Pulse Counting Unit

PCU for SEM


Version 1.0

9. September 1997
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Please note: Some components described in this manual may be optional. The delivery volume depends on the ordered configuration.

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Channeltron® is a registered trademark of Galileo Electro-Optics Corporation. Other product names mentioned herein may also be trademarks and/or registered trademarks of their respective companies.

Please note: This documentation is available in English only.

Attention: Please read the safety information on pages 7 and 8 before using the instrument.

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<tr>
<td>SEM/SAM User's Guide</td>
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<tr>
<td>Instruction Manual for Model 97 SED Preamplifier by PHI</td>
</tr>
<tr>
<td>SPECTRA 6.xx</td>
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Conditions of CE Compliance

OMICRON instruments are designed for use in an indoor laboratory environment. For further specification of environmental requirements and proper use please refer to your quotation and the product related documentation (i.e. all manuals, see individual packing list).

The OMICRON Pulse Counting Unit for SEM complies with CE directives as stated in your individual delivery documentation if used unaltered and according to the guidelines in the relevant manuals.

Limits of CE Compliance

This compliance stays valid if repair work is performed according to the guidelines in the relevant manual and using original OMICRON spare parts and replacements.

This compliance also stays valid if original OMICRON upgrades or extensions are installed to original OMICRON systems following the attached installation guidelines.

Exceptions

Omicron cannot guarantee compliance with CE directives for components in case of

- changes to the instrument not authorised by OMICRON, e.g. modifications, add-on's, or the addition of circuit boards or interfaces to computers supplied by OMICRON.

The customer is responsible for CE compliance of entire experimental setups according to the relevant CE directives in case of

- installation of OMICRON components to an on-site system or device (e.g. vacuum vessel),
- installation of OMICRON supplied circuit boards to an on-site computer,
- alterations and additions to the experimental setup not explicitly approved by OMICRON

even if performed by an OMICRON service representative.

Spare Parts

Omicron spare parts, accessories and replacements are not individually CE labelled since they can only be used in conjunction with other pieces of equipment.
1. Introduction

The **Pulse Counting Unit for SEM** consists of a rack unit "Pulse Counting Control" equipped with a Channeltron® HV supply and a Channeltron® bias supply, including mains and DC voltages supply for the Channeltron® preamplifier. It is intended for use with an OMICRON SEM package.

The **Pulse Counting Unit for SEM** must always be used in combination with the secondary electron detection part (SED) of an OMICRON SEM package consisting of:

1. Flange mounted Channeltron®
2. Preamplifier
3. Pulse Counting Unit for SEM

The **Pulse Counting Unit for SEM** shall always be used:

- with original cable sets which are explicitly specified for this purpose
- with all cabling connected
- with all electronics equipment switched on
- in an indoor research laboratory environment
- by personnel qualified for operation of delicate scientific equipment
- in accordance with all related manuals.

**Warning: Lethal Voltages!!**

Adjustments and fault finding measurements as well as installation procedures and repair work may only be carried out by authorised personnel qualified to handle lethal voltages.

**Attention:** Please read the safety information in the relevant manual(s) before using the instrument.

The pulse counting control unit (PCU) provides Channeltron® HV supplies, Channeltron® bias supplies and preamplifier operating voltages. The basic frame (power module) provides electrical supplies and logical signals for up to four units. Blind front panels are fitted in place of missing modules. For secondary electron detection in SEM the related Channeltron® is working in analogue mode. The gain is set by the Channeltron® HV sub-unit.
Figure 1. Wiring diagram for secondary electron detection using the PCU in SEM configuration.
Safety Information

**Important:**

- Please read this manual and the safety information in all related manuals before installing or using the electronics equipment.
- The safety notes and regulations given in this and related documentation have to be observed at all times.
- Check for correct mains voltage before connecting any equipment.
- Do not cover any ventilation slits/holes so as to avoid overheating.
- The Pulse Counting Unit may only be handled by authorised personnel.

**Warning: Lethal Voltages!!**

Adjustments and fault finding measurements may only be carried out by authorised personnel qualified to handle lethal voltages.

- Lethal voltages are present at the MHV sockets during operation.
- Lethal voltages are present inside the Pulse Counting Unit.

