NAICAM

CATALOGUE 2018

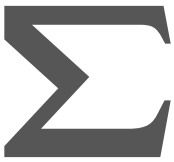
Electronic instrumentation
for subnuclear, nuclear
and astroparticle physics

TABLE OF CONTENTS

PREAMPLIFIERS

low noise technology

Naicam technologies provides front-end electronics to measure the charge, current and voltage from different detectors. We develop charge sensitive preamplifiers, fast amplifiers, SiPM preamplifiers. We can customise frond-end electronics for scientific applications.



CHARGE SENSITIVE PREAMPLIFIERS

FAST AMPLIFIERS

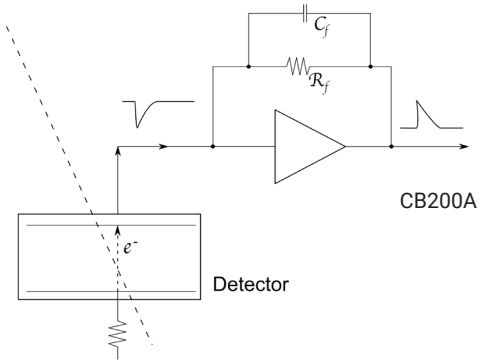
SiPM PREAMPLIFIERS

CUSTOM SOLUTIONS

APPLICATIONS

The function of a preamplifier is to extract the signal from the detector without significantly degrading and receive maximum the signal to noise ratio. Usually the preamplifier is located as close as possible to the detector. The requirement for low noise and stable sensitivity with these detectors is met by using a charge sensitive preamplifier with an FET (Field-Effect Transistor) input stage. The input circuits are designed to match the characteristics of the detector:

- photodiodes;
- photomultiplier tubes (PMT);
- scintillation detectors (different scintillator mounted on a PMT);
- micro channel plate PMTs;
- micro channel plates;
- Si multipliers.



CB200A - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200A is a low noise charge sensitive preamplifier. CB200A series has four fixed gain values. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit. Different number of amplifiers can be housed in different boxes. There are 2 type of boxes (see below).

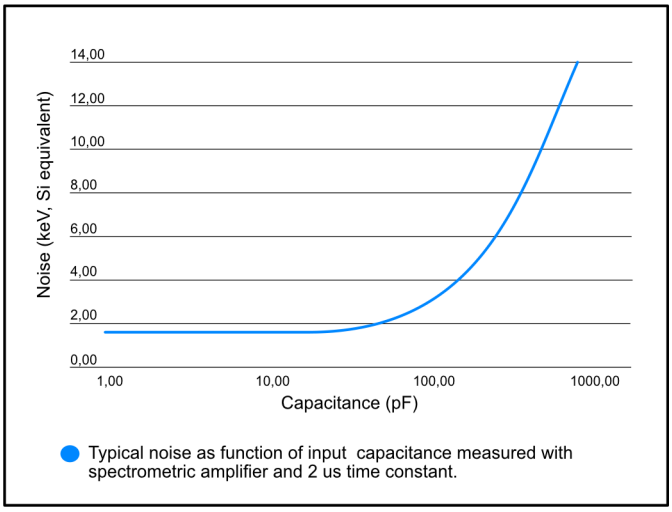
Model	Charge sensitivity (Si Equivalent 3,62)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200A	45 mV/MeV	< 1,5 KeV	0-200 MeV
CB200A2	20 mV/MeV	< 1,5 KeV	0-400 MeV
CB200A3	12 mV/MeV	< 1,9 KeV	0-600 MeV
CB200A7	5,5 mV/MeV	< 1,9 KeV	0-1200 MeV

PERFORMANCE

Decay time	CB200A CB200A2 CB200A3 CB200A7	100 µs 200 µs 165 µs 70 µs
Dynamic input capacitance	Up to 1000 pF	
Noise/input capacitance ratio	CB200A CB200A2 CB200A3 CB200A7	9 e^-/pF 10 e^-/pF 12 e^-/pF 14 e^-/pF
Integral nonlinearity	0,03% (without termination)	
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)	
Temperature stability	± 100 ppm/C	
Rise time	< 12 ns	
Open loop gain	30,000	
HV Bias resistor	26 MegΩ	
Output resistors	100 Ω	
Test Capacitance	3 pF (±3%)	

INPUT/OUTPUT

Input	Accepts positive or negative charge signal. SHV connector standard, BNC connector without bias connection.
Bias	High voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 26 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier or portable power supply.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

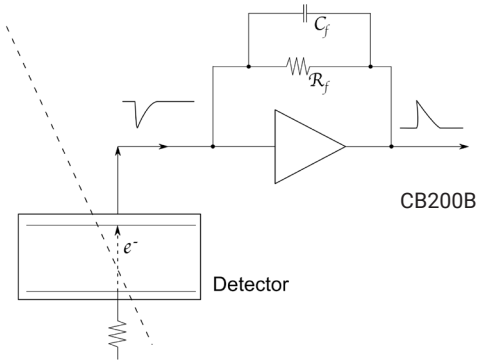
P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

version 1 (one channel)	111x80x40 mm
version 2 (two channels)	111x80x40 mm
version 4 (four channels)	111x80x40 mm
version 8 (eight channels)	160x165x103 mm
weight	0,5 kg
cable length	3 m



CB200B - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200B is a low noise charge sensitive preamplifier. Fast timing and small size make this preamplifier excellent module for small charged particle detectors or laboratory measurements. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.

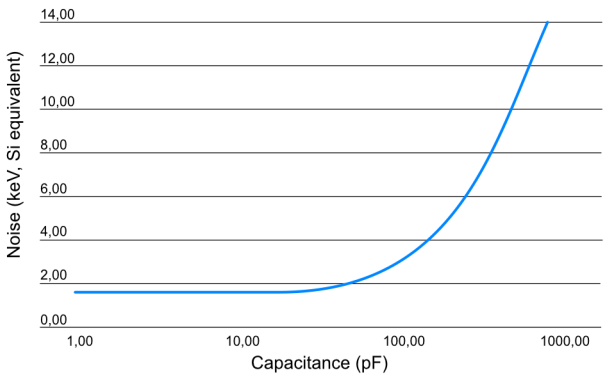
Model	Charge sensitivity (Si Equivalent)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200B	60 mV/MeV	< 1,2 KeV	0-130 MeV

PERFORMANCE

Decay time	150 µs
Dynamic input capacitance	Up to 1000 pF
Noise/Input capacitance ratio	< 9 e^-/pF
Integral nonlinearity	0,1% (without termination)
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)
Temperature stability	± 100 ppm/C
Rise time	< 12 ns
Open loop gain	30,000
HV Bias resistor	50 MegΩ
Output resistors	100 Ω
Test Capacitance	3 pF (±3%)

INPUT/OUTPUT

Input	Accepts positive or negative charge signal.
Bias	Voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 26 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier, NIM crate power supply or portable power supply.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

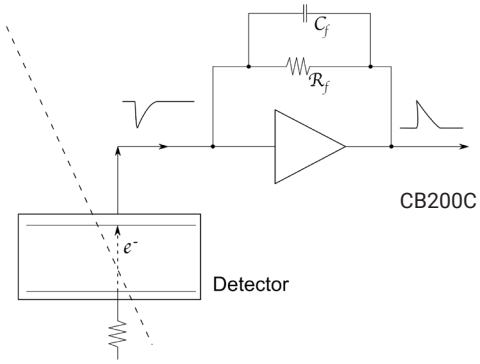
P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB200C - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200C is a low noise charge sensitive preamplifier. Fast timing and small size make this preamplifier excellent module for small charged particle detectors or laboratory measurements. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.

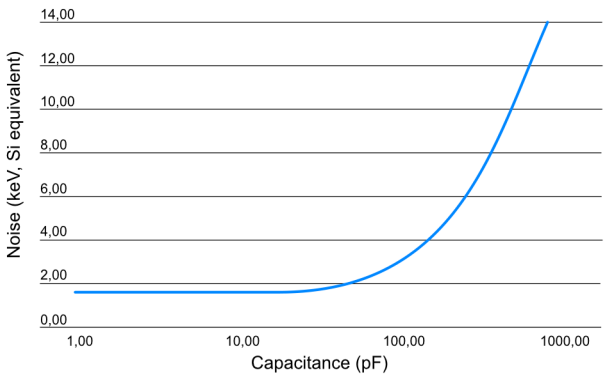
Model	Charge sensitivity (Si Equivalent)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200C	80 mV/MeV	< 1 KeV	0-100 MeV

PERFORMANCE

Decay time	100 µs
Dynamic input capacitance	Up to 1000 pF
Noise/Input capacitance ratio	< 9 e^-/pF
Integral nonlinearity	0,1% (without termination)
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)
Temperature stability	± 100 ppm/C
Rise time	< 10 ns
Open loop gain	30,000
HV Bias resistor	≤ 50 MegΩ
Output resistors	100 Ω
Test Capacitance	3 pF (±3%)

INPUT/OUTPUT

Input	Accepts positive or negative charge signal.
Bias	Voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 26 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier or portable power supply.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

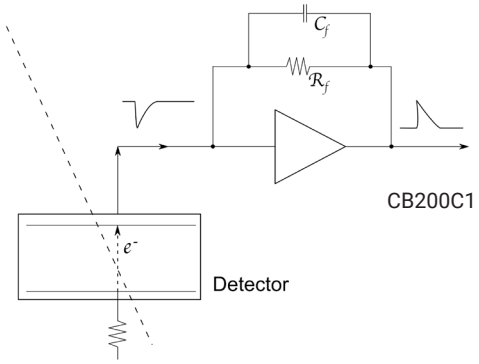
P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB200C1 - 1 CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200C1 is low noise charge sensitive preamplifier. CB200C1 series has adjustable gain values. The preamplifier is optimized for high input capacitance (up to 1000pF).
The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.
C200C1 module has only ±12 Volt power supply voltage.

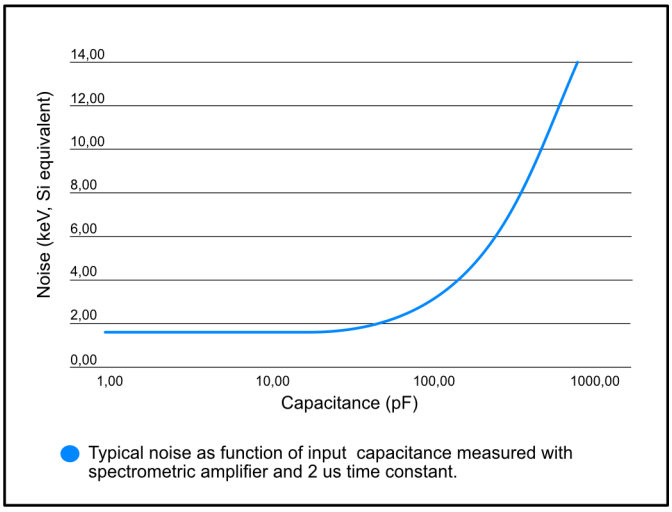
Model	Charge sensitivity (Si Equivalent)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200C1	20-100 mV/MeV	< 1,5 KeV	0-200 MeV

PERFORMANCE

Decay time	100 µs
Dynamic input capacitance	Up to 1000 pF
Noise/Input capacitance ratio	9 e^-/pF
Integral nonlinearity	0,03% (without termination)
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)
Temperature stability	± 100 ppm/C
Rise time	< 20 ns
Open loop gain	30,000
HV Bias resistor	26 MegΩ
Output resistors	100 Ω
Test Capacitance	3 pF (±3%)

INPUT/OUTPUT

Input	Accepts positive or negative charge signal.
Bias	High voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 50 MegΩ.
Test	Pulse input connector is LEMO type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier or portable power supply.
Energy	LEMO type connector



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

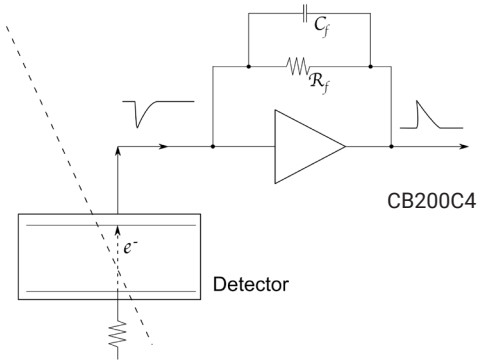
P. Voltage (V)	Current/ch (mA)
+12	24,0
-12	20,0

Power supply pin out:

Pin number	
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB200C4 - 4 CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200C4 is low noise charge sensitive preamplifier. CB200C4 series has four fixed gain values. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.
In module C200C4 are housed four PCB boards of CB200 preamplifier that has only ±12 Volt power supply voltage.

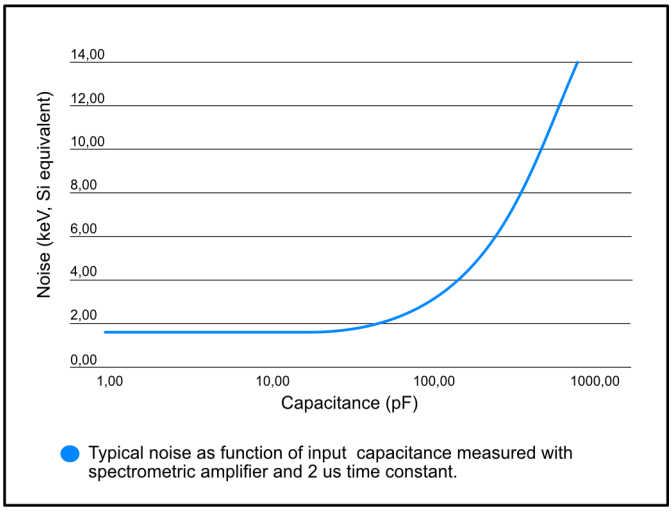
Model	Charge sensitivity (Si Equivalent 3,62)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200C	45 mV/MeV	< 1,5 KeV	0-200 MeV
CB200C2	20 mV/MeV	< 1,5 KeV	0-400 MeV
CB200C3	12 mV/MeV	< 1,9 KeV	0-600 MeV
CB200C7	5,5 mV/MeV	< 1,9 KeV	0-1200 MeV

PERFORMANCE

Decay time	CB200C CB200C2 CB200C3 CB200C7	100 µs 200 µs 165 µs 350 µs
Dynamic input capacitance	Up to 1000 pF	
Noise/Input capacitance ratio	CB200C CB200C2 CB200C3 CB200C7	9 e^-/pF 10 e^-/pF 12 e^-/pF 14 e^-/pF
Integral nonlinearity	0,03% (without termination)	
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)	
Temperature stability	± 100 ppm/C	
Rise time	< 20 ns	
Open loop gain	30,000	
HV Bias resistor	26 MegΩ	
Output resistors	100 Ω	
Test Capacitance	3 pF (± 3%)	

INPUT/OUTPUT

Input	Accepts positive or negative charge signal.
Bias	High voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 26 MegΩ.
Test	Pulse input connector is LEMO type connector.Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier or portable power supply.
Energy	Output negative or positive linear pulse. LEMO type connector



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

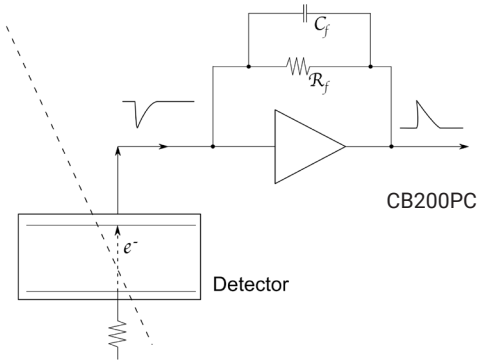
P. Voltage (V)	Current/ch (mA)
+12	90,0
-12	70,0

Power supply pin out:

Pin number	
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,78 kg
cable length	3 m



CB200PC - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200PC is a low noise charge sensitive preamplifier with very high gain 6 V/pC. Fast timing and small size make this preamplifier excellent for charged particle detectors or laboratory measurements.
The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.

