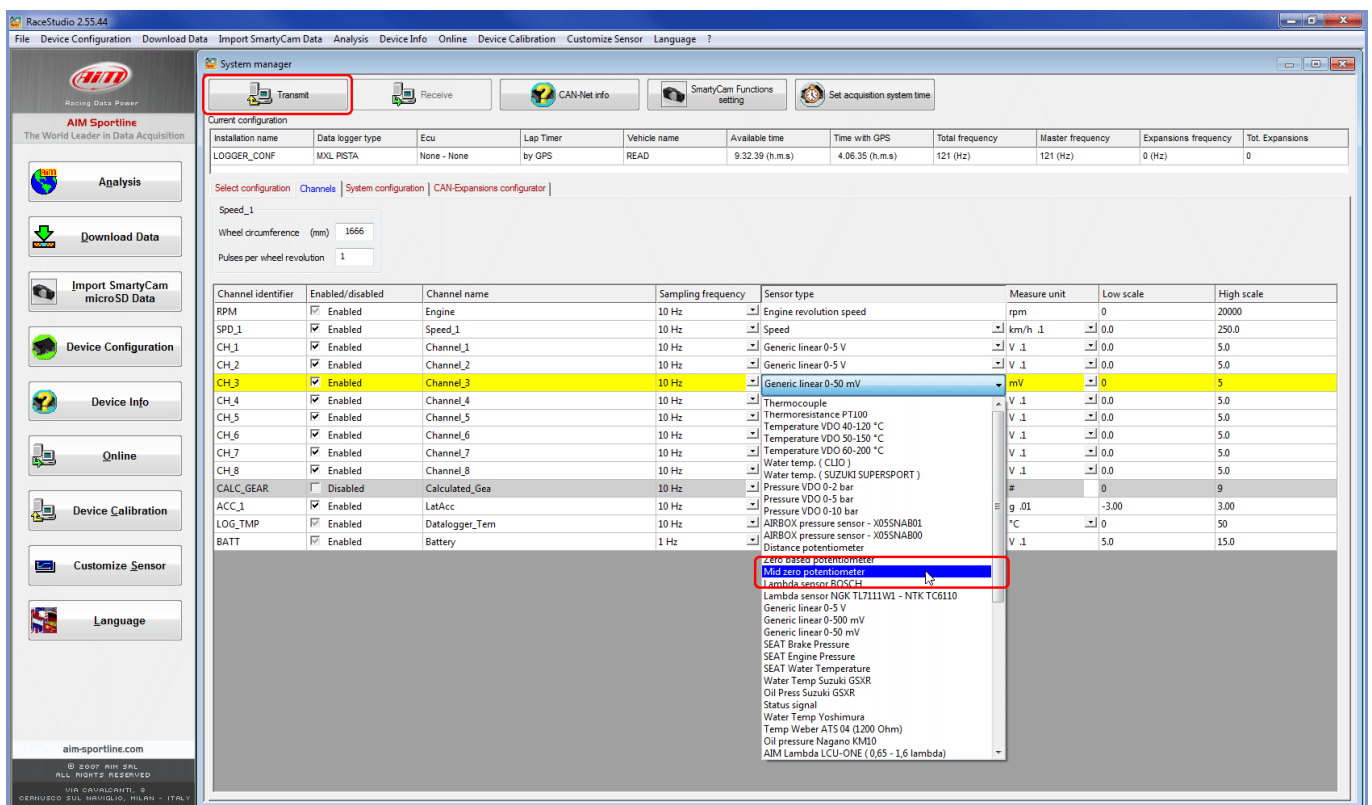
Cestino

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 "Mid zero potentiometer" in "Sensor type" column as shown here below.



