PCBMotor

Integrating rotary movement and electronics

An SMD-mounted piezo motor

- ***Integrate multiple motors***
- ***Enhance designs***
- ***Improve accuracy***
- ***Reduce production costs***

Watch the introduction video here on our Youtube channel:
http://www.youtube.com/pcbmotor

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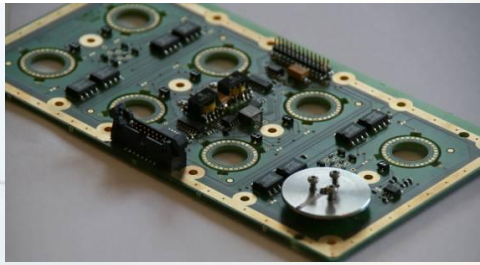
Email *Henrik Staehr-Olsen* at info@pcbmotor.com

Four new ways to succeed

- Integrate multiple motors on one PCB
- Enhance product designs and reduce building height
- Improve precision through ultra-high resolution
- Lower assembly costs with automatic mounting



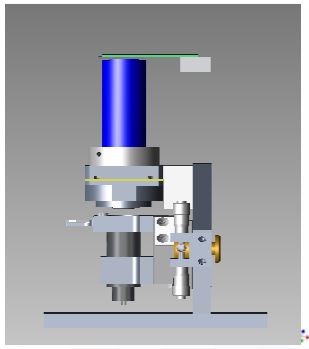
Key features

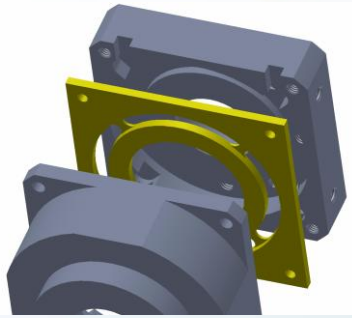
- Direct drive, no gears, slack-less
- High torque and holding torque
- Built-in clutch, tamper proof/safe
- Non-magnetic
- Fast start & stop actions
- Optional position sensor

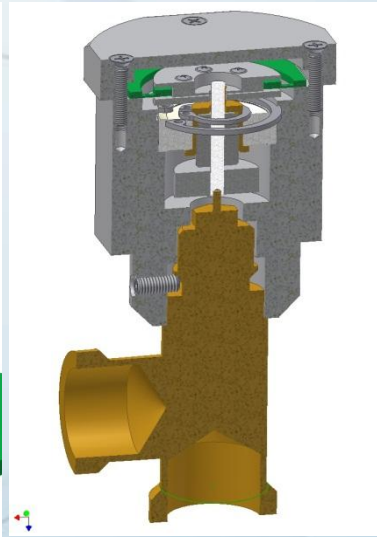
Competitive advantages & increased profit

Application examples

- **Medico**
  - Microscope focus
  - Dosing equipment
- **Optics & Lasers**
- **Camera**
  - Focus
  - Pan, tilt & zoom
- **Instrumentation**
  - Dashboard pointers
  - Positioning, stages
  - Laboratory equipment
- **Industrial**
  - Valve application







Ultra-high resolution & accuracy

Creating movement right on the PCB

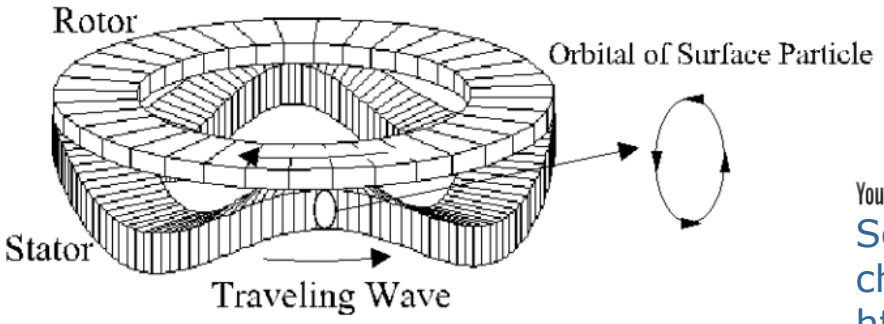
A PCBMotor consists of

1. **The Stator**

   The PCB with piezos mounted, to which a voltage is applied, thus causing the traveling wave

2. **The Rotor**

   Pressed onto the stator, delivers the mechanical output



1. Stator

See the traveling wave on our Youtube channel:
http://www.pcbmotor.com/pcbmotor

Turn your PCB into a motor

Flexible designs → Automated assembly

Smaller, lighter, more compact designs

- **Application-specific rotors**. Our solutions accommodate variable rotor widths and heights, thus allowing more flexible application designs
- **The control driver.** Can be integrated onto the same PCB as the stator

