Equipment for Measuring and Analyzing Dynamic Process Variables

- Multichannel data acquisition systems
- PXI measurement modules
- MS measurement modules
- Signal conditioners
- Software

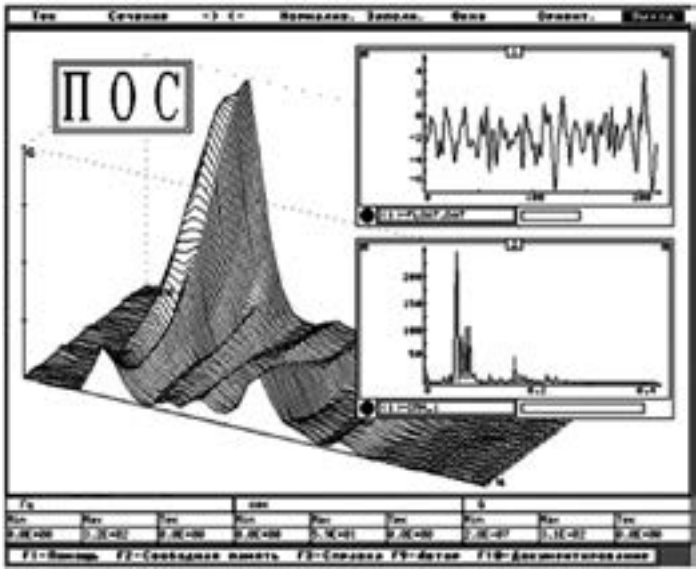
Equipment for Measuring and Analyzing Dynamic Process Variables

Contents

Equipment for Measuring and Analyzing Dynamic Process Variables

Since its foundation in 1992, MERA has been focused on developing software for recording and processing dynamic process variables.

One of our first software products, POS signal processing suite for MS-DOS, was widely used for vibration testing, gas-dynamic testing, strength testing, etc. It was adopted by almost all industries and by many research establishments.



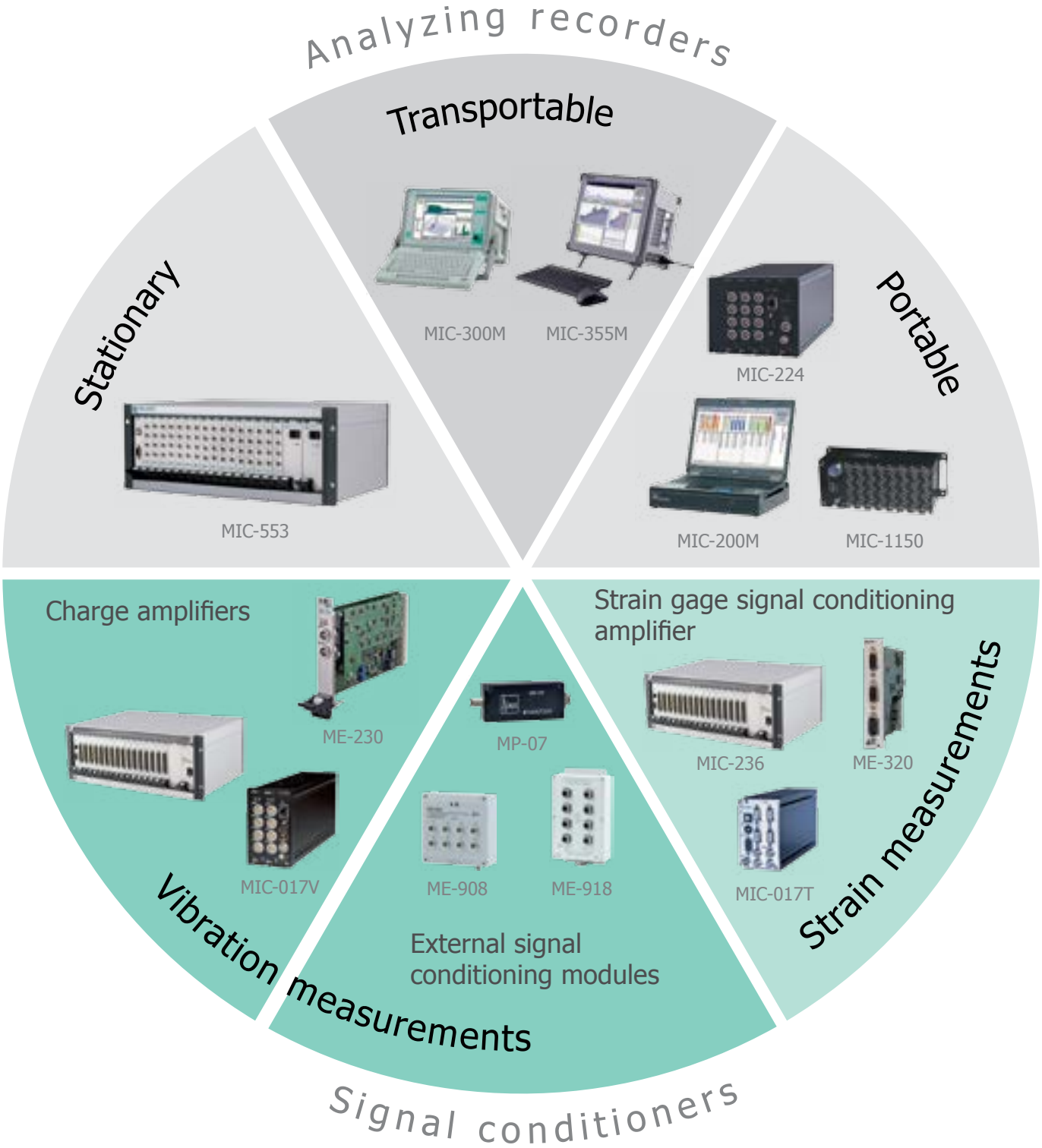
POS: Over 300 licenses sold

In 1999 MERA started development and production of its own multichannel measuring equipment, soon followed by full range data acquisition and processing systems and automated test bed systems.

Delivered to companies:

- MIC-300M and MIC-355M – over 300 systems
- WinPOS signal processing suite – over 1800 licenses
- Dynamic variable measurement modules – over 10,000

Developments of MERA for recording dynamic process variables in 1999-2016



Measuring Equipment for Real Time Recording and Processing of Dynamic Process Variables

Test

Strain

Vibration

Transient pressure

Acoustics

Up to 64 channels
Sampling frequency
up to 108 kHz per channel
On-line analysis

MIC-224

Thousands of
synchronized
channels

MIC-553

Up to 24 channels
Sampling frequency
up to 216 kHz per channel
On-line analysis

MIC-355M

Data acquisition
workstation with integrated
instrumentation crate

Ethernet

Optical
interface

Data acquisition
workstation

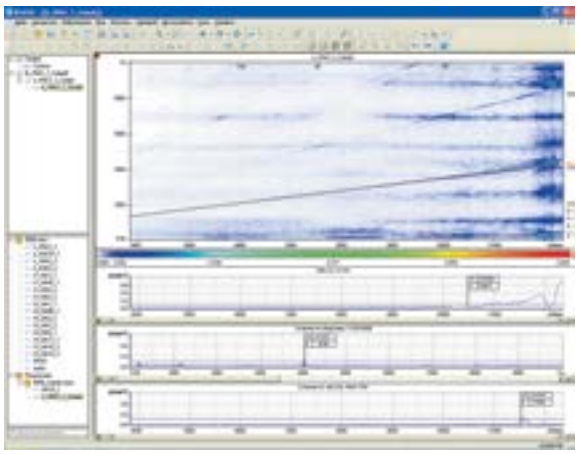
Data acquisition
workstation

Management, monitoring, analytics,
reporting

Data Format Compatibility

On-line Analysis and Post-test Processing Software

MR-300



WinPOS

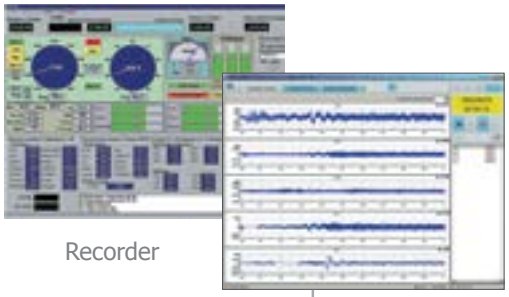
MR-300 and WinPOS in Measurement Life Cycle

WinPOS seamlessly integrates with recording equipment developed by MERA and enhances it, and can be deployed as a standalone solution or with other research tools.

Test object

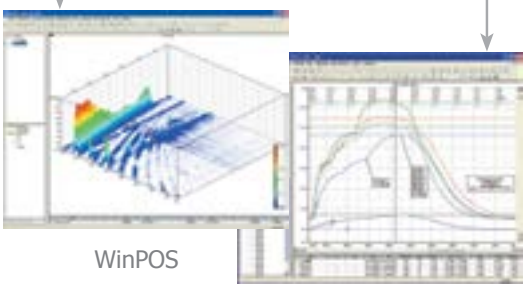
Test bed systems

MIC-355M
Transportable systems



Recorder

MR-300



WinPOS

Multichannel DAQ systems

MIC-200M

Purpose

This portable standalone analyzing recorder for rapidly changing variables is used to:

- Measure and analyze dynamic process variables
- Record, display and replay measurement data and transfer it to LAN
- Perform on-line analysis (band, 1/3 octave band, frequency response, trend, etc.) and post-test analysis of measurement data.

MIC-200M

Key Features

- Modern laptop connected to the measurement crate via digital interface
- Standalone power supply from standard built-in batteries
- Support of additional external batteries
- Connections to standard computer peripherals
- Differential and single-ended inputs
- Programmable low- and high-pass filters by channel
- Support of IEPE (ICP™, Isotron™, Deltatron™, etc.) transducers, including those equipped with TEDS.

