

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

A. Product Data

1. For each type include dimensions, weights, electrical characteristics, ratings, operating characteristics, voltage rating, rated capacity, bus configuration, short circuit current ratings, accessories, wiring diagrams for power and control and finishes.

1.2 GENERAL STANDARDS

A. Comply with applicable requirements of the following:

1. ANSI.
2. NEMA (including ICS 1).
3. NFPA 70.
4. NFPA 99.
5. NFPA 101.
6. NFPA 110.
7. UL, including UL 1008 (unless requirements of these Specifications are stricter).
8. IEEE.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide Transfer Switch products by one of the following:

1. Caterpillar; Engine Div.
2. Eaton Electrical Inc.
3. Emerson; ASCO Power Technologies, LP.
4. GE Zenith Controls.
5. Generac Power Systems, Inc.
6. Kohler Power Systems; Generator Division.
7. Onan/Cummins Power Generation; Industrial Business Group
8. Russelectric, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. General:

1. Refer to drawings for required voltage, phase and amperage ratings, and for required number of poles.
2. Provide auxiliary contacts as required for interfaces to affected equipment, to render all ancillary functions operational. Provide necessary equipment, accessories, components, controls, programming hardware and software, etc. as required to render systems fully operational.
3. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including applicable classes of loads for the project.
4. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
5. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
6. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions. Unless overridden by programmed transition, provide total transfer time (in either direction) that does not exceed 6 cycles at 60 Hz. with nominal voltage applied to the actuator.
7. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
8. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - a. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
 - b. Transition Type: Programmed, with mechanical and electrical interlocking to prevent source-to-source connection through either the power or control wiring.
 - c. Switching Arrangement: Double-throw type.
 - d. Switch Action: Double throw; mechanically held in both directions.
 - e. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts. Provide main contacts that are 600VAC rated, long life, mechanically held contacts with magnetic "blowouts" and with multiple leaf arc chute barriers.
 - f. Provide insulated transparent dead front within the enclosure (to protect servicing personnel when door is open).
 - g. Provide neutral bar (with lugs). Provide equipment ground bar (with lugs).
9. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

10. Provide lugs, lug kits and related accessory work as required to accommodate the conductor sizes and quantities needed for each application. Coordinate with single-line diagram, field conditions, etc.
 11. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."
 - a. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 - b. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 - c. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 12. Heater: Equip outdoor switches and indoor switches in unconditioned or high-humidity spaces, with an internal heater. Provide thermostat within enclosure to control heater.
 13. Neutral Switching: Where four-pole switches are indicated, provide fully-rated neutral pole switched simultaneously with phase poles. Where three-pole switches are indicated, provide solid and fully-rated neutral terminal unless otherwise indicated.
- B. Battery Charger For Generator Starting Batteries: Float type rated 2A, with ammeter to display charging current, and with fused ac inputs and dc outputs.
- C. Enclosures: General-purpose NEMA 250, Type 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated. Provide enclosures with swing-out service panels and door locks. Coat enclosures with manufacturer's standard color acrylic enamel finish over corrosion-resistive primer.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. General:
1. Comply with Level 1 equipment according to NFPA 110.
 2. Manual Switch Operation: Unloaded or under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
 3. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
 4. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5

second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

B. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Minimum of two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated minimum 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features shall include the following:

- a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.
13. Provide voltmeter, ammeter, frequency meter, and key operated test/normal/retransfer switch.
 14. Provide peak demand history metering integral to factory metering package, or external to each automatic transfer switch.
 15. Provide time-delay features to prevent excessive transfer and retransfer operation during momentary line voltage dips; for load retransfer; for start; for engine shutdown; and for cool down timer. Provide minimum of two Form C (12C, 12D) dry contacts to indicate switch in emergency position.
 16. Provide contact to contact transfer speed for the manual operators identical to that for the Automatic Transfer Switches electrical operator (independent of speed at which the handle is moved).

2.4 REMOTE ANNUNCIATOR SYSTEM

- A. Functional Description: Remote annunciator panel shall annunciate conditions for transfer switches and generators. Annunciation shall include the following: Sources available, as defined by actual pickup and dropout settings of transfer-switch controls; Switch position; Switch in test mode; Failure of communication link.
- B. Annunciator Panel: LED-lamp type with audible signal and silencing switch. Provide indicating lights, grouped for each transfer switch monitored. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves. Provide flush, modular, steel cabinet, unless otherwise indicated. Provide push-to-test or lamp-test switch on front panel.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Provide construction and bracing as required to permit shipping, rigging, etc. of products in any physical position or orientation without compromising product warranty.

2.6 GENERATOR CONTROL WIRING

- A. Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(1) of NFPA 70. The integrity of the collective generator system, including generator control wiring, shall be continuously monitored. Any malfunction of the collective generator system, including loss of integrity of the remote start circuit(s), shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s). Loss of integrity of the remote start circuit(s) shall start the generator(s).

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install equipment and accessories according to either NECA 407 or NEMA PB1.1. Provide enclosures fastened firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are level, and permanently and mechanically secure, plumb and rigid without distortion of box. Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from equipment.
2. Provide control wiring as required, in conduit, between transfer switches and generator control panels for engine start. Provide each installation with a 120V, 20A circuit to the battery charger and clock exerciser. Provide additional electrical work for other accessory components as required for a complete operational system (i.e. transfer switch, remote annunciator, monitoring equipment, support equipment, pumps, gages, etc.). Set field-adjustable intervals and delays, relays, and engine exerciser clock.
3. Mount top of trim 90 inches above finished floor unless top-most operable handle or control would end up being above 79 inches in which case the top of trim shall be mounted so that the top-most handle or control will be below 79 inches. Mount wall-mounted units flush in wall in finished areas, unless otherwise indicated. For floor-mounted switches, provide concrete base, anchor to floor by bolting, and brace to wall if next to a structural wall.
4. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring. Provide wiring/cable in conduit from transfer switch(es) to generator(s), remote annunciator(s) and remote controls as required to render the collective system fully operational.

B. Coordinate training for work of this section with that for generator equipment. Perform tests and inspections and prepare test reports. Coordinate tests with tests of generator and run them concurrently.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
3. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shut-down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level,

- generator voltage, amperes, and frequency. Verify that manual transfer warnings are properly placed. Perform manual transfer operation.
4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available. Simulate loss of phase-to-ground voltage for each phase of normal source. Verify time-delay settings. Verify pickup and dropout voltages by data readout or inspection of control settings. Test automatic transfer-switch operations. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

END OF SECTION 263600