

SECTION 26 36 23  
AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of open-transition automatic transfer switches with bypass isolation.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section in Division 26.
- B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personal safety and to provide a low impedance path for possible ground fault currents.
- D. Section 26 05 33, RACEWAYS AND BOXES
- E. Section 26 32 13, ENGINE-GENERATORS: Requirements for normal and emergency power generation.

1.3 QUALITY ASSURANCE

- A. QUALITY ASSURANCE  
Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. A factory-authorized representative shall maintain a service center capable of providing emergency maintenance and repair services at the project site within an 8hour maximum response time.
- C. Automatic transfer switch, bypass/isolation switch, and annunciation control panels shall be products of same manufacturer.
- D. Comply with OSHA - 29 CFR 1910.7 for the qualifications of the testing agency.

1.4 FACTORY TESTS

- A. Automatic transfer switches shall be thoroughly tested at the factory to ensure that there are no electrical or mechanical defects. Tests shall be conducted per UL standards. Factory tests shall be certified. The following factory tests shall be performed:
  - 1. Visual inspection to verify that each ATS is as specified.
  - 2. Mechanical test to verify that ATS sections are free of mechanical hindrances.
  - 3. Insulation resistance test to ensure integrity and continuity of entire system.
  - 4. Main switch contact resistance test.

5. Electrical tests to verify complete system electrical operation and to set up time delays and voltage sensing settings.

1.5 SUBMITTALS

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
  1. Clearly present sufficient information to determine compliance with drawings and specifications.
  2. Include electrical ratings (including withstand), dimensions, weights, mounting details, conduit entry provisions front view, side view, equipment and device arrangement, elementary and interconnection wiring diagrams, factory relay settings, and accessories.
  4. Complete nameplate data, including manufacturer's name and catalog number.
  5. A copy of the markings that are to appear on the transfer switches when installed.
- C. Manuals:
  1. When submitting the shop drawings, submit companion copies of complete maintenance and operating and maintenance manuals, including technical data sheets, wiring diagrams and information, such as telephone number, fax number and web sites, for ordering replacement parts.
  2. Two weeks prior to final inspection, submit four copies of a final updated maintenance and operating manual to the Contracting Officer's Representative/COR.
    - a. Include complete "As Installed" diagrams that indicate all pieces of equipment and their interconnecting wiring.
    - b. Include complete diagrams of the internal wiring for each piece of equipment, including "As Installed" revisions of the diagrams.
    - c. The wiring diagrams shall identify the terminals to facilitate installation, maintenance, operation, and testing.
- D. Certifications:
  1. When submitting the shop drawings, submit a certified test report from a recognized independent testing laboratory that a representative sample has passed UL 1008 prototype testing.
  2. Two weeks prior to final inspection, submit four copies of the following to the Contracting Officer's Representative/COR.
    - a. Certification that no design changes have been made to the switch or its components since last certified by UL or tested by an independent laboratory.

- b. Certification by the manufacturer that the equipment conforms to the requirements of the drawings and specifications.
- c. Certification that the withstand current rating has been coordinated with upstream protective devices.
- d. Certification by the contractor that the equipment has been properly installed, adjusted, and tested.
- e. A certified test report from an independent laboratory that a representative sample has passed the ANSI surges withstand test for transfer switches which incorporate solid-state components.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only:
- B. Institute of Electrical and Electronic Engineers (IEEE):
  - 446-95.....Recommended Practice for Design and Maintenance of Emergency and Standby Power Systems
  - C37.90.1-02.....Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
  - C62.41.1-02.....Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
  - C62.41.2.....Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- C. National Electrical Manufacturers Association (NEMA):
  - 250-03.....Enclosure for Electrical Equipment (1000 Volts Maximum)
  - ICS 6-06.....Enclosures
  - IC3 4-05.....Industrial Control and Systems: Terminal Blocks
  - MG 1-07.....Motors and Generators
- D. National Fire Protection Association (NFPA):
  - 70-08.....National Electrical Code (NEC)
  - 99-05.....Health Care Facilities
  - 110-10.....Emergency and Standby Power Systems
- E. Underwriters Laboratories, Inc. (UL):
  - 50-95.....Enclosures for Electrical Equipment
  - 508-99.....Industrial Control Equipment
  - 891-05.....Dead-Front Switchboards
  - 1008-96.....Transfer Switch Equipment

