



ECM and CONE DRIVE INTEGRATE PCB STATOR TECHNOLOGY INTO THEIR ROBOTIC JOINT ACTUATOR APPLICATIONS

OVERVIEW

ECM and CONE DRIVE (a Division of TIMKEN) recently partnered to integrate ECM's printed circuit board (PCB) stator technology with CONE DRIVE's harmonic drive technology, Harmonic Solutions, to create remarkably small, powerful, integrated actuator packages for robotic applications. CONE DRIVE is a large, multinational, high-tech precision gearing company whose products are widely used in industrial robots, semiconductor manufacturing equipment, medical equipment, and aerospace programs. ECM's PCB Stator motors are used to power fans, pumps, and small vehicles, on land, sea, and air. ECM and CONE DRIVE are working together to create additional robotic joint actuator designs.

"Our customers frequently asked us for solutions which are lighter weight, more compact, and energy efficient. We decided to team up with ECM because they have a game changing approach which fits neatly with the range of our solutions." - Jeff Breakey, Cone Drive, Global Accounts

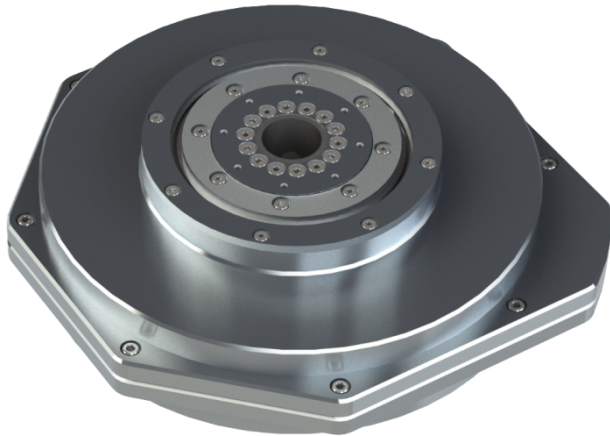
BENEFITS

ECM and CONE DRIVE decided to join forces because they each offer technologies that integrate seamlessly into a range of robotic applications to provide compact, efficient, torque-dense solutions. CONE DRIVE's Harmonic Solutions, which utilize harmonic drive technology, paired with ECM's customer-designed flexible form factor, enables compact, lightweight robotic designs that were previously not possible. Combining CONE DRIVE's and ECM's technologies increases motor efficiency, improves battery life for mobile applications, and reduces energy costs for stationary ones. Hollow shaft capabilities of both designs add flexibility to the combined technology packages.

"We knew that ECM's PCB Stator technology - which simplifies the geometry of the rotor and stator - could reduce the number of parts within a fully integrated actuator gear drive platform for a wide range of robotic automation applications. We wanted to team up with CONE DRIVE because they are a recognized leader in this growing field, and their 'challenger' culture is totally compatible with ours." - Chris Fielding, ECM VP Applied Engineering

RESULTS

ECM and CONE DRIVE designed and prototyped a hollow shaft robotic joint actuator with a fully integrated CONE DRIVE Harmonic Solution Drive and ECM PCB Stator. The resulting actuator is significantly more efficient at 2/3 the weight and 1/2 the axial length of any previously available integration.



NEXT STEPS

ECM is continuing to work with CONE DRIVE Harmonic Solutions to integrate the combination of harmonic drive technology and PCB Stator technology into a variety of robotic applications including medical, manufacturing, and automation. This breakthrough comes at a time when most major manufacturing, food processing, and logistics firms are seriously considering re-engineering their manufacturing and delivery supply chains.



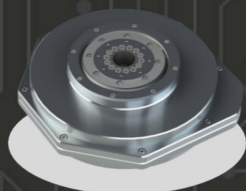
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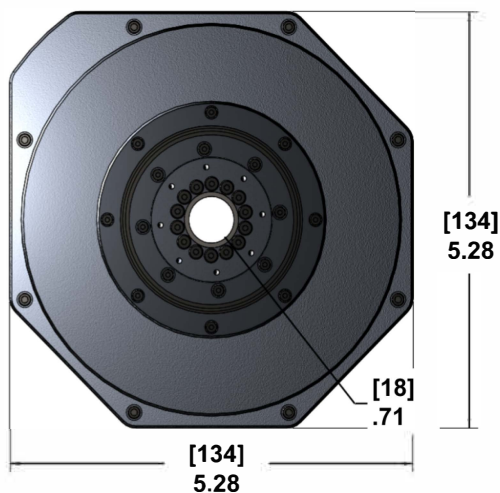
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CONE DRIVE is a subsidiary of TIMKEN

 Integrated Actuator and Drive	 Currently Available Hollow Shaft Integration	 ECM - Cone Drive Hollow Shaft Integration
Strain Wave Gear Size - Reduction Ratio	17 - 100:1	Cone Drive Harmonic Drive™: 17 - 100:1
Motor	Brushless Servo: 200/100VAC, DC24V	PCB Stator: 200/100VAC, 12-72V DC
Torque - Continuous, Max (Nm)	24, 47	24, 47
Max Speed	4,800	4,800
Max Load - Axial, Radial (kN)	9.8, 2.9	16.3, 5.1
Moment Load (kN)	188	205
Axial Length (mm)	78	43
Mass (kg)	2.5	1.63



The integrated Cone Drive / ECM PCB stator package punches above its weight.

This unit delivers more than half a kilowatt of power across a range of rpm requirements.