4 channel IC PLUS Electronics unit

YMCS0012

Operating and Service Manual

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2 Warranty

1. OXFORD DANFYSIK warrants that the Equipment shall be free from defects by reason of faulty design, workmanship or materials and that if within the guarantee period set out in sub-clause 3 the Equipment proves defective for such reason OXFORD DANFYSIK shall adjust, repair or replace it as it sees fit free of charge, provided that:

   1.1. The Equipment has been used solely for the purpose for which OXFORD DANFYSIK understands it is to be used and in accordance with the operating instructions;

   1.2. The defect has not been caused by fire, accident, misuse, neglect, incorrect installation by the customer, its customers, agents or servants or unauthorised repair or maintenance or by use of sub-standard consumables;

   1.3. The defect has not arisen from any design, specification, component or material supplied by the customer.

   1.4. No part of the Equipment has been replaced with a part not supplied by OXFORD DANFYSIK or approved as suitable by it;

   1.5. Payment in full or all sums due in respect of the Equipment has been made;

   1.6. The customer shall be liable for any costs incurred by OXFORD DANFYSIK in responding to claims made in respect of erroneous results caused by operator error or incorrect application.

   1.7. Upon the customer making a claim under sub-clause 1 it shall accord sufficient access to the Equipment to enable OXFORD DANFYSIK staff to inspect and adjust, repair, remove or replace the Equipment.

   1.8. OXFORD DANFYSIK will co-operate with the customer in the assessment of reported defects by the final decision regarding the applicability of this guarantee shall rest with OXFORD DANFYSIK.

2. OXFORD DANFYSIK shall decide if the Equipment should be repaired pursuant to sub-clause 1 at its site or returned.

3. The applicable guarantee period shall be 12 months after delivery save where the Equipment is installed and/or commissioned by or under the supervision of OXFORD DANFYSIK in which case it shall be 12 months from the date of the installation certificate or 18 months after the date of delivery, whichever is the earlier.

3 OXFORD DANFYSIK Software Licence Agreement and Limited Warranty

3.1 Licence Agreement

As part of the sales package for the OXFORD DANFYSIK IC PLUS Electronics unit, the customer will receive from OXFORD DANFYSIK a licence to use the accompanying software subject to the following terms and conditions;

- The sofware package may be used, without time limit, on one personal computer or workstation
- A separate licence agreement and fee is required for each additional personal computer or workstation on which the package is used.
- The software package may not be duplicated or copied except for archive purposes or to replace defective media, and each copy made must bear the copyright notices carried on the original. The software package may not be transferred in any event to a third party unless written consent is obtained from OXFORD DANFYSIK.
- This software package is protected under copyright law and OXFORD DANFYSIK reserves the right to terminat this licence upon any violation of these laws. In the event of termination, the customer will be required to return all copies of the software package to OXFORD DANFYSIK.
- Some parts of the software package are specially protected in order to be read or modified only by OXFORD DANFYSIK engineers. Under no circumstances will OXFORD DANFYSIK be under obligation to disclose information relating to these parts of the software.

3.2 Limited Warranty

The standard software is fully tested and under normal use is guaranteed to be free of bugs and defects on IC PLUS Electronics units.

The insurance is not valid for special software adaptations on non-standard electronics units. In this case, OXFORD DANFYSIK agrees to correct at its own expense, during a one year warranty period, any defect arising during the use of the modified software package.

In no event will OXFORD DANFYSIK be liable for any direct or indirect incidental or consequential damages arising from a software failure.

4 Key Features

The **4 channel IC PLUS ELECTRONICS** module offers maximum low current measurement stability and permits remote control and measurements through a RS232 communication port. It is fully compatible with any **IC PLUS** Ionization chamber intensity monitors.

