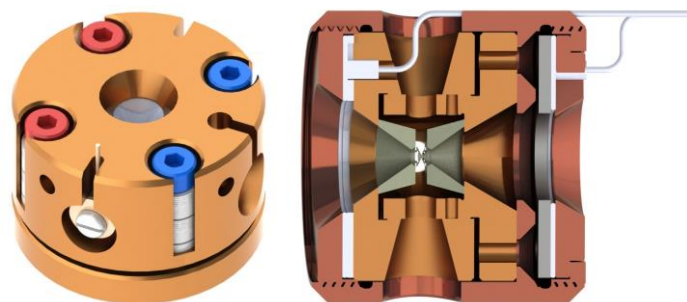
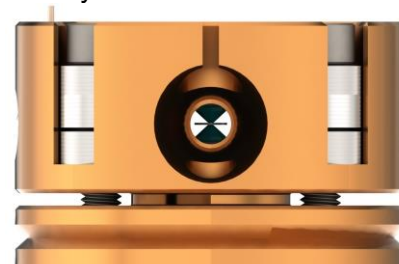




LARGE OPENING CRYOGENIC BeCu DACs

A large number of physical phenomena, such as superconductivity, magnetic ordering, quantum critical phenomena, and others often appear only at extremely low cryogenic temperatures (e.g. below 5-10 K). Therefore there is a lot of interest in studying various materials at simultaneously low temperature and high pressure by different experimental methods and thus a significant demand for a variety of different diamond cells designed for low temperature studies. While DACs made of hard steel (SS 440C, Vascomax C300/350, etc.) can be used in low temperature experiments, especially in “wet” cryostats, the material of choice for cryogenic DACs is Beryllium Copper alloy (e.g. C17200 / Alloy 25) which has a unique combination of properties: non-magnetic, high strength, high thermal conductivity.

Currently our most popular BeCu DAC is Shortened Symmetric DAC. It is based on a Metric Symmetric DAC (48 mm OD) but with cylinder shortened by 5 mm to decrease working distance (for e.g. Raman spectroscopy) to ~12 mm and reduce thermal mass. The DAC can be easily integrated into a number of cold-finger cryostat and has built-in features such as socket for mounting temperature sensor in CU package, holes and threads for bolting the DAC to cold finger base, and so on.



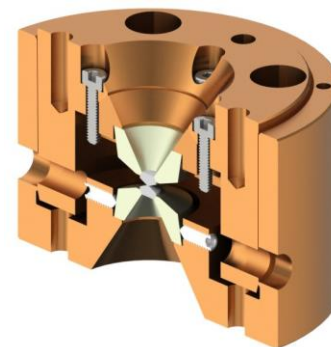
Another modification of the Standard Symmetric DAC is a Mini-Symmetric DAC with 40 mm Diameter. This DAC has smaller outside dimensions and is ~50% lighter than the full sized BeCu DAC. Nevertheless, the inner diameter and height of the diamond / seat area is the same and allows using “standard” sized diamond anvils and seats.

The DAC can be easily integrated with single or double membrane BeCu canister (compression and decompression) and fit into 47 mm (all versions) and <59 mm (shortened version) cryostat bores along and normal to the bore axis respectively.

Another large opening cryogenic DAC recently developed by DACTools has 70 degrees symmetric opening and diamond tilt mechanism so that the DAC can be easily used with Boehler-Almax type diamond anvils and seats. The DAC was initially developed as a part of cryogenic system for single crystal Brillouin scattering (can continuously rotate about the DAC axis inside the cryostat) but can be used for a variety of other studies such as single crystal x-ray diffraction.

Virtually any type of DACTools’ DACs (e.g. split-style SSDAC 70/80 and Mini-BX80, BX-60/70/80, or custom DACs) can be made of BeCu alloy providing that there is sufficient demand (e.g. 4-5 DACS) to justify production.

If the DACs are intended to be used in strong magnetic fields, they can be supplied with non-magnetic screws (e.g. BeCu, Inconel 718, Titanium5) and spring washers (Inconel 718) or split cylinder springs (BeCu), as well as non-magnetic diamond seats made of either WC with Ni binder, BeCu, Pascalloy (non-magnetic NiCrAl alloy) or cemented cubic boron nitride.



