SORB-AC® Cartridge Pumps MK5 Series

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SORB-AC®
Cartridge Pumps
MK5 Series

General Features
- High pumping speed for all active gases
- Constant pumping speed in HV and UHV pressure region
- No low pressure limitation (down to $10^{-12}$ Torr region)
- Reversible pumping of hydrogen and its isotopes
- Possibility of operation at room temperature after activation, without power
- Operation in the presence of high magnetic fields
- Oil free and vibration free ultra high vacuum
- Low weight

Applications
- Improving ultimate vacuum in combination with ion, diffusion, cryogenic or turbomolecular pumps
- Surface analysis systems
- Particle accelerators, synchrotron radiation sources and related equipment
- Process pumps for vacuum devices
- Portable vacuum instrumentation
- Pumping, storing and releasing hydrogen isotopes
- Plasma machines
- Hydrogen traps
- Impurities removal in rare gas filled devices
SAES® Getters, the world leader in Gettering Technology, presents the MK5 series of the SORB-AC Cartridge non evaporable getter pumps. These pumps are based on the well-known St 707 getter material, which achieves high sorption performances for all the active gases even after an activation at moderate temperature. The MK5 series includes a new flange design. This makes the overall pump assembly more simple and compact, with foot print and reliability advantages over the previous series. In particular, the flange includes an electrical connector which integrates both power and thermocouple pins. In this way the design gains in reliability adopting a thermocouple solution, which does not need to be sheathed, and in operability since the connector is bakeable up to 400 °C. In addition the pump also gains in compactness since it gets rid of the previous bulky electrical connector. The St 707 getter material used in the pump cartridge is provided as metal powder mechanically coated by cold compression onto a constantan strip folded to form the getter cartridge. St 707 provides high pumping performances for all active gases at the lowest activation temperatures. Standard activation temperature is 450 °C, but full activation is also achievable at temperatures as low as 350 °C if maintained for a suitably long time. SORB-AC Cartridge pumps find wide use in a variety of applications, alone or in combination with traditional UHV pumps. They are particularly suitable to boost the vacuum performances of general purpose vacuum systems, thanks to their high pumping speed for hydrogen and other active gases. In particular the SORB-AC Cartridge pumps exploit a high pumping speed for hydrogen which does not decrease at UHV level, where other UHV pumps show poor performance. Typical applications of SORB-AC Cartridge pumps are in the field of particle accelerators, synchrotron radiation sources and related equipment, surface analysis systems and other R&D vacuum systems.

1. Not available for the GP 50 model.
Cartridge

The cartridge is made by coating the getter alloy onto costantan strips, which are then pleated in concertina fashion and formed into cylinders which make up the cartridge. For the SORB-AC MK5 cartridge pumps, only St 707 cartridges are available. A stainless steel separator is inserted in the cartridge to facilitate the correct positioning of the thermocouple.

Pump Body

The optional pump body is a simple double flanged nipple. If desired, the pump can be mounted nude inside the vacuum system to fully exploit its pumping speed. The pump body can be supplied with a water-cooled jacket, but it should be noted that water cooling is not necessary for the pump to function efficiently. The pump body is leak tested to $1.5 \times 10^{-10}$ sccm/s.

Heater

The heater consists of a tantalum wire spiral-wound on an alumina element supported by a stainless steel rod. The heater assembly also includes the cartridge and the thermocouple-positioning (stainless steel tube) and securing components.

Thermocouple

The thermocouple is a K-type, electrically insulated within an alumina tube. The thermocouple is assembled to the support flange. It is connected to the thermocouple pins of the connector with compensated contact terminations.

Flange

The support flange is a standard CF type flange in which one Special Connector equipped with six conductors for electrical- and thermocouple-connections is TIG welded. The pump flange is leak tested to $1.5 \times 10^{-10}$ sccm/s.

