Purchase Contract

(hereafter the "**Contract**")

1. CONTRACTUAL PARTIES

1.1 **Fyzikální ústav AV ČR, v. v. i.**,

with seat: Na Slovance 1999/2, 182 21 Praha 8, Czech Republic
represented by: RNDr. Michael Prouza, Ph.D., Director,
registered in the Register of public research institutions of the Ministry of Education, Youth and Sports of the Czech Republic.

Bank: UniCredit Bank Czech Republic and Slovakia, a.s.
Account No. IBAN: CZ3127000000002106535627; SWIFT (BIC): BACXCZPP
ID No.: 68378271
Tax ID No.: CZ68378271

(hereinafter the "**Buyer**")

and

1.2 **CAEN GmbH,**

with seat: Klingenstraße 108, D-42651 Solingen, Germany
represented by: Nico von Düring, Managing Director (Geschäftsführer),
registered in Commercial Register at Amtsgericht Wuppertal.

Bank: Commerzbank Neuss
Account No. IBAN: DE300800000107391800
ID No.: HRB 19637
Tax ID No.: 128/5804/4220

(hereinafter the "**Seller**"),

(the Buyer and the Seller are hereinafter jointly referred to as the "**Parties**" and each of them individually as a "**Party**").

2. FUNDAMENTAL PROVISIONS

2.1 The Buyer is a public research institution whose primary activity is scientific research in the area of physics, especially elementary particles physics, condensed systems, plasma and optics.

2.2 The Buyer is in the process of implementing a project Reg. No. CZ.02.1.01/0.0/0.0/16_013/0001402 with the title "Future of the Czech participation at the Pierre Auger Observatory – AUGER-CZ" within the framework of the Operational Programme Research, Development and Education (OP RDE) (hereafter the **"Project"**).

2.3 The subject matter of this Contract is funded using grant provided to the Project, for which it is destined.

2.4 The Buyer wishes to acquire the subject of performance hereof (VME modules) in order to finalize the equipment of the astroparticle physics laboratory to be able to perform a wide range of measurements needed for testing of components for current and future astroparticle experiments.

2.5 The Seller was selected as the winner of a public procurement procedure announced by the Buyer for the public contract called **"VME modules"** (hereinafter the "**Procurement Procedure**").

2.6 The documentation necessary for the execution of the subject of performance hereof consist of

2.6.1 Technical specifications of the subject of performance hereof attached as **Annex No. 1** hereto**.**

2.6.2 The Seller´s bid submitted within the Procurement Procedure in its parts which describe the subject of performance in technical detail (hereinafter the "**Sellers's Bid**"); the Sellers´s Bid forms **Annex No. 2** to this Contract and is an integral part hereof.

In the event of a conflict between the Contract's Annexes the technical specification / requirement of the higher level / quality shall prevail.

2.7 The Seller declares that he has all the professional prerequisites required for the supply of the subject of performance under this Contract, is authorised to supply the subject of performance and there exist no obstacles on the part of the Seller that would prevent him from supplying the subject of this Contract to the Buyer.

2.8 The Seller acknowledges that the Buyer considers him capable of providing performance under the Contract with such knowledge, diligence and care that is associated and expected of the Seller's profession, and that the Seller's potential performance lacking such professional care would give rise to corresponding liability on the Seller's part. The Seller is prohibited from misusing his qualities as the expert or his economic position in order to create or exploit dependency of the weaker Party or to establish an unjustified imbalance in the mutual rights and obligation of the Parties.

2.9 The Seller acknowledges that the Buyer is not in connection to the subject of this Contract an entrepreneur and also that the subject of this Contract is not related to any business activities of the Buyer.

2.10 The Seller acknowledges that the production and delivery of the subject of performance within the

specified time and of the specified quality, as shown in Annexes No. 1 and 2 of this Contract (including invoicing), is essential for the Buyer.

2.11 The Parties declare that they shall maintain confidentiality with respect to all facts and information, which they learn in connection herewith and / or during performance hereunder, and whose disclosure could cause damage to either Party. Confidentiality provisions do not prejudice obligations arising from valid legislation.

3. SUBJECT-MATTER OF THE CONTRACT

3.1 The subject of this Contract is the obligation on the part of the Seller to deliver and transfer into the Buyer's ownership:

the VME modules (hereafter the **"Equipment"**)

and the Buyer undertakes to take delivery of the Equipment and to pay to the Seller the agreed upon price.

3.2 The following activities form an integral part of the performance to be provided by the Seller:

3.2.1 Transport of the Equipment incl. all accessories specified in Annexes 1 and 2 of the Contract to the place of delivery,

3.2.2 Telephone or email assistance with the installation of the Equipment at the site,

3.2.3 Delivery of instructions and operating and repair manuals to the Equipment in Czech or English language to the Buyer, in electronic and hardcopy (printed) versions,

3.2.4 Free-of-charge warranty service,

3.2.5 Ensuring out-of-warranty and post-warranty service,

3.2.6 Provision of technical support in the form of consultations.

3.3 The subject of performance (Equipment) is specified in detail in Annexes No. 1 and No. 2 hereto.

3.4 The Seller shall be liable for the Equipment and related services to be in full compliance with this Contract, its Annexes and all valid legal regulation, technical and quality standards and that the Buyer will be able to use the Equipment for the defined purpose. In case of any conflict between applicable standards it is understood that the more strict standard or its part shall always apply.

