TELEDYNE LECROY
Everywhereyoulook™

Motor Drive Power Analysis Software

Key Features

- Complete Motor Drive System Debug and Validation in One Instrument
- Three-Phase Power Measurements; Real, Apparent, Reactive Power
- Efficiency Measurements
- User-Configurable Power Table
- Two- and Three-Wattmeter Methods Supported
- Per-Cycle Time-Correlated Waveforms From Power Values
- Dynamic Drive Response Analysis, From Startup To Overload
- Standard Line-Line To Line-Neutral Voltage Conversion
- 1000 V_{RMS} Isolation with HVD Series Differential Probes
- Easily Interface Other Current Measurement Devices
- Complete Motor Integration (Torque, Speed, Position)
- Flexible Setup Capability
- Graphical User Interface

Motor Drive Power Analysis software for Teledyne LeCroy HDO8000 High Definition Oscilloscopes (8 analog channels with 12-bit resolution) provides three-phase numerical and waveform power analysis from motor drive input through motor mechanical output. Included are real, apparent, and reactive power measurements, power factor and phase angle, efficiency, and various voltage and current parameters. Both two-wattmeter and three-wattmeter methods are supported, as well as line-line to line-neutral voltage conversion. Motor speed, position, and torque integration are the most complete available.

Complete Drive System Debug

The HDO8000 oscilloscope with Motor Drive Power Analyzer software permits waveform captures from the drive power section, power transistors, and embedded control system, and performs three-phase power analysis of the power section waveforms in one high-performance instrument, enabling debug and analysis of all aspects of the complete motor drive.

Numeric Power Table

Various voltage, current, power (real, apparent, and reactive), phase angle/power factor, and efficiency parameters are calculated on acquired voltage and current waveforms and displayed in a table. The table is displayed along with the acquisition waveform.

Graphical User Interface

An intuitive, graphical user interface provides setup/connection guidance. Setup capability is provided for any combination of single-phase or three-phase drive input/output

Most Complete Motor Mechanical Integration

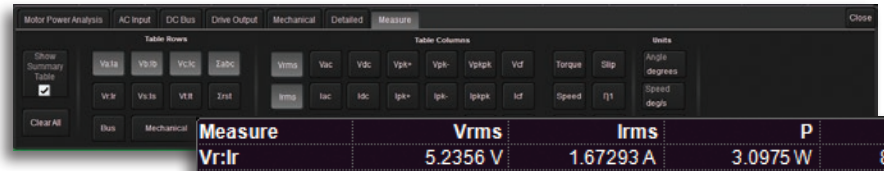
Simple integration is provided for nearly any type of speed, rotation or position sensor, including analog and digital (pulse) tachometers, Brushless DC (BLDC) Hall sensor, Quadrature Encoder Interface (QEI), and Resolvers. Additionally, Hall sensor and QEI signals can be integrated through digital inputs, preserving valuable analog input channels for other signals.

BEYOND “NUMBERS” - MORE INFORMATION

Numeric Power Table

A user-configurable table is provided for display of a selection of power (real, apparent, reactive), power factor, phase angle, efficiency, voltage, current or motor mechanical parameters. Up to 120 values total may be displayed in 10 rows and 12 columns for any selection of input or output individual phase or total three-phase values, DC bus/link, or motor mechanical. Efficiency can be also be displayed.

The Power Table values displayed are mean values from a statistical data set that is calculated on a “per-cycle” basis using a user-defined synchronization source signal. This display corresponds to what is normally provided by a power analyzer.