Specifications

Specification	Value
Number of analog input channels	4/8/12/16
Sampling frequency, Hz (each channel)	333 ... 64,000
Signal measurement input range, V	±0.02 ... ±10
Bandwidth (with charge amplifier), Hz	20 ... 28,000 (admissible values from 0.7 to 28,000)
ADC resolution, bits	16
Minimum battery life (depends on deployed modules) without external batteries, hours	4
Display, "	15
Weight, kg	7
Dimensions, mm	215 x 238 x 115

MIC-224

Purpose

This system is used to measure signals from temperature and pressure sensors, DC voltage, DC resistance, current, signal frequency, relative voltage, relative resistance, etc.

Due to its construction, it can be used as a basis for measurement control systems, including:

- Distributed data acquisition systems
- Central crate systems
- Combined systems
- Laboratory data acquisition systems
- Portable measurement systems.

MIC-224

Key Features

- Compact DAQ system supporting a variable set of MR-series modules
- Modular construction with functional modules installed on a common bus
- Modules managed by a built-in controller, which also supports data exchange with a data acquisition and control workstation via Ethernet.

Specifications

Specification	Value
Number of slots	4
Maximum power input at maximum supply voltage, VA	150
Weight, kg	3
Dimensions, mm	150 x 112 x 240
Operating conditions	
Ambient temperature, °C	5 … 50
Maximum relative humidity, %	80
Ambient pressure, kPa (mm Hg)	70 … 106.7 (525 … 800)
Supply voltage, V	90 … 260

MIC-355M

MIC-355M

Purpose

This portable analyzing recorder for dynamic process variables is used to:

- Measure and analyze dynamic process variables
- Record, review and display measurement data and transfer it to LAN
- Perform real time analysis (statistical evaluations, spectrum, 1/3 octave spectrum, order analysis, etc.) and post-test analysis of measurement data.

MIC-355M is primarily used to analyze processes with rapidly changing variables, and to diagnose and monitor the mechanical, acoustic and vibration states of machines and machine parts.

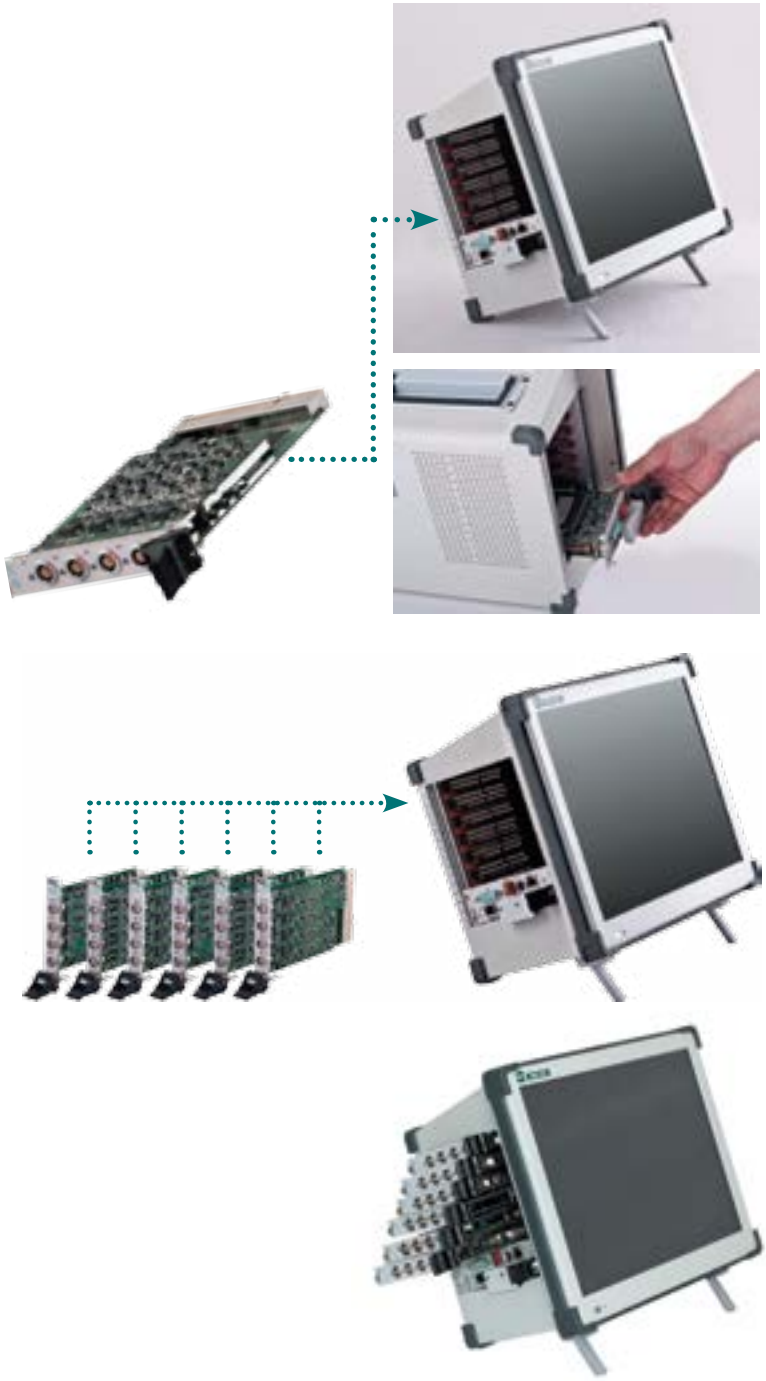
Key Features

- Installation of up to 6 PXI modules
- Programmable low- and high-pass filters by channel
- Support of IEPE (ICP™, Isotron™, Deltatron™, etc.) transducers, including those equipped with built-in electronic data sheets (TEDS)
- Hard drive storage of data
- Dedicated MR-300 software for recording and on-line processing
- Dedicated WinPOS software for detailed analysis of measurement data
- LCD
- Connections to standard computer peripherals
- Differential and single-ended inputs
- Inter-channel skew less than 200 ns; support of IRIG-B and synchronization with GLONASS/GPS time
- Audio channel
- Transport container.

The recorder's controller uses a high-performance dual-core Intel® Core™ 2 Duo T7500 processor with frequency of 2.2 Hz. The controller has 1 GB RAM, DVI interfaces and 2xGigabit LAN. The recorder is equipped with a 240 GB solid state drive.

Due to its sensor display and connections to standard peripherals (keyboard, mouse, etc.), MIC-355M is suitable for transportable data acquisition systems, in laboratory research and other activities that require measurements with high sampling frequency and real time measurement data processing.

The MIC-355M measurement system has a modular construction that supports up to 6 measurement modules per unit. The system can be configured with any set of PXI data acquisition modules offered by MERA: MX-224, MX-228, MX-240, MX-310, MX-340.



Specifications

Specification	Value
Number of slots	6
Number of measurement channels	Up to 24
Sampling frequency, kHz/channel	Up to 216
ADC resolution (individually per channel), bits	24
Display, "	15
Weight, kg	9.4
Dimensions, mm	345 x 285 x 190
Maximum power consumption, VA	300
Supply voltage, V (50 Hz)	90 ... 260

MIC-551

MIC-551 PXI

Optical interface

Data acquisition workstation with
a PCI MXI-4 interface board

Purpose

This multichannel PXI measurement system is used to measure dynamic variables. It supports MX-224, MX-228, MX-240, MX-310 and MX-340 measurement modules. The system is designed for laboratory and test bed measurements.

It has a modular crate construction with measurement modules installed on a common bus. The system is delivered with a system slot for a controller and slots for PXI measurement modules.

Key Features

- Compact system with carrying handle
- Crate controller for measurement module management, data recording and communication with a remote data acquisition workstation via an optical line
- Real time recording and analysis of dynamic process variables
- Interchannel synchronization time less than 200 ns
- Support of channel synchronization between several devices
- Support of synchronization with GLONASS/GPS time
- One compact system for strain gage, IEPE transducer, charge and voltage measurement channels
- Support of concurrent data recording via 16 (32) channels with sampling rate up to 216 kHz per channel
- Custom sets of programmable measurement modules
- Dedicated MR-300 software for recording and on-line processing.

Specifications

Specification	Value
Number of slots in a crate	4
Maximum rated power consumption, VA	300
Measurement system warm-up time, min.	40
Minimum Mean Time Between Failures, hours	10,000
Minimum average lifetime, years	7
Weight, kg	5
Dimensions, mm	257 x 213 x 177

MIC-553

MIC-553 PXI

Optical interface

Data acquisition station with
a PCI MXI-4 interface board

Purpose

This multichannel PXI measurement system is used to measure dynamic variables. It supports MX-224, MX-228, MX-240, MX-310 and MX-340 measurement modules. The system is designed for laboratory and test bed measurements.

It has a modular crate construction with measurement modules installed on a common bus. The system is delivered with a system slot for a controller and slots for PXI measurement modules.

Key Features

- Crate controller for measurement module management, data recording and communication with a remote data acquisition workstation via an optical line
- Real time recording and analysis of dynamic process variables
- Inter-channel skew less than 200 ns
- Support of channel synchronization between several devices
- Support of synchronization with GLONASS/GPS time
- One compact system for strain gage, IEPE transducer, charge and voltage measurement channels
- Support of concurrent data recording via 64 (128) channels with sampling rate up to 216 kHz per channel
- Custom sets of programmable modules
- Dedicated MR-300 software for recording and on-line processing.

Specifications

Specification	Value
Number of slots in a crate	16
Maximum rated power consumption, VA	600
Measurement system warm-up time, min.	40
Minimum Mean Time Between Failures, hours	10,000
Minimum average lifetime, years	7
Weight, kg	15
Dimensions, mm	484 x 435 x 177

MIC-1150

Purpose

The MIC-1150 is a portable modular signal recorder used for data acquisition systems and various equipment monitoring systems, as well as for transportation tests. The MIC-1150 is equipped with up to 8 MS -series measurement modules.

MIC-1150 P

MIC-1150 E

MIC-1150 PE

It is available in three versions:

- MIC-1150 P, standard industrial version for test bed systems
- MIC-1150 E, field version for harsh environmental conditions
- MIC-1150 PE, onboard version (high-level vibration protection and acoustic pressure protection up to 130 dB).

