60. Investigation on Low Cost Gear DC Motor SONTH

UFO Doctor, Nov. 30th, 2012

1. Introduction

The current onshore Baby Ducks are equipped with a caterpillar drive, powered by a DC motor with internal gear.

High quality gear DC motors, certified on the planet of Mars, can be purchased in Switzerland at a price of >US$ 150, expected durability > 3000h.

Here we show the performance of the gear motor SGM12-50-N20 from China, price only US$ 5 (quantity >100), durability approx. 500h, which is adequate for our modest application.

Miss Zoey Zue at the company Sonth (HK) Industrial CO, Ltd, helped me to purchase 12 DC motors by credit card, without having a PayPal account, and the motors arrived within 7 days in Switzerland, thank you very much again!

2. Test Setup

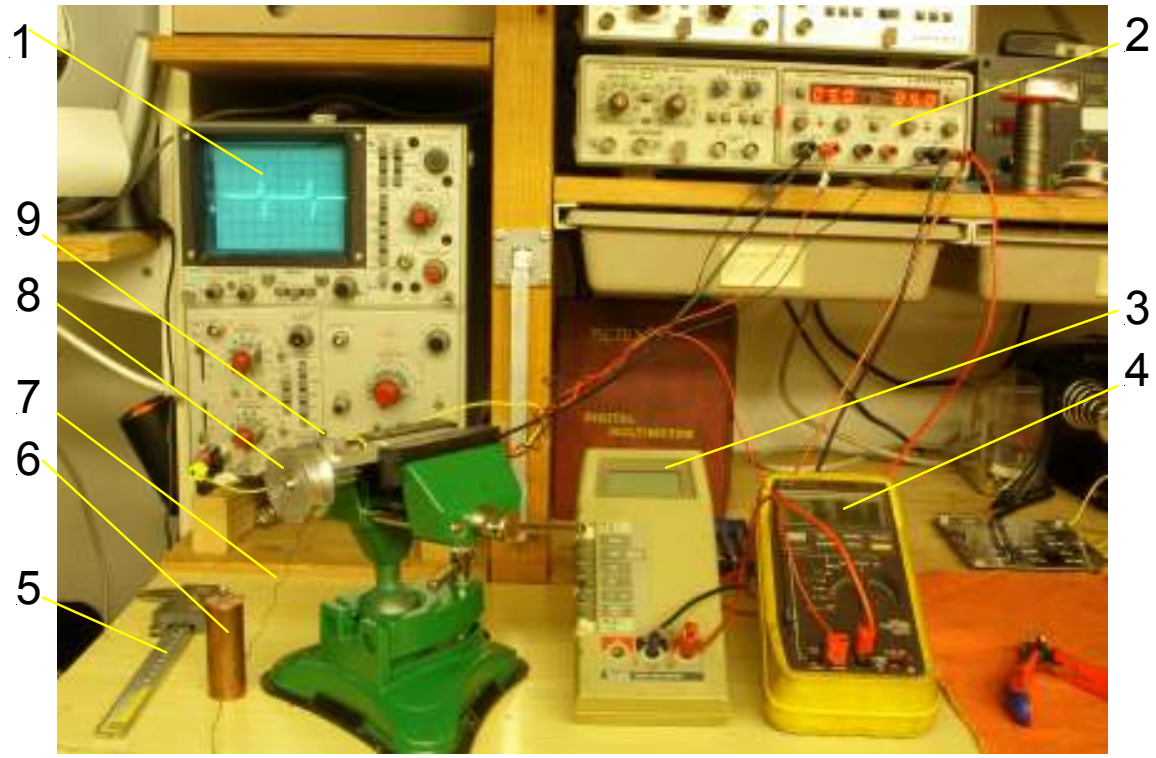
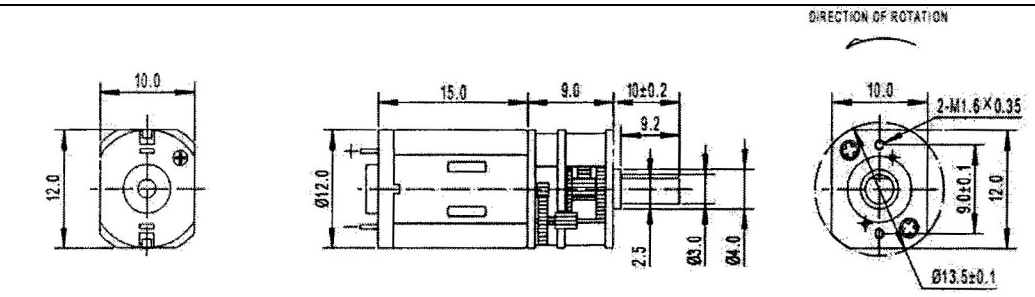


