



with **INSTRUMENTS**   
**ELECTRONICS** 

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## INSTRUMENTS

PREVAC designs and manufactures a wide range of advanced UHV instruments for the surface science techniques. Every aspect of every instrument is fully developed and manufactured in-house using the very latest, best practice technologies and manufacturing methods, to produce next generation functionality and to ensure the very best support and responsiveness to our customers. All of our instruments are fully application tested and field proven for exceptional long term performance characteristics and stability. Each instrument in our range is easy to use, fully interlocked where appropriate, and delivered with the very latest modular control software for maximum flexibility and integration.

Our range of UHV instruments are used for spectroscopic and surface analysis techniques such as:

- XPS – X-ray Photoelectron Spectroscopy (X-ray source),
- AES – Auger Electron Spectroscopy (electron source),
- SIMS – Secondary Ion Mass Spectrometry (ion sources),
- ISS – Ion Scattering Spectroscopy,
- TPD – Temperature Programmed Desorption (mass spectrometer).

PREVAC also manufactures a suite of UHV instruments for thin film growth and molecular beam epitaxy:

- Electron Beam Evaporator,
- Effusion Cell configured for use with low to medium vapor pressure materials,
- Quartz Oscillator sensor head that is compatible with all third party electronics units.

For special requirements we can modify and develop our instruments to suit your individual requirements.

**ORDERING** | When ordering or requesting a quote, please specify required insertion length. Dimensions and ranges shown in specifications and drawings can be modified to suit your requirements.

## ELECTRONICS

This chapter introduces our range of electronic device controllers, which are fully designed, developed and fabricated in-house.

Our talented electronics team has more than 10 years of experience in the specific design of scientific and vacuum device controllers and continually strive to implement the very latest worldwide standards in our products.

Our device controllers support not only our own products but can also be supplied fully compatible with many third party devices and instruments such as vacuum gauges, ion and electron guns etc., providing a significant cost saving and introducing new functionality to existing equipment.

All of our designs utilize the very latest international standards technology and safety standards whilst focusing on clear, user-friendly operational features. Since every aspect of the design and manufacture is kept in-house we can provide custom adaptations and also implement individually requested design developments, both quickly and efficiently.

All of the device controllers have individual and full interlocks to protect the equipment from damage in the event of incorrect use.

The combination of latest design practices and highest quality components guarantees that our devices deliver long working lifetimes with minimal downtime to the user. We deliver our equipment with full warranty as standard and offer rapid, no-fuss support as required. Our range of electronics devices addresses the needs of both academic and industrial customer's alike.

## EA15 HEMISPHERICAL ENERGY ANALYSER



XPS | UPS | ARPES | AES | ISS

## DESCRIPTION

PREVAC EA15 hemispherical energy analyser provides high-resolution PES measurements with a 150 mm mean radius analyser.

The analyser is wrapped in a shield constructed of up to two parallel mu-metal plates guaranteeing adequate analysis conditions for low-and high-energy photoelectrons.

Equipped with a total number of 11 slits, the analyser offers the possibility to choose between best energy resolution and best intensity. According to given photoelectron energy the analyser is set up with up to 8 predefined PE to satisfy customer's requirements.

## DETECTORS

- **MCP-CCD detector**
  - 40 mm diameter dual MCP detector
  - 656 energy channels available simultaneously
  - 494 angular spatial channels available simultaneously
  - 90 fps
- **7-MCD detector**
- **DLD detector** (on request)

## ANALYSER PACKAGE

The PREVAC analyser package includes:

- EA15 hemispherical energy analyser
- RUDI-EA2 high stable and low noise electronics
- SPECTRIUM acquisition and analyser control software with Windows OS computer system.

## ADDITIONAL INFORMATION

EA15 hemispherical energy analyser can be controlled directly by LabVIEW programming environment.

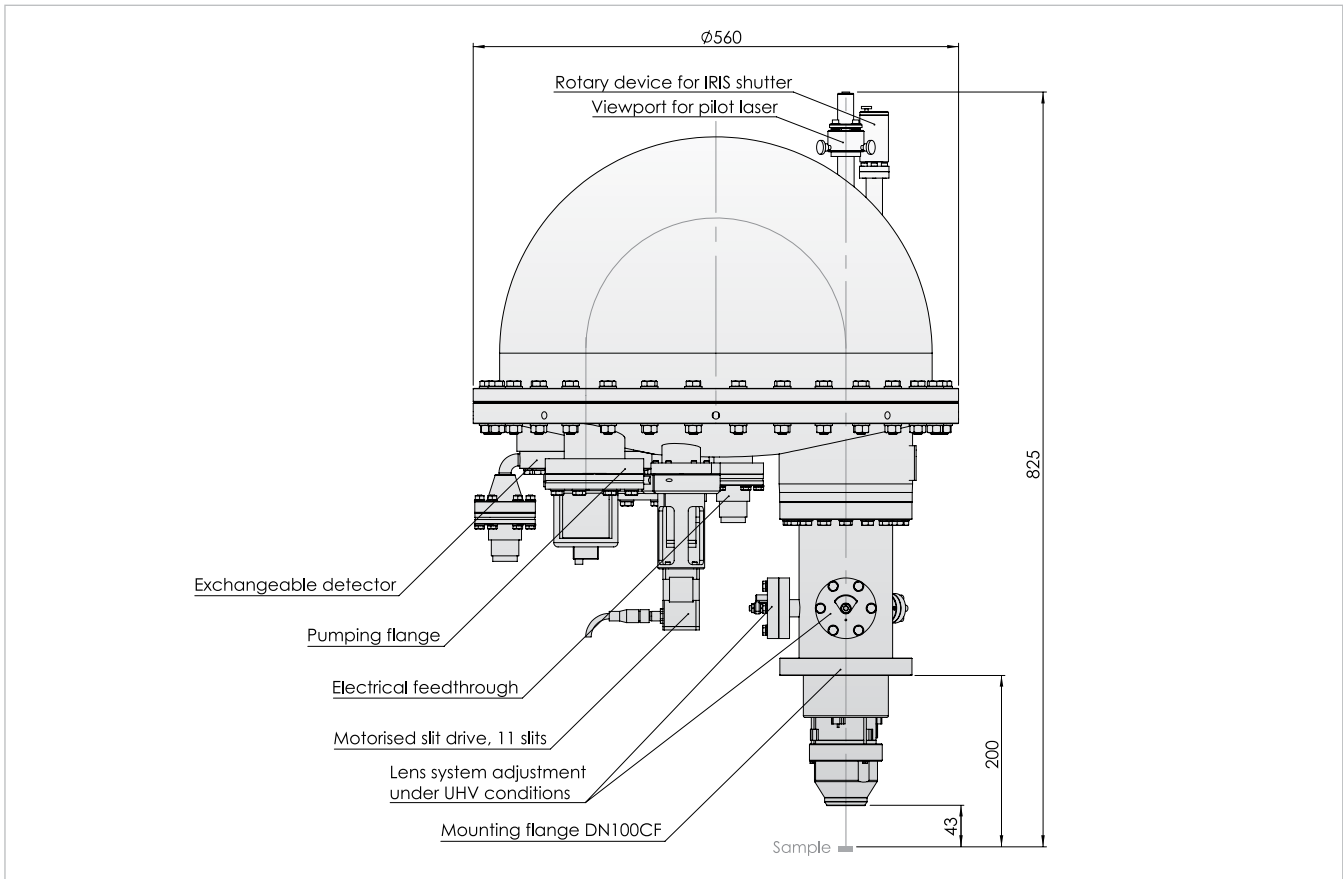
**NOTE** | The use of a mu-metal analysis vacuum chamber or an inner mu-metal shielded chamber in combination with PREVAC EA15 analyser is recommended in order to minimize influence of external magnetic fields and to maximize performance of the analyser.

## TECHNICAL DATA

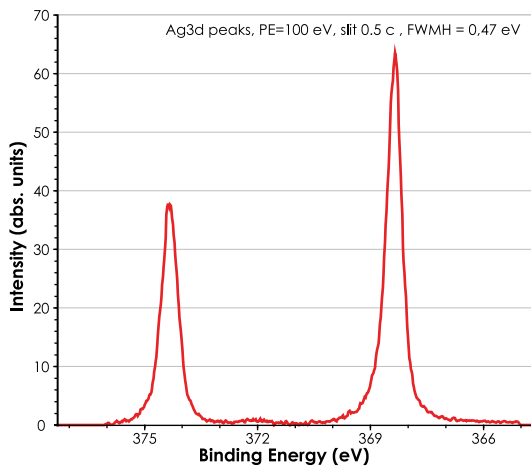
Mounting flange	DN 100 CF
Bakeout temperature	up to 150 °C
Working distance	43 mm
Analyser mean radius	150 mm
Pass energies	
	<b>XPS</b> 20, 50, 100, 200 eV
	<b>XPS/UPS &amp; XPS/UPS/ARPES</b> 1, 2, 5, 10, 20, 50, 100, 200 eV
Energy resolution	
	<b>XPS</b> < 20 meV FWHM
	<b>XPS/UPS &amp; XPS/UPS/ARPES</b> < 3 meV FWHM
Kinetic energy range	0.5 - 3000 eV
Acquisition modes	fixed, scan
Transmission and angular lens mode:	
▪ lens acceptance angle (transmission mode)	+/- 15°
▪ lens acceptance angle (angular mode)	+/- 10°
Maximum energy window in fixed mode	12.5 % of pass energy (for MCP-CCD)
Completely designed of non-magnetic materials	

## SPECTRIUM SOFTWARE



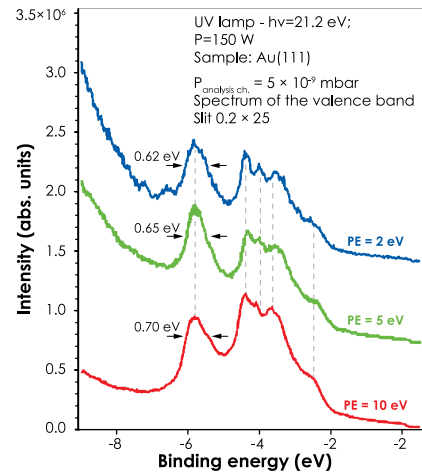


XPS measurements



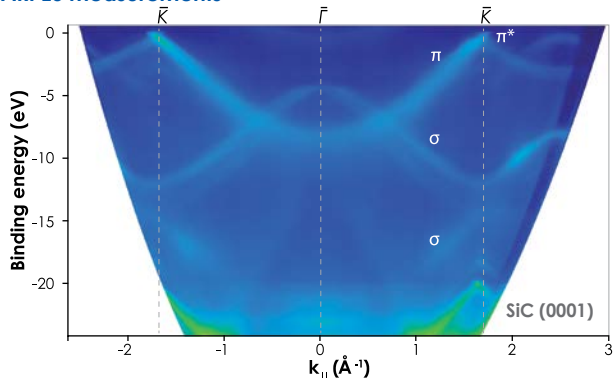
Spectra of silver, obtained by EA15 analyser and X-ray source with monochromator RMC50, excitation Aika 1486,74 eV.

UPS measurements

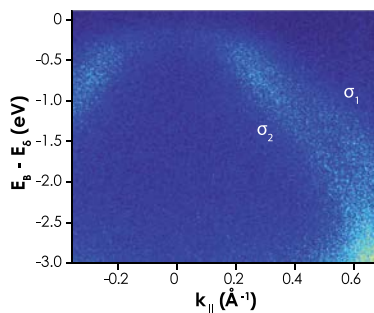


Valence state UPS spectra of Au(111) excited by a non-monochromatic UV lamp (radiation from He I line).

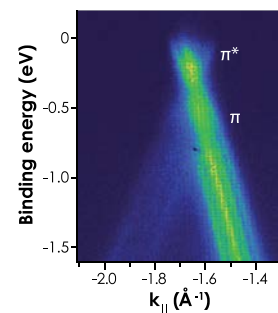
ARPES measurements



The electronic band structure along  $\bar{\Gamma}\bar{K}$  direction for the  $h\nu=40.8$  eV at room temperature.



Dispersion of the  $\sigma$  band around  $\bar{\Gamma}$  point for  $h\nu = 40.8$  eV.



Multilayer graphene with four  $\pi$ -band branches together at  $\bar{K}$  point.



## EA15-HP5 HEMISPHERICAL ENERGY ANALYSER



XPS | UPS\* | ARPES\*\* | AES\*\* | ISS\*\*

## DESCRIPTION

The PREVAC EA15-HP5 hemispherical energy analyser, which is based on the EA15 analyser, allows due to special designed extraction cones and automatic vacuum control, high-resolution PES measurements in static and dynamic environments **up to 5 mbar**.

Equipped with a total number of 11 slits, the analyser offers the possibility to choose between best energy resolution and best intensity. According to given photoelectron energy the analyser is set up with up to 8 predefined PE to satisfy customer's requirements.

## DETECTORS

- **MCP-CCD detector**
  - 40 mm diameter dual MCP detector
  - 656 energy channels available simultaneously
  - 494 angular spatial channels available simultaneously
  - 90 fps
- **7-MCD detector** (for UHV)
- **DLD detector** (for UHV, on request)

## ANALYSER PACKAGE

The PREVAC analyser package includes:

- EA15-HP5 hemispherical energy analyser
- RUDI-EA2 high stable and low noise electronics
- SPECTRIUM acquisition and analyser control software with Windows OS computer system.

## ADDITIONAL INFORMATION

EA15-HP5 hemispherical energy analyser can be controlled directly by LabVIEW programming environment.

**NOTE** | The use of a mu-metal analysis vacuum chamber or an inner mu-metal shielded chamber in combination with PREVAC EA15-HP5 analyser is recommended in order to minimize influence of external magnetic fields and to maximize performance of the analyser.

## TECHNICAL DATA

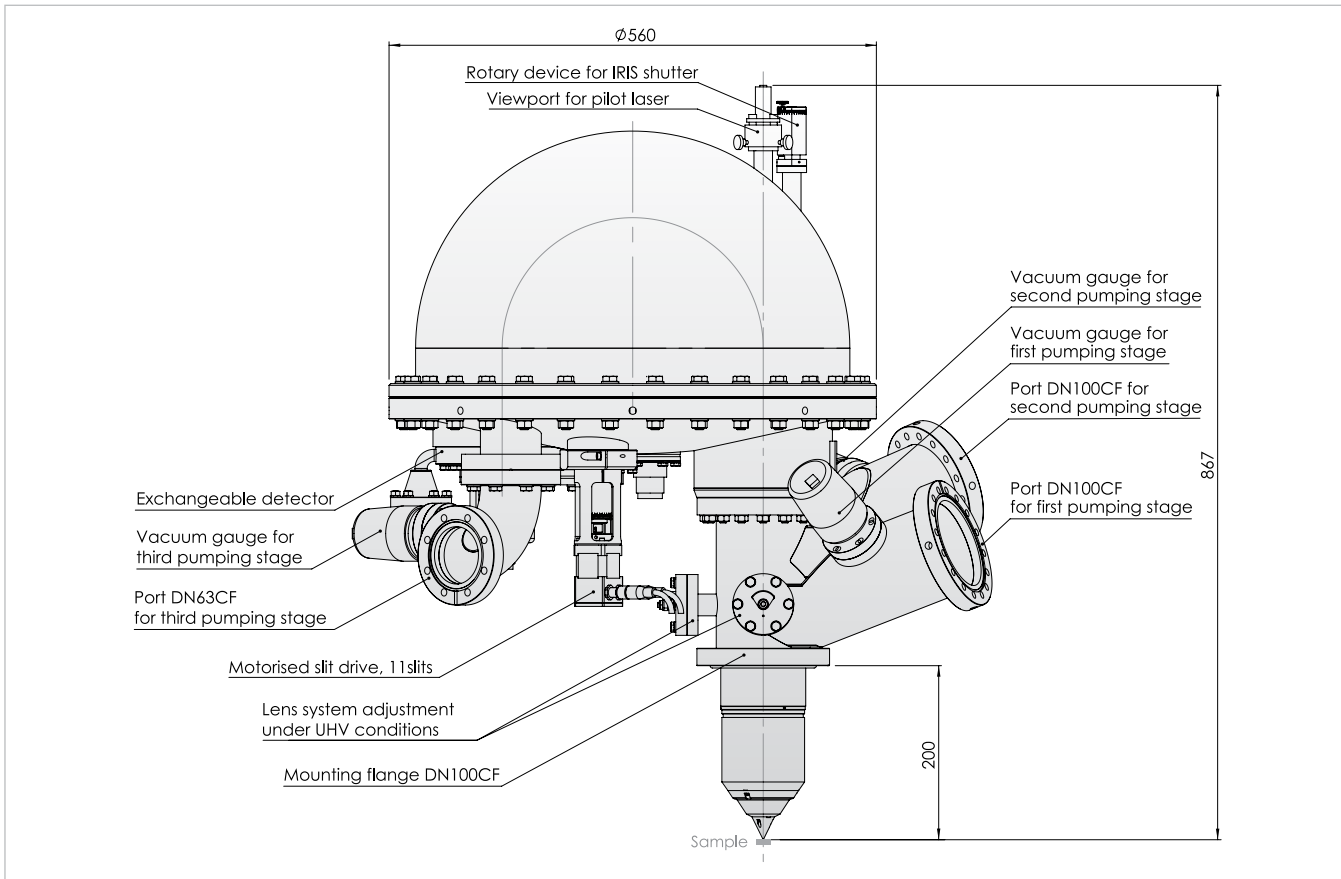
Mounting flange	DN 100 CF
Bakeout temperature	up to 120 °C
Working distance	1-2 mm (dependent on cone opening)
Analyser mean radius	150 mm
Pass energies	
<b>XPS</b>	20, 50, 100, 200 eV
<b>XPS/UPS &amp; XPS/UPS/ARPES</b>	1, 2, 5, 10, 20, 50, 100, 200 eV
Energy resolution	
<b>XPS</b>	< 20 meV FWHM
<b>XPS/UPS &amp; XPS/UPS/ARPES*</b>	< 3 meV FWHM
Kinetic energy range	0.5 - 3000 eV
Acquisition modes	fixed, scan
Transmission and angular lens mode:	
▪ lens acceptance angle (transmission mode)	+/- 15°
▪ lens acceptance angle (angular mode)	+/- 10°
Maximum energy window in fixed mode	12.5 % of pass energy (for MCP-CCD)
Completely designed of non-magnetic materials	

