# Price Single Duct Exhaust Terminal Units

# Division 23 – Heating, Ventilating, and Air Conditioning

# Section 23 36 00 – Air Terminal Units

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

##  Section Includes

1. Single-duct terminal units.

##  Related Requirements

1. Section 01 40 00 - Quality Requirements
2. Section 01 74 19 - Construction Waste Management and Disposal
3. Section 01 78 00 - Closeout Submittals
4. Section 01 79 00 - Demonstration and Training
5. Section 23 09 93 - Sequence of Operations for HVAC Controls.
6. Section 23 31 00 - HVAC Ducts and Casings.
7. Section 23 33 00 - Air Duct Accessories.
8. Section 23 37 00 - Air Outlets and Inlets.
9. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

##  Reference Standards

1. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
2. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
3. AHRI 880 - Performance Rating of Air Terminals.
4. AHRI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
5. ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality.
6. ASHRAE 130 - Methods of Testing for Rating Ducted Air Terminal Units.
7. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
8. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
9. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.
11. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
12. NFPA 70 - National Electrical Code.
13. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
14. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
15. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.

##  Administrative Requirements

1. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section, and require attendance by all affected installers.
2. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

##  Submittals

1. See Section 01 30 00 - Administrative Requirements for submittal procedures.
2. Product Data shall be provided with data indicating configuration, general assembly, and materials used in fabrication, including catalog performance ratings that indicate air flow, static pressure, NC designation, electrical characteristics, and connection requirements.
3. Shop Drawings shall indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
	1. Manufacturer shall include schedules listing discharge and radiated sound power level for each of the second through seventh octave bands (125 – 4000 Hertz) at specified differential static pressures.
4. Certificates shall be issued to certify that the air coil capacities, pressure drops, and selection procedures meet or exceed specified requirements or coils are tested and rated in accordance with AHRI 410.
5. Manufacturer's Installation Instructions shall indicate support and hanging details, installation instructions, recommendations, and service clearances required.
6. Project Record Documents shall record actual locations of units and controls components and locations of access doors.
7. Operation and Maintenance Data shall include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
8. Manufacturer’s warranty shall be submitted and ensure forms have been completed in Owner's name and registered with manufacturer.
9. Maintenance Materials shall be furnished for the Owner's use in maintenance of the project.

##  Quality Assurance

1. Manufacturer Qualifications shall be specified in this section, with minimum ten years of documented experience.
2. Product Listing Organization Qualifications: The manufacturer shall be listed with an organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

##  Warranty

1. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
2. Provide 18 month manufacturer warranty from date of shipment for air terminal units, integral sound attenuators, integral heating coils, and integral controls.

# PART 2 – PRODUCTS

## 2.01 Exhaust Terminal Units

1. Basis of Design: Price Industries, Inc.
2. Exhaust, Single-Duct Terminal Unit: SDE (direct digital controls).
3. Exhaust, Quiet Single-Duct Terminal Unit: SDEQ (direct digital controls).
4. Performance Requirements:
5. The assemblies shall be pressure independent and shall reset to any air flow between zero and the maximum cataloged air volume. Sound ratings of air distribution assemblies: Not to exceed \_\_\_\_ NC at \_\_\_\_ inlet static pressure, with a downstream static pressure of \_\_\_\_\_.
6. Use attenuation values found in AHRI 885 Appendix E.
7. General:
8. The terminal units shall be factory-assembled, AHRI 880 rated and bearing the AHRI seal for an air volume control terminal with damper assembly and flow sensor.

