

# ORC-Cylindric ORC-Cubic

## Reference Cavity in Vacuum

**MenloSystems**

### KEY SPECIFICATIONS

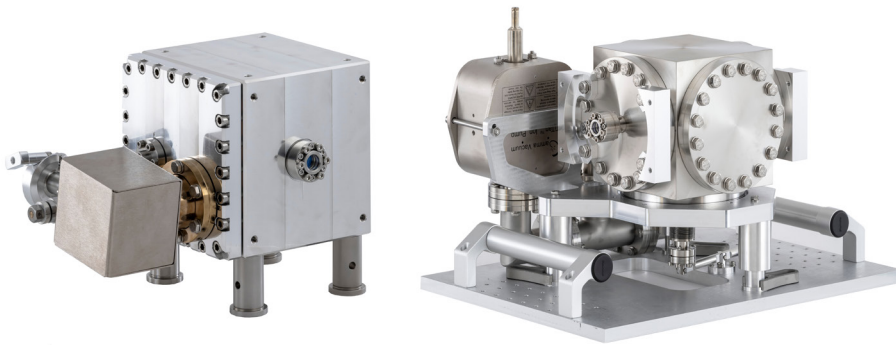
- 5 cm Cubic or 12 cm Cylindric ULE Spacer
- Thermal Noise Limit at  $1.6 \times 10^{-16}$  (ADEV)
- Wavelength  
500–2000 nm (IBS Coatings)  
900–5000 nm (XTAL Coatings)
- Ion-getter Pump and Controller

### APPLICATIONS

- Laser Frequency Stabilization
- Quantum Computing
- Laser Cooling and Trapping
- High Resolution Spectroscopy

### OPTIONS

- Optics Module for Input Coupling, PDH Locking, and Monitoring
- Fused Silica Mirror Substrates with ULE Compensation Rings
- Rack-mounting (ORC-Cubic only)
- Crystalline Mirror Coatings (XTAL)
- Multiple Wavelengths Mirror Coatings
- High / Mid / Low Finesse
- Pound-Drever-Hall Servo Electronics
- TEC Driver
- Reference Cavity without Vacuum Enclosure
- Reference Cavity Spacer
- Characterization of the Zero-Crossing Temperature



The Optical Reference Cavity (ORC) series is our solution when customization is pivotal. Choose from the exceptional portfolio of adaptations, auxiliary instruments and services and profit from our experience in designing generations of ultrastable laser systems.

The ORC family are Fabry-Pérot-type cavities with a resonator spacer made out of ultra-low expansion glass (ULE). The cavity is mounted in a sealed vacuum housing, engineered for exceptional temperature stability to enable low frequency drift. The compact design ensures minimal spatial demand. The ORC-Cubic is available as a 6U, 19" rack module. It is based on a rigidly mounted cubic spacer licensed from National Physical Laboratory. The ORC-Cylindric uses a cylindric spacer designed by the Physikalisch Technische Bundesanstalt, that is horizontally mounted on four support points. Here, portability is ensured by a mechanical locking mechanism.

A broad variety of add-ons and options is available for customization: mirror substrates are available as ULE or fused silica (FS), mirror coatings can either be ion-beam sputtered (IBS) or crystalline (XTAL), the latter is needed when ultimately low thermal noise is paramount. The highly reflective coatings are available over a broad wavelength range and also as dual or triple highly reflective mirrors. Modules for input coupling, PDH locking, and output monitoring can be rigidly mounted onto the chamber, rendering tedious realignments after transportation obsolete.

Every system is baked-out during the assembly process. The built-in NTC and Peltier elements are accessible via vacuum feedthroughs, allowing for operation at the zero crossing of the coefficient of thermal expansion (CTE). Characterization of the CTE is available on request. Both cavities are also available without enclosure.



Reference Cavity Spacers

# ORC-Cylindric ORC-Cubic



## Reference Cavity in Vacuum

SPECIFICATIONS	ORC-CUBIC	ORC-CYLINDRIC
Wavelength	500 – 2000 nm (IBS Coatings) 900 – 5000 nm (XTAL Coatings)	
Finesse	Low / Mid / High	
Cavity Length	5 cm	12.1 cm
Free Spectral Range	3 GHz	1.24 GHz
Windows	AR Coated, Angled and Wedged	
Thermal Shields	Active and Passive	Active
Linear Drift Rate	~ 150 mHz/s	
Ambient Temperature Sensitivity	~ 4 mK/°C	
Temperature Sensor	10 kΩ NTC	
Peltier Elements	2 x 25 W	1 x 56 W
Ion Getter Pump	5 l/s	10 l/s
Achievable Pressure	< 10 <sup>-7</sup> mbar	
Stainless Steel Valve	Cu Sealed, KF Flange	Cu Sealed, CF Flange
Dimensions	W 28 cm, L 28 cm, H 18 cm	W 48 cm, L 35 cm, H 35 cm
Vacuum Chamber Material	Aluminum	Stainless Steel
Mass	15 kg	55 kg
Rack Integration	19", 6U Enclosure (optional)	n.a.

### CALCULATED THERMAL NOISE FLOOR

	MIRROR SUBSTRATES – MIRROR COATINGS		
	ULE-IBS	FS-IBS	FS-XTAL
Thermal noise ADEV limit 5 cm CUBIC	1.4 x 10 <sup>-15</sup>	9 x 10 <sup>-16</sup>	4 x 10 <sup>-16</sup>
Thermal noise ADEV limit 12 cm CYLINDRICAL	5.8 x 10 <sup>-16</sup>	3.8 x 10 <sup>-16</sup>	1.6 x 10 <sup>-16</sup>

### ORDERING INFORMATION

Product Code	ORC-Cubic	ORC-Cylindric
--------------	-----------	---------------

Please call for pricing. Specifications are subject to change without notice. Custom modifications are available, please inquire. The cubic cavity is an NPL patented design that is sold under a licensing agreement with the National Physical Laboratory (NPL). This configuration of the NPL cavity is intended for terrestrial use only. For further information on space-cus-tomised or space-qualified cavities, please contact NPL.



**Menlo Systems GmbH**  
T+49 89 189 166 0  
sales@menlosystems.com

**Menlo Systems, Inc.**  
T+1 973 300 4490  
ussales@menlosystems.com

**Thorlabs, Inc.**  
T+1 973 579 7227  
sales@thorlabs.com