## SPECTRIUM SOFTWARE

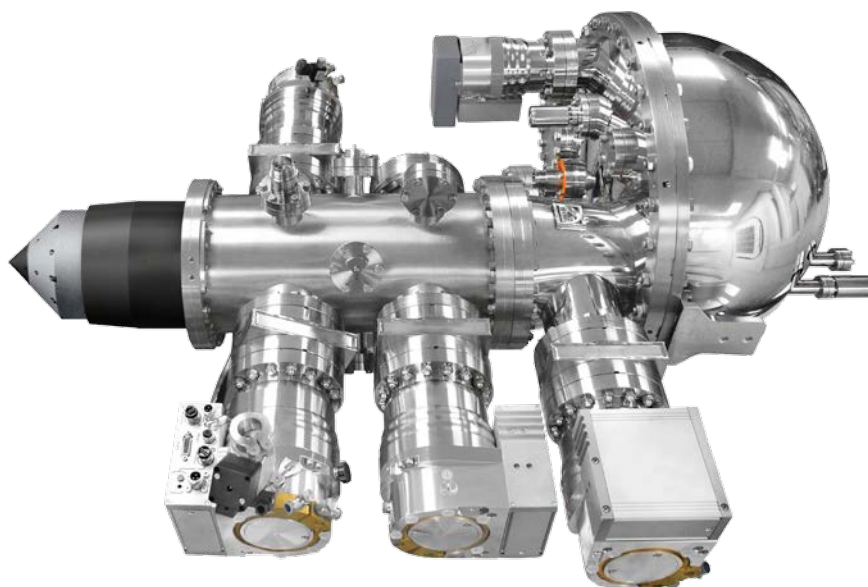


\* up to 0.1 mbar.

\*\* only in UHV conditions, without cone



## EA15-HP50 HEMISPHERICAL ENERGY ANALYSER



XPS | UPS\*

## DESCRIPTION

The PREVAC EA15-HP50 hemispherical energy analyser allows due to special designed extraction cones and automatic vacuum control, high-resolution PES measurements in static and dynamic environments **up to 50 mbar**.

Equipped with a total number of 11 slits, the analyser offers the possibility to choose between best energy resolution and best intensity. According to given photoelectron energy the analyser is set up with up to 9 predefined PE to satisfy customer's requirements.

## DETECTORS

- **MCP-CCD detector**
  - 40 mm diameter dual MCP detector
  - 656 energy channels available simultaneously
  - 494 angular spatial channels available simultaneously
  - 90 fps
- **7-MCD detector** (for UHV)
- **DLD detector** (for UHV, on request)

## ANALYSER PACKAGE

The PREVAC analyser package includes:

- EA15-HP50 hemispherical energy analyser
- RUDI-EA2 high stable and low noise electronics
- SPECTRIUM acquisition and analyser control software with Windows OS computer system.

## ADDITIONAL INFORMATION

EA15-HP50 hemispherical energy analyser can be controlled directly by LabVIEW programming environment.

**NOTE** | The use of a mu-metal analysis vacuum chamber or an inner mu-metal shielded chamber in combination with PREVAC EA15-HP50 analyser is recommended in order to minimize influence of external magnetic fields and to maximize performance of the analyser.

## TECHNICAL DATA

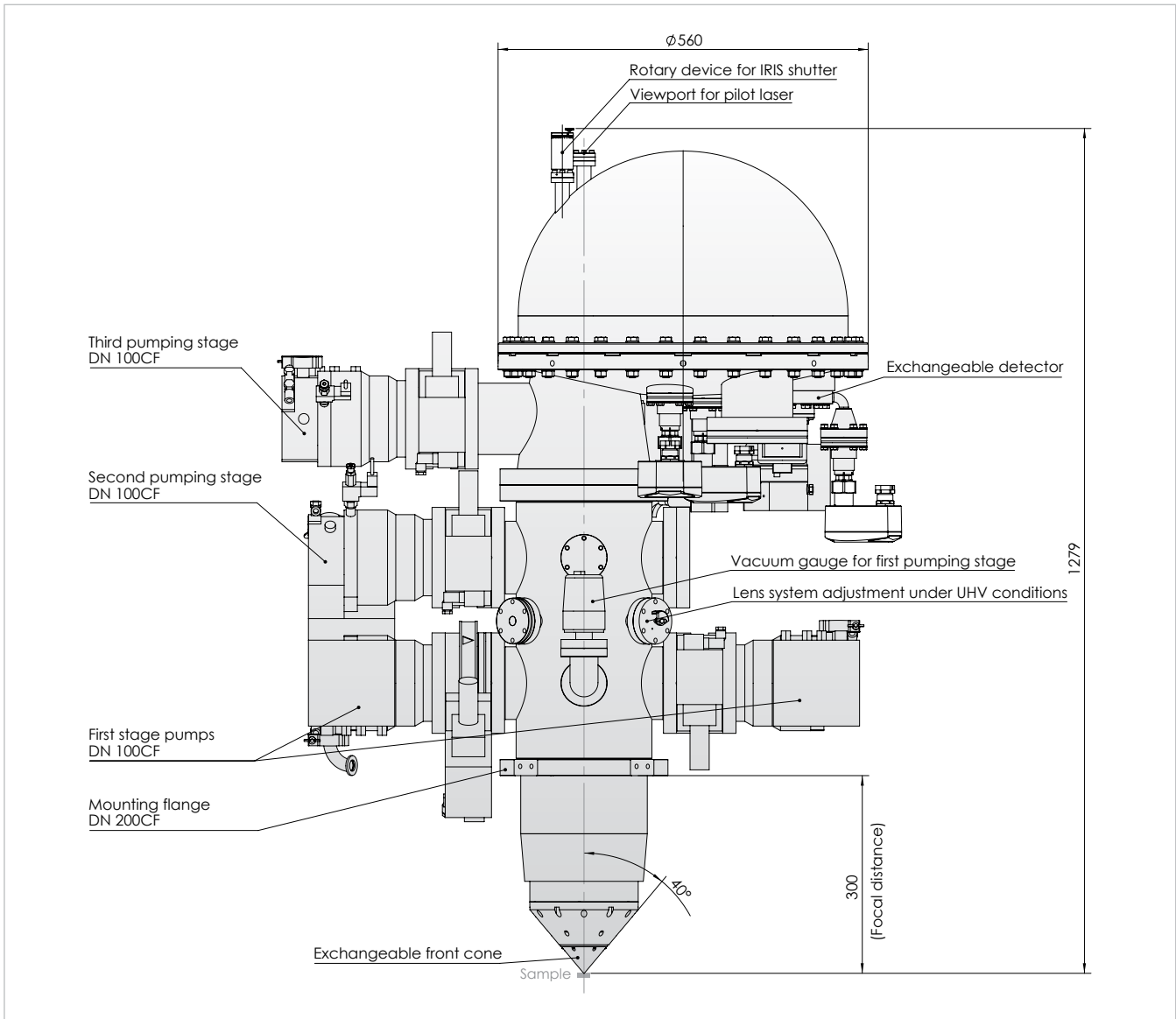
Mounting flange	DN 200 CF
Bakeout temperature	up to 120 °C
Working distance	0.3 - 2 mm (dependent on cone opening)
Analyser mean radius	150 mm
Pass energies	5, 10, 20, 50, 100, 200, 250, 300, 500 eV
Energy resolution	<b>XPS</b> < 20 meV FWHM
Kinetic energy range	0.5 - 1500 eV
Acquisition modes	fixed, scan
Lens acceptance angle (transmission mode)	+/- 9°
Maximum energy window in fixed mode	12.5 % of pass energy (for MCP-CCD)
Completely designed of non-magnetic materials	

## SPECTRIUM SOFTWARE



\* up to 0.1 mbar.





# RUDI-EA2 RESEARCH UNIT DIGITAL INSTRUMENT



## DESCRIPTION

RUDI-EA2 is a novel, modular high voltage power supply for photoemission and other demanding research applications. The electronics features fully calibrated, independently operating modules utilising the very latest electronics and software technology. Voltage supplies are controlled by high precision 16-bit digital-to-analog converters with high linearity and extremely high temperature stability. Automatic low and high voltage range settings, as well as output polarity, are under full user control.

The combined high specification and system flexibility makes RUDI-EA2 the obvious choice for many analysis applications, where stable, high voltage supplies are required and can also be readily configured by the end user.

Each RUDI-EA2 unit is supplied with a comprehensive serial communication protocol description which can be easily implemented for individual control needs, thus removing the reliance on specific, often prohibitive supplier software.

As the demand for smarter, connected technologies increases, PREVAC provides the best in class electronic solutions. The electronic mainboard of the RUDI-EA2 system is a showcase for the best in active digital and analog electronic components currently on the market.

For 3U racks there is available compact size high voltage power supply **RUDI-8M**, for up to 8 modules.

## TECHNICAL DATA

Power supply	110 - 260 V 50/60 Hz, max. 200 VA, depends on modules number
Maximum number of modules in 9U rack	28 of all modules chosen from DAC and HV
High voltage modules	different version up to 6 kV, bipolar, floating output
DAC modules	high precision 16 bit +/-12.5 V
Insulation	all HV and DAC modules have full insulation 6 kV to power and ground
Temperature stability	<0.5 ppm/°C for all modules
External interlock	active when the contact is closed
Communication interface	MODBUS-TCP 460 Kbit/s
Rack dimensions	483 x 395 x 360 mm (W×H×D), rack 9U height, 84HP width
Weight (approx.)	18 kg (for ~20 modules)



# RUDI-8M RESEARCH UNIT DIGITAL INSTRUMENT

## TECHNICAL DATA

Maximum number of modules in 3U rack	8 (8HP wide) or 4 (12HP) + 2 (8HP), chosen from DAC and HV
Rack dimensions	448.8 x 132.5 x 437 mm (W x H x D), rack 3U height, 84Hp width
Weight (approx.)	6 kg

## FEATURES

- Special techniques have been used to achieve rapid temperature stabilization. The system is ready for use after only 3 minutes from switch on.
- Each independent voltage module achieves temperature stability below 0.5 ppm of the voltage span per degree Celcius.
- Using 16bit AD converters, the 6 kV power supplies can be set with a resolution of just 92 mV and with a maximum noise level of only 200  $\mu$ Vp-p.
- Each modules can be controlled independently via MODBUS-TCP 460 Kbit/s interface.
- Each module has a floating output which means a wide range of configurations are possible making the unit truly universal - serial configuration is unlimited.

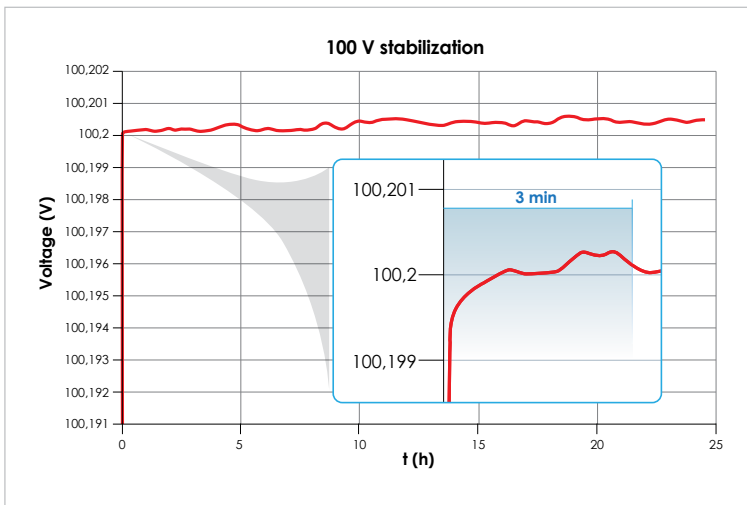
- Any other voltages up to 6000 V available on request
- High linearity controlled with an accuracy of 16 bits
- Up to 28 modules fit into 9U rack
- Voltage deviation calculated with two-point calibration at min and max voltage

## DAC MODULES

Output voltage	0... +/- 12.5 V
Precision	16 bit
Step size	200 $\mu$ V
Protection	surge protection 23 kV

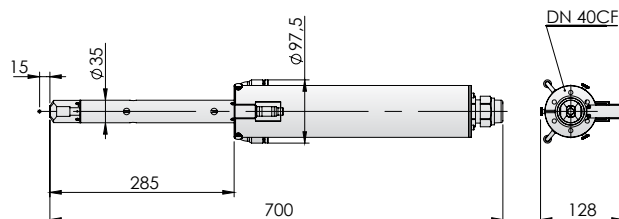
## HIGH VOLTAGE MODULES

modules	output voltage	maximum output current
HV 100V	~0 - 100 V, 16 bit, step size ~1.6 mV	~600 $\mu$ A
HV 600V	~0 - 600 V, 16 bit, step size ~9.2 mV	~300 $\mu$ A
HV 600/100V	Low range ~0 - 100 V, 16 bit, step size ~1.6 mV High range ~0 - 600 V, 16 bit, step size ~9.2 mV	~300 $\mu$ A
HV 1900/100V	Low range ~0 - 100 V, 16 bit, step size ~1.6 mV High range ~0 - 1900 V, 16 bit, step size ~23 mV	~200 $\mu$ A
HV 2200V	~0 - 2200 V, 16 bit, step size ~34 mV	~150 $\mu$ A
HV 4000V	~0 - 4000 V, 16 bit, step size ~61 mV	~100 $\mu$ A
HV 6000/600V	Low range ~0 - 600 V, 16 bit, step size ~9.2 mV High range ~0 - 6000 V, 16 bit, step size ~92 mV	~100 $\mu$ A



Maximum non-linearity over the range of 100 V is ~0,2 mV.

# RS 40B1 X-RAY SOURCE



XPS/ESCA | HIGH PRESSURE XPS

## DESCRIPTION

The RS 40B1 X-ray Source is a high intensity twin anode Al/Mg source optimized for XPS and high pressure XPS experiments (option). Design of the anode, filament and source housing guarantees maximum X-ray intensity and very low crosstalk between the anode faces. A specially configured nose cone allows maximum access to the sample. Twin anode used in standard source, allows for separated emission of two different characteristic X-ray radiation emission lines: Mg (1253 eV), Al (1487 eV) – other coating materials on request.

