

SECTION 13431

MEASUREMENT & CONTROL SYSTEMS CONTROL & INSTRUMENT PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and place into satisfactory operation control panels and/or enclosures.

B. Related Sections:

1. Section 13400, Measurement & Control General Requirements.
2. Section 13413, Optical Fiber Cable,
3. Section 13421, Valve & Gate Controllers,
4. Section 13422, Primary Sensors & Field Instrumentation,
5. Section 13431, Control & Instrument Panels,
6. Section 13441, Programmable Logic Controllers,
7. Section 13451, Computer Control System,
8. Section 13422, Operator Interface,
9. Section 13481, Instrument List,
10. Section 13482, Input/Output List,
11. Section 13485, Software Logic & Display Descriptions,
12. Section 13491, Factory Testing.
13. Section 13492, Field Testing, Check-out, & Start-up.
14. Section 13493, Training.
15. Division 16, Electrical.

1.2 QUALITY ASSURANCE

A. Standards, Codes and Regulations:

1. Construction of panels and the installation and interconnection of all equipment and devices mounted within shall comply with applicable provisions of the following standards, codes and regulations:
 - a. National Fire Protection 79, Electrical Standard for Industrial Machinery (NFPA 79).
 - b. National Electrical Code (NEC).
 - c. National Electrical Manufacturer's Association Standards (NEMA).
 - d. American Society for Testing and Materials (ASTM).
 - e. Operational Safety and Health Administration (OSHA) Regulations.
 - f. State and Local code requirements.
 - g. Where any conflict arises between codes or standards, the more stringent requirement shall apply.
2. All electrical materials and equipment shall be new and shall bear the label of the Underwriters' Laboratory (UL), Inc., Factory Mutual (FM) or equivalent where standards have been established and label service regularly applies.

B. General Design Requirements:

1. Comply with the requirements of Section 13400, Measurement & Control General Requirements.

- C. Factory Assembly and Testing:
 - 1. Comply with the requirements of Section 13493, Training.

1.3 SUBMITTAL

- A. Comply with the requirements of Section 13400, Measurement & Control General Requirements.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with the requirements of Section 13400, Measurement & Control General Requirements.

PART 2 - PRODUCTS

2.1 GENERAL CONSTRUCTION REQUIREMENTS

- A. Components
 - 1. Provided designs require that manufacturers of components specified in the Bill of Materials shall be as indicated in the drawings. All substitutions require pre-approval.
 - 2. Components not indicated specifically shall be industrial grade, from the following major industrial manufacturers:
 - a. Hoffman
 - b. Schroff
 - c. Bradey
 - d. 3M
 - e. Thomas & Betts
 - f. Phoenix Contact
 - g. Panduit
 - h. Hubbell
 - i. Square D
 - j. Allen Bradley
 - k. Cutler Hammer
 - l. Others pre-approved by the ENGINEER

2.2 EQUIPMENT

- A. Some components within the control panel (such as instrument transmitters) may be specified in other sections.
- B. Provide additional hardware that may not be specifically indicated in the Bill of Materials, but is normally required for a complete assembly such as:
 - 1. Wire
 - 2. Wireway
 - 3. Wire Ties
 - 4. Wire Labels
 - 5. Screws, bolts, & washers
 - 6. Brackets
 - 7. Spiral Wrap
 - 8. Spacers
 - 9. Paint
 - 10. Corrosion Inhibitor

11. Equipment Labels & Nameplates
12. Mounting Track
13. Terminal Accessories including End Caps, Shorting Bridges, & Numbers
14. Connectors

C. Provide a minimum of 120% of the quantity of each type of terminal block indicated.

PART 3 - EXECUTION

3.1 SUBMITTALS

- A. Copy of UL-508 certification.
- B. Supplementary Bill of Materials and Cutsheets of items required by specification 2.02B above.
- C. Optional substitution requests. All wiring schematic changes and Bill of Materials substitutions require approved submittals prior to fabrication. Substitution requests must include:
 1. Cutsheets,
 2. detailed schematics of all wiring changes,
 3. power requirements and/or any other relevant calculations,
 4. reason for the substitution.
- D. Certification of Completion of shop test, indicating tests performed.

