http://www.didel.com/ **info@didel.com** http://www.bricobot.ch/ **info@bricobot.ch**

www.didel.com/mot/Rome.pdf

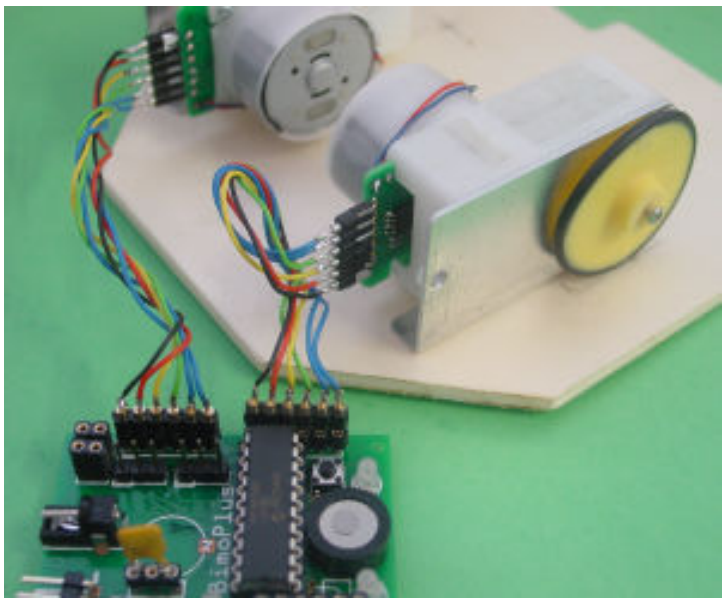
ROME - Didel multipurpose motor for robotics

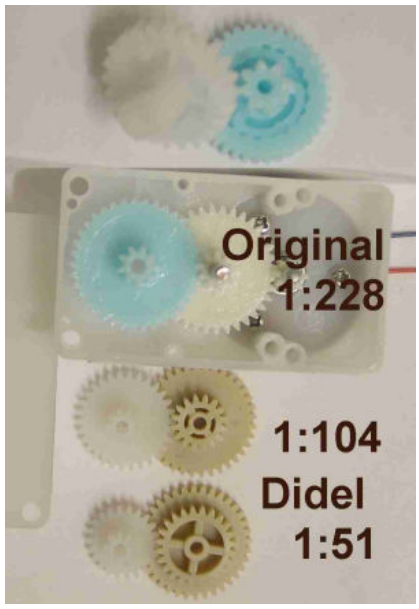
What do you expect for a motor you can use for your nicely designed robot ?
Good torque, low power, low noise, optimum gear ratio,
speed and position control, low cost.
We have it ! – ROME for RObot Motor with Encoder

The motor itself is well known. You can buy it from Solarbotics.com. It has drawbacks like all existing robotic motors who never match all the requirements above. But Didel developed special gears and a PCB so you can have a motor with three possible gear factors and an encoder. Just buy the extension kit from Didel and distributors if you already have the motor.

		suggested price USD/CHF
Rom-otor	3-6V, 1 :228, 20 Ohm, 70 grams	7
Rom-gear	Gear kit for 1 : 104 and 1 : 51 factor	4
Rom-enco	Encoder and motor driver kit 12 transitions per motor turn	9
Rom-supp	Pair of alu supports for 2 motors (out of stock)	3.5
Rom-wheel	Solabotics GMPW 69mm dia, 8mm thick	5
Rom-twin	2x Em-otor+Em-gear+Em-enco+GMPW (no support)	38 (save 8)

Two motors with encoders for 28 USD only, and you can control precisely a lightweight and responding robot in the 300 grams range. No need for heavy batteries, no expensive 9 or 12 V supply. Just one 3.5 to 5V supply for the logic, the sensors and the motors. Simple !





