

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

PART 1 PRODUCTS

1.01 PRODUCT DESCRIPTION

- A. The ZTS-MVD Medium Voltage Automatic Transfer Switch will transfer to alternate / emergency source in the event of any disruption of the commercial / normal source. The ZTS-MVD shall utilize microprocessor based controller (MX250) to perform sensing and controlling.. Microprocessor controller shall monitor the normal source, and if the voltage and frequency fall outside of set parameters then the microprocessor shall initiate the starting of the alternate source. The microprocessor shall command the opening of the normal source breaker and the subsequent closing of the alternate source breaker once the alternate source is above the set voltage and frequency.
- B. Transfer to alternate source and back to normal source upon return shall be either in open or closed (< 100 ms) transition. Output of the microprocessor controller shall be applied to two medium voltage vacuum circuit breakers to perform the transition operation in either open or closed transition transfer. Microprocessor controller shall also be capable of transferring to alternate source and back to normal source through local or remote test command.
- C. The Microprocessor controller and the low voltage ATS shall be sourced from the same manufacturer.

1.02 MANUFACTURER

- A. General Electric Company products have been used as the basis for design.

1.03 EQUIPMENT

- A. Furnish GE Zenith Type ZTS-MVD.

1.04 COMPONENTS

- A. Refer to Contract Drawings for actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; interrupting and withstand ratings of devices, buses, and components; and other required details.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

B. Medium Voltage Switchgear

1. The automatic switchgear shall be rated for a line voltage of [4,160V] [12,000V] [13,800V], 3 phase, 3 wire, 60 Hertz with a maximum ampere rating of 1200A, interrupting class rating of 250MVA for 5kV(500MVA for 15kV).
2. Comply with ANSI / IEEE C37.20.2, C37.04 and C37.06
3. Comply with NPFA 70-1999 National Electrical Code
4. Comply with NEMA SG-4 and SG-5.
5. Comply with ANSI / IEEE C57.13 for instrument transformers.
6. Circuit breaker shall be three pole, single throw, electrically operated, draw-out mounting units using three individually mounted Vacuum Interrupter modules, which includes contact wear indicator, position indicator, manual open & close push-button, manual charge mechanism, electrical charge / close coils (120V AC), trip coil (Capacitor trip 120V AC), 6 form a, b auxiliary contacts, manual levering mechanism.
7. Bus bars shall be silver plated copper insulated with flame retardant epoxy coat. Bus bar supports shall be Polyester Glass insulators.
8. The current rating shall be a 24-hour continuous rating when enclosed and shall conform to NEMA temperature rise standards.
9. The full load and thermal rating of the unit shall be based on all classes of loads.

C. Sequence of Operation

1. The ATS shall incorporate adjustable three phase under and over-voltage and three phase under and over-frequency sensing on the normal source.
2. When the voltage of any phase of the normal source is reduced to 80% or exceeds 110% nominal voltage, or frequency is displaced 2Hz from nominal, for a period of 0-10 seconds (programmable) a pilot contact shall close to initiate starting of the engine generator.
3. The ATS shall incorporate adjustable three phase under and over-voltage and three phase under and over-frequency sensing on the emergency source.
4. When the emergency source has reached a voltage value within +/- 10% of nominal and achieved frequency within +/- 5% of the rated value, the load shall be transferred to the emergency source after a programmable time delay.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

