

#### **Atom Beam Sources**

# **Cold Atomic Beam System**

Complete cold atomic beam sources for alkaline-earth precision experiments and atomic devices. Small chambers with patented permanent-magnet Zeeman slowers and in-vacuum 2D MOT optics allow high flux with low outgassing and no thermal beam flux at the cold atom port, which provides a CF-133 connection to customer vacuum chamber. Advanced thermal design of the effusion oven allows long-lifetime operation at minimal heating power, with no water cooling. An integrated low-outgassing hot window is provided for coupling of on-axis Zeeman cooling light. Ion and getter pumps integrated into the chamber manage outgassing from the oven at temperatures up to 600 °C. Operating baseline pressures below 1×10<sup>-11</sup> Torr can be attained in the customer's downstream cold atom (typically 3D MOT) science chamber, with suitable pumping speed provided at the differentially-pumped cold beam output port.



## Features

- 0 Cold atom flux > 10<sup>11</sup> atoms/s at  $T_{\perp} < 3$  mK, axial speed ~40 m/s.
- Miniature chambers (1-2 L) and in-vacuum optics achieve baseline pressures < 10<sup>-10</sup> Torr.
- Proprietary oven and Zeeman slower, hot window, and integrated transverse cooling/trapping.
- Of Hot beam flux is entirely blocked from entering the cold beam output port.
- Species available: strontium, calcium, or ytterbium.

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## Specifications

Cold Atomic Beam System	
Cold atom flux	10 <sup>11</sup> atoms/s
Temperature transverse	T⊥ < 3 mK
Axial speed	~40 m/s
Atomic Beam Oven	
Strontium flux @ 420 °C	8 ×10 <sup>13</sup> atoms/s
Calcium flux @ 520 °C	4 ×10 <sup>14</sup> atoms/s
Ytterbium flux @ 420 °C	4 ×10 <sup>14</sup> atoms/s
Power consumption	10 W at 520 °C
Water cooling	none
Maximum temperature (tested)	650 °C
Approx. strontium lifetime at 420 °C	15000 h
Zeeman Slower	
Туре	Sigma-minus standard
B-field generation	Permanent magnets
Magnetic shield	Integrated
Thermal shield	Integrated
Mounting	In-vacuum
Hot Window for Slower	
Maximum temperature (tested)	480 °C
Mounting	In-vacuum
Window material	Z-cut sapphire, AR coating
Clear aperture	8.5 mm diameter
Atomic Beam Chambers	
Windows	Welded, AR coated
Seals	ConFlat
Volume	2 L, complete system
lon pump	2 L/s
Getter pumps	100 L/s and 5 L/s
Beam chamber baseline vacuum level (before	
pressure drop across the differentially-pumped	
output tube):	
<ul> <li>Oven and hot window off</li> </ul>	~1×10 <sup>-10</sup> Torr
<ul> <li>480 °C oven, 350 °C window – typical Sr</li> </ul>	~7×10 <sup>-8</sup> Torr
operation	
	UHV gate valve to differential pumping
Connection to customer systems	tube. CF 1.33 rotatable flange output.
	Larger output flange on request.

Sub-assemblies can be provided in off-the-shelf vacuum enclosures by request. For more information, contact us at <u>sales@aosense.com</u>.

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## Product Details





### High Flux Atomic Beam Oven

• Low power consumption.



#### Zeeman Slower

• Permanent magnet design (US Patent 8,710,428 B1).