Application Note:
Flow Rates and Fittings for Water-Cooled Sensors

Introduction

This Application Note describes the sensor flow rates and fitting requirements for various water-cooled sensors from Coherent.

Caution

While working with the water connections, avoid getting water on the surface of the sensor. Water corrodes the coating on the sensor surface and causes 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 to keep it from soaking into the coating.

Requirements for Coolant

Following are requirements for coolant for the sensors:

- 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.
- The use of deionized (DI) water, requires additional monitoring of your cooling loop as it can be aggressive on aluminum and brass. Care must be taken to ensure a neutral PH level.
- 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. This will avoid errors due to the baseline Zero shift as the water temp equalizes.
- 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), running a separate line and metering block is fine. 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 in a direct series plumbing configuration, and cause erroneous measurements. Adding a sensor head to a laser cooling supply can also cause problems by creating thermal strain on the cooling system, make sure that your cooling unit is size appropriately for the additional heat load.

Specifications for Fittings and Water Flow

The flow rates described in this Application Note are minimums for proper heat transfer from these sensors.

- Higher water flow rates are not discouraged during use.
- Water flow should be maximized when using these products near the upper limit of their power specifications.

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The damage threshold on these sensors drops as they heat up. If you have any questions about the maximum power limits or power density specifications, refer to the catalog specifications or contact Coherent.

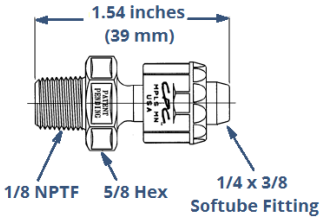
It is recommended that you use the water fittings supplied by Coherent with these sensor models. Removal of fittings and replacement with fittings other that those provided can cause damage to the water ports on these sensors and could void the Warranty on the product.

Abbreviations in this document include:

- *n*" = inch, *n*' = foot
- ID = Inside Dimension, OD = Outside Dimension
- GPM = Gallons per minute
- LPM = Liters per minute
- PSI = Pounds per square inch

PM-Series 10W and 150W Water-Cooled Sensors

- Water port threads: 1/8" NPT
- Minimum water flow rate: 0.2 GPM (0.75 LPM)
- Included fittings: Plastic quick-connect for hose size ¼" ID x 3/8" OD

Diameter	Part Number	Drawing
Tubing size: 1 /4" ID x 3/8" OD Threads: 1 /8" NPTF	ST 10-02-04 Male Straight Softube Fitting	

PowerMax-Pro 150HD, HP and PM300 Water-Cooled Sensors

- Water port threads: 1/8" NPT
- Minimum water flow rate: 0.5 GPM (2 LPM)
- Included fittings: Brass quick-connect for hose size ¼" ID

The following fittings are available at Foster Manufacturing: http://www.couplers.com/

Diameter	Part Number	Drawing
1 /4 I.D.	FS204 | FS204P	
5 /16 I.D.	FS205	
3 /8 I.D.	FS206 | FS206P	

Diameter	Part Number	Drawing
1 /8 NPT	FP251	
1 /4 NPT	FP252	
3 /8 NPT	FP253	

PowerMax Series kW Water-Cooled Sensors (PM1K,3K,5K)

- Water port threads: 1/8” NPT
- 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
- Included fittings: brass quick-connect for hose size ¼” ID

The following fittings are available at Foster Manufacturing: http://www.couplers.com/

Diameter	Part Number	Drawing
1 /4 I.D.	FS204 | FS204P	
5 /16 I.D.	FS205	
3 /8 I.D.	FS206 | FS206P	

Diameter	Part Number	Drawing
1 /8 NPT	FP251	
1 /4 NPT	FP252	
3 /8 NPT	FP253	

PowerMax-Pro Series kW Water-Cooled Sensors (PMP 1kW,3kW)

- Water port threads: 1/8” NPT
- Minimum water flow rate:
  - 1 GPM (4 LPM) at 1-3 kW
- Included fittings: stainless push to connect for hose size 10mm or 3/8” ID

The following fittings are available at PISCO: http://www.pisco.com/products/Fittings

Diameter	Part Number	Drawing
3 /8 I.D. hose 1/8 NPT	POC3/8-N1U	
10mm I.D. hose 1/8 NPT	POC10-01-01	
3 /8 I.D. tube to 8mm tube	PPJ 3/8-8	

LM-1000 and BeamFinder Water-Cooled Sensors

- Water port threads: 1/8” NPT
- Minimum water flow rate: 1 GPM (4 LPM)
- 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

The following Stainless Steel Hose Connector is available at Swagelok: https://www.swagelok.com/

Diameter	Part Number	Drawing
1/8” male NPT 1/4” Hose ID	SS-4-HC-1-2	

LM-2500 and LM-5000 Water-Cooled Sensors

- Water port threads: 1 / 4” NPT
- The following fittings are available at Foster Manufacturing: http://www.couplers.com/

Diameter	Part Number	Drawing
1 /8 NPT	FP251	
1 /4 NPT	FP252	
3 /8 NPT	FP253	

Included fittings: Brass quick-connect for hose size 3/8” ID

Diameter	Part Number	Drawing
1 /8 I.D.	FS214 | FS214P	
1 /4 I.D.	FS215	
3 /8 I.D.	FS216 | FS216P	

- 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: Water flow is measured at the input of the sensor.

- 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

Contact Coherent

For additional information, contact Coherent Technical Support as follows:

- Contact your local Coherent Service Representative (or visit www.Coherent.com to view a list of contacts worldwide)
- Send an e-mail to: LSMservice@Coherent.com
- Call the Coherent Technical Support Hotline
  - Within the USA: 1-(800)-343-4912
  - Outside of the USA: 1-(408)-764-4042

For additional information about **sensor products**, go to:

https://www.coherent.com/measurement-control

For answers to **frequently asked questions**, go to this link, scroll down and click FAQ, then select Ask a Question or Read the Answers:

https://www.coherent.com/measurement-control/measurement/laser-measurement-and-control-help-center

To download the **current software** for sensor products, go to this link and scroll down to the Software, Drivers & Manuals section:

https://www.coherent.com/measurement-control/measurement/laser-measurement-and-control-help-center