## FEATURES

- High intensity twin anode Al / Mg
- Specially configured nose cone
- Very low cross-talk
- Low magnetic field
- Hermetically sealed housing
- Very efficiently water-cooled inner housing in order to reduce thermal damage to the sample during operation
- In-built double high voltage protection together with hermetically sealed housing
- Able to work in high pressure experiments in the mbar range (option)

## OPTIONS

- High Pressure version, up to 5 mbar (20 mbar in development)
- Linear shift with tilt 75 - 100 mm (for HP X-ray source equipped with additional pumping port)
- Chiller

## TECHNICAL DATA

Mounting flange	DN 40CF (non-rotatable)
Anode	Al/Mg (other materials on request)
Power	Al 600 W / Mg 400 W
Energy range	7 - 15 keV
Cathode current ( $I_{cath}$ )	up to 2.5 A
Emission current range ( $I_e$ )	0 - 50 mA
Cross talk	< 0.35 %
Magnetic field at sample	< 0.5 $\mu$ T
Increased sample temperature	< 5 °C
Cathode type	thoriated tungsten
Water cooling	required, pressure 3.5 - 5 bar (max. 6 bar), flow $\geq$ 3 l/min., $T_{max} = 30$ °C
Insertion length	285 mm; OD: 35 mm
FWHM	dependent on working distance (e.g. 30 mm for distance 15 mm)
Typical working distance	5 - 30 mm (optimum 15 mm)
Bakeout temperature	up to 250 °C
Working pressure	< $5 \times 10^{-6}$ mbar

# XR40B X-RAY SOURCE ELECTRONICS SET



## DESCRIPTION

The **XR40B set** comprises 3 units for full control of the X-ray Source RS40B1: **XR40B-EC Emission Controller**, **XRHV01-PS High Voltage Power Supply** and **XRCB-02 Cooling Controller**.

The XR40B-EC unit controls the emission current of the X-ray source and also the XRHV01-PS high voltage power supply, displaying both, the high voltage and emission current, on a single display. The XR40B-EC displayed emission current is the exact emission current (corrected by the water leakage current of the cooling system). This combination allows very convenient and stable control of the X-ray source. The unit stores information about total anode working time and dissipated power. Communication with cooling box is via fiber optic wire. The XR40B set has both operational and standby modes, guaranteeing the most accurate and stable emission at the start of an experiment. The XRCB02 Cooling Controller delivers water cooling safely and efficiently to the anode and to the housing. It is fully interlocked, monitoring water temperature, pressure and flow, so that the instrument can only operate if fully safe to do so. The cooling box can handle up to two X-ray sources. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## OPTIONS

- Capability to operate up to two X-ray sources.

**NOTE** | If any interlock condition is not met, the source cannot be powered on. In addition to these three interlocked safety mechanisms, water leakage current is continuously monitored.

## TECHNICAL DATA

Supply voltage	
XR40B-EC	100 - 240 VAC, 50/60 Hz
XRHV01-PS	85 - 260 VAC, 50/60 Hz
XRCB02	230 VAC (with water pump) 110 VAC (with water pump) 110-240VAC (without water pump)
Emission current range ( $I_a$ )	0 - 50 mA, accuracy 0.1 mA
Anode high voltage range ( $U_{HV}$ )	0.5 kV - 15 kV, accuracy 0.1 kV
Cathode current ( $I_{cath}$ )	output 1: 2.5 A output 2: up to 6 A in operate mode
Anode power limit	750 W
Emission current ramp	0.1 - 50 mA/sec
High voltage ramp	1 - 1000 V/sec
Interlocks XR40B-EC	master, 2 X-ray cover, high vacuum, cooling water, remote
Water cooling XRCB02	max. 6 bar, 5 l/min. prepared for de-ionized water
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface XR40B-EC	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions XR40B-EC	483 × 133 × 380 mm (W×H×D), 19" rack mountable
Dimensions XRHV01-PS	483 × 45 × 420 mm (W×H×D), 19" rack mountable
Dimensions XRCB02	483 × 133 × 295 mm (W×H×D), 19" rack mountable

# XR40B-EC X-RAY SOURCE EMISSION CONTROLLER



## DESCRIPTION

The XR40B-EC electronic unit controls the X-ray source emission current. It fully controls the high voltage X-ray source power supply XRHV01-PS via analogue interface 0 - 5 V, so the user can see the high voltage and emission current on the XR40B-EC display. The XR40B-EC displayed emission current is the exact emission current (corrected by the water leakage current of the cooling system). This combination allows very convenient and stable control of the X-ray source. The XR40B-EC controller has several interlocks: master interlock, two X-ray tube cover interlocks, high vacuum interlock, cooling water interlock and remote interlock to fully protect both the user and X-ray source. If any interlock condition is not met the source is disabled. Two operating modes, Standby and Operate, guarantee the most accurate and stable emission immediately after starting an experiment. Easy firmware update via USB port. The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## OPTIONS

- Capability to operate up to two X-ray sources
- X-ray monochromator quartz crystal heating

**NOTE** | If any interlock condition is not met, the source cannot be powered on. In addition to these three interlocked safety mechanisms, water leakage current is continuously monitored.

## TECHNICAL DATA

Supply voltage	100 - 240 VAC, 50/60 Hz, (power consumption max 1600 W)
Emission current range ( $I_e$ )	0 - 50 mA, accuracy 0.1 mA
Anode high voltage range ( $U_{HV}$ )	0.5 - 15 kV, accuracy 0.1 kV
Cathode current ( $I_{cath}$ )	output 1: 2.5 A output 2: up to 6 A in operate mode
Anode power limit	750 W
Emission current ramp	0.1 - 50 mA/sec
High voltage ramp	1 - 1000 V/sec
Interlocks	master, 2 X-ray cover, high vacuum, cooling water, remote
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	483 × 133 × 380 mm (W×H×D), 19" rack mountable
Weight (approx.)	7 kg

## X-RAY SOURCE CONTROL APPLICATION





## XRHV01-PS HIGH VOLTAGE POWER SUPPLY



### DESCRIPTION

The XRHV01-PS unit provides a 0 to 15 kV output voltage and 800 W max. output power. The power supply is controlled via analogue I/O by XR40B-EC. The high voltage can be set via 0 - 5 V analog input, corresponding to a monitored 0 - 15 kV output voltage. The current limit can be set via 0 - 5 V analog input corresponding to a monitored output current of 0 - 50 mA. The output is fully protected in case of either short or overload current.

### ADDITIONAL INFORMATION

Full functionality only in connection with the Emission Controller XR40B-EC.

### TECHNICAL DATA

Supply voltage	85 - 260 VAC, 50/60 Hz
Output voltage range $V_o$	0 - 15 kV
Output current range $I_o$	0 - 50 mA
Max output power	800 W
Voltage regulation	< 0.005%
Polarity	positive
Remote control	via indirect coupled analogue I/O (male D-SUB 9)   set and monitor 0 - 5 V
Protection	over load and short circuit, voltage supply and temperature
Dimensions	483 × 45 × 420 mm (W×H×D), 19" rack mountable
Weight (approx.)	6.5 kg

## XRCB-02 X-RAY COOLING CONTROLLER



### DESCRIPTION

The XRCB-02 Cooling Controller is mainly used to cooling control of the X-ray Sources. Water cools the X-ray source's anode, which operates at high potential. All water cooling pipework is electrically isolated. The XRCB-02 Cooling Controller requires a water feed from a re-circulating chiller for correct operation. Water flow, temperature and pressure are continually monitored.

### FEATURES

- Over pressure safety valve
- Anti condensing internal pipework
- High voltage resistance pipework for cooling water
- Adjustable flowmeter and over pressure valve
- Communication with cooling box is via fiber optic wire

### TECHNICAL DATA

Supply voltage	230 VAC (with water pump) 110 VAC (with water pump) 110-240VAC (without water pump)
Water cooling	max. 6 bar, 5 l/min. prepared for de-ionized water
Dimensions	483 × 133 × 295 mm (W×H×D) 19" rack mountable
Weight (approx.)	18 kg

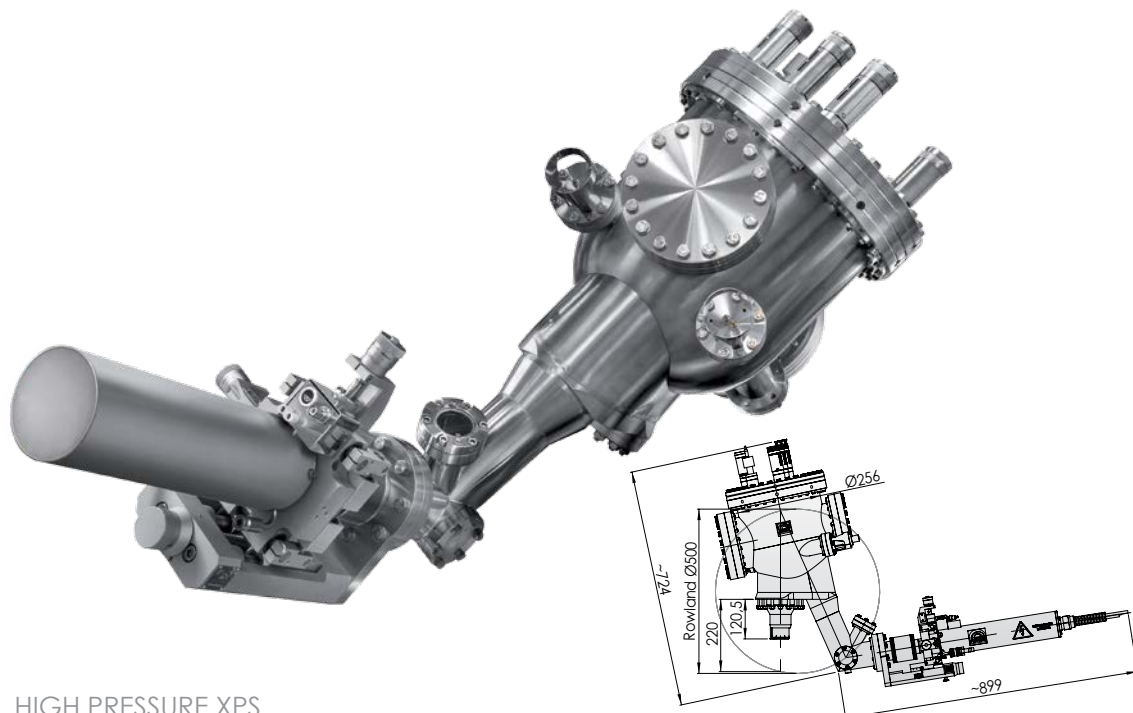
### ADDITIONAL INFORMATION

Full functionality only with connection to the XR40B-EC.

### OPTIONS

- Capability to operate up to two X-ray sources

# RMC50 X-RAY SOURCE with MONOCHROMATOR



XPS/ESCA | HIGH PRESSURE XPS

## DESCRIPTION

The RMC50 X-ray source with monochromator is based on ellipsoidal quartz crystal and operates according to Bragg Law of X-ray diffraction. Crystal mirror has been installed on special designed independent retraction, pitch, roll mechanism to precise adjustment working position and two halogen heaters controlled via PID regulator. The monochromator with a Rowland circle of 500mm diameter for a high X-ray energy resolution has a compact design with differential pumping ports and an optional polymer aluminized window can be installed to prevent from sputtering. X-ray source based on redesigned dual anode source has been installed on three degrees of motion high precise manipulator. Source has two operate modes – high power up to 600W, and small spot for high spatial/energy resolution measurement.

**High pressure versions are available:**  
**RMC50 HP5 with working pressure range up to 5 mbar, and**  
**RMC50 HP50 with working pressure range up to 50 mbar.**

## FEATURES

- Two anode types (Al/Ag) radiation to be monochromized with one single crystal
- High photon intensity giving a line width of < 0.2 eV
- Excellent energy resolution
- Satellites and ghosts line eliminated
- Reduce background
- Reduce sample distortion
- Crystal temperature stability
- Small spot working mode

## TECHNICAL DATA

Mounting flange	DN 100 CF
Crystal area	200 mm x 100 mm
Rowland circle diameter	500 mm
Chamber diameter	310 mm
Chamber port length	220 mm
X-ray source anodes	dual anode Al/Ag
Modes:	
normal (non-focusing)	1 mm x 4 mm
small spot (focusing)	1 mm x 2 mm
Voltage	up to 15 kV
Power	Al: 200 W (focusing), 450 W (non-focusing) Ag: 300 W (focusing), 600 W (non-focusing)
Manipulator X/Y/Z range	± 6.5 mm / ± 6.5 mm / 25 mm
Differential pumping	yes
Crystal heating	yes (with stabilisation)
Shutter	option
Bakeout temperature	up to 150 °C
Weight (approx.)	65 kg
Working pressure	<b>UHV</b> < 5 × 10 <sup>-6</sup> mbar <b>HP5</b> < 5 mbar <b>HP50</b> < 50 mbar

## ELECTRONICS

### XR40B XRAY SOURCE ELECTRONICS SET

Please refer to the product page: 13



# XREC20 X-RAY SOURCE ELECTRONICS SET

## for SAX sources



### DESCRIPTION

The **XREC20 set** comprises 2 units for full control of the SAX X-ray Sources: **XREC20-1 emission controller**, **XRHV02-PS high voltage power supply**.

The XREC20-1 unit controls the emission current of the X-ray source and also the XRHV02-PS high voltage power supply, displaying both the high voltage and emission current on a single display. The unit allows measurement of working time and anode power. The X-ray source electronics set has both operational and standby modes, guaranteeing the most accurate and stable emission at the start of an experiment. Easy firmware update via USB port (XREC20-1). The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

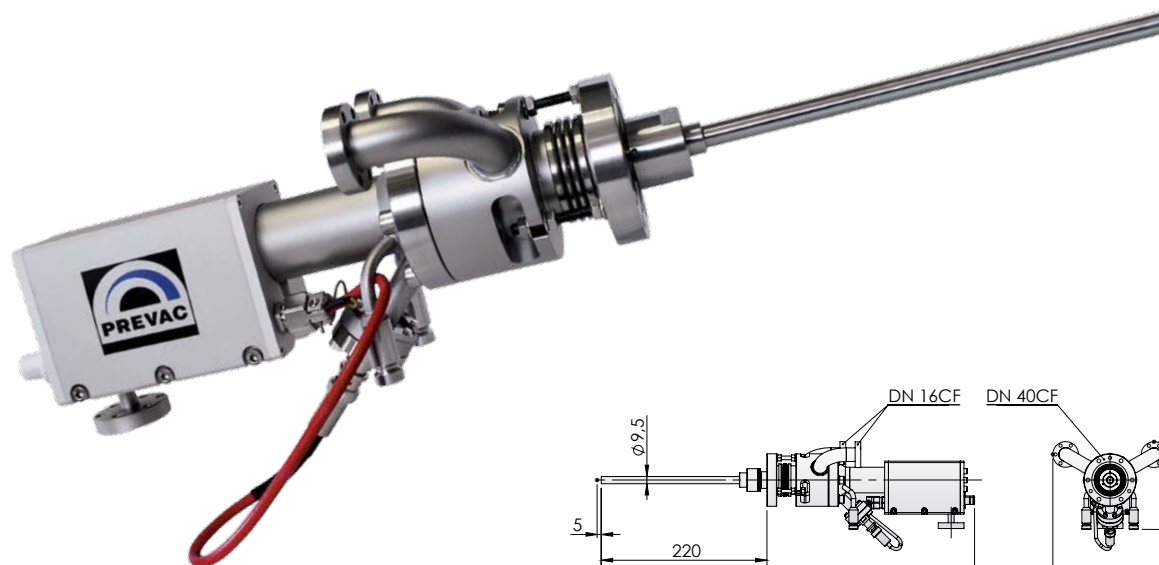
### TECHNICAL DATA XRHV02-PS

Supply voltage	85 - 260 VAC, 50-60 Hz
Output voltage range $V_o$	0 - 15 kV
Output current range $I_o$	0 - 100 mA
Max output power	1.5 kW
Polarity	negative
Remote control	via indirect coupled analogue I/O (male D-SUB 9) set and monitor 0 - 5 V
Protection	over load and short circuit, voltage supply and temperature
Dimensions	483 × 88 × 420 mm (W×H×D), 19" rack mountable
Weight (approx.)	6.5 kg

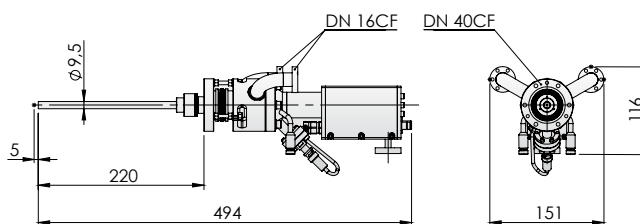
### TECHNICAL DATA XREC20-1

Supply voltage	110 or 230 VAC, 50/60 Hz, (power consumption max 1800 W)
Emission current range ( $I_e$ )	0 - 100 mA, accuracy 0.1 mA
Anode high voltage range ( $U_{HV}$ )	0.5 - 15 kV, accuracy 0.1 kV
Cathode current ( $I_{cath}$ )	3 A in Standby mode up to 20 A in Operate mode
Anode power limit	650 W
Emission current ramp	0.1 - 50 mA/sec
High voltage ramp	1 - 1000 V/sec
Interlocks	high vacuum, cooling water (master), X-ray cover
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	483 × 133 × 380 mm (W×H×D), 19" rack mountable
Weight (approx.)	10 kg

# UVS 40A2 UV SOURCE



UPS



## DESCRIPTION

The UV Source (UVS) is a high intensity photon source that can be operated with a variety of discharge gases. The UVS 40A2 is used in UPS (ultraviolet photoelectron spectroscopy) research. The UVS is water cooled for maximum stability and features fully interlocked safety circuitry. The discharge has a maximum photon intensity at a pressure of several mbar so dual differential pumping stages are employed in order to maintain the host chamber pressure. The UVS 40A2 is designed so that a continuous gas flow is maintained through the discharge region. This is a great advantage in maintaining the cleanliness of the discharge capillary and results in very long service intervals.

