**Price Power and Control Modules for Underfloor Systems**

**Section 23 06 30 – Product**

The following specification is for a defined application. Price would be pleased to assist in developing a specification for your specific need.

**PART 1 – GENERAL**

* 1. **Summary**
1. This section includes the following:
	* + 1. Power and Control Modules

**1.02 Related Documents**

1. Section 01 30 00 – Administrative Requirements
2. Section 01 40 00 – Quality Requirements
3. Section 01 60 00 – Product Requirements
4. Section 01 74 19 – Construction/Demolition Waste Management and Disposal
5. Section 01 78 00 – Closeout Submittals
6. Section 01 79 00 – Demonstration and Training
7. Section 23 30 00 – HVAC Air Distribution
8. Section 23 32 00 – Air Plenums and Chases
	1. **Reference Standards**
9. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
10. ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy
11. ASHRAE Standard 62.1 – Standards for Ventilation and Indoor Air Quality
12. ASHRAE Standard 70 – Method of Testing the Performance of Air Outlets and Air Inlets
13. ASTM Standard D610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
14. ASTM Standard D714 – Standard Test Method for Evaluating Degree of Blistering of Paints
15. ASTM Standard D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
16. ASTM Standard D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
17. ASTM Standard D4752 – Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
18. ASTM Standard E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
19. NFPA Standard 70A, Article 100 – National Electrical Code
20. NFPA Standard 90B – Standard for the Installation of Warm Air Heating and Air-Conditioning Systems

**1.04 Administrative Requirements**

A. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

**1.05 Submittals**

1. See Section 01 30 00 – Administrative Requirements for submittal procedures.
2. Product Data:
	1. Provide data indicating configuration, general assembly, materials used in fabrication, rated capacities, and furnished specialties and accessories.
	2. Include drawings indicating size, profiles and dimensional requirements of the linear floor grilles that are based on the specific system indicated.
	3. Include catalog performance ratings that indicate air volume flow, initial pressure drops, sound performance, and throw, as tested in accordance with ASHRAE 70.
3. Shop Drawings: For each type of product indicated, include the following:

1. Equipment assemblies and indicated dimensions

2. Required clearances

3. Method of field assembly

4. Revit models

1. Coordination Drawings:
	1. Include floor plans, and other details, drawn to scale, on which the following items are shown and coordinated based on input from installers:
	2. Floor or underfloor-mounted items including:
		* 1. Floor structure (floor tiles, concrete, etc.)
			2. Floor finishing (carpet, tile, etc.)
			3. Access panels
			4. Electrical components
			5. Plumbing
			6. Networking components
			7. Terminal Units and other HVAC components
2. Operation and Maintenance Data: Include manufacturer’s descriptive literature, operating instructions, maintenance schedules and repair data, and parts lists.

**1.06 Quality Assurance**

1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.
2. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
3. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

**1.07 Warranty**

1. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
2. Provide 18 month manufacturer warranty from date of shipment for grilles and registers.

**PART 2 – PRODUCTS**

**2.01 General**

1. Basis of Design: Price Industries, Inc.
2. Power and Control Module with UMC3 Zone Controller
3. Power and Control Module with PCU Pressure Controller
4. General Product Information:
5. Furnish and install Price modular floor diffusers of the sizes and capacities indicated on the drawings or outlet schedule.
6. Unit sizes shall be selected in accordance with ASHRAE guidelines and manufacturer’s literature.
7. Manufacturers shall demonstrate that they have successfully supplied and installed underfloor HVAC products, as well as the computer modeling thereof for a minimum of ten years.
8. Manufacturers must be pre-qualified to bid based on the completion of a minimum of [xx] jobs in similar climates.
9. Manufacturers shall provide a list of completed jobs and references.
10. Underfloor Air System Controls:
	1. Air Grilles and diffusers specified for underfloor service shall incorporate the following requirements:
	2. Damper construction shall include an integral flow-modulation damper and motor (air valve) that is specifically designed for low static pressure air distribution, and throw no higher than 4.5 feet under full load in the interior zone 1.5 feet from the wall surface to achieve a Ventilation Effectiveness of 1.2 or higher in accordance with ASHRAE 62.1.
	3. Air dampers shall not include fast acting actuators that require high life cycle ratings.
	4. Flow-modulation with constant plenum air temperature shall reduce air flow and throw heights in response to lower space demands. Flow-modulation technique shall be implemented to maximize stratification, leading to energy savings and increased thermal comfort.
	5. Modulation by timed duty cycle of fully open and closed periods shall not be acceptable. This type of modulation can greatly reduce stratification, removing potential energy savings. Timed duty cycle modulation also increases the possibility of creating stagnant zones and starving buoyancy driven flow. Any use of this type of modulation shall be modified in order to demonstrate stratification to the project team prior to being considered acceptable.
	6. Plenum Rated Cables: Color-coded plug-and-play plenum rated cables with [RJ12] or [RJ45] connectors shall be used between devices.
	7. Terminal block type plugs shall not be acceptable.
	8. Plug-and-Play cables shall carry both the power and control signal to each device and connect to a single port on the device control board.
	9. Cable types shall be limited to no more than one type and connector per device to reduce complexity in wiring and future modifications.
	10. Cables shall be stranded wire to increase flexibility in the wires, to improve ease of installation, and reduce damage during installation.
	11. Cables shall have six wires with redundant wires to provide a more robust system and protection against damage, and to allow the current for multiple devices to be controlled through a single cable. Solid wires shall not be acceptable.
	12. The Power and Control Module shall include a direct digital controller (DDC) and transformer to supply both power and control signals to air devices.

