ALV-MultiCorr Series Multiple Tau Digital Correlators

USB2 based Communication Interface

ALV-7002/USB-25, ALV-70004/USB, ALV-70004/USB-FAST
Technical Data

	ALV-7002/USB-25	ALV-7004/USB	ALV-7004/USB-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
The ALV-700X series computes multiple correlation functions in parallel. All correlation functions are computed simultaneously in real time with identical inital sampling time. The following correlation modes are supported :	Mode 1 : Auto 0/0, 1/1 Mode 2 : Cross 0/1, 1/0	Mode 1 : Auto 0/0, 1/1, 2/2, 3/3 Mode 2 : Cross 0/1, 1/0, 2/3, 3/2 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	Mode 1 : Auto 0/0, 1/1, 2/2, 3/3 Mode 2 : Cross 0/1, 1/0, 2/3, 3/2 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
Initial sampling time (valid for all correlation functions & correlation modes)	**25 ns** (100 % real-time)	**25 ns** (100 % real-time)	**3.125 ns** (100 % real-time)
Number of Correlation Channels	2 x up to 312 Correlation Channels	4 x 312 Correlation Channels	4 x 336 Correlation Channels
Number of Monitor Channels	2 x up to 296 Channel Monitors 2 x up to 38 STC Group Monitors	4 x 296 Channel Monitors 4 x 38 STC Group Monitors	4 x 320 Channel Monitors 4 x 41 STC Group Monitors

Min. / Max. Sampling Time Lag Time Range	25 ns / 3436 s 0 … 54976 s	25 ns / 3436 s 0 … 54976 s	3.125 ns / 3436 s 0 … 54976 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 Max. Input Count Rate per Input Min. Input Pulse/Pulse Time Voltage Level of Counting Inputs	Two independent inputs 80 Mcps sustained (> 140 Mcps peak) 6 ns 2 x LVTTL, 2…3.3V @ 50 Ohm (Inputs are 5V tolerant)	Four independent inputs 80 Mcps sustained (> 140 Mcps peak) 6 ns 4 x LVTTL, 2…3.3V @ 50 Ohm (Inputs are 5V tolerant)	Four independent inputs 80 Mcps sustained (> 140 Mcps peak) 6 ns 4 x LVTTL/TTL, 2…5V @ 50 Ohm (Inputs are 5V tolerant)
Fast Count Rate Trace	Parallel output on HD, real-time, based on 102,4 µs integration time	Instead 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“ *	LVTTL signal for each counting input Overload limit fixed at ~12 Mcps Automatic Reset ~70µs after Overload	LVTTL signal for each counting input Overload limit fixed at ~12 Mcps Automatic Reset ~70µs after Overload	LVTTL signal for each counting input Overload limit fixed at ~12 Mcps Automatic Reset ~70µs after Overload
Integrated Test Data Generator Count Rate Expectation CF Fluctuation Time Expectation	High precision/long period time pseudo random data test generator with exponential correlation function expectation ~312,5 kcps ~0,1032 ms	High precision/long period time pseudo random data test generator with exponential correlation function expectation ~312,5 kcps ~0,1032 ms	High precision/long period time pseudo random data test generator with exponential correlation function expectation ~312,5 kcps ~0,1032 ms
Standard clock generator	+/- 10 ppm initial frequency accuracy less than +/- 15 ppm temperature drift (10°C … 45°C range)	+/- 10 ppm initial frequency accuracy less than +/- 15 ppm temperature drift (10°C … 45°C range)	+/- 10 ppm 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	+/- 0.25ppm initial frequency accuracy less than +/- 0.5 ppm temperature drift (10°C … 55°C range) GPS based manual ageing correction	+/- 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	LVTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns, 6 … 39 ns	LVTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns, 6 … 39 ns	LVTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns, 6 … 39 ns
Additional I/O pins	3 Switchable LVTTL Outputs (10 mA) Optional 10 MHz clock output (LVTTL) 5 LVTTL Inputs for Level Detection or Frequency Measurement (max. 24 bit @ 100 ms timebase)	3 Switchable LVTTL Outputs (10 mA) Optional 10 MHz clock output (LVTTL) 5 LVTTL Inputs for Level Detection or Frequency Measurement (max. 24 bit @ 100 ms timebase)	3 Switchable LVTTL Outputs (10 mA) Optional 10 MHz clock output (LVTTL) 5 LVTTL 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	USB2 based with up to 10 Mbyte/s transfer speed	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 7/8 compatible (32/64 bit)	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS) WIN-NT/2000/2003/XP/VISTA and WINDOWS 7/8 compatible (32/64 bit)	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS) WIN-NT/2000/2003/XP/VISTA and WINDOWS 7/8 compatible (32/64 bit)
Power Supply Requirements	Powered by the USB typ. 140 mA @ 5V	Powered by the USB or external PSU typ 150 mA @ 5V	Powered by the USB or external PSU typ 180 mA @ 5V
Power Consumption	Typ. 0.7 W at max. Input Count Rate	Typ. 0.75 W at max. input Count Rate	Typ. 0.9 W at max. input Count Rate