It features current measurement ability on 4 input channels from **35 pA to 0.7 mA** in 6 ranges:

- Range 1: 35 pA to 350 nA
- Range 2: 70 pA to 700 nA
- Range 3: 140 pA to 1.4 µA
- Range 4: 0.7 nA to 7 µA
- Range 5: 7 nA to 70 µA
- Range 6: 70 nA to 0.7 mA

with 2 analogue outputs per channel:

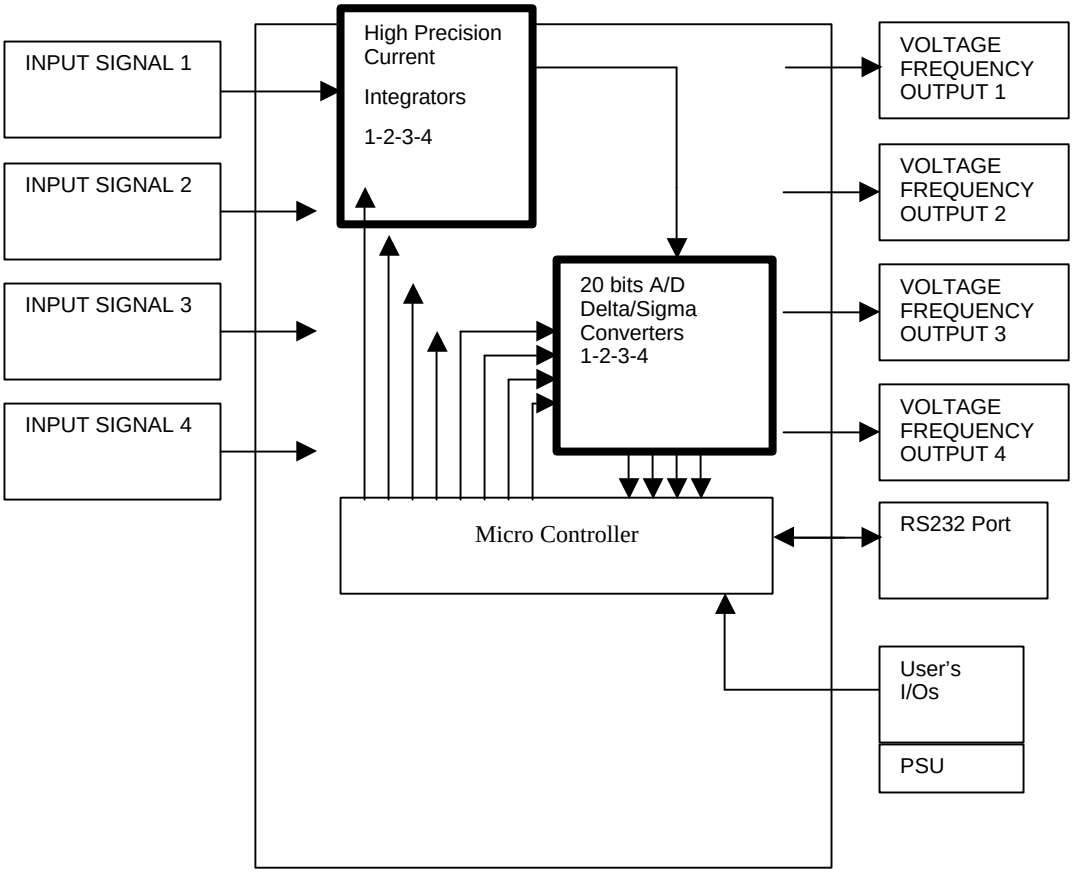
- voltage output from 1 mV to 10 V
- frequency output from to 0 to 1 MHz