3.5 The delivered Equipment and all its parts and accessories must be brand new and unused.

3.6 The Equipment must be Linux OS supported.

4. PERFORMANCE PERIOD

4.1 The Seller undertakes to manufacture and deliver the Equipment to the address specified in Section

7.1 hereof within 3 months of the conclusion of this Contract.

4.2 The performance period shall be extended for a period during which the Seller could not perform due to obstacles on the part of the Buyer.

5. PURCHASE PRICE, INVOICING, PAYMENTS

5.1 The purchase price is based on the Seller's submitted bid and amounts to **19.274,- €** (in words: Nineteenthousandtwohundredseventyfour Euro) excluding VAT (hereinafter the **"Price"**). VAT shall be paid by the Buyer and settled in accordance with the valid Czech regulation.

5.2 The Price represents the maximum binding offer by the Seller and includes any and all performance provided by the Seller in connection with meeting the Buyer's requirements for the proper and complete delivery of the Equipment hereunder, as well as all costs that the Seller may incur in connection with the delivery, and including all other costs of expenses that may arise in connection with creation of an intellectual property creation and its protection.

5.3 The Parties agreed that the Price shall be invoiced after the acceptance protocol in accordance with Section 9.5 will have been signed. In case the Equipment will be delivered with minor defects and / or unfinished work, the Price will be invoiced after removal of these minor defects and / or unfinished work.

5.4 The invoice issued by the Seller as a tax document must contain all information required by the applicable laws of the Czech Republic. Invoices issued by the Seller in accordance with this Contract shall contain in particular following information:

5.4.1 name and registered office of the Buyer,

5.4.2 tax identification number of the Buyer,

5.4.3 name and registered office of the Seller,

5.4.4 tax identification number of the Seller,

5.4.5 registration number of the tax document,

5.4.6 scope of the performance (including the reference to this Contract),

5.4.7 the date of the issue of the tax document,

5.4.8 the date of the fulfilment of the Contract,

5.4.9 purchase Price,

5.4.10 registration number of this Contract, which the Buyer shall communicate to the Seller based on Seller's request before the issuance of the invoice,

5.4.11 declaration that the performance of the Contract is for the purposes of the project "Future

of the Czech participation at the Pierre Auger Observatory – AUGER-CZ", Reg. No.: CZ.02.1.01/0.0/0.0/16_013/0001402,

and must comply with the double taxation agreements, if applicable.

5.5 The Buyer prefers electronic invoicing, with the invoices being delivered to efaktury@fzu.cz. All issued invoices shall comply with any international double taxation agreements, if applicable.

5.6 Invoices shall be payable within thirty (30) days of the date of their delivery to the Buyer. Payment of the invoiced amount means the date of its remittance to the Seller's account.

5.7 If an invoice is not issued in conformity with the payment terms stipulated by the Contract or if it does not comply with the requirements stipulated by law, the Buyer shall be entitled to return the invoice to the Seller as incomplete, or incorrectly issued, for correction or issue of a new invoice, as appropriate, within five (5) business days of the date of its delivery to the Buyer. In such a case, the Buyer shall not be in delay with the payment of the Price or part thereof and the Seller shall issue a corrected invoice with a new and identical maturity period commencing on the date of delivery of the corrected or newly issued invoice to the Buyer.

5.8 The Buyer shall be entitled to unilaterally set off any of his payments against any receivables claimed by the Seller due to contractual penalties, if any.

6. OWNERSHIP TITLE

6.1 The ownership right to the Equipment shall pass to the Buyer by acceptance and full payment of the Price. Acceptance shall be understood as delivery and acceptance of the Equipment duly confirmed by the Buyer on the acceptance protocol in accordance with Section 9.5.

7. PLACE OF DELIVERY OF THE EQUIPMENT

7.1 The place of delivery of the Equipment shall be the premises of the Buyer at Na Slovance 1999/2, 182 21 Praha 8, Czech Republic.

8. COOPERATION OF THE PARTIES

8.1 The Seller undertakes to notify the Buyer of any obstacles on his part, which may negatively influence proper and timely delivery of the Equipment.

9. DELIVERY AND ACCEPTANCE

9.1 The Seller shall transport the Equipment at its own cost to the place of delivery. If the shipment is intact, the Buyer shall issue delivery note for the Seller.

9.2 The Buyer shall verify whether the Equipment is functional and meets the technical requirements of Annexes No. 1 and 2 hereof.

9.3 The Buyer undertakes to perform the verification whether the Equipment is functional and meets the technical requirements within 2 weeks of the delivery of the Equipment.

9.4 The delivery shall include all technical documentation pertaining to the Equipment, user manuals and certificate of compliance of the Equipment and all its parts and accessories with approved standards.

9.5 The procedure shall be completed by acceptance of the Equipment confirmed by the acceptance protocol containing specifications of all performed tests. The protocol shall contain the following information:

9.5.1 Information about the Seller, the Buyer and any subcontractors,

9.5.2 Description of the Equipment including description of all components and serial numbers,

9.5.3 List of technical documentation including the manuals,

9.5.4 Date and signature of the representative of the Buyer specified in 11.2 hereof.

9.6 Acceptance of the Equipment does not release the Seller from liability for defects that were not detected during the acceptance procedure.

9.7 The Buyer shall not be obliged to accept Equipment which would show defects or unfinished work and which would otherwise not form a barrier, on their own or in connection with other defects, to using the Equipment. In this case, the Buyer shall issue a record containing the reason for his refusal to accept the Equipment.