Electrical Connector

The Special Connector allows the connection of the pump to the power supply and control unit. The connector is bakeable up to 400°C.
The SAES Getters Group manufacturing companies are ISO9001 certified, the Asian and Italian companies are ISO14001 certified also. Full information about certifications for each company of the Group is available on the corporate website at: www.saesgetters.com
We support your innovation

**HIGHLIGHTS**

**General features**
- High pumping speed for all active gases
- Constant pumping speed in HV and UHV pressure region
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- Operation in the presence of high magnetic fields
- Oil free and vibration free ultra high vacuum
- Low weight

**Applications**
- Improving ultimate vacuum in combination with ion, diffusion, cryogenic or turbomolecular pumps
- Surface analysis systems
- Particle accelerators, synchrotron radiation sources and related equipment
- Process pumps for vacuum devices
- Portable vacuum instrumentation
- Pumping, storing and releasing hydrogen isotopes
- Plasma machines
- Hydrogen traps
- Impurities removal in rare gas filled devices

The GP 50 pump still maintains its original configuration with the two copper current feedthrough protruding out of the base flange. It uses both St 707 and St 101 getter cartridges mounted on a heater structure based on a single heater element, and is available on CF35 (2 3/4”) flange. The pumping speed curves and the activation curves are shown in the enclosed graphs.

<table>
<thead>
<tr>
<th>Ordering Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>4H0306 GP 50 2F</td>
</tr>
<tr>
<td>4H0295 GP 50 W2F</td>
</tr>
<tr>
<td>4H0030 C 50-St101</td>
</tr>
<tr>
<td>4H0065 C 50-St101AM</td>
</tr>
<tr>
<td>4H0205 C 50-St707</td>
</tr>
</tbody>
</table>

Dimensions in mm
Typical Pump Characteristics

<table>
<thead>
<tr>
<th>Alloy Type</th>
<th>St 101</th>
<th>St 707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getter Alloy Mass (g)</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>Getter Surface (cm²)</td>
<td>830</td>
<td>830</td>
</tr>
<tr>
<td>Pumping Speed (l/s)</td>
<td>H₂</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>CO</td>
<td>110</td>
</tr>
<tr>
<td>Sorption Capacity (Torr l)</td>
<td>H₂</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>CO Room Temperature</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>CO Total</td>
<td>215</td>
</tr>
</tbody>
</table>

Note: Pumping speed data refer to the initial values of the pump without the pump body. CO capacity based on speed below 10 l/s.

Conversion Table

<table>
<thead>
<tr>
<th>Pressure (Torr)</th>
<th>Pa</th>
<th>mbar</th>
<th>Torr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>10</td>
<td>750.06x10⁻⁶</td>
</tr>
<tr>
<td>1 mbar</td>
<td>10⁻³</td>
<td>1</td>
<td>0.75006</td>
</tr>
<tr>
<td>1 Torr</td>
<td>133.322</td>
<td>1.333</td>
<td>1</td>
</tr>
</tbody>
</table>

Sorption temperature: 25 °C
Activation: 450 °C x 45’
Sorption pressure: 3e-6 Torr

Lainate (Italy)
Avezzano (Italy)
Köln (Germany)
Moscow (Russia)
Paris (France)
Daventry (UK)
Nanjing (China)
Tokyo (Japan)
Seoul (Korea)
Chin Chon (Korea)
Singapore
Hsin Chu (Taiwan)
Cleveland OH (USA)
Colorado Springs CO (USA)
San Luis Obispo CA (USA)
Sparks MD (USA)
The GP 100 MK5 pump uses an St 707 getter cartridge mounted on a heater structure based on a single heater element, and is available on CF63 (4 1/2”) flange. The flange is conveniently supplied with a custom-made, bakeable electrical connector which combines power and thermocouple pins, for best integration and minimum footprint. The pump sorption speed is at its maximum when mounted directly in the vacuum system without a body. The pumping speed curves and the activation curves are shown in the enclosed graphs.