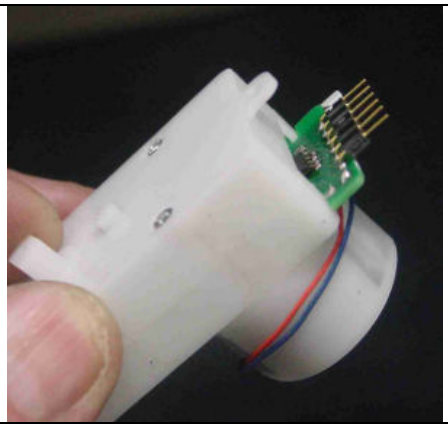
Motor specs at 4V : noload current 30mA @ 18 RPM, max efficiency 150 mA @ 15 RPM, 900 gcm, stall 350 mAh, 3000 gcm.

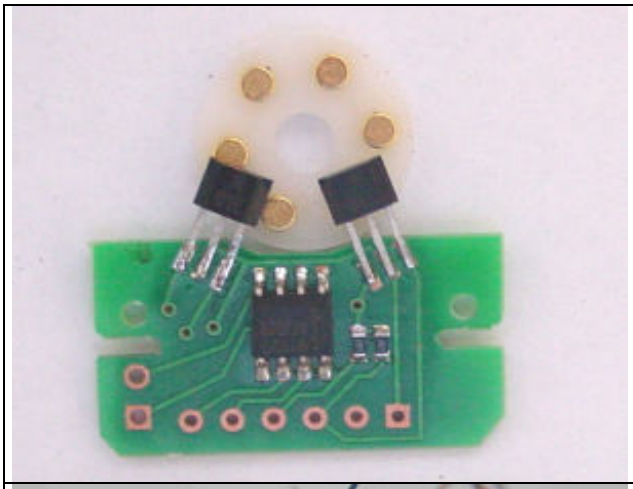
For a mobile robot platform with 4-5 cm wheels, the gear ratio must be 50-100. The Em-otor and Solarbotics GM17 ratios are 228 :1, good for a robot arm, but too slow for the robot wheels. Didel has developed two sets of gears to get a 104 :1 and 51 :1 ratio and it is easy to substitute two gears.

Original	8 – 36 / 9 – 37 / 9 – 37 / 8 – 24	factor 1 : 228
Option 1	8 – 36 / 16 – 30 / 9 – 37 / 8 – 24	factor 1 :104
Option 2	8 – 36 / 24 – 22 / 9 – 37 / 8 – 24	factor 1 :51

We selected this geared motor because of its efficiency and a construction with enough space inside to add an encoder that allows to know with a simple software the exact distance covered by the robot and its speed.

A disk with two or 6 magnets must be inserted on the pinion.
Two hall sensors generate the quadrature signals any microcontroller can decode.
A motor driver (H-bridge) is already on the PCB. Find 4 bits on you microcontroller, 2 inputs and 2 outputs, and the interface is done.

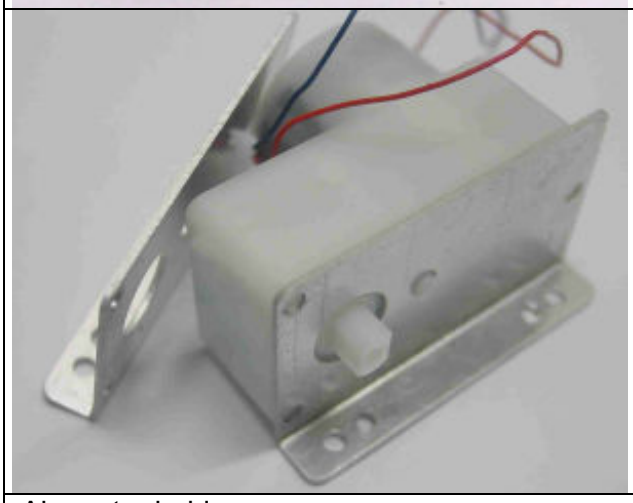




A 6-pin SIL connector (2.54mm) interface with the Hall sensors and the motor. Software can decode 12 edges per turn, evenly spaced.

