# Part 1. GEneral

## Field Wiring

### Field Wiring is the wiring that connects the field equipment (instruments, control stations, control panels, MCC) to the Process Automation Controller. Use only CSA approved and labeled cables and conductors.

### This specification applies to field wiring only.

### Refer to Section 13310 Panel Specification for panel internal wiring specifications and color to be utilized.

### Refer to Section 13310 Panel Specification for surge protection devices to be utilized.

## Measurement and Payment

.1 All costs associated with the work of this Section shall be included in the price for Item No. A13.07 in the Bid Form.

# PRODUCTS

## Analog Signals

### Definition: Analog signals are 4-20 mA inputs received from field instruments.

### Conductors: #16 AWG, 26/30 strand minimum, tinned copper, unless otherwise indicated, 600 V minimum insulation.

### Construction: Twisted pair, triplet and quad grouping with nominal 50 mm staggered lay and 100% aluminum-Mylar tape shield with minimum 25% overlap.

### Drain wire: Over each group, bare, #18 AWG minimum, tinned copper, in direct continuous contact with shield.

### Jacket: PVC (-40C) low acid gas, FT4 rated low flame spread.

### Identification: Each grouping (pair, triplet, quad) by consecutive number coding, permanently marked at 25 mm intervals.

### Armour: For exposed or direct buried cables, aluminum or steel interlocking armour with overall PVC jacket.

### General purpose instrumentation cable: Part #73-242 by Deca Cables Inc. or Equivalent.

### Shields: Signal shields should have one ground point located at the PAC panel. Shields should be continuous through cabinets, panels, and junction boxes.

### Color Coding Analog Signals:

#### Black (-)

#### White (+)

### The power supply connection for each individual two or three wire field device shall be wired through a fuse.

### RS232 and RS422 cables: 4 pair, 22 AWG stranded copper, separately twisted pairs, overall 100% aluminum-polyester shield, tinned copper stranded drain wire, type #9305 by Belden Wire and Cable.

#### Termination fittings: Type, configuration and gender required to connect cable directly to equipment without additional adapters or fittings.

### Data highway communication cable: Stranded, tinned copper conductor with aluminum armour and overall PVC jacket, Type #9463 by Belden Wire and Cable.

## DC Digital Input Signals

### DC digital input signals are at 24 VDC sourced from the PAC panel.

### Single Cable: For individual contact closure circuits use single pair, two inch lay, #14 AWG, twisted, 19 X .0147 stranded copper conductors CSA labeled tray cable at 600 volts, type T90, PVC insulation and nylon jacket, 90°C.

### Multi-pair Cable: TECK cable.

### Color Coding: Blue.

### The conductor designation is that green conductors are always at ground.

## AC Digital Input Signals

### AC digital input signals are 120 VAC and less than 20 amperes, and sourced from the PAC panel.

### Single Cable: For individual contact closure circuits use single pair, two inch lay, #14 AWG, twisted, 19 X .0147 stranded copper conductors CSA labeled tray cable at 600 volts, type T90, PVC insulation and nylon jacket, 90°C.

### Multi-Conductor: TECK Cable.

### Color Coding – Red.

### Color Coding – Control from External: Yellow.

### The conductor designation is that green conductors are always at ground.

## Multi-Conductor Cable Control Cabling

### Low Voltage Armoured Wire and Cable (1000 V and Below)

#### Construction: Stranded, annealed copper conductors, 1000 V rating, RW90 cross-linked polyethylene (XLPE) insulation, suitable for handling at minus 40C ambient, 90C maximum conductor temperature, flame test rated FT4.

#### Power cabling: TECK construction.

#### Control cabling: TECK construction.

#### Minimum conductor size: Unless otherwise indicated, #12 AWG for power and current transformer circuits and #14 AWG for control and fire alarm circuits.

#### Grounding conductor: Stranded, soft, bare copper conductor in multiconductor cables, concentric copper wires over insulation in single conductor cable.

#### Multi‑conductor cables: With inner jacket of suitable PVC (minus 40C).

#### Interlocking armour: Flexible, galvanized steel or aluminum for multi‑conductor cables and aluminum for single conductors, spirally wound over inner jacket.

#### Outer jacket: PVC (minus 40C), flame‑retardant, FT4 flame test rated, low acid gas evolution, [black] outer jacket extruded over the armour.

#### Colour coding: For insulated conductors, conform to the following:

##### 1‑conductor power ‑ Black

##### 1‑conductor control ‑ Red

##### 2‑conductor cable ‑ Black, White

##### 3‑conductor cable ‑ Red, Black, White (Neutral) ‑ Red, Black, Blue

##### 4‑conductor cable ‑ Red, Black, Blue, White

##### Multi‑conductor cables ‑ Manufacturer's standard

#### Hazardous area installations: Where indicated, TECK cables and fittings accepted for the application. Stamp outer jacket, "HL".

## Ethernet Patch Cables

### Cables shall conform to IEC 11801. Twisted-pair. Category 6. Red. Link and performance requirements in TIA/EIA-568-B.2.1. Cables to be FastCATT Snagless Moulded Cables.

## Access Closet Power Supply

### Refer to Section 13510 for Access Closet power requirements.

# INSTALLATION

## General

### For new installations, all field wiring is to enter the PAC panel from the bottom.

### For retrofit installations, filed wiring is permitted to enter the PAC panel form the top, run behind the panel back plane and come up into the wire ways from the bottom.

### Power cabling, I/O cabling and communications cabling is to be run through conduit from field device to PAC panel.

### Every I/O point shall have its own common to the field device: two (2) wires are to be run for each I/O point from the panel to the field device. Jumpering/combining commons in the field resulting in a single common for multiple I/O points is not acceptable.

### Avoid running cables inside or under power cable trays. Where field wiring is in power cable trays, insulation must be equal to or greater than the highest voltage in the cable tray.

### Where power or signal cables must cross, make them cross at an angle of 90 degrees.

### Communication cables will not be mixed with power or signal cables.

### If using TECK cable, the TECK cable is not to be run directly into the PAC control panel. The TECK cable is to terminate in an intermediate junction box installed above the PAC panel. Field wiring is to be extended from the junction box to the PAC panel through conduit. For a valve or metering camber, TECK cable may be run directly into the control panel.

## Signal Separation

### Signal separation of different signal types to be maintained.

### Analog and 24 VDC Discrete Signals: Analog 4-20 mA signals and 24 VDC discrete signals will be in separate conduits. An exception to this standard may be made in cases where it would cause parallel conduit runs to the same device and combining signals would eliminate one conduit. This exception will be limited to 3 meters only.

### AC Digital and Control: AC digital signals and AC control wiring may occupy the same conduit but all instrument power circuits should be isolated by a separate conduit from all AC digital and control circuits.

### All conduits for signal cables shall be rigid PVC conduit with the last meter flexible connecting to the field instrument unless otherwise noted in instrument specifications.

## Miscellaneous

### Thermocouple Extension Wire: Thermocouple extension circuits should be solid conductors and same gauge as the T/C of the same material as the associated thermocouple. Thermocouple signal lines should be continuous from the thermocouple connection head to the final termination point.

### Spare Conductors: Spare conductors in each conduit should be equal to no less than 15% of the number or required conductors in the conduit. Each cable should have 10% spare conductors but not less than two conductors. Spare conductors should be labeled at both ends.

### All field wiring, including wiring in MCCs, junction cabinets and wiring not terminating in the PAC panel, is to have thermal heat shrink labels installed and heat shrunk. Refer to Section 13310 – Panel Specifications for wire labeling requirements.

**END OF SECTION**