**General features**
- High pumping speed for all active gases
- Constant pumping speed in HV and UHV pressure region
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- Low weight

**Applications**
- Improving ultimate vacuum in combination with ion, diffusion, cryogenic or turbomolecular pumps
- Surface analysis systems
- Particle accelerators, synchrotron radiation sources and related equipment
- Process pumps for vacuum devices
- Portable vacuum instrumentation
- Pumping, storing and releasing hydrogen isotopes
- Plasma machines
- Hydrogen traps
- Impurities removal in rare gas filled devices

**Ordering Information**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4H0273</td>
<td>GP 100 MK5 Base Flange with Connector and Heater</td>
</tr>
<tr>
<td>4H0450</td>
<td>GP 100 MK5 B Base Flange with Connector, Heater and Body</td>
</tr>
<tr>
<td>4H0451</td>
<td>GP 100 MK5 W Base Flange with Connector, Heater and Water Cooled Body</td>
</tr>
<tr>
<td>4H0250</td>
<td>C 100-MK5 St707 St 707 Getter Cartridge on Constantan Substrate</td>
</tr>
</tbody>
</table>
Typical Pump Characteristics

<table>
<thead>
<tr>
<th>Alloy Type</th>
<th>St 707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getter Alloy Mass (g)</td>
<td>100</td>
</tr>
<tr>
<td>Getter Surface (cm²)</td>
<td>2600</td>
</tr>
<tr>
<td>Pumping Speed (l/s)</td>
<td>H₂ 600 CO 300</td>
</tr>
<tr>
<td>Sorption Capacity (Torr l)</td>
<td>H₂ 1000 CO Room Temperature 2.1 CO Total 900</td>
</tr>
</tbody>
</table>

Note: Pumping speed data refer to the initial values of the pump without the pump body. CO capacity based on speed below 30 l/s.

Conversion Table

<table>
<thead>
<tr>
<th>Pressure</th>
<th>from Pa</th>
<th>to mbar</th>
<th>to Torr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pa</td>
<td>1</td>
<td>10¹²</td>
<td>750.06x 10⁻⁵</td>
</tr>
<tr>
<td>1 mbar</td>
<td>1</td>
<td>1</td>
<td>0.75006</td>
</tr>
<tr>
<td>1 Torr</td>
<td>133.322</td>
<td>1.333</td>
<td>1</td>
</tr>
</tbody>
</table>

Sorption temperature: 25 °C
Activation: 450 °C x 45'
Sorption pressure: 3e-6 Torr

Voltage (V) vs. Temperature (°C)

GP100 MKS St 707

Voltage (V) vs. Current (A)

GP100 MKS (nude)
The GP 200 MK5 pump uses a St 707 getter cartridge mounted on a heater structure based on a single heater element, and is available on CF100 (6") flange. The flange is conveniently supplied with a custom-made, bakeable electrical connector which combines power and thermocouple pins, for best integration and minimum footprint. The pump sorption speed is at its maximum when mounted directly in the vacuum system without a jacket. The pumping speed curves and the activation curves are shown in the enclosed graphs.

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 63</td>
</tr>
<tr>
<td>157</td>
</tr>
<tr>
<td>211</td>
</tr>
<tr>
<td>33</td>
</tr>
<tr>
<td>Ø 152</td>
</tr>
</tbody>
</table>

Ordering Information

- **4H0236** GP 200 MK5 Base Flange with Connector and Heater
- **4H0452** GP 200 MK5 B Base Flange with Connector, Heater and Body
- **4H0453** GP 200 MK5 W Base Flange with Connector, Heater and Water Cooled Body
- **4H0249** C 200-MK5 St707 St 707 Getter Cartridge on Constantan Substrate
Typical Pump Characteristics

<table>
<thead>
<tr>
<th>Alloy Type</th>
<th>St 707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getter Alloy Mass (g)</td>
<td>170</td>
</tr>
<tr>
<td>Getter Surface (cm²)</td>
<td>4470</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alloy Type</th>
<th>St 707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping Speed (l/s) H₂</td>
<td>900</td>
</tr>
<tr>
<td>CO</td>
<td>350</td>
</tr>
<tr>
<td>Sorption Capacity (Torr l) H₂ Room Temperature</td>
<td>1700</td>
</tr>
<tr>
<td>CO Room Temperature</td>
<td>4.5</td>
</tr>
<tr>
<td>CO Total</td>
<td>1530</td>
</tr>
</tbody>
</table>

Note: Pumping speed data refer to the initial values of the pump without the pump body. CO capacity based on speed below 50 l/s.

