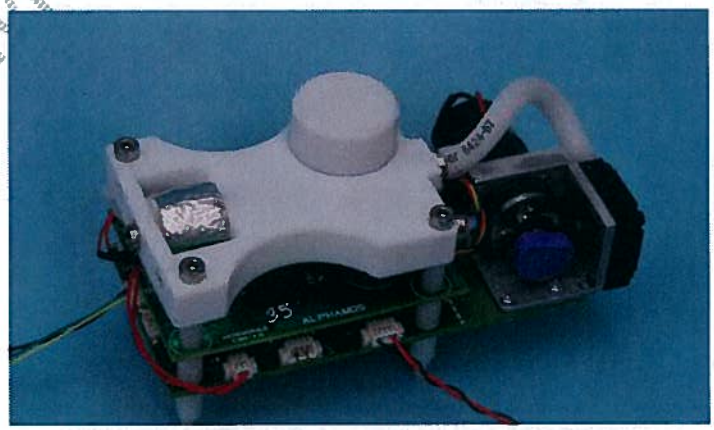
CONFIDENTIAL



NEEM Project

User Guide





Alpha MOS France
20, avenue Didier Daurat
31400 Toulouse – France
Tel. +33 5 62 47 53 80
info@alpha-mos.com

Alpha MOS America
7502 Connelley Drive, Suite 110
Hanover, MD 21076-1705 – USA
Tel. (410) 553-9736
amusa@alpha-mos.com

Alpha MOS China
Suite 705A, Xin Da Tower
#322 Xian Xia Road
Shanghai, P. R. China, 200336
Tel. 86 (0) 21 6208 1555
asia@alpha-mos.com

Alpha MOS Japan
Jowa Takanawa Bld. Minato-ku 8F
1-5-4 Takanawa
Tokyo 108-0074 - Japan
Tel. +81-3-5475-3291
japan@alpha-mos.com

Manual Reference NEEM-Systems_MBE (Request number to the production dpt)

www.alpha-mos.com

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REVISION STATUS

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a	06/2010		Original release

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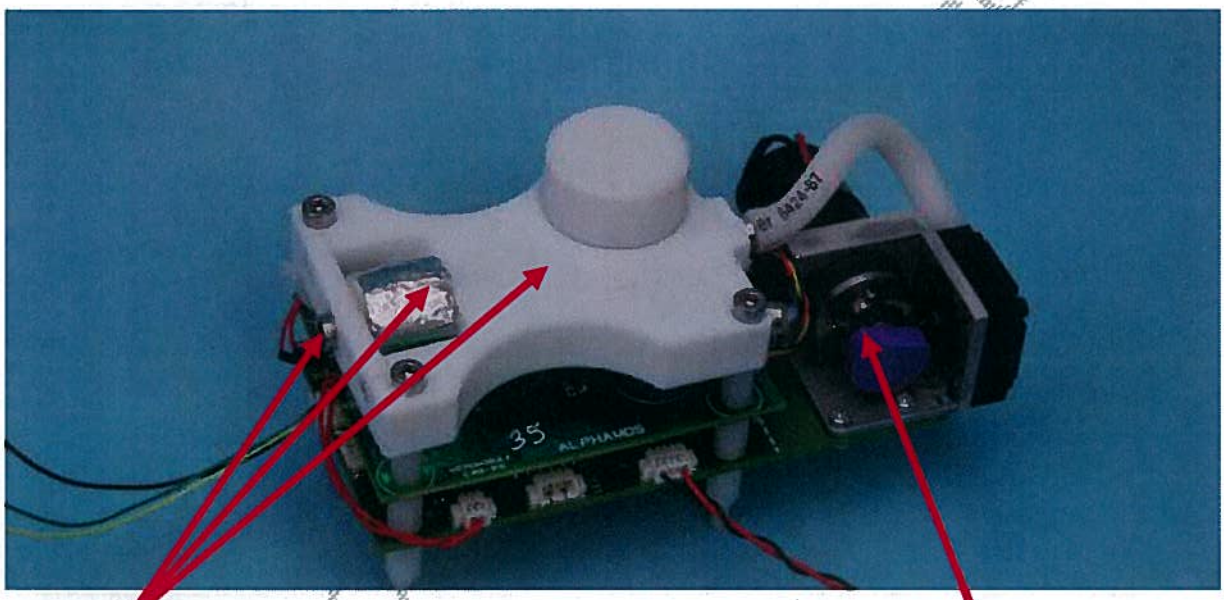
SAFETY INFORMATION

This Neem Module is designed for integration within a flying system. It doesn't have any electrical nor thermal cover protection in order to reduce the weight.

