



**MBE**

KOMPONENTEN | DR. EBERL

# OPERATING INSTRUCTIONS

MBE-Komponenten GmbH

Josef-Beyerle-Str. 18/1  
D-71263 Weil der Stadt  
(Germany)

---

**Shutter Control Unit**

**SCU 24V- 2102975**

---

## Field of Application

The only purpose of the shutter control unit SCU is to act as the power supply and manual user- or automated remote- interface for the mechanical shutter drive units made by MBE-Komponenten GmbH.

The SCU must only be used:

- with the original cable sets (lines power and shutter module connection) provided with the product (or equivalent cables according to the requirements)
- within an indoor laboratory environment, temperature range 0°C – 50°C, relative humidity below 60%,
- by qualified personnel that is familiar with vacuum technology and thin film deposition.
- in accordance to this manual and the manuals of connected equipment (power supplies, temperature controllers, cooling media supplies etc.)









Read the operating instructions thoroughly before operating the device.



Pay special attention to the safety information given in this instruction manual. Any use of the product outside its specifications may cause harm to equipment and / or the operators.

MBE-Komponenten GmbH is not liable for any damages or other consequences arising from ignoring the above stated regulations.

Symbols and Abbreviations

	GENERAL DANGER SIGN; pay attention and follow precautions given in accompanying text.
	ELECTRICITY danger of life from electric current or high voltage
	HIGH TEMPERAURE SURFACE danger of burns when touching
	TOXIC MATERIAL danger of life to personnel when absorbing particles or fumes, wear protective gear
	IRRITATING MATERIAL danger of irritations to tissue when touching or inhaling particles or fumes, wear protection
	RISK OF FIRE
	WEAR GLOVES (vinyl or latex) to prevent contamination of vacuum equipment by fingerprints and/or to protect personnel from contamination by hazardous substances
	HINTS AND BACKGROUND INFO facilitate to understand properties of the equipment and how to get the best results out of it

### *Abbreviations used in this manual*

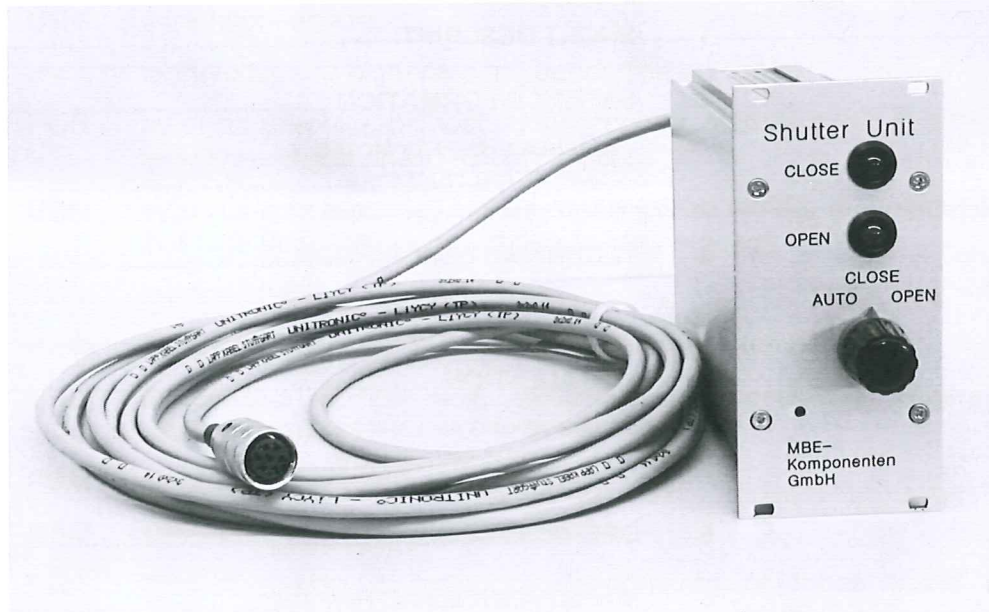
MBE	<b>m</b> olecular <b>b</b> eam <b>e</b> pitaxy
UHV	<b>u</b> ltra- <b>h</b> igh <b>v</b> acuum
HV	<b>h</b> igh- <b>v</b> oltage or <b>h</b> igh- <b>v</b> acuum, depending on context
PGR	<b>p</b> yrolytic <b>g</b> raphite, highest purity graphite, manufactured in a high temperature gas phase epitaxy process
PBN	<b>p</b> yrolytic <b>b</b> oron- <b>n</b> itride, highest purity boron nitride, manufactured in a high temperature gas phase epitaxy process
TC	<b>t</b> hermocouple
WRe	<b>T</b> ungsten- <b>R</b> henium, TC-alloy suitable for high temperature
SCU	<b>m</b> anipulator <b>c</b> ontrol <b>u</b> nit, electronic unit controlling substrate rotation
RPM	<b>r</b> evolutions <b>p</b> er <b>m</b> inute
RSM	<b>s</b> oft-acting <b>r</b> otary <b>s</b> hutter <b>m</b> odule
DN	<b>n</b> ominal inside <b>d</b> iameter of flange-bores or tubes (used in descriptions of vacuum flanges)
CF	<b>C</b> onflat flange, specifies flange sealing mechanism by flat copper gaskets and a knife-edge on each flange (™ of VARIAN), e.g. DN 63 CF
BNC	<b>(B</b> ayonet <b>N</b> eil- <b>C</b> oncelman, or sometimes <b>B</b> ritish <b>N</b> aval <b>C</b> onnecter); circular connector used on coaxial cable
PID	<b>p</b> roportional, <b>i</b> ntegral, <b>d</b> ifferential; refers to the operating principle of controllers and regulators, e.g. to keep a constant temperature
U	<b>V</b> oltage (unit Volts, V)
I	<b>e</b> lectric current (unit Amperes, A)
O.D.	<b>o</b> utside <b>d</b> iameter
I.D.	<b>i</b> nside <b>d</b> iameter
p	<b>p</b> ressure (here usually vacuum)
mbar	<b>p</b> ressure unit, millibars ( $10^{-3}$ bar)



