



ALFA CENTAURI DATASHEET



mASTRO with four channels



1 Charge Amplifier for mASTRO system

1.1 Description

The charge amplifier is designed for piezoelectric sensors (pressure, accelerometer, ecc).

The mASTRO system can host up to 10 Alfa Centauri modules, to optimize the space utilization based on the application. Modules can be added at any time.

Alfa Centauri is designed for a wide variety of sensors with different sensitivities.. Thanks to internal active electronics, Alfa Centauri supports an input range from 100pC to 28000pC. The typical application is for monitoring in-cylinder pressure of engines, especially in those applications where compactness is required (i.e. on-board vehicle and racing use).

A dedicated software is provided to configure sensor sensitivity and output amplitude for each channel. It's also possible to configure output offset, filter, time constant and output type.

The time constant is configurable, including auto drift compensation to reduce signal error and saturation problems.

The amplifier circuit is designed to minimize distortion and non-linearity while having a high signal bandwidth (filter programmable) and low noise.

The amplifier accuracy is $\pm 0.1\%$ guaranteed from calibration.

The amplifier housing is IP65 rated, made of anodized 7075-T6 aluminium, designed to guarantee a reliable operation over time.

The sensor connectors and signal outputs are BNC type, simplifying wiring and availability of mating connectors. Please refer to mASTRO datasheet to power supply, cable and other specifications.

The device is CE marked, in compliance with the EC directive 2004/108/CE.

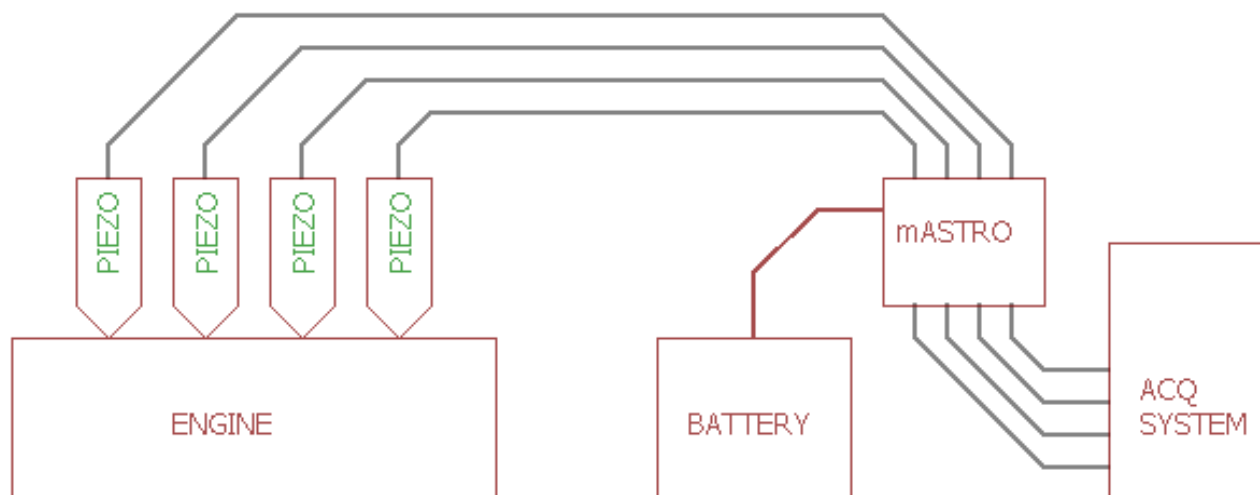
1.2 Features

- Modular with mASTRO platform
- Galvanic isolation channel by channel
- Pre-calibrated to 0.1% accuracy
- Input range up to 28000pC
- Auto drift compensation for in-cylinder engine pressure
- 16 bit output gain resolution
- $< 1\text{mV}_{\text{RMS}}$ Noise (1Hz-400kHz)
- Group delay up to $8\mu\text{s}$ (fully analog conditioning line)
- -25 to 105°C operating temperature
- Programmable output offset
- IP65, 7075-T6 aluminium
- Very compact channel height: 18mm

1.3 Application

- In-cylinder engine pressure (piezoelectric sensor)
- Industrial piezoelectric sensor
- Automotive piezo-accelerometer

1.4 Typical application



2 Specifications

2.1 Absolute maximum ratings

Characteristic	
Power consumption	1.7W per channel
Inrush power peak (3s)	2W per channel
Operating temperature	-25°C to 105°C
Storage temperature	-40°C to 125°C
Input Voltage limit	±12 V
Max Output Current	(short circuit) ±10 mA
V _{ESD} (JESD22-C101)	±1500 V
Vibration	10g sine 50-2000Hz

