

# ALV-MultiCorr Series Multiple Tau Digital Correlators

## ALV-7002, ALV-7004 and ALV-7004/FAST Technical Data

	ALV-7002	ALV-7004	ALV-7004/FAST
Correlation Function Structure	2 x 16/8 Channel Multiple Tau Correlation	4 x 16/8 Channel Multiple Tau Correlation	4 x 16/8 Channel Multiple Tau Correlation
<p>The ALV-700X series computes multiple correlation functions in parallel.</p> <p>All correlation functions are computed simultaneously in real time with identical initial sampling time.</p> <p>The following correlation modes are supported :</p>	<p>Mode 1 : Auto 0/0, 1/1</p> <p>Mode 2 : Cross 0/1, 1/0</p>	<p>Mode 1 : Auto 0/0, 1/1, 2/2, 3/3</p> <p>Mode 2 : Cross 0/1, 1/0, 2/3, 3/2</p> <p>Mode 3 : Auto 0/0, 1/1, Cross 0/1, 1/0 or Auto 2/2, 3/3, Cross 2/3, 3/2 or Auto 0/0, 1/1, Cross 2/3, 3/2 or Auto 2/2, 3/3, Cross 0/1, 1/0</p>	<p>Mode 1 : Auto 0/0, 1/1, 2/2, 3/3</p> <p>Mode 2 : Cross 0/1, 1/0, 2/3, 3/2</p> <p>Mode 3 : Auto 0/0, 1/1, Cross 0/1, 1/0 or Auto 2/2, 3/3, Cross 2/3, 3/2 or Auto 0/0, 1/1, Cross 2/3, 3/2 or Auto 2/2, 3/3, Cross 0/1, 1/0</p>
Initial sampling time* (valid for all correlation functions & correlation modes)	<b>100 ns</b> (100 % real-time)	<b>25 ns</b> (100 % real-time)	<b>3,125 ns</b> (100% real-time)
Number of Correlation Channels	2 x up to 312 Correlation Channels	4 x up to 312 Correlation Channels	4 x up to 336 Correlation Channels
Number of Monitor Channels	2 x up to 296 Channel Monitors 2 x up to 38 STC Group Monitors	4 x up to 296 Channel Monitors 4 x up to 38 STC Group Monitors	4 x up to 320 Channel Monitors 4 x up to 40 STC Group Monitors

Min. / Max. Sampling Time	100 ns / 13743,6 s	25 ns / 3435,9 s	3,125 ns / 3435,9 s
Lag Time Range	0 ... 219902,4 s	0 ... 54975,6 s	0 ... 54975,6 s
Input Data Width	Increasing with Sampling Time No scaling required	Increasing with Sampling Time No scaling required	Increasing with Sampling Time No scaling required
Number of Counting Inputs	Two independent inputs	Four independent inputs	Four independent inputs
Max. Input Count Rate	> 35 Mcps sustained (> 90 Mcps peak)	> 80 Mcps sustained (> 160 Mcps peak)	> 80 Mcps sustained (> 160 Mcps peak)
Min. Input Pulse/Pulse Time	< 5 ns	< 5 ns	< 5 ns
Voltage Level of Counting Inputs	2 x LVTTTL/TTL, 2...5V @ 50 Ohm	4 x LVTTTL/TTL, 2...5V @ 50 Ohm	4 x LVTTTL/TTL, 2...5V @ 50 Ohm
Fast Count Rate Trace**	Parallel output on HD, real-time, based on 819,2 µs integration time	Parallel output on HD, real-time, based on 102,4 µs integration time	Parallel output on HD, real-time, based on 102,4 µs integration time
Integrated „Detector Protection Unit“***	LVTTTL signal for every counting input Overload limit fixed at 12 Mcps Automatic Reset	LVTTTL signal for every counting input Overload limit fixed at 12 Mcps Automatic Reset	LVTTTL signal for every counting input Overload limit fixed at 12 Mcps Automatic Reset
Integrated Test Data Generator	High precision and long period time pseudo random data test generator with exponential correlation function expectation	High precision and long period time pseudo random data test generator with exponential correlation function expectation	High precision and long period time pseudo random data test generator with exponential correlation function expectation
Count Rate Expectation	~234,4 kcps	~312,5 kcps	312,5 kcps
CF Fluctuation Time Expectation	~0,4251 ms	~0,1038 ms	~0,1038 ms
Hardware „Start Trigger“	LVTTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns,	LVTTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns,	LVTTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns,