To minimize tear and wear and improve the performance, stability and lifetime of BeCu DACs the pistons can be coated with Hard Chrome (magnetic) or the whole DAC can be coated with a layer of WS₂.

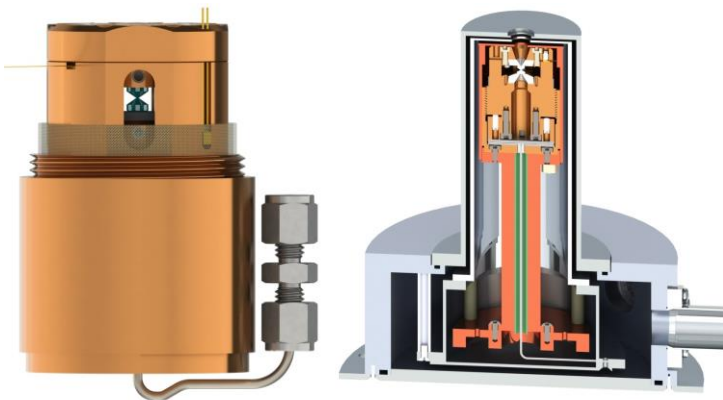
The variety of BeCu DACs and special diamond seats stocked by DACTools is constantly increasing – please contact us to check for available new models and lead times.



PANORAMIC AND SPECIALIZED BeCu DACS

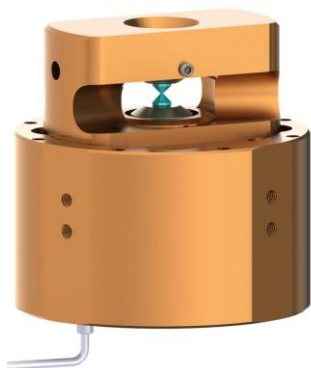
While large opening DACs can be used for a variety of experiments – X-ray scattering, optical spectroscopy, electric measurements and such, often they are not suitable for specific environments either because of limited geometry / opening or large size not appropriate for certain types of cryostats or experimental setups and conditions. Below are few examples of such DACs which have been designed and manufactured by DACTools.

The compact (38 mm OD, ~56 mm long) BeCu DAC with diamond tilt alignment rocker and integrated membrane pressure control was designed as nonmagnetic DAC for use with Janis ST-500 or Physike Scryo-S500 cryostats and strong magnetic fields (superconducting magnets with small bores) for Raman and other spectroscopy measurements requiring short working distance (WD \leq 12mm). The current version was designed for use with “blind” membrane thus the sample can be accessed optically from only top / cylinder side.



The DAC was initially designed to have an integrated membrane pressure control. Nevertheless it can be loaded and operated independently of the membrane. The DAC can be closed and pressure can be controlled with 4x M4 screws and a set of Belleville spring washers.

The Beryllium Copper version of DACTools TOMO150 DAC can be used in a variety of primarily x-ray based experiments where large (150 degrees) opening in the sample plane (perpendicular to DAC axis) is essential. It can be used in different X-ray spectroscopy / inelastic scattering measurements where the x-ray beam can be focused on the sample either through the diamond anvil or through the gasket, and the signal can be collected typically from a side through the x-ray transparent gasket. The DAC can also be used in a regular axial geometry although the angular opening is limited. The DAC can be easily integrated with a special membrane drive and radiation shield for improved temperatures.



The non-magnetic DT-25/28-55-BeCu DAC is designed for a variety of experiments at cryogenic conditions in confined spaces (28 mm min. diameter of the cryostat bore). The DAC is comparable with HMD PPMS 25 mm DAC (DAC-SRr-25-55) while has a lot of modifications to improve performance, stability, reliability, and ease of operations. The DAC has a rocker / spherical seat so that the tilt of one diamond anvil can be easily adjusted.

The pressure in the DAC is increased by rotating one pressurizing screw (1 mm pitch) with integrated ceramic thrust ball bearings. The pressure in the DAC is typically increased with an optional 100X gearbox (which can provide piston / pressurizing screw advancement with 100 nm = 0.1 μ m resolution), although other options including membranes) are possible.