Key Features

- Standalone operation and data storage on a built-in non-volatile drive (from 2 GB)
- Modular construction for flexible hardware configuration
- Data transfer via Ethernet and Wi-Fi
- Group connector: power, synchronization, Ethernet
- Custom case (up to IP65).

Specifications

Specifications	Value		
	MIC-1150 P	MIC-1150 E	MIC-1150 PE
Number of measurement modules	2/4/8		
Number of measurement channels (depends on the number and type of measurement modules)	8 ... 128		
Operating temperature, °C	-40 ... +70	-40 ... +70	-55 ... + 75
Power consumption, W	45		
Supply voltage, V	18 ... 36		
Dimensions, mm	278×100×103	262×115×114	206×120×133

PXI measurement modules

MX-224 PXI
MX-228 PXI

Purpose

This PXI module is designed for measuring dynamic process variables (noise, vibration, transient pressure, acoustic signals, etc.).

The MX-224 module is used in multichannel DAQ systems, vibration monitoring and acoustic inspection systems, vibration control systems, and measurement systems with a wide dynamic range.

It is installed in MIC-551, MIC-553 and MIC-355M multichannel DAQ systems.

Module management, signal measurement, on-line analysis and signal recording are performed with MR-300 software. WinPOS software is used for display, processing and detailed analysis of recorded signals and printing.

MX-224

MX-228

Key Features

- 4 analog input channels (available in 8-channel version – MX-228)
- Supports piezoelectric accelerometers, microphones, transient pressure sensors, strain gages with the required external converters signal amplifiers and IEPE (ICP™, Isotron™, DeltaTron™, etc.) transducers as input signal sources, including those equipped with electronic data sheets (TEDS)
- High-pass filters with programmable shutoff
- Constant component measurement of a dynamic process variable is possible (DC coupling)
- Built-in diagnostic functionality.

Specifications

Specifications	Value
Number of channels • MX-224 • MX-228	 4 8
Channel mode by input (input type)	- voltage, differential - voltage, single-ended - voltage, single-ended with current excitation (IEPE transducers)
Input range, V (ADC resolution, bits)	±10 (24) ±10 (16) ±6 (16) ±3 (16) ±1.5 (16) ±0.75 (16) ±0.375 (16) ±0.188 (16)
Sampling frequency, Hz	3375 6750 13500 27 000 54 000 108 000 216 000
High-pass filter cut-off frequency (programmable shutoff) for -3 dB at ADC input, Hz	1.7
IEPE transducer supply current (for output voltage from 0.5 to 29 V), mA	8 ± 0.4 10 ± 0.5
Built-in reference voltage, V	4.096 ± 0.004
Minimum input Common Mode Rejection for frequencies from 50 Hz to 1 kHz, dB	64
Maximum intrinsic error of built-in reference voltage, %	±0.1
Maximum secondary supply load current for +12 V and -12 V per channel, mA	120
Maximum intrinsic reduced error of DC voltage (Fs=216 kHz, input range -10.0...+10.0 V) at 25°C, %	±0.1
Maximum intrinsic reduced error of AC voltage at 1 kHz (Fs=216 kHz, input range -10.0... +10.0 V) and 25°C, %	±0.1
Maximum passband ripple for frequencies from 20 Hz to 40 kHz relative to 1 kHz input signal (Fs=216 kHz, differential input type), dB	±0.01
Maximum passband ripple for frequencies from 40 kHz to 100 kHz relative to 1 kHz input signal (Fs=216 kHz, differential input type), dB	±0.1

MX-240 PXI

Purpose

This PXI module is designed for dynamic signal measurements of voltage or charge.

The MX-240 module is used in multichannel DAQ systems, vibration monitoring and acoustic inspection systems, vibration control systems, and measurement systems with a wide dynamic range.

It is installed in MIC-551, MIC-553 and MIC-355M multichannel DAQ systems.

Module management, signal measurement, on-line analysis and signal recording are performed with MR-300 software. WinPOS software is used for display, processing and detailed analysis of recorded signals and printing.

MX-240

Key Features

- 4 independent analog input channels with built-in charge samplifiers
- Support of the following sensor types:
  - Piezoelectric transducers with single-ended output
  - Piezoelectric transducers with differential output
  - IEPE (ICP™, Isotron™, Deltatron™, etc.) transducers
- Support of TEDS technology
- Bandwidth from 0.15 to 100,000 Hz
- High- and low-pass filters with programmable shutoff
- Built-in diagnostic functionality.

Specifications

Specification	Value
Number of channels	4
Channel mode by input (input type)	- voltage, differential - voltage, single-ended - voltage, single-ended, with current excitation (IEPE transducers) - charge, differential - charge, single-ended
Channel input range, V (ADC resolution, bits)	±10 (24) ±10 (16) ±6 (16) ±3 (16) ±1.5 (16) ±0.75 (16) ±0.375 (16) ±0.188 (16)
Sampling frequency, Hz	3,375 6,750 13,500 27,000 54,000 108,000 216,000
Channel gain factor in differential or single-ended charge input mode, mV/pC (dB)	0.1(-20) 1 (0) 10 (20) 100 (40) 1,000 (60)
Channel charge input range, pC • For gain factor of -20 dB • For gain factor of 0 dB • For gain factor of 20 dB • For gain factor of 40 dB • For gain factor of 60 dB	 ±100,000 ±10,000 ±1000 ±100 ±10
Maximum intrinsic error of DC voltage in differential or single-ended voltage input mode, %	±0,1
Maximum intrinsic error of AC voltage in differential or single-ended voltage input mode with input frequency 1 kHz (input range ±10 V, Fs=216 kHz), %	±0.1
Maximum passband ripple for frequencies from 0 to 48 kHz in differential or single-ended voltage input mode (input range ±10 V, Fs=216 kHz, high-pass filter off), dB	±0.01
Maximum passband ripple for frequencies from 0 to 100 kHz in differential or single-ended voltage input mode (input range ±10 V, Fs=216 kHz, high-pass filter off), dB	±0.1
Maximum intrinsic error of charge measurement in differential or single-ended charge input mode at 1 kHz input frequency, %	±1
Channel bandwidth at -3 dB (depends on built-in charge amplifier factor) in differential or single-ended charge input mode (low-pass filter off), Hz (dB)	0,3 ... 100,000 (-20) 3 ... 100,000 (0, 20, 40) 3 ... 70,000 (60)
Bandwidth with passband ripple up to ±0.15 dB (depends on built-in charge amplifier factor) in differential or single-ended charge input mode (low-pass filter off), Hz (dB)	10 ... 70,000 (-20, 0, 20, 40) 10 ... 10,000 (60)

MX-310 PXI

Purpose

This PXI module is designed for measuring and recording signals from single strain gages during dynamic strain testing. Strain gages, external signal amplifiers, generator-type sensors with voltage output, and IEPE transducers are supported as input signal sources.

This module is mainly used for strain measurements of rapidly changing process variables. It is used in dynamic strain measurements of tested equipment parts.

The MX-310 module is used in multichannel DAQ systems, and measurement systems with a wide dynamic range.

It is installed in MIC-551, MIC-553 and MIC-355M multichannel measurement DAQ systems.

Module management, signal measurement, on-line analysis and signal recording are performed with MR-300 software. WinPOS software is used for display, processing and detailed analysis of recorded signals and printing.

MX-310

Key Features

- 4 analog input channels with built-in strain gage signal amplifiers
- External strain gage power supply (excitation) with balanced DC current from two connected power sources for high-level protection of channels from external electrostatic disturbances
- Bandwidth from 1.7 to 100,000 Hz
- Support of IEPE standard and TEDS technology
- High- and low-pass analog filters with programmable switching
- Built-in diagnostic and self-calibration functionality.

Specifications

Specification	Value
Number of channels	4
Channel mode by input (input type)	- voltage, differential - voltage, single-ended - voltage, single-ended, with current excitation (IEPE transducers) - differential input of a built-in strain gage signal amplifier
Input range with strain gage signal amplifier switched off, V (ADC resolution, bits)	±10 (24) ±10 (16) ±6 (16) ±3 (16) ±1.5 (16) ±0.75 (16) ±0.375 (16) ±0.188 (16)
Input range with strain gage signal amplifier switched on, mV (depends on gain factor Fa)	±1 (10,000) ±10 (1,000) ±20 (500) ±50 (200) ±100 (100)
Sampling frequency, Hz	3,375 6,750 13,500 27,000 54,000 108,000 216,000
High-pass filter cut-off frequency (programmable shutoff) for -3 dB at ADC input, Hz	1.7
IEPE transducer supply current (for output voltage from 0.5 to 29 V), mA	8 ± 0.4 10 ± 0.5
Built-in reference voltage, V	4.096 ± 0.004
Minimum input Common Mode Rejection for frequencies from 50 Hz to 1 kHz, dB	64
Rated supply current of strain gage, mA	4 10
Rated cut-off frequency of amplifier low-pass filter at -3 dB, kHz	2.2 48
Rated pulse modulation frequency (squarewave) of strain gage supply current with calibration unit switched on, Hz	420
Rated modulation amplitude of strain gage supply current with calibration unit switched on, μA	3.5
Rated resistance of built-in reference strain gage, ohms	200
Maximum intrinsic reduced error of DC voltage (Fs=216 kHz, input range -10.0 ... +10.0 V) and 25°C, %	±0,1
Maximum intrinsic reduced error of AC voltage at 1 kHz (Fs=216 kHz, input range -10.0 ... +10.0 V) and 25°C, %	±0.1
Maximum passband ripple for frequencies from 20 Hz to 40 kHz relative to 1 kHz input signal (Fs=216 kHz, differential input type), dB	±0.01
Maximum passband ripple for frequencies from 40 kHz to 100 kHz relative to 1 kHz input signal (Fs=216 kHz, differential input type), dB	±0.1
Intrinsic reduced error for AC voltage at 1 kHz with amplifier switched on (Fs=216 kHz), %	±0.3
Channel bandwidth with amplifier switched on at -3 dB, Hz	10 … 100,000
Channel passband ripple with amplifier switched on and frequencies from 20 Hz to 60 kHz, dB	±0.5

MX-340 PXI

Purpose

This PXI module is designed for amplifying and measuring signals from strain gages in full-, 1/2, 1/4-bridge configurations, single strain gages and strain gage potentiometer circuits for dynamic and quasi-static strain measurements.