Reaction Time to START	25 ... 50 ns	25 ... 50 ns	25 ... 50 ns
Host Communication ****	PCI/EPP based (either via PC's EPP-port or via supplied PCI board)	PCI/EPP based (either via PC's EPP-port or via supplied PCI board)	PCI/EPP based (either via PC's EPP-port or via supplied PCI board)
Software System	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS)  WIN-2000/2003/XP/VISTA & WINDOWS 7	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS)  WIN-2000/2003/XP/VISTA & WINDOWS 7	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS)  WIN-2000/2003/XP/VISTA & WINDOWS 7
Power Supply Requirements (100 ...240 VAC PSU is part of delivery)	5.2 ... 6V DC max. 150 mA	5.2 ... 6V DC max. 200 mA	5.2 ...6V DC max. 250 mA
Power Consumption	Typ. 0.65 W at max. Input Count Rate	Typ. 0.85 W at max. Input Count Rate	Typ. 1,1 W at max. Input Count Rate
Housing Type	Aluminum housing	Aluminum housing	Aluminum housing
Housing Size	143 x 127 x 74 mm	143 x 127 x 74 mm	143 x 127 x 74 mm
Total Weight	~650 g	~ 650 g	~ 650 g
RoHS Compliance	Fully compliant with RoHS regulations	Fully compliant with RoHS regulations	Fully compliant with RoHS regulations

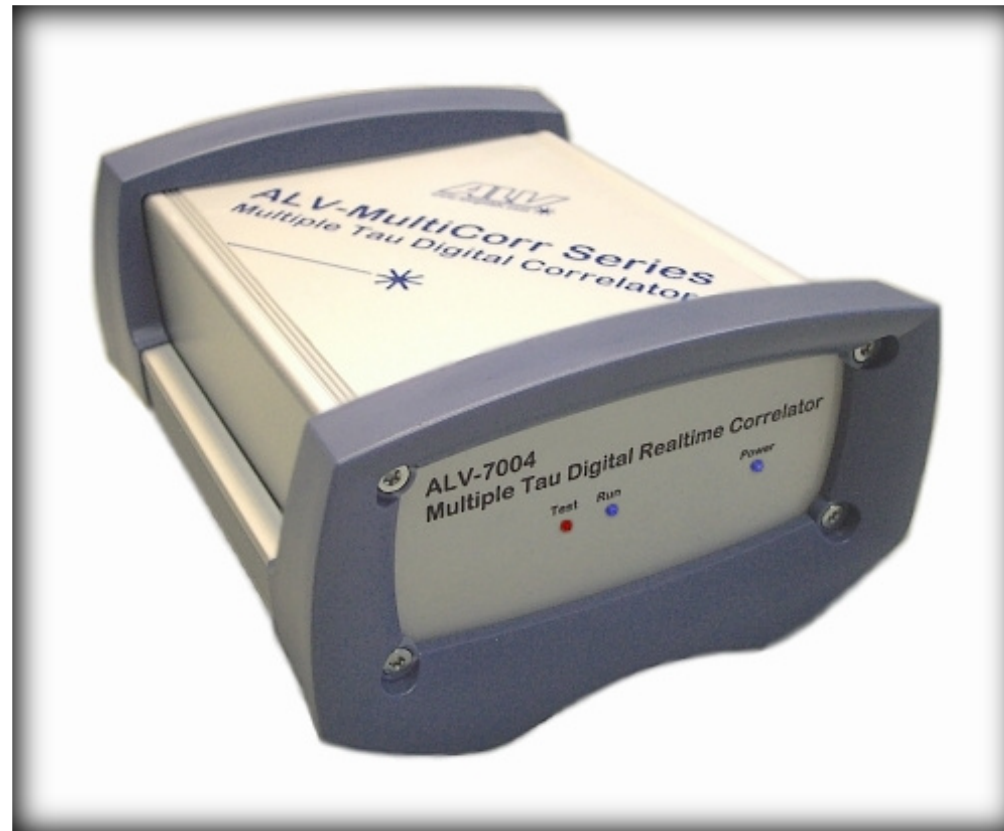
\* the ALV-7004 and ALV-7004/FAST additionally feature a user selectable „compatibility mode“ which increases the initial sampling time to 100 ns for Mode 1 operation. For practically all single photon detectors commercially available today, the use of 25 ns or even 3,125 ns initial sampling time in auto correlation mode is rather useless, because the lag time range up to at least some 100 ns of the correlation function will be severely distorted by dead time and afterpulsing effects when a single such detector is used in auto correlation mode. It is for this reason, the ALV-7004 and ALV-7004/FAST can be switched to this mode, which is simply „more compatible“ to the real-world performance of todays single photon detectors.

\*\* the START time of all correlation channels is synchronised to be absolutely identical (CH0 to CH1 data, resp. CH2 to CH3 data), resp. different to not more than 25 ns (CH0 to CH2 data, resp. CH1 to CH 3 data for ALV-7004 and ALV-7004/FAST). The latency from a START command issued by the software to the physical start of the correlator is solely driven by the command transfer time trough the EPP bus and is below 2 µs (typ. 1µs) as long as the ALV-supplied EPP/PCI board is used.

\*\*\* the „Detector Protection Unit“ ensures overload protection with  $\mu\text{s}$  response time. This perfectly fits to Avalanche Photon Diode based Single Photon Counting Modules with gating input, for example. Other detectors may not have the ability to fast switch off / gate the operation voltage to drive the detector into a „safe mode“, or may not even offer a gating input at all. For such detectors, the practical use of „Detector protection Unit“ can be limited or even be non-existent. Please inquire at ALV if your detector can make use of this feature.