## 2.02 Single-Duct Exhaust Terminal Unit

1. Description:
	1. Furnish and install Price model [SDE] single duct terminal units in the sizes and configurations as indicated on the plans.
2. Unit Casing:
3. The unit casing shall be constructed of a minimum 22-gauge, 0.032-inch galvanized steel.
4. The casing shall be assembled with longitudinal lock seam construction.
5. The terminal unit shall have a rectangular inlet with slip-and-drive connections.
6. The terminal unit shall have a rectangular discharge with slip-and-drive connections.
7. Liners:
8. Standard:
9. Fiberglass Liner - FG.
	* + 1. Insulation shall comply with the requirements of UL 181 (erosion), ASTM C1338 (fungi resistance), ASHRAE 62.1, and ASTM C1071, having a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
10. The insulation shall be secured with adhesive.
11. Insulation edges exposed to the airstream shall be coated with NFPA 90A approved sealant.
12. Insulation thickness shall be (**select one**):
13. 1/2 inch thick, R-value of 2.1.
14. 3/4 inch thick, R-value of 3.2.
15. 1 inch thick, R-value of 4.1.
16. Optional:
17. Fiber-Free Foam Insulation - FF.
18. Insulation shall comply with the requirements of UL 181 (erosion, mold growth and humidity) and ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
19. The insulation shall be secured with adhesive.
20. Insulation thickness shall be (**select one**):
21. 1/2 inch thick, R-value of 2.0.
22. 3/4 inch thick, R-value of 3.0.
23. 1 inch thick, R-value of 4.0.
24. Foil Board Liner - FB.
25. Insulation shall comply with the requirements of UL 181 (erosion, mold growth and humidity) and ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
26. The insulation shall be secured with adhesive.
27. Insulation edges exposed to airstream shall be coated with NFPA 90A approved sealant.
28. Insulation thickness shall be (**select one**):
29. 5/8 inch thick, R-value of 2.6.
30. 1 inch thick, R-value of 4.2.
31. Air Damper Assembly:
	* + 1. The damper assembly shall be heavy-gauge, galvanized steel with a solid shaft rotating in bearings.
			2. The damper shaft shall incorporate a visual position indicator etched into the end of the damper shaft to clearly indicate damper position over the full range of 90 degrees.
			3. The damper shaft shall be mounted on the [left], [right], [top], or [bottom] of the damper when looking in the direction of airflow.
			4. The 18 gauge damper assembly shall incorporate a peripheral gasket on the damper blades for tight airflow shutoff.
			5. Air leakage past the closed damper shall not exceed 2 percent of the unit maximum rated airflow at 3.0 inch water gauge inlet static pressure, tested in accordance with ASHRAE 130.
			6. The damper, seal, and bearing system shall be tested to 1.25 million cycles, or the equivalent of 100 full open/closures per day for 35 years, with no visible signs of wear, tear, or failure of the damper assembly after such testing.
32. Airflow Sensor:
33. The airflow sensor shall be a differential pressure airflow device measuring total and static pressures, and mounted to the inlet valve.
34. Plastic parts shall be fire-resistant, complying with UL 94.
35. The airflow sensor shall be RoHS (Restriction of Hazardous Substances) compliant. Material containing polybrominated compounds shall not be acceptable.
36. Control tubing shall be protected by grommets at the wall of the airflow sensor's housing.
37. The airflow sensor shall be furnished with twelve total pressure sensing ports and four static pressure sensing ports, and shall include a center averaging chamber that amplifies the sensed airflow signal.
38. After balancing, the airflow sensor signal accuracy shall be plus or minus five percent throughout terminal operating range.
39. Inlet Valve - Standard:
40. The inlet valve shall include a 1/8 inch raised single bead weld for added strength.
41. The gasket seal shall be a low leakage continuous piece with a peripheral gasket for tight airflow shutoff.
42. The inlet valve shall include two heavy duty stop pins to accurately position the damper in the closed and open positions.
43. Options:
44. Control Transformers:
	1. The terminal unit shall be supplied with a factory mounted 50 VA control transformer.
45. Electrical Requirements:
46. Single duct terminal units shall be provided with single-point power connection.
47. The terminal unit equipment wiring shall comply with the requirements of NFPA 70.
48. Controls:
49. See Section 23 09 13 - Instrumentation and Control Devices for HVAC: Thermostats and actuators for controls requirements.
50. Controls Sequence:
51. See Section 23 09 93 - Sequence of Operations for HVAC Controls for controls sequence requirements.