10. TECHNICAL ASSISTANCE – CONSULTATIONS

10.1 The Seller shall be obliged to provide to the Buyer free-of-charge technical assistance by phone or e-mail relating to the subject-matter hereof during the entire term of the warranty period. The Seller undertakes to provide to the Buyer paid consultations and technical assistance relating to the subject-matter hereof also after the warranty period expires.

11. REPRESENTATIVES, NOTICES:

11.1 The Seller authorized the following representatives to communicate with the Buyer in all matters relating to the Equipment delivery:

Nico von Düring
e-mail: n.vonduering@caen-de.com
tel. (+49) 212 2544077

11.2 The Buyer authorized the following representatives to communicate with the Seller:

RNDr. Martina Boháčová, Ph.D.
e-mail: bohacova@fzu.cz
tel. (+420) 266 05 2660

11.3 All notifications to be made between the Parties hereunder must be made out in writing and delivered to the other Party by hand (with confirmed receipt) or by registered post (to the Buyer's or Seller's address), or in some other form of registered post or electronic delivery incorporating electronic

signature (qualified certificate) to epodatelna@fzu.cz in case of the Buyer and to n.vonduering@caen-de.com in case of the Seller.

11.4 In all technical and expert matters (discussions on the Equipment testing and demonstration, notification of the need to provide warranty or post-warranty service, technical assistance etc.) electronic communication between technical representatives of the Parties will be acceptable using e-mail addresses defined in Sections 11.1 and 11.2.

12. TERMINATION

12.1 This Contract may be terminated early by agreement of the Parties or withdrawal from the Contract on the grounds stipulated by law or in the Contract.

12.2 The Buyer is entitled to withdraw from the Contract without any penalty from Seller in any of the following events:

12.2.1 The Seller is in delay with the delivery of the Equipment longer than 2 weeks after the date pursuant to Section 4.1 hereof.

12.2.2 Technical parameters or other conditions required in the technical specification defined in Annex No. 1 and 2 hereto and in the relevant valid technical standards will not be achieved by the Equipment at acceptance,

12.2.3 Facts emerge bearing evidence that the Seller will not be able to deliver the Equipment.

12.3 The Seller is entitled to withdraw from the Contract in the event of the Buyer being in default with the payment for more than 2 months with the exception of the cases when the Buyer refused an invoice due to defect on the delivered Equipment or due to breach of the Contract by the Seller.

12.4 Withdrawal from the Contract becomes effective on the day the written notification to that effect is delivered to the other Party. The Party which had received performance from the other Party prior to such withdrawal shall duly return such performance.

13. INSURANCE

13.1 The Seller undertakes to insure the Equipment against all risks, in the amount of the Price of the Equipment for the entire period commencing when transport of the Equipment starts until duly accepted by the Buyer. In case of breach of this obligation, the Seller shall be liable to the Buyer for any damage that may arise.

13.2 The Seller is liable for the damage that he has caused. The Seller is also liable for damage caused by third parties undertaken to carry out performance or his part under this Contract.

14. WARRANTY TERMS

14.1 The Seller shall provide warranty for the quality of the Equipment for a period of 24 months. The warranty term shall commence on the day following the date of signing of the acceptance protocol pursuant to Section 9.5 hereof. The warranty does not cover consumable things.

14.2 Should the Buyer discover a defect, he shall notify the Seller to rectify such defect using the email address: n.vonduering@caen-de.com.

14.3 The Seller shall be obliged to rectify any claimed defects within 30 days from receipt of the Buyer's notification. In cases of unusual defects, the Seller shall be obliged to rectify the defect in the period corresponding to the nature of the defect and to define the deadline for the handover of the rectified Equipment.

14.4 During the warranty period any and all costs associated with defect rectification / repair including transport and travel expenses of Seller shall be always borne by the Seller.

14.5 The repaired Equipment shall be handed over by the Seller to the Buyer on the basis of a protocol confirming removal of the defect (hereinafter the "**Repair Protocol**") containing confirmations of both Parties that the Equipment was duly repaired and is defect-free.

14.6 The repaired portion of the Equipment shall be subject to a new warranty term in accordance with Section 14.1, which commences to run on the day following the date when the Repair Protocol was executed, provided, however, that the aggregate warranty period shall under no circumstances exceed 36 months.

14.7 The Seller undertakes to provide the Buyer with updates of the software controlling the Equipment for the entire term of warranty service.

15. CONTRACTUAL PENALTIES

15.1 The Buyer shall have the right to a penalty in the amount of 0.1 % of the Price for each commenced day of delay with the performance pursuant to Section 4.1 hereof.

15.2 The Buyer shall have the right to a penalty in the amount of 0.1 % of the Price for each commenced day of delay with rectifying of defects claimed within the warranty period.

15.3 In case of default in payment of any due receivables (monetary debt) under the Contract, the defaulting Buyer or Seller (the debtor) shall be obliged to pay a contractual penalty in the amount of 0.1 % of the owed amount for each commenced day of delay with the payment.

15.4 Contractual penalties are payable within 30 days of notification demanding payment thereof.

15.5 Payment of the contractual penalty does not prejudice the rights of the Parties to claim damages.

16. DISPUTES

16.1 Any and all disputes arising out of this Contract or the legal relationships connected with the Contract shall be resolved by the Parties by mutual negotiations. In the event that any dispute cannot be resolved by negotiations within sixty (60) days, the dispute shall be resolved by the competent court in the Czech Republic based on application of any of the Parties; the court having jurisdiction will be the court where the seat of the Buyer is located. Disputes shall be resolved exclusively by the law of the Czech Republic.