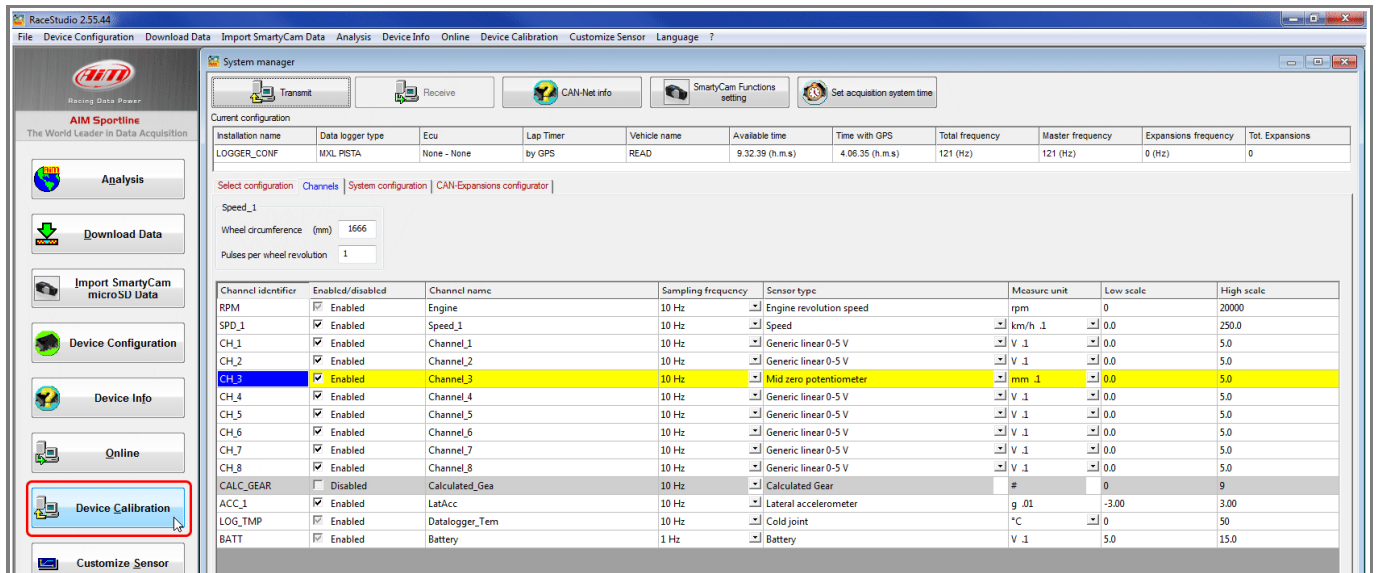
The screenshot shows the RaceStudio 2.55.44 interface. The 'Transmit' button in the top toolbar is highlighted with a red box. The 'Channels' tab is active, displaying a table of channels. Channel 3 is selected, and its 'Sensor type' dropdown menu is open, showing a list of sensors. The 'Mid zero potentiometer' option is highlighted in the dropdown menu.

Channel identifier	Enabled/disabled	Channel name	Sampling frequency	Sensor type	Measure unit	Low scale	High scale
RPM	Enabled	Engine	10 Hz	Engine revolution speed	rpm	0	20000
SPD_1	Enabled	Speed_1	10 Hz	Speed	km/h	0.0	250.0
CH_1	Enabled	Channel_1	10 Hz	Generic linear 0-5 V	V	0.0	5.0
CH_2	Enabled	Channel_2	10 Hz	Generic linear 0-5 V	V	0.0	5.0
CH_3	Enabled	Channel_3	10 Hz	Generic linear 0-50 mV	mV	0	5
CH_4	Enabled	Channel_4	10 Hz	Thermocouple	V	0.0	5.0
CH_5	Enabled	Channel_5	10 Hz	Thermoresistance PT100	V	0.0	5.0
CH_6	Enabled	Channel_6	10 Hz	Temperature VDO 40-120 °C	V	0.0	5.0
CH_7	Enabled	Channel_7	10 Hz	Temperature VDO 90-150 °C	V	0.0	5.0
CH_8	Enabled	Channel_8	10 Hz	Temperature VDO 60-200 °C	V	0.0	5.0
CALC_GEAR	Disabled	Calculated_Gea	10 Hz	Water temp. (CLIO)	V	0.0	5.0
ACC_1	Enabled	LatAcc	10 Hz	Water temp. (SUZUKI SUPERSPORT)	V	0.0	5.0
LOG_TMP	Enabled	Datalogger_Tem	10 Hz	Pressure VDO 0-2 bar	#	0	9
BATT	Enabled	Battery	1 Hz	Pressure VDO 0-5 bar	g	-3.00	3.00
				Pressure VDO 0-10 bar	°C	0	50
				AIRBOX pressure sensor - X055NAB01	V	5.0	15.0
				AIRBOX pressure sensor - X055NAB00			
				Distance potentiometer			
				Zero base potentiometer			
				Mid zero potentiometer			
				Lambda sensor BOSCH			
				Lambda sensor NGK TL7111W1 - NTK TC6110			
				Generic linear 0-5 V			
				Generic linear 0-500 mV			
				Generic linear 0-50 mV			
				SEAT Brake Pressure			
				SEAT Engine Pressure			
				SEAT Water Temperature			
				Water Temp Suzuki GSXR			
				Oil Press Suzuki GSXR			
				Status signal			
				Water Temp Yoshimura			
				Temp Weber ATS 04 (1200 Ohm)			
				Oil pressure Nagano KMGD			
				AIM Lambda LCU-ONE (0.65 - 1.6 lambda)			