5. When the normal source has been restored to not less than 90% of rated voltage on all phases, the load shall be retransferred to the normal source after a time delay of 0 to 30 minutes (programmable). The generator shall run unloaded for 5 minutes (programmable) and then automatically shut down. The generator shall be ready for automatic operation upon the next failure of the normal source.
6. If the engine generator should fail while carrying the load, retransfer to the normal source shall be made instantaneously upon restoration of proper voltage (90%) on the normal source.
7. Inspection and operational tests shall be conducted by the contractor in the presence of an engineer, to ensure that the switch satisfies the specifications.
8. The transfer switch shall be equipped with a microprocessor based control panel. The control panel shall perform the operational and display functions of the transfer switch. The display functions of the control panel shall include ATS position and source availability.
9. The digital display shall be accessible without opening the enclosure door and shall be provided with a 4 line by 20 character LCD display screen with touch pad function and display menus. The programming functions shall be pass code protected.
10. The control panel shall be provided with menu driven display screens for transfer switch monitoring, control and field changeable functions and settings.
11. The control panel shall be opto-isolated from electrical noise and provided with the following inherent control functions and capabilities:
 - a. Multipurpose display for continuous monitoring and control of the ATS functions and settings. All field changeable functions shall be pass code protected and accessible through the keypad.
 - b. Built-in diagnostic display to assure ease of troubleshooting by displaying historical data, such as number of transfers and time on emergency power source.
 - c. External communication via a Modbus network interface.
 - d. Touch pad test switch with Fast Test/Load/No Load positions to simulate a normal source failure.
 - e. Field programmable (0-10 seconds) time delay to override momentary normal source failure prior to engine start Factory set at 3 seconds.
 - f. Programmable time delay (0-60 minutes, adjustable by increments of 0.1 minute) to retransfer to normal source. If the emergency source fails during the retransfer time delay, the

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

transfer switch controls shall automatically bypass the time delay and immediately retransfer to the normal position.

- g. Programmable time delay (0-5 minutes) to transfer to the emergency source. Factory set at 1 second.
 - h. Programmable time delay (0-2 minutes) to transfer in either direction in the center-off open position is programmable Factory set at 5 seconds.
 - i. Terminals for remote test/peak shave operation and transfer inhibit to the emergency source.
 - j. Auxiliary contacts (1 N.O.) shall be provided to indicate normal and emergency source availability.
 - k. A load/no load clock exerciser shall be incorporated within the microprocessor and shall be programmable to start the engine generator set and transfer the load (when selected) for exercise purposes on a weekly basis. The exerciser shall contain a lithium battery for memory retention during an outage.
 - l. An adjustable timed auxiliary contact (1 N.C.; 0-60 seconds) shall be provided to allow motor loads to be disconnected prior to transfer in either direction.
 - m. Provide a momentary pushbutton to bypass the time delays on transfer and retransfer
 - n. Provide a programmable commit/no commit control logic.
12. The load shall be protected by a 3 phase overcurrent relay.
- a. SR350 or SR750 or SR489 per contract drawing: Provide GE Multilin Microprocessor based digital protective relay with associated CT's and heavy duty lock out relay to trip source breakers in the event of a fault. Protective relays shall have the following features: Phase, Neutral, Ground TOC / IOC ANSI / IEC flex curves for over current protection. Under voltage, over voltage, frequency, breaker failure, digital inputs / outputs and dual setting groups
 - b. GE Multilin protective relays shall have monitor RMS values – Voltage, Current, Power, PF and Frequency as minimum. Relay shall have the ability to connect to BAS / SCADA via Modbus RTU over RS485.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

D. Construction and Performance

1. The automatic transfer switch shall be arranged for single throw operation using a reliable operating mechanism.
2. The power unit shall utilize two (stationary draw-out) (5KV or 15KV) vacuum circuit breakers interlocked for safe and reliable operation. Control power to operate the transfer switch shall come from the source to which the switch is transferring.
3. All coils, relays timers, and accessories shall be readily front accessible, and isolated by grounded metal barriers from all high voltage primary devices.
4. The switch shall be mounted in a suitable NEMA enclosure to meet application requirements as indicated on the plans.
5. Transfer switchgear for MVD applications to comply with ANSI/IEEE spec C37 and NEMA spec SG5.
6. Provide a third-party certification stating that the automatic transfer switch is approved for use in Emergency Systems as defined by the National Electric Code Article 700.
7. Interconnecting bus shall be silver-plated copper, insulated by flame retardant, non-hygroscopic, fluidized bed epoxy.
8. Where drawout breakers are specified, the drawout mechanism shall be operable with the breaker doors closed. Shutters shall cover the primary stabs when the breaker is withdrawn from the Connect position.