\*\*\*\* some PCs do not feature PCI slots, but PCIe slots instead. For such cases, a EPP/PCIe board for these PCI-Express based slots can be delivered instead of the standard PCI based EPP board.

**ALV GmbH reserves the right to make changes to its products or specifications at any time, without notice, in order to improve design or performance.**



# ALV-7002/USB

## Technical Data

	<b>ALV-7002/USB</b>		
Correlation Function Structure	2 x 16/8 Channel Multiple Tau Correlation		
<p>The ALV-700X series computes multiple correlation functions in parallel.</p> <p>All correlation functions are computed simultaneously in real time with identical initial sampling time.</p> <p>The following correlation modes are supported :</p>	<p>Mode 1 : Auto 0/0, 1/1</p> <p>Mode 2 : Cross 0/1, 1/0</p>		
Initial sampling time (valid for all correlation functions & correlation modes)	<b>100 ns</b> (100 % real-time)		
Number of Correlation Channels	2 x up to 312 Correlation Channels		
Number of Monitor Channels	2 x up to 296 Channel Monitors 2 x up to 38 STC Group Monitors		
Min. / Max. Sampling Time	100 ns / 13743,6 s		
Lag Time Range	0 ... 219902,4 s		

Input Data Width	Increasing with Sampling Time No scaling required		
Number of Counting Inputs	Two independent inputs		
Max. Input Count Rate Min. Input Pulse/Pulse Time	> 35 Mcps sustained (> 90 Mcps peak) < 5 ns		
Voltage Level of Counting Inputs	2 x LVTTTL/TTL, 2...5V @ 50 Ohm		
Fast Count Rate Trace	Parallel output on HD, real-time, based on 819,2 µs integration time		
Integrated „Detector Protection Unit“ *	LVTTTL signal for every counting input Overload limit fixed at 12 Mcps Automatic Reset		
Integrated Test Data Generator	High precision and long period time pseudo random data test generator with exponential correlation function expectation		
Count Rate Expectation CF Fluctuation Time Expectation	~234,4 kcps ~0,4251 ms		
Standard clock generator	+/- 5ppm initial frequency accuracy less than +/- 15 ppm temperature drift (10°C ... 45°C range)		
Optional “high stability clock generator”****	+/- 0.25ppm initial frequency accuracy less than +/- 0.5 ppm temperature drift (10°C ... 55°C range)  GPS based manual ageing correction		

Hardware „Start Trigger“**  Reaction Time to START	LVTTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns,  6 ... 39 ns		
Additional I/O pins	3 User Switchable LVTTTL Outputs (10 mA) Optional 10 MHz clock output (LVTTTL)  5 LVTTTL Inputs for Level Detection or Frequency Measurement (max. 24 bit @ 100 ms timebase)		
Host Communication	USB2 based with up to 10 Mbyte/s transfer speed		
Software System	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS)  WIN-NT/2000/2003/XP/VISTA and WINDOWS 7 compatible		
Power Supply Requirements	Powered by the USB max. 110 mA		
Power Consumption	Typ. 0.55 W at max. Input Count Rate		
Housing Type Housing Size  Total Weight	Aluminum housing 100 x 70 x 30 mm  ~160 g		

Operating Temperature <sup>***</sup> Operating Humidity Operation Altitude	+10°C to +55°C* 10% to 90% (non-condensing) max. 2000 m		
Storage Temperature Storage Humidity	-20°C to +85°C 10% to 90% (non-condensing)		
RoHS Compliance	Fully compliant with RoHS regulations		

\* the „Detector Protection Unit“ ensures overload protection with  $\mu$ s response time. This perfectly fits to Avalanche Photon Diode based Single Photon Counting Modules with gating input, for example. Other detectors may not have the ability to fast switch off / gate the operation voltage to drive the detector into a „safe mode“, or may not even offer a gating input at all. For such detectors, the practical use of „Detector protection Unit“ can be limited or even be non-existent. Please inquire at ALV if your detector can make use of this feature.

\*\* the START time of all correlation function accumulations synchronised to be absolutely identical (CH0 to CH1 data). The latency from a START command issued by the software to the physical start of the correlator is solely driven by the command transfer time through the USB bus and can be in the 20 ms regime. If immediate reaction on START is required, the external start trigger should be used, which offers < 50 ns latency.

\*\*\* extended temperature range on request and surcharge. For extended temperature ranges the temperature drift of the clock generators (standard or “high stability clock generator”) can be considerably larger than specified above.

\*\*\*\* the GPS receiver for performing GPS based clock ageing correction is not part of the delivery. ALV recommends the use of GPS receivers with PPS output and specifically designed for timing applications (PPS standard deviation < 50 ns) or the use of a 5 MHz or 10 MHz clock reference with absolute clock accuracy better than 0.1 Hz and TTL output. The frequency drift of the “high stability clock generator” is less than 1 ppm for the first year and ageing correction is normally only required for applications that require very precise absolute clocks. The required software package to hint the ageing correction is part of the delivery with the “high stability clock generator” option. Additional, optional preageing of the “high stability clock generator” can be performed at ALV works on request and surcharge.

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