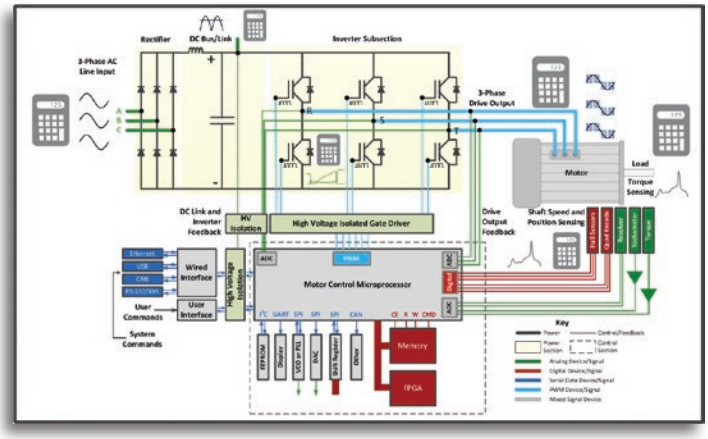


Measure	Vrms	Irms	P	S	Q	PF	Phase
Vr:Ir	5.2356 V	1.67293 A	3.0975 W	8.7598 VA	8.1937 VAR	354e-3	69.298 °
Vs:Is	5.2077 V	1.61738 A	2.9370 W	8.4238 VA	7.8951 VAR	349e-3	69.600 °
Vt:It	5.2485 V	1.62218 A	3.0193 W	8.5149 VA	7.9615 VAR	354e-3	69.237 °
Σrst	5.2306 V	1.63750 A	9.0538 W	25.6984 VA	24.0504 VAR	352e-3	69.377 °

Detailed Waveforms

In addition to the mean table values, a waveform showing any per-cycle measurement parameter variation can be displayed by simply selecting a table value. This waveform is time-correlated with other waveforms acquired by the HDO8000 oscilloscope and can be used to correlate complex drive behaviors to other control or power system waveforms, and to debug drive system problems. Statistical detail of the measurement set can also be displayed.

This additional information goes well beyond what is provided by a Power Analyzer.



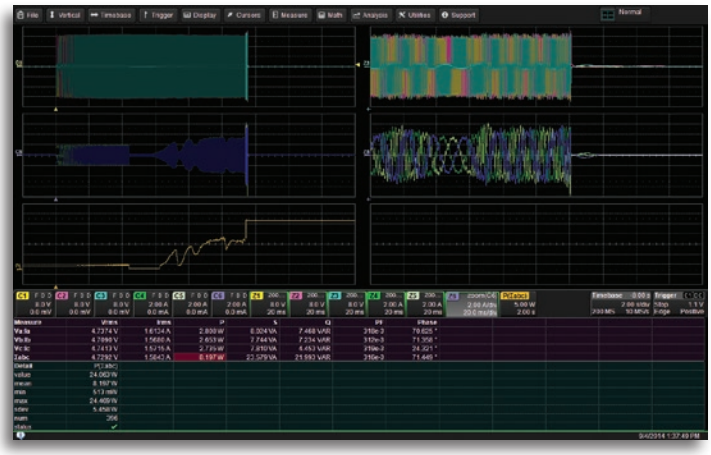
Complete Drive System Debug

A complete drive system is a complex mix of three-phase power electronics, motor/mechanical analog and digital sensors, and embedded controls, with a complex variety of analog, digital, serial data and pulse-width modulated (PWM) signals. The HDO8000 oscilloscope with Motor Drive Power Analyzer software permits waveform captures from the drive power section, individual power transistors, and embedded control system, and performs coincident three-phase power analysis of the power section waveforms in one high-performance instrument, enabling debug and analysis of all aspects of the complete motor drive

MORE DEBUG AND VALIDATION FLEXIBILITY

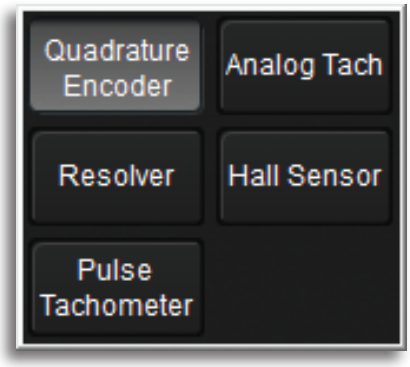
Dynamic Drive Response

The long acquisition memory in the HDO8000 (up to 250 Mpts/Ch) provides unique capabilities for motor and drive dynamic response analysis. For example, 25 seconds of continuous acquisition capture is possible at a sample rate of 10 MS/s. This permits complete understanding of dynamic drive behaviors, such as startup, application of load, or fast changing load conditions, and correlation of drive response problems to control system instructions or power section failures.