**Always**

- All connectors which were originally supplied with fixing screws must always be used with their fixing screws attached and tightly secured.
- Always disconnect the mains supplies of all electrically connected units before
  - opening the vacuum chamber or a control unit case,
  - before touching any cable cores or open connectors,
  - before touching any part of the in-vacuum components.
- Wait for at least 15 minutes after the unit has been unplugged for any stored energy to discharge.
This product is only to be used:

- indoors, in laboratories meeting the following requirements:
  - altitude up to 2000 m,
  - temperatures between 5°C / 41°F and 40°C / 104°F (specifications guaranteed between 20°C / 68°F and 25°C / 77°F)
  - relative humidity less than 80% for temperatures up to 31°C / 88°F (decreasing linearly to 50% relative humidity at 40°C / 104°F)
  - pollution degree 1 or better (according to IEC 664),
  - overvoltage category II or better (according to IEC 664)
  - mains supply voltage fluctuations not to exceed ±10% of the nominal voltage
2. Mechanical

The PCU should be fitted in a 19” rack far from sources of electronic noise. When rack-mounting, leave one unit free above and below the PCU for ventilation.

Figure 2: Front panel of the pulse counting unit, SEM configuration.

Figure 3: Back panel of the pulse counting unit, SEM configuration.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>19 inch rack mount case, width 81 U (431 mm), height 3 U (133.3 mm), depth 425 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>7 kg</td>
</tr>
</tbody>
</table>
3. **Power Module**

The power module receives the mains input and supplies the other modules with specific operating voltages according to their need.

![Power Module Diagram]

**Figure 4.** The power module front and back panel.

<table>
<thead>
<tr>
<th>Front Panel</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAINS ON</td>
<td>Push button to switch the control unit on or off, lights up when the unit is on. Press again to switch unit off.</td>
</tr>
</tbody>
</table>

**Before pressing MAINS ON** complete all wiring between the electronics and the analyser according to figure 1.
This unit is supplied with a 3-pin standard European mains socket for ac input of 100/115/200/230 volts ±8% and 50 or 60 Hz, set to customer specification. The wire insulations of the standard 3-lead mains cable are coloured in accordance with the following code:

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>Live</td>
</tr>
<tr>
<td>Green/Yellow</td>
<td>Earth</td>
</tr>
<tr>
<td>Blue</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

Mains fuse(s): 5 mm ∅, 20 mm long

Use 2 x 0.4 A (slow) for 200-230 V ac
2 x 0.8 A (slow) for 100-115 V ac

Maximum power consumption: 75 watts.

To change the fuse:
- disconnect mains
- unscrew the fuse holder(s) next to the mains socket
- replace the fuse as indicated above
- re-fit the fuse holder(s).

Power supply for the modules, to be inter-connected using the supplied 25-lead ribbon cable. It is very important to tighten the fixing screws of the cable plugs to ensure proper earth (ground) connection and to avoid damage due to HV flashovers.

These sockets are not used in SEM configuration.
4. Channeltron® HV Module

The Channeltron® HV module supplies the operating power for the Channeltron®.

Figure 5. The Channeltron® HV module front and back panel.

<table>
<thead>
<tr>
<th>Front Panel</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="ON HV" /></td>
<td>Push-button to switch Channeltron® high voltage on/off. For SEM operation this module is jumpered to work without an external SYNC signal. To save Channeltron® life time the HV should only be switched on if needed.</td>
</tr>
<tr>
<td><img src="image" alt="Potentiometer" /></td>
<td>Ten turn potentiometer for the Channeltron® operation voltage. The Channeltron® voltage is designed to run channeltrons with a resistance of ( \approx 100 , \text{M} \Omega ). The maximum current load is 40 ( \mu \text{A} ). The maximum voltage is 4 kV.</td>
</tr>
<tr>
<td><img src="image" alt="Meter" /></td>
<td>The meter does not measure the actual output voltage, it only indicates the set voltage. If there is a short inside the Channeltron® wiring, this meter will not indicate a fault.</td>
</tr>
<tr>
<td>Back Panel</td>
<td>Function</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td><img src="image" alt="PREAMP. POWER" /></td>
<td><strong>This socket is not used in SEM configuration.</strong></td>
</tr>
<tr>
<td><img src="image" alt="MOU LDE POWER" /></td>
<td>Power supply for the modules, to be inter-connected using the supplied 25-lead ribbon cable. It is very important to tighten the fixing screws of the cable plugs to ensure proper earth (ground) connection and to avoid damage due to HV flashovers.</td>
</tr>
<tr>
<td><img src="image" alt="CH+" /></td>
<td>This switch is not used in SEM configuration.</td>
</tr>
<tr>
<td><img src="image" alt="CH-" /></td>
<td>Positive supply voltage for channeltron.</td>
</tr>
<tr>
<td><img src="image" alt="EKin" /></td>
<td>Negative supply voltage for channeltron.</td>
</tr>
<tr>
<td><img src="image" alt="EKin" /></td>
<td>Input for Channeltron® HV reference voltage (CH-). The Channeltron® high voltage is the voltage difference between CH+ and CH-, i.e. between CH+ and E_{kin}. For secondary electron detection (see figure 1): connect one of the E_{kin} connectors to socket BIAS of the CHANNELTRON® BIAS module.</td>
</tr>
</tbody>
</table>