# Table of Contents

<b>1</b>	<b>SHORT DESCRIPTION .....</b>	<b>2</b>
<b>2</b>	<b>SAFETY INFORMATION .....</b>	<b>3</b>
2.1	GENERAL SAFETY NOTES .....	3
2.2	IMPORTANT NOTES .....	3
2.3	HAZARDS .....	3
<b>3</b>	<b>TECHNICAL DESCRIPTION .....</b>	<b>4</b>
3.1	GENERAL .....	4
3.2	TECHNICAL DATA .....	5
<b>4</b>	<b>INSTALLATION .....</b>	<b>6</b>
4.1	UNPACKING AND SHIPPING ISSUES.....	6
4.2	MOUNTING OF THE SCU .....	6
4.3	REAR PANEL.....	6
<b>5</b>	<b>OPERATION .....</b>	<b>8</b>
<b>6</b>	<b>MAINTENANCE AND REPAIR: .....</b>	<b>9</b>
	EG Konformitätserklärung / EC Declaration of Conformity .....	11

## 1 Short description



**Figure 1:** Shutter Control Unit SCU

The Shutter Control Unit SCU provides the power for the mechanical shutter drive units fabricated by MBE-Komponenten GmbH. It can be used for the Rotary Soft-acting Shutter Module RSM, the Linear Soft-acting Shutter Module LSM and for the Rotary Pneumatic Shutter Module RPM with pneumatic valve and position sensors.

The connected shutter can be operated manually, or can be controlled by remote signals.

The SCU can be easily interfaced with any control system of most MBE machines via TTL or relay switches for remote operation. Status LEDs indicate the actual shutter position. The status can be read out from the monitor outputs.

The SCU is a modular design, meaning that each source shutter is operated by a separate unit.

In combination with our shutter drive units, using a standardized set of cables, the SCU guarantees high flexibility, interchangeability and long life operation

## 2 Safety Information

### 2.1 General Safety Notes



Before putting the Shutter Control Unit into operation, please read the operating instructions thoroughly and follow them in every respect!

Ignoring any instruction given in this manual may result in fatal damage of the manipulator, the vacuum system or even personal injury.

Avoid mechanical and thermal stress or shocks.

<b>If in doubt ask!</b>
-------------------------

### 2.2 Important Notes



<b>High voltage (100... 240 VAC).</b>
---------------------------------------

Remove lines voltage connector before opening housing of the SCU
--

Use only input voltage, that is written on the rear panel of the SCU

**Attention:** Replacement of fuses or setting the lines voltage selector must be performed by authorized personal only!

CAUTION!

For continued protection against risk of fire, replace only with same type and rating of fuse.