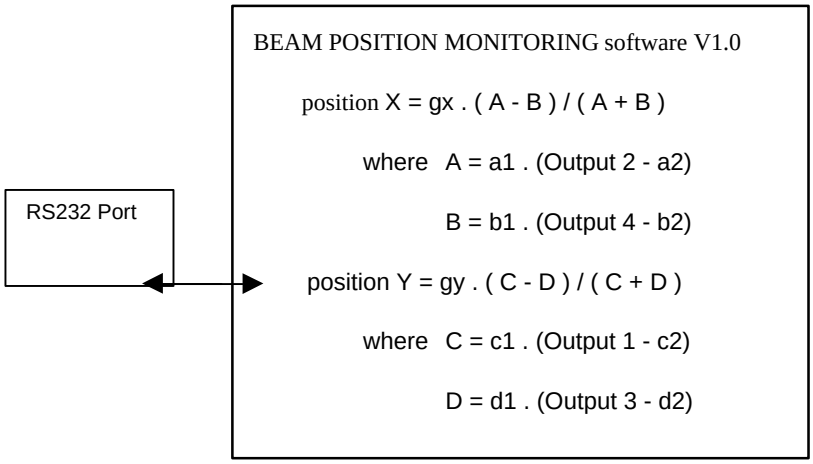
It operates in REMOTE mode (using a RS232 link to a computer), with the address of the device to be selected from 0 to 15 using 4 address micro-switches available inside the device.

A user-friendly Windows™ software is provided for easy remote control.

5 Detailed Specifications

5.1 Block diagram





5.2 Preamplifiers

- Input impedance: 1000 GΩ // 1 pF. Input is protected against High Voltage breakdown through ionization chamber electrodes
- Typical input bias current: 20 fA below 0°C, 100 fA at 25°C, 300 fA at 40°C
- Typical input offset current temperature drift : 6 fA / °C between 0 and 30°C
- Low frequency (0.1 to 10 Hz) current input noise: 10 fA peak to peak max on range 1 (highest gain range)
- Input offset voltage average drift: 1 µV / °C typical, 5 µV / °C max
- Long term offset stability: 15 µV / month
- Integration capacitor: 100 pF ± 0.5 %, temperature coefficient -25 ppm / °C typical
- Integration time:

  Range 1: 200 ms

  Range 2: 100 ms

  Range 3: 50 ms

  Range 4: 5 ms

  Range 5: 1 ms

  Range 6: 100 µs

- Full scale output voltage : 10 volts, short circuit protected.

5.3 Voltage to Frequency Converter

- Non-linearity: 0.1% typical (100Hz to 1 MHz)
- Temperature drift: ± 150 ppm / °C typical at 100 kHz
- Output impedance: 50 Ω, short circuit protected.

5.4 RS 232 Communication Port

- Transfer rate: 19200 bauds
- Enables daisy-chain connection of up to 16 modules
- Enables remote configuration, measurement retrieval and user I/Os control

5.5 User Inputs & Outputs

- Three 50 KΩ impedance inputs (default logic value = 1 if input NC) suitable for:

  - contact reading (must be refered to 0 V): CLOSE = logic level zero

  - logic level voltage reading: 0 V for logic 0, 3 V min for logic 1

- Three PNP open collector outputs: 500 mA, one lead connected to ground. Common supply of 30 VDC max to be injected from outside the module (see section 7.6 for details).

5.6 Power requirements

24 Volts DC nom (23 V min - 27 V max), 150 mA nom.

6 Connectors Description

6.1 Input Currents

4 standard BNC sockets

6.2 High Voltage Supply (optional)

1 SHV BNC socket

6.3 Preamplifiers outputs

4 LEMO ERN00 sockets: 1 per channel

6.4 Voltage to Frequency Converter outputs

4 LEMO ERN00 sockets: 1 per channel

6.5 RS 232 Communication Port

9-pin male SUB-D socket (see section 8 for more details):

Pin2: RX from Computer - Pin3: TX to Computer

Pin7: RX from other unit - Pin8: TX to other unit

Pin5 is 0V (= common = ground)

6.6 User Inputs & Outputs - 24 VDC Power supply

9-pin female SUB-D socket:

Pin5: 24 VDC supply input - Pin9: 0V (= common = ground)

Pin4: User Output 1 - Pin3: User Output 2 - Pin2: User Output 3

Pin1: DC positive supply (30 V max) for open collector User Outputs supply only

Pin8: User Input 1 - Pin7: User Input 2 - Pin6: User Input 3

(*caution:* when User Inputs are not connected, internal pull-up resistors set their default digital values to 1)

7 RS232 Remote Control

7.1 Introduction

The 4 channel IC PLUS Electronics units has to be remotely controlled by a host computer (PC or workstation) through a serial link (RS 232). A network of up to 16 units can be built, requiring only one serial port on the host computer.