The MX-340 module is used in multichannel DAQ systems and measurement systems with a wide dynamic range.

It is installed in MIC-551, MIC-553 and MIC-355M multichannel DAQ systems.

Module management, signal measurement, on-line analysis and signal recording are performed with MR-300 software. WinPOS software is used for display, processing and detailed analysis of recorded signals and printing.

MX-340

Key Features

- 4 analog input channels with built-in strain gage signal conditioning amplifiers
- Strain gage power supply (excitation) with balanced DC current from two connected power sources for high-level protection of channels from external electrostatic disturbances in the circuit (compared to an asymmetrical (grounded) power supply)
- Adjustable supply current and voltage
- Analysis bandwidth from 0 to 100 kHz
- High- and low-pass analog filters with programmable enabling and disabling
- 2 rated values for 1/4 bridge completions; 2 shunt resistors; dynamic shunt mode
- Built-in diagnostic and self-calibration, including dynamic calibration
- 120 kiloohm shunt resistor connection for gage calibration and signal line test.

Specifications

Specification	Value
ADC input types (with built-in amplifiers switched off)	Single-ended Differential
Sampling frequency (Fs), Hz	6,750 13,500 27,000 54,000 108,000 216,000
Strain gage configurations (with built-in amplifiers switched on)	Bridge, 1/2 bridge, 1/4 bridge, strain gage, potentiometer
Supply (excitation) current range, mA	1 … 17
Supply (excitation) voltage range, V	0.5 ... 18
Adjustment range (zero offset) for built-in amplifiers (in input range), mV	-100 ... +100
Intrinsic error of DC current in input range ±10 V (Fs=216 kHz, ADC 16 bits, built-in amplifier switched off), %	±0.1
Bandwidth, kHz	0 … 100
Channel bandwidth at -3 dB (low-pass filter switched off), kHz	0 ... 100 (single strain gage: 10 Hz ... 100 kHz)
Minimum dynamic measurement range, dB	100
Input ranges as a function of gain factor (Fa) of built-in amplifiers, mV	±100 (Fa=100) ±50 (Fa=200) ±20 (Fa=500) ±10 (Fa=1,000) ±5 (Fa=2,000) ±2 (Fa=5,000) ±1 (Fa=10,000)
Cut-off frequency of switchable 3rd level low-pass filters of built-in amplifiers at -3 dB (standard), kHz	2 40 (stored in PROM module and displayed in setup menu)
Cut-off frequency of switchable 1st level high-pass filter at ADC inputs (at -3 dB), Hz	0.17
Cut-off frequency of switchable 1st level high-pass filters of built-in amplifiers (at -3 dB), Hz	1
Rated resistance of built-in calibration shunt resistors (standard), kohms	559.9 174.4 (stored in PROM module and displayed in setup menu)
Rated resistance of built-in reference strain gages, ohms	100 120 200 350

MS measurement modules

MS-202

MS-202

Purpose

The MS-202 module is designed for measuring voltage signals from the sensors with a wide dynamic range.

The MR-202 can be used together with external charge amplifiers to measure signals from piezoelectric accelerometers, microphones and other types of PE transducers. Key application areas:

- Vibration monitoring and control
- Frequency analysis of rapidly changing process variables
- Measurement of acoustic signals and noise levels
- Recording impulse and transient processes

Module management, signal measurement, and signal recording are performed with Recorder software. WinPOS software is used for display, processing and detailed analysis of recorded signals and printing.

Key Features

- Differential and single-ended voltage inputs
- Individually programmable inputs
- Protecting inputs from voltage over ±15 V range. Independent hardware overvoltage indicators
- Support of IEPE standard and TEDS technology
- Analysis bandwidth from 0 to 50 kHz.

Specifications

Specification	Value
Number of channels	4
Measurement range, V	±10
Sampling frequency, Hz	13,500 27,000 54,000 108,000
Maximum intrinsic reduced error, %	±0.2
Maximum passband ripple (bandwidth from 20 Hz to 20 kHz, Fs=108 kHz, open input), dB	±0.015
Minimum input Common Mode Rejection at 60 Hz, dB	-80
S/N ratio (Fs=108 kHz, Finp=1 kHz, Uinp=7 Vrms), dB, at least	98
Maximum harmonic factor (Fs=108 kHz, Finp=1 kHz, Uinp=3.5 Vrms), %	0.02
Maximum signal flow from adjacent channels at 1 kHz, dB	-90
Minimum out-of-band input signal suppression at 100 kHz ... 1 MHz (Fs=108 kHz), dB	-95
Operating temperature range, °C	-40 … +50
Module dimensions, mm	71×77

MS-340

MS-202

Purpose

The MS-340 module is designed for amplifying and measuring signals from strain gages arranged in a measurement bridge, 1/2-bridge, 1/4-bridge, single strain gages and strain gage potentiometer circuits for dynamic and quasi-static strain measurements.

Module management, signal measurement, and signal recording are performed in Recorder software. WinPOS software is used for display, processing and detailed analysis of recorded signals and printing.

Key Features

- 4 independent channels with built-in strain amplifiers
- Strain gage power supply (excitation) with balanced DC current from two connected power sources for high-level protection of channels from external electrostatic disturbances in the circuit (compared to an asymmetrical (grounded) power supply)
- Adjustable supply current and voltage
- Analysis bandwidth from 0 to 50 kHz.
- High- and low-pass analog filters with programmable switching
- 2 rated values for 1/4 bridge completions; 2 rated bypass shunt resistor values; dynamic shunt mode
- Built-in diagnostic and self-calibration, including dynamic calibration, functionality.

Specifications

Specification	Value
Number of channels	16
Sampling frequency, kHz/channel	8 ... 108
Strain gage configuration (with built-in amplifiers switched on)	Bridge, 1/2-bridge, 1/4-bridge, single strain gage, potentiometer
Supply (excitation) current range, mA	5 … 25
Supply (excitation) voltage range, V	2 ... 10
Adjustment range (zero offset) for built-in amplifiers (in input range), mV	-100 ... +100
Reduced measurement error at 1 kHz, %	±0.3
Bandwidth, kHz	0 … 50
Minimum dynamic measurement range, dB	100
Input signal range, mV	±1 ... ±10 ±10 ... ±1,000
Cut-off frequency of switchable 3rd level low-pass filters of built-in amplifiers at -3 dB, kHz	10; 40
Cut-off frequency of switchable 1st level high-pass filter of built-in amplifiers at -3 dB, Hz	1.1
Rated resistance of built-in calibration shunt resistors (standard), kohms	59.9 174.4

Signal Conditioners

ME-230

Purpose

The ME-230 charge amplifier is designed for converting dynamic signals from piezoelectric transducers at amplifier's input to output voltage and for output signal amplification and filtering. It is used in MIC-017-V and MIC-236 measurement systems.

ME-230

MIC-017-V

Key Features

- Support of piezoelectric (PE) transducers with differential or single-ended charge output and IEPE transducers (ICP™, Isotron™, Deltatron™, etc.) with voltage output
- Transducer electronic data sheets (TEDS) support
- Built-in (calibration) tool for channel availability check.

MIC-236

Specifications

Specification	Value
Number of channels	2
Channel mode by input (input type)	- charge, differential - charge, single-ended - voltage, single-ended, with current excitation (IEPE transducers)
Channel gain factor in voltage input mode, V/V (dB)	1 (0)
Channel charge input range, pC	
• For gain factor of -40 dB	±1,000,000
• For gain factor of -20 dB	±100,000
• For gain factor of 0 dB	±10,000
• For gain factor of 20 dB	±1,000
• For gain factor of 40 dB	±100
Intrinsic noise level in channel for 40 dB gain factor, pC	0.05 (RMS)
Maximum intrinsic error of channel gain factor at 1 kHz, %	±0.5
Channel bandwidth at -3 dB, Hz	0.7 … 80,000
Maximum channel passband ripple at frequencies from 10 Hz to 40 kHz (with low-pass filter switched off), dB	±0.5

ME-320

Purpose

The ME-320 module is designed for conditioning, amplifying and filtering signals from strain gages and sensors based on strain gages (force, torque, pressure sensors, piezoresistive accelerometers, etc.). The module can be used for dynamic and static measurements. It is used in MIC-017-T and MIC-236 measurement systems.

ME-320

MIC-017-T

MIC-236

Key Features

- Two independent channels supplying gages with DC current (or voltage) with adjustable current (or voltage)
- Cable conductor resistance compensation circuits
- Embedded fixed resistors complementing the circuit to support sensors and strain gages arranged in 1/2 bridge or 1/4 bridge configuration
- Embedded tools for balancing, calibration and sensitivity testing of the measurement circuit, and built-in shunt resistors for gage calibration
- Circuits for evaluating and indicating channel state
- Versions:
  - ME-320L, no galvanic isolation
  - ME-320F, galvanic isolation of input and output circuits by channel to protect input circuits and prevent grounding problems. The ME-320F is preferred for remote signal sources and high levels of electromagnetic interference.