Connector pinout

1 Gnd (square pad)
2 Vcc 3.5 to 6 Volts
3 Encoder channel 1
4 Encoder channel 2
5 Motor control 1
6 Motor control 2

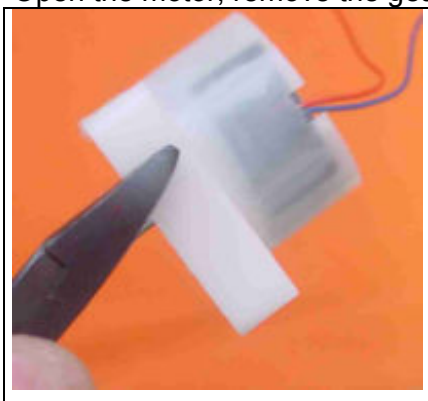


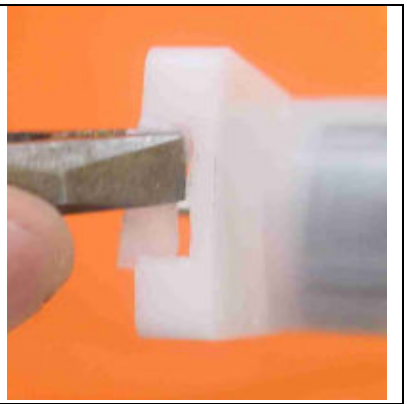
Alu motor holder

We work on wheels and levers

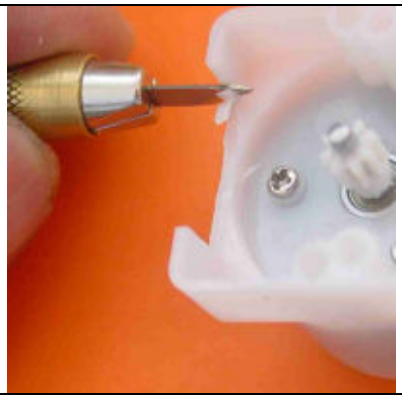
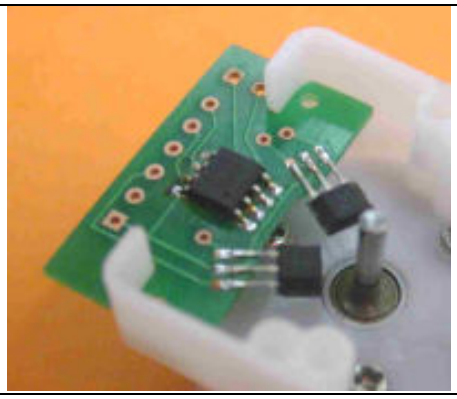
How to install the encoder

Open the motor, remove the gears

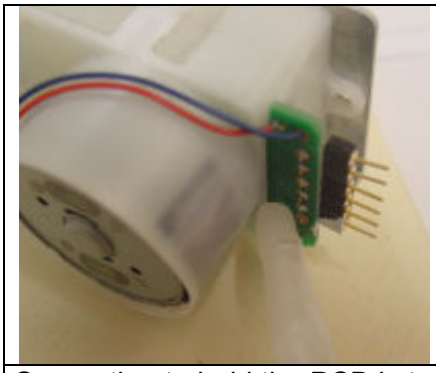
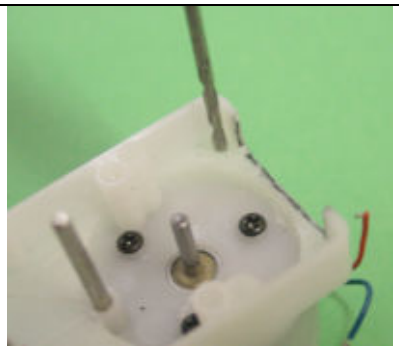
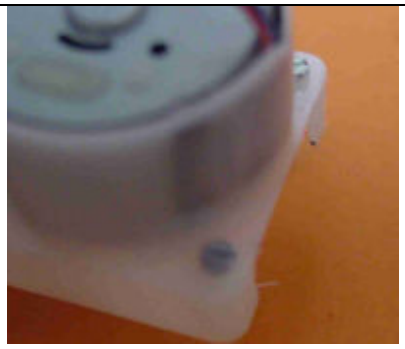




