
SECTION 22 05 19
PLUMBING METERS AND GAUGES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid meters.
- B. Thermometers and thermometer wells.

1.2 RELATED REQUIREMENTS

- A. Section 22 00 00 - Plumbing Common Work Results; for additional administrative requirements.
- B. Section 22 00 00 - Plumbing Common Work Results; for additional product requirements.
- C. Section 22 00 00 - Plumbing Common Work Results; for closeout submittal requirements.
- D. Section 22 00 00 - Plumbing Common Work Results
- E. Section 22 10 05 - Plumbing Piping
- F. Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2013.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2013.
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.
- D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 22 00 00 - Plumbing Common Work Results; for submittal procedures.
- B. Listed manufacturers and series are for reference only and do not promote any single product. Series are provided for reference, and should not be used as an ordering model number. Accessories and options may be custom components purchased separately.
- C. Product Data: Provide manufacturer's most current catalog data sheet for equipment indicating rough-in size, finish, and accessories. Manufacturer's data sheets on each item of equipment and device, shall be clearly marked up to identify the items, accessories and options to be used on the project.
 - 1. Fluid Meters (22 05 19 - 001 - A)
 - 2. Pressure Gauges (22 05 19 - 002 - A)
 - 3. Thermometers (22 05 19 - 003 - A)
- D. Chart: Provide chart indicating system name, system pressure / temperature operating range, fluid type and instruments scale range.
 - 1. Fluid Meters (22 05 19 - 001 - A)
 - 2. Pressure Gauges (22 05 19 - 002 - A)
 - 3. Thermometers (22 05 19 - 003 - A)
- E. Start-up Report: Indicate start-up results verifying nominal efficiency, voltages and current.
 - 1. Refer to section 22 00 00 - Plumbing Common Work Results
 - 2. Fluid Meters (22 05 19 - 004 - A)
- F. Project Record Documents: Record actual installed locations of components and tag numbering.
 - 1. Refer to Section 22 00 00 - Plumbing Common Work Results; for closeout requirements

2. Record Documents (22 00 00 - 005 - A)
- G. Operation and Maintenance Data: Include installation instructions and spare parts lists.
 1. Refer to Section 22 00 00 - Plumbing Common Work Results; for closeout requirements.
 2. Operation and Maintenance Data Books (22 00 00 - 006 - A)
 3. Operation and Maintenance DVD (22 00 00 - 007 - A)

PART 2 PRODUCTS**2.1 FLUID METERS - LIQUID**

- A. Manufacturers:
 1. Sensus Meter Omni Turbo (T2).
- B. Meter: Epoxy coated ductile iron turbine meter with floating ball technology.
 1. Service: rated for the fluid type, temperature and pressure of the system the meter is measuring.
 2. Maximum operating pressure is 5 PSI at full flow of total connected flow.
 3. Accuracy: 1-1/2 percent.
 4. Flow shall be read in Gallons.

2.2 STEM TYPE THERMOMETERS

- A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
 1. Size: 9 inch scale.
 2. Window: Clear Lexan.
 3. Accuracy: 1 percent, per ASTM E77.
 4. Calibration: Degrees F. Thermometers shall be able to read, twice the operating temperature.

2.3 STEM TYPE THERMOMETERS**2.4 DIAL THERMOMETERS**

- A. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
 1. Size: 5 inch diameter dial.
 2. Accuracy: 1 percent.
 3. Calibration: Degrees F.

2.5 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Thermowells:
 1. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 2. Material for Use with Copper Tubing: CNR or CUNI.
 3. Material for Use with Steel Piping: CRES.
 4. Type: Stepped shank unless straight or tapered shank is indicated.
 5. Bore: Diameter required to match thermometer bulb or stem.
 6. Insertion Length: Length required to match thermometer bulb or stem.
 7. Lagging Extension: Include on thermowells for insulated piping and tubing.

8. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- C. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.6 TEST PLUGS

- A. Other acceptable manufacturers offering equivalent products.
- B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.
- C. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.
 1. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.
 2. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.
 3. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.
 4. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 EXECUTION

3.1 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Confirm framing and support members.
- B. Confirm rough-in and framing of walls and partitions with supports for equipment and accessories.
- C. Confirm rough-in locations and power requirements before rough-in installation. Refer to Section 26 05 83 - Wiring Connections.

3.2 EXAMINATION

- A. Verify that surfaces are suitable for installation.
- B. Verify that field measurements are as shown on the drawings.
- C. Examine areas to receive equipment for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- D. Electrical:
 1. Verify electrical power, voltage, phase and current is available and of the correct characteristics.
 2. Verify rough-in for electrical connections to verify actual locations before installing.
- E. Controls:
 1. Verify signal power, voltage, phase and current is available and of the correct characteristics.
 2. Verify rough-in for control connections to verify actual locations before installing.
- F. Maintain clearances to combustibles and service clearances.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Install in accordance with the following:
 1. Federal, State and Local Codes.
 2. Manufacturer's recommendations.
- B. Thermometers:

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1. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
 2. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.
 3. Provide Thermometers at the following locations:
 - a. Within the piping connections for the inlet and outlet of thermostatic mixing valves, domestic water recirculation pump, domestic water heaters.
 - b. Within the duct for outside air, return air and supply air of an air handling equipment.
 4. Coil and conceal excess capillary on remote element instruments.
- C. Fluid Meters:
1. Install with strainer and pressure gage upstream of meter.
 2. Install isolation valves upstream and downstream of meter.
 3. Install meter with Manufacturer's recommendations of straight inlet and outlet piping.
 4. Field coordinate remote reader location with owner.
- D. Test Plugs:
1. Install at each pressure gauge.
 2. Install at each thermometer.
 3. Install at each pressure sensor and temperature sensor within a hydronic system.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install instruments in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.4 START-UP

- A. Perform start-up in accordance with 22 00 00 - Plumbing Common Work Results
1. Fluid Meters.
 2. Verify system is ready for start-up with visual inspection and sign off from installing personnel.
 3. Start-up meter per equipment manufacturer's recommendations.
 4. Minimum Data to be recorded.
 - a. Meters location / associated system.
 - b. Manufacturer.
 - c. Model / Size.
 - d. Start Reading / Units.
 - e. Confirm same reading within Control System.

END OF SECTION 22 05 19