Specifications

Specification	Value
Number of channels	2
Channel gain factor (programmable)	2.5 5 10 20 50 100 200 500 1000
Strain gage configuration	Bridge 1/2 bridge 1/4 bridge Single strain gage
Gain factor error for DC current, %	±0.1
Linearity, %, at least	±0.01 (of full scale)
Minimum bandwidth at -3 dB (low-pass filter switched off), kHz	0 … 200
Maximum passband ripple for frequencies from 0 to 50 kHz (with low-pass filter switched off), dB	±0.5
Channel phase response, ° (kHz), at least	±2 (0 … 1) ±5 (1 … 10)
Minimum S/N ratio, dB	60
Maximum interchannel signal flow, dB	-50
Minimum input signal Common Mode Rejection (for frequencies from 0 to 50 Hz), dB	90
Maximum common mode level at inputs, V	±10 (ME-320L) ±300 (ME-320F)
Cut-off frequency of high-pass filter at -3 dB (programmable switching), Hz	8
Cut-off frequency of Butterworth 3rd level low-pass filter (programmable), Hz	10 100 1,000 10,000
Embedded resistor for 1/4 bridge completion, ohms	100 ± 0.05% 120 ± 0.05% 200 ± 0.05% 350 ± 0.05% 1,000 ± 0.05%
Minimum input resistance, Mohms	50 (closed input) 10 (open input)
Calibration shunt resistance, kohms	100 120 174.4 840
Maximum admissible input voltage, V	±50 (differential) ±300 (in-phase)
Channel output resistance, ohms	0.5
Supply (excitation) voltage range, V	0.5 … 10
Supply (excitation) voltage increment, V	0.0024
Minimum admissible power supply load current, mA	30
Short-circuit current limit for gage power supply, mA	50
Maximum supply (excitation) voltage error, %	±0.1 + 0.005%/mA
Supply (excitation) voltage temperature drift (in adjustable voltage supply mode), ppm/°C	10
Supply (excitation) current range (in adjustable current supply mode with voltage range from 0.5 to 13.5 V), mA	0.5 … 15
Supply (excitation) current error, %	±0.1 + 0.005%/ohm
Maximum channel output load current, mA	70
Short-circuit current limit at channel output, mA	115

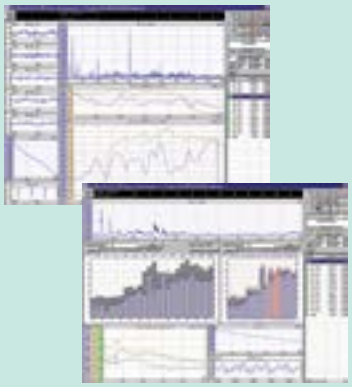
Software

Software functionality

Test run preparation

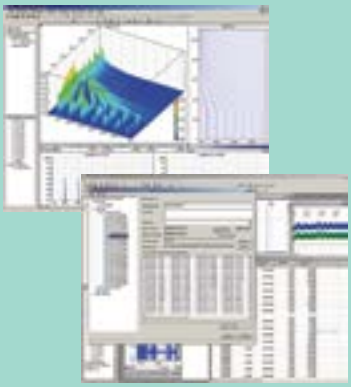
- Test script development (measurements, processing, output)
- Uniform system setup (shortens preparation time)
- Simple reuse of previous settings
- Automated calibration and validation of measurement channels

Testing

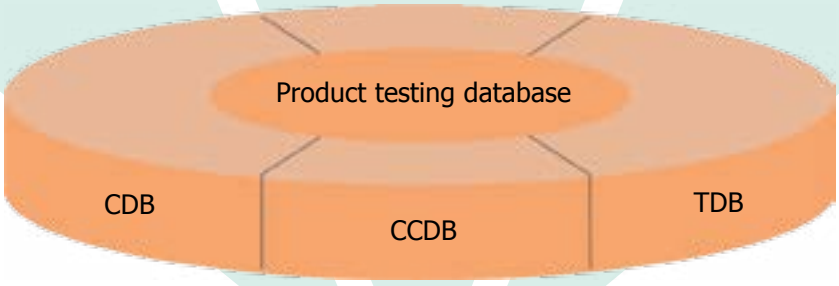


- Reliable measurement and recording of continuous data flow
- Real time calculations and measurement data output with customized layout
- Threshold monitoring (emergency monitoring)
- Data transfer via OPC protocol

Test data processing and analysis



- Easy data structuring
- Simple data search, selection, and retrieval
- Effective shared processing of large data volumes
- Intuitive results output
- Documented solutions, protocols, and reports



Test report

CDB – configuration database
CCDB – calibration curve database
TDB – test database

Software architecture

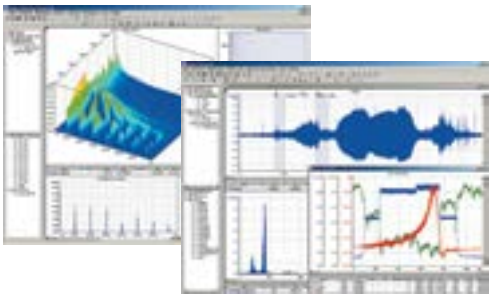
Real Time physical layer

Real Time input/output system: based on DSP processor assembler and C++

Runtime application layer

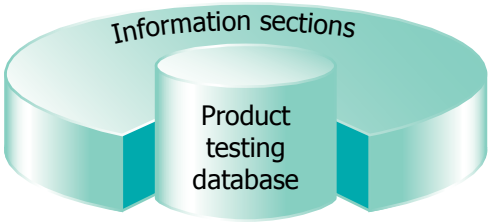
Runtime data processing system: Real time data processing, processed data displayed on screen

Application layer



Post-test data processing: mathematical processing of data, documentation of measurement and processing results

Data storage application layer



Test and processing database

- Limited access with authorization
- Quick data search
- Unified data format

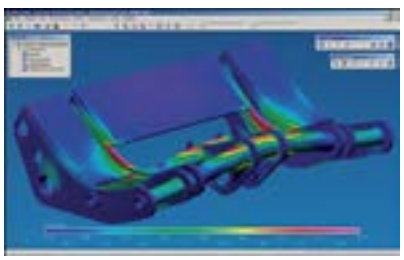
OPC industrial interface

SCADA systems

MERA top layer software

ActiveX

CAD/CAE systems



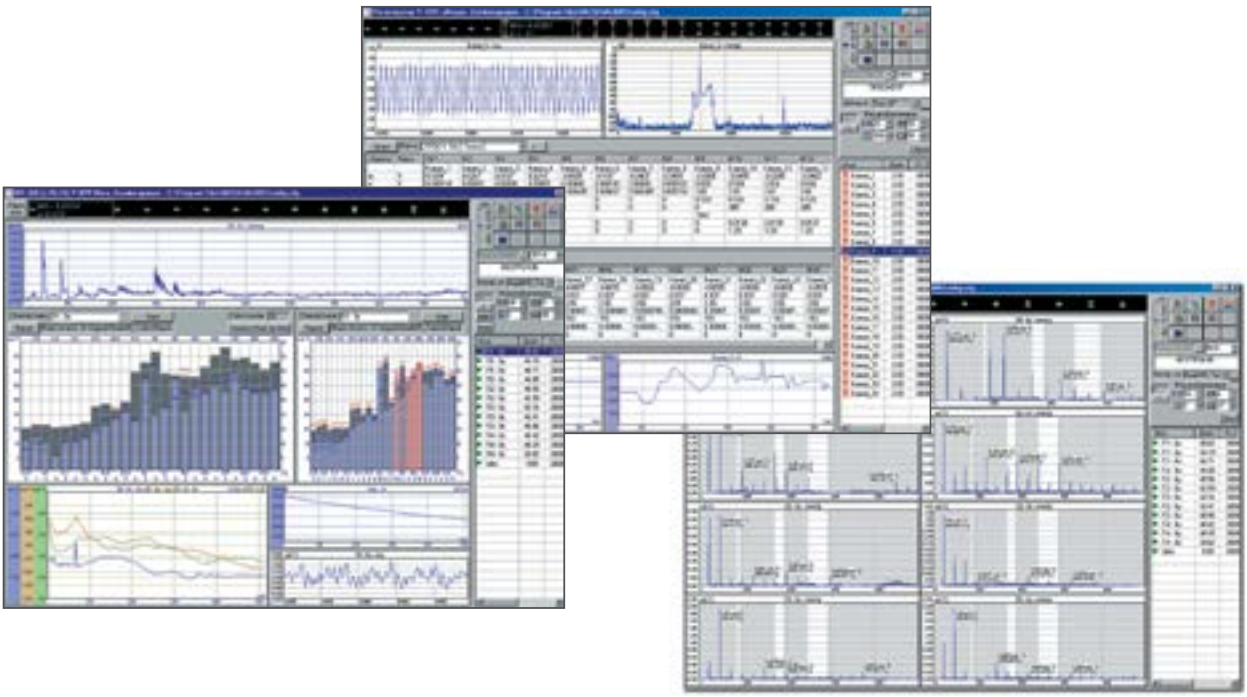
MR-300 – Real Time Dynamic Process Recording and On-line Analysis

MR-300 performs real time dynamic process recording and on-line analysis.

The software is designed to manage MIC-355M, MIC-300M, MIC-200M, MIC-553 and MIC-254 analyzing recorders for dynamic process variables.

MR-300 can be used to:

- Manage and set up measurement channels and store calibration curves (scales)
- Manage recording/playback
- Monitor measured variables and design performance displayed on operator station screens
- Save the whole measurement data flow with exact timestamps
- Enhance functionality using plugins.



Recorder features

Hard disk storage, display as oscillograms in recording mode, recording and playback of synchronous audio tracks (via a channel independent from measurement channels), playback of recorded signals via analog outputs.

Real time analysis features

- Cumulative performance evaluation: RMS, amplitude, etc.
- Narrow spectrum calculation
- 1/3 spectrum calculation with masking control
- Harmonic amplitude and phase calculation (harmonic locus) in multiples of rotor frequency
- Frequency calculation from tacho signal
- Campbell diagrams
- Simultaneous display of oscillograms for all activated channels
- Vibration test processing: resonance and sinusoidal vibration tests (amplitude- and phase-frequency response), broadband vibration tests, power density spectrum building, impact tests.