E. BILL OF MATERIAL (ZTS-MVD).

SPECIFIER NOTES

1. Specify higher pickup and dropout settings on normal sensing, as required.
2. Consult factory for additional protective relaying requirements, additional options, or other special needs.
3. ZTS-MVD

The system shall contain the following basic equipment and any additional components necessary to provide a complete and dependable system.

- a. 1 Enclosure type NEMA 1 (95"H x 72"W x 92"D); NEMA-3R (109"H x 72"W x 99.5"D)
- b. 2 volt amp vacuum breakers, electrically interlocked

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

- c. 2 Draw out trunions with two potential transformers, ratio as required (utility and generator sides)
- d. 2 Potential transformer
- e. 2 Three phase over-current relay, industrial grade with CT's
- f. 1 Transfer control panel, complete with necessary control relays, voltage sensing relays, etc., to contain the following accessories:
- g. 1 A1 Auxiliary contact: Normal available (SPDT)
- h. 1 A1E Auxiliary contact: Emergency available (SPDT)
- i. 1 A3 Auxiliary contact: Closed in emergency
- j. 1 A4 Auxiliary contact: Closed in normal
- k. 1 A6 Auxiliary contact: Pre-transfer control circuit disconnect with adjustable time delay
- l. 1 C/D Engine exercise clock load/no load
- m. 1 E Engine start contact
- n. 1 J2E Over/under frequency sensor: Emergency source
- o. 1 J2N Over/under frequency sensor: Normal source
- p. 1 L1 Indicating light: Emergency position
- q. 1 L2 Indicating light: Normal position
- r. 1 L3 Indicating light: Normal available
- s. 1 L4 Indicating light: Emergency available
- t. 1 P1 Adjustable time delay to engine start
- u. 1 Q2 Area protection/Remote test connection
- v. 1 Q3 Input for inhibit transfer to emergency
- w. 1 R1 Over-voltage sensing: Normal
- x. 1 R8 Over-voltage sensing: Emergency

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

y.	1	R16	Phase sequence sensing
z.	1	R17	Under-voltage sensing: Emergency (3 phase)
aa.	1	T	Adjustable time delay to retransfer to norm
bb.	1	U	Adjustable time delay to engine cool-down
cc.	1	W	Adjustable time delay to transfer to emergency
dd.	1	YEN	Pushbutton bypass of T & W timers

1.05 FINISH

- A. All steel surfaces shall be chemically cleaned prior to painting.
- B. Exterior paint color shall be ANSI 61 Light Gray polyester powder paint applied electrostatically.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

PART 2 GENERAL

2.01 SECTION INCLUDES

- A. Medium Voltage Automatic Transfer Equipment

2.02 SUBMITTALS

- A. Manufacturer shall provide [4] copies of the following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:

1. Product Data on specified product;
 - a. Rated capacities, Operating Characteristics, Furnished specialties and accessories for individual circuit breakers,
 - b. Technical data on features, performance, electrical characteristics, ratings, factory settings, time-current characteristic curve for protective relays, over-current devices and finishes
 - c. Description of sequence of operation of automatic transfer switch.
2. Shop Drawings on specified product; dimensioned plans, elevations, sections and details including required clearances and service space around equipment.
 - a. Outline and general arrangement drawing showing dimensions, shipping sections and weights of each assembled sections.
 - b. Drawing of cable termination compartments showing preferred location of conduits and indicating space available for cable terminations.
 - c. Floor plan drawing showing location of anchor bolts and leveling channel.
 - d. Name plate legends
3. Trip curves for each specified product.
4. Wiring Diagrams: For each type of switchgear and related equipment, include the following:
 - a. Power, control and signal wiring
 - b. Three line diagrams of power and future secondary circuits showing devise terminal numbers and internal diagrams.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

- c. Schematic control diagrams. Diagrams showing connections of component devices and equipment.

