Motor Test Systems
MTS Series

- **Fast Production Quality Test**
- **Motor Efficiency Measurements**
- **AC and DC motors**
- **ASD - VFD analysis**
- **1, 3 and 6 Phase Configurations**
- **Steady State and Start-up Analysis**
- **Modular Turn Key System**
- **Detailed Data Logging to Disk**
- **Comprehensive Test Reports**

Production Quality Test

Test both AC and DC motors for quality problems with the California Instruments Motor Test System (MTS). Identify incorrect start-up winding weights, capacitors, shorted windings, excessive friction etc. within 3 seconds, without the need for dynos or loads.

Efficiency Measurements

The MTS offers inputs for torque and speed sensors, allowing the MTS software to calculate output power and efficiency of the motor under test. Test reports can be generated to provide complete details on motor performance.

ASD and VFD Motor Drives

Variable frequency (VFD) and adjustable speed (ASD) drives can be tested using the dual channel, six phase architecture of the MTS with ASD option.

Both, the input power to the drive, and output to the motor are monitored in real-time.

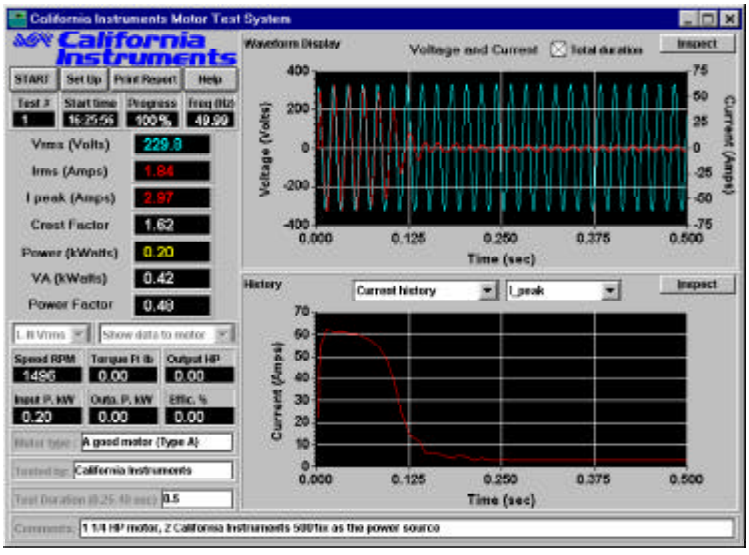
Voltage and current signals are digitized for display and analysis on single, three and six phase systems. To measure the high frequency voltage signals produced by an ASD motor drive unit, the MTS samples data at up to 500 Ks/s.

This provides the required time resolution to accurately determine instantaneous power. Combined with the drive input power, high confidence efficiency calculations can be made.

Simple User Interface

Setting up for a motor test is as simple as connecting the unit under test to the output connector on the MTS system unit. Starting a test run is as easy as clicking on the Start button.

The motor test software will acquire voltage and current to the motor and display both in a time domain graph. Additional displays such as the harmonic spectrum of the voltage and current can be selected. The left portion of the display shows common electrical motor parameters such as power, torque, horsepower and efficiency.



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Measurement Specifications

Available Data Displays

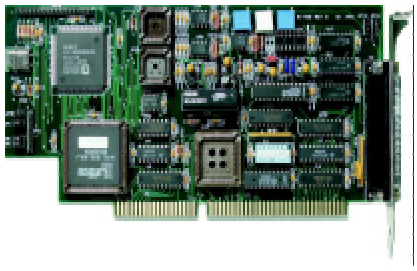
The following graphical displays are provided by the motor test software:

- Voltage and Current time domain
- Voltage Harmonics spectrum
- Current Harmonics spectrum
- Start up current
- Numeric display of V_{rms}, I_{rms}, I_{pk}, CF, PF, W, and VA

Start-up Current Analysis

Motors often require start-up currents far greater than their steady state operating current. The change of current over time when power is applied to a motor provides important information on motor performance. The MTS system eliminates the need to set up special test equipment to characterize this behavior. The iX Series AC source used as the power source of the MTS system, provides accurate voltage start phase angle control to evaluate worst case start-up conditions. A special transient acquisition mode is available for this purpose. The high sampling rate and frequency response of the data acquisition system makes accurate analysis of startup behavior possible by providing cycle by cycle as well as half cycle by half cycle rms calculations for a user specified acquisition window.

