

SW 4181



WATKINS - JOHNSON COMPANY

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Microwave Device Products • Easylink 62802190

Production Equipment Products • Easylink 62887411

PROCUREMENT SPECIFICATION
W-J Quick Response Model 9QR-97
Quick Response Conveyor Furnace

- 1.0 Scope This specification shall cover the manufacture of a controlled atmosphere conveyor furnace capable of operating to 1000 Degrees C in an air atmosphere. This specification shall include all items necessary to deliver a complete furnace ready for installation and connection to utilities.
- 2.0 Specifications
- 2.1 Temperature The furnace shall be capable of continuous operation to 1000 Degrees C in the firing section, with the exception that Zone 1 shall be rated to 600 Degrees C maximum.
- 2.2 Furnace Chamber
- 2.2.1 Vertical Clearance A minimum vertical clearance of 1 inch above the conveyor belt shall be provided.
- 2.2.2 Entry Section A nominal 9-3/4 inch wide by 1 inch high (inside dimensions) 304 Stainless Steel alloy entry section shall be provided.
- 2.2.3 Heated Section A nominal 10 inch wide by 2 inch high (inside dimensions) insulated chamber shall be provided. The belt shall ride on a quartz hearth that extends throughout the heated section.
- 2.2.4 Cooling Section A nominal 9-3/4 inch wide by 2 inch high by 60 inch long water cooling section shall be provided. The cooling section shall be made of 304 Stainless Steel alloy. A water flow switch shall be provided to shut off conveyor and element power in the event of a water flow failure. An indicator light and an alarm bell are provided to signal water flow failure.

2.3 Atmosphere

- 2.3.1 Adjustable Height Door An adjustable height door shall be provided at the entry to the furnace.
- 2.3.2 Burnout Section An atmosphere system located in the burnout section shall be provided with a flowmeter calibrated for air. The atmosphere flows in a direction counter to belt travel.
- 2.3.3 Firing Section An atmosphere system shall be provided in the cooling section. The atmosphere line shall be provided with a flowmeter calibrated for air. The atmosphere flows in a direction counter to belt travel.
- 2.3.4 Exhaust System The furnace shall be equipped with a powered exhaust system providing variable exhaust capability from the exhaust outlet located at the entry end of the furnace. The exhaust system shall be provided with a binder trap and cleanout. A 4 inch diameter exhaust duct extends through the top cover near the entry end of the furnace.
- 2.3.5 Exit Curtain Assembly The furnace shall be provided with a flapper door assembly at the exit end of the furnace. The exit flapper door assembly shall be provided with a flowmeter calibrated for air.

2.4 Conveyor System

- 2.4.1 Conveyor Belt The furnace shall be provided with a 9 inch wide conveyor belt of Nichrome V (mesh BS-60-35-16).
- 2.4.2 Conveyor Speed The furnace shall be provided with a variable speed conveyor drive system capable of control between 1 to 10 inches per minute. Tachometer feedback closed loop control shall be provided. Speed control accuracy shall be $\pm 1/2\%$ over the full range.

2.4.3 Drive System The conveyor drive system shall provide positive traction and belt alignment throughout the furnace and shall be controlled through a dc motor.

2.4.4 Conveyor Belt Return The conveyor belt return shall be lined with Arguto Hi-D, or an equivalent, low friction material.

2.5 Temperature/Power Controls

2.5.1 Thermocouples A duplex type Chromel/Alumel (Type K) thermocouple shall be provided in each heated zone. One thermocouple shall be used for primary temperature control and the other shall be used for overtemperature control. Thermocouples shall be removable from the top of the furnace chamber.

2.5.2 Process Controller The furnace shall be provided with a multi-channel microprocessor based temperature controller. The controller shall provide three-mode temperature control with keyboard entry of setpoint, power level, proportional band, reset, rate and high-low process alarm settings for each individual zone. Belt speed control shall be accomplished through the Model WJ-988 Process Controller. Up to eight different profiles (recipes) can be stored and recalled through the keyboard. An alphanumeric one line readout is provided for belt speed, temperature, setpoint, power level, proportional band, reset, rate and high-low process alarm settings for each zone.

2.5.3 Safety Features

2.5.3.1 Water Flow Failure A water flow switch shall be provided to shut off conveyor and element power in event of a water flow failure. An indicator light and alarm will signal this condition.

2.5.3.2 Overtemperature Protection An eight channel WJ-991 Thermoguard Overtemperature Controller shall be provided. An overtemperature condition in any zone shall shut off all element power and power a visual and audible alarm.

2.5.4 Power Controls Power to the heating elements shall be controlled through zero-firing optically isolated SCR power controllers.

2.5.5 Function Controls The furnace shall be provided with switches and indicator lights for the following functions:

Control Power	Conveyor Power
Exhaust Power	Element Power
Alarm Silence	Water Fail

2.5.6 Heating Elements The furnace shall be provided with heating elements of Kanthal A-1 alloy. The element wire is vacuum molded to a layer of low mass ceramic fiber insulation. These highly responsive elements are arranged in sections above and below the belt.

2.6 Furnace Chamber The furnace shall be divided into the following sections:

Entry Section 19 inches

Heated Section

Zone 1 Preheat	12-1/8 inches
Zone 2 Preheat	12-1/8 inches
Zone 3 Firing	12-1/8 inches
Zone 4 Firing	12-1/8 inches
Zone 5 Firing	12-1/8 inches
Zone 6 Firing	12-1/8 inches
Zone 7 Firing	12-1/8 inches
Zone 8 Firing	12-1/8 inches

Total Heated Length 96-3/4 inches

Cooling Section

Insulated Pre-Cooling	5-3/4 inches
Water Cooling	60 inches

3.0 Construction

3.1 Frame The furnace shall be constructed on a welded steel frame. A leveling capability of $\pm 1\frac{1}{2}$ inches shall be provided.

PROCUREMENT SPECIFICATION
W-J Quick Response Model 9QR-97
Quick Response Conveyor Furnace

Page Five

3.2 Panels The furnace shall be enclosed with removable metal panels.

3.3 Insulation The heated section of the furnace is composed of a tiered combination of low mass insulation which minimizes heat loss and storage characteristics.

3.4 Load/Unload Tables A 26 inch long load table and a 26 inch long unload table shall be provided. The table tops shall be of Type 304 Stainless Steel.

NOTE: Useable exposed belt is 2 inches less than the table lengths.

3.5 Weight and Dimensions The furnace shall have the following approximate overall dimensions.

Length:	18.5 feet
Width:	38 inches
Height:	50 inches

Conveyor Belt Height:	33 inches
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Shipping Weight:	1700 pounds.
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4.0 Utilities

4.1 Electrical Power Supply 20.8 KVA maximum connected load (10 KVA typical operational), 208/230 volts, three-phase, 50/60 Hz.

NOTE: Optional 440/480 volt system is available.

NOTE: Main fused disconnect shall be provided by the customer.

4.2 Atmosphere Flowmeter Ratings Filtered air at 20 psig plumbed to 3/8 inch pipe couplings to supply the following:

Atmosphere Distribution System	.5-6 scfm
Firing	.5-6 scfm
Exit Curtain	.5-6 scfm

4.3 Water Supply 50 gph (minimum) at 60 psig.

4.4 Utility Connections Atmosphere inlet and water connections shall be located at the top back side of the control console. Electrical power connection shall be located at the top back side of the control console.

NOTE: Supply requirements in Paragraph 4.0 are recommended supplies and may exceed actual furnace requirements.

5.0 Documentation

5.1 Manuals Two sets of Installation, Operation and Maintenance manuals shall be provided.