- ***Avoid touching the module when running; some parts could be hot.***
- ***Avoid any contact with metallic or conductive part in order to prevent short cut***
- ***Avoid touching the mechanically rotating part of the micro-pump***



Hot surfaces **rotating part**

Warning: Do not use silicon (seal , grease, cleaning…) near the sensors.
This will poison the sensors.

DECLARATION OF CONFORMITY

This module is a prototype, no declaration of conformity is required

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WARRANTY

The Neem Module is under warranty for one year starting from delivery, covering parts and labor at Alpha MOS factory (20 av Didier Daurat 31 400 Toulouse France).

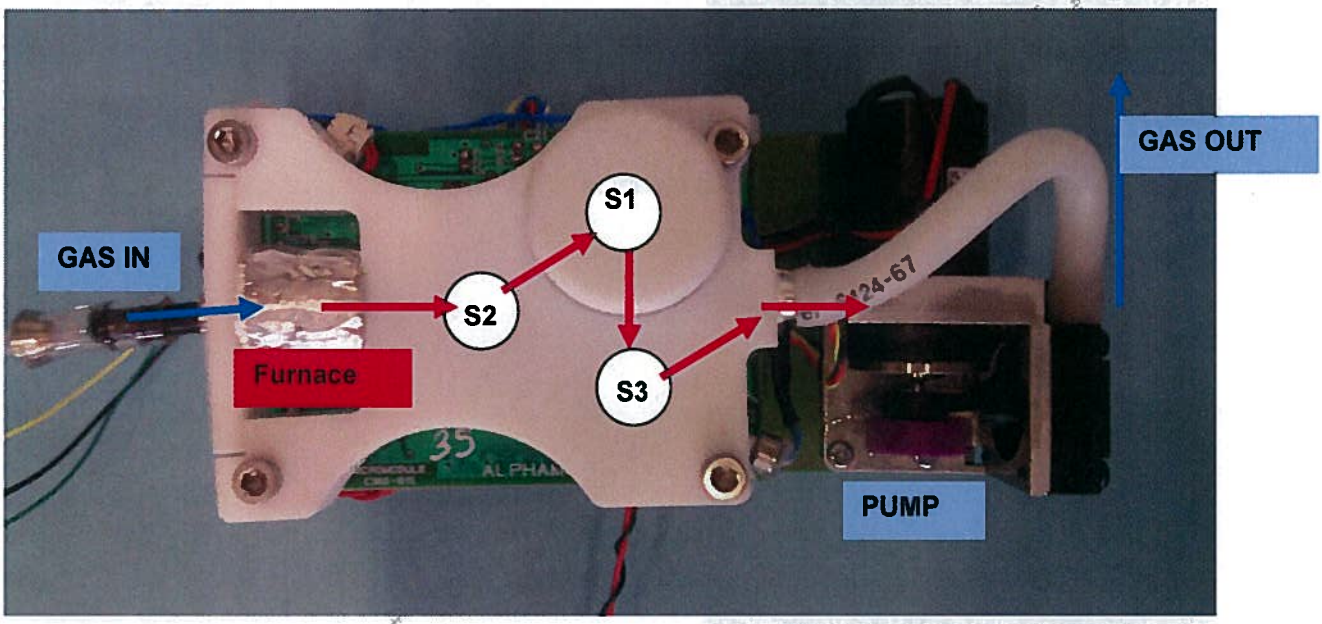
Sensors are not under warranty.

1. USE AND FUNCTIONALITIES

NEEM module is a small electronic nose dedicated to small flying aircrafts.

It will analyze gas thanks to 3 Metal Oxide Sensors :

- **S1** : P55/25 sensor dedicated to smoke detection (containing CO)
- **S2** : P30/1 sensor for COV, solvent, ethanol detection
- **S3** : P10/9 sensor for hydrogen detection

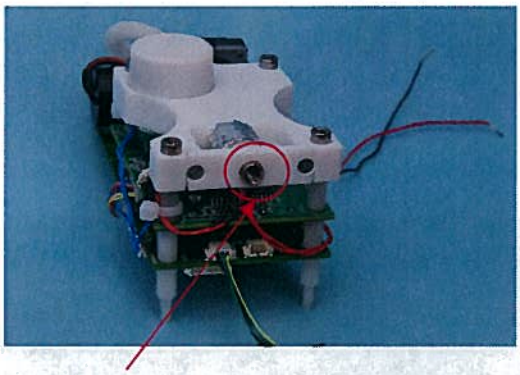


In order to obtain reproducible analysis conditions the gas flow is regulated by a pump and thermostated by a micro furnace. Hygrometry is also measured within the air flow.