In the single shot acquisition mode, the lower graph display can be used to visualize any of the current channels. For ASD applications, the ASD output frequency can be plotted as a function of time.



CI400AD - DSP Based Digitizer Card

Measurement	Specification	Unit
Bandwidth		
Frequency Range Voltage	DC or 2 Hz - 200 KHz	
Current	DC or 2 Hz - 20 KHz	
Volts (Line-Neutral)		
Range[1]	0 - 350.00 or 0 - 700.00	V_{rms}
Max. input	1000	V_{peak}
Max. crest factor	5:1	
Accuracy	±0.1 % ± 0.05 % FS ± 100 mV	
Resolution	10	mV
Voltage CMRR	80	dB
RMS Current		
Current ranges, internal	10, 40	A_{PEAK}
Current range, external[2]	> 1000	A_{PEAK}
Max. input [permanent, no damage if < 200 A_{PEAK}]	40.00	A_{rms}
Max. Crest Factor [High and Low Current Range]	5:1	
Accuracy	±0.1 % ± 0.05 % FS ± 20 mA	mA
Resolution	1	mA
Power		
Range	0.1 - 12,500	W / ø
Accuracy	±0.25 % ± 0.25 % FS ± 0.5 W	W
Resolution	0.1	W
Apparent Power		
Range	0.1 12,500	VA / ø
Accuracy	±0.15% ± 0.15% FS ± 0.5 VA	VA
Resolution	0.1	VA
Power Factor		
Range	0.000 - ± 1.000	
Accuracy (> 0.6 PF)	± 0.005	
Resolution (> 0.6 PF)	0.001	
Crest Factor		
Range	1.00 - 20.00	
Accuracy	± 0.05	
Resolution	0.01	
Frequency		
Range	10.0 - 500.0	Hz
Accuracy	0.1 % of reading	Hz
Resolution	0.1	Hz
Harmonic Analysis		
Range	DC - 50th harmonic	
Accuracy Harmonics	±0.1 %±0.1%/kHz	
Measurement Window	2 periods	
	16 periods for -IEC option	

[1] *User selectable Voltage range change.*

[2] *External signal conditioning CT option available for currents up to 1000 A_{PEAK}*

Reporting & Data Logging

A summary report can be printed at the end of the test which includes all test results for the UUT. If needed, measurement data can be saved to disk at a user specified time interval. This data is then available for further data analysis applications. File formats are in tab delimited format for easy import into spreadsheet programs. All graphs can be printed directly from the MTS program or copied to the Windows Clipboard for inclusion in custom reports.

Modular Architecture

The California Instruments MTS System consists of the following components:

- Programmable AC power source, single or three phase. For applications where stable and controllable AC power is not needed, a configuration without the AC power source is available.
- MACS PC based high speed digital signal processing acquisition subsystem (PC not included)
- Motor Test Software.

AC Source Specifications

California Instruments

Total Customer Satisfaction is the goal of all California Instruments' employees. It is the driving force behind everything we do. This not only affects the product that you purchase from California Instruments, but everything about your interface with the company. Our applications engineers are ready to assist you with your AC power application. With over 35 years of experience designing and building precision AC power supplies, chances are we can meet your needs and exceed your expectations. The same dedication to customer satisfaction you will find in our applications group also permeates our modern manufacturing facility where our products are carefully built. No unit leaves our factory without being thoroughly tested to ensure quality, reliability and conformance to specifications.

