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.

<mark>2</mark> 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 totheed 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 braket (**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"

RaceStudio3	3.08.06	1	3 🕅 🗳 🛓								
All MXL2 0	3×										• •
Save	Save As		Close Transmit	•							
Channels	ECU Stream	CAN	V2 Stream Math Channels	Paramet	ers Shift Lights	and Ala	rms Display	SmartyCam St	ream CAN Exp	ansions	
	ID		Name	Functio	n	Sens	or	Unit	Freq	Parameters	
	RPM	•	RPM	RPM	🚈 Channel Settings					16000 ; factor: /1 ;	
	Spd1	☑	Speed1	Vehicle S	Name		Channel05			el: 1600 ; pulses: 1 ;	
	Spd2	\checkmark	Speed2	Vehicle S	Function	2	Angle		\$	el: 1600 ; pulses: 1 ;	
	Spd3	\checkmark	Speed3	Vehicle S						el: 1600 ; pulses: 1 ;	
	Spd4	☑	Speed4	Vehicle S	Sensor	2	Angular Pot	Calib		el: 1600 ; pulses: 1 ;	
	Ch01	☑	Channel01	Voltage	Sampling Freque	ency	20 Hz				
	Ch02	☑	Channel02	Voltage	Unit of Measure	ency	dea		•		
	Ch03	☑	Channel03	Voltage	Display Provision		no docimal pl	200			
	Ch04	☑	Channel04	Voltage	Display Precision	Daramo	tor	ace	•		
	Ch05		Channel05	Voltage	Poleniiomeier	ratame	iei				
	Ch06	☑	Channel06	Position	Total p	otentio	meter travel	[deg] 18	0 4	travel: 50 ;	
	Ch07	☑	Channel07	Voltage							
	Ch08	☑	Channel08	Voltage							
	AccX	☑	AccelerometerX	Inline Acc							
	AccY	☑	AccelerometerY	Lateral Ac				Save .	Cancel		
	AccZ		AccelerometerZ	Vertical Ad					<u></u>		
	GyrX	☑	GyroX	Ang Veloc	ity	AiM Int	ernal Gyro	deg/s	20 Hz		
	GyrY		GyroY	Ang Veloc	ity	AiM Int	ernal Gyro	deg/s	20 Hz		
	GyrZ	☑	GyroZ	Ang Veloc	ity	AiM Int	ernal Gyro	deg/s	20 Hz		
	Spd		GPS Speed	Vehicle Sp	bd	AiM GF	S	km/h 0.1	10 Hz		
	OdD		Odometer	Odometer	Total	Aim OE	00	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.

RaceStudio3	3.08.06						
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AII MXL20	3 ∞						
Save	Save As	Close Transmit					
hannels	ECU Stream	CAN2 Stream Math Channel	s Parameters Shift Lights	and Alarms Display Sm	artyCam Stre	eam CAN	Expansions
	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)

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All MXL2 03 🕷								
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	Speed1	0.0	km/h		Speed2	0.0	km/h	
	Speed3	0.0	km/h		Speed4	0.0	km/h	
	Channel01	5	mV		Channel02	28	mV	
	Channel03	29	mV		Channel04	33	mV	
	Channel05 3	-90	deg	۵	Channel06	0	mm	
	Channel07	30	mV		Channel08	31	mV	E
	AccelerometerX	0.00	g		AccelerometerY	0.00	g	
	AccelerometerZ	0.00	g		GyroX	0.0	deg/s	
	GyroY	0.0	deg/s		GyroZ	0.0	deg/s	
	SM_RPM		rpm		SM_PPS		%	
	SM_PEDAL_ANGLE		%		SM_WHSPD_FL		km/h	
Connected Devices	SM_WHSPD_FR		km/h		SM_WHSPD_RL		km/h	
AIM ANEL: No devices is view 2	SM_WHSPD_RR		km/h		SM_VEH_SPEED		km/h	
	SM_ECT		С		SM_OIL_T		С	
	SM_OIL_P		bar		SM_STEERANGLE		deg	
	SM_STEERSPEED		deg/s		SM_BRAKE_SW		#	
	SM_GEAR	-	gear		SM_FUEL_LEVEL		1	
	SM_KICKDOWN		#		SM_ATM_PRESS		bar	
Cestino Cestino	SM FUEL TEMP		c.		SM ENGINE TEMP		c	-



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.