3.2 ASSEMBLY

- A. All knockouts and cutouts through the exterior of painted, steel control panels shall be deburred, primed and painted to maintain the level of corrosion protection provided by the original finish.
- B. All components mounted to the back or side panels shall be securely fastened with machine screws and lock washers. Holes for mounting screws shall be directly drilled and tapped into the back panel, or threaded rivets may also be used.
- C. Grounding terminals shall be electrically connected to the back panel. The grounding connection shall have all of the paint removed from the contact area. The connection shall be coated with a corrosion inhibitor.
- D. Ground the control panel end of all 4-20mA shielded cables to the control panel.
- E. DC and Analog wiring shall be segregated as much as possible from AC wiring. 120 VAC wiring shall not be bundled with other wiring types.
- F. Wiring bundles to the I/O modules and/or other components shall be neat and securely fastened with wire ties and screwed nylon fasteners. Self adhesive pads shall not be used.
- G. Door harnesses shall be protected from chaffing with an automotive type plastic sheath, or spiral wrap manufactured specifically for this purpose.
- H. Every wire shall be permanently and professionally labeled with numbers indicated on the schematics.

- I. Devices on the exterior of the enclosure shall be labeled with industrial quality laminated engraved nameplates attached with double-backed 3M permanent adhesive tape.
- J. All devices on the interior of the panel shall be labeled with the device tag number to match the schematics. Push buttons, pilots and other devices protruding into the panel through the front panel or body of the enclosure shall be labeled with the device tag number inside the panel. All of these labels shall be industrial quality laminated engraved nameplates attached with double-backed 3M permanent adhesive tape.
- K. All wiring within the control panel shall be as follows, unless otherwise indicated.
 - 1. 120VAC Line - #12 AWG THHN/TWN, Black
 - 2. 120 VAC Neutral - #12 AWG THHN/TWN, White
 - 3. Ground - #12 AWG Green
 - 4. 120 VAC Control - #16 AWG THHN/TWN, Red
 - 5. 24VDC Control - #16 AWG THHN/TWN Blue
 - 6. Analog Signals - #18 AWG Shielded Twisted Pair, Belden 8760 or equivalent. The black wire is generally positive, and the white or clear wire is negative.

3.3 SHOP TEST

- A. Each termination shall be double checked for accuracy.
- B. The panel shall have 120VAC and/or other external power applied.
- C. All switches and push-buttons on the panel shall be operated and have signals verified at the proper PLC input point or other logical destination within the panel. Other digital inputs shall have power applied via jumper to the field terminals and similarly verified.
- D. Document the testing as it is completed with the signature of the responsible technician.
- E. Install UL-508 listing sticker.

3.4 INSTALLATION

- A. The Control Panel shall be securely and professionally mounted as indicated.
- B. Ground the control panel to system ground or local ground rod.
- C. Electrically connect cable segments of 4-20mA loops so that all shields drain to the control panel. Avoid instrument ground loops. Do not ground the PLC or field end of the shield conductor or sheath. Neatly trim the PLC or field end so that the shield will remain electrically isolated.
- D. Protect components within the control panel from metal chips and shards during all cutting and drilling operations with a plastic sheeting taped into place. Components contaminated with metal chips shall be replaced.
- E. All knockouts and cutouts through the exterior of painted, steel control panels shall be deburred, primed and painted to maintain the level of corrosion protection provided by the original finish. Alternate methods of corrosion prevention must be submitted to the ENGINEER and approved prior to installation.

- F. All field terminations shall be labeled per Section 16030 and colored and sized as indicated on the prints, or otherwise, in this section.

3.5 FIELD TEST

- A. Provide a capable technician who is familiar with the control panel to assist with verification of proper operation of every device and control point by the ENGINEER.

++ END OF SECTION ++