Fig. 1: Test Setup for DC motor power measurement
1: Storage Scope with rotation signal; 2: Power Supply for Motor and Sensor; 3: Voltage at Motor; 4: Current to Motor; 5: Slide caliper for period measuring at the storage scope display; 6: Test Load; 7: Thin thread; 8: Wheel with 0.1 m perimeter for winding the thread with its attached load; 9: Hall sensor for rotation detection

2. Test subject SONTH DC Motor with gear



TECHNICAL PARAMETER

MODEL	VOLTAGE		NO LOAD		AT MAXIMUM EFFICIENCY					STARTING		
	OPERATING RANGE	NOMINAL	SPEED	CURRENT	SPEED	CURRENT	TORQUE		OUTPUT	TORQUE		CURRENT
	V	V	r/min	A	r/min	A	mN.m	g.cm	W	mN.m	g.cm	A
SGM12-N20	2~6	5	145	0.05	110	0.15	30	300	0.3	78	780	0.52

Fig. 2: Original drawing and specification of the DC motor SGM12-N20-08260-100 (Courtesy of SONTH Ltd, H.K.)

3. Test results by UFO Doctor:

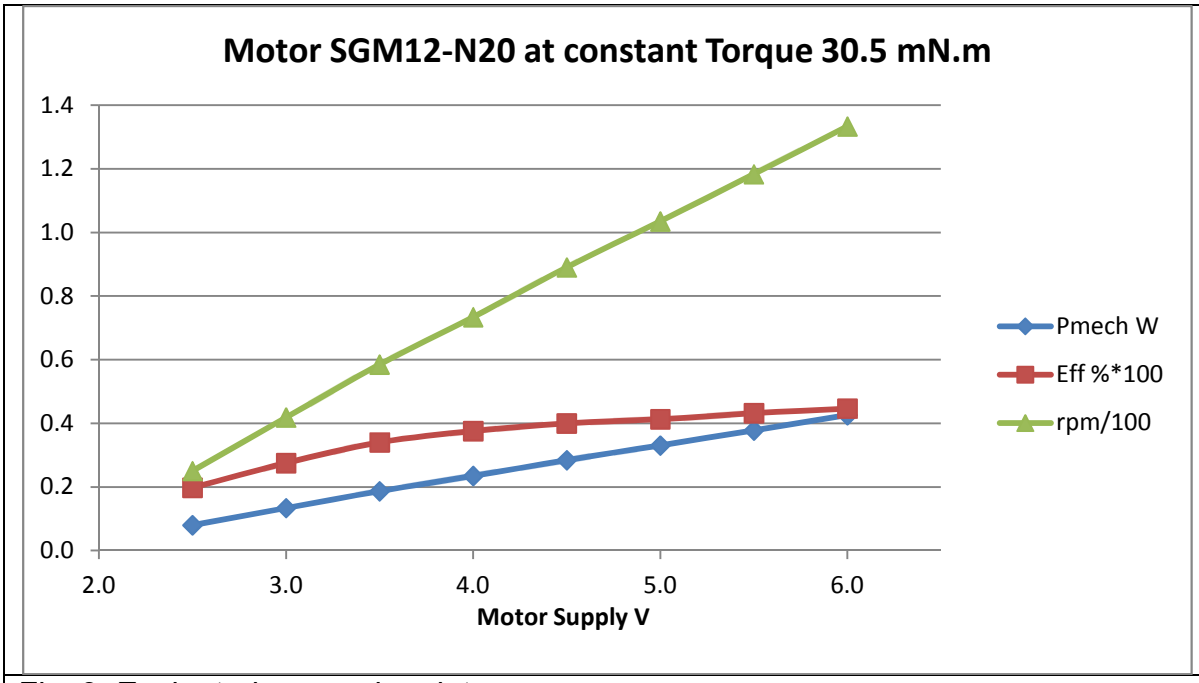


Fig. 3: Evaluated measuring data

Summary of the test:

Supply V	Current A	Torque mN.m	Speed rpm	Mech. Power W	Efficiency %
5	0.16	30.5	103	0.331	41

This motor is perfect for our application.
Congratulations to SONTH Ltd for this good product!

