

**PART 1      General**

**1.1          REFERENCES**

- .1      National Electrical Manufacturer's Association (NEMA)
  - .1          NEMA 1

**1.2          SUBMITTALS**

- .1      Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittal & Review Process.
- .2      Include:
  - .1          Information as specified for each device.
  - .2          Manufacturer's detailed installation instructions.
- .3      Manufacturer's Instructions
  - .1          Submit manufacturer's installation instructions for specified equipment and devices.

**PART 2      Products**

**2.1          GENERAL**

- .1      Control devices of each category to be of same type and manufacturer as per existing building EMCS system.
- .2      External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant assembly.
- .3      Operating conditions: 0 - 32 °C with 10 - 90 % RH (non-condensing) unless otherwise specified.
- .4      Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.
- .5      Transmitters to be unaffected by external transmitters (eg. walkie talkies).
- .6      Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .7      Outdoor installations: use weatherproof construction in EEMAC 12 enclosures.
- .8      Devices to be installed in user occupied space must not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

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## **2.2 TEMPERATURE SENSORS**

- .1 Sensors:
  - .1 Room type: wall mounting, in slotted type covers having brushed stainless steel finish, with guard as indicated. Element 10-50 mm long with ceramic tube or equivalent protection.
  - .2 Room type for fan coil/VAV type boxes: as for room type, above or thermistor, 100,000 ohm, accuracy of plus or minus 0.5 °C.

## **2.3 TEMPERATURE TRANSMITTERS**

- .1 Requirements:
  - .1 Input circuit: to accept 3-lead, 100 ohm at 0 deg C, platinum resistance detectors type sensors.
  - .2 Power supply: 575 ohms at 24 V DC into load of 575 ohms. Power supply effect less than 0.01 deg C per volt change.
  - .3 Output signal: 4 - 20 mA into 500 ohm maximum load.
  - .4 Input and output short circuit and open circuit protection.
  - .5 Output variation: less than 0.2 % of full scale for supply voltage variation of plus or minus 10 %.
  - .6 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 0.5 % of full scale output.
  - .7 Maximum current to 100 ohm RTD sensor: not to exceed 25 mA.
  - .8 Integral zero and span adjustments.
  - .9 Temperature effects: not to exceed plus or minus 1.0 % of full scale/ 50 °C.
  - .10 Long term output drift: not to exceed 0.25 % of full scale/ 6 months.
  - .11 Transmitter ranges: Select narrowest range to suit application from following:
    - .1 0 to 35 °C, plus or minus 0.5°C

## **2.4 ELECTRICAL RELAYS**

- .1 Requirements:
  - .1 Double voltage, DPDT, plug-in type with termination base.
  - .2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.
  - .3 Contacts: rated at 5 amps at 120 V AC.
  - .4 Relay to have visual status indication

## **2.5 SOLID STATE RELAYS**

- .1 Requirements:

## **2.6 CURRENT TRANSDUCERS**

- .1 Requirements:

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- .1 Range: as indicated on I/O Summaries.
  - .2 Purpose: measure line current and produce proportional signal in one of following ranges:
    - .1 4-20 mA DC.
    - .2 0-1 volt DC.
    - .3 0-10 volts DC.
    - .4 0-20 volts DC.
  - .3 Frequency insensitive from 10 - 80 hz.
  - .4 Accuracy to 0.5% full scale.
  - .5 Zero and span adjustments. Field adjustable range to suit motor applications.
  - .6 Adjustable mounting bracket to allow for secure/safe mounting inside the MCC.

## **2.7 CURRENT SENSING RELAYS**

- .1 Requirements:
  - .1 Complete with metering transformer ranged to match load, plug-in base and shorting shunt to protect current transformer when relay is removed from socket.
  - .2 Suitable for single or 3 phase metering into single relay.
  - .3 To have adjustable latch level, adjustable delay on latch and minimum differential of 10 % of latch setting between latch level and release level.
  - .4 3-Phase application: provide for discrimination between phases.
  - .5 To have adjustable latch level to allow detection of worst case selection. To be powered from control circuit of motor starter being metered. Relay and base to be mounted in adjacent auxiliary cabinet only if control circuit power to be brought into auxiliary cabinet. Adjustments to be acceptable from auxiliary cabinet.
  - .6 Relay contacts: capable of handling 10 amps at 240 V AC.