## FEATURES

- Can be operated with various discharge gases
- Manual or auto ignition
- Control of the He I / He II ratio via precise adjustment of helium pressure and discharge current
- Easy operation
- Stable output
- Special designed discharge chamber
- Electronically stabilised discharge current
- Windowless, direct sight connection

## OPTIONS

- Gas dosing system
- Customised insertion length
- Linear shift (50 - 100 mm)
- Differential pumping (required)
- Chiller

## TECHNICAL DATA

Mounting flange	DN 40 CF (non-rotatable)
Gases	He, Ar, H <sub>2</sub> * (option: Kr, Xe, Ne)
Photocurrent	1 - 80 nA
Photon flux	>10 <sup>16</sup> photons / s*sr
<b>He I / He II ratio</b>	<b>better than 3:1</b>
Water cooling	required, pressure 2 - 3 bar (max. 6 bar), flow > 1.5 l/min, T <sub>max</sub> = 30 °C
Port aligner	integral , +/- 4°
Discharge current	40 - 300 mA
Beam divergence	small beam divergence: <1°
Capillary I.D.	1.5 mm (others on request)
Insertion length	220 mm (standard), other on request, OD: 9.5 mm
FWHM	dependent on working distance (e.g. 1.2 mm for distance 10 mm)
Typical working distance	5 - 100 mm (optimum 5 - 50 mm)
Bakeout temperature	up to 200 °C
Working pressure	< 1 mbar

\* Mo anode required.

# UV40A-PS UV SOURCE POWER SUPPLY



## DESCRIPTION

The UV40A-PS can work in either constant discharge current or discharge voltage mode to provide the best operation conditions for the UV source. The source can be automatically ignited directly from the power supply or manually on the source via a piezo-electric igniter. All adjustable parameters are clearly displayed on the large front-panel TFT and precisely controlled via digital encoders. The unit also features a built in timer and automatic standby mode. The UV40A-PS is supplied as a full width 19" rack mounting unit (3U height). Easy firmware update via USB port. The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## APPLICATION

The UV40A-PS power supply controls the UV40A1 UV Source in ultraviolet photoelectron spectroscopy (UPS) applications.

## OPTIONS

- Analog I/O card for vacuum measurement (1 gauge)

## UV SOURCE CONTROL APPLICATION

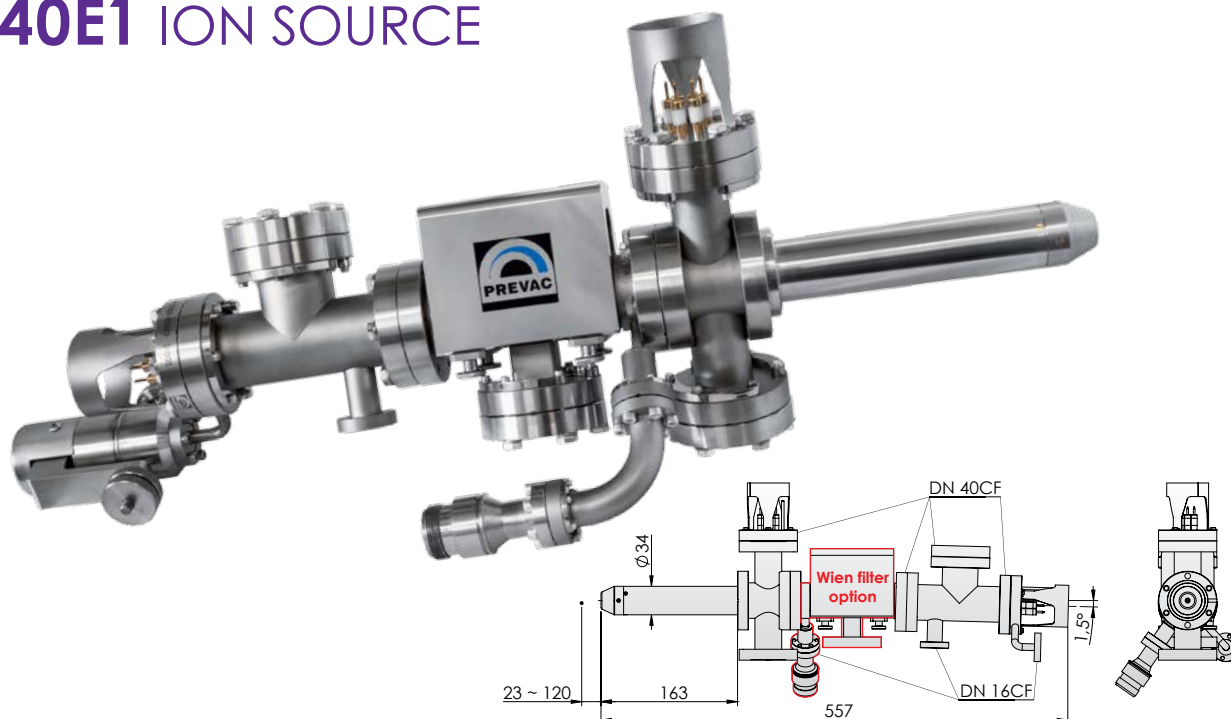


## TECHNICAL DATA

Supply voltage	100 - 120 VAC/200 - 240 VAC, 50/60 Hz (power consumption max 800 W)
Output power	300 W
Discharge voltage ( $U_{\text{source}}$ )	200 - 1000 V, resolution 10 V, ripple $< 0.5 V_{\text{pp}}$
Discharge current ( $I_{\text{emis}}$ )	5 - 300 mA, resolution 1 mA
Vacuum measurement (optional)	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	448.8 × 132.5 × 435 mm (W×H×D), 19" rack mountable
Weight (approx.)	9.3 kg



## IS 40E1 ION SOURCE



DEPTH PROFILING | ISS | SIMS | SAMPLE CLEANING

## DESCRIPTION

The IS 40E1 Ion Source is a two lens, extractor type, focused, differentially pumped ion gun. The source is able to raster a 10 mm x 10 mm area of the surface at the recommended working distance. It is particularly suitable for depth profiling in XPS, ISS and SIMS. The source can be also used for sample surface cleaning.

## FEATURES

- Specially configured nose cone
- Operation with inert (Ar) & reactive gases (O<sub>2</sub>, H<sub>2</sub>, hydrocarbons with reduced lifetime)
- Continuously variable spot size
- Onside replaceable filament
- UHV gas inlet
- UHV conditions maintained in chamber
- Integrated scan and deflection unit
- Correction of incident electron beam angle (provided by IS40-PS power supply)

## OPTIONS

- **Wien mass filter**
- Gas dosing system
- Linear shift: 25, 50, 75, 100 mm
- Differential pumping (2 stages)

## TECHNICAL DATA

Mounting flange	DN 40 CF (rotatable)
Gases	Ar and reactive gases (O <sub>2</sub> , H <sub>2</sub> hydrocarbons with reduced lifetime)
Energy range	0.15 keV - 5 keV
Scan area	10 mm × 10 mm (for distance of 23 mm)
Current density	up to 4 mA/cm <sup>2</sup> (for distance 23 mm)
Beam current	> 1 μA (for distance 23 mm)
Cathode type	yttrium oxide coated iridium
Small cone angle	50°
In vacuum side	no magnetic parts
Insertion length	163 mm; OD: 34 mm
FWHM	dependent on working distance (e.g. < 150 μm for distance 23 mm)
Typical working distance	23 - 120 mm
Bakeout temperature	up to 250 °C
Working pressure	10 <sup>-8</sup> mbar (with max beam current)



# IS40-PS ION SOURCE POWER SUPPLY (IS 40E1 mode)



## DESCRIPTION

The IS40-PS power supply drives the IS40E1 Scanning Ion Source. It allows fine adjustment of the primary beam energy, ion density and beam profile (by adjustment of extractor, focus lenses, deflection and positioning elements). Up to 4 parameters can be varied via the digital encoder. The current status of each parameter is displayed on the large front panel LCD display. All settings can be manually adjusted or can be stored and recalled automatically after unit switch on. The unit also features a built in timer and automatic standby mode. Easy firmware update via USB port. The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## OPTIONS

- Analog I/O card for vacuum measurement (1 gauge)

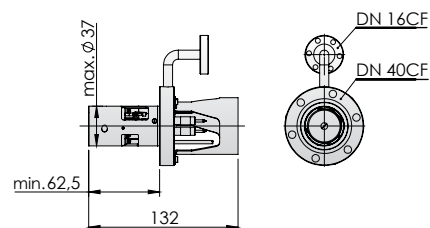
## ION SOURCE CONTROL APPLICATION



## TECHNICAL DATA

Supply voltage	100 - 240 V, 50-60 Hz, (power consumption max 250 W)
Beam energy (E)	0.15 - 5 keV, resolution 0.01 keV, ripple < 0.2 V <sub>pp</sub>
Emission current (I <sub>e</sub> )	0.01 - 10 mA, resolution 0.01 mA
Focus (1,2) voltage	0 - 5000 V, resolution 1 V, ripple < 0.2 V <sub>pp</sub>
Extractor voltage (Ex)	60 - 100 % of energy, resolution 0.1 %, ripple < 0.2 V <sub>pp</sub>
Beam position (Px, Py)	-5 mm - 5 mm, resolution 0.01 mm
Scanning area (Δx, Δy)	10 mm × 10 mm, resolution 0.01 mm
Scanning speed (time/dot)	20 μs - 30 ms
Timer	dual mode timer 0 s - 99 h 59 m
Vacuum measurement (optional)	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	483 × 133 × 437 mm (W×H×D), 19" rack mountable
Weight (approx.)	12 kg

## IS 40C1 ION SOURCE



SAMPLE CLEANING

## DESCRIPTION

The Ion Source IS 40C1 is a compact, easy-to-use extractor type ion gun for sample surface cleaning. The source generates an ion current of  $>70 \mu\text{A}/\text{cm}^2$  (Argon) with Gaussian beam profile. The source insertion length is adaptable to individual requirements (between 62.5 mm - 384.5 mm, other on request).

## FEATURES

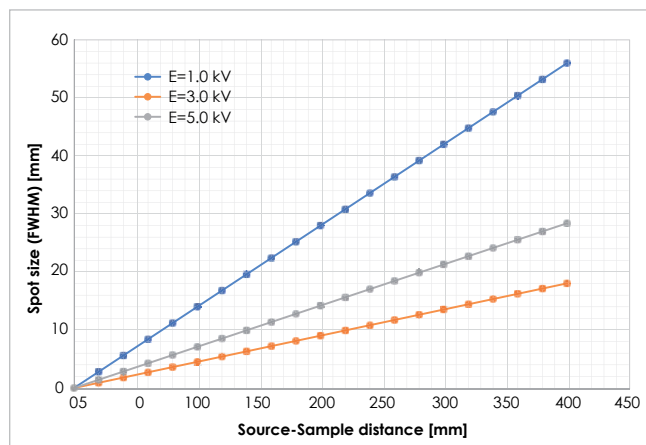
- Operation with inert (Ar) & reactive gases ( $\text{O}_2$ ,  $\text{H}_2$ , hydrocarbons with reduced lifetime)
- High Ion Beam Current
- Long lifetime
- High stability

## OPTIONS

- Gas dosing system
- Customised insertion length
- Linear shift

## TECHNICAL DATA

Mounting flange	DN 40CF (non-rotatable)
Energy range	0.12 keV - 5 keV
Current density	$> 120 \mu\text{A} / \text{cm}^2$ (for distance 30 mm)
Shield	Cu, stainless steel (for reactive gases)
Cathode type	yttrium oxide coated iridium
Insertion length	min. 62.5 mm, other lengths possible OD: max. 37 mm
FWHM	dependent on ion energy and working distance (e.g. 3 mm for distance 30 mm)
Typical working distance	30 - 250 mm
Bakeout temperature	up to 250 °C
Working pressure	$10^{-5}$ - $10^{-6}$ mbar



# IS40-PS ION SOURCE POWER SUPPLY (IS 40C1 mode)



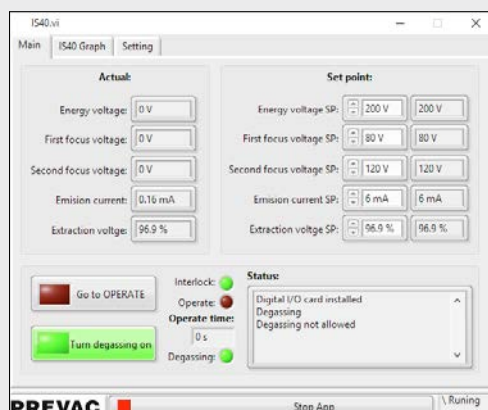
## DESCRIPTION

The IS40-PS power supply drives the IS40C1 Ion Source which is used for broad area UHV sample cleaning and preparation. The IS40-PS power supply allows fine adjustment of both beam energy and ion density via digital encoders. All settings can be manually adjusted or can be stored and recalled automatically after unit switch on. The unit also features a built in timer and automatic standby mode. Easy firmware update via USB port. The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## OPTIONS

- Analog I/O card for vacuum measurement (1 gauge)

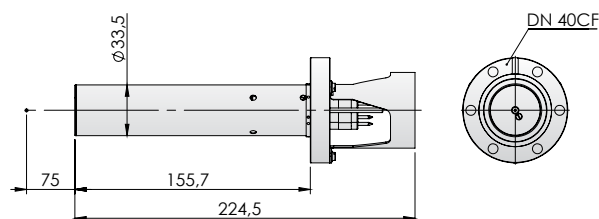
## ION SOURCE CONTROL APPLICATION



## TECHNICAL DATA

Supply voltage	100 - 240 V, 50-60 Hz, (power consumption max 250 W)
Beam energy ( $U_{eng}$ )	0.00 - 5.00 keV, resolution 0.01 keV, ripple <200 mV
Emission current ( $I_e$ )	0.01 mA - 10 mA, resolution 0.01 mA
Timer	dual mode timer 0 s - 99 h 59 m
Vacuum measurement (optional)	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	483 × 133 × 437 mm (W×H×D), 19" rack mountable
Weight (approx.)	9.2 kg

# ES 40C1 ELECTRON SOURCE



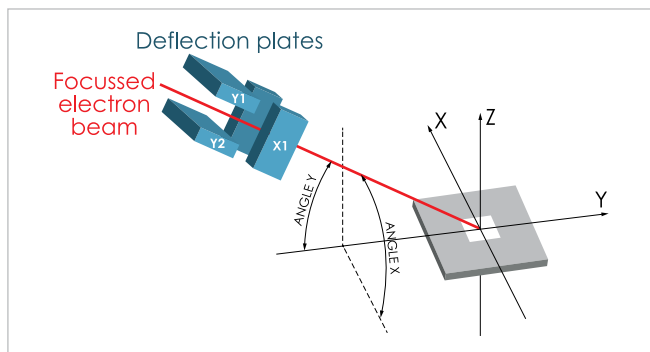
AES | EELS | SCANNING APPLICATIONS | ELECTRON PULSE OR DESORPTION EXPERIMENTS (ESD)

## DESCRIPTION

The ES 40C1 Electron Source is a scanable electron gun with small spot profile. Due to the high transmission of its Einzel-Lens, the ES 40C delivers a high electron beam current over a wide energy range. The ES 40C1 is designed for a stable and reliable operation in e.g. AES, scanning applications, imaging, EELS and electron pulse or desorption experiments (ESD).

