

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

A. Product Data

1. For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, filter dryers and strainers.

B. Shop Drawings

1. Show 1/4 inch equals 1 foot layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type K or L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8.

E. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Check Valves:

1. Body: Ductile iron or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron or cast bronze.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

B. Service Valves:

1. Body: Bronze with bronze cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

C. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

E. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Bronze or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.

3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Superheat: Adjustable.
6. Reverse-flow option (for heat-pump applications).
7. End Connections: Socket, flare, or threaded union.
8. Working Pressure Rating: 450 psig.

F. Moisture/Liquid Indicators:

1. Body: Bronze.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

G. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: Sized to meet tonnage of system
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

H. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: Sized to meet tonnage of system
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

2.3 REFRIGERANTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Atofina Chemicals, Inc.
 - 2. DuPont Company; Fluorochemicals Div.
 - 3. Honeywell, Inc.; Genetron Refrigerants.
 - 4. INEOS Fluor Americas LLC.
- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Suction Lines NPS 2 to NPS 3-1/2 for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.
- C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump applications:
 - 1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 3. NPS 1-1/4 to NPS 2: Copper, Type K, drawn-temper tubing and wrought-copper fittings with brazed joints.
- D. Safety-Relief-Valve Discharge Piping:
 - 1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 3. NPS 1-1/ to NPS 2: Copper, Type K, drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

- C. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- D. Install a full-sized, three-valve bypass around filter dryers.
- E. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- F. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- G. Install filter dryers in liquid line between compressor and thermostatic expansion valve.
- H. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Select system components with pressure rating equal to or greater than system operating pressure.
- B. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- C. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Liquid lines may be installed level.
- D. Install sleeve seals for piping penetrations of concrete walls and slabs.
- E. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- F. Refrigerant piping shall be sized per equipment manufacturer's recommendations including all necessary traps, double suction risers, etc, and pipe size increases based on actual layout, distance and unit sizing.
- G. Provide bushings between copper piping and pipe supports to eliminate dissimilar metal condition.
- H. Where outdoor units are mounted on grade, route refrigerant piping above grade and through outside wall and up within wall for extension to indoor unit.

- I. Bleed dry nitrogen through refrigerant piping during brazing operations.
- J. Provide locking-type tamper resistant caps on all refrigerant circuit access ports.

3.4 PIPE JOINT CONSTRUCTION

- A. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- B. Steel pipe can be threaded, but threaded joints must be seal brazed.
- C. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

END OF SECTION 232300