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

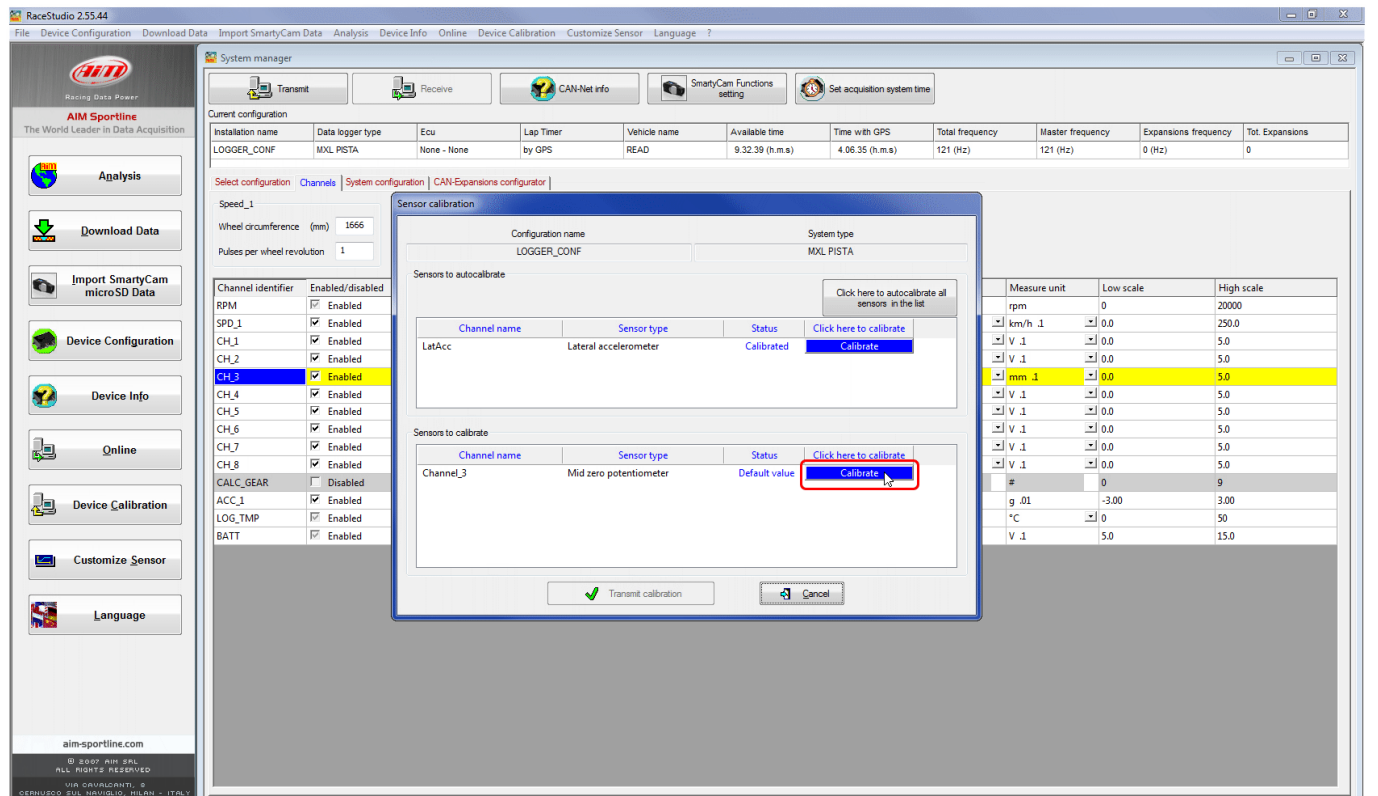
To calibrate the potentiometer:

- Press "Device Calibration"



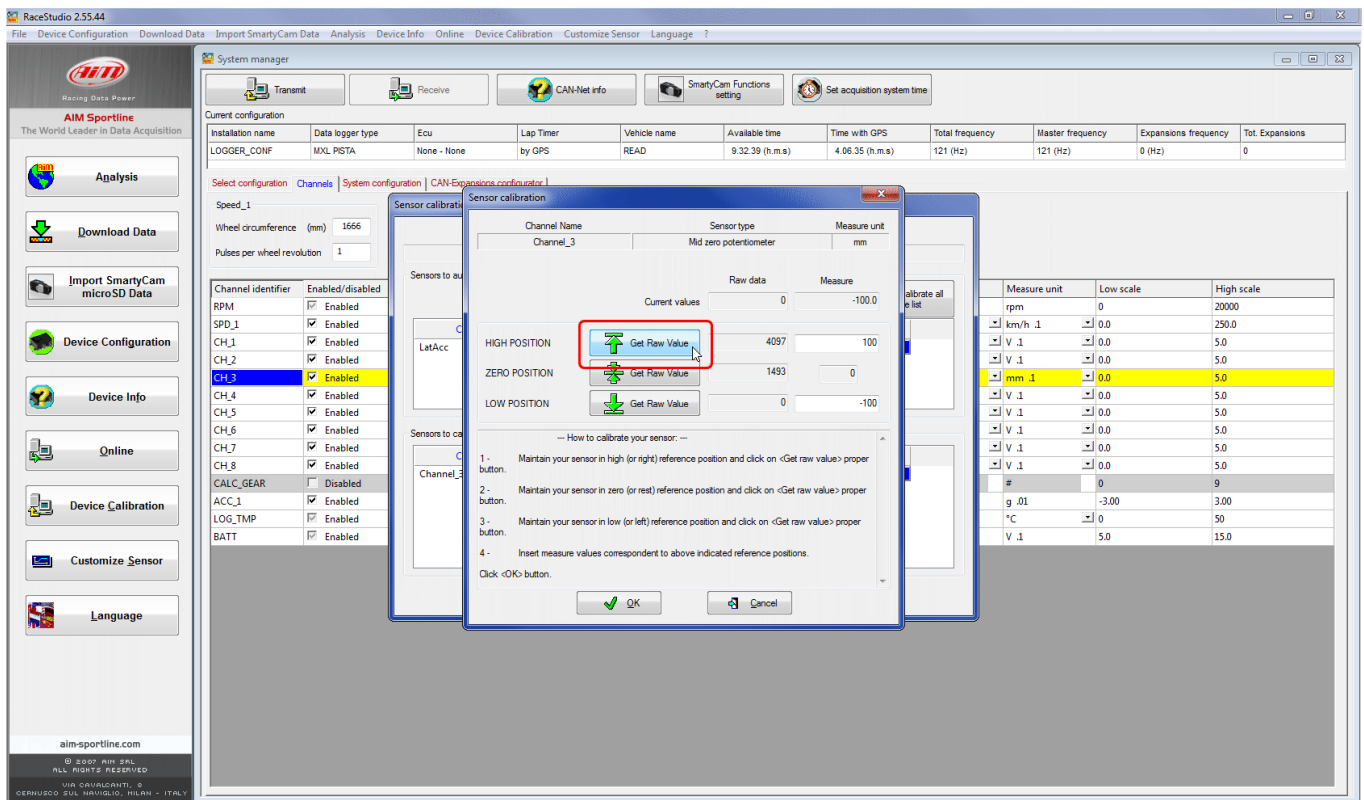
Calibration panel shows up:

- Press "Calibrate" button of "Mid zero potentiometer"