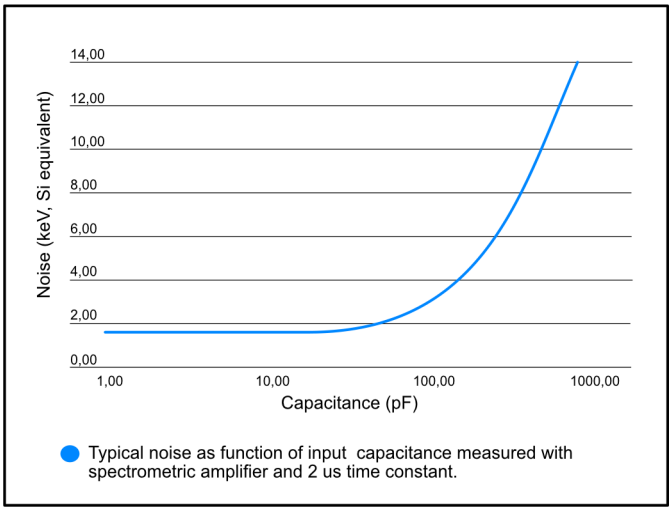
Model	Charge sensitivity (Si Equivalent)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200PC	160 mV/MeV	< 0,6 KeV	0-50 MeV

PERFORMANCE

Decay time	100 µs
Dynamic input capacitance	Up to 1000 pF
Noise/Input capacitance ratio	< 8 e^-/pF
Integral nonlinearity	0,1% (without termination)
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)
Temperature stability	± 100 ppm/C
Rise time	< 7 ns
Open loop gain	30,000
HV Bias resistor	50 MegΩ
Output resistors	100 Ω
Test Capacitance	3 pF (±3%)

INPUT/OUTPUT

Input	Accepts positive or negative charge signal.
Bias	Voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 50 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier, NIM crate power supply or portable power supply.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

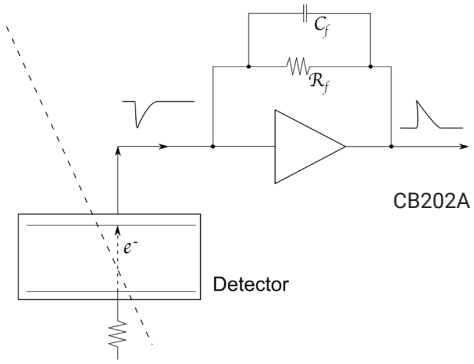
P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB202A - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB202A is fast charge sensitive preamplifier specially studied from gas based detectors. The rise time is less 7 ns with 50 Ω termination. The module has bias input SHV connector (up to 3 KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit. The module has only ± 12 Volt alimentation.

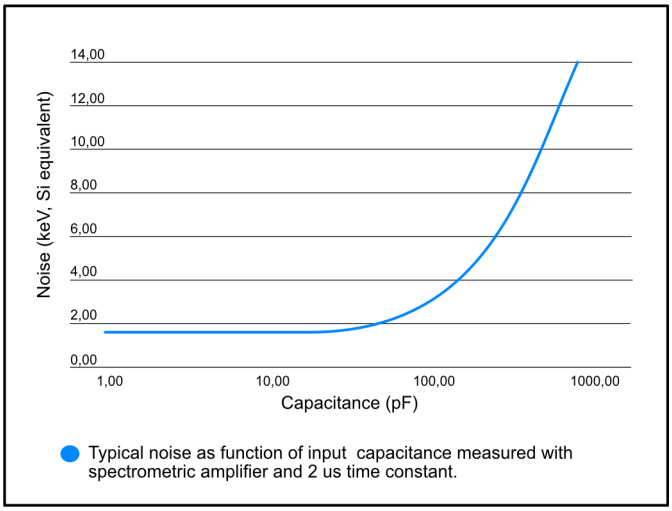
Model	Charge sensitivity	Max. Noise	Energy range
CB202A	150 mV/pC	200 e^-	N/S

PERFORMANCE

Decay time	50 µs
Dynamic input capacitance	N/S
Noise/Input capacitance ratio	< 4 e^-/pF
Integral nonlinearity	0,1% (without termination)
Dynamic output range	± 6 V (without termination) ± 3 V (with 50 Ω termination)
Temperature stability	± 100 ppm/C
Rise time	< 7 ns
Open loop gain	30,000
HV Bias resistor	50 MegΩ
Output resistors	50 Ω
Test Capacitance	3 pF (±3%)

INPUT/OUTPUT

Input	Accepts positive or negative charge signal. BNC pin connector or SHV connector to specify in the order.
Bias	Voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 50 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

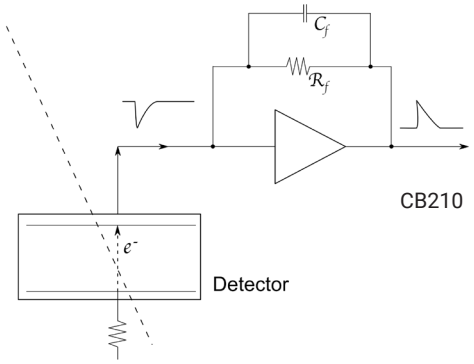
P. Voltage (V)	Current/ch (mA)
+12	30,0
-12	24,6

Power supply pin out:

Pin number	
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB210 - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB210 is a low noise charge sensitive preamplifier designed for PMTs. Low gain 10, 20, 30 mV/pC and Z=50 Ω impedance make it an excellent module for PMTs. The preamplifier is optimized for high input capacitance (up to 5000pF) and impedance of dividers. The module has protection circuit to avoid breakdown of the input of the preamplifier circuit.

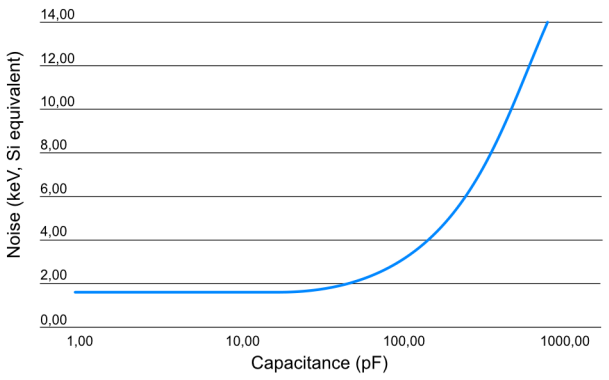
Model	Charge sensitivity (Si Equivalent 3,62)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB210	0,6 mV/MeV (10mV/pC)	< 1,45 KeV	0-11600 MeV
CB210A	1,2 mV/MeV (20mV/pC)	< 1,45 KeV	0-5800 MeV
CB210B	1,8 mV/MeV (30mV/pC)	< 1,45 KeV	0-3860 MeV

PERFORMANCE

Decay time	CB210 CB210A CB210B	100 µs 50 µs 30 µs
Dynamic input capacitance	Up to 5000 pF	
Noise/Input capacitance ratio	< 5 e^-/pF	
Integral nonlinearity	0,1% (without termination)	
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)	
Temperature stability	± 100 ppm/C	
Rise time	< 7 ns	
Open loop gain	30,000	
HV Bias resistor	max 500 VDC	
Output resistors	100 Ω	
Test Capacitance	3 pF (±3%)	

INPUT/OUTPUT

Input	BNC connector, accepts positive or negative charge signal.
Bias	Voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is optional value. Default is BNC connector.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier, NIM crate power supply or portable power supply.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

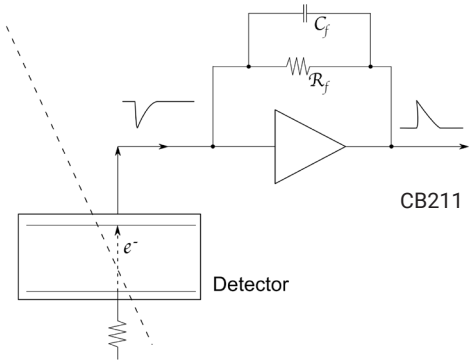
P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB211 - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB211 is a low noise charge sensitive preamplifier designed for PMTs. Low gain 166mV/pC and Z=50 Ω impedance make it an excellent module for PMTs. The preamplifier is optimized for high input capacitance (up to 1000pF) and impedance of dividers. The module has bias input (up to 3 KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.

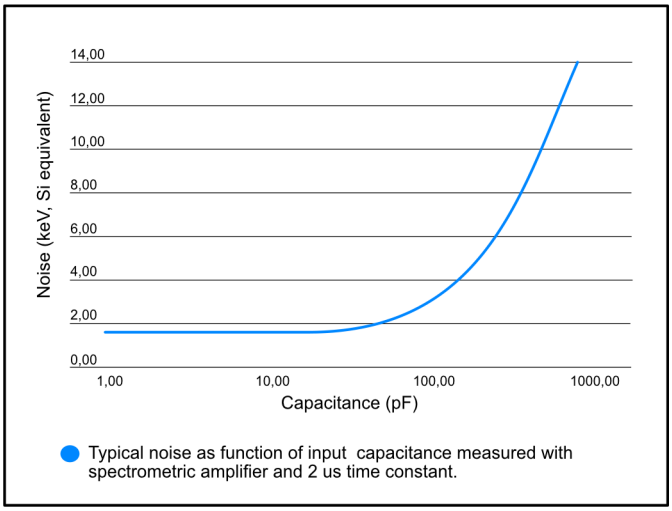
Model	Charge sensitivity (Si Equivalent)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB211	10 mV/MeV	< 1,45 KeV	0-700 MeV

PERFORMANCE

Decay time	1000 µs
Dynamic input capacitance	Up to 1000 pF
Noise/Input capacitance ratio	< 9 e^-/pF
Integral nonlinearity	0,03% (without termination)
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)
Temperature stability	± 100 ppm/C
Rise time	7 ns (up to 100 pF detector capacitance)
Open loop gain	50,000
HV Bias resistor	50 MegΩ
Output resistors	100 Ω
Test Capacitance	3 pF (±3%)

INPUT/OUTPUT

Input	Accepts positive or negative charge signal. DC Input resistance is 100KΩ BNC connector.
Bias	Voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is optional value. Default value 50 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier, NIM crate power supply or portable power supply.
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

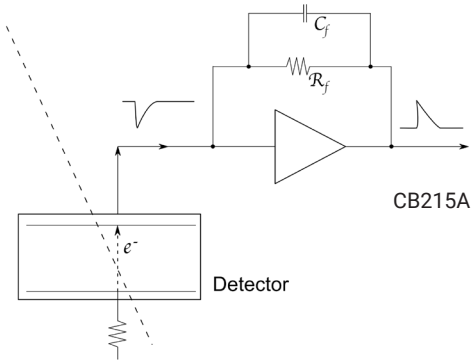
Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	3 m

- Option version:
  power voltage ±12 Volt



CB215A - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB215A is a low noise charge sensitive preamplifier. CB215A series has four fixed gain values. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 5KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit.

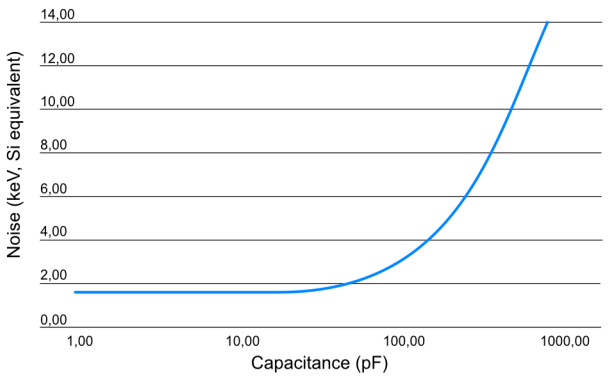
Model	Charge sensitivity (Si Equivalent)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB215A	40 mV/MeV	< 1,5 KeV	0-266 MeV
CB215A2	20 mV/MeV	< 1,5 KeV	0-532 MeV
CB215A3	12 mV/MeV	< 1,9 KeV	0-800 MeV
CB215A7	5,5 mV/MeV	< 1,9 KeV	0-1600 MeV

PERFORMANCE

Decay time	CB215A CB215A2 CB215A3 CB215A7	100 µs 200 µs 165 µs 350 µs
Dynamic input capacitance	Up to 1000 pF	
Noise/Input capacitance ratio	CB215A CB215A2 CB215A3 CB215A7	9 e^-/pF 10 e^-/pF 12 e^-/pF 14 e^-/pF
Integral nonlinearity	0,1% (without termination)	
Dynamic output range	± 10 V (without termination) ± 5 V (with 100 Ω termination)	
Temperature stability	± 100 ppm/C	
Rise time	< 12 ns	
Open loop gain	40,000	
HV Bias resistor	Up to 5 kV/ default value 3 kV through 26 MegΩ	
Output resistors	N/S	
Test Capacitance	3 pF (±3%)	

INPUT/OUTPUT

Input	Accepts positive or negative charge signal.
Bias	High voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 26 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Timing output	Unipolar inverted signal, 50 Ω termination, LEMO connector
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies. Input power through 3m screened cable from amplifier or portable power supply.

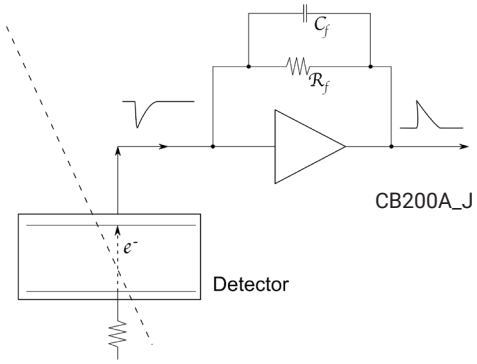
P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	20,0
-12	20,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

version 1 (one channel)	111x80x40 mm
weight	0,5 kg
cable length	3 m



CB200A_J - CHARGE SENSITIVE PREAMPLIFIER

The preamplifier CB200A_J is a low noise charge sensitive preamplifier. CB200A series has fixed gain values and can be changed by jumpers inside the box. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3 or 5KV, specified in order) and protection circuit to avoid breakdown of the input of the preamplifier circuit.
Different number of amplifier can be housed in different boxes. There are 2 type of boxes (see below).

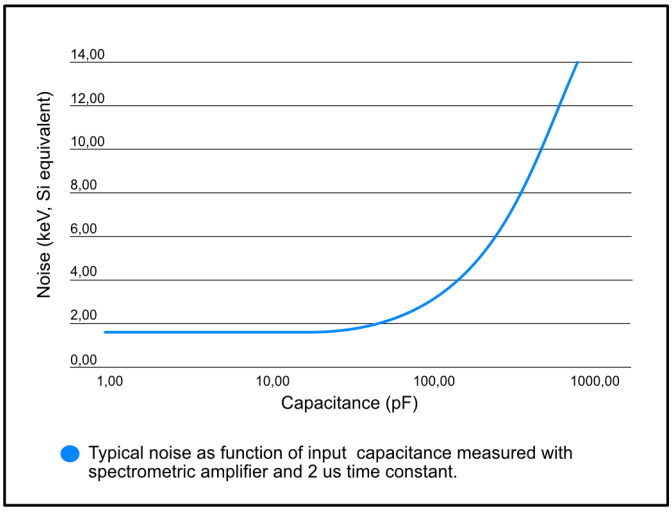
Model	Charge sensitivity (Si Equivalent 3,62)	Max. Noise (KeV/(Si)) (Cin=0pF)	Energy range
CB200A_J_1_2	60 or 45 mV/MeV	< 1,5 KeV	125-166 MeV
CB200A_J_3_4	30 or 15 mV/MeV	< 1,5 KeV	250-500 MeV
CB200A_J_5_6	10 or 5 mV/MeV	< 1,9 KeV	750-1500 MeV

PERFORMANCE

Decay time	CB200A_J_1_2 CB200A_J_3_4 CB200A_J_5_6	75/100 µs 75/150 µs 75/150 µs
Dynamic input capacitance	Up to 1000 pF	
Noise/Input capacitance ratio	CB200A_J_1_2 CB200A_J_3_4 CB200A_J_5_6	9 e^-/pF 10 e^-/pF 12 e^-/pF
Integral nonlinearity	0,03% (without termination)	
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)	
Temperature stability	± 100 ppm/C	
Rise time	< 12 ns	
Open loop gain	30,000	
HV Bias resistor	26 MegΩ	
Output resistors	100 Ω	
Test Capacitance	3 pF (±3%)	

INPUT/OUTPUT

Input	Accepts positive or negative charge signal. SHV connector standard or BNC connector if module has not bias connection.
Bias	High voltage can be applied through SHV input connector. The serial resistance between input and bias connectors is 26 MegΩ. Optional if any bias used.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through 3m screened cable from spectrometric amplifier or portable power supply
Energy	Output negative or positive linear pulse. BNC connector.



