Model MCA-3 Series  PCI based Multichannel Analyzers

Features (depends on model - see page 2)

Complete MCA data acquisition system on a full lengths PCI-bus compatible board
- Three alternative operating modes:
  - PHA (pulse height analysis),
  - MCS (multichannel scaling) using 1 or 2 inputs and
  - PHA with SVA (Sampled Voltage Analysis)
- On board ultra fast pulse height analyzing 8k ADC with 500 ns conversion time for Pulse-Height Analysis
- ADC-port, 16 bit, throughput up to 50,000,000 converted events/s
- Digital Stabilizer for Gain and Zero stabilization
- Capability to store PHA data from ADC in list-mode format in addition to normal histogramming mode
- On-board 512k channels SRAM memory, 32 bit capacity
- Memory segmentation for sequential spectra acquisition
- Multiscaling mode offers two inputs with programmable discriminators, Countrates in excess of 350 MHz (400 MHz typical)
- No deadtime between channels, no end-of-sweep deadtime
- Dwell time from 100 ns to 50s (200ns to 50s using two inputs), manual and external
- Mossbauer Spectroscopy control lines are available on a mounting bracket connector:
  - Laser induced chemical reactions
  - Portable Spectrum Analysis
  - Setup of experiments in High Energy Physics
  - OEM-applications
  - Remote Spectrum Acquisition

Description

The MCA-3 Series is a family of PC-based, software controlled PCI-bus Multichannel Analyzers. The design is capable of converting incoming signals at up to 1,000,000 events/s or collect data at rates of up to 5 Megaevents/s. The large data memory can be segmented to enable to accumulate successive measurements. Spectra accumulated in sequential PHA mode can be displayed in a two-dimensional array. For use in remote locations an autostore function can be selected that will store both spectra and setup parameters at regular intervals. The MCA-3-Series boards can be remotely controlled by a host computer, “GO”-line compatibility enables the MCA’s to start and stop accumulation synchronously with other FAST ComTec products such as the MS-12 Timer/ Scaler, the MPA-3 Multiparameter System etc. The MCA-3-Series Multichannel Analyzers are available in five versions:

- **MCA-3FADC** - is an advanced Multi Channel Analyzer with a built-in ultra-fast ADC with 500 ns conversion time and 8k conversion range. The throughput capability is in excess of 1,000,000 events/s depending on the shape and duration of the input pulses. In addition an MCS mode is available with one or two inputs for fast multiscaling are provided - a time resolution of 100 ns sets the MCA-3- FADC apart from standard MCA’s.

- **MCA-3A** - this unit is identical to the MCA-3FADC but without the multiscaling facility

- **MCA-3** - this model offers an external ADC port and a dual input multiscaler. Such a combination is preferred by scientists doing Mossbauer work as it can be operated in PHA mode for setup and testing while one or both multiscalers are used for data acquisition.

- **MCA-3S** - is a dual-input Multiscaler. For details see the P7882 datasheet.

Applications

- Nuclear- and X-ray spectroscopy
- LIDAR
- Two channel Mössbauer Spectroscopy
- Dynamic Desorption Studies
- Cross-correlation measurements
- Scanning Mass Spectrometers
- One or two input, time-correlated single-photon and ion counting
- Fluorescence lifetime studies
Operating Software is based on the MCDWIN software - a proven - easy to use graphical user interface for mouse and keyboard operation. High resolution displays with linear and log scales, autoscaling, ROI, zoom, Gaussian-Fit, FWHM calculation are just a few features MCDWIN offers. MACRO's offer a flexible way for user to execute task oriented batch programs.

The interactive display software can be set to display spectra with a high resolution, linear or log scale. Screendumps allow text insertion and graphic editing with a variety of tools. This package also supports graphic output devices installed under WINDOWS 2000 and XP.

The open domain Analysis Software of the IAEA, Vienna, can be delivered with each MCA-3 that is capable of operating in PHA mode. An IAEA compatible software interface enables the user to directly use such analysis packages as GANAAS, QXAS, POSFIT and other programs. The file format is compatible to GAMMA-W, SODIGAM, ALPS and other precision analysis software from Dr. Westmeier.

**A valuable feature of the MCA-3-Series MCA's is the selectable autostore facility. In case of a power failure the MCA-3's will retain all but the last minute of data.**

As all setup parameters are retained and a measurement can be continued as soon as power has been restored.

---

### Key Feature Table

<table>
<thead>
<tr>
<th>Features</th>
<th>MCA-3</th>
<th>MCA-3A</th>
<th>MCA-3FADC</th>
<th>MCA-3S</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-board 500 ns ADC, 8192 channel conversion range</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>ADC port for connection of external ADC</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SCA output, programmable ULD, LLD and ZERO</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Gate input for Anticoincidence/COincidence signals</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TAG input for tagging PHA spectra (8-bit = 256 tags)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pulse-Height mode acquisition</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SVA Sampled Voltage Analysis mode</td>
<td>ext. A DC</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Multi-point digital spectrum stabilizer, gain and zero</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>MCS Multichannel mode of acquisition</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Two-inp. MCS with 100ns min. dwell time</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Presetable sweep-counter</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mossbauer Control Lines on mounting bracket</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>X-Ramp (triangular or sawtooth) output 0-10 V, 12 bit</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data Memory, 32 bit capacity</td>
<td>$12k</td>
<td>$12k</td>
<td>$12k</td>
<td>$12k</td>
</tr>
<tr>
<td>Memory Segmentation 8k x 64 to 2 x 256k</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sequential PHA spectra acquisition</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sweep summing and segmented memory averaging</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Digital I/O for external control, sample changer etc.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote control via RS232C, Ethernet, Exp. Control line</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Inputs and outputs on LEMO 00 or D-SUB-15 connectors</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MUX-tasking for up to four boards in one PC</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MCDWIN Operating Software including 2D-display</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Event by event storage in List-Mode</td>
<td>Yes</td>
<td>IN+ext A DC</td>
<td>IN+ext A DC</td>
<td>Yes</td>
</tr>
<tr>
<td>W IN 2000, W IN-NT and W IN-XP compatible</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DLL for LabVIEW „C“ and Visual Basic</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td>Driver for LINUX</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td>Downloadable software upgrades free for one year</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Model MCA-3 Series  PCI based Multichannel Analyzers