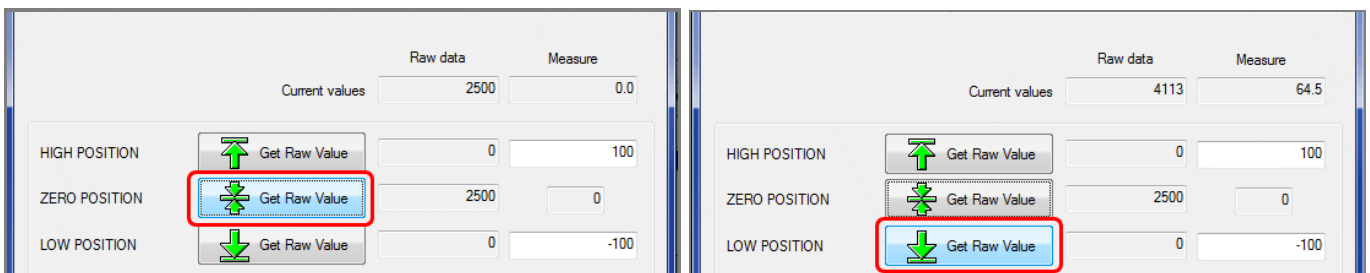


The software shows "Calibration panel" to learn the three calibration points:

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

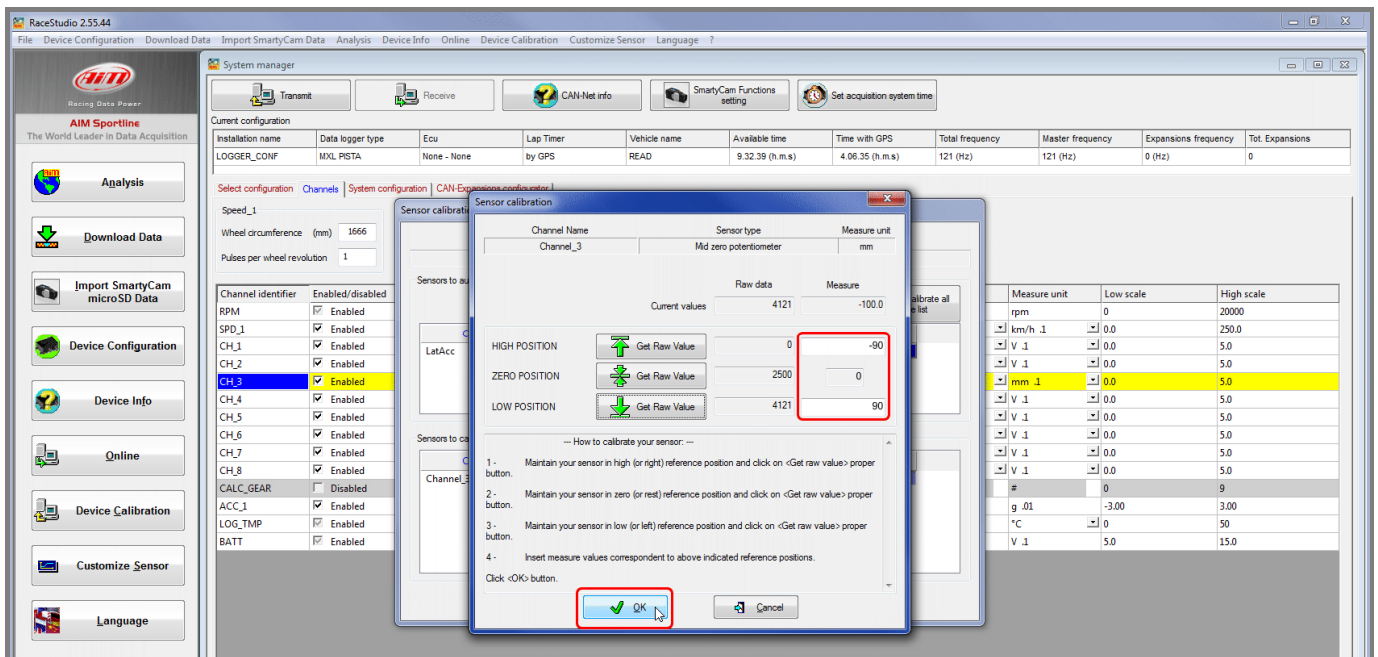


- place the steering in its zero position and press "Get raw value" corresponding to "Zero position" (image below on the left)
- swerve to the right stop and press "Get raw value" corresponding to "Low position" (image below on the right)