## 2.03 Quiet Single-Duct Exhaust Terminal Units

1. Description:
	1. Furnish and install Price model SDEQ quiet single duct terminal units in the sizes and configurations as indicated on the plans.
2. Unit Casing:
3. The unit casing shall be constructed of a minimum 22-gauge, 0.032-inch galvanized steel.
4. The casing shall be assembled with longitudinal lock seam construction.
5. The terminal unit shall have a rectangular inlet with slip-and-drive connections.
6. The terminal unit shall have a rectangular discharge with slip-and-drive connections.
7. Liners:
8. Standard:
9. Fiberglass Liner - FG.
10. Insulation shall comply with the requirements of UL 181 (erosion), ASTM C1338 (fungi resistance), ASHRAE 62.1, and ASTM C1071, having a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
11. The insulation shall be secured with adhesive.
12. Insulation edges exposed to the airstream shall be coated with NFPA 90A approved sealant.
13. Insulation thickness shall be (**select one**):
14. 1/2 inch thick, R-value of 2.1.
15. 3/4 inch thick, R-value of 3.2.
16. 1 inch thick, R-value of 4.1.
17. Optional:
18. Fiber-Free Foam Insulation - FF.
19. Insulation shall comply with UL 181 erosion, mold growth and humidity requirements in accordance with ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
20. The insulation shall be secured with adhesive.
21. Insulation thickness shall be (**select one**):
22. 1/2 inch thick, R-value of 2.0.
23. 3/4 inch thick, R-value of 3.0.
24. 1 inch thick, R-value of 4.0.
25. Foil Board Liner - FB.
26. Insulation shall comply with UL 181 erosion, mold growth and humidity requirements in accordance with ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
27. The insulation shall be secured with adhesive.
28. Insulation edges exposed to airstream shall be coated with NFPA 90A approved sealant.
29. Insulation thickness shall be (**select one**):
30. 5/8 inch thick, R-value of 2.6.
31. 1 inch thick, R-value of 4.2.
32. Primary Air Damper Assembly:
	* + 1. The damper assembly shall be heavy-gauge, galvanized steel with a solid shaft rotating in bearings.
			2. The damper shaft shall incorporate a visual position indicator etched into the end of the damper shaft to clearly indicate damper position over the full range of 90 degrees.
			3. The damper shaft shall be mounted on the [left], [right], [top], or [bottom] of the damper when looking in the direction of airflow.
			4. The 18 gauge damper assembly shall incorporate a peripheral gasket on the damper blades for tight airflow shutoff.
			5. Air leakage past the closed damper shall not exceed 2 percent of the unit maximum rated airflow at 3.0 inches water gauge inlet static pressure, tested in accordance with ASHRAE 130.
			6. The damper, seal, and bearing system shall be tested to 1.25 million cycles, or the equivalent of 100 full open/closures per day for 35 years, with no visible signs of wear, tear, or failure of the damper assembly after such testing.
33. Airflow Sensor:
34. The airflow sensor shall be a differential pressure airflow device measuring total and static pressures, and mounted to the inlet valve.
35. Plastic parts shall be fire-resistant, complying with UL 94.
36. The airflow sensor shall be RoHS (Restriction of Hazardous Substances) compliant. Material containing polybrominated compounds shall not be acceptable.
37. Control tubing shall be protected by grommets at the wall of the airflow sensor's housing.
38. The airflow sensor shall be furnished with twelve total pressure sensing ports and four static pressure sensing ports, and shall include a center averaging chamber that amplifies the sensed airflow signal.
39. The airflow sensor signal accuracy shall be plus or minus five percent throughout terminal operating range.
40. Inlet Valve - Standard:
41. The inlet valve shall include a 1/8 inch raised single bead weld for added strength.
42. The gasket seal shall be a low leakage continuous piece with a peripheral gasket for tight airflow shutoff.
43. The inlet valve shall include two heavy duty stop pins to accurately position the damper in the closed and open positions.
44. Options:
45. Silencer:
46. Construction:
	* 1. Casing shall be constructed of material that matches terminal unit casing and attach to terminal unit with slip and drive connection.
		2. Casing seams and joints shall be lock-formed and sealed, to provide leakage-resistant construction.
		3. Perforated steel shall be adequately stiffened to insure flatness and form.  Spot welds shall be painted as required.
		4. Internal baffles shall be provided with a radiused inlet and sloped tail.
47. Principal Sound-Absorbing Mechanism:
	1. Packless (No-Media) Silencers:
48. Models shall not contain absorptive media. Attenuation shall be achieved with controlled impedance membranes and broadly tuned resonators.
49. Absorptive (Dissipative) and Film Lined Silencers:
	* + 1. Standard Acoustic media:
				1. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin.  Glass fiber density and compression shall be as required to insure conformance with laboratory test data.
				2. Media shall be packed with a minimum of 15% compression during silencer assembly.
				3. Media shall be resilient such that it will not pull apart during normal applications, and shall resist settling, breakdown, and sagging from vibration.  Media shall not rot, mildew, or otherwise deteriorate, and shall have sufficient flexibility to readily form around corners and curved surfaces.
				4. Media shall not cause or accelerate corrosion of aluminum or steel.
				5. Mineral wool is not permitted as a substitute for glass fiber.
50. Media Protection:
	1. Dissipative silencers:
		1. Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber.
	2. Film Lined silencers:
		1. The acoustic media shall be completely wrapped with polymer film to help prevent shedding, erosion and impregnation.
		2. The wrapped acoustic media shall be separated from the perforated metal by a factory-installed acoustically transparent spacer.
		3. The spacer shall be flame retardant and erosion resistant.
		4. Mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.
		5. Silencer manufacturer shall provide a written test report showing silencer assemblies have Class 1 flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
		6. Control Transformers:
	3. The terminal unit shall be supplied with a factory mounted 50 VA control transformer.
51. Electrical Requirements:
52. Single duct terminal units shall be provided with single-point power connection.
53. The terminal unit equipment wiring shall comply with the requirements of NFPA 70.
54. Controls:
55. See Section 23 09 13 - Instrumentation and Control Devices for HVAC: Thermostats and actuators for controls requirements.
56. Controls Sequence:
57. See Section 23 09 93 - Sequence of Operations for HVAC Controls for controls sequence requirements.

