

SECTION 16902

ELECTRICAL CONTROL DEVICES

PRODUCTS

2.01 MANUFACTURERS



A. Cutler-Hammer

B.  _____C.  _____

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 CONTROL RELAYS


A. Electro-Mechanical Control Relays – Electro-Mechanical


1. 600V Industrial Control Relays shall be Cutler-Hammer type D15 or approved equal.
2. Contacts shall be rated NEMA A600 with a continuous thermal rating of 10 amperes AC and NEMA P300 with a continuous thermal rating of 5 amperes DC.
3. Relays shall be available with interchangeable AC or DC magnetic coils. The standard coils shall be rated 120V AC/60 Hz and 110V AC/50 Hz.  [Optional AC coil ratings shall be 240/60 or 220/50, 480/60 or 440/50, 600/60 or 550/50, 208/60, 277/60, 208-240/60, and 24/60.]  [Optional DC coil ratings shall be 120V DC, 12, 24 and 48.]
4. The Control Relays shall be 4-pole as standard and available in any configuration of NO or NC contacts. Expansion of the number of available contacts shall be possible through the addition of top mount front deck adders. These adders shall be available in 2-pole or 4-pole units. The 2-pole top deck adder can come with any configuration of NO or NC contacts and the 4-pole adder shall be available with up to four (4) NO or two (2) NC contacts.
5. The control relay shall also be capable of conversion to a solid-state or pneumatic timer by addition of a field installable timer attachment.

B. Control Relays – Solid-State

C. Addressable Relay II (ADR)

1. Where shown on the drawings, provide Addressable Relay(s) (ADR), Cutler-Hammer type ADR II or approved equal capable of being controlled from remote computer over the communications network. The ADR shall have two (2) status indicating circuits which can be used to transmit the status of external device contacts over the communication network. The ADR shall be provided with the following features:

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- a. One (1) form C addressable contact shall be rated 115 to 120V AC, 43.2-ampere make and 7.2-ampere break
 - a. Three (3) hexadecimal selector switch dials to provide unique addresses for computer identification
 - b. A light emitting diode (LED) to indicate when the relay is energized
 - c. An LED shall be provided to indicate active communication status to the communications network.
 - d. Communications rate shall be selectable for 9600 baud or 1200 baud over twisted pair of #18 wires.
 - e. Relay operation powered from 120V AC or 48- to 125V DC
 - f. Operation suitable over a temperature range of 0 degrees C through 70 degrees C.
2. Addressable relay shall have field-settable latch to allow the relay to turn OFF after 10 seconds if communications ON signal not received or to stay ON.

D. Breaker Control Relay

1. Where shown on the drawings or herein specified, provide a Breaker Control Relay (BC) for use with electrically operated breakers and having communications capability for remote open or close of the breakers from a personal computer or programmable logic controller over a twisted pair network up to 7,500 feet. The BC shall be equal to Cutler-Hammer type ADR Breaker Control Relay, having the following specified features and functions:
2. The BC shall be wired to the breaker close and trip coil circuits and serve as supervisory control relays. The BC shall be capable of being activated only from a remote computer by coded signal that selects the proper relay by its address and then commands the relay contacts to close or open. The BC shall have suitable hexadecimal wheels to field program its particular address. The BC shall include the ability to provide remote status indication over the same twisted pair of wires providing OPEN/CLOSE status by monitoring auxiliary contacts located on the breaker. For drawout breakers with Truck Operated Cell (TOC) switches, the BC shall also monitor the position of the TOC switch contacts.
3. The BC shall be capable of being powered by either 120V AC or 48 to 125V DC.
4. The BC shall have a selectable baud rate of 1200 or 9600.
5. The BC shall be capable of transmitting the following data for real-time display of breaker status:

<u>STATUS</u>	<u>REASON</u>	<u>BREAKER CELL POSITION</u>
OPEN	NORMAL	Connected
CLOSED	NORMAL	Connected
TRIP	PROTECTIVE RELAY	Connected
OPEN	TEST	Test Position
CLOSED	TEST	Test Position
TRIP	TEST	Test Position

2.03 PUSHBUTTONS

- A. Pushbuttons and Pilot Devices shall be Cutler-Hammer 30.5 mm, heavy duty, oil tight type 10250T, E34, or approved equal.

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- A. Pushbuttons and Pilot Devices shall be Cutler-Hammer 22.5 mm industrial heavy-duty type E22 or approval equal.
- B. Device bodies shall be zinc die cast with chrome plating or cathodic epoxy coating.
- C. Devices shall utilize a single panel gasket and provide integral grounding by means of either a built-in grounding terminal or a pointed grounding surface integral to the device.
- D. Devices shall be UL or CSA listed or CE marked for types 1, 2, 3, 3R, 4, 4X, 12 and 13 when mounted in a suitable enclosure with the same ratings.
- E. Devices shall have an operating temperature range of -17 degrees C to 66 degrees C.
- F. Pushbuttons and contact blocks shall have a published mechanical life of not less than 10,000,000 operations.