17. ACCEPTANCE OF THE PROJECT RULES

17.1 The Seller, using all necessary professional care, shall cooperate during financial inspections carried out in accordance with Act No. 320/2001 Coll., on Financial Inspections, as amended, or during other financial inspections carried out by any auditing entities (particularly by the Managing Authority of the Operational Program Research, Development and Education) and shall allow access also to those portions of the bid submitted within the Procurement Procedure, the Contract and related documents which may be protected by special legal regulation, given that all requirements set forth by legal regulation with respect to the manner of executing such inspections will have been observed.

18. FINAL PROVISIONS

18.1 This Contract represents the entire agreement between the Buyer and the Seller. The relationships between the Parties not regulated in this Contract shall be governed by the Act No. 89/2012 Coll., the Civil Code, as amended.

18.2 In the event that any of the provisions of this Contract shall later be shown or determined to be invalid, ineffective or unenforceable, then such invalidity, ineffectiveness or unenforceability shall not cause invalidity, ineffectiveness or unenforceability of the Contract as a whole. In such event the Parties undertake without undue delay to subsequently clarify any such provision or replace after mutual agreement such invalid, ineffective or unenforceable provision of the Contract by a new provision, that in the extent permitted by the laws and regulations of the Czech Republic, relates as closely as possible to the intentions of the Parties to the Contract at the time of creation hereof.

18.3 This Contract may be changed or supplemented solely by means of numbered amendments in writing, furnished with the details of time and place and signed by duly authorised representatives of the Parties. The Parties expressly reject modifications to the Contract in any other manner.

18.4 This Contract is drawn up in three (3) counterparts, each of which is deemed to be the original. The Buyer shall receive two (2) counterparts, the Seller shall receive one (1) counterpart.

18.5 The Parties expressly agree that the Contract as a whole, including all attachments and data on the Parties, subject-matter of the Contract, numerical designation of this Contract, the Price and the date of the Contract conclusion, will be published in accordance with Act No. 340/2015 Coll. on special conditions for the effectiveness of some contracts, publication of these contracts and Contract Register, as amended (hereinafter the "**CRA**"). The Parties hereby declare that all information contained in the Contract and its Annexes are not considered trade secrets under § 504 of the Civil Code and grant permission for their use and disclosure without setting any additional conditions.

18.6 The Parties agree that the Buyer shall ensure the publication of the Contract in the Contract Register in accordance with CRA.

18.7 This Contract becomes effective as of the day of its publication in the Contract Register.

18.8 The following Annexes form an integral part of the Contract:

Annex No. 1: Technical specification on the subject of performance

Annex No. 2: Technical description of the device as presented in Seller's bid

18.9 The Parties, manifesting their consent with the entire contents of this Contract, attach their signature hereunder.

In Prague on 9. 7. 2018	In Solingen on 2. 7. 2018
For the Buyer:	For the Seller:
_____	_____
RNDr. Michael Prouza, Ph.D.	Nico von Düring
Director	Managing Director (Geschäftsführer)

Annex No. 1

Technical specification on the subject of performance as defined by the Buyer

The Equipment shall consist of Linux OS supported VME64 standard modules, namely:

	Description and minimum specification of the Equipment as defined by the Buyer	Description and specification of the Equipment offered by the Seller	Complies YES/NO
1.	VME controller PCIe 8x optical link, optical fiber 20m	V 27188B Kit	YES
2.	TDC 8 ch., 12 bit resolution, 25ps LSB, high linearity	V 1290 N	YES
3.	Translator 8 ch., NIM/ECL ECL/NIM , Fan Out	V 538 AB	YES
4.	Logical unit 8 ch., AND/OR/MAJ, NIM/TTL input/output	V 976 B	YES
5.	Dual Timer	V 993 C	YES
6.	HV power supply 6 ch., negative HV, 4kV/3mA	V 6533 N	YES
7.	Variable gain amplifier	V 974 B	YES

Annex No. 2

The Seller's bid in the extent it describes technical parameters of the Equipment

CAEN Tools for Discovery Electronic Instrumentation

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Jobs

V2718

VME-PCI Optical Link Bridge

- No boot required, ready at power ON
- PC control through A2818/A3818 Optical Controllers
- CONET1 OR CONET2 CAEN Proprietary Optical link Compatible
- PCI 32bit / 33MHz (A2818) - PCIe x8 (A3818)
- Daisy chain capability
- Up to 80 MByte/s sustained data transfer rate (with CONET2)
- VME Master (arbiter or requester)
- VME Slave (register and test RAM access)
- Cycles: RW, RMW, BLT, MBLT, IACK, ADO, ADOH
- Addressing: A16, A24, A32, CR/CSR, LCK
- Data width: D8, D16, D32, D64
- System Controller capabilities
- Interrupt handler
- Transparent interrupt passing
- Front panel Dataway Display (available also from PC and VME)
- 5 outputs and 2 inputs, NIM or TTL, fully programmable
- Libraries, Demos (C and LabVIEW) and Software tools for Windows and Linux

The **V2718** is a **VME to PCI Optical Link Bridge**, housed in a **1-unit wide VME 6U** module. The unit acts as a **VME Master module** and can be controlled by a standard PC equipped with PCI or PCIe CAEN Controller cards (Models A2818 and A3818). The connection between the V2718 and the Controller takes place through an optical fibre cable (AI2700 - Optical Fiber Series). Multi-crate sessions can be easily performed, since up to eight daisy chained V2718 (via optical fibre cables) can be controlled by a single A2818/A3818, thus building a CONET (Chainable Optical Network).