2. INSTALLATION PROCEDURE

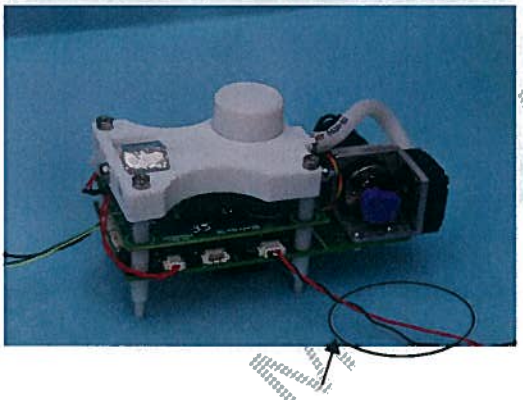
- *Carefully unpack the electronic nose*

2.1 Fluid connection



Connect tubing to the gas inlet M5 thread let available

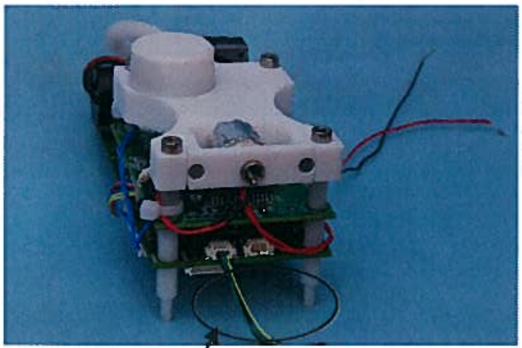
2.2 Power connection



Connect Red wire to continuous Plus (9 to 18 Volts)

Connect Neutral to black wire

2.3 I2C Connection



Connect Black Wire : Mass

Connect Green wire : SDA (Serial DAta line)

Connect Yellow wire : SCL (Serial CLock line)

2.4 I2C protocol

2.4.1 Set chamber temperature and pump voltage

When starting the module, all temperature values are set at 0 °C and pump voltage at 0 V.

Never apply less than 4V to the pump if chamber setpoint is applied. Without an airflow inside the system, thermal regulation is impossible. Anyway, the temperature of the furnace is limited to 130°C.

	Writing T°C Chamber and pump Voltage Setpoint								
master bus									
slave bus									
		Adress			T°C setpoint		Pump voltage setpoint		
Module One	Start	0x52	Writing	Ack	8 bits	Ack	8 bits	Ack	Stop
					T°C *2		Voltage*20		
Nominal Value					80 (40°C)		100 (5V)		
					Don't applied T°C setpoint without applied a mimium of 4Volt to the pump				

2.4.2 Reading status, chamber temperature, pump voltage and hygrometry

	Reading Status,T°C ,Pump Voltage, % of hygrometry															
master bus																
slave bus																
		Adress			Status		Room Temperature		Pump voltage		Hygrometry					
Module One	Start	0x52	read	Ack	8 bits	ack	8 bits	ack		ack	8 bits	ack	stop			
					Status (see table)		T°C *2		Voltage*20		% of hygrometry					

Status definition

					Temperature status		pump status	
	bit1	bit2	bit3	bit4	bit5	bit6	bit7	bit8
status table	Not used	Not used	Not used	Not used				
Temperature OK					0	0		
Temperature no OK Outside +/-0.5°C					0	1		
No loading or pump stopped							0	0
pump Ok							0	1
Too much pump current							1	0

2.4.3 Writing heater tension

When starting the module, all values are set at 0.

Be careful, never apply more than 2.4 Volts to sensor 1 (value 87), since sensor could be damaged.

