OptiCool Wiring and Feedthrough Options

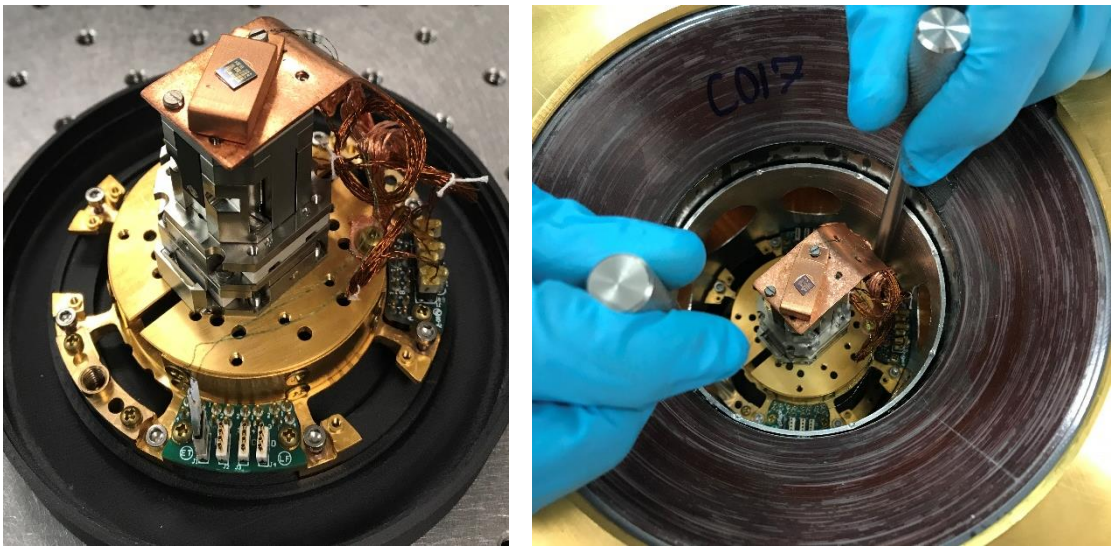
Wiring and feedthrough options are available to get electrical and optical signals into and out of the OptiCool cryostat. Pick from these options to meet your experimental needs. Each is described in more detail on the following pages.

- X300 Standard Sample Wiring. 16 wires (8 twisted pairs) for user signals.
- X301 3-Axis Positioner Wiring. Used to drive piezo positioners.
- X310 RF Coax Wiring. Four coax lines for signals up to 20 GHz.
- X280 Optical Fiber Feedthrough. Feed four or more optical fibers into the sample volume. Can also be used for other items such as gas tubes.

The wiring options are permanently mounted in the cryostat, so are usually installed at the factory. The fiber feedthrough is easily installed or removed by the end user.

To use the wiring, you make all connections to your experiment hardware on the bench. Simply wire from the pod connectors to your hardware. When the pod is inserted into OptiCool, connections are automatically made to the cryostat wiring (fiber connections must be made manually). The signals then run from your experiment to the OptiCool front panel. There is never any need to perform wiring inside the cryostat. All the wiring is thermally anchored inside the cryostat, ensuring the wires will not disrupt your sample's temperature.

All these wires are available to the user—none are used for system temperature control, including the auxiliary thermometer for measuring sample temperature. Please contact Quantum Design to discuss the best wiring combination for your needs.



(Left) Pod shown with one X300 standard wiring bay and one X301 attocube wiring bay. (Right) Pod being inserted into OptiCool chamber. Thermal and electrical connections between the pod and cryostat are made by simply plugging in the pod.

X300 – Standard Sample Wiring

Standard sample wiring provides 16 wires (8 twisted pairs) for many uses, including resistance measurements, I-V curves, and gating. It may be possible to drive positioners using these wires, but if you know you will need positioners, be sure to include X301 positioner wiring (next page).

Twisted pairs are typically useful up to tens of kHz. If you use higher-frequency signals, see X310 RF Coax wiring.

- Configuration: 16 wires (8 twisted pairs) for user signals
- External connector: 16-pin Fischer connector. Mating cable connector provided.

- Mating cable available for purchase: 3318-404-01 adapts from the Fischer connector to a standard DB-25 connector.
- Pod connector: four 4-pin Min-E-Con connectors. Mating connectors with solder pins are provided.

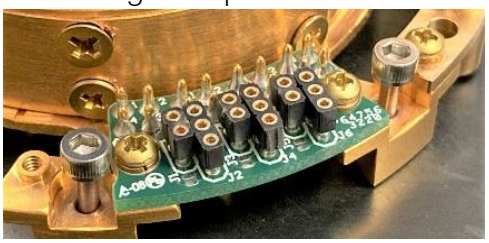
- Wire info: Eight 36-gauge (0.13 mm) phosphor-bronze twisted pairs (16 wires)
- Wire resistance: 5 Ohms (typical) from Fischer to Min-E-Con
- Maximum Voltage: 150 V

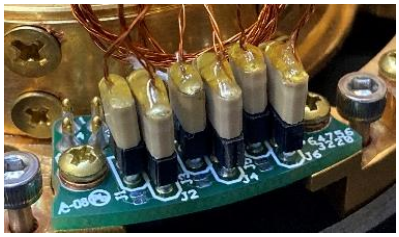
X301 – 3-Axis Positioner Wiring

Positioner wiring is optimized for piezo-driven nanopositioner stacks. This wiring is compatible with attocube stages with or without /RES feedback. It can drive 3 positioners with /RES feedback or 6 positioners without feedback.