# PART 3 – EXECUTION

## 3.01 Examination

1. Verify that conditions are suitable for installation.
2. Verify that field measurements are as shown on the drawings.

## 3.02 Installation

1. Install the terminal units in accordance with the manufacturer's instructions.
2. Install the inlets of the air terminal units with the air flow sensors a minimum of three duct diameters from elbows, transitions, and duct takeoffs.
3. See drawings for the size(s) and duct location(s) of the air terminal units.
4. Provide ceiling access doors or locate units above easily removable ceiling components.
5. Support the terminal units individually from the structure.
6. Embed anchors in concrete in accordance with ASTM E488/E488M.
7. Do not support the terminal units from the ductwork.
8. Connect the terminals to the ductwork in accordance with Section 23 31 00.

Verify that electric power is available and of the correct characteristics.

## 3.03 Adjusting

1. Ensure the damper operator attached to the assembly allows full modulation of flow range from 100 percent of design flow to zero.

## 3.04 Field Quality Control

1. See Section 01 40 00 - Quality Requirements, for additional quality requirements.

## 3.05 Cleaning

1. See Section 01 74 19 - Construction Waste Management and Disposal for additional cleaning requirements.

## 3.06 Closeout Activities

1. See Section 01 78 00 - Closeout Submittals for closeout submittals.
2. See Section 01 79 00 - Demonstration and Training for additional closeout requirements.