Fully-automated production that

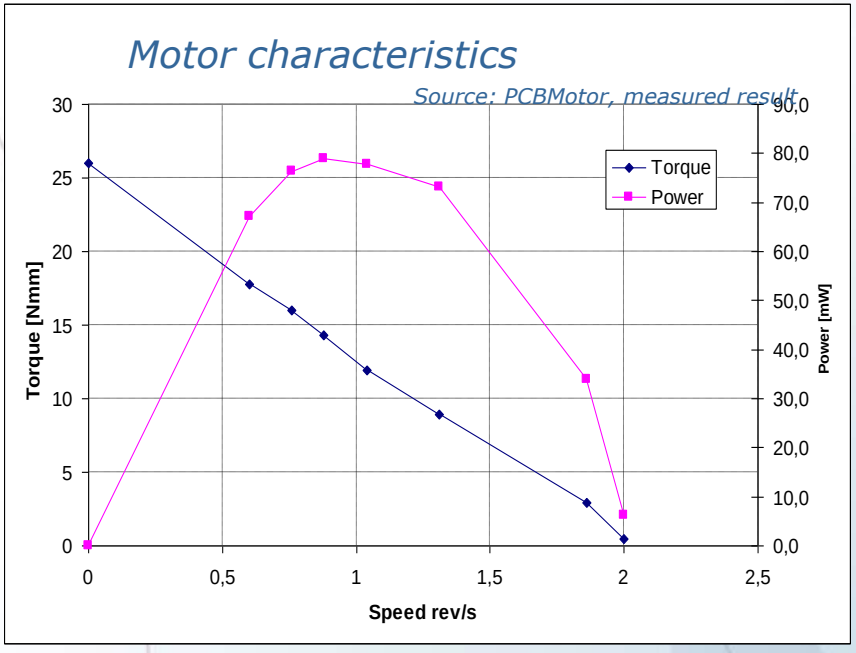
- Employs electronic-industry manufacturing standards
- Uses ”landing bridges” to connect the stator to the driver
- Piezo ceramics mounted as SMD components
- *Pick & Place* robotics with rotary head

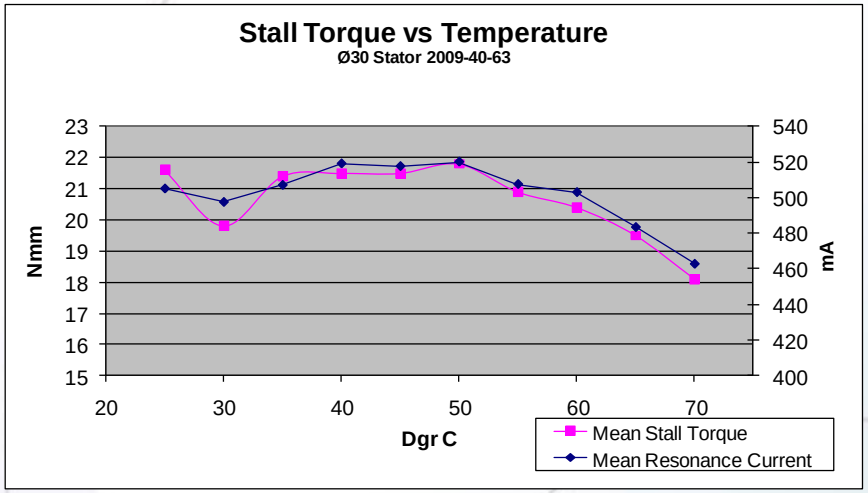
Buy piezos from us and get a license to our patented technology