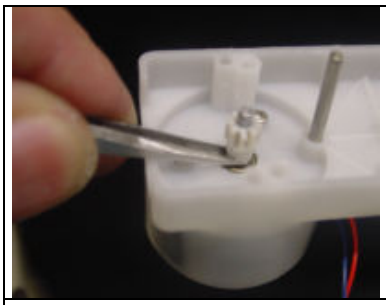
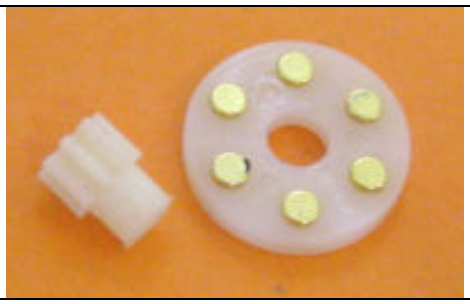
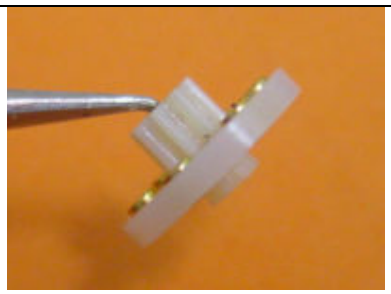
Use a plier cutter and a plier to cut and break the side next to the motor, leaving 4-5mm every side

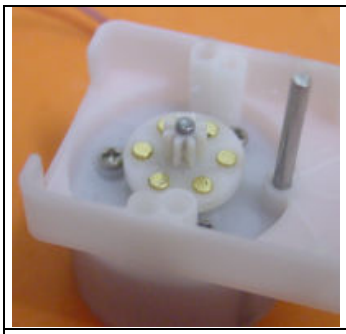
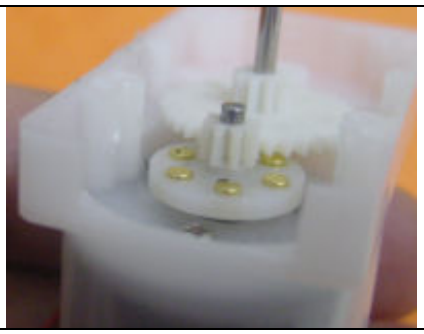
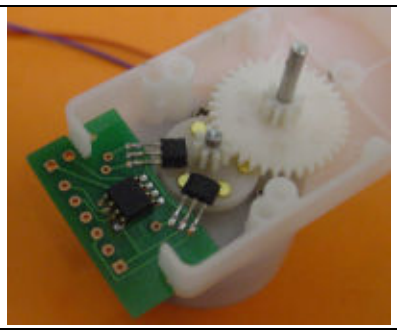
Finish with a sharp knife, so the opening is symetrical and 18mm wide. Check the PCB inserts in the slots. Must be a tight fit preferably.

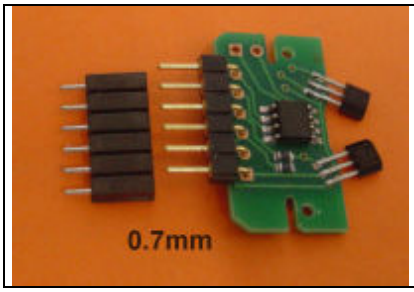
One option to hold the PCB is to use two M1.6x4 screws. You need to drill with a 1.3-1.4 mm drill through the PCB holes, then remove the PCB and enlarge the hole in the plastic to 1.6-1.7mm.