## FEATURES

- Fine focus microformed tip cathode
- Scannable electron source with a small spot profile
- Integrated scan and deflection unit
- Correction of incident electron beam angle (provided by ES40-PS power supply)



Correction of incident electron beam angle

## OPTIONS

- Linear shift
- Customised insertion length
- Source shielding material ( $\mu$ -metal or copper)

## TECHNICAL DATA

Mounting flange	DN 40 CF (rotatable)
Energy range	0 - 5 keV
Sample current	up to 100 $\mu$ A
Scan area	10 mm $\times$ 10 mm
Shield	Cu (for $\mu$ -metal chambers) or $\mu$ -metal (for stainless steel chambers)
Cathode type	thoriated tungsten
Insertion length	min. 155.7 mm, other on request OD: 33.5 mm ( $\mu$ -metal), 35 mm (Cu)
FWHM	dependent on working distance, min. 120 $\mu$ m (for distance 56 mm),
Working distance	23 mm - 150 mm (typical 75 mm)
Bakeout temperature	up to 250 $^{\circ}$ C
Working pressure	$< 5 \times 10^{-6}$ mbar

# ES40-PS ELECTRON SOURCE POWER SUPPLY



## DESCRIPTION

The ES40-PS power supply allows fine adjustment of electron beam energy, density, position on the sample and also beam profile. Scanning features allows for independently controlled scanning speed and range. All settings can be manually adjusted or can be stored and recalled automatically after unit switch on. The unit also features a built in timer and automatic standby mode. The ES40-PS can be supplied as a full width 19" rack mounting unit (3U height) or free standing. Easy firmware update via USB port. Unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## APPLICATION

The ES40-PS power supply is intended to use with the ES40C1 Low Energy Electron Source or Double Pass Mini Cylindrical Mirror Analyzer CMA 40CF. The power supply allows fine adjustment of the electron beam profile to achieve a small spot at high energy and emission currents.

## OPTIONS

- Analog I/O card for vacuum measurement (1 gauge)

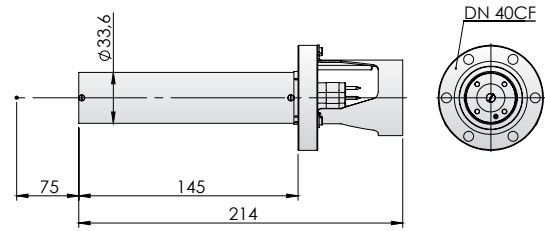
## ELECTRON SOURCE CONTROL APPLICATION



## TECHNICAL DATA

Supply voltage	100 - 240 V, 50-60 Hz (power consumption max 250 W)
Beam energy	0 - 5000 eV, resolution 0.1 eV, ripple < 200 mV
Emission current	0.1 - 300 μA, res. 0.01 μA [ES mode] 1 - 3000 nA, res. 1 nA [CMA mode]
Focus voltage	60 - 100 % related to energy voltage, resolution 0.1 %
Wehnelt voltage	0 - 150 V, res. 0.1 V [ES mode] -12 - 12 V, res. 0.1 V [CMA mode]
Beam position (Px,Py)	resolution 0.01 mm, middle pos ±5 mm
Scanning area (Δx, Δy)	10 mm × 10 mm, resolution 0.01 mm
Scanning speed (time/dot)	20 μs - 30 ms
Timer	dual mode timer 0 s - 99 h 59 m
Vacuum measurement (optional)	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User Interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	483 × 133 × 435 mm (W×H×D), 19" rack mountable
Weight (approx.)	9.2 kg

# FS 40A1 FLOOD SOURCE



CHARGE NEUTRALIZATION

## DESCRIPTION

Low cost electron Flood Source for charge neutralisation of insulators or semiconductors in XPS/AES and SIMS applications. The Flood Source operates in two energy ranges, is fully software controlled and can also be supplied with custom insertion lengths (145 - 421 mm, other on request) and shielding materials, e.g. mu-metal, copper.

## FEATURES

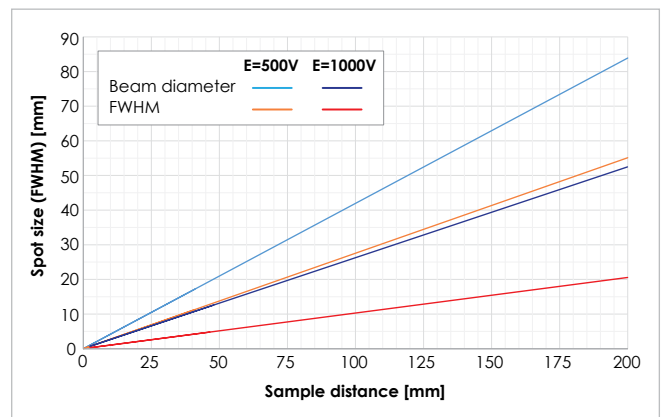
- High electron beam current
- Selectable energy ranges
- Stabilised emission
- Beam profile control

## OPTIONS

- Linear shift
- Customised insertion length
- Source shielding material ( $\mu$ -metal or copper)

## TECHNICAL DATA

Mounting flange	DN 40 CF (non-rotatable)
Energy range	0.01 - 1000 eV
Sample current	up to 100 $\mu$ A
Cathode type	thoriated tungsten
Shield	Cu (for $\mu$ -metal chambers) or $\mu$ -metal (for stainless steel chambers)
Insertion length	min. 145 mm (other on request) OD: 33.6 mm ( $\mu$ -metal), 35 mm (Cu)
FWHM	depending on working distance (e.g. 10 mm for distance 30 mm)
Typical working distance	20 - 100 mm
Bakeout temperature	up to 250 °C
Working pressure	< $5 \times 10^{-6}$ mbar





# FS40-PS FLOOD SOURCE POWER SUPPLY



## DESCRIPTION

The FS40-PS power supply allows fine adjustment of all instrument parameters for achieving a wide range of beam profiles; no additional electronics are required. All adjustable parameters are displayed on the large TFT display with touchscreen. All settings can be manually adjusted or can be stored and recalled automatically after unit switch on. The unit also features a built in timer and automatic standby mode. The FS40-PS can be supplied as a full width 19" rack mounting unit (3U height) or free standing. Unit can be remotely controlled via one of available interfaces. Unit also provides remote control of beam energy, emission current, focus and extractor voltages using analog interface. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

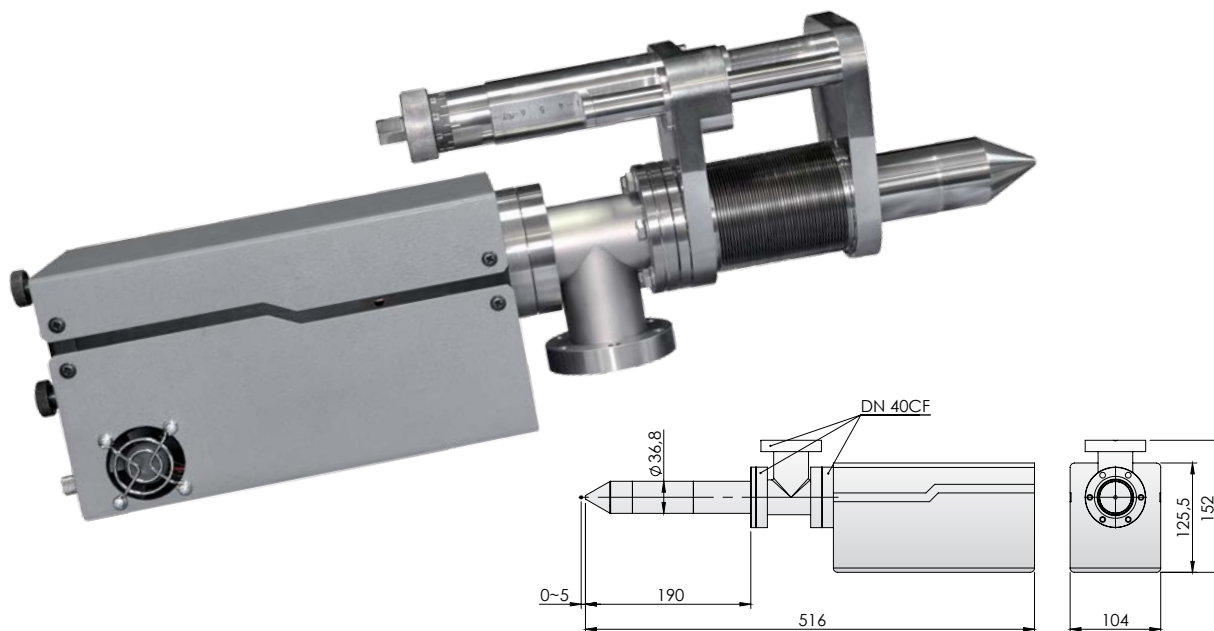
## APPLICATION

The FS40-PS power supply is designed for use with the FS40A1 Electron Flood Sources which are used for charge neutralization of insulator and semiconductor samples in XPS/AES and SIMS applications.

## TECHNICAL DATA

Supply voltage	100 - 240 V, 50-60 Hz (power consumption max 70 W)
Beam energy (low energy range)	0.01 - 50 eV, resolution 0.01 eV
Beam energy (high energy range)	50 - 1000 eV, resolution 0.1 eV
Emission current	1 - 1000 $\mu$ A, resolution 0.1 $\mu$ A
Focus voltage	300 - 1000 V, resolution 0.1 V
Extractor voltage	0 - 150 V, resolution 0.1 V
Analog inputs	4 (0 - 10V)
Timer	dual mode timer 0 s - 99 h 59 m
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	483 × 133 × 435 mm (W×H×D), 19" rack mountable or alone
Weight (approx.)	5.2 kg

# TDS 40A1 THERMAL DESORPTION SPECTROMETER



TDS

## DESCRIPTION

The TDS 40A1 is designed for Temperature Programmed Desorption (TPD) applications, also known as Thermal Desorption Spectroscopy (TDS). TPD involves heating a sample under UHV conditions and simultaneously measuring a number of desorbing gas species as a function of sample temperature. A custom designed conical sampling end piece ensures the best possible response to desorbing species.

## FEATURES

- Completely programmable
- Unique filament design
- Wide operation temperature range

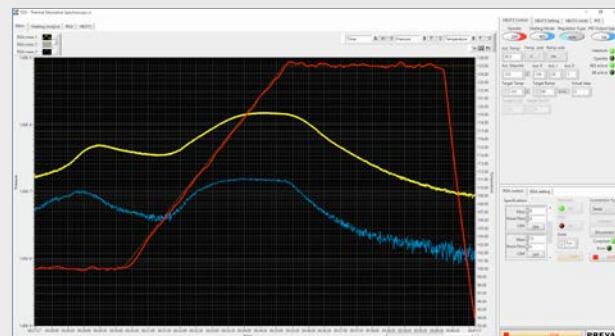
## OPTIONS

- Quadrupole MS: 100, 200 or 300 amu
- High stability linear shift
- Differential pumping (1 stage)

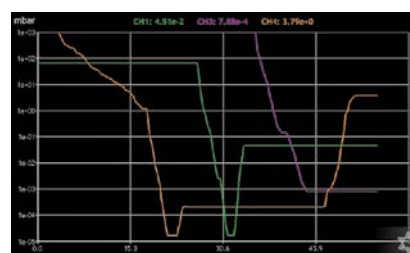
## TECHNICAL DATA

Mounting flange	DN 40CF (non-rotatable)
Bakeout temperature	up to 150 °C
Insertion length	190 mm (other on request) OD: 36.8 mm
Mass range	1 to 300 amu
Mass filter	quadrupole
Detector type	electron multiplier (EM)
Resolution	better than 0.5 amu
Sensitivity	$2 \times 10^{-4}$ A/Torr (FC), $< 200$ A/Torr (EM)
Minimum detectable partial pressure	$5 \times 10^{-11}$ Torr (FC), $5 \times 10^{-14}$ Torr (EM)
Working pressure	$< 10^{-4}$ Torr to UHV (FC) $< 10^{-6}$ Torr to UHV (EM)

## TDS/TPD SOFTWARE APPLICATION



# HEAT3-PS HEATING POWER SUPPLY



Real time pressure charts (data export possibility).

## DESCRIPTION

The HEAT3-PS is used for resistive heating or electron bombardment heating. The power supply can also be used for effusion cell evaporators. The unit is equipped with a PID temperature controller. Ramp heating function control sample temperature to protect sample from damage. Sample overheating can also be protected by setting the voltage and current limits. The unit can be operated in auto mode (with temperature control) or manual mode (without temperature control). The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## FEATURES

- **Dual heating mode: resistive and electron bombardment**
- Wide range temperature measurement (1.4 - 2473.15 K)
- **2D real time chart module**
- High efficiency
- Setpoint based over-voltage and over-current output protection
- Fully manual or PID temperature controlled (by setpoint and ramp)
- Process temperature control with built-in PID controller (with autotuning function for optimized process PID parameters)
- Various kind of temperature sensors: thermocouples K/C/E/N (other on request), Pt, diode
- Multiple I/O (10 digital/4 analog) - individual reprogrammable
- High resolution (16-bit analog I/O, 0.1 K temp.)
- One vacuum channel for active gauges
- **Shutter control function** - up to 2\* shutters (e.g. shutters of sources or manipulators)
- Mobile solutions for remote access and control
- Customised menu options (for robust and effectivity)
- Support (easy firmware update via USB)

\* for double DC module version, 1 shutter per channel

## OPTIONS

- **Second DC module** available: **two resistive heating zones** with independent control, or one resistive heating zone with **higher output power** (90V, 17A or 45V, 30A) excluding EB module
- Analog I/O card for vacuum measurement (1 gauge)

