Technical Information Manual

Revision n. 2
19 June 2014

MOD. A422 – A422 A

CHARGE SENSITIVE PRE-AMPLIFIERS

CAEN will repair or replace any product within the guarantee period if the Guarantor declares that the product is defective due to workmanship or materials and has not been caused by mishandling, negligence on behalf of the User, accident or any abnormal conditions or operations.

CAEN declines all responsibility for damages or injuries caused by an improper use of the Modules due to negligence on behalf of the User. It is strongly recommended to read thoroughly the CAEN User's Manual before any kind of operation.

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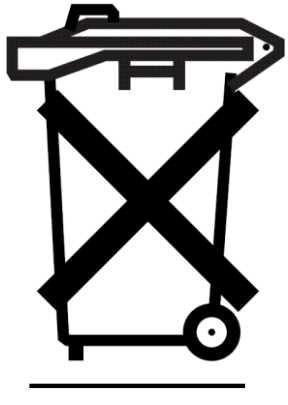
CAEN reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.

Disposal of the Product

The product must never be dumped in the Municipal Waste. Please check your local regulations for disposal of electronics products.



MADE IN ITALY : We stress the fact that all the boards are made in Italy because in this globalized world, where getting the lowest possible price for products sometimes translates into poor pay and working conditions for the people who make them, at least you know that who made your board was reasonably paid and worked in a safe environment. (this obviously applies only to the boards marked "MADE IN ITALY", we can not attest to the manufacturing process of "third party" boards).

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1. Introduction

Fig. 1.1 – Mod. A422 A Charge Sensitive Preamplifier

The Mod. A422 and A422 A are charge sensitive preamplifiers designed for optimum performances with semiconductor detectors, in particular when the charge division is required, as in position-sensitive silicon detectors.

The Mod. A422 is implemented on a 14-pin single in-line package hybrid, the Mod. A422 A is housed in an alloy box with I/O connectors.

The modules accept both positive and negative charge pulses from any type of detector and provide an energy output and a fast-timing output.

The modules feature also a test input to accept positive or negative input for calibration purposes.

A 8-slot motherboard, the Mod. A658 A, is also available for the A422; it can be purchased also provided with LEMO 00 type I/O connectors (Mod. A658).

Table 1.1: Available items

Code	Item	Description
WA422AXAAAAA	A422A	Charge Sensitive Preamplifier with timing (Box)
WA422XAAAAAA	A422	Charge Sensitive Preamplifier with timing (Hybrid)
WA658AXAAAAA	A658A	A422 Mother Board (Without connectors)
WA658XAAAAAA	A658	A422 Mother Board (With connectors)

2. Technical specifications

2.1 Packaging[1]

The Mod. A422 is implemented on a single in-line package hybrid, with 14 pins for the power lines and the I/O connections.

The Mod. A422 A is housed in an alloy box, provided with BNC, SHV and LEMO 00 I/O connectors and a 9-pin Cannon connector for the power lines.

The Mod. A658/A658 A motherboards can house up to 8 A422 each; the A658 is provided with LEMO 00 for all the I/O signals and a pin-strip for the power lines, the A658 A has ordinary pad-contacts for all the signals.

2.2 Power requirements

Table 2.1: Power requirements

Power supply	*A422*	*A422 A*
+12 V	-	15 mA
-12 V	-	15 mA
+24 V	30 mA	30 mA
-24 V	20 mA	5 mA

2.3 Safety and operation requirements

The input circuit includes a protection network to prevent damage to the input circuit from transient generated in the IN/DETECTOR and HV network: this protection circuit provides a limited amount of protection against transients, for this reason, care must be taken in the use of A422x with high voltage detectors.

Please remember to:

- Turn down gradually bias voltage prior to connect or disconnect preamp input
- Avoid fast changes in bias voltage
- Avoid Detector breakdown or discharge

[1] Refer to § 2.4 for all the components location.

2.4 Input/Output connections location[2]

Switch Configuration			
Sensitivity (mV/MeV)	SW1/A	SW1/B	SW2
90	OFF	OFF	ON
45	ON	OFF	ON
1	ON	ON	OFF

The switches appear as soldering pads:
- switch OFF means no soldering;
- switch ON requires a drop of lead.