The V2718 can perform all the cycles foreseen by the **VME64** (except those intended for 3U boards). The board can operate as **VME System Controller** (normally when plugged in the slot 1) acting as a **Bus Arbiter** in Multi-Master systems. The VME bus activity can be monitored in detail, both locally (through a LED display) and remotely.

The front panel includes also 5 TTL/NIM programmable outputs on LEMO 00 connectors (default assignment is: DS0/1, AS, DTACK, BERR and LOCATION MONITOR) and two programmable TTL/NIM inputs (on LEMO 00 connectors). The I/Os can be programmed via USB in order to implement functions such as Timer, Counter, Pulse generator, I/O register, etc.. The LED display and the TTL/NIM I/Os are not available on Mod. V2718LC version.

The sustained data transfer rate is up to 80 MByte/s. Thanks to the 128KByte memory buffer, the activity on the VME bus is not slowed down by the transfer rate on the CONET when several V2718 units share the same network.

The Module can be integrated into the most common PC platforms (Windows XP/Vista/7/8, Linux) thanks to the A2818/A3818 drivers; also, it is provided with libraries and useful example programs in C/C++, .NET and LabVIEW. Firmware upgrade can be performed via PCI/PCIe.

Packaging	1-unit wide and 6U high VME module
PC Interface	Optical Link
Transfer rate	up to 70 MByte/s (CONET1); up tp 80 MByte/s (CONET2)
Addressing	A16, A24, A32, CR/CSR, LCK; ADO, ADOH cycles
Data cycles	D08, D16, D32 for R/W and RMW, D16, D32 for BLTD64 for MBLT
Interrupt cycles	D08, D16, D32, IACK cycles
Interrupts transfer and monitor	VME interrupts IRQ[7:1] passed directly from VME to the PCI/PCIe bus via optical link host system is notified asynchronously (polling not required)
LED display	Data bus, address bus, address modifier, interrupt request, control signals
Panel outputs	5 NIM/TTL programmable (default: DSn, AS, DTACK, BERR, LMON)
Panel inputs	2 NIM/TTL programmable

Code	Description

Code	Description
WK2718LCXAAA	V2718KITLC - VME-PCI Bridge (V2718)+PCI Optical Link (A2818)+Optical Fibre 5m duplex (AY2705) (Rohs)
WV2718XAAAAA	V2718 - VME-PCI Bridge
WK2718XAAAAA	V2718KIT - VME-PCI Bridge (V2718) + PCI OpticalLink (A2818) + Optical Fibre 5m duplex (AY2705)
WK2718XBAAAA	V2718KITB - VME-PCI Bridge (V2718) + PCIe Optical Link (A3818A) + Optical Fibre 5m duplex (AY2705)

CAEN Tools for Discovery Electronic Instrumentation

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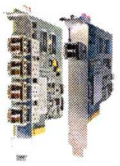
A3818

PCI Express CONET2 Controller



- PCI Express 1.1/2.0 x8 card up to 4 indipendent optical links
- 1,2,4 Links available
- CONET2 CAEN Proprietary Optical link Compatible
- Up to 32 CAEN CONET2-compliant Optical slave cards (CAEN VME Bridges or Waveform Digitizer) controlled by a single A3818
- API/Drivers for Windows and Linux

The Mod. **A3818***(*)* is a **PCI Express x8** card that can plug into both **x8 and x16** PC PCI Express slot (V1.1 or 2.0), which allows the control of up to **4 CONET2** independent networks (each network can be made of up to 8 CONET2 slaves).

CONET2 is an optical link based network with Daisy chain capabilities. Through the CONET2 it is possible to handle the VMEbus through the CAEN VMEbus Optical Link Bridges (such as the V2718) or to control directly CAEN modules with built-in optical link (such as the N67xx, DT57xx and V17xx digitizers).

The communication path uses optical fiber cables as physical transmission line (AI2700 - Optical Fiber Series).

Note: A3818 may not be supported on some DELL computers

*(*) From **Q3 2013**, the 167,65 mm PCB length version definitely substituted the old version (featuring 196,69 mm length). Both the PCB versions are declared to be full functionally interchangeable.*

ARCHITECTURE	PCI Express x8	
SLOT COMPATIBILITY	PCI Express x8, x16 (V1.1 or 2.0)	
PCI EXPRESS LANES	**Lane Capability** x8	**Compatibility** x1, x4 lanes slots
Transmission Channel	Optical Fiber	
Data Transfer rate	Up to 85 MB/sec (**CONET 2** CAEN proprietary protocol)	
Channel Bandwidth	1.25 Gb/sec	
NUM. OF BOARDS / LINK	Up to 8 boards can be controlled by a single CONET 2 link thanks to Daisy-chain capability	
NUM. OF OPTICAL LINKS	1 (mod. A3818A) 2 (mod. A3818B) 4 (mod. A3818C)	
MECHANICAL	**Form Factor** Half size	**Dimension** 106,65 x 167,65 mm (HxL)
POWER RAILS	+12 V +3.3 V	
OPERATING SYSTEMS SUPPORTED	Windows® and Linux platforms	

Code	Description
WA3818AXAAAA	A3818A - PCIe 1 Optical Link
WA3818BXAAAA	A3818B - PCIe 2 Optical Link
WA3818CXAAAA	A3818C - PCIe 4 Optical Link
WK2718XBAAAA	V2718KITB - VME-PCI Bridge (V2718) + PCIe Optical Link (A3818A) + Optical Fibre 5m duplex (AY2705)
WKX2718XBAAA	VX2718KITB - VME-PCI Bridge (VX2718) + PCIe Optical Link (A3818A) + Optical Fibre 5m duplex (AY2705)