**Attention:** Even if the Channeltron® HV is switched off or turned down the Channeltron® still is referenced to E_{kin}. **This may be a dangerous high voltage.** When unplugged do not touch the inside of any coax connectors.
5. Channeltron® Bias Module

The Channeltron® bias module supplies the bias voltage (range -50 V to +250 V) to the Channeltron® grid and the operating power for the respective preamplifier, see figure 7.

![Channeltron® Bias Module Diagram]

Figure 6. The Channeltron® bias module front and back panel.

<table>
<thead>
<tr>
<th>Front Panel</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV ON</td>
<td>Push-button to switch Channeltron® bias voltage on/off.</td>
</tr>
<tr>
<td>Ten-turn potentiometer</td>
<td>Ten-turn potentiometer to set the bias voltage output. Range: -50 V to +250 V.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Back Panel</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-pin (Amphenol) socket</td>
<td>5-pin (Amphenol) socket for power supply of the analogue preamplifier.</td>
</tr>
<tr>
<td>Pin No.:</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>220/110 V AC</td>
</tr>
<tr>
<td>B</td>
<td>220/110 V AC</td>
</tr>
<tr>
<td>C</td>
<td>0 V = ground</td>
</tr>
<tr>
<td>D</td>
<td>-15 V, 30 mA</td>
</tr>
<tr>
<td>E</td>
<td>+15 V, 30 mA</td>
</tr>
<tr>
<td>Pins A and B: mains voltage set to customer specification.</td>
<td></td>
</tr>
</tbody>
</table>
### BIAS

DC bias voltage adjustable via front panel. Range: -50 V to +250 V, ripple < 0.1 %.

For SEM operation this MHV socket must be connected to the \( E_{\text{kin}} \) socket of the CHANNELTRON® HV module.

### POWER

Power supply for the modules, to be inter-connected using the supplied 25-lead ribbon cable. It is very important to tighten the fixing screws of the cable plugs to ensure proper earth (ground) connection and to avoid damage due to HV flashovers.

### Mains input socket to be connected to a mains supply. The mains power applied here is transferred to an analogue preamp via the 5-pin socket PREAMP POWER.

### Fuses

There are two fuses (5 mm \( \varnothing \), 20 mm long) inside the CHANNELTRON® BIAS module.

- Use 2 x 0.2 A (slow) for 200-230 V ac
- 2 x 0.4 A (slow) for 100-115 V ac

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![Channeltron® connections in SEM mode.](image)

**Figure 7.** Channeltron® connections in SEM mode.
6. Circuit Diagrams

[Image of Circuit Diagram]
Service Procedure

Should your equipment require service

- Please contact OMICRON headquarters or your local OMICRON representative to discuss the problem. Preferably use the provided FAX form below to make sure all necessary information is supplied and because the required service engineer may not be available immediately.

The service department may also be contacted via e-mail.

CompuServe: "ccmail:service at omihqger"
Internet: "service@omihqger.ccmail.compuserve.com"

- Always note the serial number of your instrument or have it at hand when calling.

If you have to send any equipment back to OMICRON

- Please contact OMICRON headquarters before shipping any equipment.
- Place the instrument in a polythene bag.
- Use the original packaging and transport locks.
- Take out a transport insurance policy.