## PART 2 - PRODUCTS

## 2.1 OPEN-TRANSITION AUTOMATIC TRANSFER SWITCH

## A. General:

1. Comply with UL, NEMA, NEC, ANSI, IEEE, and NFPA.
2. Automatic transfer switches are to be 4 pole draw-out construction, electrically operated, mechanically held open contact type, without integral overcurrent protection. Automatic transfer switches utilizing automatic or non-automatic molded case circuit breakers, insulated case circuit breakers, or power circuit breakers as switching mechanisms are not acceptable.
3. Automatic transfer switches shall be completely factory-assembled and wired such that only external circuit connections are required in the field.
4. Each automatic transfer switch shall be equipped with an integral bypass/isolation switch.
5. Ratings:
  - a. Phases, voltage, ampere rating, poles, and withstand current rating shall be as shown on the drawings.
  - b. Transfer switches are to be rated for continuous duty at specified continuous current rating on 60Hz systems.
  - c. Maximum automatic transfer switch rating: 260 A. with minimum of 22KAIC @ 208V 3P.
6. Markings:
  - a. Markings shall be in accordance with UL 1008.
  - b. Markings for the additional withstand test specified below shall be included in the nameplate data.
7. Tests:

Automatic transfer switches shall be tested in accordance with UL 1008. The contacts of the transfer switch shall not weld during the performance of withstand and closing tests when used with the upstream overcurrent device and available fault current specified.
8. Surge Withstand Test:

Transfer switches utilizing solid-state devices in sensing, relaying, operating, or communication equipment or circuits shall comply with IEEE C37.90.1.
9. Housing:
  - a. Enclose automatic transfer switches in wall mounted steel cabinet, with metal gauge not less than No. 14, in accordance with UL 508, or in a switchboard assembly in accordance with UL 891, as shown on the drawings.

- b. Enclosure shall be constructed so that personnel are protected from energized bypass-isolation components during automatic transfer switch maintenance.
  - c. Automatic transfer switch components shall be removable without disconnecting external source or load power conductors.
  - d. Finish: Cabinets shall be given a phosphate treatment, painted with rust-inhibiting primer, and finish-painted with the manufacturer's standard enamel or lacquer finish.
  - e. Viewing Ports: Provide viewing ports so that contacts may be inspected without disassembly.
- B. Automatic transfer switches shall include the following features:
- 1. Operating Mechanism:
    - a. Actuated by an electrical operator.
    - b. Electrically and mechanically interlocked so that the main contact cannot be closed simultaneously in either normal and emergency position.
    - c. Normal and emergency main contacts shall be mechanically locked in position by the operating linkage upon completion of transfer. Release of the locking mechanism shall be possible only by normal operating action.
    - d. Contact transfer time shall not exceed six cycles.
    - e. Operating mechanism components and mechanical interlocks shall be insulated or grounded.
  - 2. Contacts:
    - a. Main contacts: Silver alloy.
    - b. Neutral contacts: Silver alloy, with same current rating as phase contacts continuous current rating not less than twice the rating of the phase contacts.
    - c. Current carrying capacity of arcing contacts shall not be used in the determination of the automatic transfer switch rating, and shall be separate from the main contacts.
    - d. Main and arcing contacts shall be visible for inspection with cabinet door open and barrier covers removed.
  - 3. Manual Operator:

Capable of operation by one person in either direction under no load.
  - 4. Replaceable Parts:
    - a. Include the main and arcing contact individually or as units, relays, and control devices.
    - b. Switch contacts and accessories shall be replaceable from the front without removing the switch from the cabinet and without removing main conductors.