The communication protocol is a subset of the SCPI (Standard Commands for Programmable Instruments) language.

7.2 Description

The 4 channel IC PLUS Electronics unit holds a C programmable sub-miniature controller. The program is factory stored in its FLASH Eprom. This program recognizes commands coming from a host computer and is therefore able to drive the unit:

- by controlling its two configuration parameters: High Voltage and Selected Range,
- by enabling Input Currents values retrieval; they are encoded on 20 data bits, refered to a Full Scale value of 1048576,
- by enabling remote control of three digital User Inputs and three digital User Outputs,
- by resetting the unit to its default configuration parameters:

  - Selected Range = 6

  - User Outputs = 0

  (the unit is reset at power on)

Every unit has an address between 0 and 15 (4-bit encoding), selected by DIP switches inside the device, with weights 8, 4, 2 and 1 from left to right. Lower position of each switch is zero. For example, set the first and the third switches (from left side on) to select address 10.

7.3 Commands list

***RSTad**	reset the unit
:CONFad:CURR:RANG x	set Input Range to x
:CONFad:CURR:RANG?	read Input Range
:CONFad:AVGCURR x	the input Current values will be averaged on x measurements (1<x<100)
:CONFad:WDWCURR x	the input Current values will be filtered by means of a moving average filter using a first-in, first-out stack of x measurements (1<x<100)
:CONFad:SINGLE	the input Current values will not be filtered
:READad:CURRx?	read Input Current value (Full Scale = 1048576) on channel x (x =1,2,3 or 4)
:READad:CURRALL?	read the four Input Current values in a row delimited with a space character (Full Scale = 1048576)
:READad:POSX?	read the X position calculated by: X = GX . (A - B) / (A + B) A = A1 . (CURR1 - A2) B = B1 . (CURR2 - B2)
:CONFad:GX x	set GX to x value (x : float)
:CONFad:GX?	read GX value (float)
:CONFad:A1 x	set A1 to x value (x : float)
:CONFad:A1?	read A1 value (float)
:CONFad:A2 x	set A2 to x value (x : long)
:CONFad:A2?	read A2 value (long)
:CONFad:B1 x	set B1 to x value (x : float)
:CONFad:B1?	read B1 value (float)
:CONFad:B2 x	set B2 to x value (x : long)
:CONFad:B2?	read B2 value (long)
:READad:POSY?	read the Y position calculated by: Y = GY . (C - D) / (C + D) C = C1 . (CURR3 - C2) D = D1 . (CURR4 - D2)

:CONFad:GY x	set GY to x value (x : float)
:CONFad:GY?	read GY value (float)
:CONFad:C1 x	set C1 to x value (x : float)
:CONFad:C1?	read C1 value (float)
:CONFad:C2 x	set C2 to x value (x : long)
:CONFad:C2?	read C2 value (long)
:CONFad:D1 x	set D1 to x value (x : float)
:CONFad:D1?	read D1 value (float)
:CONFad:D2 x	set D2 to x value (x : long)
:CONFad:D2?	read D2 value (long)
:READad:POSXY?	read the X and Y position values in a row delimited with a space character
:SENSad:STATx?	read User input x (x = 0,1 or 2)
:SOURad:STATx y	set User Output x (x = 0,1 or 2) to y (y = 0 or 1)
:SOURad:STATx?	read User Output x (x = 0,1 or 2)

ad (unit address): an integer value from 0 to 15

Values range for x parameter:

range	integer from 1 (FS = 350 nA) to 6 (FS = 0.7 mA)
Input channel	integer from 1 to 4
User I/Os	integer from 0 to 2

Examples

:READ0:CURR3? will return channel 3 Input Current value of address 0 unit

Warning: The program waits for strings ending with a special character (Line Feed: ASCII code = 10). This character must be transmitted by the host computer. When the program returns a value, it also sends this character after the value.