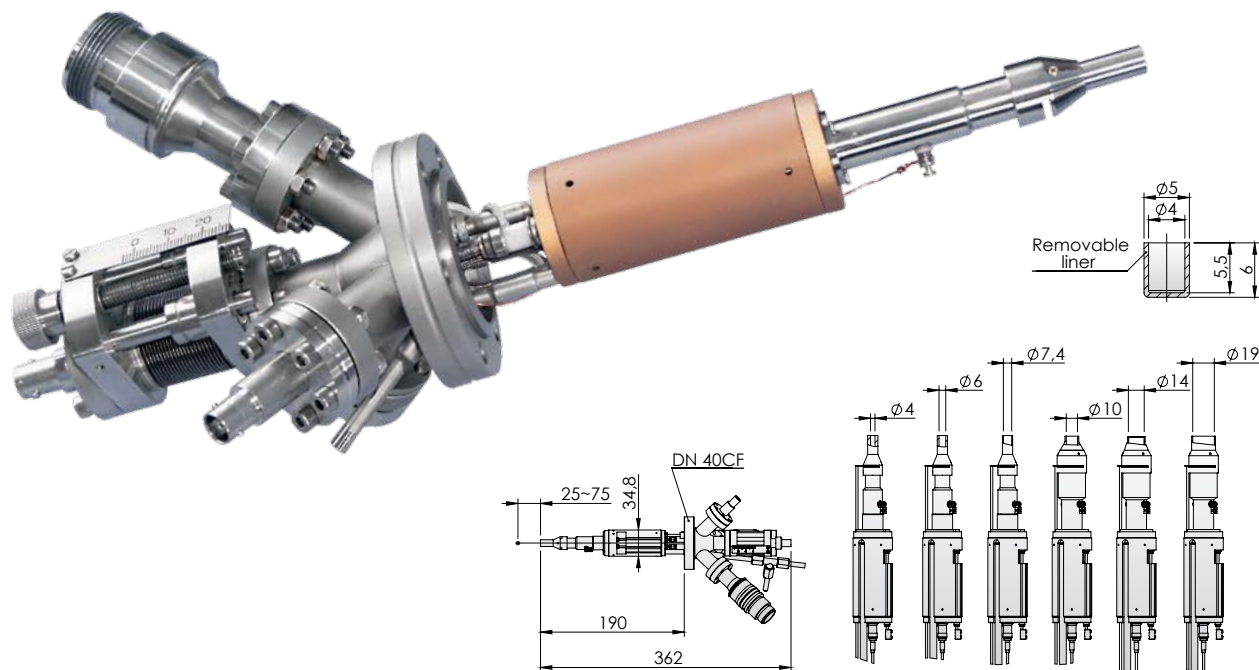
## TECHNICAL DATA

Supply voltage	100-130VAC/200-260 VAC, 50-60Hz (power consumption max 1600 W)
<b>Resistive heating</b> mode parameters	45 V, 17 A - standard; other versions on request
<b>EB heating</b> mode parameters	1000 V, 300 mA - standard; other versions on request
Temperature range	• <b>273.15 K - 2473.15 K</b> for type C thermocouple (dependent on sample holder type or evaporator)  • <b>73.15 K - 1645.15 K</b> for type K thermocouple • <b>1.4 K - 500 K</b> for DT670/DT470 silicon diodes (dependent on sample holder type and conditions in chamber)
Temperature independent inputs	2 - for thermocouples K/C/E/N 2 - for silicon diodes DT670/DT470
Temperature setpoint ramp rate	adjustable from 0.1 K to 1000 K/s   min   h
ΔT setpoint	0.1 to 5.0 K/s
Vacuum measurement (optional)	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	448.8 × 132.5 × 375 mm (W×H×D), 19" rack mountable
Weight (approx.)	8.8 kg (for standard version)

## APPLICATION

- Any thermal process according to the specifications
- Effusion cells supply
- Sample holders heating
- Thermal monitoring

# EBV 40A1 ELECTRON BEAM EVAPORATOR



## DESCRIPTION

The electron beam evaporator EBV 40A1 is designed for ultra-pure sub-monolayer and multilayer thin film growth by molecular beam epitaxy. The precisely defined evaporant beam means highly uniform deposition on the sample, the deposition area being determined by the distance from the E-beam evaporator to the sample and the choice of one of the easily exchangeable exit apertures. The electron beam evaporator EBV 40A1 is configured with choice of manual or automatic shutter. Custom insertion length 190 - 345 mm (other on request).

## FEATURES

- Manual or electro-pneumatic shutter, integrated flux monitor
- W/Th-filament for evaporation from rod material or from small conductable crucible
- Wide range of exchangeable exit apertures
- Integral water cooling
- Suitable for various materials
- Unique high reliability design
- Extremely high power densities

## OPTIONS

- Customised insertion length
- With or without integrated manual/electro-pneumatic shutter
- Linear shift
- Crucibles

## TECHNICAL DATA

Mounting flange	DN 40 CF (rotatable)
Temperature range (for evaporated materials)	160 °C - 2300 °C (3300 °C for molybdenum connector)
Filament current	typically 1.8 - 2.2 A, max 2.3 A
Evaporating rod diameter	2 mm standard (other on request); step 2 mm, wire feed 25 mm, wire length 43 mm
Water cooling (required)	water flow > 0.5 l/min temperature: 20 - 30 °C max pressure: 6 bar
Exit aperture diameters	set 1: ID 4, ID 6, ID 7.4 (standard) set 2: ID 10, ID 14, ID 19
Type of shutter	manual or pneumatic
Power	<ul style="list-style-type: none"> <li>• 50 W for high vapor pressure materials</li> <li>• up to 200 W for crucibles and thick wires</li> </ul>
Energy range	1 - 1500 eV
Cathode type	thoriated tungsten
Crucible type (option)	Knudsen cell type made of: Mo, W, liner PBN, Al <sub>2</sub> O <sub>3</sub>
Crucibles volume	0.07 ml
Evaporated materials	all typical materials according to crucible type
Others	<ul style="list-style-type: none"> <li>• flux regulation via ion current incl. electrode, feedthrough, display unit and regulator</li> <li>• rear-loading evaporant</li> </ul>
Insertion length	min. 190 mm (other on request); OD: 34.8 mm
Deposition area	dependent on working distance (e.g. 6 mm for distance 25 mm - ID 4, 33 mm for distance 75 mm - ID 19)
Working distance	25 - 75 mm (optimum)
Bakeout temp.	up to 250 °C
Working pressure	< 10 <sup>-5</sup> mbar

# EBV40A-PS EBV POWER SUPPLY



## DESCRIPTION

A key feature of the EBV40A is the integrated flux monitor. Evaporant flux is indirectly monitored via the measured ion current, providing accurate flux adjustment and faster deposition rate control. The ion collector is contained within the beam exit column. At a given electron emission current and beam energy the measured ion flux measured is directly proportional to the flux of evaporated atoms. The EBV40A-PS is equipped with built-in PID controller which stabilizes evaporant flux at the desired level. The unit can be operated in AUTO mode (with ion flux control) or MANUAL mode (without ion flux control). The EBV40A-PS can be supplied as a full width 19" rack mounting unit (3U height) or free standing. Unit can be remotely controlled via one of available interfaces.

## APPLICATION

The EBV40A-PS power supply drives the EBV40A Electron Beam Evaporator for ultra-pure sub-monolayer and multi-layer growth in MBE applications.

## EBV CONTROL APPLICATION



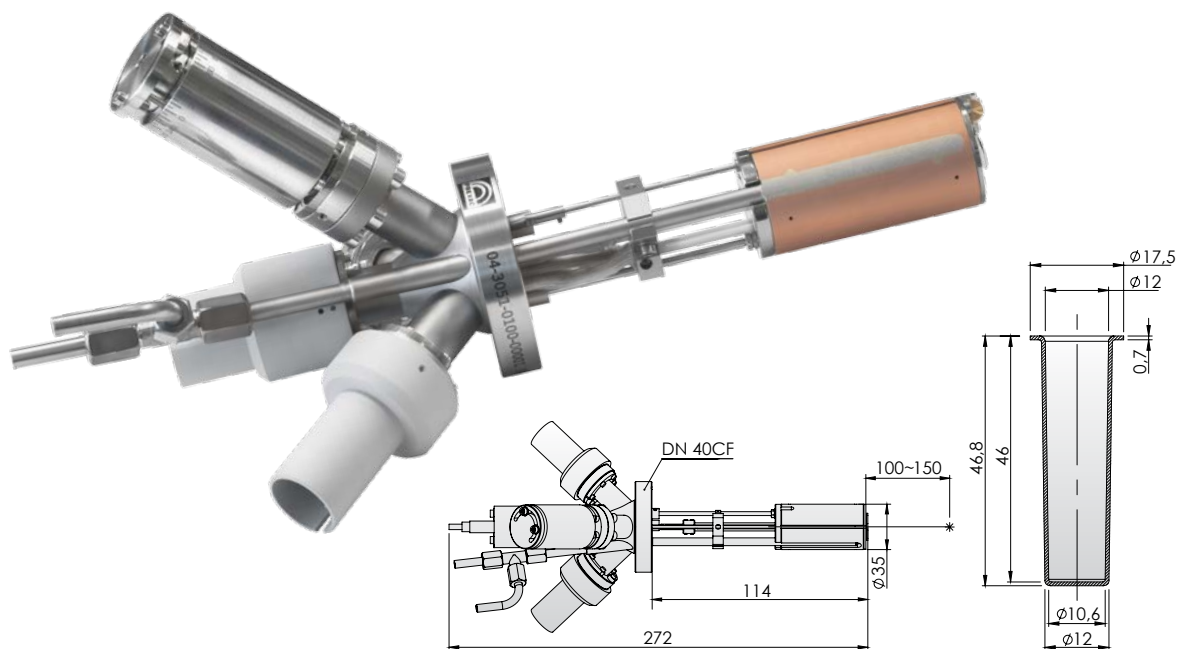
## TECHNICAL DATA

Supply voltage	110 V or 230 V, 50/60 Hz (specify at order) (power consumption max 600 W)
Anode voltage range ( $U_{eng}$ )	0 - 1500 eV at max 200 mA; resolution < 1V; ripple < 0.5 <sub>pp</sub>
Cathode current range ( $I_{fil}$ )	0 - 2.3 A, resolution < 0.1 A, ripple < 0.05 A
Ion current range (Flux)	1.00 nA - 99.9 mA
Max emission current	200 mA
Temperature monitor	0 - 75 °C, temperature of water-cooled copper cylinder
Flux current regulator	flux current controlled with internal regulator
Operating modes	auto/manual
Timer	dual mode timer 0 s - 99 h 59 min
Communication interface* (option)	RS232/485/422, USB
User interface	large LCD graphics display, functions keys & digital encoder
Interface languages	English, Polish
Dimensions	483 × 133 × 380 mm (W×H×D), 19" rack mountable
Weight (approx.)	9 kg

\* Only one comms interface can be used at any one time and is chosen at time of order. However, this may be swapped/interchanged with any other comms interface at any future date via simple rear panel plug and play swap, without having to access the internals of the unit.



# EF 40C1 EFFUSION CELL



## DESCRIPTION

EF 40C1 Effusion Cell (Knudsen Cell) is a source designed for delivering highly constant evaporation rates by indirect resistive heating at the material. Custom insertion length 114 - 380 mm (other on request).

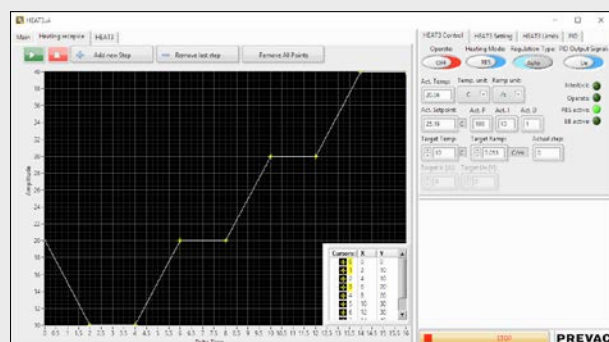
## FEATURES

- Extremely stable flux rates
- Various crucible materials
- Highly reproducible & reliable
- Suitable for use in any MBE system
- Mo free construction (allows high outgassing temperatures)
- Integral water cooling

## OPTIONS

- Customised insertion length
- With or without integrated manual/electro-pneumatic shutter
- Linear shift
- Crucibles
- Thermocouple type K

## HEATING CONTROL APPLICATION



## TECHNICAL DATA

Mounting flange	DN 40 CF (rotatable)
Heater	W wire (tungsten)
Temperature range	<b>EF 1500 °C</b> (~250 °C - 1500 °C, 1600 °C for degas) <b>EF 1200 °C</b> (~250 °C - 1200 °C)
Temperature stability	± 0.1 °C
Crucible type (option)	PBN, Al <sub>2</sub> O <sub>3</sub> , Quartz (other materials on request)
Crucibles volume	5cc
Evaporated materials	all typical materials according to crucible type
Thermocouple type	<b>EF 1500 °C</b> - type C (standard) <b>EF 1200 °C</b> - type K (option)
Degassing temp.	1600 °C
Type of shutter	side or flip type, manual or pneumatic
Water cooling (required)	water flow > 0.5 l/min temperature: 20 - 30 °C max pressure: 6 bar
Insertion length	min. 114 mm (other on request) OD: 35 mm
Deposition area	dependent on working distance
Working distance	100 - 150 mm
Bakeout temperature	up to 250 °C
Working pressure	< 10 <sup>-5</sup> mbar

## ELECTRONICS

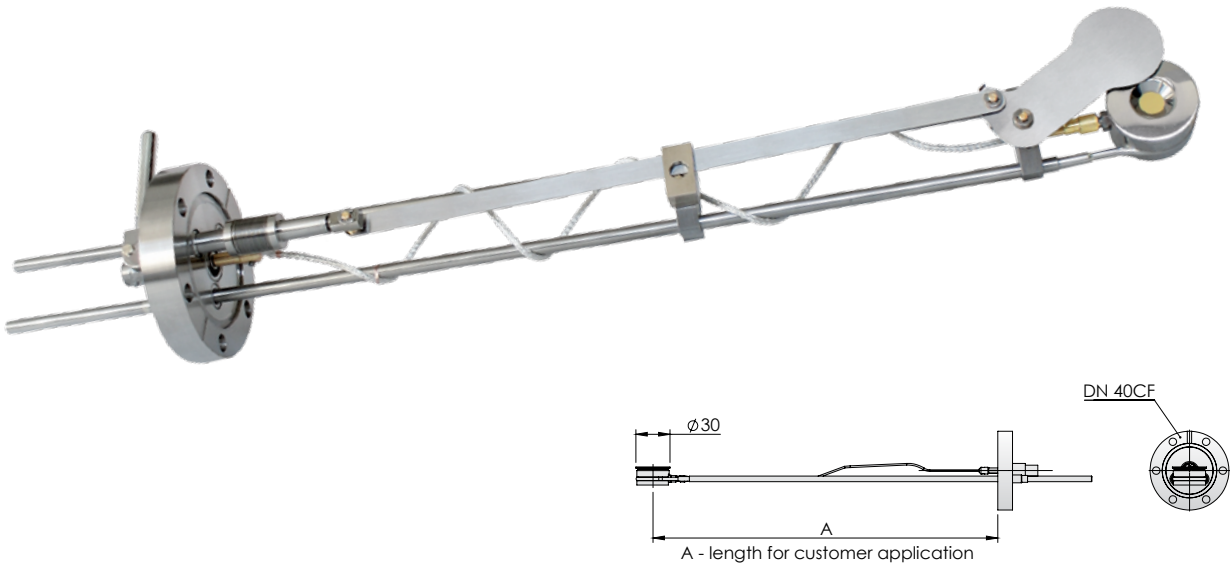
### HEAT3-PS HEATING POWER SUPPLY (resistive mode)

Please refer to the product page: 29





# QO 40A1 QUARTZ BALANCE



## DESCRIPTION

The Quartz Balance QO 40A1 instrument provides a real-time, continuous indication of coating thickness during deposition, allowing the production of coatings of high accuracy and reproducibility. The thickness of both evaporated and sputter coated films can be monitored. The sensor head placed in non-magnetic housing is water cooled. The crystal face is parallel to the water cooling feedthrough pipes. The Quartz balance QO 40A1 is mounted on a DN 40CF flange with two Ø6 pipes and Microdot S-50 coaxial connector. Customized insertion length 130 - 500 mm (other on request).

## FEATURES

- Water-cooled sensor head
- Easy exchangeable quartz

## OPTIONS

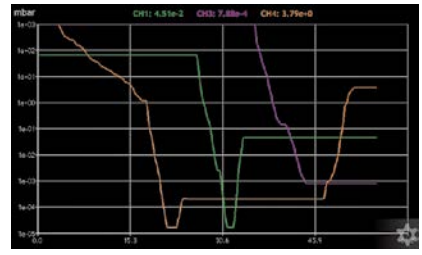
- Customised insertion length
- With or without integrated manual/electro-pneumatic shutter
- Different mounting flanges (e.g. DN 40 KF)
- Other quartz balance geometries on request (e.g. perpendicular head geometry)
- Linear shift

## TECHNICAL DATA

Mounting flange	DN 40 CF (rotatable)
Max operation temperature	up to 300 °C (with water cooling)
Water cooling (required)	water flow > 0.5 l/min temperature: 20 - 30 °C max pressure: 6 bar
Crystal frequency	4.8 - 6 MHz, 14 mm diameter (industry standard)
Insertion length	dependent on specification and geometry of the chamber
Bakeout temperature	up to 150 °C

# TMC13 THICKNESS MONITOR CONTROLLER

INSTRUMENTS with POWER SUPPLIES



Real time pressure charts (data export possibility).