## 5. Sensing Relays:

- a. Under voltage 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% of nominal, and dropout voltage is adjustable from 75 to 98% of pickup value. Factory set for pickup at 90% and dropout at 85%.
- b. 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.
- c. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100% of nominal. Factory set for pickup at 90%. Pickup frequency shall be adjustable from 90 to 100% of nominal. Factory set for pickup at 95%.
- d. 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 under voltage of emergency source, provided normal supply has been restored.
- e. Test Switch: Simulate normal-source failure.
- f. Switch-Position Pilot Lights: Indicate source to which load is connected.
- g. Source-Available Indicating Lights: Supervise sources via transfer switch normal- and emergency-source sensing circuits.
- h. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
- i. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
- j. Transfer Override Switch: Overrides automatic retransfer control so that automatic transfer switch shall remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- k. Engine Starting Contacts: One isolated and normally closed and one isolated and normally open; rated 10 A at 32-V dc minimum.
- l. 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.
- m. Engine-Generator Exerciser: Programmable exerciser starts engine-generator(s) and transfers load to them from normal source for a preset time, then retransfers and shuts down engine-generator(s)

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 shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period.

6. Controls:
  - a. Control module shall provide indication of switch status and be equipped with alarm diagnostics.
  - b. Control module shall control operation of the automatic transfer switches.
7. Factory Wiring: Train and bundle factory wiring and label either by color-code or by numbered/lettered wire markers. Labels shall match those on the shop drawings.
8. Annunciation, Control, and Programming Interface Components: Devices for communicating with remote programming devices, annunciators, or control panels// and paralleling switchgear// shall have open-protocol communication capability matched with remote device.
9. Auxiliary Contacts:
  - a. Provide contacts as necessary to accomplish the functions shown on the drawings, as specified herein, and as designated in other sections of these specifications, as well as one spare normally open contact and one normally closed contact.
  - b. Provide remote contact to bypass retransfer time delay to normal source.
11. In-Phase Monitor: Factory-wired, internal relay controls transfer, so that it occurs only when the two sources are synchronized in phase. The relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70% or more of nominal voltage.
13. 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 seconds, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

## 2.2 SEQUENCE OF OPERATION

- A. The specified voltage decrease in one or more phases of the normal power source shall initiate the transfer sequence. The automatic transfer switch shall start the engine-generator) after a specified time delay to permit override of momentary dips in the normal power source.
- B. The automatic transfer switch shall transfer the load from normal to the standby power source when the frequency and voltage of the engine-generator(s) have attained the specified percent of rated value.
- C. Engine Start: A voltage decrease, at any automatic transfer switch, in one or more phases of the normal power source to less than the specified value of normal shall start the engine-generator(s) after a specified time delay.
- D. Retransfer to Normal (All Loads): Automatic transfer switches shall retransfer the load from the Standby Power Source to normal source upon restoration of normal supply in all phases to the specified percent or more of normal voltage, and after a specified time delay. Should the emergency source fail during this time, the automatic transfer switches shall immediately transfer to the normal source whenever it becomes available. After restoring to normal source, the engine-generator shall continue to run unloaded for a specified interval before shut-down.
- E. Exercise Mode: Transfer to emergency power source shall be accomplished by remote manual test switches on a selective basis.

## 2.3 BYPASS/ISOLATION SWITCH

- A. Provide each automatic transfer switch with two-way bypass/isolation manual type switch. The bypass-isolation switch shall permit load bypass to either normal or emergency power source and complete isolation of the automatic transfer switch, independent of transfer switch position. Bypass and isolation shall be possible under all conditions including when the automatic transfer switch is removed from service.
- B. Operation: The bypass/isolation switch shall have provisions for operation by one person through the movement of a maximum of two handles at a common dead front panel in no more than 15 seconds. Provide a lock, which must energize to unlock the bypass switch, to prevent bypassing to a dead source. Provide means to prevent simultaneous connection between normal and emergency sources.
  - 1. Bypass to normal (or emergency): Operation of bypass handle shall allow direct connection of the load to the normal (or emergency) source, without load interruption or by using a break-before-make design, or provide separate load interrupter contacts to momentarily interrupt the load.