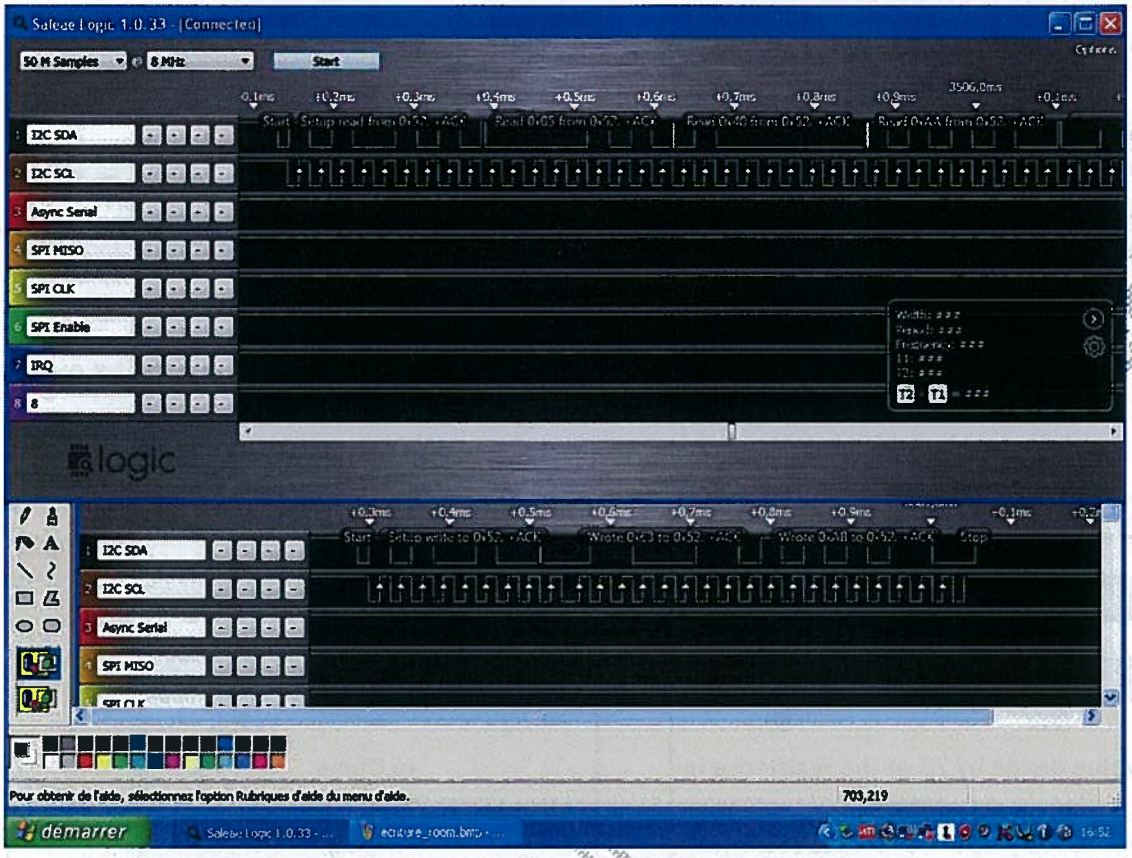
	Writing sensors tension															
master bus																
slave bus																
		Adress					Sensor1 Heater Tension		Sensor 2 Heater Tension		Sensor 3 Heater Tension					
Moduke Two	Start	0x57	Write	ack	0x06	ack	8 bits	ack	8 bits	ack	8 bits	ack	stop			
							0 to 5.3 volt		0 to 5.3 volt		0 to 5.3 volt					
							0 -> 0V 1-> 0.9 V 255-> 5.3 Volt V=57.72*Value-50.95		0 -> 0V 1-> 0.9 V 255-> 5.3 Volt V=57.72*Value-50.95		0 -> 0V 1-> 0.9 V 255-> 5.3 Volt V=57.72*Value-50.95					
Nominal Value							86 (2.39 V)		244 (5.1V)		244 (5.1V)					
							Never exceed 2.4 V for sensor 1 (Value =87)									