### 2.3 Hazards



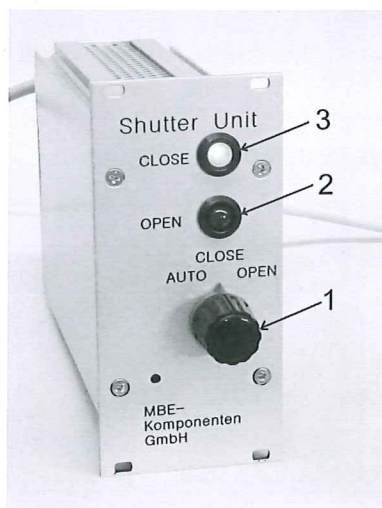
HAZARD:	HIGH VOLTAGE (lines voltage)
RISK:	SERIOUS BODILY INJURY OR DEATH from touching electrical installations or elements carrying lines voltage
AVOIDANCE:	Follow the instructions in this manual, Disconnect lines voltage connector before opening housing and servicing parts.



### 3 Technical description

#### 3.1 General

Figure 2 shows the front panel of the Shutter Control Unit.



- (1) Switch for manual shutter actuation and remote mode selection (AUTO)
- (2) Green LED lights up, when shutter has reached the open position.
- (3) Red LED indicates the "shutter closed" position.

**Figure 2:** Front Panel of the Shutter Control Unit SCU

The operation mode of the shutter is determined by the rotary switch (1). The switch positions "CLOSE" and "OPEN" operate the shutter accordingly in manual mode.

In the automatic mode ("AUTO"), the shutter is controlled via remote TTL- or relay switch signals

In switch positions "CLOSE" and "OPEN" (manual mode) remote operation is disabled.

The shutter end positions are displayed by the LEDs (2) OPEN or (3) CLOSE.



### 3.2 Technical data

---

Mains Input: 100 - 240V AC / 50 - 60Hz / 0.5A max. wide range  
Fuse: 250V / 1,6A lazy (inside lines voltage socket)  
Output: 24V DC, max 800mA, (~20W), see chapter 4.3

#### Remote I / O:

Shutter open / close control: TTL compatible input,  
TTL high at  $U_{in} > 2,75V$ , up to 24V, max 30V,  
TTL low at  $U_{in} < 1,0V$   
Input resistance  $R_{in} \approx 2k\Omega$ ;  
 $I_{max}: 16mA$ , @  $U_{in} = 24V$ ,  
 $I_{in} = 2,5 mA$  @ 5V  
 $I_{in} = 5 mA$  @ 9V  
 $I_{in} = 8 mA$  @ 12V

Outputs: 2 position monitor outputs, one for each shutter state  
rated at:  
4,8V if shutter is open / closed , 0V if NOT open / closed  
suitable for loads with an impedance  $R_{in} > 2k\Omega$ , max. 2,5mA  
  
24V DC with output resistance of 1k $\Omega$ ,  
only for use with external relay control (see chapter 4.3)

Dimensions: front panel: 3 HE (128.4mm) x 14 TE (61mm)  
installed depth: 170mm + 50mm for connectors

---

## 4 Installation

### 4.1 Unpacking and shipping issues

Before unpacking, please inspect the transport box for obvious damage. In case of a damage contact MBE-Komponenten GmbH immediately! MBE-Komponenten may also be reached via e-mail:

***info@mbe-components.com***

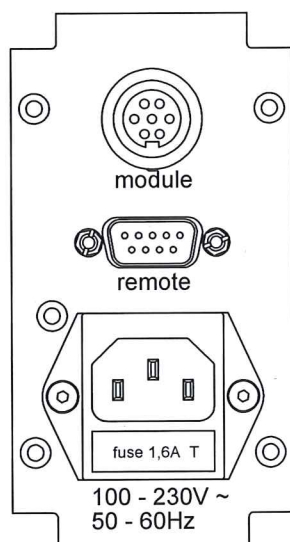
### 4.2 Mounting of the SCU

The SCU is designed to fit into a standard 19" rack-insert. The dimensions of the front panel are 3 Units in height and 14 TE in width. The SCU requires an installation depth of about 220mm within the rack, including space for connectors.

A slight convection cooling of the SCU must be ensured within the rack to avoid damage due to overheating.