🚰 RaceStudio 2.55.44												_ - ×
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Qnline	CH_7	Enabled	Channel_7		10 Hz	- Tem	perature VDO 60-200 °C	V .1		- 0.0	5.0	
	CH_8	Enabled	Channel_8		10 Hz	⊥ Wate	r temp. (SUZUKI SUPERSPORT)	V .1		1 0.0	5.0	
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Device Calibration	ACC_1	Enabled	LatAcc		10 Hz	I Press Press	ure VDO 0-3 bar ure VDO 0-10 bar	≡ g.01		-3.00	3.00	
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- 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"

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Calibration panel shows up:

Press "Calibrate" button of "Mid zero potentiometer"

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Device Longuration CH_1 Device Info CH_2 CH_3 CH_4 CH_5 CH_5 Qnline CH_8 CALC_GEAR CALC_GEAR	I Enabled	Channel n	ame	Sensor type	Status	Click here to calibrate		≤ km/h .1	0.0	2	250.0
Device Info CH_3 CH_4 CH_5 CH_6 CH_7 CH_8 CALC_GEAR	Enabled	LatAcc	Lateral acc	elerometer	Calibrated	Calibrate		• V 1	100		5.0
Device Info CH_4 CH_5 CH_5 CH_6 CH_7 CH_8 CH_8 CALC_GEAR CALC_GEAR	Enabled							- V.1	- 0.0		5.0
Qnline CH.5 CH.6 CH.7 CH.7 CH.8 CALC_GEAR	Enabled							• V .1	- 0.0		5.0
Qnline CH_6 CH_7 CH_8 CALC_GEAR	Enabled							. V .1	 0.0		5.0
Qnline CH_7 CH_8 CALC_GEAR	Enabled	Sensors to calibrate						× V.1	- 0.0		5.0
CH_8 CALC_GEAR	Enabled	Channel n	ame	Sensor type	Status	Click here to calibrate		▪ V .1	- 0.0		5.0
CALC_GEAR	Enabled	Channel 3	Mid zero p	otentiometer	Default value	Calibrate		⊥ V .1	 0.0		5.0
	Disabled	_				13		#	0	9	9
Device Calibration	I Enabled							g .01	-3.00		3.00
	Enabled							-C	- 0		15.0
BATT	Enabled							V .1	5.0		15.0
Customize Sensor											
				Transmit calibration		Cancel					
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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"

10 2.55.44												
Configuration Download Data	Import SmartyCam [Data Analysis Dev	ice Info Online	Device Calibration Customiz	e Sensor Language	?						
	System manager											
	1_		1			adu Cam Europtiana	<u> </u>	7				
tacing Data Power	Transmi	t (Receive	CAN-Net info		setting	Set acquisition system tir	ne				
IM Sportline Q	urrent configuration											
ader in Data Acquisition	Installation name	Data logger type	Ecu	Lap Timer	Vehicle name	Available time	Time with GPS	Total frequen	icy M	aster frequency	Expansions frequency	Tot. Expansions
	_OGGER_CONF	MXL PISTA	None - None	by GPS	READ	9.32.39 (h.m.s)	4.06.35 (h.m.s)	121 (Hz)	12	21 (Hz)	0 (Hz)	0
Analysis												
Allahana	Select configuration C	hannels System config	guration CAN-Expa	nsions configurator								
	Speed_1		Sensor calibration	sensor calibration								
Download Data	Wheel circumference	(mm) 1666		Channel Name		Sensor type	Measure unit					
	Pulses per wheel revolu	ution 1	·	Channel_3	Mid	zero potentiometer	mm					
	Pubes per wheetrevor											
nport SmartyCam	Channel identifier	Enabled/disabled	Sensors to au			Raw data	Measure		Measure	unit Low se	ale Higt	scale
microSD Data	RPM	Fnabled			Current values	0	-100.0 e lis	rate all	rnm	0	2000	0
	SPD 1	Enabled							≤ km/h .1	L 0.0	250.0	-
vice Configuration	сн_1	Enabled	Lat Oak	HIGH POSITION	Get Raw Value	4097	100		. V .1	.00	5.0	
	CH_2	Enabled	Lanace						• V .1	0.0 🖃	5.0	
	CH_3	Enabled		ZERO POSITION	Get Raw Value	1493	0		<mark> </mark>	스 0.0	5.0	
Device Info	CH_4	Enabled				0	100		. v .1	⊥ 0.0	5.0	
	CH_5	Enabled		LOW POSITION			-100		. V .1	 0.0	5.0	
[][CH_6	Enabled	Sensors to ca	How to ca	alibrate vour sensor:				⊥ V .1	⊥ 0.0	5.0	
Qnline	CH_7	Enabled	C	1. Maintain your sensor in	hich (or right) reference r	osition and click on (Get	mu unit unit compare		. V .1	- 0.0	5.0	
	СН_8	Enabled	Channel 3	button.	ringir (or ngilt) reference p		raw value> proper		▪ V .1	± 0.0	5.0	
	CALC_GEAR	Disabled		2 - Maintain your sensor in	zero (or rest) reference p	osition and click on <get< td=""><td>raw value> proper</td><td></td><td>#</td><td>0</td><td>9</td><td></td></get<>	raw value> proper		#	0	9	
evice <u>C</u> alibration	ACC_1	M Enabled		button.					g .01	-3.00	3.00	
	LOG_TMP	M Enabled		3 - Maintain your sensor in button	n low (or left) reference po:	ition and click on <get ra<="" td=""><td>sw value> proper</td><td></td><td>°C</td><td><u> </u></td><td>50</td><td></td></get>	sw value> proper		°C	<u> </u>	50	
	BATT	M Enabled		A least manager united	company dant to shows it	utiontad reference analtic			V .1	5.0	15.0	
ustomize <u>S</u> ensor				4 · Insert measure values	conespondent to above it	laicated reference positio	ris.					
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- 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)