Industry standards ensure economies of scale

Motor performance results

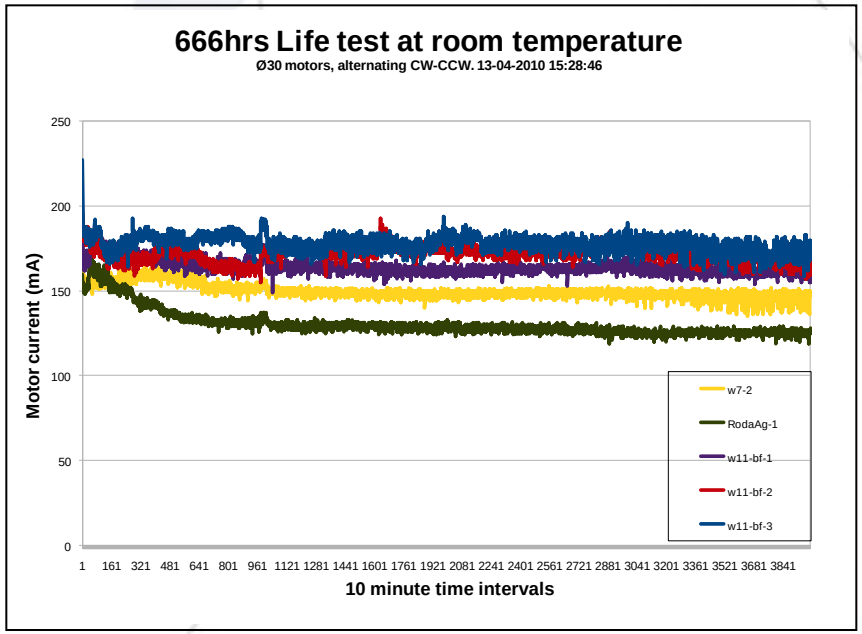
Motor characteristics for a Ø30 mm stator measured at 200 Vrms.
Maximum available power at the shaft is 80 mW at a speed of 1 rev/s.
Notice the linear Torque/Speed curve.





An operating temperature range of **-10 to 85 C** has been tested and confirmed in some applications.

Endurance test results



PCBMotors are well-suited for customer integrations.

Our motors have an expected life of >1000 hrs.

The final application and its actual operating environment ultimately determine the motor's life expectancy.

The above results were compiled from a Ø30 mm motor running continuously, logging data every 10 min.

Note: The experiment shows no changes (*End-of-life*) in the given timeframe.

High-precision applications

Superior resolution with up to 2,6M µpulses/revolution

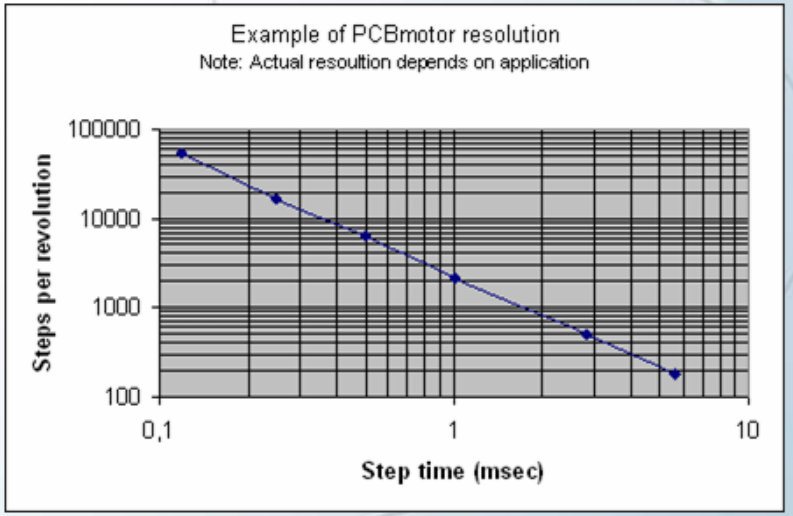
Utilizing open-loop and micro-pulsing the controller, system engineers can now achieve superior micro-positioning in applications with resolutions over 2.6 million µpulses per revolution.

Technology experiment record

The controller is open-loop, i.e. the µpulses are entirely "free-running". In a practical application, external feedback is needed to determine the position. The digital codewheel can be used for calibrating µpulses/step for each digital step.

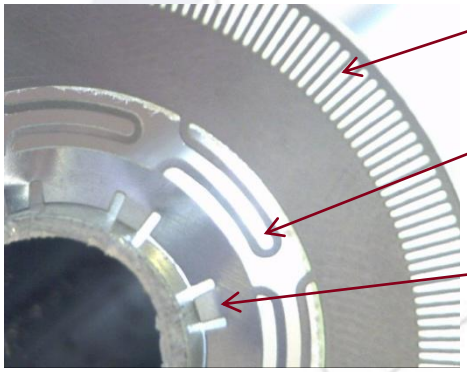
YouTube

Watch the high resolution technology record on our Youtube channel:
http://www.youtube.com/pcbmotor



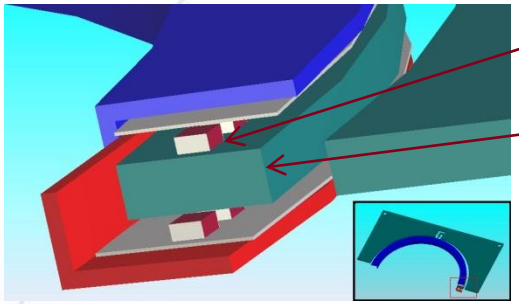
Increased resolution gives greater accuracy