4. Test Setup Parts

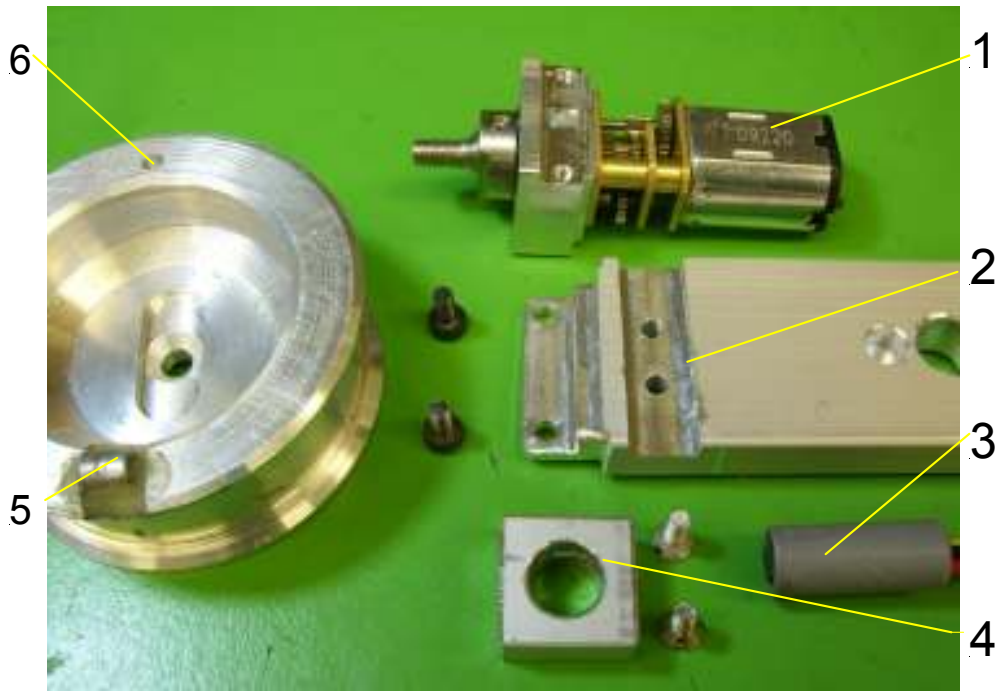


Fig. 4: Test Setup Details
1: DC-Motor mounted on anchor chair; 2: Platform; 3: Hall-Sensor;
4: Clamp for Hall-Sensor; 5: Magnet D3x4; 6: Winding spindle

5. Montage material for DC motor

Fig. 5: Montage material for DC motor
1: Test wheel; 2: M3 Nut; 3: Ball bearing D10/3x4; 4: Seeger Ring D11x1;
5: Axis Extension; 6: Stud screw M2x3; 7: Screw M2x5 to Base plate;
8: Original motor; 9: Anchor chair; 10: Screw M1.6x4 to Motor; 11: Mounted Motor