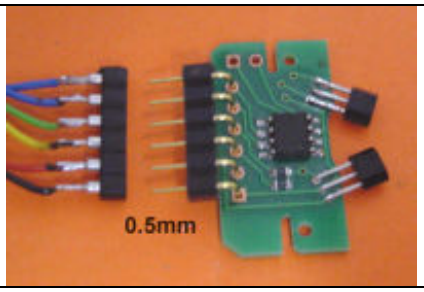




Remove the motor pinion and insert the disk. Put the pinion back, check for a small play between the gear and motor bearing, so it spins freely.

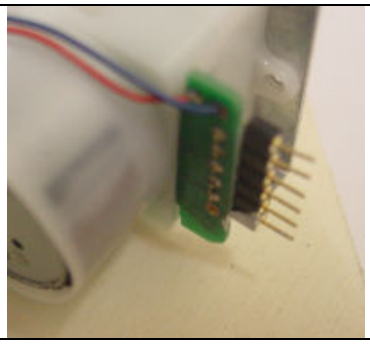




Insert the first gear. There is enough space for the magnets and it will not touch, except if the pinion is not correctly inserted. Check the PCB again. Distance between magnets and Hall sensors is not critical. Of course it must not touch. 1 mm gap is still acceptable.





Solder the connectors. Male connectors are logical, since the motor is a slave receiving the power, but you may have your reason to use male, female, straight or 90 degrees, 0.5mm or 0.7mm pins. Micromatch and flat cable is a more professional option. Put the PCB in place, Cut, strip and solder the motor wires.



Decide how you will hold the PCB. If you have drilled the holes, just use the screws. If you prefer to glue, that's OK. If you consider the fit is tight enough, check from times to times what is the effect of vibrations.

Note about PWM/PFM
Recommended PWM or PFM frequency is in the range of 500 – 1000 Hz.
Examples of PWM and PFM routines for the Microchip microcontrollers in http://www.didel.com/picg/doc/PicSoft.pdf section 10 page 14.

Encoder signals
What is usually done is to sample the two outputs at 1 khz min and apply the algo suited for the processor and language you use. See www.didel.com/mot/RomEnco.pdf for more explanations and example of optimized Microchip Pic program.

Simpler algorithms can be used if only position in one direction has to be known or if only speed is important.

Relation between encoder, wheel diameter and distance

The encoder software gives 12 pulses per turn
The geartrain has 3 possible factors :

Original	8 – 36 / 9 – 37 / 9 – 37 / 8 – 24	factor **1 : 228**
Option 1	8 – 36 / 16 – 30 / 9 – 37 / 8 – 24	factor **1 :104**
Option 2	8 – 36 / 24 – 22 / 9 – 37 / 8 – 24	factor **1 :51**

1:228 means 12 x 228 = **2736 pulses** per shaft turn
If the wheel is 50mm dia, 157mm circumference, this means 0.0578 mm per pulse
If you want 0.05 mm per pulse (20 pulses per mm) use a wheel dia of 43.5mm
If you want 0.0625 mm per pulse (16 pulses per mm) use a wheel dia of 54.46mm

1:104 means 12 x 104 = **1248 pulses** per shaft turn
If the wheel is 50mm dia, 157mm circumference, this means 0.126 mm per pulse
If you want **0.125 mm** per pulse (8 pulses per mm) use a wheel dia of **49.6mm**
note : for a processor, the best is to divide by 2, 4, 8, 16..