**2.02 Power and Control Module with UMC3 Zone Controller**

1. Description:
2. Furnish and install Price model UMC3 with Price thermostat, with the voltage, wiring, and configurations indicated on the plans and controllers schedule. All components shall be factory wired, calibrated and pre-tested to ensure a fully functional unit.
3. The digital control package shall include a Price thermostat mounted in the occupied zone and a dedicated, microprocessor-based UMC3 controller that shall modulate up to a max thirty ModuFlex devices based on the room temperature through a series of plug-and-play connectors. The thermostat shall be (**select one**):
	1. Remote type
	2. Room Sensor type
	3. Dial type
	4. LCD type
	5. Motion Sensor with LCD type
4. The digital controller shall have two dedicated RJ45 ports to control up to twelve ModuFlex linear floor heaters with a maximum of six units per chain.
5. The digital controller shall have five RJ12 ports to control up to thirty ModuFlex cooling only devices with a maximum of six units per chain.
6. The UMC3 shall be provided with an integral 96VA transformer, and the controller shall have LED display lights to indicate availability of control power, overload of each output, and the direction of damper movement.
7. The UMC3 controller shall be configurable in the field with either the LCD thermostat, service port or the BACnet BAS network. The LCD thermostat will allow setup and balancing of the UMC3 controller without need to access the plenum space. It will include a zone temperature sensor, set point adjust, and character LCD display, and a service port for computer access to the UMC3 controller. The LCD and key pad functions shall include the following:
	* + - 1. Customer Mode:

Space Temperature/Set-point display

Set-point adjustment

* + - * 1. Service and Commissioning Mode (password protected):

Control sequence diagnostics

Control of VAV damper position over entire stroke (Manual Force to min/max flow, or min/max position/ Automatic Mode)

VAV Sensor calibration

* + - * 1. Configuration Mode (password protected):

Network configuration

Display option configuration

1. The programmable native BACnet controller shall be used in either a stand-alone operation or a peer-to-peer Building Automation networked architecture.
2. The controller shall have an RS-485 network port to allow for plug in connection onto a BACnet MS/TP LAN. The RJ12 Service Port shall allow for the connection of a personal computer, which shall allow for the full display of all VAV control parameters and Inputs/Outputs.
3. All components shall be factory wired, calibrated and pretested to ensure a fully functional unit.
4. The UMC3 with DDC Interface control package shall include a modulation controller capable of accepting an input signal from BAS network, integration by Controls Contractor. The UMC3 shall be a dedicated, microprocessor based controller mounted in the underfloor plenum, and shall have the following technical specifications:
	* + - 1. Inputs: one analog input – 8-bit
				2. Outputs: two binary triac outputs (24 VAC)
				3. Transformer: 96 VA
				4. Ambient Ratings: 32 degrees Fahrenheit to 131 degrees Fahrenheit (0 to 55 degrees Celsius), 10 to 90 percent relative humidity (non-condensing)
				5. Technology: 8-bit microprocessor
				6. Connections: 5 RJ12 connectors plus 5 RJ45 connectors
				7. Wiring: Class II
				8. Size (including housing): 3.8 x 15.5 x 8.5 inches (97 x 394 x 216 millimeters)
				9. Weight: 10.18 pounds (4618 grams)
				10. Enclosure: All control components shall be mounted inside a protective metal enclosure.
				11. Certifications: The PCU shall be ETL listed to UL 873 and CSA C22.2. The UMC3 circuit board shall be RoHS compliant.