- Configuration: 3 pairs of low-resistance piezo drive wires and 3 sets of signal wires for /RES feedback.
- External connector: 16-pin Fischer connector. Mating cable connector provided.

- Mating cables: the following cables that mate with the Fischer connector can be purchased for use with this wiring:
  - 3318-401: Connects to attocube controller cables for up to 3 positioners with /RES feedback
  - 3318-403: Connects to attocube controller cables for up to 6 positioners without feedback
- Pod connector: 2 mm headers (three 2-pin and three 3-pin). Attocube positioners connect directly to these as shown on the right. Mating connectors with solder pins are provided for connecting other positioners.





- Wire info:
  - Three pairs of drive wires for driving piezo positioners.
  - Three sets of signal wires (3 signals each) for /RES resistive position feedback. User configurable to drive up to 3 more piezo positioners instead.
- Wire Resistance:
  - Drive wires: 0.8 Ohms (typical) from Fischer to Min-E-Con
  - Signal wires: 5 Ohms (typical) configured for resistive feedback; 2.5 Ohms (typical) configured to drive piezo positioner.
- Maximum Voltage: 150 V

X310 – RF Coax Wiring

RF coax wiring provides four RF lines for use up to 20 GHz. Like other wiring options, you make connections from your sample to the pod. When you plug the pod into the cryostat, the pod connectors mate to the permanently installed (and thermally anchored) coax lines in the cryostat. There is no need to make coax connections by hand inside the cryostat.

- Configuration: Four RF coax lines for signals up to 20 GHz
- External connector: SMA

- Pod connector: SMPM (Mini SMP)

- Coaxial Wires: Four .047 inch (1.19 mm) semi-rigid copper-nickel coax
- Isolation: All coax lines and RF connectors isolated from cryostat ground (inner and outer conductors)
- Maximum Voltage: 325 VRMS
- Maximum attenuation from front panel to pod connector:

0.5 GHz	1.6 dB
1.0 GHz	2.1 dB
5.0 GHz	4.3 dB
10 GHz	6.0 dB
20 GHz	8.3 dB

X280 – Optical Fiber Feedthrough

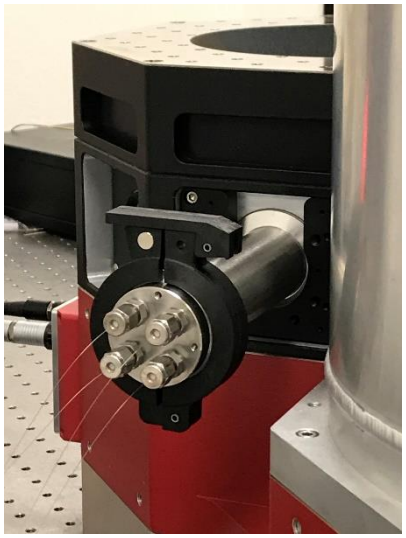
The Optical Fiber Feedthrough kit makes it easy to feed optical fibers from outside the cryostat to your experiment on the OptiCool Sample Pod. The kit provides four 1/8-inch compression fittings with Teflon ferrules designed for 125 micron fibers. Simply insert a fiber through a ferrule, then tighten the compression nut to achieve a vacuum tight seal. With no fiber-connector interfaces, light loss is minimized.

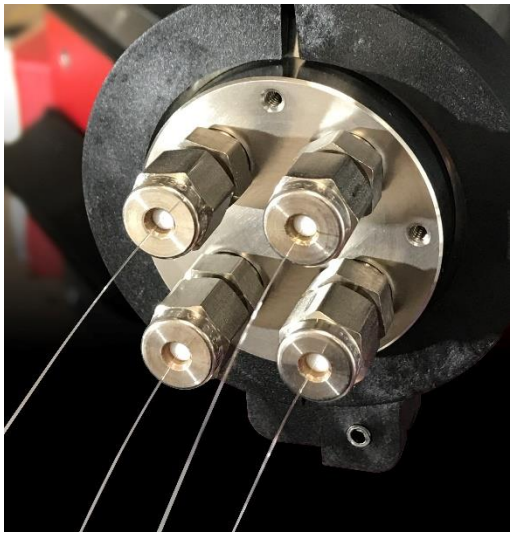
The kit includes an interface to the OptiCool thermal shield to cool the fibers to <50 K before routing to your sample. This ensures that your experiment reaches OptiCool's low base temperature (<1.7 K).

If your fibers are too large to fit in the existing ferrule holes, you can simply drill out the holes. You can add extra holes to install more than one fiber in each of the four compression fittings.

The feedthrough kit can be used with any item that is compatible with 1/8-inch Swagelok compression fittings. For example, a gas membrane-controlled Diamond Anvil Cell (DAC) typically uses a 1/16-inch gas tube, which can be installed using a 1/8 to 1/16-inch compression adapter. This uses only one of the four compression fittings, so the other three are still available for fibers or other uses.

The feedthrough kit is easily installed by the user in their laboratory. One pair of side windows (vacuum and shield) are removed, then the feedthrough hardware is installed in their place. Any of the seven side window locations can be used.





(Left) Fiber feedthrough installed in location of one side window.
(Right) Closeup of fibers passing through compression fittings with white Teflon ferrules.