Threshold monitoring

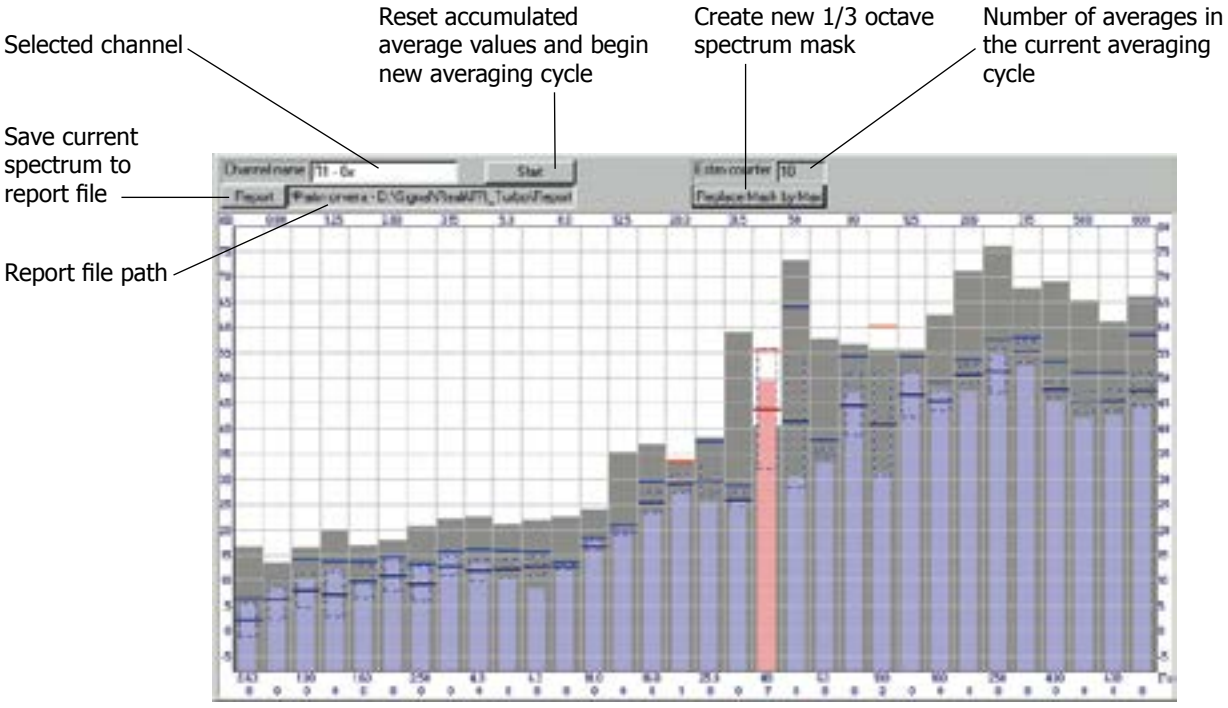
- Monitoring measured variable values and converted values, comparison with warning (alarm) thresholds for all channels
- When an alarm is triggered – color-coded indication on diagrams and addition of labels to measurement data files.

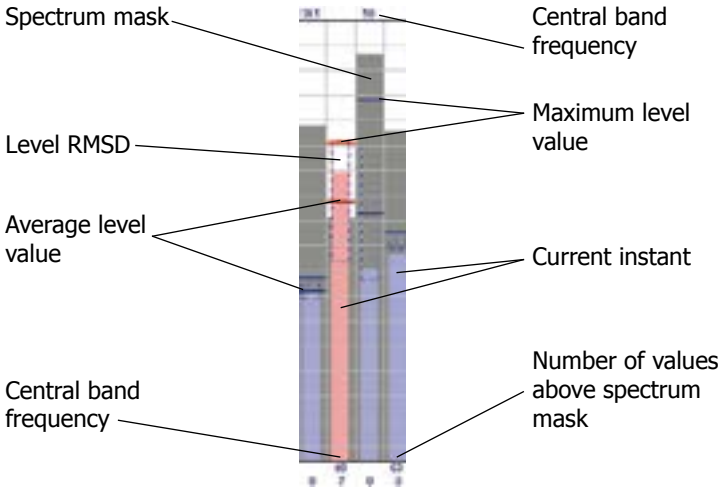
Automated report generation

- Addition of current product state (according to on-line analysis results) to a report file by pressing a single button; this generates a test report with detailed information on product characteristics in different modes and checkpoints
- Addition of current display page with diagrams, trends and tables to a graphical file for inclusion in the report.

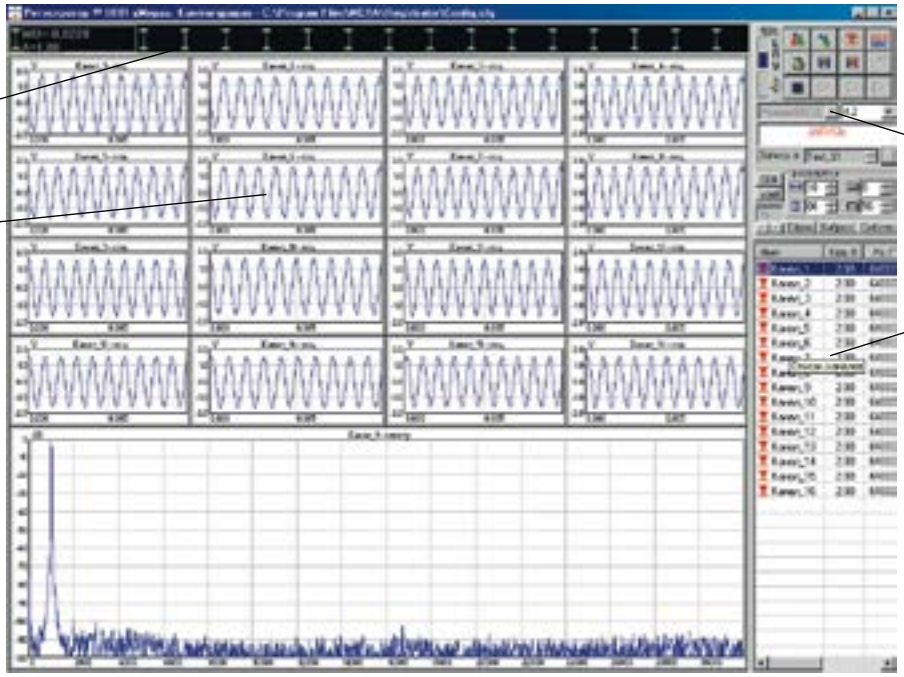
Metrological support

- Automated calibration, graduation, and balancing of analog channels.