2.2 Electrical characteristics

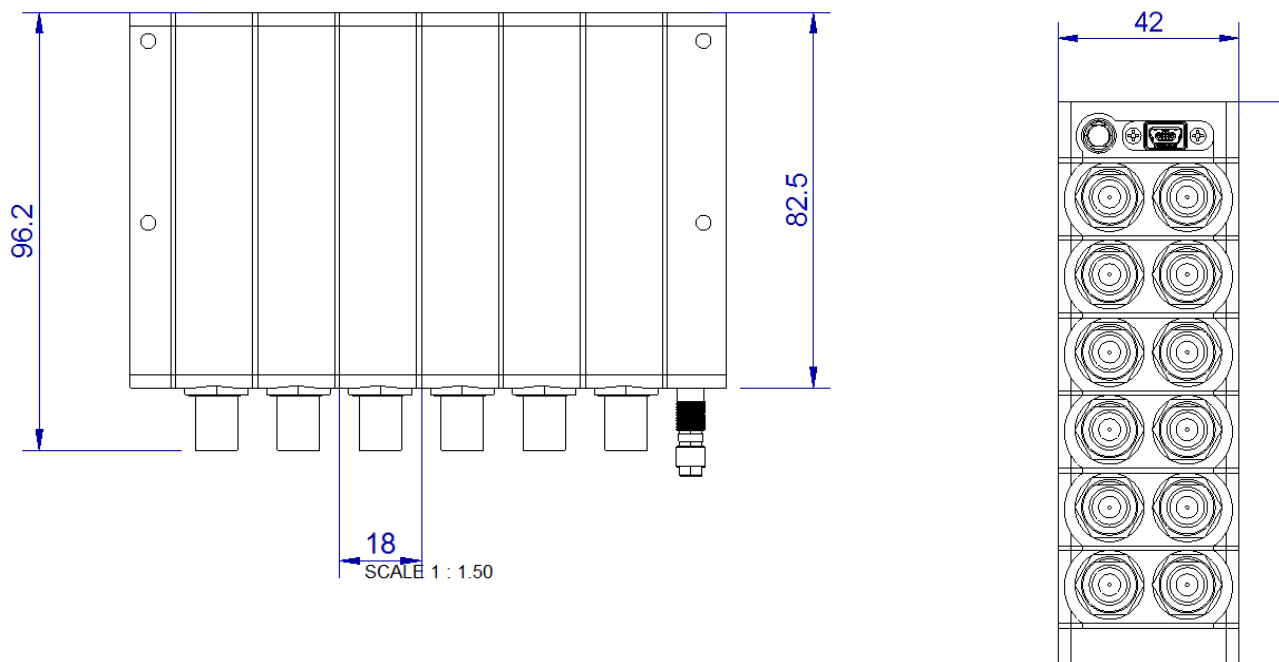
Characteristic	note	Min	Typ	Max	Units
Max Input range	User selectable		28'000		pC
Sensitivity	User selectable	0.2		64	mV/pC
Output resolution			16		bit
Time constant	User selectable	0.1		>400	s
Isolation	Channel by channel	250			V
Output range	User selectable			±10	V
Output impedance			6		Ω
Output offset	User selectable	-9.9		+9.9	V
Output offset accuracy			0.05	0.1	V
Cut-off frequency filter accuracy	-1db@fc			100	Hz
Group delay	10kHz 20kHz 30kHz 40kHz 50kHz 60kHz 70kHz 80kHz 90kHz 100kHz 110kHz 120kHz 130kHz 140kHz 150kHz		82 41 28 21 17 14 12 11 10 9 8 8 7 6 6		μs
Output noise	1Hz – 400kHz			1	mV _{RMS}
Accuracy				0.1	%
Start-up time				1	s

2.3 Mechanical characteristics

Characteristic	note	Value
Channel dimension	Without BNC	82.5 x 42 x 18 mm
Channel dimension	With BNC	96.2 x 42 x 18 mm