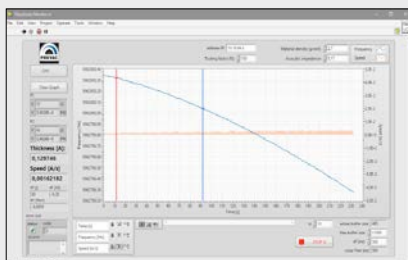
## DESCRIPTION

The TMC13 Thickness Monitor Controller is the newest technology electronics designed for monitoring and controlling any coating and deposition processes. Up to six channel inputs and two additional vacuum gauge channels together with 7" TFT display makes this unit really unique and universal. Sensor inputs can be assigned to different materials with individual parameters as well. High speed and high accuracy measuring process controlled by DSP processor improves the film quality and repeatability. It brings also the features of accuracy, stability and instrument configuration. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## FEATURES

- Up to **6 channels for TM sensors with quartz balances**
- **2D real time chart module**
- Compact design
- Two inputs for most active vacuum gauges
- Up to 8 shutter and I/O reprogrammable
- Relay outputs
- Two reprogrammable analog outputs for rate and thickness monitoring with 16 bits resolution
- Frequency resolution 0.1 Hz (for TM13) or 0.01 Hz (for TM14)
- Operation of up to two multi-crystal sensor heads (pneumatic or stepper motor)
- LabVIEW libraries
- Easy firmware upgrade via USB

## THICKNESS MONITOR CONTROL APPLICATION



## TECHNICAL DATA

Supply voltage	100-240 VAC, 50/60 Hz (power consumption max 100 W)	
<b>TM sensor inputs channels</b>	<b>6</b>	
Thickness	0 - 9999000 Å	
Rate	0 - 9999 Å/s	
Compatible sensors (two channels)	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION	
Frequency resolution	<b>TM13:</b> 0.1 Hz	<b>TM14:</b> 0.01 Hz
Frequency range	2 - 6 MHz	
Thickness resolution	<b>TM13:</b> 0.1 Å	<b>TM14:</b> 0.01 Å
Rate resolution	<b>TM13:</b> 0.1 Å/s	<b>TM14:</b> 0.01 Å/s
Frequency stability	<b>TM13:</b> 0.5 ppm	<b>TM14:</b> 0.5 ppm
Tooling factor	1-400 %	
Measurement units	Å, kÅ, nm	
Measurement period	100 ms - 2 s (depend on TM type)	
Shutter control	manual, time, thickness	
Shutter time	1 - 1000000 s	
<b>Pressure channels inputs</b>	<b>2</b>	
Measurement Units	mbar, Pa, Torr, psia	
Degas Time	1 - 3 min	
<b>Outputs</b>	<ul style="list-style-type: none"> <li>• 8 relay outputs (2 outputs with COM NC and NO contacts)</li> <li>• 2 analog outputs: 0-10V (retransmission thickness, rate, pressure)</li> </ul>	
<b>Inputs</b>	4 digital inputs (in 24V logic)	
Communication interface	RS232/485, Ethernet	
Communication protocol	MODBUS-TCP	
User Interface	7" TFT display with touchscreen	
Interface languages	English, German, Polish	
Dimensions	212.6 × 128.4 × 260.9 mm (W×H×D)	
Weight (approx.)	3 kg	

# TM13 | TM14 THICKNESS MONITOR SENSORS



## DESCRIPTION

The TM13 and TM14 devices comprise: quartz oscillator, frequency measuring system and communication interface. It is connected to the input element of a quartz resonator. The measurement results are transmitted via RS232 to the master device: either a PC or TMC13 controller.

Remote control via TMC13 controller or PC.

## FEATURES

### TM13:

- **Frequency Resolution: 0.1Hz**
- Number of measurements per second: 4 (fixed)
- Maximum frequency of quartz oscillator: 6 MHz
- Stability: 0.5 ppm

### TM14:

- **Frequency Resolution: 0.01 Hz**
- Number of measurements per second: 0.5, 1, 2, 4, 10 (selectable)
- Maximum frequency of quartz oscillator: 6 MHz
- Stability: 0.5 ppm

## TECHNICAL DATA

Power supply	5V DC	
Current consumption	max 500 mA	
	<b>TM13</b>	<b>TM14</b>
Thickness resolution	0.1 Å	0.01 Å
Rate resolution	0.1 Å/s	0.01 Å/s
Frequency resolution	0.1 Hz	0.01 Hz
Frequency stability	0.5 ppm	0.5 ppm
Number of measurements per second	4	0.5; 1; 2; 4; 10 (selectable)
Communication interface	RS232	
Dimensions	80.0 × 50.0 × 27.0 mm (W×H×D)	
Weight (approx.)	0.1 kg	

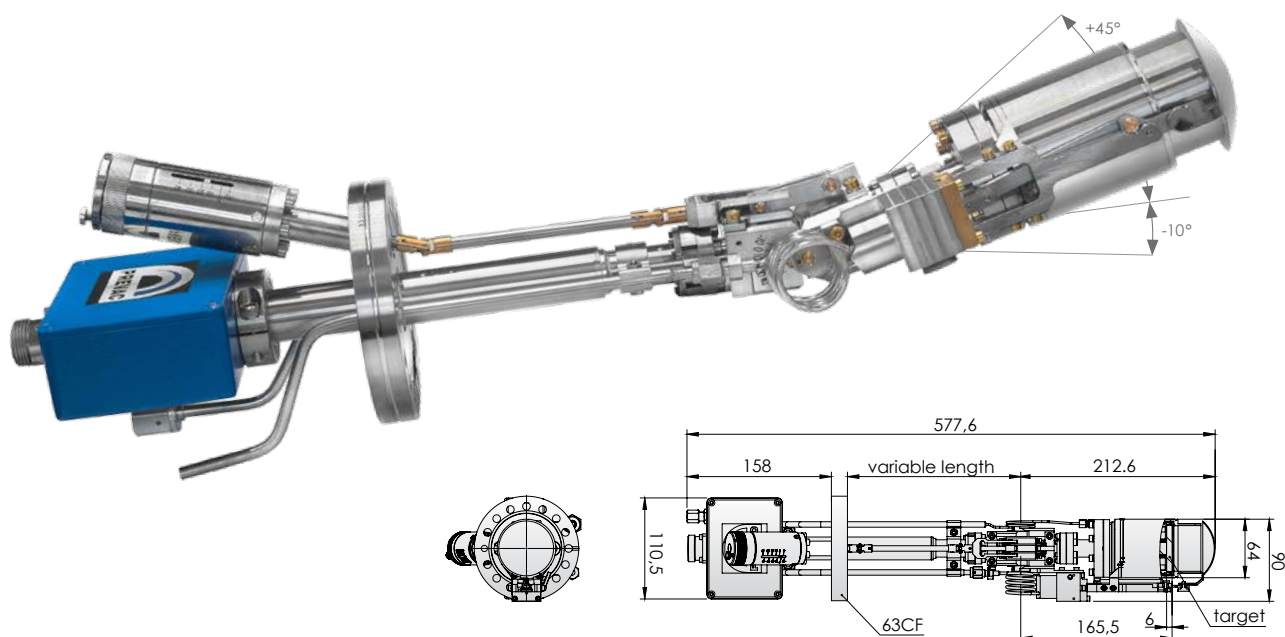
## OPTIONS

- Communication interface RS485 (specify at order)

## TM SENSOR CONTROL APPLICATION



# MS2 63C1 MAGNETRON SOURCE



## DESCRIPTION

The MS2 63C1 Magnetron Source is used to apply thin layers with high homogeneity in the sputtering process. The source is compatible with UHV conditions. Thanks to the integrated in situ tilt system, it can be used in both standard and custom geometry chambers. By using the dome type design we minimize the space needed to open the shutter. MS2 63C1 is fully compatible with our M600DC-PS power supply as well as all other DC, RF and pulsed DC power supplies available on the market.

## FEATURES

- **Mounting flange:** DN 63 CF
- **In situ tilt range:** 45° ÷ -10°
- **Chimney as standard**
- **Pneumatic dome type shutter**

Targets:

- **Diameter 2"**
- Thickness | non-magnetic: 1 - 6 mm
- Thickness | magnetic: Fe 1 mm, Co 2-3 mm, Ni 2 mm
- Indirectly cooled



## TECHNICAL DATA

Mounting flange	DN 63 CF*
Max. power (DC mode)	400 W DC **
Max. power (RF mode)	400 W RF **
Max. voltage DC	1200 V
Connector DC/RF	type 7/16
Target	
form	circular
diameter	2" (50.8 mm) ± 0.2 mm
thickness	1 - 6 mm
cooling	indirect
Water flow	min. 1l/min
Max. inlet water temperature	<28 °C
Max. water pressure	3 bar
Tubing diameter	Ø6×1 mm PTFE
Magnet material	Neodymium Iron Boride (NdFeB)
Magnet max. temperature	200 °C
Internal pneumatic shutter	yes - dome type shutter
In situ tilt module	yes, range +45° ÷ -10°
Chimney	yes
Typical rates	
Cu, 140 mm distance	45 nm/min @ 300 W
Ti, 140 mm distance	30 nm/min @ 300 W
Internal gas inlet	yes (VCR standard)
Working gas	Ar
Max. working pressure	5×10 <sup>-3</sup> - 1×10 <sup>-1</sup> mbar
Optimal working pressure	5×10 <sup>-3</sup> - 5×10 <sup>-2</sup> mbar

\* Other mounting flange on request (DN 100 CF, DN 160 CF).

\*\* The maximum power is determined by the target material.

## OPTIONS

- Mass Flow Controller (MKS MF1)
- Z manipulator

# M600DC-PS MAGNETRON POWER SUPPLY



M600DC-PSE power extending modules:



## DESCRIPTION

The M600DC-PS is compact switch-mode DC power supply designed to drive magnetron sources. All adjustable parameters are displayed on the large TFT display with touchscreen. All settings can be manually adjusted or can be stored and recalled automatically after unit switch on. The unit also features a built in timer and automatic standby mode. It is fully interlocked for both, user and device safety. Unit can be remotely controlled via one of available analog or digital interfaces.

## FEATURES

- **Easy to extend power up to 1200 W/1800 W/2400 W** with additional modules
- **Switch for 3 magnetron sources** with shutters control
- Adjustable limits of voltage, current and power separately for each output
- Multiple I/O - individual programmable
- Arc detection system
- 2D real time chart module

Support for:

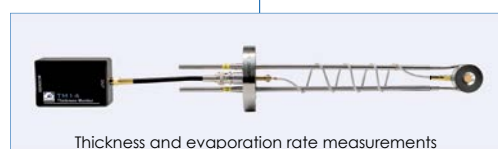
- **Thickness and evaporation rate measurements**
- **Vacuum measurements**
- **Mass Flow Controller**

## TECHNICAL DATA

Supply voltage	100 - 240 V, 50-60 Hz
Output voltage	up to 1200 V (from 50 V)
Output current	up to 1200 mA* (from 1 mA)
Output power	up to 600 W** (from 1 W)
Switch-mode	3 outputs for magnetrons
Analog inputs/outputs	3 (0 - 10V)/ 3 (0 - 10V)
Digital inputs and outputs	individual programmable
Timer	dual mode timer 0 s - 99 h 59 min.
Thickness and evaporation rate measurements	1 channel for Thickness Monitors TM13 /TM14
Vacuum measurement	1 channel for active vacuum gauges: CTR90, TTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Mass Flow Controller	1 channel for MKS MF1
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP/RTU
User interface	5" TFT display with touchscreen, digital encoder
Interface languages	English, German, Polish
Dimensions	242 × 87 × 450 mm (W×H×D), 2U 42HP
Weight (approx.)	6 kg

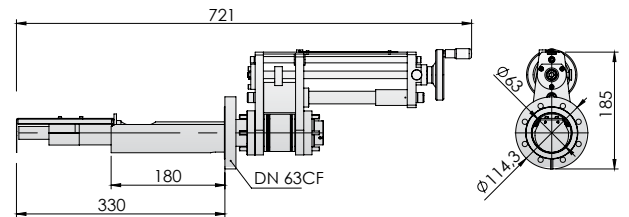
\* easy to extend with additional modules, up to: 2.4 A/3.6 A/4.8 A

\*\* easy to extend with additional modules, up to: 1200 W/1800 W/2400 W





# BEAM FLUX MONITOR



## DESCRIPTION

The Beam Flux Monitor enables measurement of the beam equivalent pressure (BEP) in MBE applications via a Bayard-Alpert ionization gauge. It is typically mounted on a linear shift/z-stage to allow the filament to be positioned near to the substrate and includes a protection shield when in the standby position.

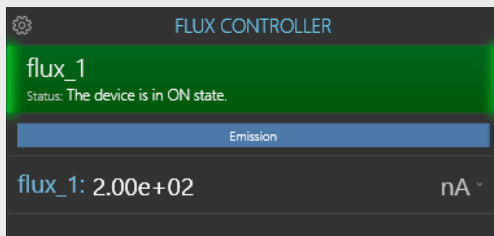
## FEATURES

- BEP measurement
- Ion current measurement [nA units]

## OPTIONS

- Motorisation
- Customised insertion length

## BEAM FLUX MONITOR CONTROL APPLICATION



## TECHNICAL DATA

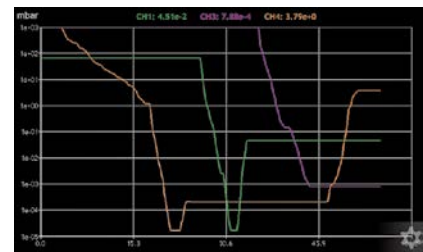
Mounting flange	DN 63 CF (non-rotatable)
Measurement system	Bayard-Alpert ion gauge
Measurement range	$10^{-3}$ to $2 \cdot 10^{-11}$ Torr
Linear stroke	150 mm (other on request)
Insertion length	180 mm, in standby position (other on request)
Max. outer diameter	63 mm
Filament	dual filament, yttrium coated iridium
Controller	3 channel MG15 - communication interface: RS232/485, Ethernet, PRO-FINET (option - specify at order)
Bakeout temperature	up to 200 °C



Beam Flux Monitor with 200 mm linear stroke.



# MG15 ION MULTI GAUGE CONTROLLER



Real time pressure charts (data export possibility).

