

BeCu DAC with rocker seat and integrated membrane pressure control

Model BeCu-MC38R12

Initially this compact (38 mm OD, ~56 mm long) DAC was designed as nonmagnetic DAC for use with Janis ST-500 (or comparable, such as Physike Scryo-S500) cryostats and strong magnetic fields (superconducting magnets) for Raman and other spectroscopy measurements requiring short working distance ($WD \leq 12\text{mm}$).

The DAC was initially designed to have an integrated membrane pressure control (no-hole membrane). Nevertheless it can be loaded and operated independently of the membrane. The DAC can be closed and pressure can be controlled with 4x M4x0.7mm screws and a set of Belleville spring washers. For studies in magnetic field Inconel / Ti5 / BeCu screws and Inconel or bronze Belleville washers can be used.

The DAC can use different types of diamond seats depending on diamond type and experimental conditions, for example flat low or high seats (~3.2 / ~5.3 mm). The ability to adjust the diamond tilt with a rocker makes this DAC ideal for use with conical support Boehler-Almax type diamond anvils. The seats can be made either from tungsten carbide (magnetic) or BeCu / Ti5 / Inconel / Pascalloy / cBN (non-magnetic).

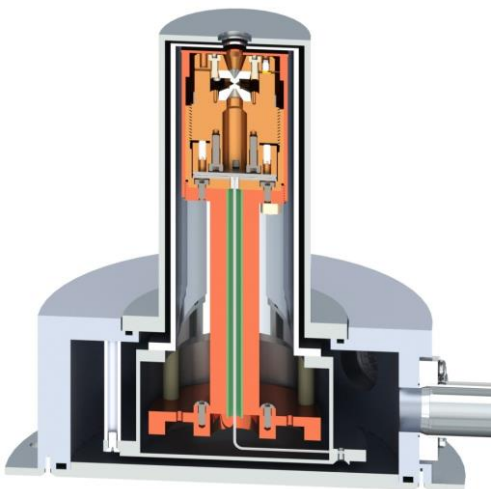
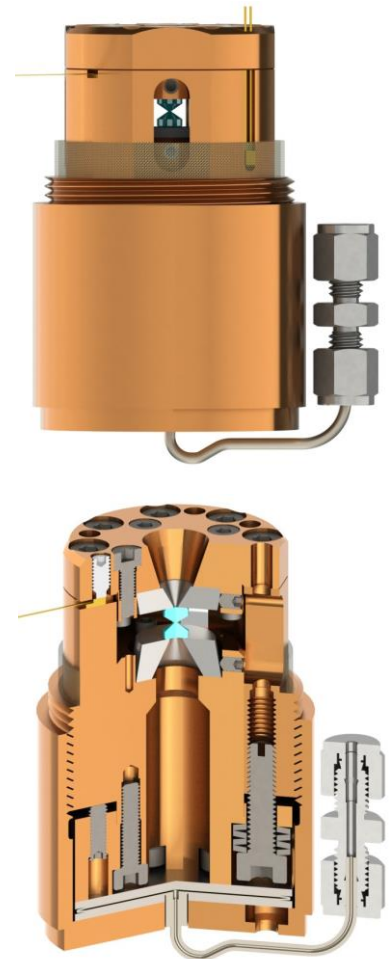
To prevent uncontrollable increase of pressure during lowering the temperature the DAC allows to transfer pressure from the screws to the membrane during / before the experiment. For that the DAC has access to the pressurizing screws from top, and the screws can be provided with either hexagonal sockets for Allen wrench (2-2.5 mm), or a slot for a screwdriver.

For even better and smoother pressure control several decompression springs can be engaged before screwing the DAC into the membrane can. For decompression springs either Belleville washers or a slotted tube spring can be used. The spring force can be adjusted by M3 set screws.

For accurate temperature measurements of the DAC there are two types of cut-outs for securing SD-type sensors (2 mm wide, 1 mm high): Two symmetric 2mm wide 1 mm deep cutouts go along the DAC body and two slots in the cylinder part normal to cylinder axis toward the piston. The sensor with Apiezon N grease can be inserted into the matching slot and secured with either G10/G11 (garolite) split ring or a nylon-tipped screws.

Both lower and upper diamond seats have adjustable lateral position. Also the sockets for diamond seats have threaded holes (M1.6) for service screws - to attach furnishings and accessories for mounting electric wires and gasket holders.

The split cylinder design (the cup with the rocker and diamond seat is detachable from the main cylinder) allows for relatively easy mounting of wires for electric measurements.





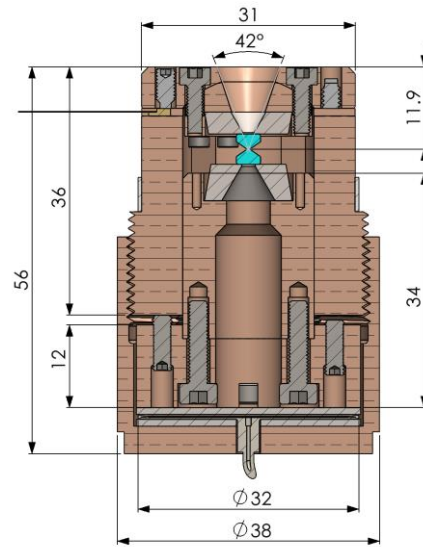
Specifications of BeCu DAC with rocker seat and integrated membrane pressure control

Main DAC Specifications

- Max. DAC diameter: 31 mm / 33 mm thread
- DAC length: ~49 mm
- Max. can diameter: 38 mm
- Overall length: <56 mm
- Optical WD: ~12 mm (~20 mm in cryostat)
- Membrane: Blind, 32 mm OD
- Max membrane force at 150 bar: 1,200 kgf
- Spring washers: Alloy steel / Inconel, BeCu (non-magnetic)
- Membrane material: SS 304/316 / Inconel (non-magnetic)
- Compression screws: M4x0.7 RH, M3x0.5 decompression sockets
- Decompression springs: Up to 5 mm OD, 8 mm long
- Sensor package: SD, e.g. DT-670-SD
- Maximum pressure: >100 GPa with 200 um diamond culets
>40 GPa with 300 um diamond culets

BeCu Material Properties

- Type: C17200 / Alloy 25
- Temper: HT04 (TH)
- Density: 8.25 g/cc
- Ultimate strength: 1380 MPa (typ)
- Yield strength (0.2%): 1240 MPa (typ)
- Hardness Rockwell C: 38-42 (typ)
- Thermal expansion (0°C): ~16.0 μm/m-°C
- Specific Heat Capacity: 0.420 J/g-°C
- Thermal conductivity (20°C): 105-130 W/m-K



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