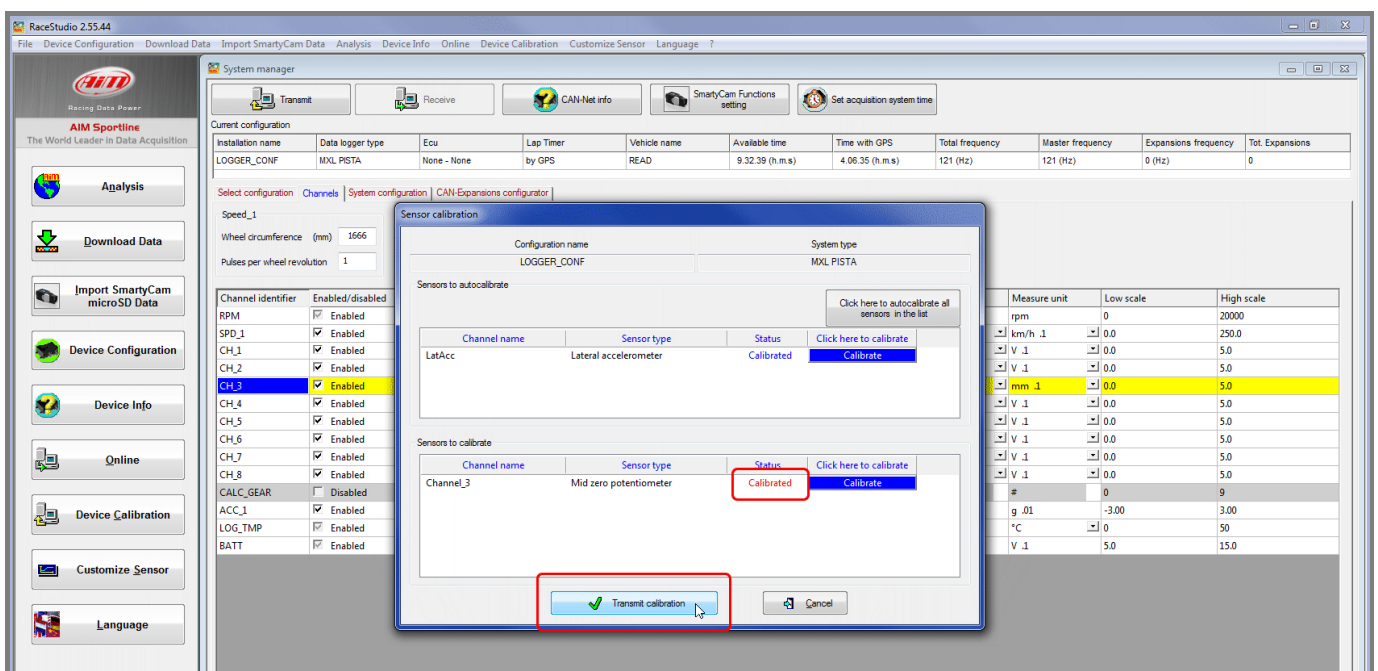
When calibration points have been learnt:

- 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:

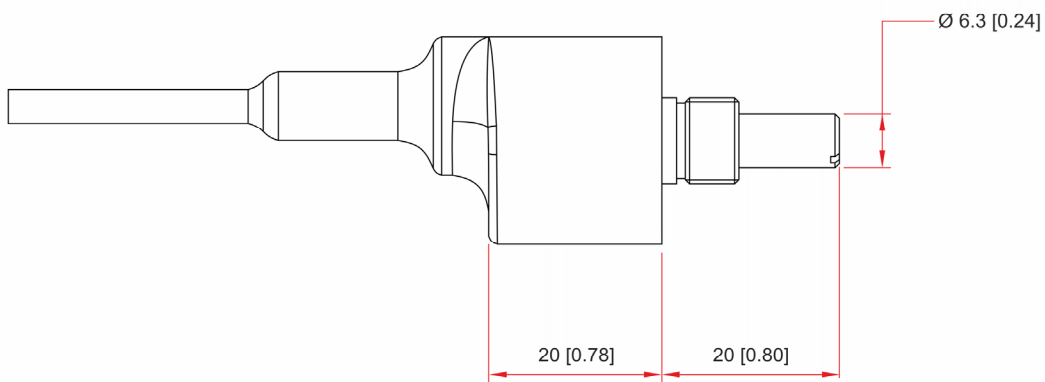
- Transmit the calibration to the logger pressing "Transmit Calibration"