CAEN Electronic Instrumentation

Tools for Discovery

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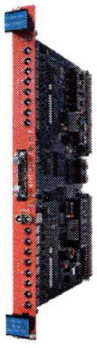
Jobs

V1290N-2eSST

16 Channel Multihit TDC (25 ps)



- 25 ps LSB
- 21 bit resolution
- 52 µs full scale range
- NIM Input Signals
- 5 ns Double Hit Resolution
- Leading and Trailing Edge detection
- Trigger Matching and Continuous Storage acquisition modes
- 32 k x 32 bit output buffer
- MBLT, CBLT and 2eSST data transfer
- Multicast commands
- Live Insertion
- Libraries, Demos (C and LabView) and Software tools for Windows and Linux

The V1290N-2eSST is a **16 channel Multihit TDC**, housed in a **1-unit wide VME 6U** module. The unit features **High Performance Time to Digital Converter** chips developed by CERN. LSB is **25 ps** (21 bit resolution, 52 µs FSR). The module accepts NIM inputs..

The channels can be enabled for the detection of hits rising/falling edges. For each channel there is a digital adjustment for the zero-ing of any offsets. The data acquisition can be programmed in "Events" ("Trigger Matching Mode", with a programmable time window) or in "Continuous Storage Mode".

The module programming is performed via a microcontroller that implements a high-level user friendly interface. The VME interface allows the module to work in A24 and A32 addressing modes.

The board houses a 32 k x 32 bit deep Output Buffer, that can be readout via VME in a completely independent way from the acquisition itself.

The device supports MBLT, CBLT and 2eSST readout modes. Live insertion is also supported.

Packaging	6U-high, 1U-wide VME unit
Inputs	16 NIM, 50 Ohm impedance
Double hit resolution	5 ns
Acquisition modes	Trigger Matching Mode; Continuous Storage Mode
Built-in memory	32 kwords deep Output Buffer
Trigger Window Width	Programmable from 25 ns to 100 µs
Dynamic Range	52 µs
LSB	25 ps
RMS resolution	< 35 ps (typical)
Integral non linearity	< 2.5 LSB
Differential non linearity	< 3 LSB
Interchannel Isolation	≤ 3 LSB
Offset spread	< 2 ns
EXT TRIGGER input	Two LEMO 00 bridged connectors, NIM signal, 50 Ohm
Clock source	Internal (40 MHz) or External (on Control connector), dip switch selectable
Control inputs	NIM std. input signals: RST: resets Output Buffer, Status and Control registers. CLR: FAST CLEAR of TAC sections rising-edge active, differential ECL input signals: CLK: external clock TRG: trigger for the TDC latching
Control outputs	NIM std. signal: OUT_PROG: control output signal, programmable via the out prog control register
Displays	DTACK: green LED; lights up at each VME access. PWR: green/red LED; green: power ON, red: failure status. TERM: green LED; control bus termination ON. FULL: red LED; memory full. ERROR: red LED; TDC global error. DRDY: yellow LED: at least one datum in the output buffer

Code	Description
WV1290BNXAAE	V1290N - 2ESST 16 Ch. Multievent Multihit TDC 25 psec NIM (no JAUX)

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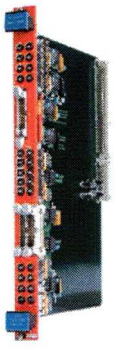
V538A

8 Channel NIM-ECL/ECL-NIM Translator



- 8 independent NIM to ECL/NIM and ECL to NIM/ECL channels
- NIM and ECL fan-out of 2
- 300 MHz maximum operating frequency
- COMMON IN input with a fan-out of 16 (both NIM and ECL)
- I/O delay <5 ns

The Model V538 A is a 1-unit wide VME module housing 8 independent logic level translators.
Each of the 8 channels accepts a NIM or ECL signal and provides two NIM and two ECL outputs (OUT 0÷7 A, B). The NIM and ECL inputs of each channel are ORed prior to fan-out.
The maximum operating frequency is 300 MHz.
Two front panel input bridged connectors accept a COMMON IN NIM signal, which allows the use of the module as a fan-out of 16 NIM and 16 ECL signals.

Packaging	1-unit wide 6U VME module
Inputs	IN 0-7 NIM: NIM logic level, 50 ohm impedance, Reflections < 3%, for input risetimes > 2 ns ; IN 0-7 ECL: Std. ECL logic levels, 110 Ohm impedance Reflections < 10%, for input risetimes > 2 ns ; COMM: Std. NIM Level, high impedance, Reflections < 10%, for input risetimes > 2 ns
Outputs	OUT 0-7 A, B NIM: Std. NIM levels on 50 Ohm impedance, Risetime: < 2 ns; OUT 0-7 A, B ECL: Differential ECL levels on 110 Ohm impedance, Risetime: < 2 ns
Max. frequency	NIM input: 300 MHz (50% duty cycle) ECL input: 250 MHz (50% duty cycle)
Min. signal FWHM	3 ns for NIM/ECL input/output
I/O delay	ECL IN to NIM OUT: 2.5 ns; ECL IN to ECL OUT: 2.5 ns; NIM IN to ECL OUT: 3.5 ns; NIM IN to NIM OUT: 3.5 ns COMMON IN to NIM OUT: 4 ns; COMMON IN to ECL OUT: 4 ns