6. Appendix 1: Drawings

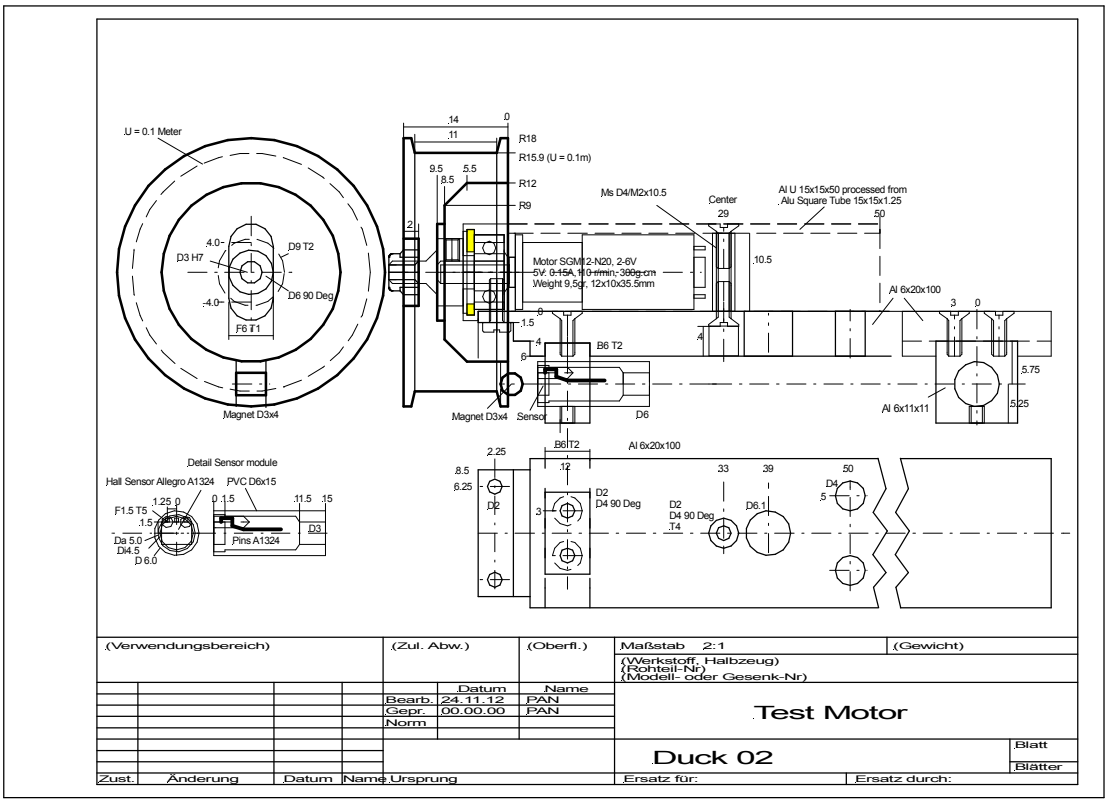


Fig.6. Test Setup Details

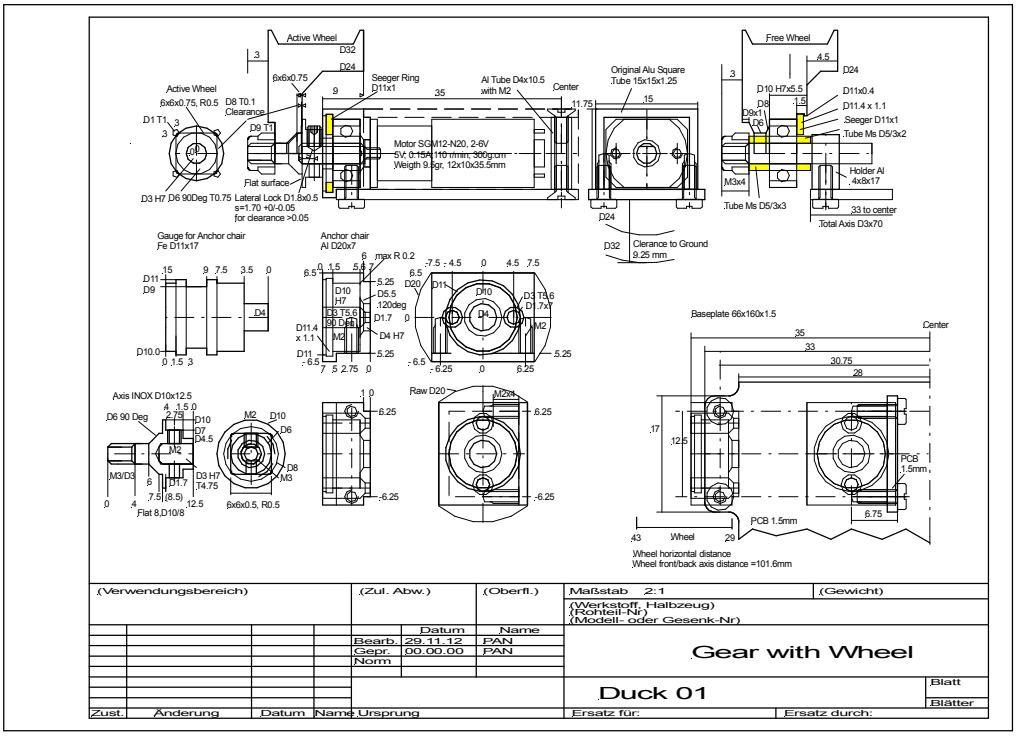


Fig.7. Motor with mounting material for heavy duty applications

7. Appendix 2: Evaluated Excel Data from mechanical power investigation

Test DC Motor SGN12

UFO Doctor, Nov 27th, 2012

Test Setup:

Weight m	0.1954	kg
Radius R	0.01592	m
Torque M	0.03052	N.m
Temp.	19.5	°C

Supply Volt	Pmech Watt	Efficiency %*100	rpm 1/100	Lp mm	Tscope s/Div	Current Amp	f Hz	Pelect Watt
2.5	0.080	0.20	0.25	42.8	0.5	0.162	0.42	0.405
3.0	0.134	0.28	0.42	64.0	0.2	0.162	0.70	0.486
3.5	0.187	0.34	0.59	45.8	0.2	0.157	0.98	0.550
4.0	0.235	0.38	0.73	73.0	0.1	0.156	1.22	0.624
4.5	0.284	0.40	0.89	60.2	0.1	0.158	1.48	0.711
5.0	0.331	0.41	1.03	51.8	0.1	0.160	1.72	0.800
5.5	0.378	0.43	1.18	45.3	0.1	0.159	1.97	0.875
6.0	0.426	0.45	1.33	40.2	0.1	0.159	2.22	0.954