Typical noise as function of input capacitance measured with spectrometric amplifier and 2 us time constant.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

P. Voltage (V)	Current/ch (mA)
+24	19,6
-24	10,0
+12	10,0
-12	11,6

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

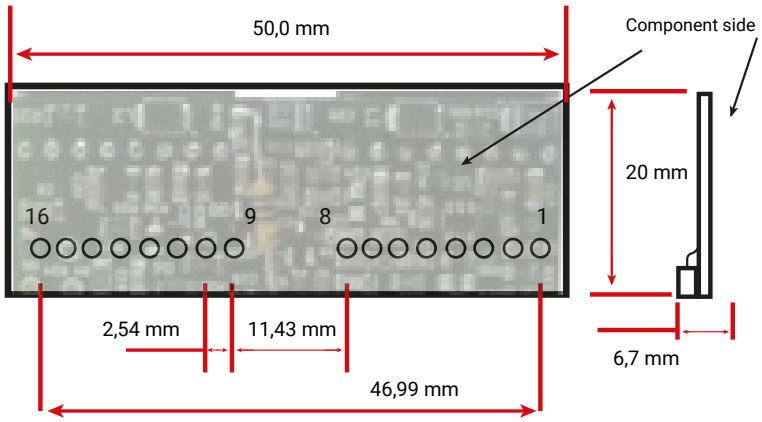
BOX DIMENSIONS

version 1 (one channel)	111x80x40 mm
version 2 (two channels)	111x80x40 mm
version 4 (four channels)	160x165x51 mm
version 8 (eight channels)	160x165x51 mm
weight	0,5 kg
cable length	3 m

PAF100 SERIES - LOW POWER PREAMPLIFIER DESIGNED FOR SiPM

The amplifier PAF100 is a low noise preamplifier for positive input signals. Preamplifier has 50 Ω input impedance. The output-amplified signal can be terminated by 50 Ω. The preamplifier is optimized specially for SiPM detectors (but can also be used for standard PMT) and on the board there are pins to connect bias voltage (through a 10KΩ resistor). Maximum applied bias voltage is 200Volt(theboarddimensionsare50x20mm)and can be supplied with male or female connectors.

The preamplifier has two circuits: fast preamplifier and shaper/driver.
The shaper/driver permit change a shaping time of signal to adapt timing of amplified signal to sampling rate of ADC. The preamplifier was tested with HAMAMATSU MPPC S10931-050P type detector.



1 - Cathode;
3 - Anode;
14 - Output;

5 - VSS;
10 - VDD;
2,4,8,9,13,16 - Ground

PERFORMANCE

Input impedance	50 Ω
Input dynamic range	Accepts positive signal
Output signal	Negative polarity
Rise time	3,5 ns (fixed gain equal 10)
Gain	10, 20, 30, 50 (custom gain solution from 10 up to 100)
Dynamic output range	2 V
Output termination	50 Ω
Gain temperature coefficient	0,03%/C
Input equivalent Noise	8 µV RMS
Shaping time	5-40 ns
Maximum Bias Value	250 VDC

ORDER INFORMATION

BOX Version PAF1XXCXX.

The PCB boards can be housed in NAICAM standard cases (up to 4 channels) or in a bigger box 160x165x51mm (up to 16 channels). Custom solutions can be designed up to 16 channels.

PAF	Name of model
1	Series
XX	Fixed gain
C	**B** - PCB board (socket pins) **D** - SIL version (male pins) **C** - box version 111x80x40 mm **A** - Alum. box 165x160x52mm
XX	Number of channel in box case

Example: PAF120DXX - single board preamplifier with fixed gain 20 and male connectors.

PAF110C04 - 4 preamplifiers in one box with fixed gain 10.

POWER SUPPLY REQUIREMENTS

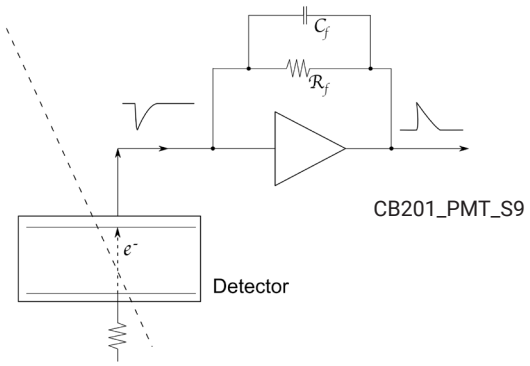
Min. Voltage	-8,5 V	+5,2 V
Nom. Voltage	-9 V	+5,3 V
Max. Voltage	-12 V	+6 V
Nom. Current	13,1 mA	5,8 mA

Power supply pin out:

Pin number	
3	+6 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	5,8 g
cable length	3 m



CB201_PMT_S9 - VOLTAGE SENSITIVE AMPLIFIER

The module CB201_PMT_S9 is a low noise voltage sensitive amplifier. The module has 9 inputs and 2 outputs. The sum circuit sum all input signals without amplification (voltage gain is equal 1).

PERFORMANCE

Offset	< 2 mV
Integral nonlinearity	0,1% (without termination)
Dynamic output range	± 10 V (without termination) ± 5 V (with 50 Ω termination)
Temperature stability	± 100 ppm/C
Rise/fall time	50 ns
Output resistors	2 Ω

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

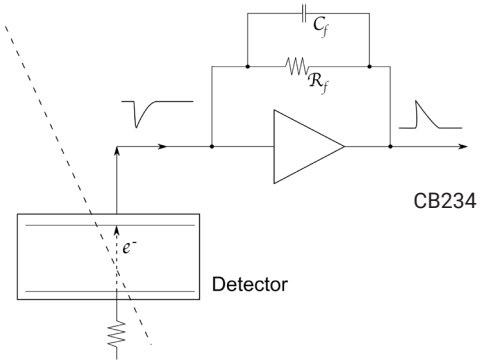
P. Voltage (V)	Current/ch (mA)
+12	24
-12	24

Power supply pin out:

Pin number	
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	111x80x40 mm
weight	0,5 kg
cable length	2,5 m



CB234 - PREAMPLIFIER/DISCRIMINATOR

The CB234 is a preamplifier/discriminator module. It specially has been designed for processing fast high count rate output pulses from electron multipliers. The dead time is selectable in six steps to allow for a precise dead time correction. The threshold can be set from 3 up 255 counts. The module is housed in small RF-shielded case. Optional version with ±12 Volt alimentation increase input signal protection range.

PERFORMANCE

Working input range	3 - 250 mV
Safe operating without damage	± 5 V (optional version ±12 V)
Threshold, adjustable in 256 counts	3 - 250 mV
Pulse width (FWHM)	5 - 30 ns (About 0,5xdead time)
Count rate	up to 2 x 10e6
Accuracy	5%
Dead time switch selectable	10-20-30-40-50-60 ns
Output NIM stardard (optional version)	-0,7 V (14 mA)
Output amplitude (open circuit)	4 V
Output amplitude (50 Ω termination)	1,5 V
Temperature stability (full range)	1%
Temperature range	0-50C

INPUT/OUTPUT

Input	LEMO style connector (optional version BNC style). Input impedance DC coupled 50 Ω.
Output	LEMO style connector (optional version BNC style).

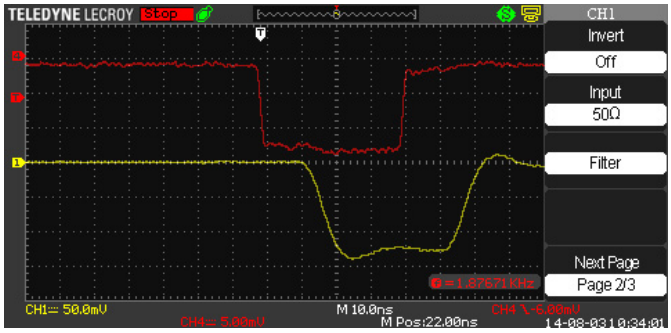


Fig.1 - Test signal of input preamplifier CB234 before discriminator 12 mV input signal.

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies like DCB101.

P. Voltage (V)	Current/ch (mA)
+6	38.5 (26 mA for optional version)
-6	38,5 (26 mA for optional version)
+12	12,5 (optional version)
-12	12,5 (optional version)

Power supply pin out:

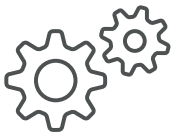
Pin number	
7	NC
6	NC
4	+12 V
9	-12 V
1	Ground
2	Ground
3	+6 V
5	-6 V
8	NC

BOX DIMENSIONS

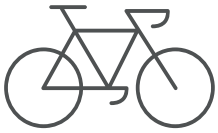
box dimensions	111x80x40 mm
weight	0,4 kg
cable length	3m

NIM STANDARD

Naicam develops NIM Modular electronic instruments and crates with associated power supply.



NIM MODULES



NIM CRATES

NIM POWER SUPPLY

APPLICATIONS

The standard established for nuclear and high energy physics is a modular system called NIM (Nuclear Instrument Module). In this system, the basic electronic apparatus, like amplifiers, discriminators, etc. are constructed in the form of standard modules according to standard mechanical and electrical specifications. These modules, housed in standardized BINs which supply the modules with standard power voltages. Any NIM module will fit into any NIM bin.
The NIM system offers enormous advantages in flexibility, interchange of instruments, reduced design effort, ease in updating instruments, reduced costs and more efficient use of instruments. For this reason, the NIM system is now adopted worldwide by research laboratories and commercial enterprises.

NCB9 - CONNECTOR ADAPTER

The NCB9 adapter has two connectors: NIM module connector and SUB D9 connector. This adapter used to connect CB200 preamplifiers directly to NIM BIN without spectrometric module.

NIM CONNECTOR PIN OUT

PIN	FUNCTION	PIN	FUNCTION
1	+3 V	23	Reserved
2	-3 V	24	Reserved
3	Spare bus	25	Reserved
4	Reserved bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	28	+24 V
7	Coaxial	29	-24 V
8	200 V DC	30	Spare bus
9	Spare	31	Spare
10	+6 V	32	Spare
11	-6 V	33	117 V AC
12	Reserved bus	34	Power return ground
13	Spare	35	Reset (Scaler)
14	Spare	36	Gate
15	Reserved	37	Reset (Auxiliary)
16	+12 V	38	Coaxial
17	-12 V	39	Coaxial
18	Spare bus	40	Coaxial
19	Reserved bus	41	117 V ACc (neutral)
20	Spare	42	High-quality ground
21	Spare	G	Ground guide pin
22	Reserved		

CONNECTOR PIN OUT

SUB D9 female connector pin out.

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground
3	+6 V
5	-6 V
8	NC

BOX DIMENSIONS

box dimensions	70x70x21 mm
weight	0,1 kg

NCB10 - NIM MODULE

The NIM module NCB10 is a 4-channel NIM power distribution and control module. All voltage outputs (±6 Volt, ±12 Volt and ±24 Volt) are protected by electronic fuses which automatically recover after short circuit. The status is displayed by LEDs. On the front panel housed connectors to check the correct voltage levels of a NIM power supply. Fuse release: when current drops to less than half the maximum current, the fuse recovers.

VOLTAGE OUTPUT AND CURRENT LIMITS

For each of the 4 output connectors
- ±6 Volt, max 1A
- ±12 Volt, max 0,4A
- ±24 Volt, max 0.25A

DISPLAY

6 green LEDs show the status BIN voltages.
4 green/red LEDs show status output voltage.

POWER CONSUMPTION

±12 Volt less than 50mA

CONNECTOR PIN OUT

SUB D9 female connector pin out.

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground
3	+6 V
5	-6 V
8	NC

DIMENSIONS

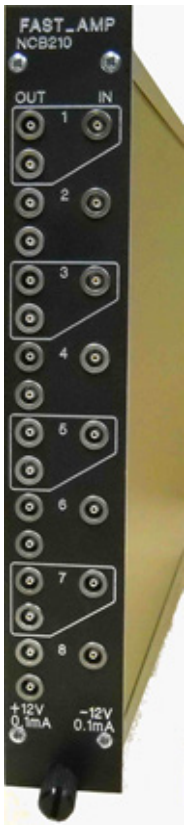
dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,8 kg

NCB210 - FAST AMPLIFIER FOR PMT

The NIM module NCB210 has 8 channels voltage sensitive amplifiers. The module has fixed gain equal 10 (it can be changed for different application from 1 to 10). Fast timing and low noise of amplifiers makes this module an excellent instrument for particle detectors or laboratory measurements. Each channel has two outputs that can be terminated to 50 Ω.

PERFORMANCE

Input	50Ω
Rise/fall time	Small signal < 4,5 ns Large signal < 10 ns
Input noise RMS	< 40μV
Integral nonlinearity	0,1 %
Dynamic output range	±2V (with 50 Ω termination)
Temperature stability	±100 ppm/C
Fixed gain	10
Output resistors	< 2 Ω



POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	100
-12	100

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,90 kg

NCB211 - 2 CHANNELS NIM FAN OUT 1-8

The NIM module NCB211 has 2 independent channels NIM FAN OUT 1 to 8 signals. Each channel has two output LEMO connectors that can be terminated to 50 Ω.

PERFORMANCE

Input	50Ω
Output	16mA negative NIM pulse
Rise/fall time	< 2 ns
Input/output delay	< 6 ns
Input frequency	130 MHz

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
-6	400

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1 kg

NCB211A - 4 CHANNELS NIM FAN OUT 1-4

The NIM module NCB211A has 4 independent channels NIM FAN OUT. Each channel has two outputs LEMO connector that can be terminated to 50 Ω. Each channel can be 8 fan-out or 12 fan-out. The module state explained in the chart.

SWITCH	LED1	LED2	STATE
OFF	OFF	OFF	4 independent
ON1	ON	OFF	8 fan out
ON2	OFF	ON	12 fan out

PERFORMANCE

Input	50Ω
Output	16 mA negative NIM pulse
Rise/fall time	< 2ns
Input/output delay	<7 ns
Input frequency	130 MHz

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
-6	600

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1 kg

NCB212F - NIM-ECL, ECL-NIM CONVERTER

The one unit wide NIM module NCB212F has 16 channels NIM to ECL and ECL to NIM converter. Fast timing makes this module an excellent instrument for particle detectors or laboratory measurements.

PERFORMANCE

NIM input **ECL input**	50Ω 110Ω
Rise/fall time	ECL < 0,7 ns NIM signal < 1,3 ns
Min. input pulse width	2 ns (NIM-ECL) 2 ns (ECL-NIM)
Input-Output delay	2 ns (NIM-ECL) 1,5 ns(ECL-NIM)
Dynamic output range	ECL - 800 mV NIM - standard NIM signal
Max. operating frequency	300 MHz (NIM input) 200 MHz (ECL input) 200 MHz (COOM input optional)

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
-6	1,2

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,8 kg

NCB213 - UNIVERSAL COINCIDENCE

The module NCB213 is a universal coincidence unit with 5 inputs. Each input is accepted through a front-panel connector. Input accepts an input signal and regenerates an internal signal that will be used for coincidence comparisons. The input A signal width is adjustable for a resolving time of 200 ns to 3 µs from a front-panel.
The function of each input is selectable, and can be used for coincidence or anticoincidence. This permits compose different combinations of input signal relations.

