

## OptiCool Wiring Options

The OptiCool can hold a maximum of 5 prefabricated wiring sets of varying types. Each wiring option outlined below represents a wiring set that occupies a single bay on the OptiCool's temperature control column. Please contact Quantum Design to discuss specific wiring bundle combinations.

### Wiring Sets

#### 1. X300 – Standard Sample Wiring

- a. External connector: 16-pin Fischer connector
- b. Pod connector: four unkeyed 4-pin Min-E-Con connectors
- c. Wires: Eight 36-gauge (0.13 mm) phosphor-bronze twisted pairs (16 wires)
- d. Wire resistance: 5 Ohms (Typical) from Fischer to Min-E-Con

#### 2. X301 – 3-Axis Positioner Wiring (compatible with attocube stages with or without RES feedback)

- a. External connector: 16-pin Fischer connector
- b. Pod connector: three keyed 5-pin Min-E-Con connectors.
- c. Wires:
  - i. Three 30-gauge (0.23 mm) phosphor-bronze twisted pairs (6 wires); low resistance to drive piezo elements.
  - ii. Six 36-gauge (0.13 mm) phosphor-bronze twisted pairs arranged in twinned pairs<sup>1</sup> (9 wires total); for resistive position feedback or to drive more piezo elements.
- d. Wire Resistance:
  - i. 30-gauge wires: 0.8 Ohms (typical) from Fischer to Min-E-Con
  - ii. 36-Gauge wires: 5 Ohms (typical) for single wires and 2.5 Ohms (typical) for the twinned wire.

#### 3. X310 – Four High Frequency Coax (20 GHz)

- a. Outside connector: SMA
- b. Pod connector: SMPM
- c. Coaxial Wires: Four .047 inch (1.19 mm) semi-rigid copper-nickel coax
- d. Expected losses (Values in table are estimates. Actual losses may vary.):

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

<sup>1</sup> Twinned pairs have one side of each twisted pair doubled up to form a single, low-resistance, wire. This geometry allows the user to either drive a resistive position feedback element or double up the two higher resistance wires to drive another Piezo stage if needed.

## Connectors

### *16-Pin Fischer (Used on X300 and X301)*



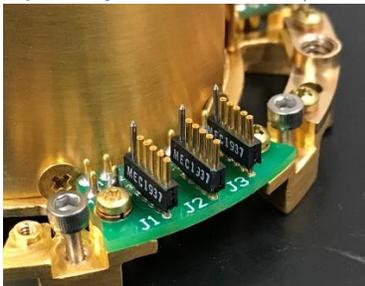
16-pin Fischer connector shown on the wiring feedthrough plate on the outside of the cryostat. A mating Fischer connector with solder cups is provided with the OptiCool.

### *4-pin Min-E-Con (Used on X300)*



Connector shown mounted onto standard Sample Pod. Mating connector with solder pins are provided with the OptiCool.

### *5-pin Keyed Min-E-Con (Used on X301)*



Connector shown mounted onto standard Sample Pod. Mating connector with solder pins are provided with the OptiCool.

### *SMA (Used on X310)*



SMA coax connector shown on the wiring feedthrough plate on the outside of the cryostat. Each coax wiring set will add 4 SMA connections to the cryostat.

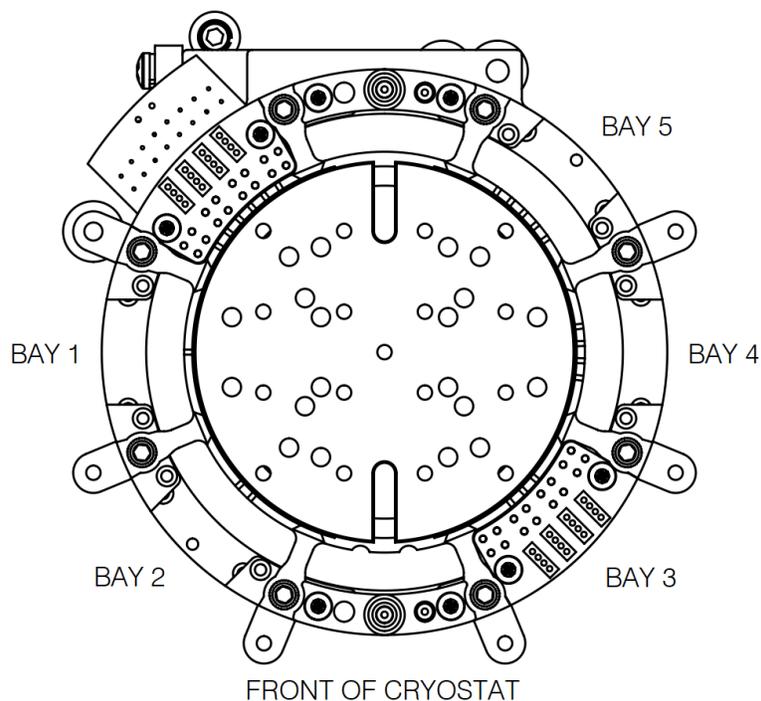
*SMPM (Used on X310)*

**Picture not available.**

SMPM connectors are mounted to the Sample Pod. The customer can solder appropriate coax into these connectors to bring the high frequency signal to the sample.

### Column Configuration

The wiring sets can be installed in the 5 available bays on the sample column. Mating assemblies are mounted to the Sample Pod to make contact to the installed wiring sets. The Pod wiring configuration must match the underlying wiring configuration of the temperature control column. The figure below shows a top view of the Sample Pod plugged into the temperature control column. The 5 available wiring bays are labelled. The 6<sup>th</sup> bay (upper left) is used for system wiring and connection to the auxiliary thermometer included with the OptiCool.



*Top view drawing of the Sample Pod with the wiring bays labeled. The pod is shown plugged into the sample column. Other features of the cryostat are hidden for simplicity.*