Housing Type Housing Size Total Weight	Aluminum housing 100 x 70 x 30 mm ~160 g	Aluminum housing 100 x 70 x 30 mm ~ 160 g	Aluminum housing 100 x 70 x 30 mm ~ 160 g
Operating Temperature*** Operating Humidity Operation Altitude Storage Temperature Storage Humidity	+10°C to +55°C* 10% to 90% (non-condensing) max. 2000 m -20°C to +85°C 10% to 90% (non-condensing)	+10°C to +55°C* 10% to 90% (non-condensing) max. 2000 m -20°C to +85°C 10% to 90% (non-condensing)	+10°C to +55°C* 10% to 90% (non-condensing) max. 2000 m -20°C to +85°C 10% to 90% (non-condensing)
RoHS Compliance	Fully compliant with RoHS regulations	Fully compliant with RoHS regulations	Fully compliant with RoHS regulations

* the „Detector Protection Unit“ ensures overload protection with µs 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.

EPP/PCI based Communication with PC

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
The ALV-700X series computes multiple correlation functions in parallel. All correlation functions are computed simultaneously in real time with identical inital sampling time. The following correlation modes are supported :	Mode 1 : Auto 0/0, 1/1 Mode 2 : Cross 0/1, 1/0	Mode 1 : Auto 0/0, 1/1, 2/2, 3/3 Mode 2 : Cross 0/1, 1/0, 2/3, 3/2 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	Mode 1 : Auto 0/0, 1/1, 2/2, 3/3 Mode 2 : Cross 0/1, 1/0, 2/3, 3/2 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
Initial sampling time* (valid for all correlation functions & correlation modes)	**100 ns** (100 % real-time)	**25 ns** (100 % real-time)	**3,125 ns** (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 Lag Time Range	100 ns / 13743,6 s 0 … 219902,4 s	25 ns / 3435,9 s 0 … 54975,6 s	3,125 ns / 3435,9 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 Max. Input Count Rate Min. Input Pulse/Pulse Time Voltage Level of Counting Inputs	Two independent inputs > 35 Mcps sustained (> 90 Mcps peak) < 5 ns 2 x LVTTL/TTL, 2…5V @ 50 Ohm	Four independent inputs > 80 Mcps sustained (> 160 Mcps peak) < 5 ns 4 x LVTTL/TTL, 2…5V @ 50 Ohm	Four independent inputs > 80 Mcps sustained (> 160 Mcps peak) < 5 ns 4 x LVTTL/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“ ***	LVTTL signal for each counting input Overload limit fixed at ~12 Mcps Automatic Reset ~70µs after Overload	LVTTL signal for each counting input Overload limit fixed at ~12 Mcps Automatic Reset ~70µs after Overload	LVTTL signal for each counting input Overload limit fixed at ~12 Mcps Automatic Reset ~70µs after Overload
Integrated Test Data Generator Count Rate Expectation CF Fluctuation Time Expectation	High precision and long period time pseu-do random data test generator with expo-nential correlation function expectation ~234,4 kcps ~0,4251 ms	High precision and long period time pseu-do random data test generator with expo-nential correlation function expectation ~312,5 kcps ~0,1038 ms	High precision and long period time pseu-do random data test generator with expo-nential correlation function expectation 312,5 kcps ~0,1038 ms
Hardware „Start Trigger“ Reaction Time to START	LVTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns, 25 … 50 ns	LVTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns, 25 … 50 ns	LVTTL Input Signal, Triggered on high level (> 2 V @ 50 Ohm) min. high time 50 ns, 25 … 50 ns

