

2000

Torque Pulse Simulation Drive

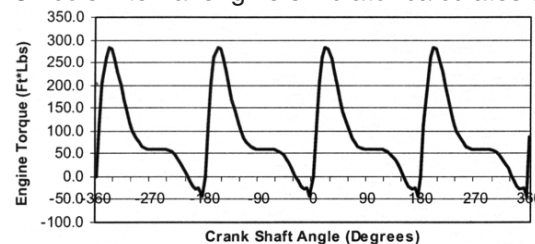


Overview

Unico's Torque Pulse Simulation Drive is an all-digital AC flux vector drive engineered for engine-testing applications. The drive system consists of a Unico 2000 Series Performance Vector Drive that incorporates software designed specifically for simulating the torque pulses produced by internal combustion engines.

Engine Simulator

Unico's internal engine simulator calculates the real-time torque output of an internal combustion engine based upon engine design characteristics. The torque output of the drive automatically updates with changes in throttle position and engine speed to provide a realistic simulation.



Torque Estimator

Unico's torque estimator calculates the feedback torque produced by the motor without the need for expensive torque transducers. With a bandwidth that exceeds 2 kHz, the torque estimator provides feedback at rates that can track the profile of an individual torque pulse. When combined with Unico's torque regulator, the drive can internally close the loop on the torque estimator to ensure that the amount of torque commanded is the amount that is produced.

High-Frequency Output

The drive is capable of simulating torque signals up to 2 kHz. This allows it to simulate not only the fundamental frequency output of the engine, but the harmonics that make up the shape of the torque pulse as well. The result is a much more realistic engine simulation.

Dual Processor

This hardware and software feature takes Unico's performance digital signal processor (DSP) and adds a second processor that is dedicated to doing the engine simulation and vector control. By dedicating a processor to these tasks, software update rates of 20 kHz can be achieved, giving a significantly better reproduction of an actual engine torque pulse.

2000

Torque Pulse
Simulation
Drive

Overview NVH Configurable

(continued)

The drive can be configured for ultra-quiet operation using the built-in dual current regulators. The ability to set switching frequencies as high as 20 kHz makes the drive ideal for sound-sensitive applications requiring very low torque ripple.

Inertia Simulation

With the inertia of an internal combustion engine being significantly smaller than a typical AC motor, the drive uses inertia simulation to cancel out the additional inertia of the motor so that the motor inertia appears to be the same as the internal combustion engine that is being simulated.

Four-Quadrant Operation

The drive has full four-quadrant operation with the ability to limit or block operation in any of the quadrants. Additionally, the drive has the capability to limit power for both motoring and regenerating modes.

Modular Design

The modular design of the drive allows individual components to be selected and sized for each application. Inverters for running motors and for use as line-regenerative front ends are fully interchangeable, thus reducing the size of individual components and the quantity of spare parts required.

Motor Independent Design

A unique design incorporating a proprietary digital current regulator and a state-of-the-art controller allows the drive to operate any AC induction, AC synchronous, servo, or brushless DC motor without the current-loop setup required by conventional drives.

Auto Tuning

The drive features full automatic tuning capabilities that can be operated from either a remote terminal or the drive's built-in keypad. After entering the motor nameplate data, the auto-tuning algorithm automatically identifies the additional parameters for operating the attached motor and configures itself for operation.

Test Applications

- FEAD
- Compressors
- Cams/cam shafts
- Gears
- Oil pumps
- Superchargers
- Flywheels
- Snowblowers
- Alternators
- Transmissions
- Clutches
- Chains
- Power steering pumps
- Tensioners
- Water pumps
- Lawn mowers
- Air conditioners
- Belts
- Engine simulation
- Fuel injectors
- Pulleys and hubs
- Torque converters
- Small engine simulator
- Generators

Control and Data Acquisition

Full-Featured HMI

The high-speed control option includes Unico's Titan interface:

- Sampling capabilities up to 2 kHz
- 15" SVGA liquid crystal display with touch screen for test system status and results
- National Instruments data-acquisition hardware
- Windows OS

Software

- Data acquisition and analysis
- Export capabilities
- Multiple test sequences
- Real-time display of test data
- Operator prompting
- Uses MS Excel for support files
- Control capabilities for load, drive motor, and product under test

Basic HMI

The basic control option includes Unico's Motion interface with sampling capabilities up to 10 Hz.

Standard Interface

The standard interface included on all systems provides a keypad for programming the drive and entering engine parameters, speeds, and torques.

- Serial connectivity to various PLC, PC, and control platforms
- Three 14-bit analog commands
- Two 12-bit analog feedbacks

Machine Base with Hydraulic Power Unit

Standard Base

- Steel welded reservoir with 1/4"-thick sides, top, and bottom, cleanout end plate, side mount filler/breather, drain, sight gauge, and leveling pads
- 1"-thick Blanchard ground test bed with (24) 1/2" or M12 locating holes and mounting holes for servo base
- Servo motor mounting base weldment with motor mount bolt pattern and oil hole
- Hydraulic circulation system 3 to 5 gpm (10 to 20 lpm) including hydraulic pump, motor, couplers, flow control valve, relief valve, filter, and plumbing
- Power unit sound abatement cover

Custom Base

- Designed and built to customer specifications

Control Configurations

Basic (S27)

- Analog torque and speed commands
- Frequency response to 300 Hz
- Speeds to 15,000 rpm
- Speed mode with torque override
- Torque mode with speed override
- Bumpless switching between torque and speed modes
- On-the-fly adjustable switching frequency
- Inertia simulation
- Dual-input torque regulator
- Internal torque feedback estimator (98% accurate)

Performance (E27)

- Includes all Basic features
- Frequency response to 600 Hz
- Speeds to 30,000 rpm
- Fiber-optic interface
- Ultra-quiet digital space vector (DSV) current regulator
- Harmonic simulation software
- Internal torque feedback estimator (99% accurate)

Pulsation (V27)

- Includes all Basic and Performance features
- Frequency response to 2,000 Hz
- Speeds to 120,000 rpm
- Engine simulation software
- Downloadable torque profile table
- Internal torque feedback estimator (99.5% accurate)
- Dual digital signal processors (DSPs)

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Unico is a leading global innovator of motion-control solutions for industry. Founded in 1967, the company develops, manufactures, and services variable-speed drives, application-engineered drive products, integrated drive systems, and ancillary products that improve operations by increasing productivity, safety, and equipment life while lowering energy and maintenance costs.