PERFORMANCE

Input a resolving time	200 ns to 3 µs; controlled by a front-panel, 10-turn, screwdriver adjustable potentiometer; inputs B, C, D and E controlled by input pulse width.
Input controls	Five 3-position toggle switches select Coincidence, Anticoincidence, or OFF (disabled)
Input polarity	Internal switch able input
Positive pulse **Negative pulse (default set NIM standard input)**	+2 V min, 12 V maximum. NIM standard signal.
Input pulse width **Output pulse width**	50 ns to DC 200 ns
Input connectors **Output connectors**	BNC BNC
Input impendance **Output impendance**	>1,5 k Ω, dc-coupled for positive polarity signal; 50 Ω for negative polarity. <8 Ω, dc-coupled
Positive output	+5 V
Negative output	-5 V (optional solution NIM standard signal)
Coincidence	Selects number of inputs necessary to satisfy a coincidence requirement (majority logic)
Temperature instability	Input change in resolving time, τ ±0,1%/°C.
Operating temperature	0 - 50°C

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	84
-12	68
+6	106
-6	690

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	Net 0,8 kg

NCB214 - FAST COINCIDENCE MODULE

The one unit wide NIM module NCB214 has 2 channels fast coincidence circuit. Each channel has 4 selectable inputs, VETO input, positive and negative outputs.
Each channel can work in OR function or AND function. The function by switch on front panel is selected. Output pulse width is regulated by trimmer on front panel in ranges from 20 ns up to 3µs.

PERFORMANCE

Input	NIM signal, 50 Ω impedance, minimum pulse width 4 ns
Output	NIM signal, pulse width from 20 ns to 3 µs
Logic unit delay	Double pulse resolution: 5 ns; Minimum coincidence overlap: 4 ns
VETO	NIM signal, 50 Ω impedance, minimum pulse width 10 ns

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	50
-6	780

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,75 kg

NCB215 - SPECTROMETRIC AMPLIFIER

The NIM module NCB215 is a general-purpose spectrometric amplifier for energy spectroscopy with all types of detectors. The module has unipolar output, low noise, wide-gain range and front-panel selectable time constant.
The Module NCB215 has active filter networks of circuit that generate a very symmetrical unipolar output with optimal signal-to-noise ratio over a wide range of time constants.
The module NCB215 has a good output DC stability.

PERFORMANCE

Gain range	Continuously adjustable 10 - 1500 range
Pulse shape	Semi-Gaussian on all ranges
Integral nonlinearity	<±0,05%
Noise	<8 µV (measured with 3 us shaping time)
Temperature instability	Gain ≤±0,01%/°C, 0 to 50°C DC Level ≤±50 µV/C, 0 to 50°C
Spectrum broadening	Typically <20% FWHM
Spectrum shift	Peak position shifts typically <0,03%

FRONT PANEL CONTROLS

Fine Gain	10-turn precision potentiometer variable gain factor of x0,5 to x1,5
Coarse Gain	6-position switch selects feedback resistors for gain factors of 20, 50, 100, 200, 500, and 1k.
Input polarity	Locking toggle switch selects either POS or NEG input pulse polarity
Shaping time	6-position switch selects time constants from 0.5, 1, 2, 3, 6 and 10 µs.
Pole zero ADJ (PLR)	Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25 µs to ∞

INPUT/OUTPUT

Input	Front-panel BNC connector accepts positive or negative pulses with rise times of 15 to 1000 ns and decay times of 30 µs to ∞, Zin 1 KΩ DC-coupled; maximum ± 10V; absolute maximum ±12V.
Outputs	UNIPOLAR Front-panel BNC connector with Zo= 100Ω, short-circuit proof; prompt with full scale linear range of 0 to +10V (without termination); active filter shaped; DC-restored; DC-level adjustable to ±20 mV.
Outputs Zero ADJ (Vos)	Front-panel screwdriver adjustment to compensate output offset in range ±20mV. Adjustment is regulated automatic base line restorer threshold (BLZ)
Preamp power	Rear-panel standard D9 power connector

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	90
-12	90

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1 kg

NCB215P - SPECTROMETRIC AMPLIFIER

The NIM module NCB215P is a precise spectrometric amplifier for energy spetroscopy with all types of detectors. The module has unipolar output, low noise, wide-gain range and front-panel selectable time constant.
The Module NCB215P has active filter networks of circuit that generate a very symmetrical unipolar output with optimal signal-to-noise ratio over a wide range of time constants. The module NCB215P has a good DC output stability. The Gain is adjustable from 10 to 3000 using a front-panel screwdriver potentiometer (FG) and Gain Switch (GAIN). The output full scale linear range of 0 to +10 Volt (without termination). BLZ front-panel potentiometer used to adjust pole-zero cancellation for decay time constants from 25 µs to ∞. There is additional screwdriver potentiometer on the front panel output offset regulator.

PERFORMANCE

Gain range	Continuously adjustable from 10 to 3000
Pulse shape	Semi-Gaussian on all ranges
Integral nonlinearity	<±0,025%
Noise	< 8µV (measured with 3 us shaping time)
Temperature instability	Gain ≤±0,01%/°C (0 to 50°C) DC Level ≤±30 µV/C (0 to 50°C)
Spectrum broadening	Typically <16% FWHM
Spectrum shift	Peak position shifts typically <0,03%

FRONT PANEL CONTROLS

Fine Gain	10-turn precision potentiometer variable gain factor of x0,5 to x3
Coarse Gain	6-position switch selects feedback resistors for gain factors of 20, 50, 100, 200, 500, and 1k.
Input polarity	Locking toggle switch selects either POS or NEG input pulse polarity
Shaping time	6-position switch selects time constants from 0.5, 1, 2, 3, 6 and 10 µs
Pole zero ADJ (PLR)	Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25 µs to ∞

INPUT/OUTPUT

Input	Front-panel BNC connector accepts positive or negative pulses with rise time of 15 to 1000 ns and decay time of 30 µs to ∞, Zin 1 KΩ dc-coupled; maximum ± 10V; absolute maximum ±12V.
Outputs	UNIPOLAR Front-panel BNC connector with Zo= 100Ω, short-circuit proof; prompt with full scale linear range of 0 to +10V (without termination); active filter shaped; DC-restored; DC-level adjustable to ±20 mV.
Outputs Zero ADJ (Vos)	Front-panel screwdriver adjustment to compensate output offset in range ±20mV. Adjustment is regulated automatic base line restorer threshold (BLZ)
Preamp power	Rear-panel standard D9 power connector

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	90
-12	90

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1 kg

NCB216 - FAST ANALOGUE FAN OUT

The NIM module NCB216 has 8 channels FAN OUT voltage amplifiers. The module has one input and two outputs. The module has gain equal 1(Can be changed by internal trimmer from 1 to 10). Fast timing and low noise of amplifiers makes this module an excellent instrument for particle detectors or laboratory measurements. Each channel has two outputs that can be terminated to 50Ω.

PERFORMANCE

Input	50Ω
Rise/fall time	Small signal is < 5ns Large signal is < 15 ns
Noise RMS	< 300µV
Integral nonlinearity	0,1%
Dynamic output range	±3 V (with 50 Ω termination)
Temperature stability	±100 ppm/C
Fixed gain	1
Output resistors	< 2 Ω

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	120
-12	120

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1 kg

NCB217 - NIM-TTL, TTL-NIM CONVERTER

The NIM One unit wide NIM module NCB217 has 8 channels NIM-TTL and 8 channels TTL-NIM converter. Fast timing makes this module an excellent instrument for particle detectors or laboratory measurements.

PERFORMANCE

Input	50Ω
Rise/fall time	TTL < 2,5ns NIM signal < 2ns
Min. input pulse width	5ns (NIM-TTL) 5ns (TTL-NIM)
Input-output delay	7ns (NIM-TTL) 8ns (TTL-NIM)
Dynamic output range	TTL -5 V NIM –standard NIM signal
Max. operating frequency	60 MHz (NIM-TTL) 60 MHz (TTL-NIM)

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	160
-6	490

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,76 kg

NCB218 - DUAL TIMER

The NIM module NCB218 consists of two channel triggered pulse generator. Output and input signals are NIM pulses with adjustable width from 50 ns to 10 s. The module has START, VETO, RESET inputs and OUT, OUT*, END_MARKER outputs.

PERFORMANCE

Input	50Ω
Rise/fall time	< 2ns
Input/output delay	< 13ns
Dead Time	Shorter than cycle time
Led time	< 0,1 s
END_MARKER width	15 ns
Output pulse width	From 50 ns to 10 s, adjustable by 10 step switch and potentiometer for fine adjustment
Temperature coefficient	$10e^{-}$ 3/C

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
-6	500
+6	100
+12	20
+24	50
-24	50

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,90 kg

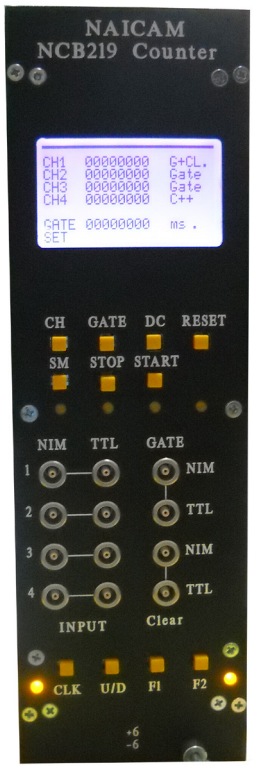
NCB219 - COUNTER

The two wide NIM module NCB219 has 4 channels counter housed in two units width NIM module. Each channel has one NIM level and one TTL level inputs. All information displayed by one graphic LCD 128x64 pixel on the front panel. Maximum frequency is 120 MHz.

- Up to 120 MHz counting rate - NIM and TTL inputs;
- 8-digits decimal up-counters;
- 8 digit up-counter timer.
- External GATE, CLEAR signal.
- Manual or self triggered RESET.

PERFORMANCE

Inputs	**NIM**: Inputs accept NIM standard pulses. **TTL**: Inputs accept TTL pulses (2,5 V minimum high Level, 50 Ω termination).
Gate	**NIM**: Inputs accept NIM standard pulses. **TTL**: Inputs accept TTL pulses (2,5 V minimum high Level, 50 Ω termination).
Clear	**NIM**: Inputs accept NIM standard pulses. **TTL**: Inputs accept TTL pulses (2,5 V minimum high Level, 50 Ω termination).



POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	440
-6	100

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1,0 kg

USER MANUAL

Front panel controls:

CH	select channel
GATE	set gate
DC	optional button
START	start counter
STOP	manual stop
SM	select mode of counter
RESET	reset counters and timer

Under LEMO connectors controls:

CH	clock to set
GATE	select UP or DOWN timer symbol
DC	optional button
START	optional button

LCD display 128x64 pixel:

QUICK START

Press CH to select channel:

Symbol **<--** indicate selected channel
Symbol **<>** selected all channels.

Channel working mode indicated on the right part of LCD.

Press **SM** to select working mode of a counter:

- **GATE** Counter count input hits during internal GATE time.
- **G.Cl.** Counter count input hits during internal GATE time and Clear counter after 1 sec. after end GATE time.
- **C++** Counter count input hits in continues.
- **Ex.G.** Counter count inputs hits during external gate and can be reset by external CLEAR pulse.

After power on all set up of these values will be read from the internal memory.

Press **RESET** to clear selected counter or all counters and timer.

Press **GATE** to set timer:

The value of internal register is displayed on row GATE.

On row SET under GATE digits select by X cursor one of 8 digit of timer.
The value of timer counter is measured in msec.

GATE 0 0 0 0 1 0 0 0
SET - - - - x - - -

For example, 00001000 corresponds 1 second time

Press **CLK** to decrease value
Press **U/D** and **CLK** to increase value.

The value automatically is written to memory and will used by timer.
After power on this value will be read from the internal memory.
Return to timer counter if digits on the SET row disappeared.

Press **START** a timer.
On the bottom part there are to yellow LED that indicate timer start period and stop signal of timer.
Left LED corresponds to measured time. Right LED corresponds to stop pulse.

Press **STOP** to stop timer.

Note: External GATE input pulse width have set less then internal timer time. In other case counter counts only partial input hits.

NCB221 - 8 CHANNELS DISCRIMINATOR

The one wide NIM module NCB221 is an 8 channels Leading Edge discriminator.
The module accepts 8 negative inputs and has 2x8 NIM outputs, on front panel LEMO 00 connectors.
The pulse output width is adjustable in a range from 25ns to 400ns. The discriminator thresholds are individually settable in a range from -1 mV to -255 mV (1 mV step), via an 8-bit DAC and displayed by 4 digit led display. The minimum detectable signal is-1mV (see note 1).
On the front panel there are SUM_OR , SUM_AND and SUM_I (input currents) of all 8 channels.
During VETO signal all channels are disabled.

PERFORMANCE

Input	50 Ω impedance, negative polarity, DC coupled
Rise time	< 3 ns
Threshold range	-1 mV to -255 mV (1 mV step) (Optional version up to 1 V range).
Output Width	25 ns to 400 ns
Maximum dynamic input range	5 V (with 50 Ω termination)
Input/output delay **Input -OR output** **Input -AND outpu**	11 ns 12 ns 12 ns
Pulse Resolution	7 ns
Channels output	Double NIM logic signal
Veto	Veto outputs of all channels, 1 kΩ input
I **Sum out**	Analogue output of the SUM input signals, output resistor 100 Ω
Sum OR	Output function OR all 8 channels, NIM standard
Sum AND	Output function AND all 8 channels, NIM standard

Note1: For low threshold (less then 3 mV) very important avoid DC input offset from detector by using decoupling capacitance.

SET UP MODULE PARAMETERS

The module has 4 keys, 4 digits LED display and rotate switch to set all settable parameters of module.

CH	select channel
T	set threshold
W	set width output pulse
R	revers key

The last working value thresholds and output pulse widths always are saved in memory of module. These parameters will be installed after power on.
On the LED display the text **Run** is appeared. Select channel by **CH** key and press **T** (or **W**) key to install a threshold (a output pulse width) of selected channel.
Press **T** key to increase or **R** key to decrease threshold by step one.
Press **W** key to change output pulse width and **R** key to decrease it. The first value is actual installed threshold or pulse width. Escape without change press **CH** and **R**.
The rotated switch has used to increase or decrease settable value more then step 1 of selected channel. Select channel by **CH**, select T or W key. After moving the rotated switch press **T**, **R** or **W**, **R** key to increase/ decrease valueby step 1. After key press **R** or **CH** the rotated switch is disabled to avoid missing setup.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	280
-6	1430
+12	21
-12	20

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,91 kg

NCB222 - SINGLE CHANNEL ANALYZER

The logic output NCB222 is provided TTL and NIM-level output pulses like response for input analog pulses whose peak amplitude is between the levels determined by the lower level discrimination and timing window (full scale range of the WINDOW (ΔE) control as +1,0 Volt DC or +10,0 Volt dc). Full range of delay can be selected by switch as 2 µs or 10 µs added. All this parameters are adjustable by controls resistance on the front panel of the module.

PERFORMANCE

Discriminator nonlinearity	<±3% of full scale
Discriminator stability	≥ 0,01%/C (±100 ppm/°C) of full scale
Discriminator range	100:1
Delay nonlinearity	<±1% of full scale
Delay stability	≤0,01%/C (±100 ppm/C) of delay range
Pulse pair resolution	Output pulse width (positive) plus the DELAY selected plus 200ns cycle time. Minimum resolving time 800ns.
Signal input	From 0 to +10,0 V DC, Input resistance is 1 kΩ

FRONT PANEL CONTROLS

Lower level (E)	Front panel ten-turn locking dial potentiometer to set lower discriminator threshold level.
Window (ΔE)	Front panel ten-turn locking potentiometer to set window width (upper discriminator threshold level above lower level).
Delay	Front panel ten-turn locking potentiometer to set delay of outputs.
ΔE range	Front panel toggle switch to set full scale range of the WINDOW (ΔE) control as +1,0 V DC or +10,0 V DC.
Delay range	Front panel toggle switch to set full scale range of the DELAY control as 2 µs or 10 µs added delay.