Code	Description
WV538XBAAAAA	V538AB - 8 Channel NIM-ECL/ECL-NIM Translator (noJAUX)

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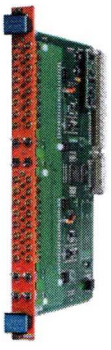
Jobs

V976

Quad 4 Fold AND/OR/MAJ, NIM-TTL TTL-NIM Translator. Fan-In Fan-Out



- Four independent sections with four channels each
- TTL and NIM inputs automatically detected
- NIM/TTL selectable output level
- AND, OR, Majority function with selectable number of inputs
- Logic Fan In / Fan Out
- Selectable direct or negated output

The Mod. V976 is a 1-unit VME module housing four 4-input Coincidence Fan in/Fan out and NIM - TTL / TTL - NIM adapter sections. Each section features 4 inputs and 4 outputs on LEMO 00 connectors and can operate as a 4 channel level translator or as AND/OR gate. It is possible to use two or four sections together to obtain an 8 or 16 input majority The logic functions can be selected via front-panel and internal switches. Some extra functions, such as a 1 to 12 Fan Out, can be performed by cascading properly the module's sections. The output width is not regulated by a monostable, but it is equal to the duration of the input condition which makes the logic function true. The module accepts NIM and TTL inputs; the output can be programmed to provide either NIM or TTL levels as well, either direct or negated.

Packaging	1U-wide VME unit
Input channels	16 NIM/TTL levels
Output channels	16 NIM/TTL normal/negated levels (switchable),driving a 50 Ohm load each
Min. input width	2 ns
Max. input frequency	150 MHz (translator mode, with NIM signals, normal output)
I/O delay	Translator: 9 ns; AND/OR: 11.5 ns
Rise/Fall Time	NIM: 1/2 ns; TTL: 2/2.5 ns
Min. coincidence width	2 ns
NIM signals	V0in: >-250 mV; V1in: <-600 mV V0out: 0÷100 mV; V1out: -600÷-1600 mV
TTL signals	V0in: <700 mV; V1in: >1000 mV V0out: <30 mV; V1out: >2.4 V

Code	Description
WV976XBAAAAA	V976B - Quad 4 Fold AND/OR/MAJ, NIM-TTL TTL-NIMLevel Translator and Fan-In Fan-Out (no JAUX)

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Jobs

V993C

Dual Timer

- Manual or pulse triggered START (NIM, TTL or ECL)
- Monostable or bistable operation
- NIM, TTL and ECL output pulses from 50 ns to 10 s
- Manual or pulse triggered RESET
- (NIM, TTL and ECL) END-MARKER pulse
- VETO input

The Mod. V993C Dual Timer is a 2-unit VME module housing two identical triggered pulse generators.
The module produces NIM/TTL (NIM/TTL selection is performed via an on-board switch) and ECL pulses whose width ranges from 50 ns to 10 s when triggered. Output pulses are provided normal and negated.
Timers can be re-triggered with the pulse end marker signal, a short pulse occurring at the end of each output pulse.
The coarse adjustment of the output width is provided via a 9-position rotary switch, the fine adjustment can be performed via either 10 turn dial handle (with lock) or by providing an external voltage.
The trigger START can be provided via either an external signal (NIM, TTL or ECL) or manually via a front panel switch.
The module features also VETO and RESET input signals.
RESET is also avaible on a front panel switch.
The V993C is equipped with LEMO 00 connectors for NIM/TTL signals and male pin couples for ECL signals.

Packaging	2U-wide VME unit
Output / Section	OUT: NIM/TTL signal with a Fan-Out of 2, ECL signal /OUT: negated NIM/TTL signal, ECL signal
Output width	50 ns ÷ 10 s (NIM, TTL and ECL)
WSET (width set voltage)	0 ÷ 5 V d.c.
START/OUT delay	<25 ns
RESET delay	~30 ns: the timing cycle stops ~30 ns after the RESET pulse is sent
Rise/Fall Time	<2 ns
Thermal stability	-60 ppm/°C

Code	Description
WV993XCAAAAA	V993C - Dual Timer (no JAUX)

Accessories

Firmware/Software

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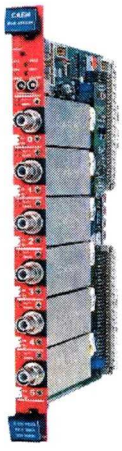
V6533

6 Channel 4 kV/3 mA VME HV Power Supply Module (9 W)



- 6 channels in 1 unit wide VME 6U module
- 4 kV / 3mA output ranges (9W max)
- Available with positive, negative or mixed polarity
- SHV coaxial output connectors
- Common floating return
- Low Ripple (Typ: from 3mVpp to 10mVpp)
- 100 mV Vset/Vmon resolution
- 50 nA Iset/Imon resolution (Optional Imon-Zoom: 5 nA)
- Status output
- Channel ON/Status LEDs
- Interlock logic for board enable
- Individual channel enable
- Optional A6580 DC Input Power Equalizer
- Module control via OPC Server

The **V6533** is a 1-unit wide VME 6U module housing **6** High Voltage Power Supply Channels **4kV, 3mA** (9W max). The board is available with either positive or negative output polarity; mixed version with 3 positive and 3 negative channels is also available. The channels share a common floating return, which allows on-detector grounding reducing the noise level. HV outputs are delivered through SHV connectors.
The HV output RAMP-UP and RAMP-DOWN rates may be selected independently for each channel in the 1÷ 500 V/s range with 1 V/s steps. The module features 50nA Iset/Imon resolution. A Zoom option is available for Imon, increasing resolution to 5nA. The modules fit into both VME/VME64 standard and V430 crates. Functional parameters can be programmed and monitored via VMEbus.