5

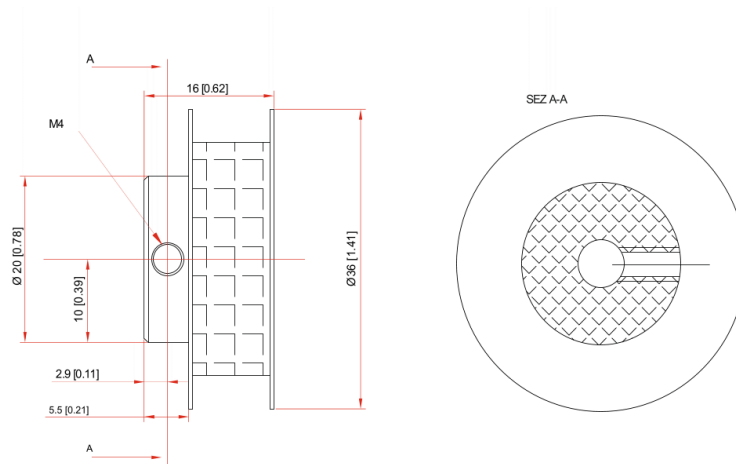
Dimensions, pinout and technical characteristics

The drawing there below shows the sensor dimensions in millimetres [inches].

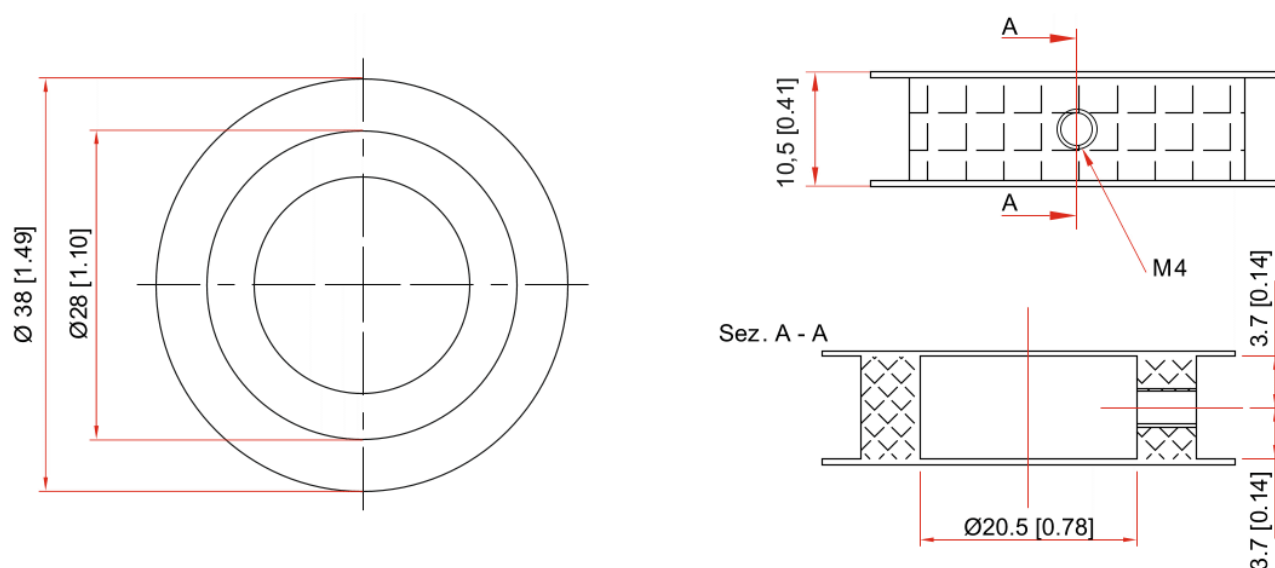


The following images shows the pulleys dimensions in millimetres [inches]:

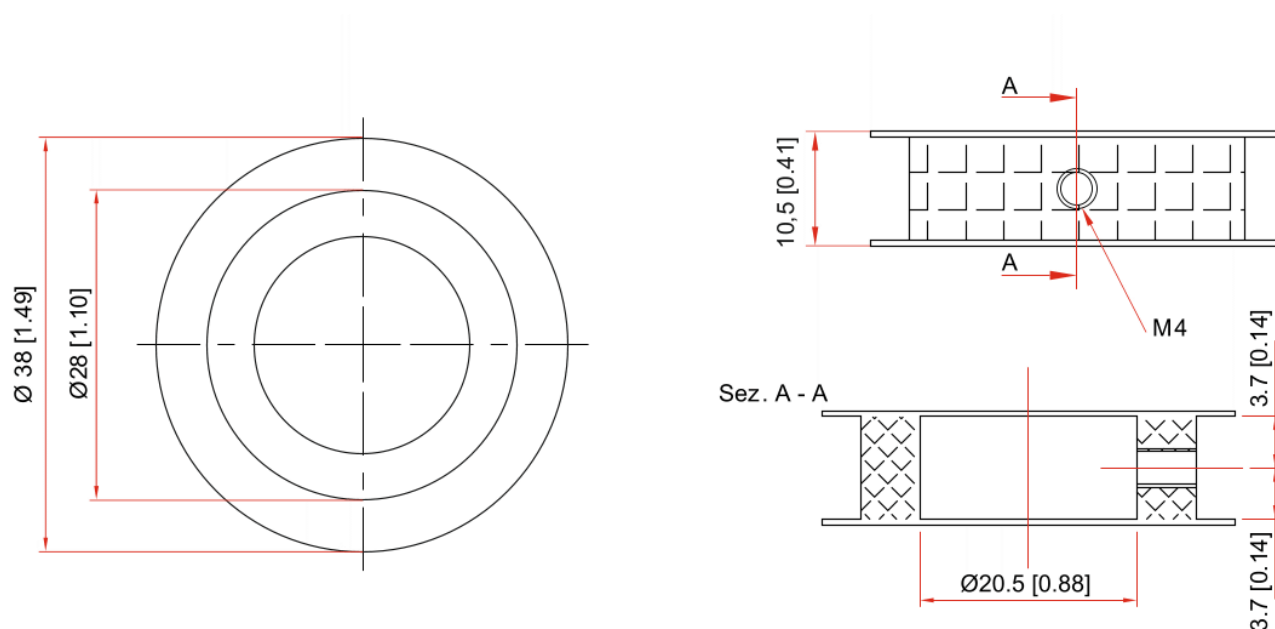
- pulley to be installed on the potentiometer



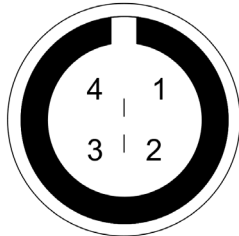
- 20 mm diameter pulley to be installed on the steering wheel for 5G potentiometer



- 22 mm diameter pulley to be installed on the steering wheel for 10G potentiometer



The potentiometer cable ends with a 4 pins Binder 719 male connector. Here below it is shown from solder termination view with the related pinout.



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

The steering potentiometer **electrical characteristics** are:

- nominal resistance: 10k Ω
- tolerance on resistance value: $\pm 5\%$
- precision (%):
 - 0.030 for 10G potentiometer
 - 0.034 for 5G potentiometer

The steering potentiometer **mechanical characteristics** are:

- mechanical displacement: 1080°/5 or 10laps
- working temperature range: -55/+125 °C
- dissipated power at 40°C:
 - 2.4W for 10G potentiometer
 - 1.6 W for 5G potentiometer
- dissipated at 70°C:
 - 1.5W for 10G potentiometer
 - 1W for 5G potentiometer

6

Extension cables

The potentiometer is sold with a 30 cm cable and standard lengths extension cables are available as optional: 0,5 m, 1m e 1,5 m; 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:

- Channel Expansion
- MyChron Expansion
- EVO4.

Part numbers:

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



Extension cable for connection with:

- MXG
- MXS
- MXL2
- 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