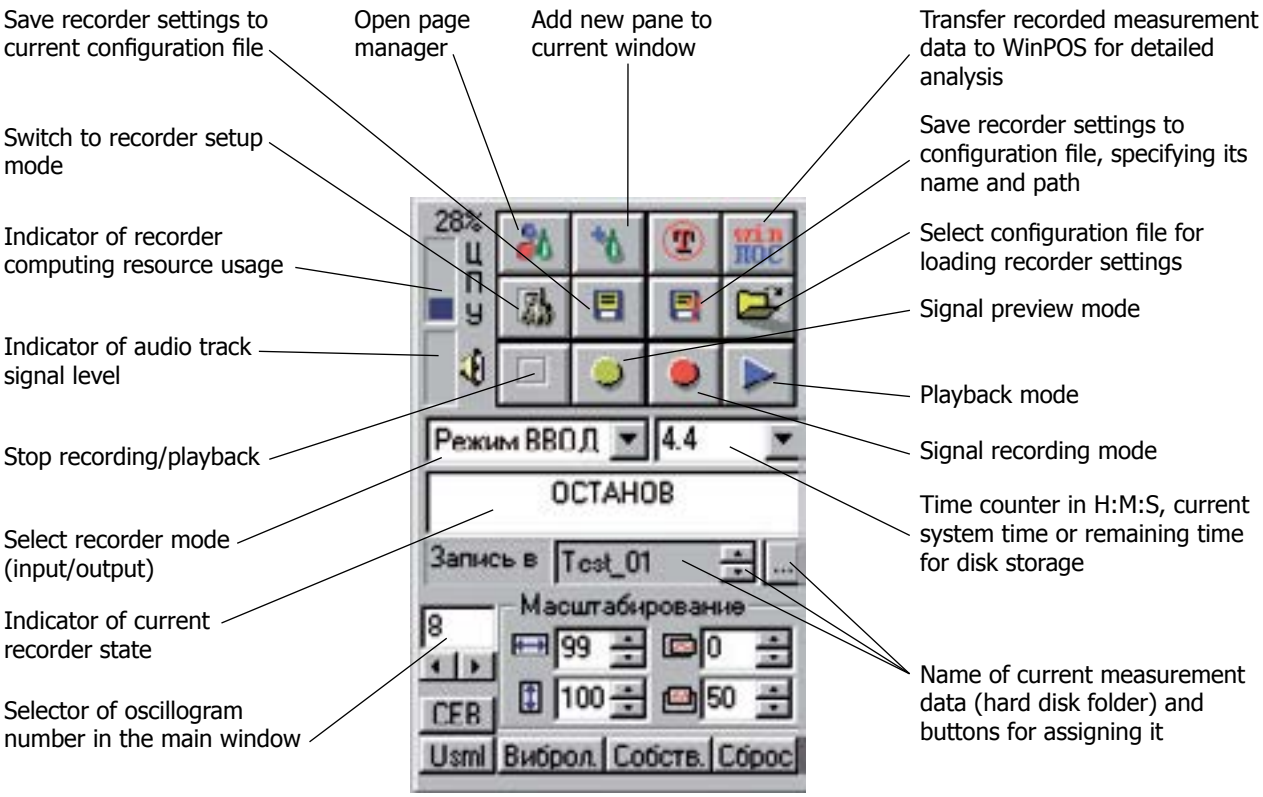




MR-300 main window



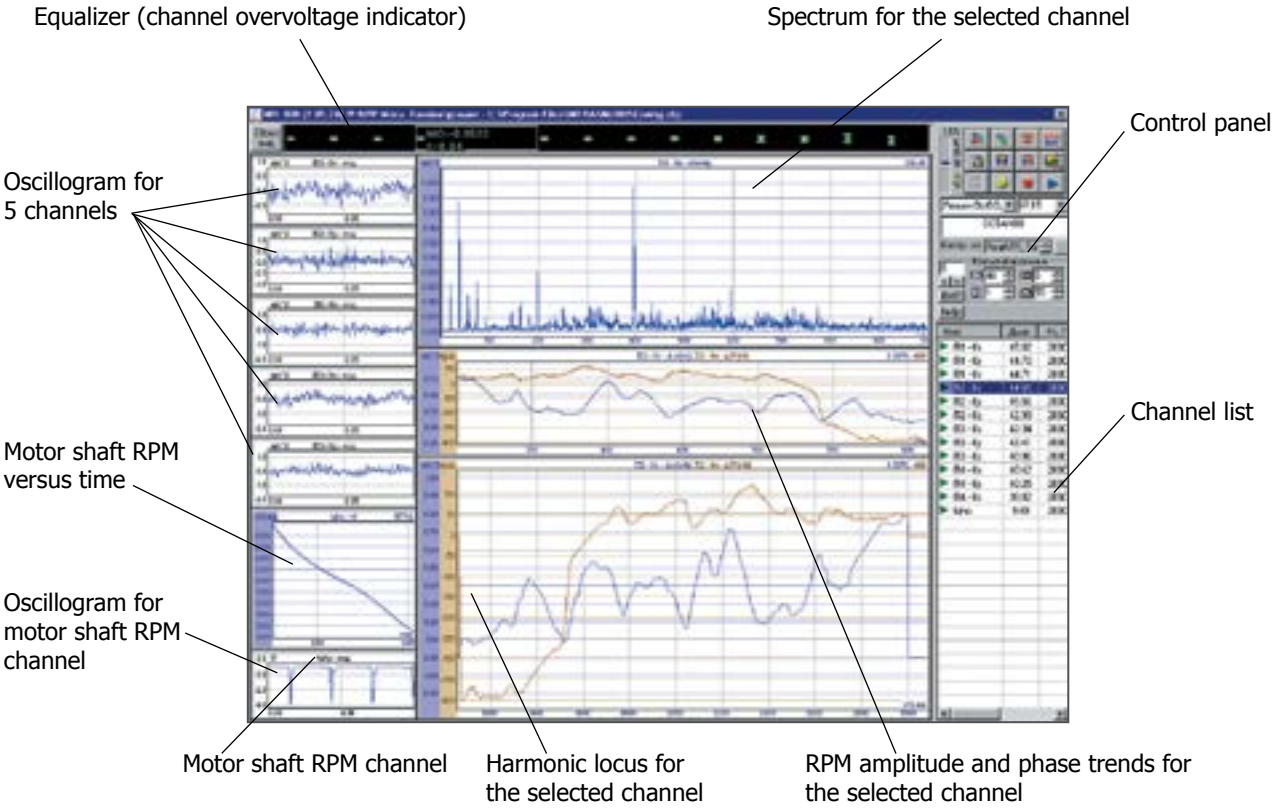
MR-300 control panel



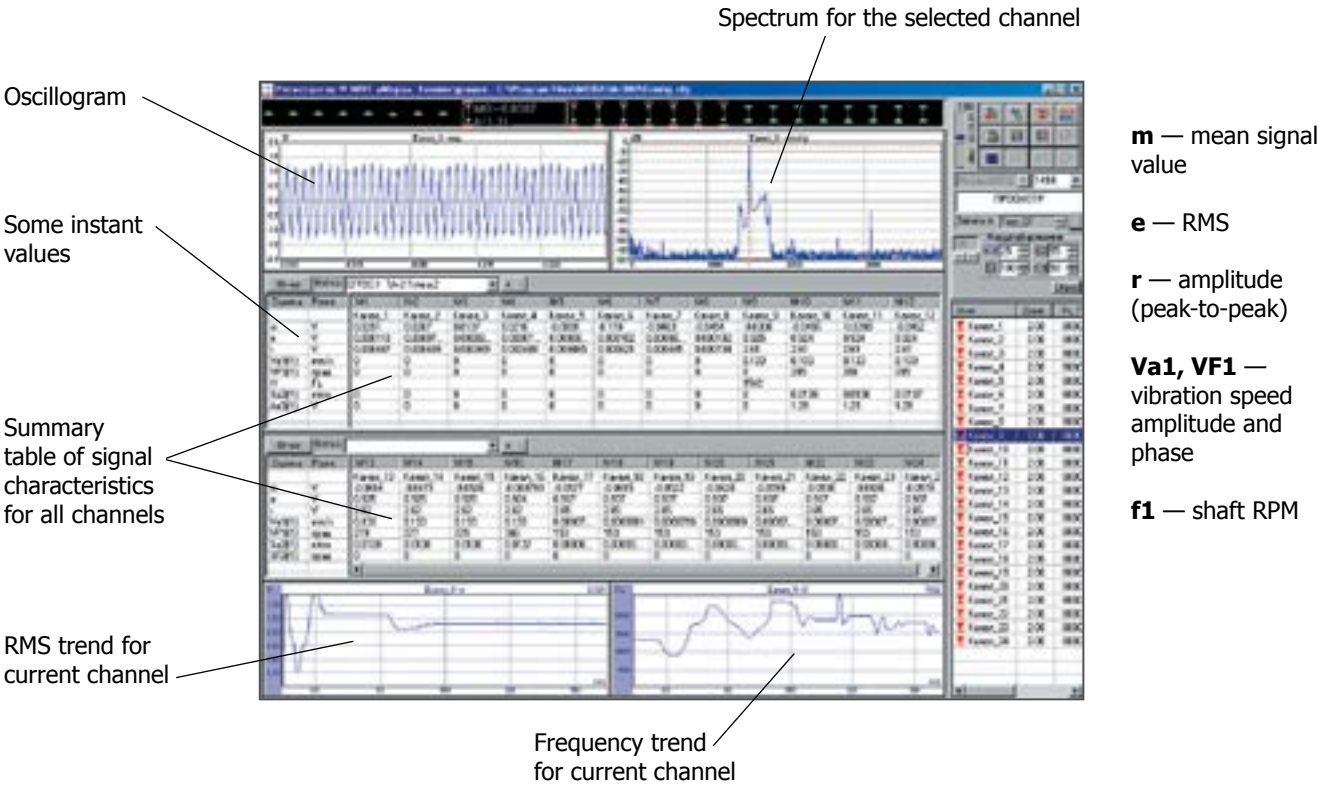
MR-300
Sample Outputs

Display window for 1/3 octave spectra

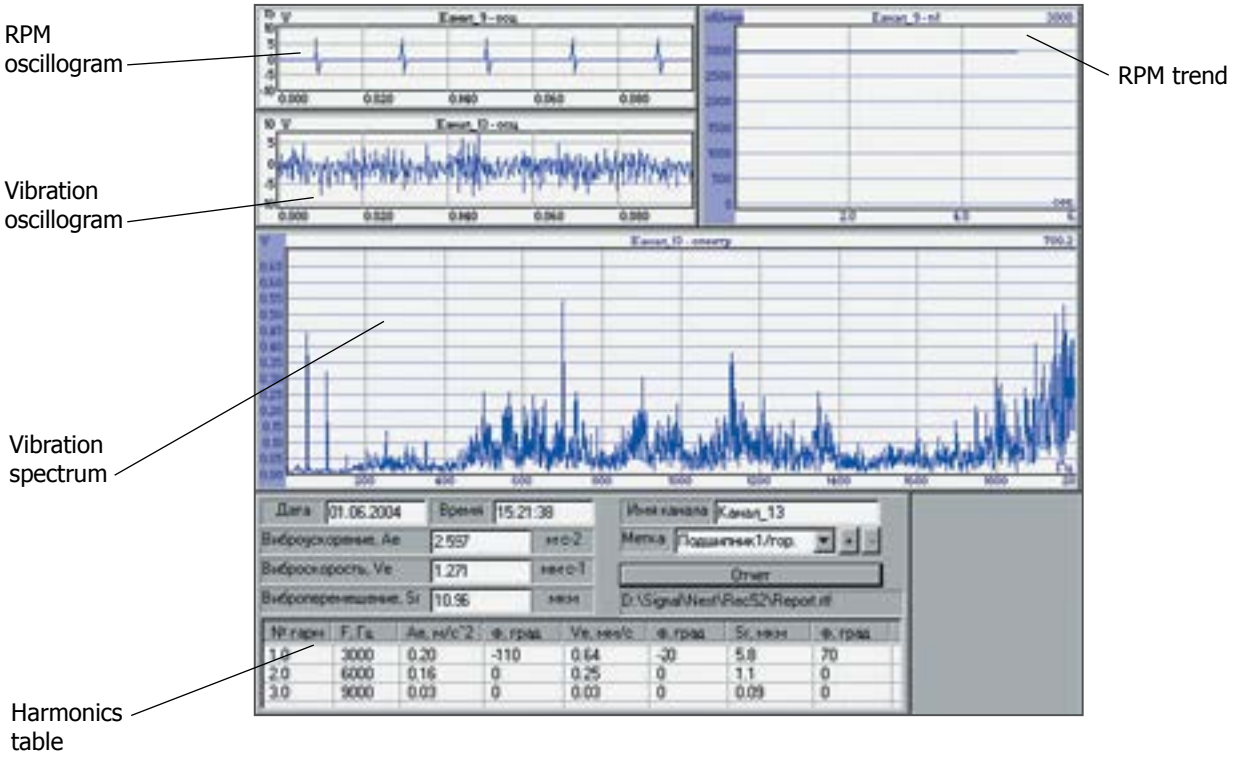
Display window for harmonic locus calculation