2.4.4 Reading sensors resistance

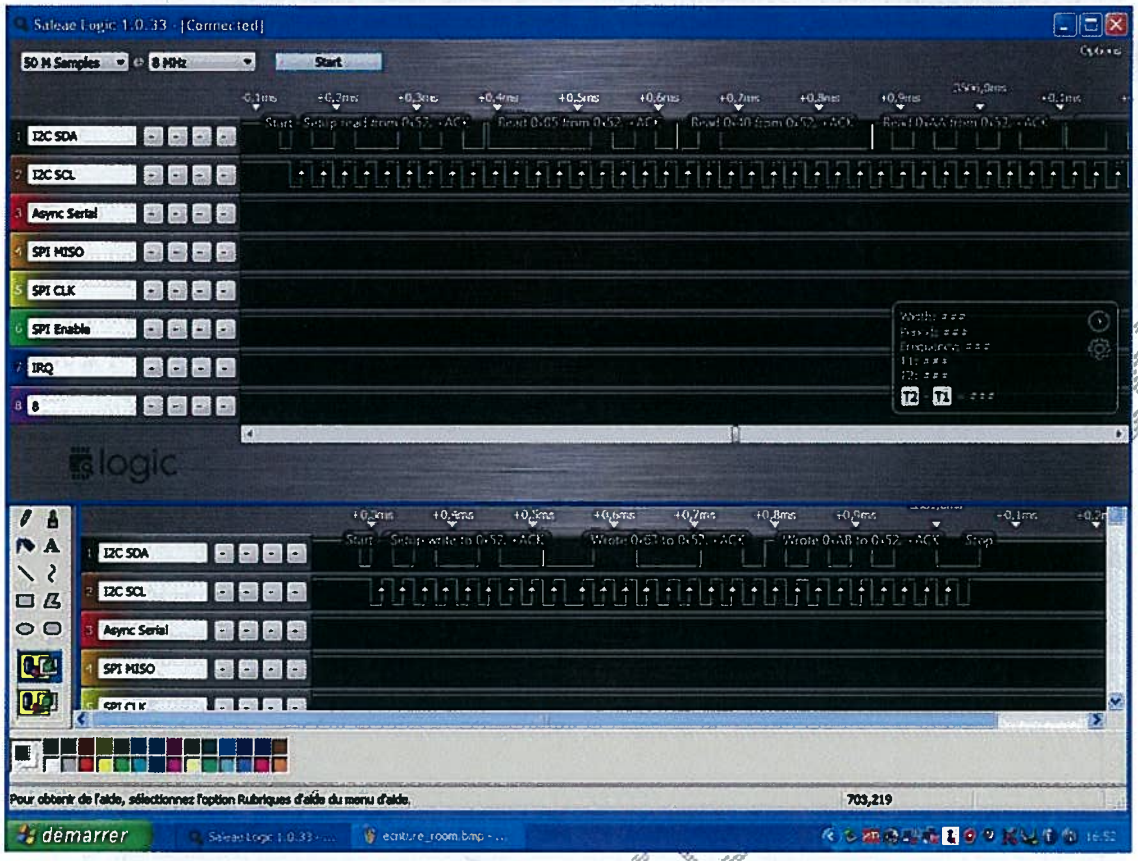
	Setup reading of board							Reading of sensors resistance value						
master bus														
slave bus														
		adress							adress			Resistance of Sensor1		
Module Two	Start	0x57	Write	ack	ox00	ack	stop	start	0x57	read	ack	MSB1	ack	LSB1
												8bit		8bit
												Value divide by 20 of the resistance in Ohms 0 to 65535 (*20)-> 0 to 1 310 700 Ohms)		

Reading of sensors resistance value									
	Resistance of Sensor2				Resistance of Sensor3				
ack	MSB2	ack	LSB2	ack	MSB3	ack	LSB3	ack	stop
	8bit		8bit		8bit		8bit		
	Value divide by 20 of the resistance in Ohms 0 to 65535 (*20)-> 0 to 1 310 700 Ohms)				in Ohms 0 to 65535 (*20)-> 0 to 1 310 700 Ohms)				