### 4.3 Rear panel

There are three different connectors located on the rear panel of the Shutter Control Unit. Figure 3 shows their arrangement:



Connectors from top to bottom:

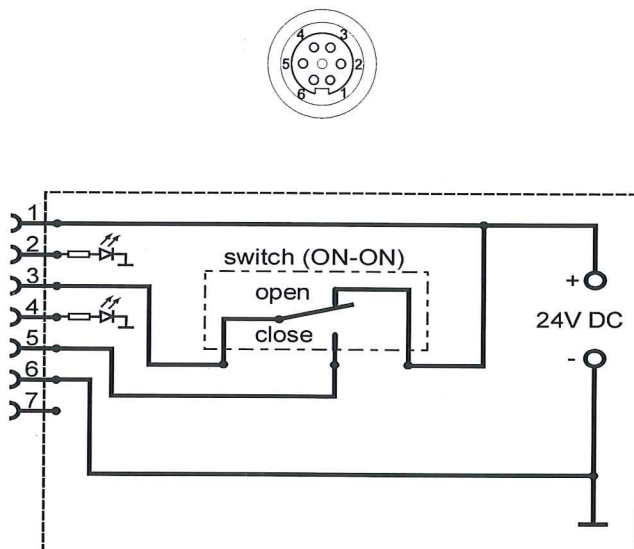
- "module": connects to the mechanical shutter drive module;  
7-pin female round (DIN-type) connector
- "remote" connector for remote control signals and monitor outputs for shutter state;  
9-pin SUB-D connector, male
- "100-240V ~" lines voltage connector, Euro style  
wide range 100...240V AC  
with integrated fuse

**Figure 3:** Rear panel of the Shutter Control Unit SCU

### 7-pin round connector "module"

The 7-pin round connector is used to attach the cable to the mechanical drive unit (called "shutter module" in our nomenclature). This connector has the following pinout:

If you have ordered any of our shutter modules RSM, RPM or LSM together with the SCU, a readily assembled cable is delivered with it. Please see their respective manuals for more details.



**Figure 4:** simplified schematics of the SCU drive circuit for shutter modules

Pin No.	Function
1	+24 V DC (permanent)
2	feedback input for "shutter is closed"; 24V DC lights up red LED.
3	+24 V DC, when switch toggled "OPEN"
4	feedback input for "shutter is open"; 24V DC lights up green LED.
5	internally connects to pin 3 when switch toggled "CLOSE", feature used for RSM and LSM shutter modules only
6	GND
7	n.c., not used

### 9-pin Sub-D connector "remote"

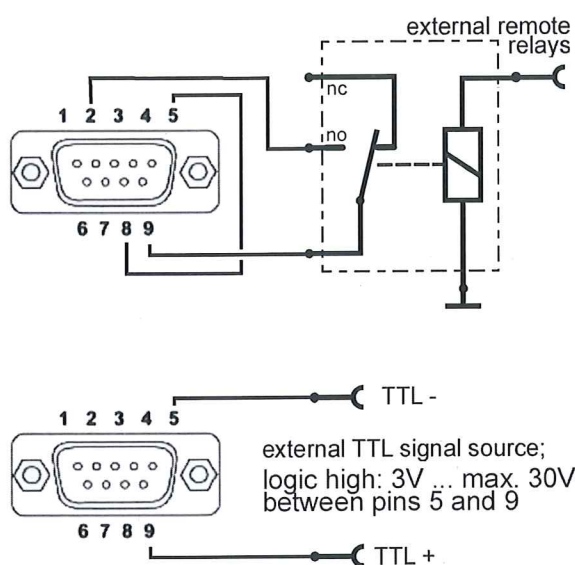
For automated shutter control the 9-pin Sub-D connector allows to connect external hardware of e.g. a layer growth control system, to operate the shutter when the front panel switch is in "remote" position.

The pinout definition of this remote plug is described in the table below. Figure 5 illustrates the two different possibilities, using either an external relay (i.e. a simple switch) or a remotely generated TTL signal to operate the shutter.

The SCU remote input internally provides a robust solid state relay with TTL-compatible logic input levels for the remote control signal. Thus the input (between pins 5 and 9) is electrically isolated from the SCU circuit, i.e. a floating logic input, allowing reliable operation via TTL signals from any external source.

Simply connect your TTL signal source to pins 5 and 9, according to the lower Figure 5.