Conversion Table

<table>
<thead>
<tr>
<th>Conversion given</th>
<th>1 Pa</th>
<th>1 mbar</th>
<th>1 Torr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10⁻²</td>
<td>0.7506</td>
<td>750.06 x 10⁻³</td>
</tr>
<tr>
<td>1 mbar</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1 Torr</td>
<td>133.322</td>
<td>1.333</td>
<td>1</td>
</tr>
</tbody>
</table>

Voltage (V) | Current (A)

Temperature (°C) | Voltage (V) | Current (A)

GP200 MK5 St 707

Sorption temperature: 25 °C
Activation: 450 °C x 45’
Sorption pressure: 3e-6 Torr

Sorbed Quantity (Torr l)

GP200 MK5 (nude)
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HIGHLIGHTS

GP 500 MK5

The GP 500 MK5 pump uses a St 707 getter cartridge mounted on a heater structure based on three heater elements, and is available on CF150 (8”) flange.

The flange is conveniently supplied with a custom-made, bakeable electrical connector which combines power and thermocouple pins, for best integration and minimum footprint.

The pump sorption speed is at its maximum when mounted directly in the vacuum system without a jacket.

The pumping speed curves and the activation curves are shown in the enclosed graphs.

Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4H0243</td>
<td>GP 500 MK5 Base Flange with Connector and Heater</td>
</tr>
<tr>
<td>4H0454</td>
<td>GP 500 MK5 B Base Flange with Connector, Heater and Body</td>
</tr>
<tr>
<td>4H0455</td>
<td>GP 500 MK5 W Base Flange with Connector, Heater and Water Cooled Body</td>
</tr>
<tr>
<td>4H0248</td>
<td>C 500-MK5 St707 St 707 Getter Cartridge on Constantan Substrate</td>
</tr>
</tbody>
</table>

General features

- High pumping speed for all active gases
- Constant pumping speed in HV and UHV pressure region
- No low pressure limitation (down to 10^{-12} Torr region)
- Reversible pumping of hydrogen and its isotopes
- Possibility of operation at room temperature after activation, without power
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Applications

- Improving ultimate vacuum in combination with ion, diffusion, cryogenic or turbomolecular pumps
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Dimensions in mm
Typical Pump Characteristics

<table>
<thead>
<tr>
<th>Alloy Type</th>
<th>St 707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getter Alloy Mass (g)</td>
<td>540</td>
</tr>
<tr>
<td>Getter Surface (cm²)</td>
<td>14290</td>
</tr>
<tr>
<td>Pumping Speed (l/s)</td>
<td>H₂ 1900</td>
</tr>
<tr>
<td></td>
<td>CO 650</td>
</tr>
<tr>
<td>Sorption Capacity (Torr l)</td>
<td>H₂ Room Temperature 5400</td>
</tr>
<tr>
<td></td>
<td>CO Room Temperature 10</td>
</tr>
<tr>
<td></td>
<td>CO Total 4860</td>
</tr>
</tbody>
</table>

Note: Pumping speed data refer to the initial values of the pump without the pump body. CO capacity based on speed below 100 l/s.

Conversion Table

<table>
<thead>
<tr>
<th>Sought</th>
<th>Pa</th>
<th>mbar</th>
<th>Torr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pa</td>
<td>1</td>
<td>10⁻²</td>
<td>750.06x10⁻⁵</td>
</tr>
<tr>
<td>1 mbar</td>
<td>10⁻²</td>
<td>1</td>
<td>0.75006</td>
</tr>
<tr>
<td>1 Torr</td>
<td>133.322</td>
<td>1.333</td>
<td>1</td>
</tr>
</tbody>
</table>

SAES Getters S.p.A.
Group Headquarters:
Viale Italia, 77
20020 Lainate (Milano), Italy
Tel.: + 39 02 931 78 1
Fax: + 39 02 931 78 320

SAES Advanced Technologies S.p.A.
Nucleo Industriale:
Via Diesel, 1
67051 Avezzano (AQ), Italy
Tel.: + 39 0863 496 1
Fax: + 39 0863 267 43

www.saesgetters.com

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**CapaciTorr CF35 Power Supply**

The CapaciTorr CF35 Power Supply is an electronic unit specifically designed to control the activation process of the CapaciTorr B 200, CapaciTorr D 400 and CapaciTorr D 400-2 getter pumps.