INPUT/OUTPUT

Input	Front-panel BNC connector accepts positive or negative pulses SIGNAL INPUT range – from 0 to +10,0 V DC, Input resistance is 1 kΩ
Outputs	**TTL OUTPUT**: Positive logic +5 V nominal pulse amplitude; Pulse width is 0,5 µs, nominal; rise time and fall time <25 ns; BNC connector. **NIM OUTPUT:** NIM logic 16 mA current pulse; pulse width 40 ns, nominal; rise time <5 ns; BNC connector.
Preamp power	Rear-panel standard D9 power connector.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	100
-24	50
+12	150
-12	120

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1,5 kg

NCB223 - QUAD CONSTANT FRACTION DISCRIMINATOR

The module NCB223 Quad Constant-Fraction Discriminator is a single-width NIM module. Each channel provide constat-fraction timing on fast, negative-polarity signals with pulse width more then 1 ns. Each channel provides two NIM standard timing outputs.
The Model 223 uses the constant fraction timing technique to select a timing point on each input pulse that is independent of pulse amplitude. The zero crossing discriminator detects this point and generates the corresponding timing output pulse.
The input pulse is delayed and sumed with inverted input fraction. The delay time is selected by an external delay cable to be equal to the time taken for the input pulse to rise from 20% of maximum amplitude.
"Walk" is the error in detecting the time for the 20% fraction as a function of input pulse amplitude. The results in a walk guarantee <±50 ps over a 100:1 dynamic range of input pulse amplitudes.
The discriminator thresholds are individually settable in a range from -1 mV to -1120 mV (4 mV step), via an 8-bit DAC and displayed by 4 digit led display. The minimum detectable signal is - 1 mV. Internal jumper permit change the range of threshold from up to -2 volts (10 mV step).
Walk range from +3 mV to - 44 mV with step 0,185 mV.
On the front panel there are OR_SUM, AND_SUM and SUM_I (sum input current) of all 4 channels.
The output pulse width is adjustable from front panel by 8 bits DAC from 25 ns to 400 ns.

PERFORMANCE

Input pulse	Accepts negative input pulses from 0 to 5 V
Threshold	Threshold dynamic range from 0 mV to 1120 mV (Optional version from 0-255 mV- note A, Optional version from 0-2 V- note D).
Walk	<±50 ps over a 100:1, with external delay 2 ns, input pulse rise time < 1 ns, input pulse width 10 ns, leading edge threshold -20mV, walk threshold -0,7 mV
Constant fraction	20%
Pulse-pair resolution	<15 ns in the updating mode (optional version 5 ns - Note B)
Input/output rate	Operates at burst rates >70 MHz (optional version 200 MHz - Note B)
Transmission delay	**Input-output:** <14 ns with 2-ns external delay; **Input- AND_S, OR_S outputs:** <15,6 ns with 2-ns external delay
Operating temperature	0 - 50°C
Threshold temperature sensitivity	<0,01%/°C, from 0 - 50°C
Transmission delay temperature sensitivity	<±10 ps/°C from 0 - 50°C
Threshold_1	control (T) on front-panel are individually settable in a range from -1 mV to -1120 mV (4 mV step), via an 8-bit DAC and displayed by 4 digit led display.
Walk_1	Control (T) on front panel adjustable from +3 mV to -44 mV range

Output width	Control (W) on front-panel the pulse output width is adjustable in a range from 25 ns to 400 ns (optional version from 5 ns to 100 ns - note C).
Veto	During VETO signal all channels are disabled
Input DL1-4	A front panel pair connectors to determine the constant shaping delay. Internal delay is 2 ns. For best triggering, the shaping delay time should be is equal 20% of rise time of input signal
Output M1-4	Analogue outputs that permits observation of the shaped signal. Output is DC coupled and can be terminated by 50 Ω. The monitor outputs are attenuated by factor 5 in relation to input signals
Output OR_S	Logical function OR of 4 output channels. NIM standard signal
Output AND_S	Logical function AND of 4 output channels. NIM standard signal
Output SUM_I	Fast analogue inverted sum signal of 4 input channels. Gain of each channels is 0,52 in relation to single input signal (without termination). Output resistance of is 100 Ω and can be terminated by 50 Ω. The rise time of this signal is less then 10 ns. Maximum output signal is 4 Volt.

Note of ordering:

A. NCB223TXX	Threshold dynamic range 0-255 mV.
B. NCB223XFX	Pulse-pair resolution 5 ns in the updating mode. Operates at burst rates 200 MHz.
C. NCB223XXW	The pulse output width is adjustable from 5 ns to 100 ns.
D. NCB223HXX	Threshold dynamic range 0-2 V.

SET UP MODULE PARAMETERS

The module has 4 keys, 4 digits LED display and rotate switch to set all settable parameters of module.

CH	select channel
T	set threshold
W	set width output pulse
R	revers key

The last working value thresholds and output pulse widths always are saved in the module memory. These parameters will be installed after power on. On the LED appears: "**RUN**".

Select channel by **CH** key and press **T** key to install a threshold or **W** an output pulse width of selected channel. Press **T** key to increase or **R** key to decrease threshold by step one.
Press **W** key to change output pulse width and R key to decrease it.
The first value is actual installed threshold or pulse width. Escape without change press **CH** and **R**.
The rotated switch has used to increase or decrease settable value more then step 1 of selected channel. Select channel by **CH**, select T or W key. After moving the rotated switch press **T**, **R** or **W**, **R** key to increase/ decrease value by step 1. After press key **R** or **CH**; the rotated switch is disabled to avoid missing setup.

Threshold (T) SET table:

Channel 0 - INPUT 1 Walk discriminator threshold.
Channel 1 - INPUT 1 Normal leading edge discriminator threshold.
Channel 2 - INPUT 2 Walk discriminator threshold.
Channel 3 - INPUT 2 Normal leading edge discriminator threshold.
Channel 4 - INPUT 3 Walk discriminator threshold.
Channel 5 - INPUT 3 Normal leading edge discriminator threshold.
Channel 6 - INPUT 4 Walk discriminator threshold.
Channel 7 - INPUT 4 Normal leading edge discriminator threshold.

Pulse width (W) SET table:

Channel 0 - Channel 1 pulse width.
Channel 1 - disabled.
Channel 2 - Channel 2 pulse width.
Channel 3 - disabled.
Channel 4 - Channel 3 pulse width.
Channel 5 - disabled.
Channel 6 - Channel 4 pulse width.
Channel 7 - disabled.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	280
-6	1430
+12	21
-12	20

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,92 kg

NCB226 - TIMING FILTER AMPLIFIER

The Module NCB226 fast filter amplifier is especially designed to shape pulses and permit optimizing the signal to noise ratio for timing measurements. This module can receive input signal directly from the preamplifier output.
The fast rise time, high output drive, and high gain capabilities of the module NCB226 make it useful for other applications utilizing low-gain photomultiplier tubes. The parameters the pole-zero cancellation and the time-invariant baseline restorer (only in optional version NCB226B) permit use this module in energy spectroscopy with scintillation detectors and Si charged particle detectors at ultra-high count rates.

PERFORMANCE

Input amplitude range	0 to ±1 V signal, 0 to ±5 V DC offset; maximum input ±5 V total
Output amplitude range	0 to ±5 V with a 100-Ω load
Noise RMS (maximum gain, with filter out)	referred to the input is ≤30 μV; Input RMS noise referred to input with 200 ns integration and differentiation is less then 6 μV (positive switch position), 8 μV (negative switch position)
Rise time	≤10 ns with filter Out or x2,2 τ for other selections
Nonlinearity	≤±0,05% not over ±5 V range. Variation of nonlinearity in over range signal is less then 0,1%.
Temperature instability	Level ≤±25 μV/C referred to the output (in range 0 to 50°C)
Coarse gain	Front-panel 6-position switch for selection of x10, x20, x40, x60, x100, or x200.
Gain stability	< 0,04 %/C in full range.
Fine gain	Front-panel 10-turn potentiometer, continuous from x0,9 to x2
Pole zero ADJ (PLR)	Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25μs to ∞.
Time constant	Two 6-position switches on front panel: Integrate RC time constants: Out (about 7 ns), 20, 50, 100, 200, and 500 ns. Differentiate RC time constants: Out (about 0,2 ms), 20, 50, 100, 200, and 500 ns. Pos./Neg. Selects inversion or non-inversion of the input signal.

INPUT/OUTPUT

Input	Positive or negative polarity selectable by front-panel switch; amplitude 0 to ±1V; protected to ±6 V dc; impedance 50 Ω, dc-coupled; front-panel BNC connector. Accepts a ±5 V dc maximum input signal.
Outputs	Front-panel BNC connector. Amplitude 0 to ±10 V (without termination); rise time ≤10 ns for filter out (2,2 τ filter selections).
Outputs zero ADJ (Vos)	Front-panel screwdriver adjustment to compensate output offset in range ±100 mV. In optional version this front panel screwdriver adjustment regulate automatic base line restorer threshold (BLZ).
Preamp power	Rear-panel standard power connector.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	96
-12	96

Module provide DSUB 9 connector for connection one preamplifier.
Connector has standard pin out and provide ±24V, ±12 V.

Power supply pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,78 kg

NCB228 - ECL-TTL TRANSLATOR MODULE

The NIM One unit wide NIM module NCB228 has 16 channels translator ECL signals to positive TTL signals. TTL output can be terminated to 50 Ω.

PERFORMANCE

Input	ECL signal, 100 Ω impedance, minimum pulse width 4 ns
Output	positive TTL signal
Input/output connector	34 pin flat connector

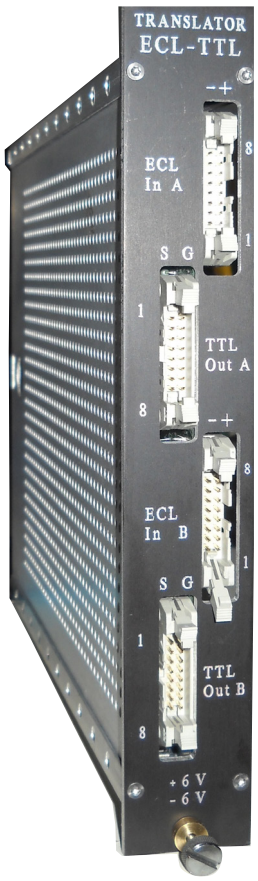
POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	100
-6	300

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,8 kg



NCB231 - QUAD TIMING FILTER AMPLIFIER

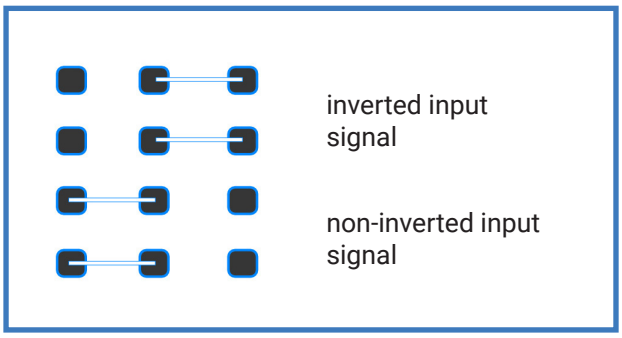
The single-width NIM module NCB231 has four separate timing filter amplifiers. This design can provide optimum timing for up to four germanium detectors or also be used for timing with other solid-state detectors, or operate as a general-purpose wideband amplifier with selectable bandwidth.
The Gain can be selected and is adjustable over the nominal range from 10 to 2500. The Gain is adjustable from 10 to 500 using a front-panel screwdriver potentiometer (FG) and Gain Switch (GAIN).
Internal jumper selects a Coarse Gain of x1 or x5. Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25µs to ∞ (B/L). Front-panel screwdriver adjustment to compensate output offset in range ± 100mV.

PERFORMANCE

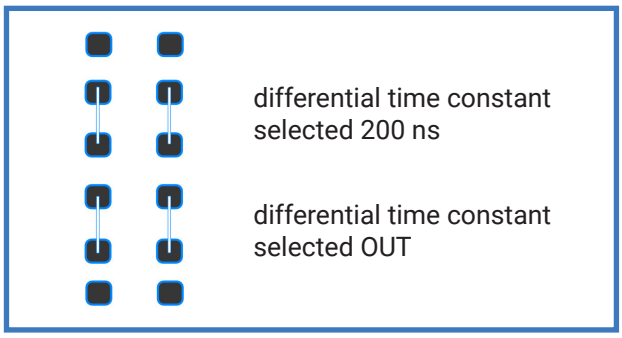
Input signal amplitude range	0 to ±1,0 V AC signal; 0 to ±2 V DC offset; maximum input ±5 V
Output amplitude range	0 to ±5 V linear into a 100-Ω load. Output DC-coupled with DC regulated offset <±1 mV
Rise time	<10 ns with Integration and Differentiation time constants set to OUT. (See note 2,4)
RMS noise	(Maximum gain, Integration and Differentiation set to OUT) referred to the input <50 µV
Integral nonlinearity	<±0,5% over ±5 V into a 100-Ω load
Temperature sensitivity	DC level <±10 µV/C referred to the output
Controls	Each section of the Model NCB231 has separate controls for Coarse Gain, Fine Gain, P/Z, Differentiation, and Integration time constant.
Internal coarse gain	Jumpers selectable for nominally x1 or x5 (see note 3)
Coarse gain	Selectable by 10 positions switch for nominally x10, x15, x20, x30, x45, x60, x80, x120, x160, and x250
Fine gain	Front-panel screwdriver potentiometer adjustable from 1 to 2
B/L	Front-panel potentiometer used to adjust pole-zero cancellation for decay time constants from 25 µs to ∞.
Invert/noninvert	Jumpers selectable to invert or Non-invert the Output signal relative to the Input signal (see note 1).
Differentiation	Time constant jumper selectable as OUT (equivalent to 0,1 ms) or 200 ns. A third position is available for custom modification. The Model NCB231 is shipped with this jumper in the OUT position (see note 2).
Integration	Time constant jumper selectable as OUT or 50, 35, 20 ns. The Model NCB231 is shipped with this jumper in the OUT position (see note 4).

Input	Positive or negative polarity selectable with a jumper; amplitude 0 to ±1 V ac signal; 0 to ±2 V dc offset; maximum input ±2 V signal plus offset. Input impedance is 50 Ω, protected to ±6 V.
Output	Front-panel LEMO connector with Zo = 100 Ω furnishes the shaped and amplified signal up to ±5 V with 100 Ω termination.

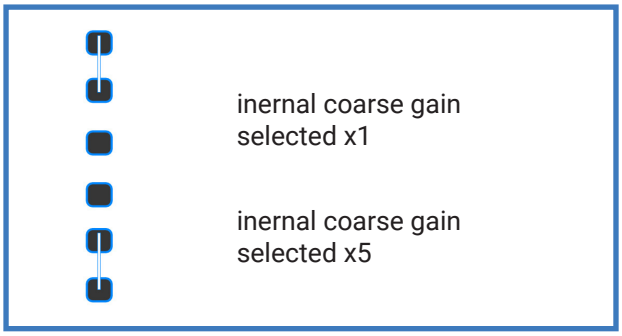
Note 1 - set 1 jumpers



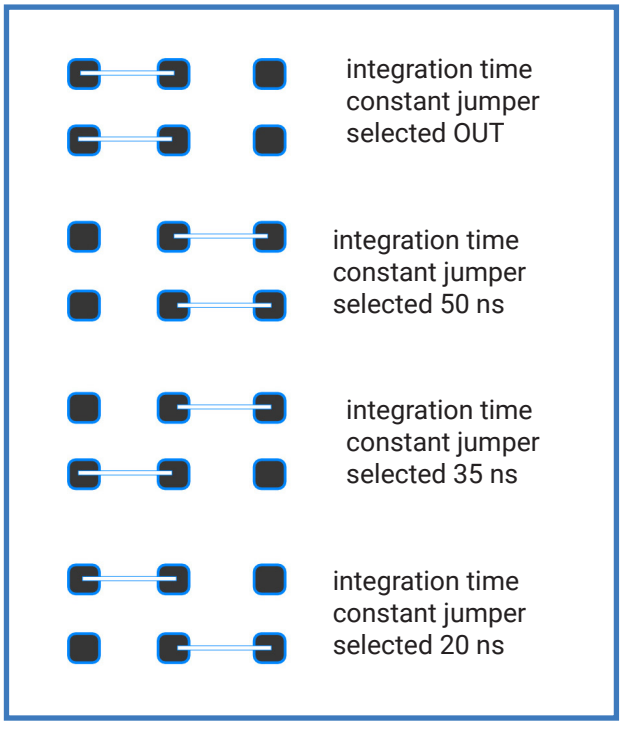
Note 2 - set 2 jumpers



Note 3 - set 3 jumpers



Note 4 - set 4 jumpers



POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	350
-12	350

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,78 kg

NCB233 - DUAL DELAY

The NCB233 is a passive dual sections delay unit housed in a single unit NIM module. Each section can delay a signal in range 0 up 31,5 ns with a 1,6 ns offset. Common delay can be installed from 0 to 63 ns. The module is made of calibrated coaxial cable to rich high accuracy delay during measurement. Each section has 0,5 ns resolution and VSWR less then 1,15. Accuracy of delay is 100 ps in full range. Six switches on the front panel of module can select delay. Attenuation of signal is less then 2,5 dB.