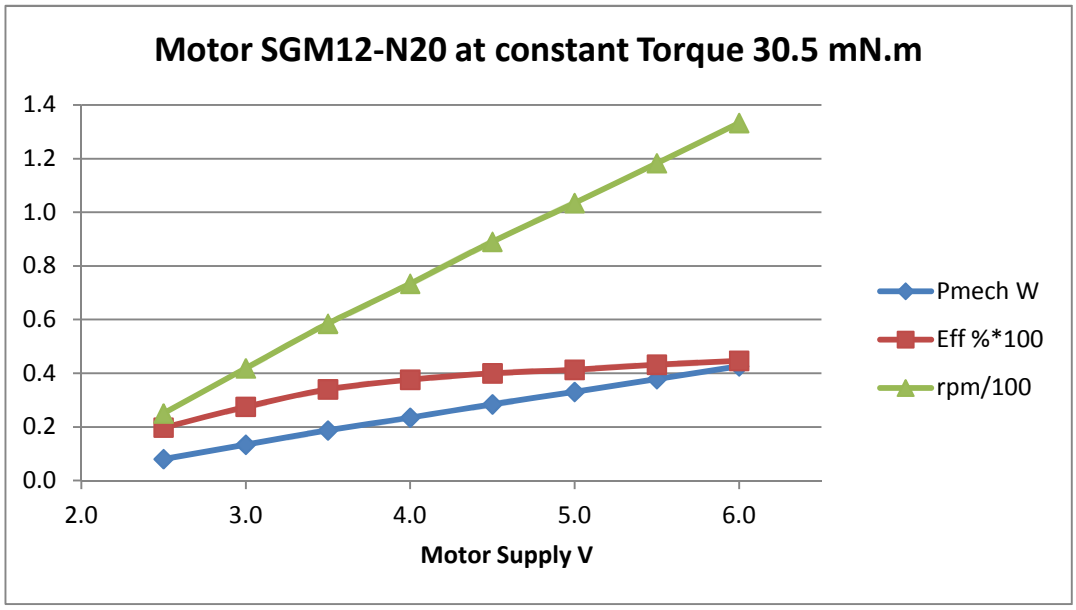


Fig.8 : Experimental EXCEL Data on DC motor SGM12-N20-08260-100S

8: Appendix 3: Excel Data calculations

Test DC Motor SGN12
UFO Doctor, Nov 27th, 2012

Specification DC Motor SGM12-N20

Parameter	Value	Unit	Description	Forumula/Notes
U	5	V	Voltage	
I	0.15	A	Current	
M	0.03	N.m	Momentum of Torque	
rpm	110	r/min	Driving Speed	rev per minute
f	1.83	Hz	Frequency of Rotation	rpm/60

Constants

g	9.81	m/s^2	gravity acceleration	
Pi	3.14156	1	Number Pi	
f		1/s	Frequency	
w		1/s	Omega, Angular Velocity	w=2*Pi*f

Storage Scope Data

tscope	0.1	s	Time/Div on scope	Depending on Speed
Lscope	0.00893	m	Length of 1 Div on scope	

Mechanical Test setup data

R	0.01592	m	Radius Wheel	
cf	0.1000	m	Circumference Wheel	2*R"Pi
m	0.1954	kg	Mass Load with M3x8 screw	
M	0.0305	N.m	Momentum of Torque	m*g*R

First Trial (Voltage& Current +/-2%)

U	5.0000	V	Nominal Voltage	
I	0.158	A	Measured Current	
Pelect	0.79	W	Calculated Electrical Power	U*I
Lp	0.0492	m	Length periode on scope	
Tp	0.5504	s	Periode duration	T=tscope*Lp/Lscope
f	1.817	Hz	Frequency Rotation	1/T
rpm	109.02	r/min	Driving Speed	60/Tp
w	11.42	1/s	Omega, Angular Velocity	2*Pi*f
Pmech	0.348	W	Power Mechanical	M*w
Eff	44.10	%	Efficiency %	100*Pmech/Pelect

v	0.1817	m/sec	Speed	cF/Tp
Plift	0.348	W	Lifting Power	m*g*v