Sample Form with Free Tables



Sample Signal Harmonics Form



WinPOS – Post-Test Measurement Data Processing Suite

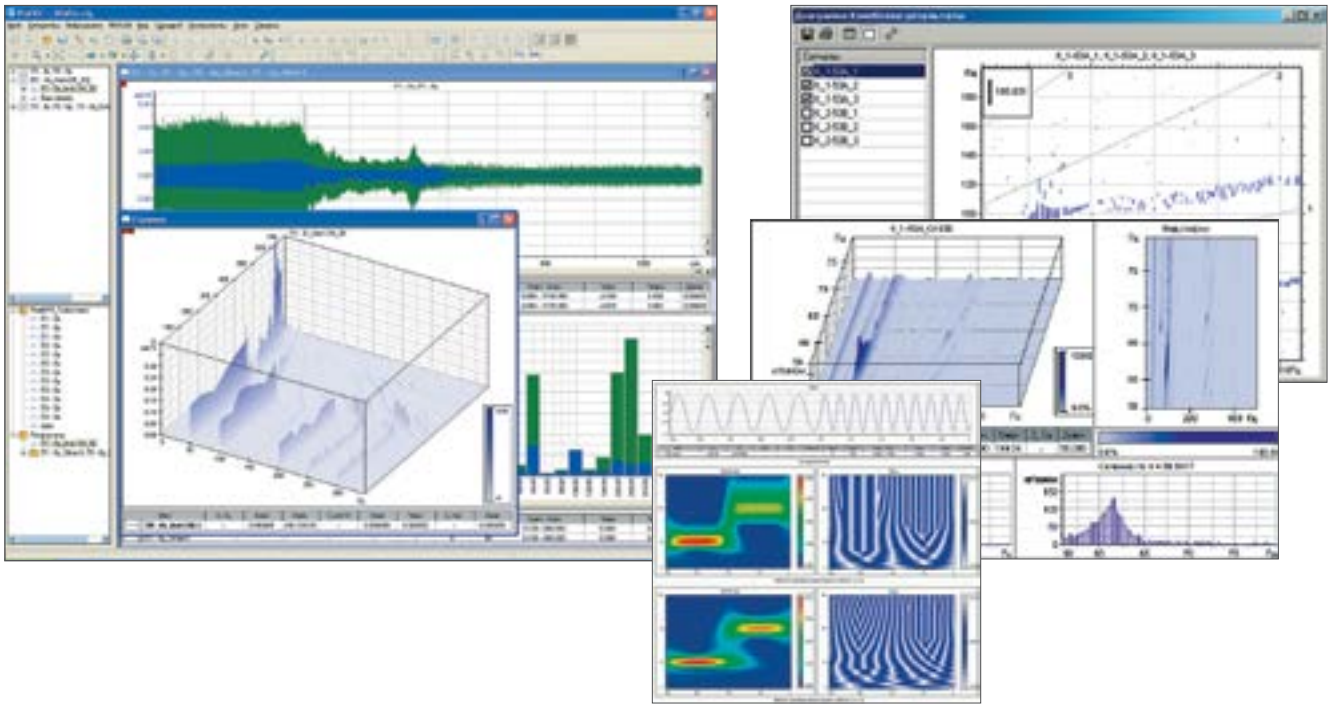
WinPOS is a post-test measurement data processing suite.

It is a professional tool for analyzing dynamic and slowly changing processes, graphical display of data and generating reports.

WinPOS provides users with interfaces for developing custom scripts, plugins and applications to work with WinPOS data and algorithms almost in any programming environment.

WinPOS is available in two versions: Professional and Expert.

WinPOS Expert supports analysis of non-stationary dynamic processes, including vibrations.



Key Features

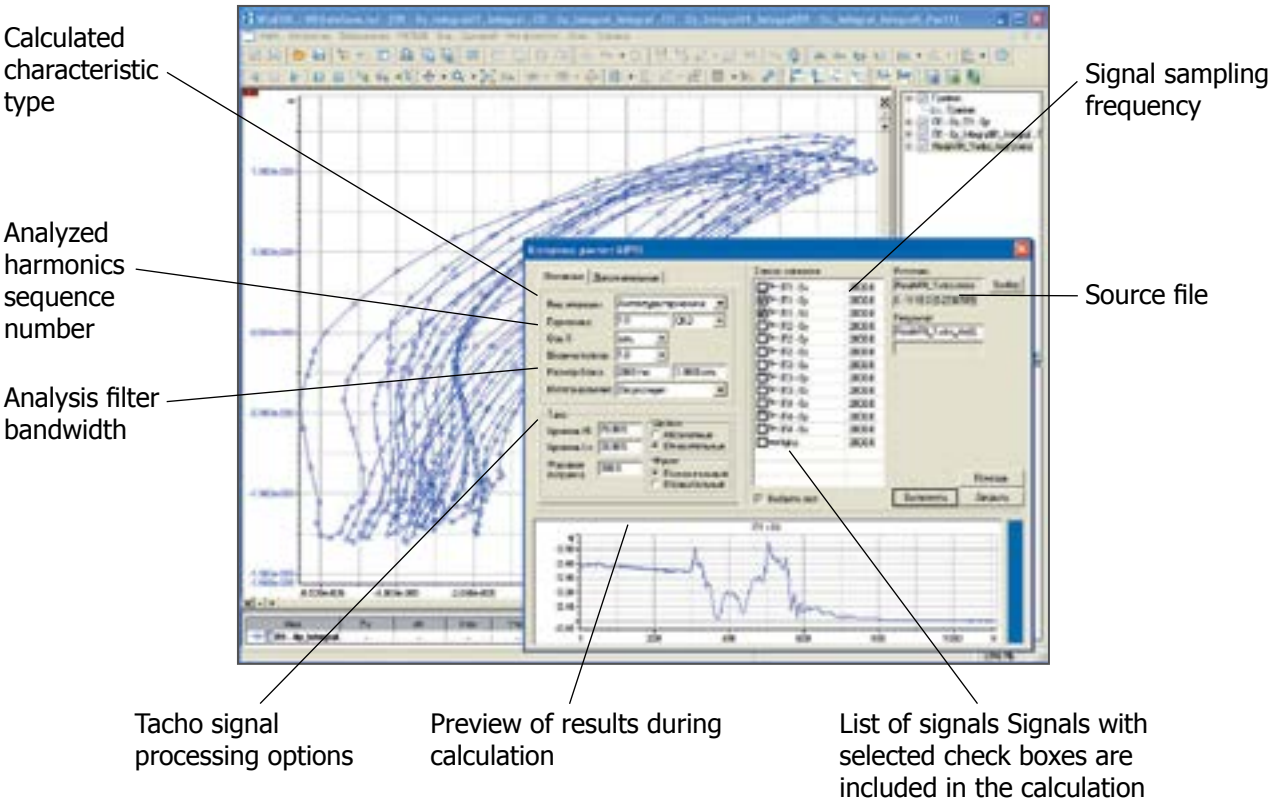
- Over 50 signal processing algorithms
- Powerful tools for building and customizing report diagrams (two- and three-dimensional, parameterized and in polar coordinates)
- Express reporting functions
- Batch processing
- Support of WAV and UFF formats
- Signal editing
- Support of scripts (embedded VBScript editor) and plugins (interfaces for developing custom building blocks and applications in almost every modern programming environment)
- Support of data import/export plugins
- Signal value table view
- Unlimited signal length
- Integration in MATLAB™
- May be used as a distributed client-server system for post-test data processing
- Support of OS Windows XP/Vista/7
- Detailed help.

Processing algorithms

- Auto-spectrum
  - Amplitude spectrum, power spectrum, power density spectrum, energy density spectrum, module and phase, Real and Image
  - Hanning windows, Blackman-Harris windows, FLAT-TOP, rectangular and triangular
  - Selection of fast or discrete Fourier transform
  - Fast Fourier transform portion from 32 to 1,048,576 points
- 1 octave, 1/3 octave, 1/12 octave and 1/24 octave spectrums
- 3D spectrum
- Cross- and complex spectrum
- Transfer
- Coherence and incoherence
- Spectrum transformation
- Recursive and non-recursive filtering
- Median filtering
- Resampling
- Logarithms
- Integration and differentiation
- Hilbert transform
- Envelope
- Normalization and mean correction
- Arithmetic operations
- Auto- and cross-correlation
- Probabilistic characteristics
- Probability density function
- Campbell diagram
- Order analysis
- Wavelet analysis
- Harmonic locus calculation.

WinPOS
Sample Output

Harmonic locus calculation algorithm



New in WinPOS V3.2

- Updated software interface:
  - Improved 3D diagram management and setup
  - Added font setup for all diagram elements
  - Enhanced cursor management and setup options
- Added new processing algorithms:
  - Logarithmic decrement
  - Shock spectrum algorithm (with highlighted shocks and their spectra as processing results)
  - Two new Campbell diagram views: 3D diagram and color field; added order cursor and frequency response cross-section
  - During harmonic locus calculation, buffer size adapts to RPM changes; number of periods per portion is specified as a single number or as a table
  - Added support of external algorithms with all the features of native algorithms
- Streamlined performance
  - Faster processing of multiple signals; no signal length limit
  - Faster calculations of:
    - Campbell diagrams
    - Non-recursive and median filtering
    - Integration and differentiation
    - Auto- and cross-correlations
    - Frequency, etc.
  - Faster diagram rendering.

WinPOS inherits all the best features from POS (powerful mathematical tools, simple and convenient to use, enhanced functionality) and takes this suite to a whole new state-of-art level. It was officially registered as PC software in 2004.

СВИДЕТЕЛЬСТВО

об официальной регистрации программы для ЭВМ

№ 2004611912

Пакет обработки сигналов
WinПОС (WinПОС)

Правообладатель(ли): *Общество с ограниченной ответственностью "Научно-производственное предприятие "МЕРА" (RU)*

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Руководитель Федеральной службы по интеллектуальной собственности, патентам и товарным знакам

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WinPOS: over 1,800 licenses sold

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