Rotor & hollow shaft examples

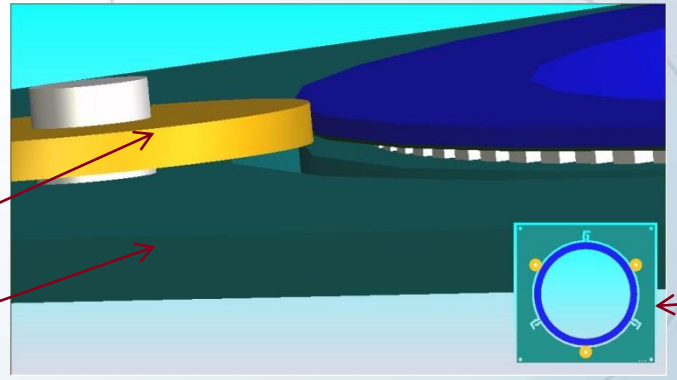


12 mm ‘free center’ using a rotor disc for Ø30 mm stator with spring & sensor markings.

Hollow 60 mm rotor construction with 3 rollers.



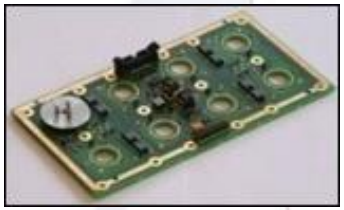
Interlocked rotor discs for maximum ‘free center’ diameter.



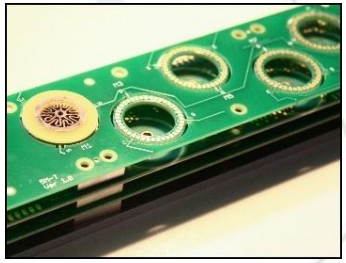
3-point roller support principle for radial alignment.

High resolution and low cost hollow shaft

Customized design examples

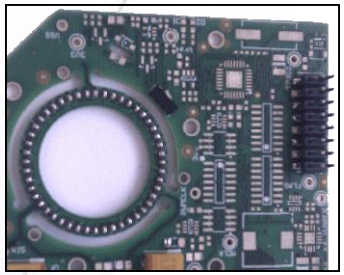


8 motor, one-layer design (Ø20 mm) with one integrated driver based on customer specifications.



5 motor, two-layer design (Ø25 mm), one central driver in a *sandwhich* construction. Upper & lower decks contain the motors, with the driver placed on the center board.

High Resolution Twin Motor development kit. Experience 2.6 million µpulses/rev and dual, bi-directional rotational movement with multiplexing capabilities. *Available online.*



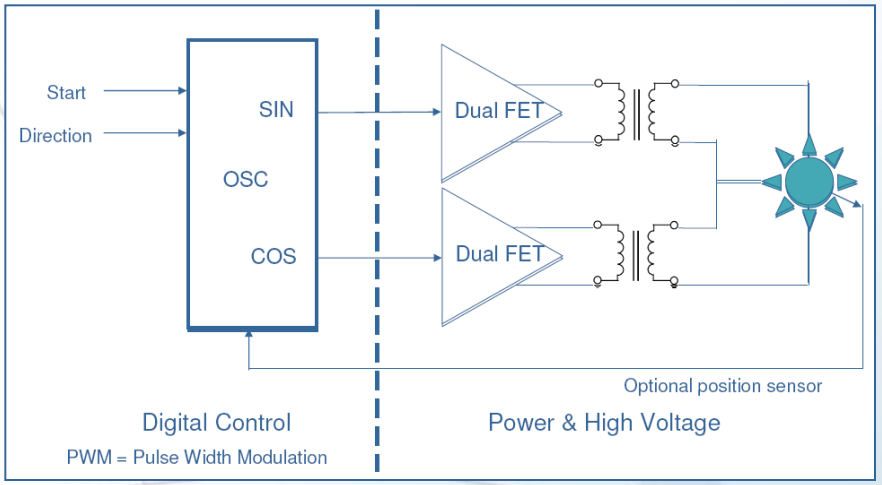
Single motor, one-layer design (Ø30 mm stator) with an integrated driver based on customer specifications.