1:51 means 12 x 51 = **612 pulses** per shaft turn
If the wheel is 50mm dia, 157mm circumference, this means 0.256 mm per pulse
If you want **0.25 mm** per pulse (4 pulses per mm) use a wheel dia of **48.70mm**

Specifications for the motor driver

马达控制驱动芯片 **L9110**

特点：

- 低静态工作电流；
- 宽电源电压范围：2.5V-12V；
- 每通道具有 800mA 连续电流输出能力；
- 较低的饱和压降；
- TTL/CMOS 输出电平兼容，可直接连 CPU；
- 输出内置钳位二极管，适用于感性负载；
- 控制和驱动集成于单片 IC 之中；
- 具备管脚高压保护功能；
- 工作温度：-20°C-80°C。

DP 后缀 塑料封装(DIP8)

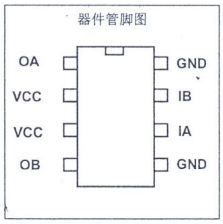
SO 后缀 塑料封装(SOP8)

描述：

L9110 是为控制和驱动电机设计的两通道推挽式功率放大专用集成电路器件，将分立电路集成在单片 IC 之中，使外围器件成本降低，整机可靠性提高。该芯片有两个 TTL/CMOS 兼容电平的输入，具有良好的抗干扰性；两个输出端能直接驱动电机的正反向运动，它具有较大的电流驱动能力，每通道能通过 800mA 的持续电流，峰值电流能力可达 1.5A；同时它具有较低的输出饱和压降；内置的钳位二极管能释放感性负载的反向冲击电流，使它在驱动继电器、直流电机、步进电机或开关功率管的使用上安全可靠。L9110 被广泛应用于玩具汽车电机驱动、脉冲电磁阀门驱动，步进电机驱动和开关功率管等电路上。

管脚定义：

序号	符号	功能
1	OA	A 路输出管脚
2	VCC	电源电压
3	VCC	电源电压
4	OB	B 路输出管脚
5	GND	地线
6	IA	A 路输入管脚
7	IB	B 路输入管脚
8	GND	地线



绝对最大范围： Ta=25°C

符 号	参 数	最 小	典 型	最 大	单 位
Vcc max	电源电压	2.2	5.0	12.0	V
Iout max	输出电流	—	800	1000	mA
VH_{in}	输入高电平	2.2	5.0	12.0	V
VL_{in}	输入低电平	0	0.5	0.7	V
Pd max	允许电源消耗	—	—	800	mW
Topr	操作温度	-30	25	85	°C

地址：深圳市南山区南油立交创世纪滨海花园 4 栋 6D 邮编：518054
TEL:0755-26965868 FAX:0755-26549868 Http://www.asic.net.cn Email: Sales@asic.net.cn

马达控制驱动芯片 **L9110**

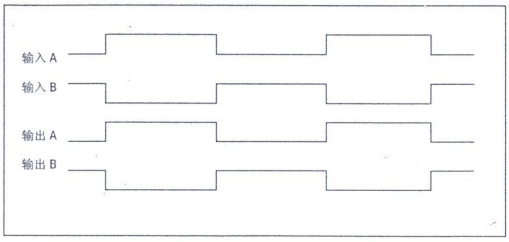
电气特性： Ta=25°C Vcc=5V

		范围			
		最小	典型	最大	
I_{DD}	静态电流	—	0.1	2.0	uA
$V_{o(sat1)}$	输出饱和压降 Io=500mA	—	1.00	1.15	V
$V_{o(sat2)}$	输出饱和压降 Io=200mA	—	0.75	0.85	V
I_{IN}	操作电流	—	100	200	uA
I_{OUT}	持续输出电流	750	800	850	mA
I_{max}	电流峰值	—	1500	2000	mA