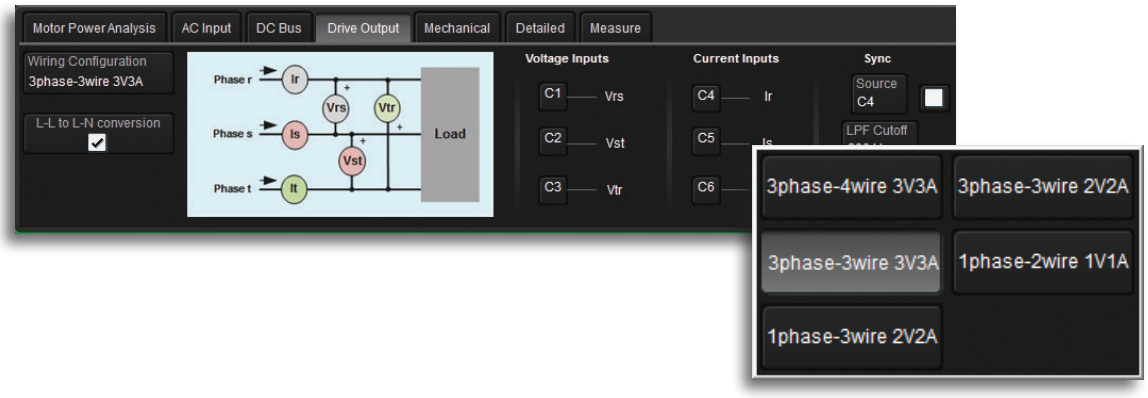
Motor Mechanical Integration

The combination of analog and digital inputs on the HDO8000 series of mixed-signal oscilloscopes provides more motor integration capability than a power analyzer. For instance, not only can standard analog and digital (pulse) tachometers be integrated for speed sensing, but analog Resolvers, digital Quadrature Encoder Interface and Brushless DC Hall Sensors may also be used to provide speed, direction, and absolute position information, not normally possible with a power analyzer.



Flexible Setup Capability

The eight analog input channels provide capability for direct measurement of three voltage and three current signals from a drive input or output. However, support is provided for a two-wattmeter measurement method for three-phase power, which allows three-phase measurements to be made using two voltage and two current signals. Therefore, input/output efficiency measurements of a complete drive can be performed using the eight analog input channels. Support is also provided for a line-line to line-neutral voltage conversion so as to allow intuitive line-line probing with per-phase line-neutral reported results.



CAPABILITIES AND PERFORMANCE

Motor Drive Power Analysis Software

Setup Capability

Number of Phases	1-phase or 3-phase, input or output
Measurement Location	Motor Drive Input, DC Link/Bus, Motor Drive Output, Mechanical Output
Drive Input/Output Setup Selections	3-phase, 4-wire (3V/3A), 3-phase, 3-wire (3V/3A), 3-phase, 3-wire (2V/2A), 1-phase, 3-wire (2V/2A), 1-phase, 2-wire (2V/2A)
Voltage Measurement Method	Line-Line or Line-Neutral (with conversion supported)
Calculation Waveform Sources	Any input channel or stored memory trace

Power Measurement Parameters (Per-Cycle, For Individual Phases or Total Three-Phase Values)

Voltage	RMS voltage, AC Voltage, DC Voltage, Peak Positive Voltage, Peak Negative Voltage, Peak-Peak Voltage, Voltage Crest Factor
Current	RMS Current, AC Current, DC Current, Peak Positive Current, Peak Negative Current, Peak-Peak Current, Current Crest Factor
Power and Efficiency	Real, Apparent, and Reactive Power, Power Factor, Phase Angle, Incremental Efficiency, Total Efficiency
Motor Mechanical	Torque, Speed, (Rotor Field) Angle (or absolute position), Mechanical Power
Other	AC Induction Motor Slip

Motor Mechanical Integration

Speed (some types provide rotation direction and absolute position as well)	Analog Tachometer (0-xVdc = speed) Digital Tachometer (x pulse/revolution = speed) Hall Sensors (three digital inputs) Resolvers (two analog inputs) Quadrature Encoder Interface (QEI) (A, B, and Z input)
Torque	0-xVdc = Torque mV/V type

Detailed Waveforms and Statistics

Waveforms	A time-correlated waveform of any per-cycle power measurement parameter may be created and displayed anywhere on the grid. Up to 12 detailed waveforms may be displayed at one time, with up to 40 waveforms total (channels, memories, zooms, math, and detailed waveforms) displayed at any one time.
Statistics	Detailed statistics on up to 12 per-cycle power measurement parameters may be displayed at one time.

Typical Accuracy

Voltage, Current and Power	Typically within 1%, depending on voltage and current measurement device. Recommended voltage probe = Teledyne LeCroy HVD Series High Voltage Differential Probe Recommended current probes = Teledyne LeCroy CP Series Current Probes Other voltage and current measurement devices may be integrated into the oscilloscope and motor drive power analysis software. .

Compatibility

Oscilloscopes	Teledyne LeCroy HDO8000 Series

Customer Service

Teledyne LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year. This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge

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