	Current values	Raw data 2500	Measure 0.0		Current values	Raw data 4113	Measure 64.5
HIGH POSITION	Get Raw Value	0	100	HIGH POSITION	Get Raw Value	0	100
ZERO POSITION	Get Raw Value	2500	0	ZERO POSITION	Get Raw Value	2500	0
LOW POSITION	Get Raw Value	0	-100	LOW POSITION	Get Raw Value	0	-100



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"

vice Configuration Download Da	ita Import SmartyCam	Data Analysis Dev	ce into Unime Device	alibration Customize	Sensor Language ?							
	🦉 System manager											
Racing Data Power	Trans	nit (Receive	CAN-Net info	Smart	yCam Functions setting	Set acquistion system time]				
AIM Sportline	Current configuration							-				
orld Leader in Data Acquisition	Installation name	Data logger type	Ecu	Lap Timer	Vehicle name	Available time	Time with GPS	Total frequency	Master	frequency	Expansions frequency	Tot. Expansions
	LOGGER_CONF	MXL PISTA	None - None	by GPS	READ	9.32.39 (h.m.s)	4.06.35 (h.m.s)	121 (Hz)	121 (Hz	z)	0 (Hz)	0
Analysis	01.0		r lews	e . 1								
	Select configuration	Channels System config	uration CAN-Expansions co	nfigurator	974703907070404.00							
	Speed_1		Sensor calibration									
Download Data	Wheel circumference	(mm) 1666		Configuration name			System type					
_	Pulses per wheel rev	Nution 1		LOGGER CONF			MXI PISTA					
Import SmartyCam	Channel identifier	Enabled/disabled	Sensors to autocalibrate				Chall have be as described		Measure unit	Low scale	Hig	n scale
inicioso Data	RPM	Enabled					sensors in the list	e al	rpm	0	2000	0
	SPD_1	Enabled	Changel pa		Seprentine	Status	Click here to calibrate		km/h .1	• 0.0	250.)
Device Configuration	CH_1	Enabled	LatAcc	lateral acc	elerometer	Calibrated	Calibrate	- 1	1 V .1	 0.0	5.0	
	CH_2	Enabled	Luonee	Editoriate	.cicrometer	comprotect	Conorace	1	1 V 1	 0.0	5.0	
	CH_3	Enabled						-	່ <mark>mm 1</mark>	<u>-0.0</u>	5.0	
Device Info	CH_4	Enabled							1. V L	- 0.0	5.0	
	CH_5	Enabled							1 V .1	0.0 🛋	5.0	
	CH_6	Enabled	Sensors to calibrate						1 V .1	0.0 🛋	5.0	
Qnline	CH_7	Enabled	Chappel par	ne	Sensor type	Status	Click here to calibrate		1 V 1	- 0.0	5.0	
	CH_8	Enabled	Channel 3	Mid zero p	otentiometer	Calibrated	Calibrate	-	1 V .1	 0.0	5.0	
	CALC_GEAR	Disabled							#	0	9	
Device Calibration	ACC_1	Enabled							g .01	-3.00	3.00	
	LOG_TMP	Enabled							°C	I 0	50	
	BATT	Enabled							V .1	5.0	15.0	
Customize <u>S</u> ensor						_						
				🖌 🗸 1	Transmit calibration	4	Gancel					
Language					L.S.							



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.

4	1	
3	2	

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: 10kΩ
- tolerance on resistance value: ±5%
- precision (%):
 - o 0.030 for 10G potentiometer
 - o 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:
 - o 2.4W for 10G potentiometer
 - o 1.6 W for 5G potentiometer
- dissipated at 70°C:
 - o 1.5W for 10G potentiometer
 - o 1W for 5G potentiometer



<mark>6</mark> 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