CE Mark

All Motor Test Systems have been fully tested for compliance with CE Mark requirements. This allows these systems to be used in the European Economic Community. (5001iX and 15003iX based systems require -400 option for CE Mark).

The following specifications are valid for the AC Source module of the MTS system. Note that the 15003iX-MTS includes three 5001iX units, one for each phase. The iX Series offers arbitrary waveform output capability and programmable output impedance. For complete AC Source product specifications, refer to the specific product data sheet.

AC Source Model	1251RP	2001RP	3001iX / 5001iX	Unit
Output				
AC Power	1250	2000	3000 / 5000	VA
Voltage				
Ranges (L-N)	0 - 135 0 - 270	0 - 150 0 - 300	0 - 135 / 0 - 150 0 - 270 / 0 - 300	V_{RMS}
Accuracy @ 50/60 Hz	± 1 % FS	± 0.1 % FS	± 0.5 % FS	
@ 400 Hz	± 2 % FS			
Resolution	0.1	0.1	0.1	V_{RMS}
Load Regulation	± 0.5 % FS	± 0.05 % FS	± 1 % FS	
T.H.D.@ 50/60 Hz	< 1 %	< 1 %	< 1 %	
Frequency				
Range	16 - 500	DC, 16 - 5000	DC, 16 - 500	Hz
Accuracy	0.02	0.02	0.01	%
Resolution <100 Hz	0.1	0.01	0.01	Hz
> 100 Hz	1	0.1 - 1	0.1	Hz
Current (high voltage range - 270 V L-N)				
Steady State	4.6	6.7	11.1 / 18.5	A_{RMS}
Peak	13.8	23.6	92.5	A
Protection				
Programmable Current Limit				
Constant Voltage mode	√	√	√	
Constant Current Mode		√	√	
Over voltage	√	√	√	
Over temperature	√	√	√	
Input				
Line Voltage	100-240V single phase	115V / 230V±10% single phase	208 V 1ø / 3ø 400 V 3 phase	-400
Line Current	< 15	< 30	24 @ 208 V 12 @ 400 V	A_{RMS}
Line Frequency	47 - 63	47 - 440	45 - 66	Hz
Remote Control				
IEEE-488	√	√	√	
RS232C	√	√	√	
Physical				
Dimensions (incl. handles)				
HxWxD	3.5 x 19 x 22	5.25 x 19 x 26	7 x 19 x 24	inches
HxWxD	89 x 483 x 560	133 x 483 x 650	178 x 483 x 610	mm
Weight (net)	34 / 15.4	85 / 39	61 / 28	lbs / kg
Operating Temp.	0 - 40	0 - 40	0 - 40	° C

MACS Specifications

The Motor Analyzer and Conditioning System unit provides the required interface between the AC source, the Equipment Under Test and the PC. The MACS-1 supports single motor applications. The MACS-3 supports single and three phase motor applications. Three phase MTS systems can be upgraded to six phases for ASD applications at the time of purchase by specifying option -ASD.

MACS Model:		MACS-1	MACS-3
Number of phases		1	3
Channels	Voltage (Δ or Y)	1	6
	Current	1	8
Maximum voltage		350 / 700 V_{AC}	350 / 700 V_{AC}
Maximum current	Internal CT	40 A_{PEAK}	40 A_{PEAK}
	External CT	1000 A_{PEAK}	1000 A_{PEAK}
Dimensions	HxWxD	3.5 x 19 x 22 in.	3.5 x 19 x 22 in.
	HxWxD	89 x 483 x 560 mm	89 x 483 x 560 mm
Weight		14.3 lbs / 6.5 kg	14.3 lbs / 6.5 kg