2.04 SELECTOR SWITCHES

- A. Selector Switches shall be Cutler-Hammer 30.5 mm, heavy duty, oil tight type 10250T, E34 or approved equal.

-- OR --

- A. Selector Switches shall be Cutler-Hammer 22.5 mm, industrial heavy duty type E22 or approved equal.
- B. Device bodies shall be zinc die cast with chrome plating or cathodic epoxy coating.
- C. Devices shall utilize a single panel gasket and provide integral grounding by means of either a built-in grounding terminal or a pointed grounding surface integral to the device.
- D. Devices shall be UL or CSA listed or CE marked for types 1, 2, 3, 3R, 4, 4X, 12 and 13 when mounted in a suitable enclosure with the same ratings.
- E. Devices shall have an operating temperature range of -17 degrees C to +66 degrees C.

2.05 INDICATING LIGHTS

- A. Indicating lights shall be Cutler-Hammer 30.5 mm, heavy duty, oiltight type 10250T, E34 or approved equal.

-- OR --

- A. Indicating lights shall be Cutler-Hammer 22.5 mm industrial heavy-duty type E22 or approved equal.
- B. Device bodies shall be zinc die cast with chrome plating or cathodic epoxy coating.
- C. Devices shall utilize a single panel gasket and provide integral grounding by means of either a built-in grounding terminal or a pointed grounding surface integral to the device.
- D. Devices shall be UL or CSA listed or CE marked for types, 1, 2, 3, 3R, 4, 4X, 12 and 13 when mounted in a suitable enclosure with the same ratings.
- E. Devices shall have an operating temperature range of -17 degrees C to 66 degrees C.

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- F. Indicating lights shall be ☛[full voltage LED type] [push-to-test transformer type]. Lens color shall be as indicated on the contract drawings.

2.06 TIMERS

A. Pneumatic Timers

1. Pneumatic timers shall be Cutler-Hammer type C320TP or approved equal.
2. Pneumatic timers shall be available with DPST timed contacts. Output contacts shall be rated 6A maximum make and 0.6A maximum break at 600V AC and 30A maximum make and 3A maximum break at 120V AC.
3. Pneumatic timers shall be available with adjustable timing ranges of 0.1 to 30 or 10 to 180 seconds.
4. Pneumatic timers shall be convertible from OFF to ON Delay or vice-versa.
5. Pneumatic timers must be capable of top mounting to NEMA Size 00 through 2 or IEC Size A through K Freedom starters or contactors and D15 control relays.

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A. Solid-State Electronic Timers

1. Solid-state electronic timers shall be Cutler-Hammer type C320TM or approved equal.
2. Electronic timer shall include 1NO/1NC relay output. Contacts shall be suitable for 240V AC with 15A make, 1.5A break and 1.5A continuous ratings as a minimum. Contacts shall also be suitable for a minimum 30V DC 5A resistive rating.
3. Electronic timers shall include the following timing modes: ON DELAY, OFF DELAY, ONE SHOT, ON DELAY/OFF DELAY and CYCLE MODE.
4. Electronic timer shall be available with adjustable timing ranges of 0.3 to 3, 3 to 30, or 30 to 300 seconds.
5. Electronic timer shall be capable of direct mounting to 35 mm DIN rail, panel mounting with a furnished bracket or capable of side mounting to a starter, contactor or relay through the use of an optional mounting bracket.

2.07 CONTROL STATIONS

- A. Control Stations shall be Cutler-Hammer type 10250 standard duty, heavy duty, 10250T or approved equals.
- B. For applications exceeding NEMA Type 1, devices shall be suitable for NEMA Types 4X and 13.
- C. Shall be UL listed as complete assembly.

2.08 OPERATOR INTERFACE PANEL (O/I)

A. Cutler-Hammer Operator Interface Panel (O/I) – Hardware

1. O/Is shall be of modular design for easy installation and shall have the following features:
 - a. Enclosure rated NEMA 4/NEMA 12

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- a. Rated NEMA 4X
 - b. Impact-resistant protective window over display
 - c. External horn connection
 - d. Fault relay connection
 - e. Field-replaceable flat panel backlight.
2. O/Is shall have the following display characteristics:
 - a. [10.4-inch color TFT flat panel] [8.4-inch color TFT flat panel] [8.4-inch gray scale LCD flat panel].
 3. VCPs shall use membrane key or touch screen as the operator's input device. Membrane key versions shall exhibit positive, two-step control operation. Touch screen versions shall have the following features:
 - a. Positive, two-step control or immediate one-touch control
 - b. Safe, adjustable lockout for screen cleaning
 - c. Field-replaceable touch screen
 - d. 256 x 256 cell resolution.
- B. Cutler-Hammer Operator Interface (O/I) – Communications
1. O/Is shall offer the following communications choices:
 - a. Built-in PLC drivers
 - b. Simultaneous communication to multiple PLCs and PLC brands
 - c. High-speed interfaces
 - d. Network down/uploading of configurations and firmware
 - e. Dual serial ports.
- C. Cutler-Hammer Operator Interface (O/I) – Software and Configuration
1. O/Is shall offer the following tools for creating and changing screen content:
 - a. Advanced Windows-based configuration software
 - b. Common look and feel across product line
 - c. Single configuration software for all products
 - d. Fill-in-the-blank configuration
 - e. Automatic conversion of existing configurations
 - f. Context-sensitive help screens
 - g. Pre-configured templates
 1. Indicator
 2. Table
 3. Readout
 4. Bar
 5. Display
 6. Trend
 7. Advanced trend
 - h. Pop-up maintenance window
 - i. Alarm window
 - j. Boolean logic and math operators
 - k. Direct addressing of PLC data
 - l. Transfer-only utility