- a. Ensure continuity of auxiliary circuits necessary for proper operation of the system.
  - b. A red indicating lamp shall light when the automatic transfer switch is bypassed.
  - c. Bypassing source to source: If the power source is lost while in the bypass position, bypass to the alternate source shall be achievable without re-energization of the automatic transfer switch service and load connections.
2. Isolation: Operation of the isolating handle shall isolate all live power conductors to the automatic transfer switch without interruption of the load.
    - a. Interlocking: Provide interlocking as part of the bypass/isolation switch to eliminate personnel-controlled sequence of operation, and to prevent operation to the isolation position until the bypass function has been completed.
    - b. Padlocking: Include provisions to padlock the isolating handle in the isolated position.
    - c. Visual verification: The isolation blades shall be visible in the isolated position.
  3. Testing: It shall be possible to test (normal electrical operation) the automatic transfer switch and engine-generator(s) with the isolation contacts closed and the load bypassed without interruption of power to the load.
- C. Ratings: The electrical capabilities and ratings of the bypass/isolation switch shall be compatible with those of the associated automatic transfer switch.
  - A. Include the following functions for indicated automatic transfer switches:
    1. Indication of sources available, as defined by actual pickup and dropout settings of automatic transfer switch controls.
    2. Indication of switch position.
    3. Indication of switch in test mode.
    4. Indication of failure of digital communication link.
    5. Key-switch or user-code access to control functions of panel.
    6. Control of switch-test initiation.
    7. Control of switch operation in either direction.
    8. Control of time-delay bypass for transfer to normal source.
  - B. Malfunction of control system or communication link shall not affect functions of automatic transfer switches. Automatic transfer-switch sensing, controlling, or operating functions shall not depend on remote panel for proper operation.

C. Control system shall include the following features:

1. Controls and indicating lights grouped together for each transfer switch.
2. Label each indicating light control group. Indicate the transfer switch it controls, the location of switch, and the load that it serves.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the automatic transfer switch in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. A factory-authorized service representative is required to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.

1. Following completion of automatic transfer switch installation and after making proper adjustments and settings, site tests shall be performed by the manufacturer's representative in accordance with manufacturer's written instructions to demonstrate that each automatic transfer switch functions satisfactorily and as specified. Advise Contracting Officer's Representative/COR of the site testing within five days prior to its scheduled date, and provide certified field test reports within 14 days following successful completion of the site tests. Test reports shall describe adjustments and settings made and site tests performed. Minimum operational tests shall include the following:
  - a. Insulation resistance shall be tested, both phase-to-phase and phase-to-ground.
  - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
  - c. Verify that manual transfer warnings are properly placed.
  - d. Perform manual transfer operation.
2. After energizing circuits, demonstrate the interlocking sequence and operational function for each automatic transfer switch at least three times.
  - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
  - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
  - c. Verify time-delay settings.
  - d. Verify pickup and dropout voltages by data readout or inspection of control settings.

- e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, re-transfer time delay on restoration of normal power, and engine cool-down and shut-down.

3.3 DEMONSTRATION

- A. At the final inspection in the presence of Contracting Officer's Representative/COR, demonstrate that the complete auxiliary electrical power system operates properly in every respect.

3.4 TRAINING

- A. Furnish the services of a competent, factory-trained engineer or technician for one 4-hour period to instruct VA personnel in the operation and maintenance of the equipment, including review of the operation and maintenance manual, on a date requested by the Contracting Officer's Representative/COR. Coordinate this training with that of the generator training.

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