

Flow Requirements and Fitting Specifications for Water-cooled Sensors

A Coherent Applications Note

Caution

While working with the water connections, avoid getting water on the surface of the sensor. Water will corrode the coating on the sensor surface and cause damage during use. If water does come in contact with the sensor surface, the best way to quickly remove the water is to use a blow dryer or heat gun to evaporate the water and keep it from soaking into the coating.

Coolant

- Tap or distilled water is recommended.
- The exact temperature of the water is not critical as long as the temperature is relatively stable. The water can be supplied from a chiller or local tap.
- Do not use DI water, as it will dissolve aluminum and brass.
- Ethylene Glycol is okay up to a 10% maximum in the mixture.
- Allow sufficient time for the water flow and sensor head to reach equilibrium. The water flow should run through the sensor for a couple minutes before zeroing the meter and beginning the measurement.
- Maximum input water temperature fluctuation should be 1°C per minute. It should be much slower than the time constant of the head. The maximum flow deviation should be on the order of 2% per minute. Any rapid variation in temperature or flow rate can give erroneous readings from the sensor.
- It is recommended that the water supplied to the sensor is not in series with water supplied to other equipment (such as a laser.) In certain applications, laser systems will adjust the water flow rate based on the needs of the laser. This can change the flow rate in the sensor and cause erroneous measurements. Adding a sensor head to a laser cooling supply can also cause problems with thermal strain on the cooling system.

Fitting and Water Flow Specifications

The following flow rates are minimums for proper heat transfer from these sensors. Higher water flow rates are not discouraged during use, and water flow should be maximized when using these products near the upper limit of their power specifications. The damage threshold on these sensors will drop as they heat up so refer to the catalog specifications or contact Coherent if there are any questions on the maximum power limits or power density specifications. It is recommended that the water fittings supplied by Coherent are the fittings used with these sensor models. Removal of fittings and replacement with fittings other than those provided can cause damage to the water ports on these sensors and could void the warranty on the product.

PM-series 10W and 150W water-cooled sensors

- Water port threads: 1/8" NPT
- Included fittings: plastic quick-connect for hose size 1/4" ID x 3/8" OD
- Minimum water flow rate: 0.2 GPM (0.75 LPM)

PowerMax-Pro 150 and PM300 water-cooled sensors

- Water port threads: 1/8" NPT
- Included fittings: brass quick-connect for hose size 1/4" ID
- Minimum water flow rate: 0.5 GPM (2 LPM)

PM-series kW water-cooled sensors

- Water port threads: 1/8" NPT
- Included fittings: brass quick-connect for hose size 1/4" ID
- Minimum water flow rate:
 - 1 GPM (4 LPM) at 1 kW
 - 2 GPM (7.5 LPM) at 3 kW
 - 4 GPM (15 LPM) at 5 kW

LM-1000 and BeamFinder water-cooled sensors

- Water port threads: 1/8" NPT
- Included fittings: stainless steel barb for hose size 1/4" ID
- Also included: 1/4" ID x 3/8" OD hose (20' length) and aluminum hose clamps
- Minimum water flow rate: 1 GPM (4 LPM)

LM-2500 and LM-5000 water-cooled sensors

- Water port threads: 1/4" NPT
- Included fittings: brass quick-connect for hose size 3/8" ID
- Also included: 3/8" ID x 5/8" OD hose (20' length) and stainless steel hose clamps
- Minimum water flow rate:
 - 2 GPM (7.5 LPM) at 2.5 kW
 - 4 GPM (15 LPM) at 5 kW

Recommended pressure versus flow rate

- 3 PSI at 0.5 GPM
- 6 PSI at 1 GPM
- 18 PSI at 2 GPM
- 32 PSI at 3 GPM
- 50 PSI at 4 GPM

(Water flow is measured at the input of the sensor.)

Connection Info for OEM Sensors

Passive models: **PM10-19B, PM150-19B, PM150-50B, PM150-50XB, PM1K-36B**

- Connection to sensor: BNC with positive center conductor electrically floating above ground
- Output impedance: close to 2.5 k Ω , needs to be run into a high impedance of at least 1 M Ω

Amplified models: **PM10-19A, PM150-19A, PM150-50A**

- Connection to sensor: 4-pin (Molex part # 22-12-2044)
 - Pin 1: -15 V supply voltage
 - Pin 2: Ground
 - Pin 3: +15 V supply voltage
 - Pin 4: Output signal
- Supply voltage range: ± 10 V to ± 20 V
- Current draw: approximately 8 mA at -15 V and 18 mA at +15 V
- Output impedance: 100 Ω
- Compatible connector (not included): Molex 4-pin housing part # 22-01-3047, wire crimp part # 08-50-0114

PowerMax-RS models: **PM10-19C, PM150-19C, PM150-50C**

- PC Interface: RS232
- Connector: DE-9F
- Power input connector: 6 mm barrel with 2 mm pin, center positive
- Required Power: +5 VDC $\pm 5\%$ with less than 100 mV RMS noise
- Current draw: <300 mA
- Power Supply: Optional equipment; order #1105557 for UL and PSE certified power supply with power cord.
- Alternate OEM power input:
 - Pin 1: +5 VDC
 - Pin 5: Ground (shared with Signal Ground)
- Communication:
 - Pin 2: Receive Data
 - Pin 3: Transmit Data
 - Pin 5: Signal Ground
- Cable length: 300 mm. Use standard RS232 cable to extend length and connect to PC or interface board.

Abbreviations: " = inch, ' = foot, GPM = gallons per minute, LPM = liters per minute, PSI = pounds per square inch