POWER SUPPLY REQUIREMENTS

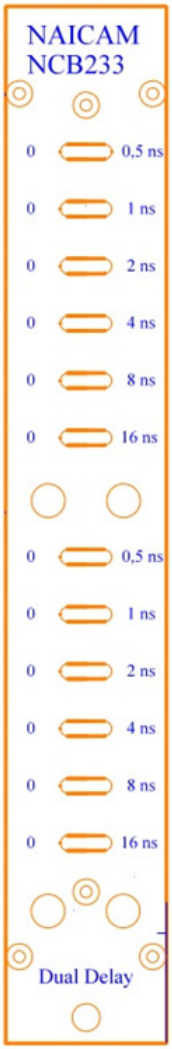
No power supply.

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1,1 kg

INPUT/OUTPUT

Input	LEMO style connectors. Input Impedance 50 Ω
Outputs	LEMO style connectors.



NCB234 - DUAL DELAY

The NCB234 is a passive dual sections delay unit housed in a single unit NIM module. Each section delay a signal in range 0 up 63,5 ns with a 1,6 ns offset. Common delay can be installed from 0 to 127 ns. The module is made of calibrated coaxial cable to rich high accuracy delay during measurement. Each section has 0,5 ns resolution and accuracy of delay is 100 ps in full range. Each channel has seven switches on the front panel of module to select delays. Attenuation of signal in bandwidth 200 MHz is less then 1,5 dB in delay range up to 15,5 ns and 4,5 dB in full delay range.

INPUT/OUTPUT

Input	LEMO style connectors. Input Impedance 50 Ω
Outputs	LEMO style connectors.

POWER SUPPLY REQUIREMENTS

No power supply.

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1,1 kg

NCB237 - GATE AND DELAY GENERATOR

The module NCB237 Gate and Delay generator accepts input logic pulse, provides a delay of up to 150µs.
The combination of two functions provided by this module various logic requirements, such as gating multichannel analyzers and alignment of coincidence timing between two channels. The module can be started by standard NIM signal and output signals can be used as logical interface between different other equipments.

PERFORMANCE

Delay nonlinearity	≤±2%
Delay temperature instability	≤±0,03% of adjusted delay per °C
Delay generator dead time	Adjusted delay from 100 ns up to 150 µs.
Output generator dead time	Adjusted width plus 0,1 µs
Delay jitter	≤0,02% of selected range

CONTROLS

Delay — 10-turn locking potentiometer adjustment within the range selected by the locking 10-position switch:

Switch position	Min delay	Range	Max Delay
1	100 ns	100 ns - 400 ns	1 µs
2	100 ns	400 ns - 700 ns	2 µs
3	120 ns	700 ns - 1 µs	2,5 µs
4	150 ns	1 µs - 2 µs	5 µs
5	200 ns	2 µs - 4 µs	7,5 µs
6	400 ns	3 µs - 5 µs	12 µs
7	400 ns	5 µs - 10 µs	20 µs
8	400 ns	10 µs - 20 µs	40 µs
9	400 ns	20 µs - 50 µs	80 µs
10	400 ns	50 µs - 100 µs	160 µs

Ampl.	Output pulse amplitude can be adjusted in the range of 2 to 10V by front-panel screwdriver control
Width	Output pulses to be adjusted in the range of 400 ns to 4 µs is changed by front panel screwdriver control

INPUT/OUTPUT

Input	**POS:** +2 V pulse minimum, 12 V maximum; 50 ns minimum width, DC-coupled; impedance 1500 Ω. **NEG:** connector accepts NIM-standard fast negative logic pulses; 5 ns minimum width, DC-coupled; impedance 50 Ω
Outputs	**Delayed period:** two BNC connector provides positive and negative pulses width equal to the adjusted delay; amplitude ±5 V (can be adjusted by internal trimmer); rise time ≤20 ns. **Delayed marker**: NIM-standard fast negative logic pulse at the end of delay time. Amplitude, –0,7 V into 50 Ω load; rise time ≤10 ns; width ≤25 ns. **Delayed gate**: Two BNC connectors. Positive and negative GATE signals. Positive and negative amplitude can be regulated by front panel trimmer from 2 Volt up to 10 Volt. The width of these signals regulated second trimmer on the front panel of module.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	80
-24	50
+12	60
-12	54
+6	5
-6	186

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,77 kg

NCB238 - TIME-TO-AMPLITUDE CONVERTER

The module NCB238 Time-to-amplitude converter (TAC) measures the time interval between start-stop pulses and generates an analog output pulse proportional to the measured time. The module has two switches: first determines the range and second multiplier factor. Total time measurement ranges can be from 10 ns to 2 ms. Valid Startand Valid Conversion outputs are provided for each accepted start and stop inputs. The duration of the Start output indicates the interval from the accepted start until the end of reset.

PERFORMANCE

Time resolution FWHM	≤0,01% of full scale plus 5 ps for all ranges
Temperature instability	≤±0,01%/°C of full scale, in range 0 to 50°C
Differential nonlinearity	Typically, <1% from 10 ns or 2% of full scale
Integral nonlinearity	≤±0,1% from 10 ns or 2% of full scale
Multiplier range	Fixed 1,0 µs for x1 and x10 Multipliers, fixed 5 µs for x100 Multiplier, and fixed 50 µs for x1K, and x10K Multipliers.
Star-to-stop conversion time	Minimum ≤5 ns
Input count rate	>30 MHz

FRONT PANEL CONTROLS

Range control (ns)	Three-position rotary switch selects full scale time interval of 50, 100, or 200 ns between accepted START and STOP input signals
Multiplier	Control is five-position rotary switch extends time range by a multiplying factor of 1, 10, 100, 1K, or 10K
Delay	Control (µs) 10-turn screwdriver-adjustable potentiometer varies the delay of the TAC output from 0,5 µs to 10,5 µs, relative to an accepted Stop input signal
Gate mode	Control is two-position locking toggle switch selects coincidence or anticoincidence mode of operation for the Start circuit

INPUT/OUTPUT

Input	All three inputs are DC-coupled, jumpers selectable to accept positive in range 2-10 V or negative NIM standard signals. Input impedance is 50 Ω in the NIM input and >1 kΩ in the positive signal. **START** Front-panel BNC connector initiates time conversion when Start input signal is arrived. Factory-set in the negative input position. **STOP** Front-panel BNC connector terminates time conversion. Factoryset in the negative input position. **GATE** front-panel BNC connector provides an external means of gating the Start circuitry in either Coincidence or Anticoincidence with the Start input signal.
Outputs	**TAC OUTPUT** Front-panel BNC connector provides unipolar pulse. Amplitude 0 V to +10 V proportional to START/STOP input time difference. **VAL_CONC**. Rear panel BNC connector, output signal NIM standard. Valid START signal. **VAL_ST** Rear panel BNC connector, output signal NIM standard. Valid conversion signal.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	20
-24	37
+12	71
-12	102
+6	180
-6	443

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,9 kg

NCB239 - DUAL SPECTROMETRIC AMPLIFIER

The single-width NIM module NCB239 has two separate spectrometric amplifiers. This design can provide optimum timing for up to two germanium detectors or also be used for timing with other solid-state detectors, or operate as a general-purpose wideband amplifier with selectable bandwidth.
Three-position printed wiring board (PWB) jumpers select either Pos or Neg input pulse polarity.
The Gain can be selected and is adjustable over the nominal range from 5 to 1500. The Gain is adjustable from 5 to 500 using a front-panel screwdriver potentiometer (FG) and Gain Switch (GAIN). Internal jumper selects a Coarse Gain of x1 or x5. Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25us to ∞ (B/L). Automatic Base line restorer. Front-panel screwdriver adjustment to compensate output offset in range +/- 20mV.
The module provide two independent outputs: unipolar and bipolar signals. Each output available on the front and back side panels. All input and outputs connectors are RADIAL BNC type connector. The connectors can be changed to LEMO 00 type connectors if this option will be specified in order.

PERFORMANCE

Input signal amplitude range	0 to ±1,0 V AC signal; 0 to ±200 mV DC offset; maximum input ±10 V
Output amplitude range	0 to ±10 V linear without load. Output DC-coupled with DC regulated offset <±1 mV
Pulse shape	Semi-Gaussian on all ranges with peaking time equal to 2,2τ of shaping time
RMS noise	(maximum gain, Integration and Differentiation set to 1-µs) referred to the input RMS <7 µV for unipolar shaping, negative polarity; <5 µV using 2-µs shaping time;
Integral nonlinearity	<±0,5% over ±10 V into a 1000-Ω load
Temperature sensitivity	DC level <±10 µV/C referred to the output
Controls	each section of the Model NCB239 has separate controls for Coarse Gain, Fine Gain, P/Z, Differentiation, and Integration time constant
Internal coarse gain	jumpers selectable for nominally x1 or x5
Coarse gain	selectable by 10 positions switch for nominally x10, x15, x20, x30, x45, x60, x80, x120, x160, and x250
Fine gain	Front-panel potentiometer adjustable from 1 to 2
Bipolar crossover walk	<5 ns at 0,5-µs shaping time for 50:1 dynamic range, P/L front-panel potentiometer used to adjust pole-zero cancellation for decay time constants from 25 µs to ∞
Invert/noninvert	jumpers selectable to invert or Non-invert the Output signal relative to the Input signal
Differentiation	Time constant jumper selectable as 0,5 µs, 1 µs, 2 µs, 3 µs. A third position is available for custom modification. The Model NCB239 is shipped with this jumper in the 1 us position
Integration	Time constant jumper selectable as 0,5 µs, 1 µs, 2 µs, 3 µs.. The Model NCB239 is shipped with this jumper in the 1 us position.
Input	Positive or negative polarity selectable with a jumper; amplitude 0 to ±1 V ac signal; 0 to ±2 V dc offset; maximum input ±2 V signal plus offset. Input impedance is 1000 Ω, protected to ±12 V.
Unipolar output	Front-panel LEMO connector, output impedance Zo = 100 Ω , active base line restorer adjustable +/- 20 mV.
Bipolar output	Front-panel LEMO connector, output impedance Zo = 100 Ω, full range scale 0-10V.

NIM CONNECTOR PIN OUT

PIN	FUNCTION	PIN	FUNCTION
1	+3 V	23	Reserved
2	-3 V	24	Reserved
3	Spare bus	25	Reserved
4	Reserved bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	28	+24 V
7	Coaxial	29	-24 V
8	200 V DC	30	Spare bus
9	Spare	31	Spare
10	+6 V	32	Spare
11	-6 V	33	117 V AC
12	Reserved bus	34	Power return ground
13	Spare	35	Reset (Scaler)
14	Spare	36	Gate
15	Reserved	37	Reset (Auxiliary)
16	+12 V	38	Coaxial
17	-12 V	39	Coaxial
18	Spare bus	40	Coaxial
19	Reserved bus	41	117 V ACc (neutral)
20	Spare	42	High-quality ground
21	Spare	G	Ground guide pin
22	Reserved		

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply and 202515-3 AMP connector on the backside of module.

P. Voltage (V)	Current/ch (mA)
+12	225
-12	225
+24	Preamplifier supply
-24	Preamplifier supply

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	0,82 kg

N410 - 32 CHANNELS SiPM AMPLIFIER

The NIM module N410 has 32 channels amplifiers specially designed for HAMAMATSU MPPC S10931-050P type detector. The amplifier has 50 Ω input impedance and amplified output signal can be terminated by 50 Ω. The module has 4 output connectors(see pin out connectors J1-4), one high density input connector and Bias connector.

PERFORMANCE

Input impedance	50 Ω
Rise/fall time	25 ns
Gain*	35 dB
Output range voltage	2 V
Termination	50 Ω
Gain temperature coefficient	0,03%/C
Input equivalent Noise	8 µV RMS
Maximum Bias Value	250 VDC
Output connector	Mini D 20 pin
Bias connector	Sub D 9 pins

* tested with HAMAMATSU MPPC S10931-050P biased by 72 V.

CABLE FOR BIAS VOLTAGE

CASE	EARTH
2	BIAS 1
3	BIAS 2
4	BIAS 3
5	BIAS 4
6	GND 1
7	GND 2
8	GND 3
9	GND 4

Bias 1 connected to 1,3,5,7,9,11,13,15 channels
Bias 2 connected to 17,19,21,23,25,27,29,31 channels
Bias 3 connected to 18,20,22,24,26,28,30,32 channels
Bias 4 connected to 2,4,6,8,10,12,14,16 channels

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	420
-12	180

DIMENSIONS

dimensions	3,43x22,13 cm per DOE/ER-0457T
weight	1,1 kg

JC1

1	Cathode 1	2	Anode 1
3	Cathode 2	4	Anode 2
5	Cathode 3	6	Anode 3
7	Cathode 4	8	Anode 4
9	Cathode 5	10	Anode 5
11	Cathode 6	12	Anode 6
13	Cathode 7	14	Anode 7
15	Cathode 8	16	Anode 8
17	Cathode 9	18	Anode 9
19	Cathode 10	20	Anode 10
21	Cathode 11	22	Anode 11
23	Cathode 12	24	Anode 12
25	Cathode 13	26	Anode 13
27	Cathode 14	28	Anode 14
29	Cathode 15	30	Anode 15
31	Cathode 16	32	Anode 16
33	Cathode 17	34	Anode 17
35	Cathode 18	36	Anode 18
37	Cathode 19	38	Anode 19
39	Cathode 20	40	Anode 20
41	Cathode 21	42	Anode 21
43	Cathode 22	44	Anode 22
45	Cathode 23	46	Anode 23
47	Cathode 24	48	Anode 24
49	Cathode 25	50	Anode 25
51	Cathode 26	52	Anode 26
53	Cathode 27	54	Anode 27
55	Cathode 28	56	Anode 28
57	Cathode 29	58	Anode 29
59	Cathode 30	60	Anode 30
61	Cathode 31	62	Anode 31
63	Cathode 32	64	Anode 32
65	NC	66	NC
67	NC	68	NC

J1

PIN	CHANNEL
1	2
2	4
3	6
4	8
5	N.C.
6	N.C.
7	10
8	12
9	14
10	16
11	GND
12	GND
13	GND
14	GND
15	GND
16	GND
17	GND
18	GND
19	GND
20	GND

J2

PIN	CHANNEL
1	18
2	20
3	22
4	24
5	N.C.
6	N.C.
7	26
8	28
9	30
10	32
11	GND
12	GND
13	GND
14	GND
15	GND
16	GND
17	GND
18	GND
19	GND
20	GND

J3

PIN	CHANNEL
1	15
2	13
3	11
4	9
5	N.C.
6	N.C.
7	7
8	5
9	3
10	1
11	GND
12	GND
13	GND
14	GND
15	GND
16	GND
17	GND
18	GND
19	GND
20	GND

J4

PIN	CHANNEL
1	31
2	29
3	27
4	25
5	N.C.
6	N.C.
7	23
8	21
9	19
10	17
11	GND
12	GND
13	GND
14	GND
15	GND
16	GND
17	GND
18	GND
19	GND
20	GND

N410_8CH - 8 CHANNELS SiPM AMPLIFIER

The NIM module N410_8ch has 8 channels amplifiers specially designed for HAMAMATSU MPPC S10931-050P type detector. The amplifier has 50 Ω input impedance and amplified output signal can be terminated at 50 Ω. The module has 8 isolated inputs and 8 outputs with common ground.