The instrument receives line voltage (100 - 240VAC, 50/60 Hz), converts it to DC voltage of 16.5 V and supplies the getter pump by way of a microprocessor-based electronic control card.

The instrument is designed to control the getter pumps in three different modes:
- **Activation.**
- **Timed-Activation.**
- **Conditioning.**

In the Activation mode the instrument supplies the power needed to heat up the getter pump to activation temperature (about 500°C). In this operating mode, the CapaciTorr CF 35 power supply delivers 100% of the available power.

In the Timed Activation mode, the instrument supplies the power required to heat up the getter pump to activation temperature (about 500°C) for one hour. In this operating mode, the CapaciTorr CF 35 power supply delivers 100% of the available power.

In the Conditioning mode, the CapaciTorr CF 35 power supply provides the power necessary to heat up the getter pump to the conditioning temperature (about 150°C). In this operating mode, it delivers 25% of the available power, using a duty cycle control.

**Block Schematic**

```
CapaciTorr CF 35 Power Supply

GND

Main Line
100-240Vac
50-60 Hz

Switching Power Supply

Control Card

16.5 Vcc

CapaciTorr CF 35 Power Supply

Getter Pump
```

**Ordering Information**

- **3B0306** CapaciTorr CF35 Power Supply
- **3B0338** Cable Mains Input CF35 3Mm*
- **3B0339** Cable Supply Output CF35 3Mm*

* Other cable lengths available on request
The NEG Pump Controller V1.1 is an electronic unit specifically designed to control the heating and in particular the activation process of all gettor pumps equipped with a thermocouple of the GP (GP100, GP200, GP500) and Capacitor Torr (Capacitor Torr B 1300-2 and Capacitor Torr B 2000) families. In addition, it can also be used as a power supply to heat and activate the pumps not equipped with a thermocouple, such as the GP 50, Capacitor Torr D 400-2 and Capacitor Torr B 200. It can also be used to control the activation process of pumps of the InsiTorr family.

The NEG Pump Controller V1.1 is a 1100 W switching power supply, with an adjustable voltage output from 0 to 110 V. The instrument has two modes of operation: in the first mode (Thermoregulation OFF), the unit behaves as a variable voltage (0-110 V) power supply. By manually adjusting the voltage delivered to the pump with the 10-turn potentiometer, it is possible to reach the desired temperature for a specific pump. In the case of pump models not equipped with a thermocouple, it is necessary to refer to the voltage temperature charts (in the pump manual) for proper setting of the potentiometer. In the second mode (Thermoregulation ON), the unit uses a thermodregulator to control the power delivered to the pump and reach the set temperature. Also, in this case, it is advisable to use the adjustable potentiometer to set the voltage output to a value compatible with pump model being powered. The use of a special thermodregulator, available on request, allows the remote control of the unit via an RS 485 interface.

Ordering Information

- 3B0351 NEG Pump Controller V1.1
- 3B0336 Cable Mains Input V1.1 2Mt
- 3B0337 Cable Supply Output V1.1-5 3Mt*  
- 3B0345 Cable Supply Output V1.1-4 3Mt*

* Other cable lengths available on request  
** For MK5 type pumps  
*** For MK4 type pumps

1 For these models, only the pumps equipped with Si 707 cartridges can be activated with the NEG Pump Controller V1.1

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**SAES Advanced Technologies S.p.A.**

**Nucleo Industriale:**

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Tel.: + 39 0863 495 1
Fax: + 39 0863 357 43

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