## **2.8 CONTROL DAMPERS**

- .1 Construction: blades, 152 mm wide, 1219 mm long, maximum. Modular maximum size, 1219 mm wide x 2438 mm high. Multiple sections to have stiffening mullions and jack shafts.
- .2 Materials:
  - .1 Frame: 2.3 mm minimum thickness galvanized steel.
  - .2 Blades: galvanized steel with two sheets 0.5 mm thick or otherwise reinforced to ensure specified low leakage when fully closed.
  - .3 Bearings: oil impregnated sintered bronze. Provide thrust bearings for vertical blades.
  - .4 Linkage and shafts: zinc plated steel.

- .5      Seals: replaceable neoprene or stainless steel spring on sides, top, bottom of frame, along all blade edges and blade ends.
- .3      Performance:
  - .1      Capacity: refer to I/O Summaries.
  - .2      0.02 L/s.m<sup>2</sup> maximum allowable leakage against 1000 Pa static pressure.
  - .3      Temperature range: minus 50 °C to plus 100 °C.
- .4      Arrangements: dampers mixing warm and cold air to be parallel blade, mounted at right angles to each other, with blades opening to mix air stream.

## **2.9            ELECTRONIC CONTROL DAMPER OPERATORS**

- .1      Requirements:
  - .1      Push-pull proportional type as indicated.
  - .2      Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.
  - .3      Operator: size so as to control dampers against maximum pressure or dynamic closing pressure (whichever is greater).
  - .4      Power requirements: 5 VA maximum at 24 V AC.
  - .5      Operating range: 0 - 20 V DC.

## **2.10          CONTROL VALVES**

- .1      Requirements:
  - .1      NPS 2 and under: bronze with screwed ends.
  - .2      Trim: type 316 stainless steel.
  - .3      Leakage: 0.5 % of rated flow maximum.
  - .4      Two or three port as indicated. Normally Open or Normally Closed, as indicated.
  - .5      Flow characteristics: linear or equal percentage as indicated.
  - .6      Rangeability: 50:1 minimum.
  - .7      Performance: Capacity refer to I/O Summaries and Valve Schedule Division 23.
  - .8      Minimum shut-off pressure: 60 kPa.

## **2.11          ELECTRONIC/ELECTRIC VALVE ACTUATORS**

- .1      Requirements:
  - .1      Construction: steel, cast iron, aluminum.
  - .2      Control voltage: 0-20V DC or 24V AC.
  - .3      Positioning time: to suit application. 90 sec maximum.
  - .4      Spring return to normal position as indicated.

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**PART 3        Execution**

**3.1            INSTALLATION**

- .1        Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
- .2        Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in all cases when dissimilar metals make contact.
- .3        Support field-mounted transmitters, sensors on pipe stands or channel brackets.
- .4        Install wall mounted devices on plywood panel properly attached to wall.

**3.2            TEMPERATURE AND HUMIDITY SENSORS**

- .1        Stabilize to ensure minimum field adjustments or calibrations.
- .2        To be readily accessible and adaptable to each type of application so as to allow for quick easy replacement and servicing without special tools or skills.

**3.3            FIELD MOUNTED TRANSMITTERS AND SENSORS**

- .1        Support properly on pipe stands or channel brackets.
- .2        Install wall mounted devices on plywood panel attached properly to wall.

**3.4            IDENTIFICATION**

- .1        Identify field devices properly.
- .2        Refer to Section 25 05 54 - EMCS: Identification.

**3.5            TESTING**

- .1        Calibrate and test field devices for accuracy and performance. Submit report detailing tests performed, results obtained to Departmental Representative for approval. Departmental Representative will verify results at random. Provide testing equipment and manpower necessary for this verification.

**END OF SECTION**