PERFORMANCE

Input impedance	50Ω
Rise/fall time	5 ns 25 ns
Gain adjustable	From 20 up to 35 dB
Output range voltage	2 V
Termination	50Ω
Gain temperature coefficient	0,03%/C
Input equivalent noise	8 µV RMS
Input connector	LEMO 00
Output connector	LEMO 00
Power connector	42 NIM connector

* tested with HAMAMATSU MPPC S10931-050P biased by 72 V.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+6	105
-12	42

DIMENSIONS

dimensions	3,43x22,13 cm
weight	0,7 kg

NC305 - NIM CRATE 7 UNITS

The NAICAM Mod. NC305 is a 7U ventilated NIM crate. This 19 inch module has 12 slot crate and available with or without pluggable 300W (optional version 450W) power supply. The Unit can be powered by 110 or 230 VAC, 50-60 Hz. The Mod NC305 is equipped with a simple FAN. On control panel of FAN unit housed LCD display and test pin for all DC voltages.

DIMENSIONS

dimensions	573x488x310 mm
weight	31 kg

PERFORMANCE

- 19” x 7U enclosure
- 12 slot ventilated NIM bin
- Pluggable linear power supplies NPS300W, NPS450W
- Short circuit protection
- Over / Under voltage protections
- Over temperature protection
- Control panel with LCD display, and test pins for all outputs

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+ 24	3	130/70	4	75(±3)
- 24	3	130/70	4	75(±3)
+12	3	130/70	4	75(±3)
- 12	3	130/70	4	75(±3)
+ 6	17	130/70	20	75(±3)
- 6	17	130/70	20	75(±3)

MAXIMUM OUTPUT POWER

300W (optional version 450W)

RIPPLE

< 3 mVpp @ ±6V, ±12 V, ±24 V (Typ.)
< 5 mVpp @ ±6V, ±12 V, ±24 V (Max.)
(20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C

NC305_TID - NIM CRATE 7 UNITS

The NAICAM Mod. NC305_TID is a 7U ventilated NIM crate. The module NSP300W_TID is compatible with any a plug-in power supply with TID20893 standard NIM pinout. This 19 inch module has 12 slot crate and available with or without pluggable 300W(optional version 450W) power supply. The Unit can be powered by 110 or 230 VAC, 50-60 Hz. The Mod NC305 is equipped with a simple FAN. On control panel of FAN unit housed LCD display and test pin for all DC voltages

DIMENSIONS

dimensions	573x488x310 mm
weight	31 kg

PERFORMANCE

19” x 7U enclosure

12 slot ventilated NIM bin

Pluggable linear power supplies NPS300W_TID20893

Short circuit protection

Over / Under voltage protections

Over temperature protection

Control panel with LCD display, and test pins for all outputs

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+ 24	3	130/70	4	75(±3)
- 24	3	130/70	4	75(±3)
+12	3	130/70	4	75(±3)
- 12	3	130/70	4	75(±3)
+ 6	13	130/70	15	75(±3)
- 6	13	130/70	15	75(±3)

MAXIMUM OUTPUT POWER

300W

RIPPLE

< 3 mVpp @ ±6V, ±12 V, ±24 V (Typ.)
< 5 mVpp @ ±6V, ±12 V, ±24 V (Max.)
(20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C

NCM150W - NIM CRATE 5 UNITS

The NAICAM Mod. NCM150W is a 5U non ventilated NIM crate . This 19 inch module has 10 slot crate as specified by DOE/ER-0457T standard and available with pluggable power supply module NPS150W. The Unit can be powered by 110 or 220 VAC, 50-60 Hz. The Module NPS150W is equipped with a simple FAN.

DIMENSIONS

dimensions	337x488x310 mm
weight	11 kg

PERFORMANCE

19” x 5U enclosure
10 slot non-ventilated NIM BIN
Pluggable linear power supplies NPS150W
All electric parameters of crate are referred to NPS150W

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+24	1,5	130/70	3	75(±3)
-24	1,5	130/70	3	75(±3)
+12	3	130/70	5	75(±3)
-12	3	130/70	5	75(±3)
+6	5	130/70	10	75(±3)
-6	5	130/70	10	75(±3)

NCM150_6S - 6 SLOTS NIM CRATE

The NAICAM Mod. NCM150_6S is a 5U ventilated NIM crate. This 220 mm width module has 6 slots as specified by DOE/ER-0457T standard and available with 150W plug in power supply. The power unit can be powered by 110 or 220 VAC, 50-60 Hz and specified before shipping.

DIMENSIONS

dimensions	337x300x202mm
weight	7 kg

PERFORMANCE

- 220mm x 5U enclosure
- 6 slot non ventilated NIM bin
- Embedded linear power supplies 150W
- Short circuit protection
- Over / Under voltage protection
- Over temperature protection
- Control panel with mains switch, status LED, over temperature LED
- Two DSUB connectors for preamplifier.

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+24	1,5	130/70	2	75(±3)
-24	1,5	130/70	2	75(±3)
+12	3	130/70	4	75(±3)
-12	3	130/70	3,5	75(±3)
+6	5	130/70	6	75(±3)
-6	5	130/70	6	75(±3)

MAXIMUM OUTPUT POWER

180W

RIPPLE

< 3 mVpp @ ±6V, ±12 V, ±24 V (Typ.)
< 5 mVpp @ ±6V, ±12 V, ±24 V (Max.)
(20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C

NPS150W - NIM POWER SUPPLY

The NIM module NSP150W is a 2,5 NIM size plug-in power supply. The module has all 6 voltages with a maximum output power 150 Watt. This module has over/under voltage, overload and overheat protection and can be adapted for a different input AC voltages 100/115/210/240 VAC, 50-60 Hz. On the front panel the status of power supply by GREEN/RED LED is indicated. The module has soft start time 0,5 ms and correspond CE isolation standard 61010.

DIMENSIONS

dimensions	85x247x221mm
weight	5 Kg

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+24	1,5	130/70	2	75(±3)
-24	1,5	130/70	2	75(±3)
+12	3	130/70	4	75(±3)
-12	3	130/70	3,5	75(±3)
+6	5	130/70	6	75(±3)
-6	5	130/70	6	75(±3)

MAXIMUM OUTPUT POWER

150W

RIPPLE IS LESS

±6V <2 mVpp
±12 V < 3 mVpp
±24 V < 5 mVpp

All measurement in 20 MHz Bandwidth.

LOAD REGULATION

< 0,3 % for 10-100% load change,
< 0,05 % for ±10% load change

TRANSIENT RESPONSE

0,10 ms for recovery to ±1% of voltage for 10-100% load change

FUSE 230VAC

2 A, class T

STORAGE TEMPERATURE

-10 +70C

NPS300W - NIM POWER SUPPLY

The NIM module NSP300W (optional version NPS450W) is a plug-in power supply. The module has all 6 voltages with a maximum output power 300 Watt (optional version 450W). This module has over/under voltage, overload and overheat protection and can be adapted for different input AC voltages: 110 or 230 VAC, 50 or 60 Hz.

DIMENSIONS

dimensions	430x170x245 mm
weight	15,6 Kg (450W -18,5 Kg)

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+24	3	130/70	4	75(±3)
-24	3	130/70	4	75(±3)
+12	3	130/70	4	75(±3)
-12	3	130/70	4	75(±3)
+6	17	130/70	20	75(±3)
-6	17	130/70	20	75(±3)

MAXIMUM OUTPUT POWER

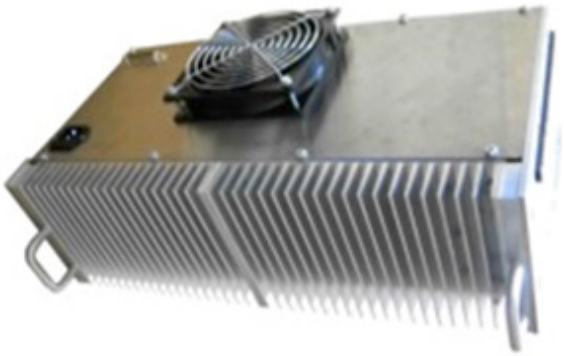
300W (optional version 450W).

RIPPLE IS LESS

< 3 mVpp @ ±6V, ±12 V, ±24 V (Typ.)
< 5 mVpp @ ±6V, ±12 V, ±24 V (Max.)
(20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C



NPS300W_TID - NIM POWER SUPPLY

The module NSP300W_TID is a plug-in power supply compatible with TID20893 standard NIM pin out. The module has all 6 voltages with a maximum output power 300 Watt (optional version 450W). This module has over/under voltage, overload and overheat protection and can be adapted for different input AC voltages: 110 or 230 VAC, 50 or 60 Hz.

DIMENSIONS

dimensions	430x170x245 mm
weight	15,6 Kg (450W -18,5 Kg)

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+24	3	130/70	4	75(±3)
-24	3	130/70	4	75(±3)
+12	3	130/70	4	75(±3)
-12	3	130/70	4	75(±3)
+6	13	130/70	16	75(±3)
-6	13	130/70	16	75(±3)

MAXIMUM OUTPUT POWER

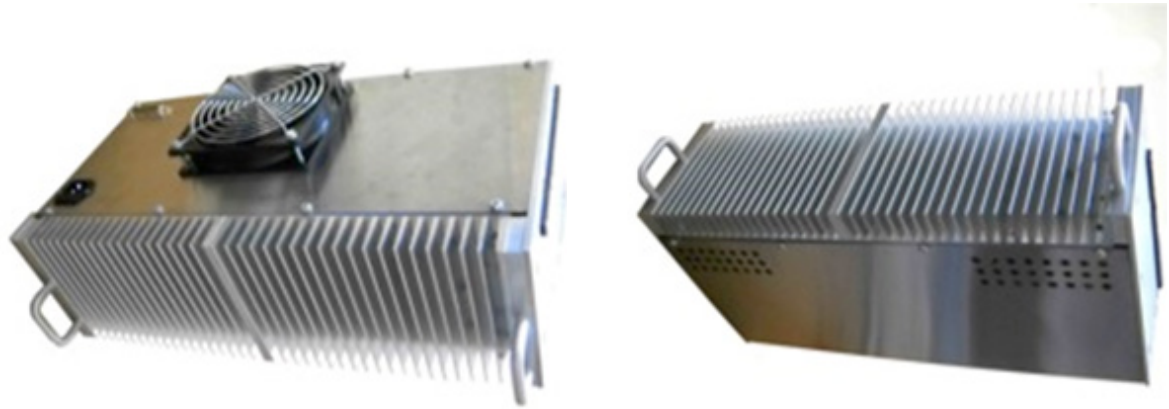
300W (optional version 450W).

RIPPLE IS LESS

< 3 mVpp @ ±6V, ±12 V, ±24 V (Typ.)
< 5 mVpp @ ±6V, ±12 V, ±24 V (Max.)
(20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C



NHV3002 - HIGH VOLTAGE POWER SUPPLY

The NHV3002 is a single width general-purpose NIM module that contains two adjustable power supplies providing the low noise, regulated, very stable high voltage necessary for operation of photomultipliers, ionization chambers, semiconductor detectors, electron multipliers, and other devices. The low-noise output is adjustable from ±10 to ±3000 V dc with up to 1000 uA load current. Noise on the output is <10 mV peak-to-peak. The front-panel graphic display 96x64 pixel and 4 touch bottom permit set all control parameters and visual monitoring of either the output voltage or the output current.
The output voltage can be controlled from ±10 to ±3000 V. Output current can be monitored with resolution 10 nA. The module NHV5004 has overload and short-circuit protection of all channels.
All channel's of the module can be controlled through RS232 or RS485 interface.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	900
-24	900
+6	100
-6	100

SPECIFICATION

Output range	10 to 3000 V
Output load capacity	0 to 1000 uA
Regulation	≤0,003% variation in output voltage
Temperature instability	<±50 ppm/°C after 30-minute warm-up; operating range 0 to 50°C
Long-term drift	<0,01%/hour and <0,03%/24-hour variation in output voltage at constant input line voltage, load, and ambient temperature after 30-minute warm-up.
Output ripple	Max value is <10 mV peak-to-peak, typical is <5 mV in bandwidth from 50 Hz to 20 MHz.
Overload protection	Internal circuitry protects against overloads and short circuits.

CONTROLS

Outputs	The SHV connectors are placed on the rear panel
Output voltage	Can be set by using graphic display and four touch bottoms The values are displayed by graphic display voltage in V and current in uA (the resolution are 1 Volt and 10 nA).
Polarity	Positive or negative output polarity by positions of internal modules is selected. Two LED are indicated polarity output voltage. Green LED Positive polarity, Yellow LED Negative polarity
Ramp up and down	Are selected in the range 1÷255 V/s step
Overvoltage and undervoltage	Warning have set before Enable output (usually ±10% of installed parameter).
Reset	Output voltage can be reset by external TTL signal.

NHV5000 - HIGH VOLTAGE POWER SUPPLY

The NHV5000 is a single width general-purpose NIM module that contains one adjustable power supply providing the low noise, regulated, very stable high voltage necessary for operation of photomultipliers, ionization chambers, semiconductor detectors, electron multipliers, and other devices. The low-noise output is adjustable from ±10 to ±5000 V dc with up to 2 mA load current. Noise on the output is <2 mV peak-to-peak.
The front-panel graphic display 96x64 pixel and 4 touch bottom permit set all control parameters and visual monitoring of either the output voltage or the output current.
The output voltage can be controlled from ±10 to ±5000 V. Output current can be monitored with resolution 1uA.
The module NHV5000 has overload and short-circuit protection. The module can be controlled through RS232 interface. The local or remote control can be selected by switch on the front panel of the module.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	500
-24	500
+6	120
-6	120

SPECIFICATION

Output range	10 to 5000 V
Output load capacity	0 to 2 mA
Regulation	≤0,003% variation in output voltage
Temperature instability	<±50 ppm/°C after 30-minute warm-up; operating range 0 to 50°C.
Long-term drift	<0,01%/hour and <0,03%/24-hour variation in output voltage at constant input line voltage, load, and ambient temperature after 30-minute warm-up.
Output ripple	Max value is < 5 mV peak-to-peak, typical is < 2 mV in bandwidth from 50 Hz to 20 MHz.
Overload protection	Internal circuitry protects against overloads and short circuits.

CONTROLS

Outputs	The SHV connector is placed on the rear panel
Output voltage	Can be set by using graphic display and four touch bottoms (Optional version with one 10-turn precision potentiometer, in this case graphic display used like indicator and set up protection parameters.); The values are displayed by graphic display voltage in V and current in uA (the resolution are 1 Volt and 1uA).
Polarity	Positive or negative output polarity by positions of internal modules is selected. Two LED are indicated polarity output voltage. Green LED Positive polarity, Yellow LED Negative polarity
Ramp up and down	Are selected in the range 1÷255 V/s step
Overvoltage and undervoltage	Warning have set before Enable output (usually ±10% of installed parameter)
Reset	Output voltage can be reset by external TTL signal

NHV5004 - HIGH VOLTAGE POWER SUPPLY

The NHV5004 is a single width general-purpose NIM module that contains four adjustable power supplies providing the low noise, regulated, very stable high voltage necessary for operation of photomultipliers, ionization chambers, semiconductor detectors, electron multipliers, and other devices. The low-noise output is adjustable from ±10 to ±5000 V dc with up to 500 uA load current. Noise on the output is <5 mV peak-to-peak. The front-panel graphic display 96x64 pixel and 4 touch bottom permit set all control parameters and visual monitoring of either the output voltage or the output current.
The output voltage can be controlled from ±10 to ±5000 V. Output current can be monitored with resolution 10 nA. The module NHV5004 has overload and short-circuit protection of all channels.
All channel's of the module can be controlled through RS232 or RS485 interface.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	900
-24	900
+6	100
-6	100

SPECIFICATION

Output range	10 - 5000 V
Output load capacity	0 - 500 uA
Regulation	≤0,003% variation in output voltage
Temperature instability	<±50 ppm/°C after 30-minute warm-up; operating range 0 to 50°C.
Long-term drift	<0,01%/hour and <0,03%/24-hour variation in output voltage at constant input line voltage, load, and ambient temperature after 30-minute warm-up.
Output ripple	Max value is <10 mV peak-to-peak, typical is <5 mV in bandwidth from 50 Hz to 20 MHz.
Overload protection	Internal circuitry protects against overloads and short circuits.

