

## 1.0 Installation Plumbing

- 1.1 Install pressure regulators on supply line before flowmeters. Two pressure regulators may serve to reduce chatter. Recommended operating range for primary regulator is 25-75 psig (1750-5000 millibar). Second stage regulator should be ranged 0-20 or 0-25 psig (0-1375 or 0-1725 mbar).
- 1.2 Install flowmeters and filters on water supply line, upstream of cooling system inlet. Typical water flow range is 0-40 gph (0-150 L/min) per flowmeter, one for each section, 2 per module. Do not install filter and flowmeters on return line or drain side.
- 1.3 Installation of a water chiller is preferred to improve CAWC system life and cooling performance. In addition, a chiller can offer improved control of heat transfer.

## 2.0 Test Water Connections

- 2.1 Set water pressure to a maximum of 30 psig (2000 millibar) for leak test.
- 2.2 Open water inlet and outlet valves and fill cooling modules. Always open the outlet valve first and then open the inlet valve.
- 2.3 Once cooling section is full of water, close outlet valve and visually check for leaks. If no leaks are apparent, close inlet valve and observe water pressure.
- 2.4 If pressure stays constant at 30 psig for 20 minutes with both inlet and outlet valves closed, the system has been sufficiently leak tested.
- 2.5 If not, fix all leaks and retest until pressure holds for 5 minutes with inlet and outlet valves closed.
- 2.6 Reset inlet water pressure to recommended level below, typically 3-8 psig (200 – 550 millibar) for higher temperature production applications.

## 3.0 Water Setup for Operation

- 3.1 Open outlet water valve.
- 3.2 Open inlet water valve and set water pressure control to preferred level.

3.2 CAWC System Preferred and Maximum Operating Pressure Settings		
Temp Inside Furnace at Cooling Section Entrance*	Preferred	Maximum
50 – 100°C	24 psig (1650 mbar)	28 psig (1900 mbar)
100 - 149°C	20 psig (1380 mbar)	25 psig (1700 mbar)
150 - 204°C	14.5 psig (1000 mbar)	19.5 psig (1340 mbar)
205 – 259°C	8.5 psig (590 mbar)	12 psig (825 mbar)
260 – 314°C	4.5 psig (310 mbar)	5.5 psig (380 mbar)
315 – 360°C	3.0 psig (210 mbar)	3.5 psig (240 mbar)

\*Note: These guidelines are related to the ultimate tensile strength of 5052-H32 Aluminum.

- 3.3 Key elements in effective cooling and prolonging the life of the water cooling section include making sure there is an adequate unimpeded flow of water through the system. Process gas flow is used to drop the temperature of the furnace atmosphere by increasing the transfer of heat via the cooling water. CAWC water systems typically flow approximately 6.7 – 10 gph (25-38 Lph) per section; total of 13-20 gph (50-75 Lph) per CAWC module (consisting of an upper and lower section). Higher flows are

possible with fewer line restrictions at lower temperatures. See tables 3.2 and 3.3 for guidelines and expected values.

3.3 CAWC Typical Cooling System Water Flow at Preferred Pressures					
Temp Inside Furnace at Cooling Section Entrance*	Pressure	Section	Module	1-Chamber	3-Chamber
100 - 149°C	20 psig (1380 mbar)	39 gph (150 Lph)	78 gph (300 Lph)	78 gph (300 Lph)	234 gph (885 Lph)
150 - 204°C	14.5 psig (1000 mbar)	34.5 gph (130 Lph)	69 gph (260 Lph)	69 gph (260 Lph)	207 gph (210 Lph)
205 – 259°C	8.5 psig (590 mbar)	22.5 gph (85 Lph)	45 gph (170 Lph)	45 gph (170 Lph)	135 gph (510 Lph)
260 – 314°C	4.5 psig (310 mbar)	13.9 gph (55 Lph)	27.8 gph (110 Lph)	27.8 gph (110 Lph)	84 gph (315 Lph)
315 – 360°C	3.0 psig (210 mbar)	8.9 gph (34 Lph)	17.8 gph (68 Lph)	17.8 gph (68 Lph)	54 gph (200 Lph)

- 3.4 Set water pressure to less than or equal to the maximum values in the table above for the expected operating temperature of the furnace at the entrance of the cooling section.
- 3.5 Open outlet water valve.
- 3.6 Adjust flowmeters to recommended water flow for expected temperature operation.

**WARNING: DO NOT OPERATE THE FURNACE WITH THE COOLING WATER SYSTEM DISABLED. THE INLET & OUTLET VALVES MUST BE OPEN AT ALL TIMES WHILE THE FURNACE LAMPS ARE ON TO AVOID OVERPRESSURIZING THE CAWC MODULES.**

## 4.0 Air Setup for Operation

- 4.1 Set cooling gas flowmeter to 200 – 400 scfh.
- 4.2 Increase air flow instead of water flow to improve cooling.

Note: Air rakes are factory set to be aimed up toward the cooling chamber walls at 45 degrees and away from product on the belt.

**COOLING SYSTEM TIPS:**

CAWC high efficiency cooling chambers are designed for high water flow at low pressure. Increasing gas flow to CAWC air rakes will increase boundary layer thermal exchange to further improve CAWC cooling efficiency.

At higher temperatures, generally more heat is transferred with less water flow provided inlet cooling temperature of the water stays below 25-30°C. Increase chiller performance to lower water inlet temperature and improve CAWC cooling performance.