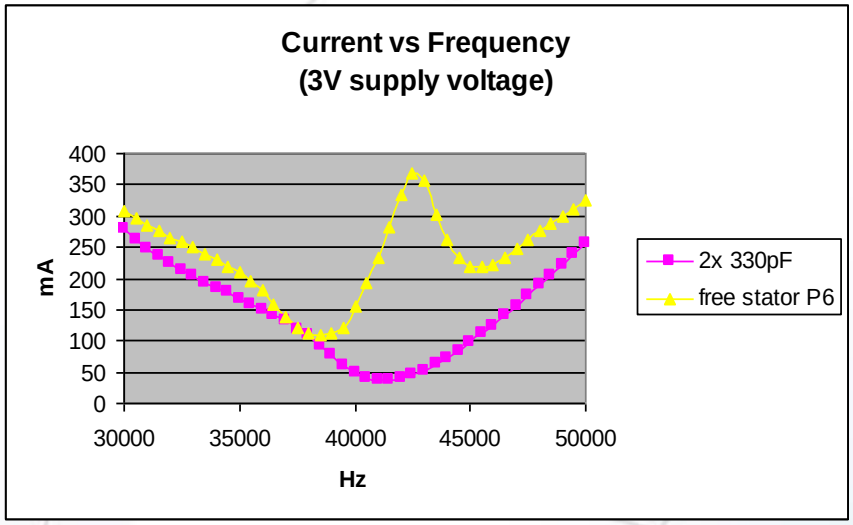
Flexible design and easy customization

Basic control driver (without position sensor)

The driver generates a two-phase sinusoidal that is stepped up through two transformers to a drive voltage of 50- 200 Vrms.

- ❑ 0.2-2.0 W power for Ø30mm motor
- ❑ Motor resonance: 40-45 kHz
- ❑ Frequency Tracking needed for max performance at different temperatures





- ❑ 1 Central control driver can drive several motor positions, with application electronics on the same PCB
- ❑ The basic component in the driver is the transformers
- ❑ Standard IC's or ASIC are possible for applications with space constraints

Low cost, flexible drivers - smaller through IC's

Next steps for application success

Need more facts about our piezo technology?

For more information download our **White Paper** – How to Solve High Resolution and Low Speed Dilemmas.

If you're department has an application in mind and you're considering using a PCBMotor, then take advantage of our **free engineering consultancy session** which is available to all white paper recipients.

The report also highlights the *Top 5 Pains* electronic movement designers and engineers have today!

Is your application PCBMotor-ready?

If you want to know if your application is right for an on-board PCBMotor, fill out the **Performance Sheet** (slide 13), send it to me and we'll respond with an assessment of your application.

You're also welcome to email our engineers any technical questions.

For more information call Henrik on 0045 7028 3210

Performance Sheet

Complete the performance sheet below, email it to us and we'll send you a **free assessment** of how our technology can (or cannot) be used in your application. Spend a minute on it. It could save you a lot more!

	Min.Max	Comments	Your Application
Dimension			
Building Height	2.6 mm	Without Rotor	*[your specifications]*
Inner Diameter	14-82 mm	Typical	…
Outer Diameter	20-90 mm		…
Performance			
Speed	2-0.3 rev/s		…
Torque	8-162 Nmm	Torque estimated for motors > 30 mm	…
Weight	4-20 grams	Without Rotor	…
Resolution	<2,600,000 μpulses		…
Positioning		Sensor/Codewheel dependent	…
Lifetime	+1000 hours continuous operation	Application dependant	…
Electrical			
Power budget	0.2-10 W		…
EMC	Tested OK	Application dependant	…
Driver size	50x30x7 mm (Typical)	Stand-alone or multiplexing	…
Environment			
Temperature	0-70 C	Non-condensing	…

Send us your specifications:

1. **Copy/Paste** the spreadsheet into an editor & enter your requirements in the *Your Application* column.
2. **Save** it to your PC.
3. **Attach** it to an email **and send** it to Henrik, at **info@pcbmotor.com**
4. We'll reply to you **within 24 hours**

Your Comments

[…]

PCBMotor ApS – service & support

Our online shop offers competitively-priced evaluation kits to application designers, electronic engineers & development teams looking to demo our innovative technology.

Go to **www.pcbmotor.com/demo-kits**

High Resolution Twin Motor Kit

The 2.6 million High Resolution Twin Motor Kit includes a main motor board, controller board, & free PCBMotor software for speedy integration and prototyping.

Lab Kit Basic

A Lab Kit is the best way to get started with using PCBMotor technology and comes with everything you need.

Evaluation Kit Basic

Evalulation kit with tracking feature for demonstration and project preparation.