CONTROLS

Outputs	The SHV connectors are placed on the rear panel.
Output voltage	Can be set by using graphic display and four touch bottoms The values are displayed by graphic display voltage in V and current in uA (the resolution are 1 Volt and 10 nA).
Polarity	Positive or negative output polarity by positions of internal modules is selected. Two LED are indicated polarity output voltage. Green LED Positive polarity, Yellow LED Negative polarity
Ramp up and down	Are selected in the range 1÷255 V/s step .
Overvoltage and undervoltage	Warning have set before Enable output (usually ±10% of installed parameter).
Reset	Output voltage can be reset by external TTL signal.

DESKTOP SOLUTIONS

The portable Desktop modules are stand alone products, that provide the same performances of standard electronics. The modules can be easily reconfigured for desktop measurement.

APPLICATIONS

Some times, a short and a small scientific experiment ask special solution like interface between standard ADC module in PC and detector. Usually numbers of interface amplifiers are from 1 to 16 channels. These interface modules are housed in small desktop box 160x165x51 mm. Desktop modules, which can be placed on the table or near to detector permit avoid using NIM BIN.

DCB10 - CHANNELS POWER DISTRIBUTOR

The module DCB10 is a 4-channel NIM power distribution and control module. All voltage outputs (±6 Volt, ±12 Volt and ±24 Volt) are protected by electronic fuses which automatically recover after short circuit. The status is displayed by LEDs. Fuse release: when current drops to less than half the maximum current, the fuse recovers. Input and output connectors are D9 Sub style.

VOLTAGE OUTPUT AND CURRENT LIMIT

For each of the 4 output connectors
±6 Volt, max 1A
±12 Volt, max 0,4A
±24 Volt, max 0.4A

DISPLAY

4 green/red LEDs show status output voltage

POWER CONSUMPTION

±12 Volt < 50mA

CONNECTOR PIN OUT

SubD9 female/male connector

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground
3	+6 V
5	-6 V
8	NC

DIMENSIONS

dimensions	—
weight	—
cable length	3m

Note: special 3 mt length cable from NIM crate to DC10 is required

DCB104 - 4 CHANNELS CURRENT/VOLTAGE CONVERTER

The module DCB104 has 4 channels current to voltage converters. The module is housed in an aluminium box.
DCB104 has on the front panel 4 input connectors and on the backside one output connector and one power connector. The module use only external power supply +24 Volt.
Special version DCB104C is a module with input and out put connectors BNC style.

PERFORMANCE

Number of channels	4
Input connectors	4 pins AMP style (High quality plastics)
Input current	Up 500 nA (optional versions 1 mA, 2 mA)
Output signal	From 0 to 10 Volt
Bandwidth	0,1-1Hz
Input resistance	50 Ω
Linearity (0-500nA)	< 0,05 %
Power supply	+ 24 V
Output resistance	50 Ω
Max output current	12 mA

INPUT CONNECTOR

1	IN(even)
2	GND
3	GND
4	IN(odd)

OUTPUT CONNECTOR

1	GND
2	OUT4
3	GND
4	OUT3
5	GND
6	OUT2
7	GND
8	OUT1

POWER CONNECTOR

1	+24V
2	GND(24V)
3	REMOTE ON/OFF
4	EARTH

Note 1: EARTH directly connected to case.
Note 2: REMOTE ON/OFF:
ON 3.0 ... 12 VDC or open circuit;
OFF 0.0 ….1.2 VDC.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	

DIMENSIONS

dimensions	160x165x51,5 mm
weight	0,8 kg

DCB108 - 8 CHANNELS CURRENT/VOLTAGE CONVERTER

The module DCB108 has 8channels current to voltage converters. The module is housed in an aluminium box.
DCB108 has on the front panel 4 input connectors and on the backside two output connectors and one power connector. The module use only external power supply +24 Volt.

PERFORMANCE

Number of channels	8
Input connectors	4 pins AMP style (High quality plastics)
Input current	Up 500 nA (optional versions 1 mA, 2 mA)
Output signal	From 0 to 10 Volt
Bandwidth	0,1-1Hz
Input resistance	50 Ω
Linearity (0-500nA)	< 0,05 %
Power supply	+ 24 Volt
Output resistance	50 Ω
Max output current	12 mA

INPUT CONNECTOR

1	IN(even)
2	GND
3	GND
4	IN(odd)

OUTPUT CONNECTOR

Ch1-8: Right connector

1	GND
2	OUT4
3	GND
4	OUT3
5	GND
6	OUT2
7	GND
8	OUT1

Ch1-8: Left connector

1	GND
2	OUT8
3	GND
4	OUT7
5	GND
6	OUT6
7	GND
8	OUT5

POWER CONNECTOR

1	+24V
2	GND(24V)
3	REMOTE ON/OFF
4	EARTH

Note 1: EARTH directly connected to case.
Note 2: REMOTE ON/OFF:
ON 3.0 ... 12 VDC or open circuit;
OFF 0.0 ….1.2 VDC.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	

DIMENSIONS

dimensions	160x165x51,5 mm
weight	0,8 kg

DCB116 - 16 CHANNELS CURRENT/VOLTAGE CONVERTER

The module DCB116 has 16 channels current to voltage converters. The module is housed in an aluminium box.
DCB116 has on the front panel 8 input connectors and on the backside four output connectors and one/two power connector/s. The module use only external power supply +24 Volt.

PERFORMANCE

Number of channels	16
Input connectors	4 pins AMP style (High quality plastics)
Input current	Up 500 nA (optional versions 1 mA, 2 mA)
Output signal	0 - 10 V
Bandwidth	0,1-1Hz
Input resistance	50 Ω
Linearity (0-500nA)	< 0,05 %
Power supply	+ 24 Volt
Output resistance	50 Ω
Max output current	12 mA

INPUT CONNECTOR

1	IN(even)
2	GND
3	GND
4	IN(odd)

OUTPUT CONNECTOR

Ch1-8: Right connector

1	GND
2	OUT4
3	GND
4	OUT3
5	GND
6	OUT2
7	GND
8	OUT1

Ch1-8: Left connector

1	GND
2	OUT8
3	GND
4	OUT7
5	GND
6	OUT6
7	GND
8	OUT5

OUTPUT CONNECTOR

Ch9-16: Right connector

1	GND
2	OUT4
3	GND
4	OUT3
5	GND
6	OUT2
7	GND
8	OUT1

Ch9-16: Left connector

1	GND
2	OUT8
3	GND
4	OUT7
5	GND
6	OUT6
7	GND
8	OUT5

POWER CONNECTOR

1	+24V
2	GND(24V)
3	REMOTE ON/OFF
4	EARTH

Note 1: EARTH directly connected to case.
Note 2: REMOTE ON/OFF:
ON 3.0 ... 12 VDC or open circuit;
OFF 0.0 ….1.2 VDC.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+24	

DIMENSIONS

dimensions	160x165x51,5 mm
weight	0,8 kg

DCB209 - CHARGE SENSITIVE PREAMPLIFIER

The DCB209 module has 8 channels low noise charge sensitive preamplifiers. Fast timing and small size make this preamplifier excellent module for small charged particle detectors or laboratory measurements. The preamplifier is optimized for high input capacitance (up to 1000pF). The module has bias input (up to 3KV) and protection circuit to avoid breakdown of the input of the preamplifier circuit

Model	Charge sensitivity (Si Equivalent)	Max. Noise (Cin=0pF)	Max. Noise (Cin=200pF)
DCB209	Adjustable 45 and 200 mV/MeV	<3,54 KeV (FWHM)	<7800 KeV(FWHM)

PERFORMANCE

Decay time	100 µs - 25 µs
Dynamic input capacitance	Up to 1000 pF
Noise/Input capacitance ratio	< 9 e^-/pF (different for different gain sensitivity)
Integral nonlinearity	0,1% (without termination)
Dynamic output range	± 7,5 V (without termination) ± 3 V (with 100 Ω termination)
Temperature stability	± 100 ppm/C (0 to 50 C)
Rise time	7 ns (Cin = 0pF)
Open loop gain	100,000
HV Bias resistor	N/S
Output resistors	100 Ω
Test Capacitance	Common test pulse for all 8 channels 3,0 pF

INPUT/OUTPUT

Input	Input SHV connector and accepts positive or negative charge signals.
Bias	Voltage can be applied through SHV. The serial resistance between input and bias connectors is 25 MegΩ.
Test	Pulse input connector is BNC type connector. Test capacitance is 3 pF.
Power	Input power through screened cable from spectrometric amplifier, NIM crate power supply or portable power supply
Energy	Output negative or positive linear pulse. BNC connector.

INPUT	OUTPUT	N
Ch1	OUT1	1
Ch2	OUT1	2
Ch3	OUT1	3
Ch4	OUT1	4
Ch5	OUT2	1
Ch6	OUT2	2
Ch7	OUT2	3
Ch8	OUT2	4

POWER SUPPLY REQUIREMENTS

The best solution is alimentation from a NIM standard power supply or special low noise linear power supplies.

P. Voltage (V)	Current/ch (mA)
+12	180
-12	140

Pin out DSUB 9 connector

Pin number	
4	+12 V
9	-12 V
1	Ground
2	Ground

BOX DIMENSIONS

box dimensions	160x165x51,5 mm
weight	1 kg
cable length	3 m

Note: Special shielded cable with LEMO S0 and Dsub9 (3 meter length).

DCB215 - SPECTROMETRIC AMPLIFIER

The desktop module DCB215 is a general-purpose spectrometric amplifier for energy spectroscopy with all types of detectors. The module has unipolar output, low noise, wide-gain range and front-panel selectable time constant.

The Module DCB215 has active filter circuit to define a very symmetrical unipolar output with optimal signal-to-noise ratio over a wide range of time constants. The module DCB215 has good DC stability of the output.

PERFORMANCE

Gain range	Continuously adjustable from 1 to 1500
Pulse shape	Semi-Gaussian on all ranges
Integral nonlinearity	< ±0,05%
Noise equivalent RMS	< 50 µV
Temperature instability	Gain ≤±0,01%/°C, 0 to 50°C. **DC Level ≤±50 µV/C, 0 to 50°C.**
Spectrum broadening	Typically <20% FWHM
Spectrum shift	Peak position shifts typically <0,03%

FRONT PANEL CONTROLS

Fine gain	10-turn precision potentiometer variable gain factor of x0,5 to x1,5
Coarse gain	6-position switch selects feedback resistors for gain factors of 20, 50, 100, 200, 500, and 1k.
Input polarity	Locking toggle switch selects either Pos or Neg input pulse polarity.
Shaping time	6-position switch selects time constants from 0.5, 1, 2, 3, 6, and 10 µs.
Pole zero ADJ (PLR)	Front-panel screwdriver adjustment to compensate for the preamplifier decay time constant from 25 µs to ∞.
Output zero ADJ (Vo)	Front-panel screwdriver adjustment to compensate output offset level, ±100 mV. Two trimmers on back side panel.
Output zero ADJ (BLZ)	Only in optional version one trimmer can be used for adjustment level threshold of automatic base line restorer threshold (BLZ).

INPUT/OUTPUT

Input	Back-panel LEMO connector accepts positive or negative pulses with rise times of 15 to 1000 ns and decay times of 30µs to ∞, Zin ≅1 KΩ dc-coupled; maximum ±10 V; absolute maximum ±12 V
Outputs	UNIPOLAR back-panel LEMO connector with Zo = 100 Ω, short-circuit proof; prompt with full scale linear range of 0 to ±10 V (Zo = 50 Ω - ± 3,49 V, output resistor 93 Ω); active filter shaped; DC-restored; output DC-level adjustable to ±50 mV.
Preamp power	Rear-panel standard D9 female power connector.

POWER SUPPLY REQUIREMENTS

The module has NIM standard power supply.

P. Voltage (V)	Current/ch (mA)
+12	85
-12	85

Pin out DSUB 9 connector

Pin number	
4	+12 Volt
9	-12 Volt
1	Ground
2	Ground

DIMENSIONS

dimensions	160x165x51,5 mm
weight	832 g
cable length	3m

DCB411 - 16 CHANNELS SiPM AMPLIFIER

The desktop module N411 has 16 channels amplifiers specially designed for HAMAMATSU MPPC S10931-050P type detector. The module has two version: with bias and without bias tension. The amplifier has 50 Ω input impedance and amplified output signal can be terminated by 50 Ω. The module has 16 input (isolated connectors - with bias tension) and 16 output LEMO type connectors, power and Bias connectors (with bias tension).

PERFORMANCE

Input impedance	50 Ω
Rise/fall time	25 ns
Gain*	35 dB
Output range voltage	2 V
Termination	50 Ω
Gain temperature coefficient	0,03%/C
Input equivalent Noise	8 µV RMS
Maximum Bias Value	250 VDC
Input, Output connectors	LEMO type connector
Bias connector	Sub D 9 pins

POWER SUPPLY CONNECTOR

Connector type D9 (9 pin)

1	GROUND
2	GROUND
3	+6 V
4	N.C.
5	N.C.
6	N.C.
7	N.C.
8	-12 V
9	N.C.

BIAS VOLTAGE CONNECTOR

Connector type D9 (9 pin)

case	EARTH
2	BIAS 1
3	BIAS 2
4	BIAS 3
5	BIAS 4
6	GND 1
7	GND 2
8	GND 3
9	GND 4

Bias 1 is connected to 13,14,15,16 channels
Bias 2 is connected to 12,11,10,9 channels
Bias 3 is connected to 8,7,6,5 channels
Bias 4 is connected to 4,3,2,1 channels

POWER SUPPLY REQUIREMENTS

The module has two power supply voltages.

P. Voltage (V)	Current/ch (mA)
+6	210
-12	90

DIMENSIONS

dimensions	160x165x51,5 mm
weight	1 kg

DPS100 - DESKTOP POWER SUPPLY

The module DSP100 is desktop power supply that provided high quality ground for preamplifiers, amplifiers and other high sensitive equipment's. The module has all 4 voltages ±24 Volt, ±12 Volt with a maximum output power 50 Watt. This module has under voltage and overload protection. The module can be adapted for a different input AC voltages 100/240 VAC, 50-60 Hz. On the front panel the status of power supply by GREEN/ RED LED is indicated.

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over Load Protection (A)
+24	0,5	1,5
-24	0,5	1,5
+12	1	1,5
-12	1	1,5

MAXIMUM OUTPUT POWER

50W

RIPPLE

Is less then 2 mV (20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C

CONNECTOR PIN OUT

SubD9 female connector pin out:

Pin number	
7	+24 V
6	-24 V
4	+12 V
9	-12 V
1	Ground
2	Ground
3	NC
5	NC
8	NC

DIMENSIONS

dimensions	160x165x51,5 mm
weight	2 kg

DPS101 - DESKTOP POWER SUPPLY

The module DSP101 is desktop power supply. The module has all 4 voltages with a maximum output power 50 Watt. This module has over/under voltage, overload and overheat protection and can be adapted for a different input AC voltages 100/240 VAC, 50-60 Hz. On the front panel the status of power supply by GREEN/ RED LED is indicated.

CONNECTOR PIN OUT

SubD9 female connector pin out:

Pin number	
7	NC
6	NC
4	+12 V
9	-12 V
1	Ground
2	Ground
3	+6 V
5	-6 V
8	NC

DIMENSIONS

dimensions	160x165x51,5 mm
weight	1,5 kg

VOLTAGE OUTPUTS SPECIFICATION

Voltage (V)	Max. Current(A)	Over/Under Protection (%)	Over Load Protection (A)	Over Heat Protection (C)
+6	1,5	130/70	2	75(±3)
-6	1,5	130/70	2	75(±3)
+12	1	130/70	1,5	75(±3)
-12	1	130/70	1,5	75(±3)

MAXIMUM OUTPUT POWER

50W

RIPPLE IS LESS

Is less then 2 mV (20 MHz Bandwidth)

STORAGE TEMPERATURE

-10 +70C

NAICAM

Naicam s.r.l.
Via Aosta 14, 35142, Padua, Italy
+39 049 20 50 437
info@naicam-tech.com
http://www.naicam-tech.com