Channel height		18 mm
Weight	Per channel	90 g
Protection Marking	When mounted with mASTRO base	IP65
mASTRO slot requirements		1 unit

mASTRO + 6x Alfa Centauri



2.4 Error LED (on mASTRO)

Error LED on mASTRO indicates output saturation

3 Configuration tool for Alfa Centauri

3.1 Characteristics

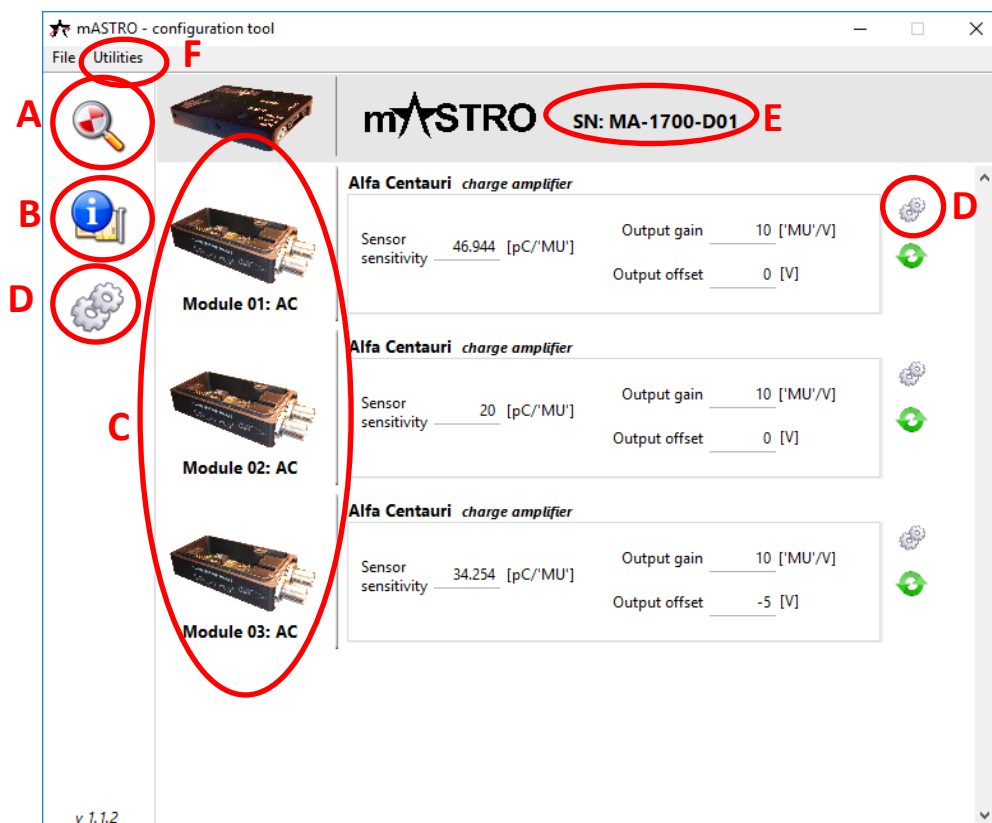
mASTRO – configuration tool allows to set Alfa Centauri relevant settings

- Sensor sensitivity
- Output gain
- Output offset
- Filter cut off frequency
- Time constant
- Floating output enable
- Firmware upgrade

3.2 mASTRO – configuration tool interface

Please refer to mASTRO datasheet for complete settings

- Search mASTRO system and connected channel
- View HW and FW version and serial of all channel
- Module type connected
- View advanced settings
- mASTRO serial number
- Utilities: Factory reset, Firmware upgrade, Reboot all



3.3 Alfa Centauri settings

Alfa Centauri charge amplifier 1

Module 01: AC

Sensor sensitivity 46.944 [pC/'MU'] 2

Output gain 10 ['MU'/V] 3

Output offset 0 [V] 4

5

Alfa Centauri charge amplifier *Advanced menu*

Module 01: AC

Filter cut off freq 150 kHz 6 Group delay [us]

Time constant Maximum 7 Time constant > 40000 [ms]

Floating output ON 8

Alfa Centauri charge amplifier *Info*

Module 01: AC

Serial AC-01EC9987D2 9

HW version 01 10 FW version 1.4 11

1. Channel name
2. Sensor sensitivity (use sensor calibration, pC/bar or pC/g)
3. Output gain: insert desired output amplitude (bar/V or g/V)
4. Output offset: insert from -9.9 to +9.9. Recommended to adapt signal for acquisition range
5. Reset drift (click to reset the sensor drift)
6. Select the frequency of filter. The correct group delay will be shown

Alfa Centauri cha

Filter cut off freq

- 10 kHz
- 20 kHz
- 30 kHz
- 40 kHz
- 50 kHz
- 60 kHz
- 70 kHz
- 80 kHz
- 90 kHz
- 100 kHz
- 110 kHz
- 120 kHz
- 130 kHz
- 140 kHz
- 150 kHz

Sensor sensitivity: 20 [pC/'MU']