Every time this special character is acknowledged, the program sends a single character (ASCII code = 6) to the host computer.

7.4 Syntax rules

Upper and lower case characters are accepted.

7.5 Connecting with a host Computer

This unit can be connected to a RS232 port of a host computer. Only three wires are needed. See section 7.5 for connections description.

If the host computer is a PC, pins 4, 6 and 8 must be tied together on the 9-pin SUB-D connector of the PC side of the cable.

The following protocol is supported by the OXFORD DANFYSIK unit:

- baud rate 19200
- data format 8 bits ASCII data and 1 stop bit
- parity none

CTS, RTS signals are disabled.

The DEMO program provided by OXFORD DANFYSIK on the floppy disc supplied with the 4 channel IC PLUS Electronics unit runs under Windows™ on IBM PC's or compatible. It is a demonstration of communication with the unit.

7.6 Network configuration

These units are designed to operate in a network made of several IC PLUS Electronics units and/or Cyberstar X1000 pulse processing units. Up to 16 units of both types can be linked together using only one RS232 port of the host computer.

When a unit is linked to the network, its address must not be already in use by any of the other units.

The wiring for a network (including two units) connected to a PC, is detailed hereafter.

PC connector	cable 1	Unit A connector	cable 2	Unit B connector
2 (RX)	}- - - -{	3 (TX 0)		
3 (TX)	}- - - -{	2 (RX 0)		
5 (ground)	}- - - -{	5 (ground)	}- - - -{	5 (ground)
		7 (RX 1)	}- - - -{	3 (TX 0)
		8 (TX 1)	}- - - -{	2 (RX 0)

When the unit B is disconnected, pins 2 and 3 of the connector located at the end of cable 2 must be grounded with a 1000 ohms resistor.

When a unit is in local mode, it does not stop communication with other units in remote mode.

8 Software description

8.1 Software installation with Windows™

1) Insert the floppy disk IC PLUS QUAD CONTROL in drive A:

2) Click on the **Start** button and select **Run**.

3) Type **a:setup** and click on the **OK** button.

4) The default directory is **C:\Demo,** you can not change it. Then click on the **Ok** button.

5) After a while you will get the following message : Setup has installed the software successfully and added the application(s) to the Program Manager. Click on the **OK** button.

6) Insert the floppy disk IC PLUS QUAD BPM in drive A:

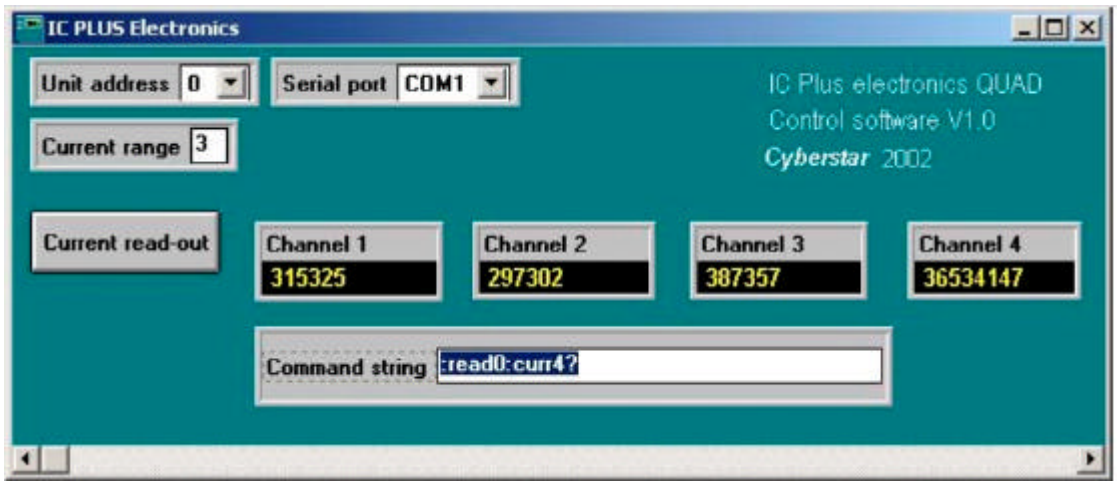
7) Click on the **Start** button and select **Run**.