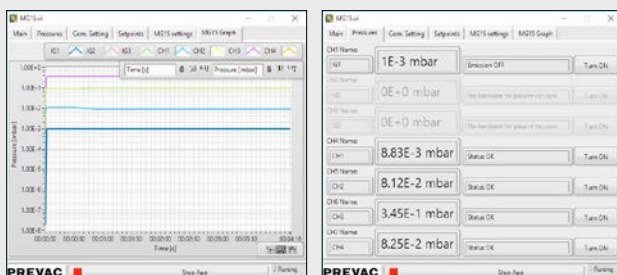
## DESCRIPTION

The MG15 is able to support four active gauges and up to three passive gauges, extending the measurement range to  $2 \times 10^{-12}$  mbar. The unit is fully software controlled. The unit can be remotely controlled via one of available interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## FEATURES

- Measurement range from atmospheric to  $2 \times 10^{-12}$  mbar
- Pressure plots
- Pressure trend graphs
- Measurement filtering (low, med, hi)
- Controls almost all commercially available Bayard-Alpert gauges
- Degassing of Bayard-Alpert with power and time limit
- Supports Ir/W/Thoria filaments
- Bayard-Alpert overpressure protection
- Selectable measurement units: mbar, Torr, Pascal, psia
- Gas specific correction with one customized setting
- Unit over-temperature protection
- 10 individually programmable set-points with threshold and hysteresis functions
- User-defined channel names
- Possibility of active gauges self-identification
- Beam flux monitor
- Black Box version available (option) - without 7" TFT display

## CONTROL APPLICATION



## TECHNICAL DATA

Supply voltage	100 - 240 VAC, 50 - 60 Hz (power consumption max 200 W)
Measurement channels	up to 7 (active channels: 4; passive channels: up to 3 - number defined at the time of order)
Supported active gauges	CTR90, TTR91, TTR211, PTR225, PKR251/360/361, PCR280, PTR90, ITR90, ITR100, Baratron, ANA-LOG IN, PG105, ATMION, User defined*
Supported passive gauges	IE414, IE514, UHV-24, UHV-24p, MKS Series 274, NUDE-UHV-8A, NR-F-UHV, G8130, BARION basic II, User defined*
Measurement range:	
Passive channel	$2 \times 10^{-12}$ mbar
Active channel	$5 \times 10^{-10}$ mbar
Display range	$2 \times 10^{-12}$ - $2 \times 10^5$ mbar
Setpoints relay outputs	10 (4xNO/NC, 6xNO)
Relay outputs with configurable activation signal	4 (Emission, Degas)
Digital inputs	4
Analog outputs	4 (0 - 10V)
Communication interface	RS232/485, Ethernet PROFINET - option (specify at order)
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen
Dimensions	212.6 x 128.4 x 260.3 mm (WxHxD), 1/2 of 3HE 19"
Weight (approx.)	3.8 kg

\* prepared to support many other custom gauges

## APPLICATIONS

- Any high and ultra high vacuum systems
- Measurement of ultimate pressure (from atmosphere to UHV range)
- Bakeable and non bakeable systems

# MG13 ION MULTI GAUGE CONTROLLER



## DESCRIPTION

The MG13 Multi Gauge Controller supports 2 vacuum gauges connected at the same time: One Bayard-Alpert (B-A) gauge and any other existing gauge on the market based on the 0-10V output standard. As standard, all of Leybold gauges are supported: ITR 100, ITR 90, DI 200, DI 2000, TTR 211 S, TTR 91, PTR 225. Any others can be implemented as an option. Although just 1U height, the controller is able to display both channels at the same time on the large alphanumeric LCD display. The high brightness display provides clear readout from large viewing angles and long distances. A useful feature of the MG13 is the availability of 4 interlocks, each of which can be separately programmed for each channel, including threshold levels and hysteresis. The measurement channels are active immediately upon power-up and ready for emission. Channel 1 is a dedicated channel for B-A gauges. It features very flexible B-A gauge parameter settings and is therefore suitable for use with almost all commercially available third party B-A gauges. The controller is perfectly suited for 2 stage pumps group units, where two ranges (low and high vacuum) need to be controlled. In addition, the emission control facility automatically controls the emission of B-A gauges for low vacuum measurement. The operational status of all triggers and transmitter outputs are also displayed. Unit can be remotely controlled via one of available interfaces.

## FEATURES

- 19" rack mounted and only 1U height
- Measurement range from atmospheric to  $2 \times 10^{-11}$  mbar
- Controls almost all commercially available Bayard-Alpert gauges
- Degassing of Bayard-Alpert with power and time limit
- Supports Ir/W/Thorium filaments
- Bayard-Alpert overpressure protection
- Selectable measurement units: mbar, Torr, Pascal
- Gas specific correction with one customized setting
- Unit over-temperature protection
- Audible alarm
- Four individually programmable set-points with threshold and hysteresis functions
- User-defined channel name

## TECHNICAL DATA

Supply voltage	90 - 230 VAC, 50 - 60 Hz (power consumption max 150 W)
Measurement channels	2
Display range	$2 \times 10^{-11}$ mbar - $2 \times 10^5$ mbar
Measurement range:	
Channel 1: B-A gauge	$2 \times 10^{-11}$ mbar
Channel 2: 0 - 10V DC input*	$5 \times 10^{-10}$ mbar
Setpoints (individual programming for each channel possible)	1×NO/NC, 3×NO
Suitable Gauges in standard**	TTR 211S, TTR91, PTR225, ITR90, ITR100, PTR 90, B-A gauge, MKS Baratron**** and many others
Hysteresis	adjustable
Communication interface*** (option)	RS232/485/422, Ethernet/IP
User interface	large LCD display 2 × 16 characters, function keys
Dimensions	240 × 260 × 44 mm (W×H×D)
Weight (approx.)	3.8 kg

## APPLICATIONS

- Any high and ultra high vacuum systems
- Measurement of pressure in wide range (from atmosphere to UHV)
- Bakeable and non bakeable systems

\*related to the connected gauge \*\*any other can be implemented on request \*\*\* Only one communication interface can be used at any one time and is chosen at time of order. However, this may be swapped/interchanged with any other communication interface at any future date via simple rear panel plug and play swap, without having to access the internals of the unit. \*\*\*\* please refer to manual

# PCU16 POWER CONTROL UNIT



## DESCRIPTION

The PCU16 Power Control Unit is a compact, standalone microprocessor device for controlling UHV vacuum systems. It supports one ultra-high vacuum pump (e. g. turbo molecular pump, ion pump, cryo pump, etc.), electromagnetic vent valve, electromagnetic safety valve, fore vacuum pump and two vacuum gauges based on the 0 - 10V output standard. The PCU16 displays the state of all of the connected peripheral devices on a large 7" TFT LCD touchscreen, providing clear readouts of important system parameters to the user. The unit comprises several interlocks to protect the vacuum system in the event of power loss or in the case that a pump or other device might fail. Five different and most popular configurations are implemented on the delivered unit. Customers can choose one of these fixed configurations and set it as the default display. Easy firmware upgrade via USB. The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## APPLICATIONS

- Control of any high and ultra high vacuum system
- Measurement of pressure
- Bakeable and non-bakeable systems
- Control and automation of pump down cycle
- Control and automation of venting cycle

The PCU16 has an externally attached UPS ensuring full control and protection of the vacuum system even on power failure. It is available with full dedicated software application or library module.

## ADDITIONAL INFORMATION

- The PCU16 front control panel is divided into two parts:
- Left - graphical presentation of vacuum system
  - Right - panel which indicates the current state of the vacuum system (set-points, power, failures etc.)

## TECHNICAL DATA

Supply voltage	100 - 240 VAC, 50/60 Hz (power consumption max 250 W)
Measurement channels	2
Display range	$2 \times 10^{-12}$ - $2.1 \times 10^5$ mbar
Compatible sensors:	
Channel 1:	CTR90, TTR91, TTR211, PKR251, PCR280, ANALOG IN, PG105
Channel 2:	CTR90, TTR91, TTR211, PTR225, PTR90, ITR90, ITR100, Baratron, ANALOG IN, MKS937A, PG105, MG13/14, PKR251/360/361, PCR280, ATMION
Supported valves	any 24V / max 2A
Supported fore vacuum pump	any 1 phase 230 VAC, 5 A max or 1 - 3 phase with external interface
Supported TMP	RS232/485 connected via TURBO. DRIVE S any with the standard ON/OFF control
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen
Interface languages	English, German, Polish
Dimensions	212.6 × 128.4 × 260.3 mm (W×H×D) 1/2 of 3HE 19"
Weight (approx.)	3.6 kg

# BCU14 BAKEOUT CONTROL UNIT



## DESCRIPTION

The BCU14 Bakeout Control Unit is a microprocessor controlled device for independent temperature control of either two heating zones of a vacuum system or a single heating zone and a sample heater inside. Heating operation for either one sample and one chamber or for two chambers is factory pre-set and cannot be modified by the user. An additional option allows the customer to independently control other non-regulated heaters such as those used for ion pumps. The unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

## FEATURES

- Instruction by video movie integrated on TFT display
- Configurable user interface
- Power failure procedures
- Configurable interlocks
- Independent fans control system
- Sensor break protection
- Additional output signals to control external units
- Easy firmware upgrade via USB

## APPLICATIONS

The main tasks of the BCU14 are regulation and stabilization of (i) the power supplied to the heaters in order to achieve a required bakeout temperature in any given zone, and (ii) parallel control of unregulated heaters (on valves, ion pumps, etc.). Target temperature, bake time and ramp times are all user-defined.

## ADDITIONAL INFORMATION

The BCU14 Bakeout Control Unit controller can be supplied in a 3HE 19" enclosure unit with steering power components (one or two units - 2 heat zones per unit) or for 19" rack mounting with external power components.

## TECHNICAL DATA

Supply voltage	230 VAC (L+N+PE, 2L+PE) (power consumption max 11.5 kW) 3x400 V (3L+N+PE) (power consumption max 19.55 kW)
Temperature range control	room temperature up to 1200 °C
Regulation method	fully automated based on PID algorithm
Measurement resolution	±1 °C
Interlocks	fully isolated, one for each zone + master interlock
Number of control zones	2 independent
Timers	2 independent for each zone
Operation modes	timer, manual (timer counter)
Process parameters	time, temperature, ramp
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen
Interface languages	English, German, Polish
Dimensions	448.8 × 132.5 × 435 mm (W×H×D) 19" rack mountable
Weight (approx.)	10 kg

# TSP03-PS TITANIUM SUBLIMATION PUMP POWER SUPPLY



## DESCRIPTION

The TSP03-PS Titanium Sublimation Pump Power Supply is configured for constant filament current operation and features a thyristor and phase-control circuit for long-term and trouble-free TSP operation. Unit can be remotely controlled via RS232/485 or Ethernet interfaces. The unit is equipped with autosave function (the device save your parameters, preset and apply them automatically after restart).

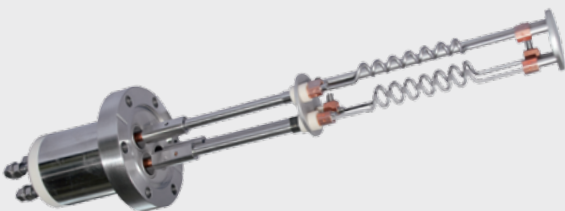
## APPLICATIONS

The Titanium Sublimation Pump Controller regulates the quantity of material sublimated from the filaments, compensating for changing conditions and eliminating the need for operator attendance or adjustment. Four filaments can be connected simultaneously, but only one at the time can be operated. To avoid the fracture of the Ti filament due to the thermal stress or the structural change of Ti, ramp time and max. current for each filament can be set. All parameters of each filament can be set individually (max current, ramp time, filament number etc.).

## ACCESSORIES

### TITANIUM SUBLIMATION PUMP

The Titanium Sublimation Pump (TSP) is a true UHV pump. It is used to supplement the pumping action of other UHV pumps (normally Ion pumps and turbo molecular pumps) as it can be more effective at pumping certain gases. The main advantage of this pump is that it is simple, inexpensive, and can produce high pumping speeds.



## TECHNICAL DATA

Supply voltage	110 V or 230 V, 50 Hz/60 Hz (specify at order) (power consumption max 750 W)
Output current	regulated at 5 to 55 A, RMS × 1 A
Output voltage	determined by the lead - max 10 V at 50 A
Timing	sublimation period: 1 s to 15 min × 1 s delay interval: 1 min to 99 h × 1 min degas time: 1 s to 15 min × 1 s operate time: 99 d 23 h 59 min
Communication interface	RS232/485, Ethernet
Communication protocol	MODBUS-TCP
User interface	7" TFT display with touchscreen
Interface languages	English, German, Polish
Dimensions	483 × 133 × 365,2 mm (W × H × D)
Weight (approx.)	13kg

## ADDITIONAL INFORMATION

4 filament outputs with common ground connection. Low cost. Simple, robust and reliable design, easy to service. All output switching is by semiconductor devices. Low-noise: complies with EC EMC and LV Directives. Vacuum interlock input. The TSP03-PS is a 19" rack mounted unit (full-width, 3U height).

## TSP CONTROL APPLICATION





# SMCD14 STEPPER MOTOR CONTROLLER



## DESCRIPTION

The SMCD14 Stepper Motor Control Device is designed for controlling the low and high power stepper motors in applications.

## APPLICATIONS

The SMCD14 device is mainly recommended for precision transfer systems, e.g. manipulators, sample transfer systems etc.

## TECHNICAL DATA

Supply voltage	230 VAC, 50-60 Hz (power consumption max 70 W)
Compatible stepper motors	<ul style="list-style-type: none"> <li>▪ 2 phase bipolar, motor current up to 3 A/phase</li> <li>▪ Motor power supply 24V</li> <li>▪ Default microstepping mode: 1/16 step (3200 steps per motor rotation)</li> </ul> Other modes available
Encoder options	Quadrature incremental encoder with or without differential RS422 line driver. Default for on-shaft rotary encoder 500CPR (2000 imp/rev)
External inputs	<ul style="list-style-type: none"> <li>▪ 2 limit switches inputs for over-travel protection</li> <li>▪ Reference position signal, for accurate position detection</li> <li>▪ Enabling signal for interlocking motor movement</li> </ul>
Indicators	Led indicators informing of current movement events and errors
Communication interface	Modbus RTU protocol over dedicated RJ45 connector allow to connect multiple devices in a chain system
Dimensions	106 × 128 × 240 mm (W×H×D), 1/4 width, 3 units height, mounted in the 19" rack
Weight (approx.)	1.4 kg



# MC6 STEPPER MOTOR CONTROL DEVICE



## DESCRIPTION

MC6 (Motion Control 6) is a device for controlling up to 6 stepper motors. It can be programmed to fit different specific requirements. Widely used Modbus-TCP communication protocol makes it easy to integrate with existing control systems - eg. PLC controllers, PC software, LabView applications. It can be shipped with standalone interface application or Tango Device Server. The device indicators inform about the transfer status for each axis, e.g. about reached limits or transferring failures.

## APPLICATIONS

The MC6 device is mainly recommended for precision transfer systems, e.g. manipulators, sample transfer systems etc.

## TECHNICAL DATA

Supply voltage	230 VAC, 50/60 Hz (rated power 300 W)
Compatible stepper motors	2 phase bipolar, motor current 1.2 up to 3.8 A/phase. Motor power supply 24V. Default microstepping mode: 1/16 step (3200 steps per motor rotation). Other modes available
Encoder options	Standard quadrature incremental encoder with differential line driver. Default for on-shaft rotary encoder 500CPR. Other options available - eg. load-side encoder
External input signals	2 limit switches inputs for over-travel protection. Reference position signal, for accurate position detection. Enabling signal for interlocking motor movement
Control functions	Programmable target velocity, acceleration, backlash compensation, homing procedure configuration. Other customizable control functions on request
Communication interfaces	MODBUS-TCP (for control), RS485 (for programming/configuration)
Dimensions	483 x 133 x 386 mm (W×H×D), 19" rack mountable (full-width, 3U height)
Weight (approx.)	10 kg

# VCH-10 VACUUM CHAMBER HIGHLIGHT



## DESCRIPTION

The VCH-10 is the perfect accessory for illuminating sample areas, movement regions and source/accessory positions within a HV and UHV systems. It combines a very high brightness, long lifetime at very low power LED illumination source with a compact power supply that can be operated from a handheld remote controller or directly from a PC.

The controller as standard can power up to 10 LEDs, either single or double types. Each source is connected via a generous USB standard cable. Just one or up to 10 channels can be connected and used at once. Individual LEDs may also be powered from a standard computer USB port.



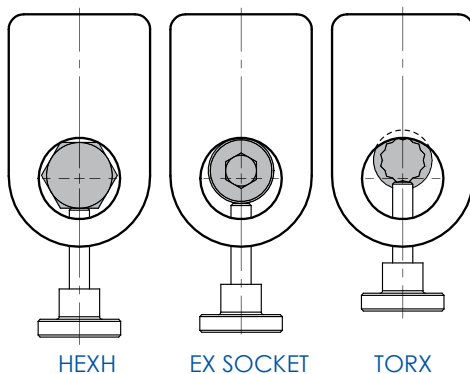
## FEATURES

- Low power: just 40 W with all 10 channels in use
- High intensity: 185 lumens
- Long lifetime: >100,000 hours per LED
- Longer lifetime, same brightness
- Single LED powered from standard USB port
- Dedicated for DN 40 CF (single type) or DN 63 CF - 200 CF (double type) flanges
- Each LED with 5 m cable

## TECHNICAL DATA

Supply voltage	100 - 230 V, 50-60 Hz, (power consumption max 25 W)
Outputs	10 x USB 5V
Communication interface	RS232/485
Dimensions	155 × 50 × 105 mm (W × H × D)
Weight (approx.)	0.68 kg

## VARIOUS SCREW TYPES



HEXH

EX SOCKET

TORX





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