For UHV equipment only:

- Make sure the plastic transport cylinder is clean and no dust or packaging materials can contaminate the instrument.
- Wear suitable cotton or polythene gloves.
- Re-insert all transport locks (if applicable).
- Cover the instrument with aluminium foil and/or place it in a polythene bag.
- Fix the instrument into its plastic cylinder (if applicable).
- Include a filled-in and signed copy of the "Declaration of Decontamination" at the back of the related manual.

No repair of UHV equipment will be carried out without a legally binding signed decontamination declaration!
# FAX

<table>
<thead>
<tr>
<th>To</th>
<th>From</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMICRON Vakuumphysik GmbH</td>
<td>................................................</td>
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<tr>
<td>................................................</td>
<td>................................................</td>
</tr>
<tr>
<td>Test and Service Department</td>
<td>Tel: ........................................</td>
</tr>
<tr>
<td>Idsteiner Straße 78</td>
<td>FAX: .....................................</td>
</tr>
<tr>
<td>D - 65232 Taunusstein</td>
<td>Type of Instrument: ................................................</td>
</tr>
<tr>
<td>Germany</td>
<td>Serial Number: ................................................</td>
</tr>
<tr>
<td>Tel: +49 - 61 28 - 987-0</td>
<td>Purchasing Date: ................................................</td>
</tr>
<tr>
<td>FAX: +49 - 61 28 - 987 193</td>
<td>(Last Service Date: ................................................</td>
</tr>
</tbody>
</table>

**Problem:**

**Date:** ................................................

**Signature:** ................................................
Useful OMICRON Contacts

Headquarters: OMICRON VAKUUMPHYSIK GmbH
Idsteiner Straße 78
D-65232 Taunusstein
Germany
Tel. +49 (0) 61 28 987-0
Fax. +49 (0) 61 28 987 185
Sales Telephone: +49 (0) 61 28 987 210
e-mail: sales@omicron.de
Service Telephone: +49 (0) 61 28 987 230
Fax. +49 (0) 61 28 987 33 230
e-mail: service@omicron.de

UK:
OMICRON Surface Science Ltd.
Tel. 01342 331000
Fax. 01342 331003
e-mail: service@omicron.co.uk

USA:
OMICRON ASSOCIATES
Tel. (412) 831-2262
Fax. (412) 831-9828
e-mail: omiassoc@sgi.net

JAPAN:
ULVAC-PHI, INCORPORATED
Tel. 0467-85-6522
Fax. 0467-85-4411

SWEDEN:
CRYSI TECHNOLOGY AB
Tel. 013 212151
Fax. 013 212147
e-mail: kristian.flodstrom@crysis.lejonet.se

TAIWAN:
OMEGA SCIENTIFIC TAIWAN LTD.
Tel. (02) 8780-5228
Fax. (02) 8780-5225
e-mail: omega001@ms3.hinet.net

CHINA:
OMICRON CHINA OFFICE
Tel. (010) 82073793
Fax (010) 82070995
e-mail: germtech@public3.bta.net.cn

INDIA:
MACK INTERNATIONAL
Tel. (022) 285 52 61
Fax (022) 285 23 26
e-mail: macktran@bom2.vsnl.net.in

SINGAPORE:
RESEARCH INSTRUMENTS PTE LTD
Tel. 775-7284
Fax 775-9228
e-mail: graham@resinst.com.sg

AUSTRALIA:
THOMSON SCIENTIFIC INSTR. PTE LTD
Tel. (03) 9663 2738
Fax (03) 9663 3680
e-mail: tsi@werpie.mira.net.au

FRANCE:
OMICRON EURL
Tel. 04 42 50 68 64
Fax. 04 42 50 68 65
e-mail: omicronfr_vig@compuserve.com

USA (WEST):
OMICRON ASSOCIATES, W. REGION OFFICE
Tel. (303) 893 2388
Fax. (303) 893 2399
e-mail: omiwest@orci.com

ITALY:
OMICRON VAKUUMPHYSIK GmbH
Tel. (06) 35 45 85 53
Fax (06) 35 40 38 67
e-mail: omicron.italia@tiscalinet.it

SOUTH KOREA:
WOO SIN CRYOVAC LTD.
Tel. (02) 598-3693
Fax. (02) 597-5615
e-mail: woosin@woosinent.co.kr

BRAZIL:
BOC DO BRASIL LTDA
Tel. (011) 3858 0377
Fax (011) 3965 2766
e-mail: edwards@snet.com.br
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