8) Type **a:setup** and click on the **OK** button.

9) The default directory is **C:\Demo,** you can not change it. Then click on the **Ok** button.

10) After a while you will get the following message : Setup has installed the software successfully and added the application(s) to the Program Manager. Click on the **OK** button.

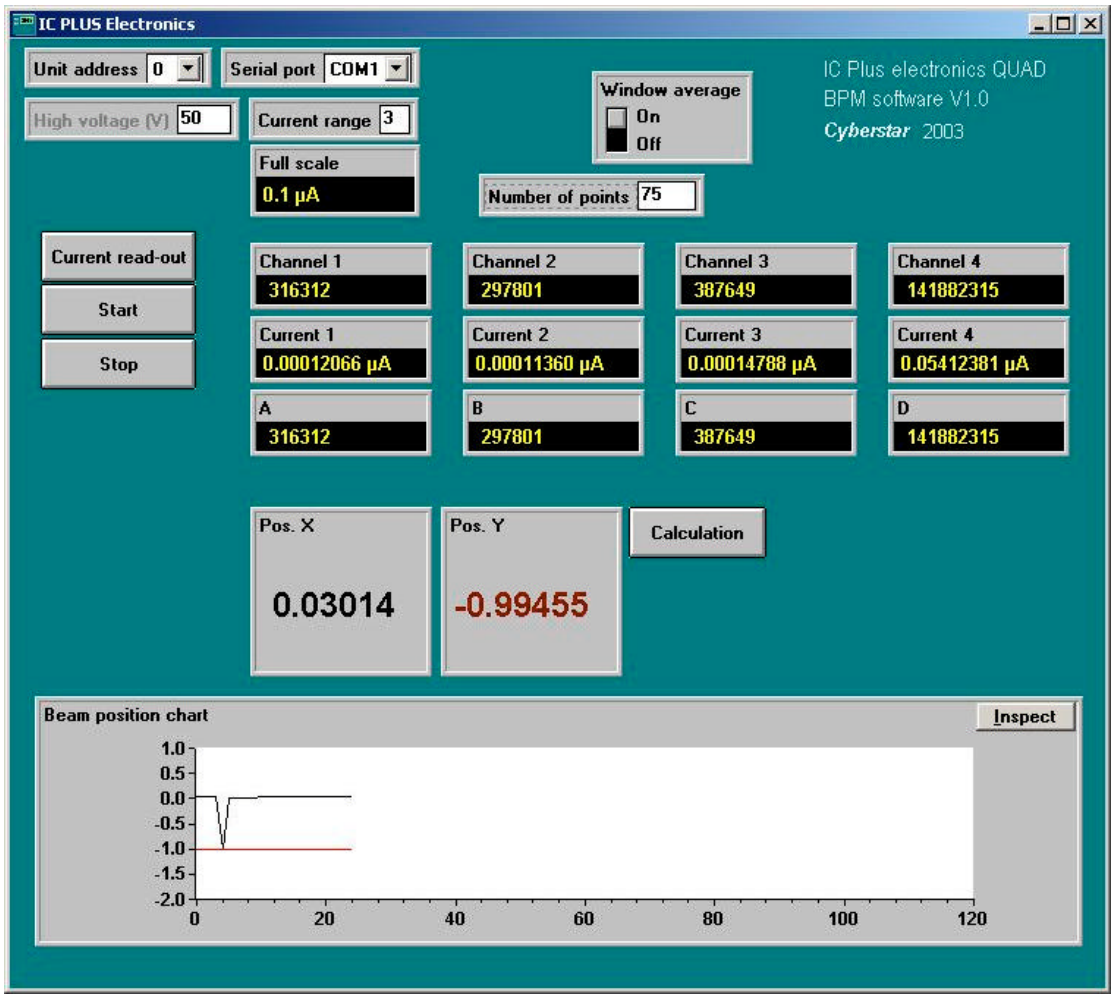
8.2 IC PLUS QUAD CONTROL software V1.0



This program allows to control the IC plus Quad in the remote mode by means of the RS232 communication port using a Windows^{tm} interface (see above).

To run this program click twice on the "IC plus quad control" icon.

8.3 BEAM POSITION MONITORING software V1.0



This program allows to control the IC plus Quad in the remote mode by means of the RS232 communication port and performs beam position monitoring.

To run this program click twice on the "IC plus quad BPM" icon.

The button "Current read-out" displays the current measurements obtained simultaneously on the four channels.

It is possible to perform averaging on N measurements by clicking on the button “Avering/On” and select the number of points N in the input box “Number of points”.