7. Select the time constant.

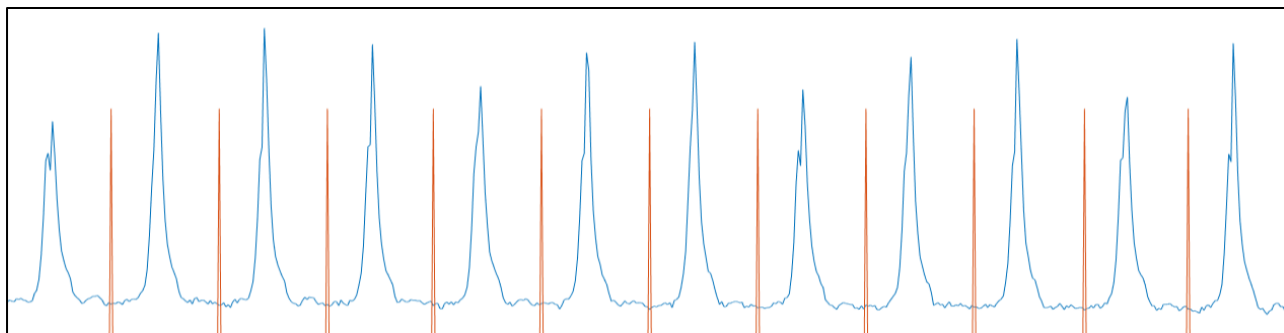
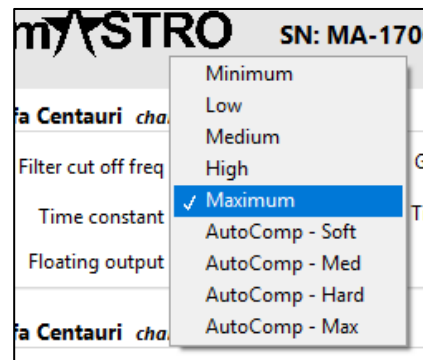
There are five values for fixed time constant and four values for auto-drift compensation mode.

The exact value of time constant is shown in millisecond.

At *Maximum* the time constant is typically more than 200s

In *Auto-Drift Compensation* the system tries to keep the signal within the optimal operating conditions of the charge amplifier by modulating the time constant, while minimizing the effect on the signal.

Red signal shows the position within the combustion cycle of the correction.

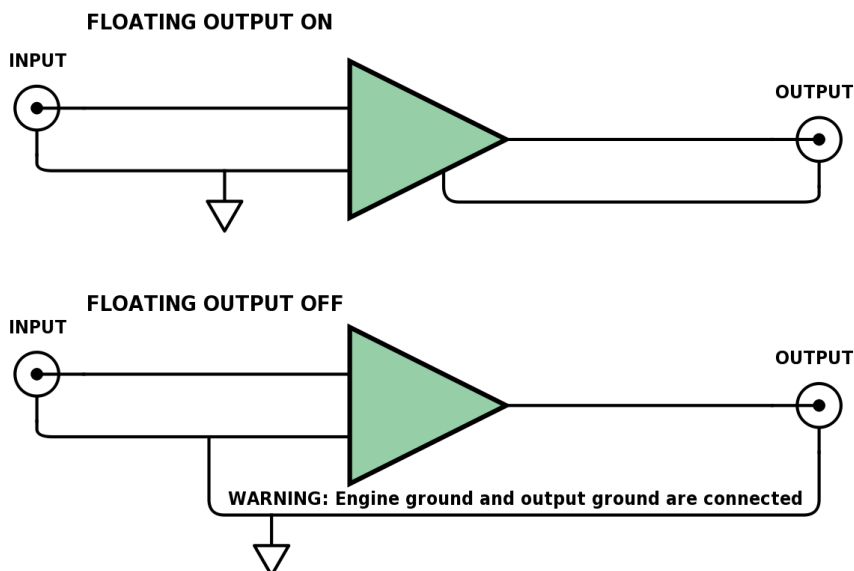


NB: Auto Drift compensation should be used only for in-cylinder pressure signals.

8. Enable or Disable floating output

Floating output ON is for ground referenced acquisition systems

Floating output OFF is for differential acquisition system: connect sensor/engine ground to Vin-



NB: if unsure, leave floating output ON

9. Serial number of Alfa Centauri Channel

10. Hardware version

11. Firmware version. You can download the last firmware from www.alma-automotive.it

Please read *Alfa Centauri Upgrade Guide* supplied with new firmware.

REV	DATE	CHANGE DESCRIPTION:
01	29/08/2017	First release
02	13/12/2018	Important update on group delay



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