**2.03 Power and Control Module with PCU Pressure Controller**

1. Description:
2. Furnish and install Price model PCU with Price Relative Pressure Node (RPN), with the voltage, wiring, and configurations indicated on the plans and controllers schedule. All components shall be factory wired, calibrated and pre-tested to ensure a fully functional unit.
3. The digital control package shall include at least one Price Relative Pressure Node (RPN) mounted on a manufacturer supplied Blank off Plate, a Price thermostat (optional for variable pressure sequence) and a dedicated, microprocessor-based PCU controller that shall modulate up to a max twelve Deflection grilles with dampers (DGD) or Variable Frequency Drive (VFD) to maintain the plenum static pressure based on the pressure signal from the RPNs. The RPN shall have the following feature(s);
	1. It shall be mounted on a manufacturer supplied Blank off plate.
	2. When multiple RPNs are used with the PCU, the PCU shall be configured to control based on one of the following options Average, Maximum or Minimum pressure signal.
	3. A pitot tube for measuring the underfloor plenum pressure shall be supplied and connected to the RPN via clear tubing provided by the manufacturer.
	4. Static pressure measurement accuracy shall be to ±1% full scale in normal ambient temperature environments.
	5. The units shall be temperature compensated to less than ±0.033% FS/oF of thermal error over the temperature range of 0 degree Fahrenheit to +150 degrees Fahrenheit
4. The digital controller shall have two dedicated RJ12 ports to control up to twelve Deflection Grilles with a Damper (DGD) with a maximum of six units per chain.
5. The controller shall house input terminations for the input signals and up to three analog peripheral devices, such as temperature probes, differential pressure sensor or connection to contact closure night setback. The PCU controller shall have LED display lights to indicate availability of control power, overload of each output, and the direction of damper movement.
6. The PCU controller shall be configurable in the field with either the LCD thermostat, service port or the BACnet BAS network. The LCD thermostat will allow setup and balancing of the PCU controller without need to access the plenum space. It will include a zone temperature sensor, set point adjust, static pressure adjust and character LCD display, and a service port for computer access to the PCU controller. The LCD and key pad functions shall include the following:
	* + - 1. Customer Mode:

Space Temperature/Set-point display

Set-point adjustment

* + - * 1. Static Pressure :

Static Plenum Pressure/Set-point display

Set-point adjustment

* + - * 1. Service and Commissioning Mode (password protected):

Control sequence diagnostics

Control of VAV damper position over entire stroke (Manual Force to min/max flow, or min/max position/ Automatic Mode)

VAV Sensor calibration

* + - * 1. Configuration Mode (password protected):

Network configuration

Display option configuration

1. The programmable native BACnet controller shall be used in either a stand-alone operation or a peer-to-peer Building Automation networked architecture.
2. The controller shall have an RS-485 network port to allow for plug in connection onto a BACnet MS/TP LAN. The RJ12 Service Port shall allow for the connection of a personal computer, which shall allow for the full display of all VAV control parameters and Inputs/Outputs.
3. All components shall be factory wired, calibrated and pretested to ensure a fully functional unit.
4. The PCU with DDC Interface control package shall include a modulation controller capable of accepting an input signal from BAS network, integration by Controls Contractor. The PCU shall be a dedicated, microprocessor based controller mounted in the underfloor plenum, and shall have the following technical specifications:
	* + - 1. Inputs: one analog input – 8-bit
				2. Outputs: two binary triac outputs (24 VAC)
				3. Transformer: 96 VA
				4. Ambient Ratings: 32 degrees Fahrenheit to 131 degrees Fahrenheit (0 to 55 degrees Celsius), 10 to 90 percent relative humidity (non-condensing)
				5. Technology: 8-bit microprocessor
				6. Connections: 2 RJ12 connectors
				7. Wiring: Class II
				8. Size (including housing): 3.8 x 15.5 x 8.5 inches (97 x 394 x 216 millimeters)
				9. Weight: 10.18 pounds (4618 grams)
				10. Enclosure: All control components shall be mounted inside a protective metal enclosure.
				11. Certifications: The PCU shall be ETL listed to UL 873 and CSA C22.2. The PCU circuit board shall be RoHS compliant.