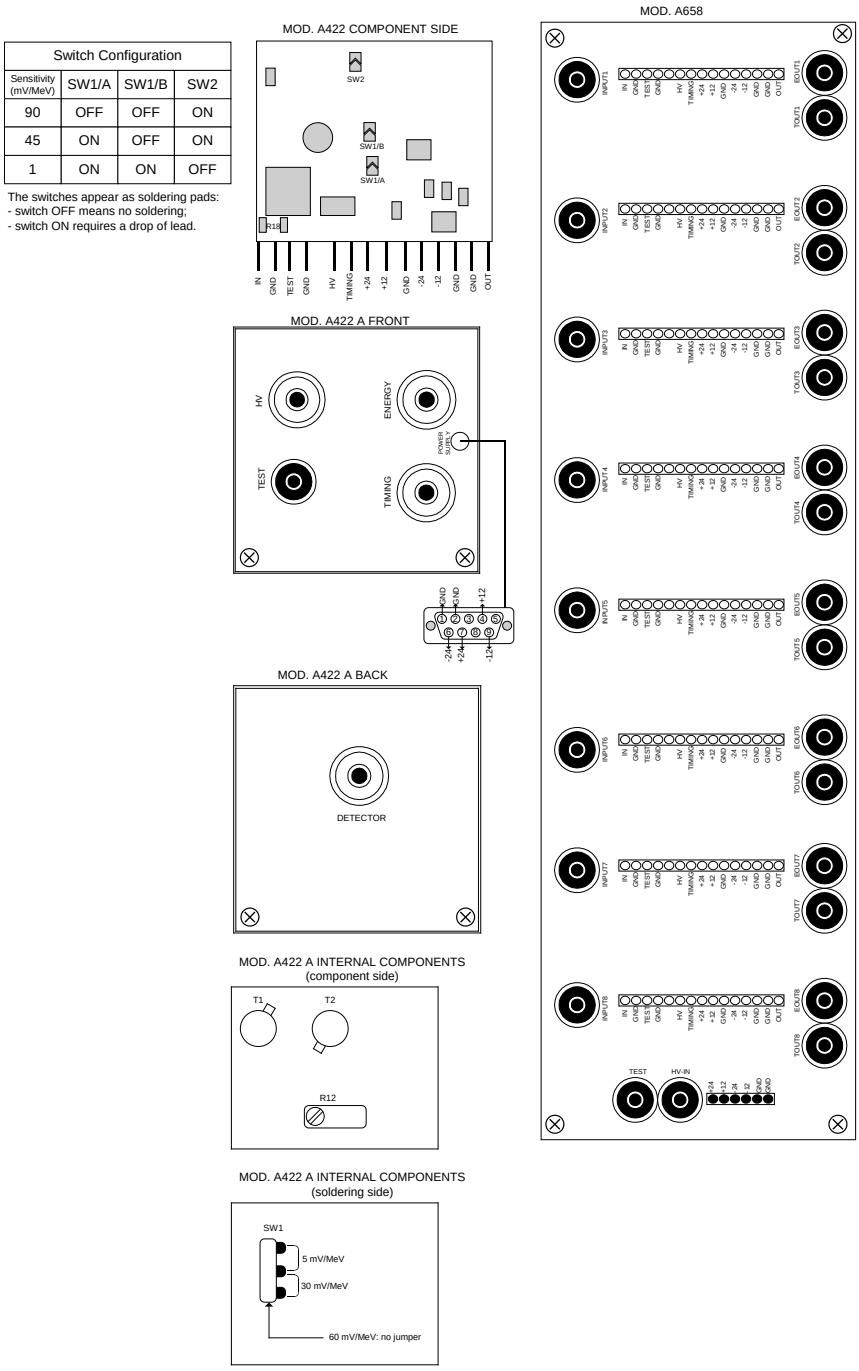

Fig. 2.1 – Mod. A422, A422 A and A658 input and output connections

[2] The A422 ±12 V power pins are actually "test points" and must not be fed with external voltage.

2.5 Technical specification table

Table 2.2: Mod. A422/A422 A Technical Features

Model		A422	A422 A[3]
Packaging		Single in-line package hybrid (38 mm x 33 mm x 7 mm); pin pitch: 2.54 mm; weight: 9.8 g	Alloy box (100 mm x 50 mm x 50 mm)
Input signals	IN/ DETECTOR	Accepts positive and negative charge pulses from semiconductor detectors and supplies the HV bias to the detector itself	SHV; accepts positive and negative charge pulses from semiconductor detectors and supplies the HV bias to the detector itself
	HV	Up to 1 kV (positive or negative) for the detector bias. 101 MΩ resistance in series (2 MΩ selectable by short circuiting R18, refer to Fig. 2.1)	SHV; up to 5 kV (positive or negative) for the detector bias. 101 MΩ resistance in series
	TEST	Positive or negative inputs to calibrate the gain of the detector input via Ctest = 10 pF	LEMO 00; positive or negative inputs to calibrate the gain of the detector input via Ctest = 10 pF
Output signals	OUT/ ENERGY	Inverting unipolar voltage pulse proportional in peak amplitude to the charge input. 20 ns minimum rise time (Csource = 0 pF, sensitivity = 90 mV/MeV)	BNC; inverting unipolar voltage pulse proportional in peak amplitude to the charge input. DC offset adjustable to zero via the internal R12 trimmer (see § 2.3). 50 ns minimum rise time, 300 µs decay time, ±8 V max. peak amplitude
	TIMING	Inverting unipolar fast voltage pulse. 5 ns minimum rise time. Requires a 50 Ω termination whether it is used or not.	BNC; inverting unipolar fast voltage pulse. 14 ns minimum rise time. Requires a 50 Ω termination whether it is used or not.
Integral non linearity		<± 0.05% (0 ÷ ±8 V peak output)	<± 0.045% (0 ÷ ±8 V peak output)
Gain drift		< ±50 ppm/°C (0 to 50°C)	< ±50 ppm/°C (0 to 50°C)
Energy sensitivity		1/45/90 mV/MeV selectable via internal shorts (see § 2.3)	5/30/60 mV/MeV selectable via internal jumpers (see § 2.3)

[3] Output tested by using an input pulse with 50 ns rise time and a 1000 µs fall time.

2.6 Test results

Table 2.3: Mod. A422/A422 A Test results

Detector Capacitance (pF)	A422		A422 A		
	Sensitivity (mV/MeV)	*Noise FWHM (KeV)*	*Sensitivity (mV/MeV)*	*Noise FWHM (KeV)*	*Energy Out rise time (ns)*
0	90	1.2	60	2	75
	45	2.0	30	2	65
	1	54	5	4	50
10	90	1.35	60	N.A.	N.A.
	45	2.3	30	N.A.	N.A.
	1	60	5	N.A.	N.A.
100	90	2.6	60	N.A.	N.A.
	45	4.8	30	N.A.	N.A.
	1	105	5	N.A.	N.A.
470	90	9.8	60	12	400
	45	18	30	12	190
	1	255	5	4.5	100
1000	90	N.A.	60	17.5	820
	45	N.A.	30	17.5	380
	1	N.A.	5	5	200