2.03 INSTALLATION, OPERATION AND MAINTENANCE DATA

- A. Manufacturer shall provide [4] copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.
 - 1. Manufacturer's written instruction of sequence of operations.
 - 2. Manufacturer's written instructions for testing and adjusting relays and over-current protective devices.
 - 3. Manufacturer's written instruction of installation and interconnect interface with other equipment / devices.
 - 4. Manufacturer's written instruction of Microprocessor Controller set up, calibration, adjustment and test.

2.04 QUALITY ASSURANCE (QUALIFICATIONS)

- 1. Installer Qualification: Engage a certified installer of medium voltage electrical distribution equipment to perform the installation specified in this section.
- 2. Manufacturer's Qualifications: Manufacture shall be member of NEMA, regularly engaged in manufacturing switchgear complying with the requirement in this specification.

2.05 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall store, protect, and handle products in accordance with recommended practices listed in the manufacturer's Installation and Maintenance Manuals.
- B. Sections shall be mounted on shipping skids and wrapped for protection.
- C. Contractor shall inspect and report concealed damage to carrier within 48 hours.
- D. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

- E. Contractor shall handle in accordance with the manufacturer's recommendations to avoid damaging equipment, installed devices, and finish. [Lift only by installed lifting eyes.]

2.06 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

- A. Follow (standards) service conditions before, during and after switchboard installation.
- B. Equipment shall be located in well - ventilated areas, free from excess humidity, dust and dirt, and away from hazardous materials. Ambient temperature of area shall be between minus 30 and plus 25 degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

2.07 WARRANTY

- A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

2.08 EXTRA MATERIALS

- A. Furnish extra materials as described below that match the products that are installed and packed with protective covering for storage.
 - 1. Fuses: 2 of each type and rating used.
 - 2. Indicating lamps: 2 of each type used.
 - 3. Touch Up paint: Two 0.5 pint can of paint matching enclosure finish.
- B. Maintenance Tools: Furnish tools and miscellaneous items required for switchgear test, inspection, maintenance and operation. Include the following:
 - 1. Fuse Puller
 - 2. Extension rails, lifting device, transport or dockable trolley and all other items necessary to remove the circuit breaker from housing. and transport.
 - 3. Racking handle to move circuit manually between connect and test / disconnect positions.
 - 4. Manual charge handle.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

2.09 FIELD MEASUREMENTS

- A. Contractor shall make all necessary field measurements to verify that equipment shall fit in the allocated space in full compliance with minimum required clearances as specified in the National Electrical Code standard.

PART 3 EXECUTION

3.01 FACTORY TESTS

- 1. Automatic transfer switch shall be fully tested before the shipment with temporary connections to ensure proper operation of the equipment.

3.02 EXAMINATION

- A. The following procedures shall be performed by the Contractor.
 - 1. Examine installation area to assure there is enough clearance to install switchboard.
 - 2. Check concrete pads for uniformity and level surface.
 - 3. Verify that the equipment is ready to install.
 - 4. Verify field measurements are as [{shown on Drawings}] [instructed by manufacturer]].
 - 5. Verify that required utilities are available, in proper location and ready for use.
 - 6. Beginning of installation means installer accepts conditions.

3.03 LOCATION: Indoor or Outdoor (NEMA-3R), Rear Access required.

3.04 INSTALLATION

Additional provisions and editing may be required for this part.

SECTION 16xxx: MEDIUM VOLTAGE AUTOMATIC TRANSFER SWITCH

- A. Installation shall be performed by the Contractor.
 - 1. Install per manufacturer's instructions.
 - 2. Install required safety labels.
- 3.05 START-UP SERVICE
- A. Provide a qualified service engineer to assist in the following:
 - 1. Pre-installation meeting with the contractor, engineer and other related personnel to coordinate the installation, interconnection of all related equipment and start-up requirements.
 - 2. Start-up of the system with complete testing.
 - 3. Four (4) hours of on-site training for operating personnel.

END OF SECTION