It is possible to use a moving average filter on N measurements by clicking on the button “Window average/On” and select the number of points N in the input box “Number of points” (see page 17).

In any case the number N of measurements to be filtered must be comprised between 1 and 100.

The beam position monitoring is started or stopped by clicking on the button "Start" and "Stop" (see page 17).

A graph showing the beam position as function of the time is displayed (see page 17).

The positions X and Y are calculated as follows:

X = gx . (A - B) / (A + B)

A = a1 . (CURR2 - a2)

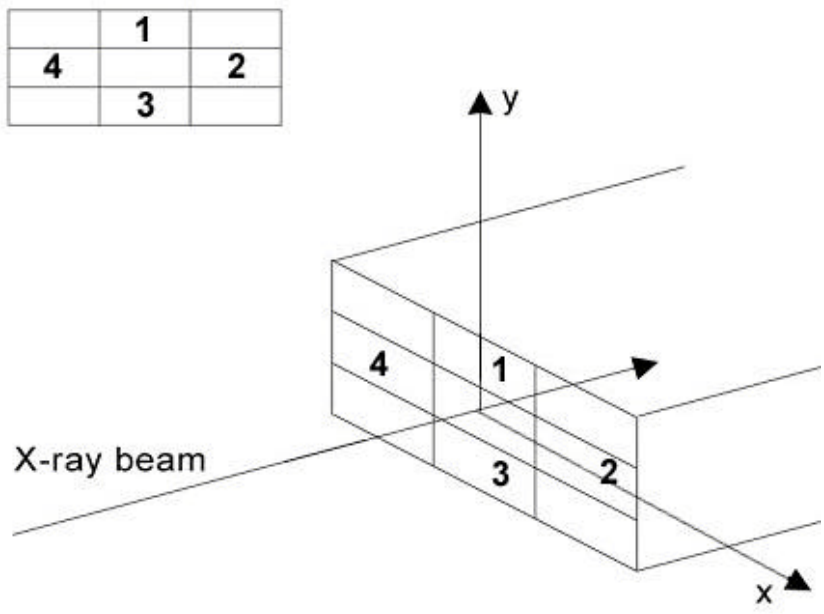
B = b1 . (CURR4 - b2)

Y = gy . (C - D) / (C + D)

C = c1 . (CURR1 - c2)

D = d1 . (CURR3 - d2)

CURR 1-4 being the current measurements obtained on the four channels corresponding to the 4 sensors mounted as depicted herebelow:



All the coefficient parameters gx, gy, a1, a2, b1, b2, c1, c2, d1, d2 can be modified within the window "Calculation" (see below). The latter is opened by clicking on the button "Calculation" (see page 17).