- m. Self documentation
 - n. Downloadable executive firmware.
2. O/Is shall provide the following graphical capabilities:
- a. Bitmap graphics
 - b. Object-based pixel graphics
 - c. Dynamic object-based graphics
 - d. 256 color power graphics with PowerBlink and PowerAnimation
 - e. Nondestructive updates
 - f. Support for importing of 3rd-party graphics.
3. Operator Interface shall be Cutler-Hammer IDT type PanelMate.

2.09 SYNCHRONOUS MOTOR FIELD CONTROL

A. Brush Type – Solid-State

1. The brush type solid-state synchronous motor control panel shall provide automatic field application for synchronous motors. The control panel shall be designed for use in conjunction with a circuit breaker or contactor type motor starter. When the motor accelerates to the proper speed, the control panel shall automatically apply the motor field.
2. The control panel shall provide the following protective features:
 - a. Locked rotor protection
 - b. Incomplete sequence
 - c. Failure to synchronize
 - d. Fuse failure
 - e. Pull-out protection
 - f. DC current line protection.
3. The application of DC power to the motor field windings shall be accomplished without the use of mechanical moving parts and shall feature a “soft turn on” circuit when applying DC voltage to the motor field.
4. The control panel shall be mounted ☛[in the medium voltage motor starter] [in a NEMA 1 floor mounted enclosure].
5. The enclosure shall be provided with a hinged front door with externally ventilated heat sinks. The enclosure shall contain the following equipment:
 - a. 1 – Stepdown exciter transformer, 3-phase
 - b. 3 – Primary fuses
 - c. 3 – Secondary fuses
 - d. 1 – SCR power supply panel
 - e. 1 – Synchronous control board
 - f. 1 – DC ammeter, panel type
 - g. 3 – MOVs for surge protection
 - h. 1 – Starting and field discharge resistor (For larger resistors provide separate mounting)
 - i. 1 – Field failure relay

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- j. 1 – Incomplete sequence timer
- k. 1 – Start timer
- l. 1 – Potentiometer.

B. Brushless Type – Solid-State

1. The brushless type solid-state synchronous motor control panel shall provide automatic field application for synchronous motors. The control panel shall be designed for use in conjunction with a circuit breaker or contactor type motor starter. Automatic synchronization shall be provided by the control panel and shall ensure application of the motor field at the proper motor speed and at a favorable angular position of the rotor and stator poles. Line disturbances resulting from synchronization shall be reduced and effective motor pull-in torque increase.
2. The control panel shall be provided with a var/PF/DC field current regulator. The var regulator shall control the AC reactive current flowing out of the motor during varying load conditions by varying the motor field current. The PF regulator shall control the power factor of the motor during varying load conditions by varying the motor field excitation. The DC field current regulator shall compensate for the motor field resistance as the motor field heats up by increasing the motor field voltage.
3. The control panel shall provide the following protective features:
 - a. Locked rotor protection
 - b. Incomplete sequence
 - c. Failure to synchronize
 - d. Fuse failure
 - e. Pull-out protection
 - f. DC current line protection.
4. The application of DC power to the motor field windings shall be accomplished without the use of mechanical moving parts and shall feature a “soft turn on” circuit when applying DC voltage to the motor field.
5. The control panel shall be mounted [☛][in the medium voltage motor starter] [in a NEMA 1 floor mounted enclosure].
6. The enclosure shall be provided with a hinged front door with externally ventilated heat sinks. The enclosure shall contain the following equipment:
 - a. 1 – Stepdown exciter transformer, 3-phase
 - b. 3 – Primary fuses
 - c. 3 – Secondary fuses
 - d. 1 – SCR power supply panel
 - e. 1 – Synchronous control board
 - f. 1 – DC ammeter, panel type
 - g. 1 – AC ammeter, panel type
 - h. 3 – MOVs for surge protection
 - i. 1 – Starting and field discharge resistor (For larger resistors provide separate mounting)
 - j. 1 – Field failure relay
 - k. 1 – Incomplete sequence timer

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ELECTRICAL CONTROL DEVICES

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- l. 1 – Start timer
- m. 1 – Timer
- n. 4 – Potentiometers
- o. 1 – Pull-out relay
- p. 1 – IQ 1000 without RTD module
- q. 1 – IQ DP-4000
- r. 1 – var/PF/DC field current board.