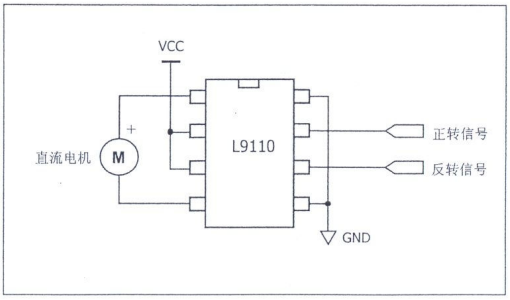
逻辑关系：

IA	IB	OA	OB
H	L	H	L
L	H	L	H
L	L	L	L
H	H	L	L

管脚波形图：



应用电路图：



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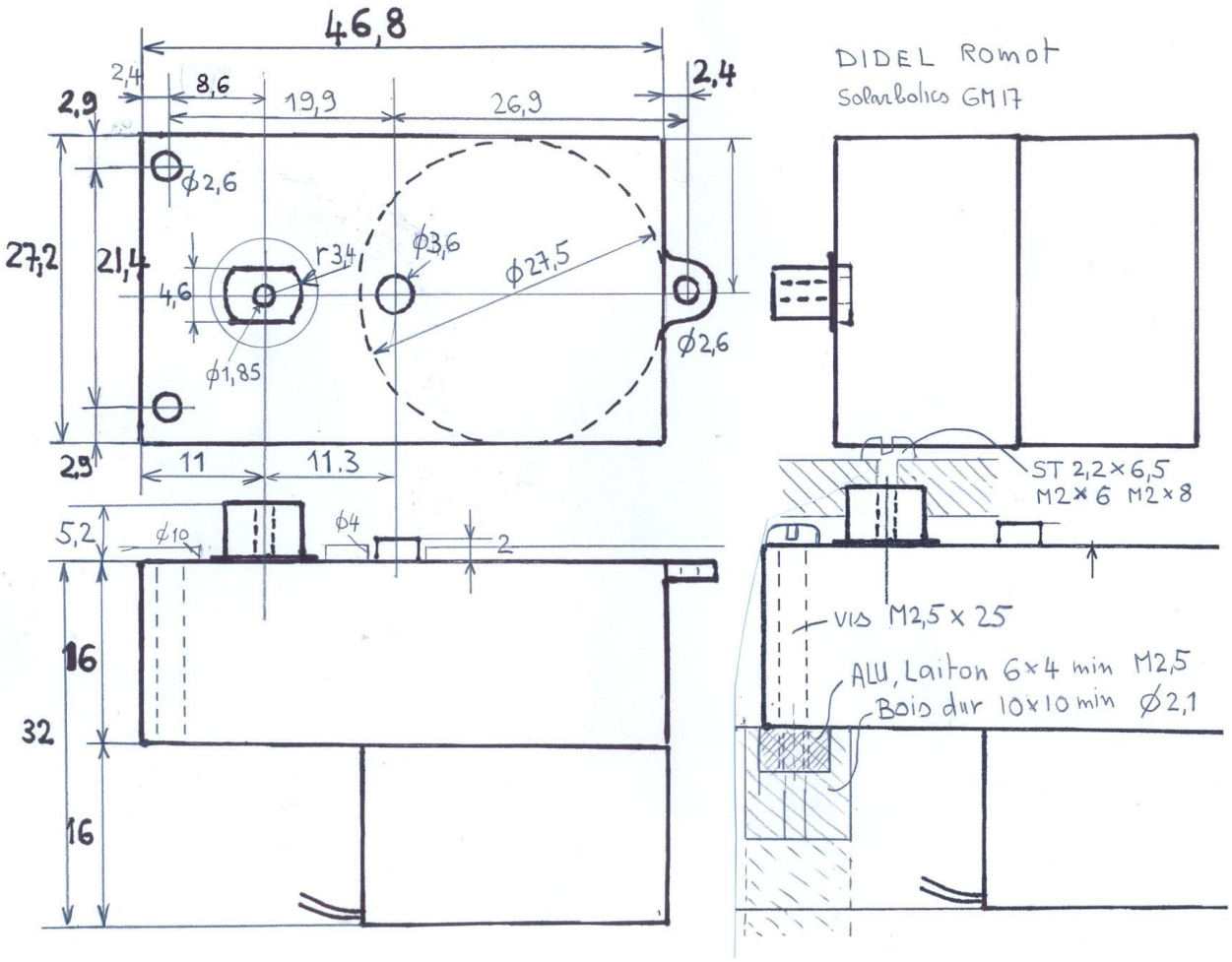
Motor sizes



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