Pin No.	Function
1	monitor output signal, indicating shutter state "open" ; (4.8V: shutter open, 0V: shutter <i>not</i> open )
2	+ 24 V DC output
3	n.c., not used
4	monitor output signal, indicating shutter state "closed" ; (4.8V: shutter closed, 0V: shutter <i>not</i> closed )
5	TTL – (TTL ground, may be floating)
6	n.c., not used
7	n.c., not used
8	common GND, SCU chassis ground
9	TTL+; remote TTL input, $R_{in}=2k\Omega$ , $I_{max}$ : 16mA, signal opens shutter at TTL high (>3V, max. 30V), closes at TTL low (<1V)

**Figure 5:** schematic wiring for remote shutter action, using either an external relay or an TTL signal source

The TTL source must be able to drive a current of about 3mA at 5V high signal.

If a relay is used, the internal 24V DC voltage from pin 2 is fed back to the actual remote input pin 9 via the relay contact. A closed contact means an open shutter. Directly connect pins 5 and 8 to provide the ground potential to the TTL- input. To define the negative TTL input

## 5 Operation

Connect the lines voltage to the SCU, respecting the voltage limit indicated on the rear panel.

Set the front panel switch to "CLOSE".

Connect the shutter module (RSM, RPM or LSM) with the supplied cable to the 7-pin round connector.



**CAUTION:** If the **shutter module** is in the mechanically opposite state to the selected switch position, it **will move instantly** to the other position **upon connection!** Keep away from the moving parts of the shutter module! Make sure this cannot damage anything on your vacuum components, if already mounted!



Turn the switch to "OPEN", observing the shutter module, to check proper function.

The front panel LED must light up, when the shutter module has reached its end position, either "OPEN" or "CLOSE". While the module is moving, both LEDs have to be dark.

Please refer to the corresponding manuals of the Shutter Modules RSM, LSM or RPM for more details on the mechanical part of your shutter drive unit.

To achieve automated shutter control, turn the front panel switch to "AUTO".

## **6 Maintenance and repair:**

Under normal operating conditions, the Shutter Control Unit SCU will give a long trouble-free service.

For additional safety a **fuse (250V 1,6A, lazy)** is installed inside the SCU lines voltage socket on the rear panel. The fuse is accessible only after unplugging the lines voltage connector.

Replace with same type of fuse only.

<p><b>EG Konformitätserklärung / EC Declaration of Conformity</b></p>		<p>Dr. Eberl MBE-Komponenten GmbH Gutenbergstr. 8 71263 Weil der Stadt, (Germany) Phone: +49 7033 6937-0 Fax: +49 7033 6937-20 email: <a href="mailto:info@mbe-komponenten.de">info@mbe-komponenten.de</a> <a href="http://www.mbe-komponenten.de">http://www.mbe-komponenten.de</a></p>
---	---	--

Hiermit erklären wir (Dr. Eberl MBE-Komponenten GmbH), dass nachstehendes Produkt aufgrund seiner Konzeption und Bauart sowie der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der EG-Richtlinien entspricht. Bei einer nicht mit uns abgestimmten Änderung des Produkts verliert diese Erklärung ihre Gültigkeit

We ( Dr. Eberl MBE-Komponenten GmbH) herewith declare, that the product described below is in accordance with the relevant safety and health requirements of the EC standards regarding design and version when delivered from our factory. This declaration becomes invalid whenever the product has been modified without our consent.

Bezeichnung des Produkts  
Description of product  
Seriennummer / Serial Number

<p><b>Shutter Control Unit SCU</b></p>
<p><i>SCU 24V - 2102975</i></p>

Das Produkt entspricht folgenden Richtlinien / The product is in conformity with the following directives

- EG Niederspannungsrichtlinie / EC low voltage directive (73/23/EWG (7/93))
- EMV Richtlinie / Electromagnetic Compatibility EMC (89/336/EWG)

Angewandte harmonisierte Normen / Applied harmonized standards

<p>EN 50081-2</p>	<p>Elektromagnetische Verträglichkeit EMV, Störaussendung, Teil2 Industriebereich / Electromagnetic compatibility (EMC) Generic emission standard, part 2 Industrial environment</p>
<p>EN 61000-6-2</p>	<p>Elektromagnetische Verträglichkeit EMV, Störfestigkeit Industriebereich / Electromagnetic compatibility (EMC) Generic standards, Immunity for industrial environments</p>
<p>EN 61010-1 (DIN VDE0411)</p>	<p>Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte / Safety requirements for electrical equipment for measurement, control and laboratory use.</p>

Weil der Stadt, den 28.07.2015 *i.A. O. Huber*  
Datum / date ( Frank Huber, Produktgruppenleiter/Product Manager)