Specifications (depends on model)

**PHA Mode**

**ADC:**

**SAR type ADC** with 500 ns conversion time. Programmable conversion gain of 256, 512, 1k, 2k, 4k and 8k. Software programmable ULD, LLD and THRESHOLD. Dead time: Input: Rise-Time + Conversion time (500 ns) + transfer time to memory (less than 150 ns).

**INPUTS:**

**ADC Input:** LEMO-Connector accepts +25mV to +10V standard (+8V optional) gaussian-shaped pulses, Zin = 1k ohm, risetime: > 100ns to 100μs, fall time: 200ns to 100μs, dc coupled or a varying voltage level when used in SVA mode. Leading edge must be positive-going.

**Gate and SVA Sample inputs:** 2 LEMO-Connectors

**Memory:** 2 MByte organized as 512k x 32bit on-board data memory segmentable in steps down to 64. Ultra high speed data storage and read operations guarantee no additional dead time. Real / Live Time storage with 1ms resolution.

Digital Stabilizer: Multipoint Gain and Zero stabilization

**Listmode storage of PHA events** from int. or ext. ADC

**MCS MODE**

**Dwell Time Modes:** software settable internal, external and manual channel advance

**Dwell Time per channel:** 100 ns (200 ns for two inputs) to 50 s, software selectable in steps of 25 ns

Max. Countrate: 350 MHz, typically >400 MHz

**Deadtime between channels:** zero, Bin accuracy (leading/trailing edge) rel. to the Reference Clock +/-0.15ns, typical +/-0.07ns

**End-of-sweep deadtime:** nil

**Trigger Delay:** 25 ns +/-12.5 ns

**Trigger / Start uncertainty:** < 25 ns

**Sweep Preset Range:** 1 to 232

**Listmode storage of MCS events**

**INPUTS:**

**START/TRIGGER/SAVA SAMPLE:** +/-5V range, 50 Ω/1kΩ slope and threshold programmable in steps of 2.44mV

**COUNT1 and COUNT2:** +/-5V range, 50 Ω/1 kΩ slope and threshold programmable in steps of 2.44mV, count rate capability 350 MHz, typically >400 MHz

Min. pulse width 2ns (typical)

**EXTERNAL CLOCK/GATE:** +/-5V range, 50 Ω/1 kΩ slope and threshold programmable in steps of 2.44mV

**EXTERNAL ADC INPUT** for nuclear type ADC's

**SVA MODE**

In SVA mode a voltage level or waveform can be successively sampled when an external trigger signal is applied to the SVA sample input

**OUTPUTS:**

Sync 1, FAST-NIM, Sync 2, TTL
RAMP DAC, 0 to 10V, 12 bit
DAC, +/- 10V, 12 bit

**Connectors:**

**Analog signal input:** LEMO 00 type connector

**Start/Trigger/Sample:** LEMO 00 type connector

**Count1, Count2:** LEMO 00 type connector

**Clock/Gate:** LEMO 00 type connector

**Sync-Out:** LEMO 00 type connector

**26 pin wall mount connector** with ribbon cable to 25 pin D-SUB on bracket for connection of external ADC

**D-SUB 15 pin female connector:**

Analog Ground, Digital Ground, +5V OUT, Ramp
DAC OUT: 0 to 10V, DIG I/O:

**Power Requirements:**

+5V / 1.4A / 7W typ. (1.6A / 8W max.), +12V, 0.8A

PC Requirements: 32 bit PCI slot, 32 bit Windows XP / Vista / 7, no DELL PC.

Physical: full size PCI board

**Software**

**Operating Software:** MCDWIN operating software - see separate datasheet.

**Software Options**

DLL for LabVIEW, Visual Basic and „C“

Driver for LINUX

**Analysis Software:** Software interfaces to programs compatible with the IAEA standard software interface. The MCA-3 Series MCA's are also compatible with a number of widely used analysis programs such as ALPS, GAMMAW, SODIGAM, etc.

The new version of GAMMAW now uses Fuzzy-Logic for Compton-edge recognition, Multipl-et-deconvolution, calculation of the background on ROI endpoints etc. for a significantly better performance with small peaks.

The following DOS-based open domain programs of the IAEA are presently available:


**QXAS:** Quantitative X-ray analysis system

**Connectors:**

**Inputs:**

- Analog signal input: LEMO 00 type connector
- Start/Trigger/Sample: LEMO 00 type connector
- Count1, Count2: LEMO 00 type connector
- Clock/Gate: LEMO 00 type connector
- Sync-Out: LEMO 00 type connector

**Power Requirements:**

- +5V / 1.4A / 7W typ. (1.6A / 8W max.), +12V, 0.8A
- PC Requirements: 32 bit PCI slot, 32 bit Windows XP / Vista / 7, no DELL PC.

**Physical:**

- Full size PCI board