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At Embedded World in Germany this week we will be showcasing high-performance independent control of two three-phase permanent magnet (PMS/BLDC) servo motors from a single low-cost microcontroller (MCU). While dual-axis control from one MCU is not new, this solution is unique in its demonstration of how quickly you can design various motor and motion control solutions, thanks to our [InstaSPIN™ solutions](#) containing motor control technology and our LaunchPad™ development kit and BoosterPack™ plug-in module ecosystem.

Controlling two motors from a single MCU can be of benefit in a variety of end applications: robotics, CNC, assembly/manufacturing, traction drives, personal transport, small-task oriented vehicles, compressor plus fan applications and even drones.

Start the Development Process with the InstaSPIN Solutions Demo below

The solution consists of a \$25 USD LaunchPad ([LAUNCHXL-F28069M](#)) development kit, which features TI's InstaSPIN motor control technology enabled by the [Piccolo™ TMS320F28069M](#) MCU. The LaunchPad includes everything you need for MCU development, including a built-in emulator, isolation and software development tools. There are two sets of connector headers, to which we attach our recently released \$49 USD 45V/15A three-phase inverter BoosterPack plug-in module ([BOOSTXL-DRV8305EVM](#)) which feature the DRV8305 integrated gate driver and CSD18540Q5B NexFET™ power MOSFETs. The BOOSTXL-DRV8305EVM features higher integration in a smaller package as well as wider voltage and current capability than the previously released BOOSTXL-DRV8301.

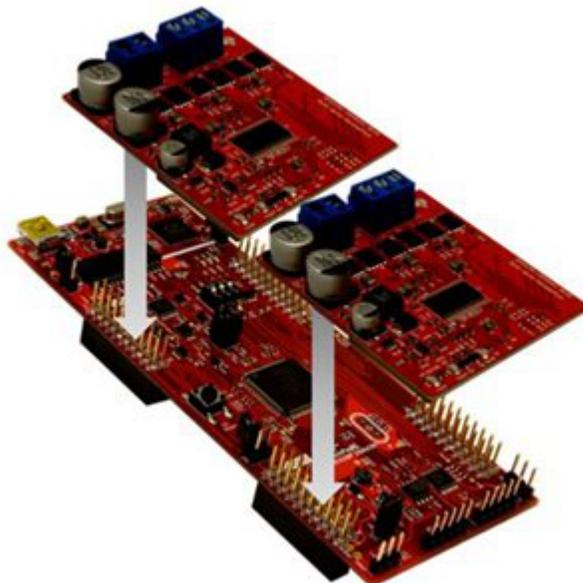


Figure 1. Launchxl-F28069M with (2) Boostxl-DRV8301

For the purposes of this demonstration we are using two low voltage servo (optical encoder) motors from Teknic ([LVSERVOMTR](#)), but with InstaSPIN solutions you can create a motion control system quickly with your own motors.



Figure 2. Teknic Low Voltage Servo Motor LVSERVOMTR

[InstaSPIN-FOC™](#) motor control software is our sensorless field-oriented control (FOC) technique that embeds our motor control expertise on-chip. It features a commissioning capability to learn the parameters of the motor, automatic tuning of the [FAST™](#) software encoder sensorless observer and empirically setting the tuning of the current controllers. In less than two minutes you have a well-tuned, high-performing sensorless FOC solution which is appropriate for many torque control applications. For sensorless velocity control, a standard PI controller is included with an initial setting that is stable for most motors, allowing you to quickly test and tune to match the performance requirements of your system.



Figure 3. InstaSPIN-FOC™ Motor Features

[InstaSPIN-MOTION™](#) solutions build upon InstaSPIN-FOC solutions by including the SpinTAC motion suite. This suite extends performance for the most challenging motion control applications, most of which will rely on mechanical rotor sensors for accurate knowledge of the rotor position at all times. The SpinTAC suite includes system inertia and friction identification, highest performing disturbance rejecting controller with single variable

tuning of velocity or position plus velocity, run-time s-curve and proprietary ultra-low jerk st-curve trajectory generation and simple state machine based motion planning.



Figure 4. InstaSPIN-MOTION™ Motor Features

MotorWare™ is a cohesive set of software used for developing InstaSPIN solution enabled applications. Included in the upcoming version 16 release are the example projects which show control of two inverters from a single LAUNCHXL-F28069M. Based on these projects we created the Embedded World demonstration which shows InstaSPIN-MOTION Sensorless velocity, encoder based velocity, and encoder based position control with a simple pre-configured motion plan.

The process for creating this demonstration is straight-forward:

- Use MotorWare project lab02 to ID the motor parameters, which are updated in a user file.
- Use MotorWare project lab05e to ID the motor inertia and friction, and then tune the controller.
- Use MotorWare project lab06e for two motor sensorless velocity control.
- Use MotorWare project lab12c for two motor encoder-based velocity control.
- Use MotorWare project lab13f for two motor encoder-based position control.

With the InstaSPIN solutions enabled LaunchPad development kit ecosystem you can choose the MCU, low voltage inverter and motor control solution which is right for your application. Take control of your motors today!

Capability	LAUNCHXL-F28027F (\$17)	LAUNCHXL-F28069M (\$25)
C2000 InstaSPIN-enabled MCU	60-MHz F28027F MCU	90-MHz F28069M MCU
Motor parameter identification	X	X
Automatic torque loop tuning	X	X
FAST™ software sensor feedback	X	X
PI velocity controller + Trapezoidal trajectory	X	X
System inertia identification		X
SpinTAC™ velocity controller		X
SpinTAC position+velocity controller		X
Motion sequence planner		X
s-curve trajectories		X
st-curve trajectories		X
PowerWarp for induction motors	X	X
Field weakening & boosting	X	X
Sinewave, space vector and trapezoidal modulation	X	X
BoosterPack support	BOOSTXL-DRV8301 BOOSTXL-DRV8305EVM	BOOSTXL-DRV8301 BOOSTXL-DRV8305EVM
BoosterPack connectors	1	2
Rotor sensor support	None	2x Encoder
Connectivity	UART	UART, CAN

Figure 5. Comparison between InstaSPIN™ Software Enabled LaunchPad™ Development Kits

Come see the InstaSPIN motor solutions demo in person at Embedded World, February 23-25 in Hall 5, booth 5-385!

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