A complete set of software tools is available to control these units, from low level libraries to graphical application software.

Safety features include:

- OVERVOLTAGE and UNDERVOLTAGE warning when the output voltage differs from the programmed value
- Programmable via trimmer HVMAX and IMAX hardware protection limit
- OVERCURRENT detection: if a channel tries to draw a current larger than its programmed limit, it enters TRIP status, keeping the maximum allowed value for a programmable time (TRIP), before being switched off. If TRIP is set to "constant current mode", the channel behaves like a current generator
- Channels can be enabled or disabled through the Global Interlock logic
- Channels individually enabled via front panel jumpers (passive or active mode available)

Option available:

- A6580 DC Input Power Equalizer
- Imon Zoom, increasing resolution to 5nA

Polarity	Positive or Negative; common floating return
Output Voltage	0÷4 kV (connector output)
Max. Output Current	3 mA (9W max), Max. 300 µA with Imon Zoom (optional)
Voltage Set/Monitor Resolution	100 mV
Current Set/Monitor Resolution	50 nA ; monitor resolution 5 nA with Imon Zoom (optional)
VMAX hardware	0÷4 kV common to all board channels
VMAX hardware accuracy	2% of FSR
IMAX hardware:	0÷3 mA common to all board channels
IMAX hardware accuracy:	2% of FSR
VMAX software	0÷4 kV selectable for each channel
VMAX software resolution	100 mV
Voltage Ripple	1kV/500µA: 3mV Typical / 5mV Maximum 2kV/1mA: 3mV Typical / 5mV Maximum 4kV/2mA: 12mV Typical / 20mV Maximum 3kV/3mA: 10mV Typical / 20mV Maximum
Ramp Up/Down	1÷500 V/s, 1 V/s step
	typical: ± 0.05% ± 1 V

Vset Vs. Vout accuracy	typical: ± 0.05% ± 1 V max: ± 0.05% ± 2 V
Imon vs. Iout accuracy	typical: ± 2% ± 1 µA max: ± 2% ± 5 µA
Iset vs. Imon accuracy	typical: ± 2% ± 1 µA max: ± 2% ± 5 µA

Code	Description
WV6533MAAAAA	V6533M - 6 Channel VME Programmable High Voltage Power Supply (3 ch -4 kV 3 mA, 3 ch +4 kV 3 mA, 9W)
WV6533XAAAAA	V6533N - 6 Channel VME Programmable High VoltagePower Supply (-4 kV 3 mA 9 W max.)
WV6533XPAAAA	V6533P - 6 Channel VME Programmable High VoltagePower Supply (+4 kV 3 mA 9 W max.)
WA6580XAAAAA	A6580 - DC Power Input Equalizer for V65XX Family
WPERS065XX01	V65XX Customization - Imon Zoom x10

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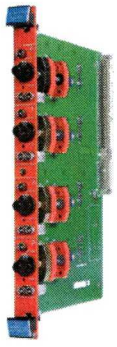
Jobs

V974

4 Channel Variable Gain Fast Amplifier



- Input bandwidth up to 170 MHz
- x10 adjustable gain with x1 steps
- 50 Ohm Input Impedance
- ±2 V output dynamics
- Drives 50 Ohm Loads
- Cascadeable Channels
- Rise/fall time <3 ns with a 25 mV unipolar input amplitude
- I/O delay <3 ns

The Mod. V974 is a 4 channel fast rise time amplifier housed in a 1-unit VME module; each channel features a voltage gain adjustable from 1 to 10 in x1 steps. Channels are non-inverting and bipolar: they amplify both positive and negative signals. Input bandwidth is 170 MHz for signals up to 50 mVpp and decreases for larger ones (up to 100 MHz @ 400 mVpp). Gain setting is performed independently for each channel via four rotary handles. Channels can be cascaded in order to obtain larger gain values. Each channel is provided with three LEMO 00 connectors, one for the input and two bridged for the output. The board features a ±2 V output dynamics. 4 screw-trimmers (one per channel) allow the offset calibration which operates over a ±25 mV range. The features include an output short circuit protection.

Packaging	1U-wide VME unit
Voltage gain	0 ÷ 10
Rise time	< 3 ns(unipolar input, ±25 mV max. amplitude)
Band width	DC to 170 MHz with ±25 mV input signal DC to 100 MHz with ±200 mV input signal
Output dynamic range	±2 V
Max input amplitude	200 mV
Offset nulling range	±25 mV (measured with 0 Ohm termination on input)
Inputs channels	4, DC coupled, 50 Ohm ± 2% impedance
Output channels	4 with Fan-Out of two, drive 50 Ohm load
Noise	< 70 µV RMS (referred to the input)
Interchannel insulation	40 dB
I/O Delay	< 3 ns
Input reflection	< 10%
Offset uniformity	±4 mV (typical) ±12 mV (maximum)
NOTE	Specifications measured with gain = 10

Code	Description
WV974XBAAAAA	V974B - 4 Channel Variable Gain Fast Amplifier (noJAUX)

Company Profile
Our Policy
Research & Development
Innovative Projects
Worldwide Presence
How to Reach Us
Careers

Modular Pulse Processing Electronics
Power Supply
Powered Crates
Educational
Digital Spectroscopy
Signal Generator
Accessories
Firmware/Software

By Function
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