2.4.5 Example of information in the I2C bus

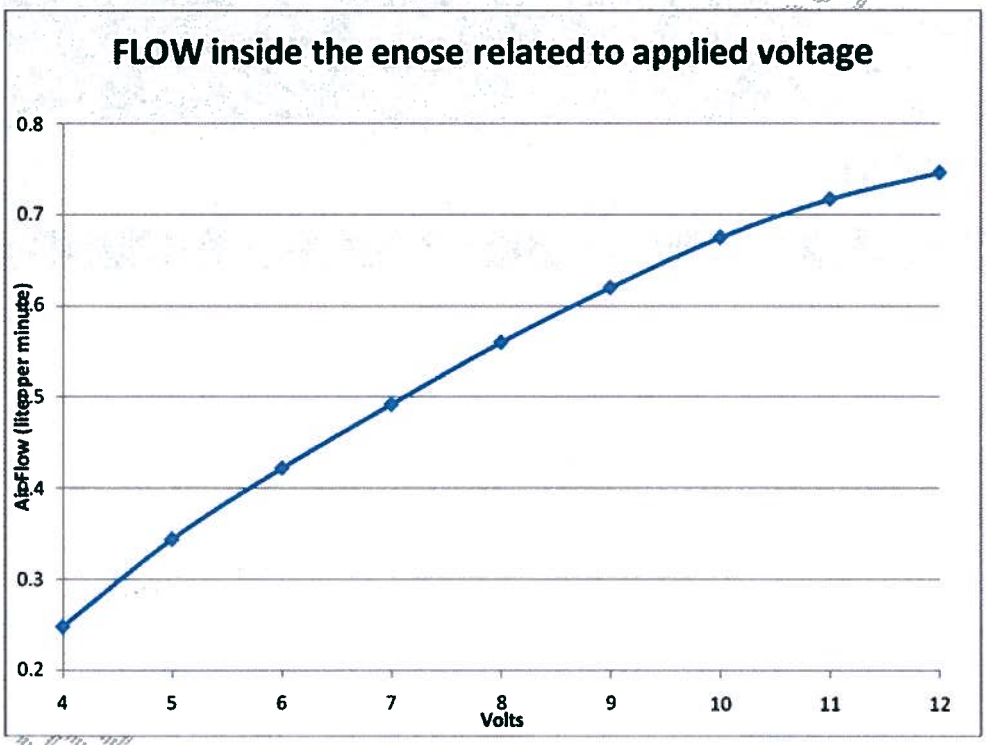


NEEM MODULE



3. SPECIFICATIONS

- **Length: 120 mm – Width: 55 mm – Height: 60 mm**
- **Weight: 185 g**
- **Power supply: 9V to 18V continuous**
- **Max Amperage: 1.8 Amps**
- **Power consumption (Pump voltage: 6V, Chamber T°: 40°C, outside T°: 25°C , input voltage: 12V) : 4 Watts (max current during test 0.45 Amps)**
- **I2C voltage: 5V**
- **Air flow through the system : the air flow depends on tension applied. It is adjustable between 0.25 and 0.75 L per minute**



Tests have been performed to check sensors activity.

The sensors react correctly with the following gases:

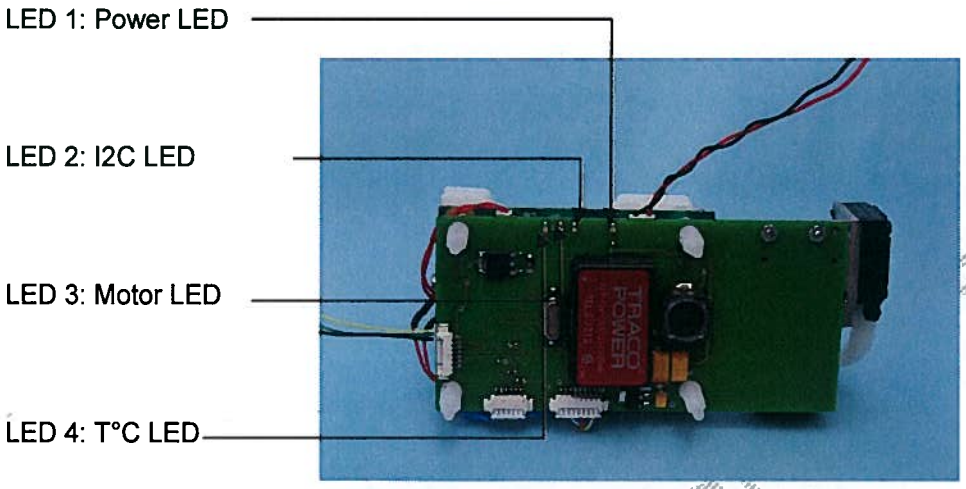
- **H_2**
- **Smoke (coming from cigarette)**
- **Butane**
- **Ethanol**

The system has run for four days without any trouble, at 60 °C with the pump at 6 V.

4. APPENDIX

4.1 Appendix: LEDS code

4.1.1 LEDS designation



4.1.2 LED Colours and blinking code

LED 1: POWER LED : Green when power is "ON"
LED 2: I2C LED : Green when communication on I2C
LED 3: MOTOR LED : Red blinking if motor not present or not started
Red permanent if too much current required
Off if normal
LED 4: heater LED : Off if T°C comprised between +/- 0.5°C around chamber T°C setpoint
Red blinking if outside