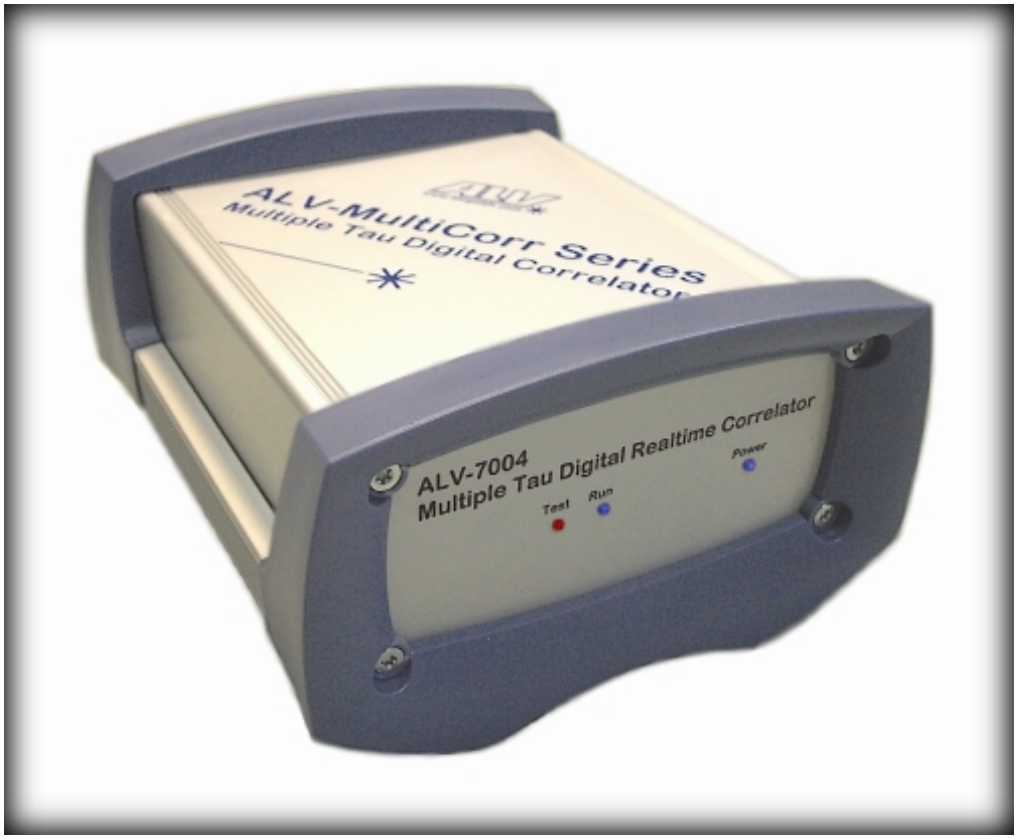
Host Communication****	PCI/EPP based (either via PC's EPP-port or via supplied PCI board, standard profile)	PCI/EPP based (either via PC's EPP-port or via supplied PCI board, standard profile)	PCI/EPP based (either via PC's EPP-port or via supplied PCI board, standard profile)
Software System	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS) WIN-2000/2003/XP/VISTA & WINDOWS 7/8 (32 bit only)	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS) WIN-2000/2003/XP/VISTA & WINDOWS 7/8 (32 bit only)	ALV-Correlator Software for live control, display and data reduction (DLS, DWS, FCS) WIN-2000/2003/XP/VISTA & WINDOWS 7/8 (32 bit only)
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 Housing Size Total Weight	Aluminum housing 143 x 127 x 74 mm ~650 g	Aluminum housing 143 x 127 x 74 mm ~ 650 g	Aluminum housing 143 x 127 x 74 mm ~ 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 µs 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 no longer 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 with identical functionality. In addittion low profile types of these boards are available as well. Please make certain any such requirement is forwarded to ALV before eventual delivery, best within an eventual purchase order.



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