Ordering Information

Model	VA Power	AC Source	MACS model
Complete Measurement Systems			
100-MTS	AC Line	none	MACS-1
300-MTS	AC Line	none	MACS-3
Single Phase Source and Measurement Systems			
1251RP-MTS	1250 VA	1251RP	MACS-1
2001RP-MTS	2000 VA	2001RP	MACS-1
3001iX-MTS	3000 VA	3001iX	MACS-1
5001iX-MTS	5000 VA	5001iX	MACS-1
5001iX-400-MTS	5000 VA	5001iX-400	MACS-1
Three Phase Source and Measurement Systems			
15003iX-MTS	15000 VA	15003iX	MACS-3
15003iX-400-MTS	15000 VA	15003iX-400	MACS-3

PC Requirements

The MTS requires the use of a PC capable of running Windows™. For best performance, networking should be disabled. Recommended PC hardware specifications are as follows:

CPU Pentium 200 MHz or faster.

RAM 32 Mbytes or more.

Hard Disk 500 Mbytes or more. 4 Mbytes required for program storage.

Display Color SVGA Monitor

Slots Available ISA bus 3/4 size card slot for CI400AD.

IEEE-488 If IEEE-488 is used for AC source control, a National Instruments bus controller and available PC slot is required. An RS232C serial port can be used also.

California Instruments will quote a PC as part of the system on request. Contact factory for details.

Options

-ASD Upgrades 3 phase MTS system to 6 phases for adjustable speed drive applications.

-IEC1 Harmonics and Flicker Test software, single phase. [iX based MTS systems only]

-IEC3 Harmonics and Flicker Test software, three phase.

-**RMS** Rack mount slides.

Accessories

203SC Four channel external CT signal conditioner.

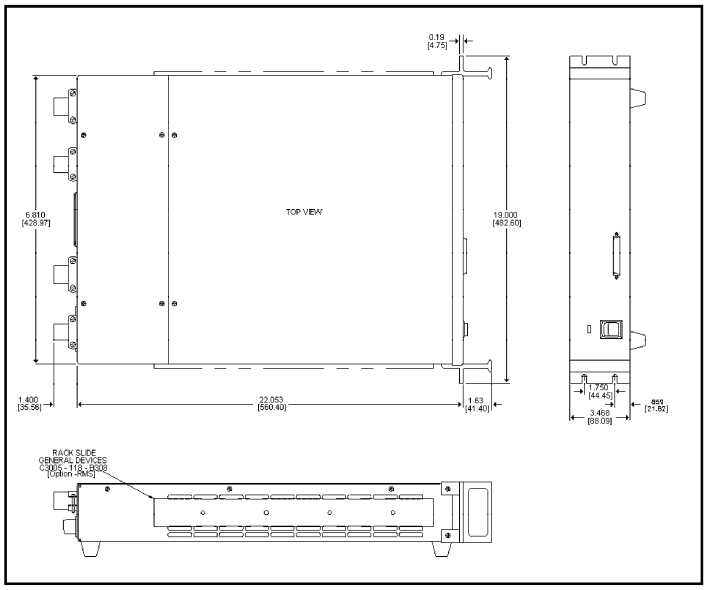
206SC Eight channel external CT signal conditioner.

CI400AD Spare A/D ISA card.

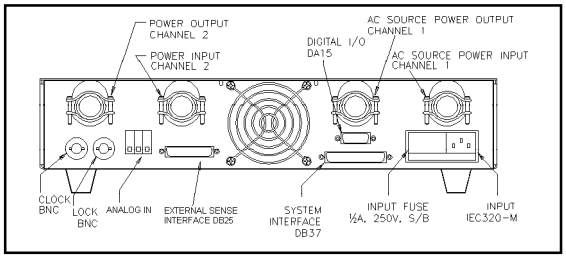
CI37C Spare 37 pin signal interface cable.

Supplied with

- North American Line Power Cord for AC Source (1251RP-MTS only).and MACS unit.
- Rackmount handles (-RMS slides optional).
- User Manuals
- Motor Test Software.



Dimension drawing MACS-1 shown with -RMS option. MACS-3 has same dimensions.



Rear panel connections for MACS-1 and MACS-3 units.

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