Guide Specification
Model ETGSE Automatic Transfer Switch

PART 1 – GENERAL

1.1 Scope

A. It is the intent of this specification to secure a automatic transfer switch that has been prototype tested, factory built, production tested and site tested that can be applied to installations requiring fully rated Service Entrance equipment. A transfer switch with the number of poles, voltage and current ratings shown on the plans and specified herein shall be provided.

1.2 Codes and Standards

A. The automatic transfer switch shall conform to the requirements of:

1. UL 1008: Underwriters Laboratories standard for automatic transfer switches
2. CSA: C22.2 No. 178 certified
3. IEC: 947-6-1 at 480 VAC
4. NFPA 70: National Electrical Code including use in emergency and standby systems in accordance with Articles 517, 700, 701, 702
5. NFPA 99: Essential electrical systems for health care facilities
6. NFPA 101: Life safety code
7. NFPA 110: Standard for emergency and standby power systems
8. IEEE 241: I.E.E.E. recommended practice for electrical power systems in commercial buildings
9. IEEE 446: I.E.E.E. recommended practice for emergency and standby power systems
10. NEMA ICS10: AC automatic transfer switch equipment
11. UL 50/508: Enclosures
12. ICS 6: Enclosures
13. ANSI C33.76: Enclosures
14. NEMA 250: Enclosures
15. IEEE 472: (ANSI C37.90A): Ringing wave immunity
16. EN55022 (CISPR22): Conducted and radiated emissions (Exceeds EN55011 & MILSTD 461 Class 3)
17. EN61000-4-2: (Level 4): ESD immunity test Class B (Level 4)
18. EN61000-4-3: (ENV50140): Radiated RF, electromagnetic field immunity
19. EN61000-4-4: Electrical fast transient/burst immunity test
20. EN61000-4-5: IEEE C62.41: Surge immunity test (1.2 x 50µs, 0.5 to 4 kV)
21. EN61000-4-6: (ENV50141): Conducted immunity test
22. EN61000-4-11: Voltage dips and interruption immunity
23. UL 869A: Underwriters Laboratories reference standard for Service equipment.
24. UL 891: Underwriters Laboratories standard for Dead-Front Switchboard applications.
25. UL1449: Underwriters Laboratories standard for Surge Suppressors

1.3 Approved Manufactures

A. The automatic transfer switch shall be as manufactured by Enercon Model ETGSE. Alternate manufactures shall submit a request two weeks prior to bid and include a written list of deviations from this specification to be considered for approval.

PART 2 – PRODUCTS

2.1 Performance and Construction

A. The automatic transfer switch shall be of double throw construction operated by a reliable solenoid driven mechanism. There shall be a direct mechanical coupling to facilitate transfer in 6 cycles or less.

B. The normal and emergency contacts shall be mechanically interlocked such that failure of any coil or disarrangement of any part shall not permit a neutral position.

C. For switches installed in systems having ground fault protective devices, and/or wired so as to be designated a separately derived system by the NEC, a 4th pole shall be provided. This additional pole shall isolate the normal and emergency neutrals. The neutral pole shall have the same withstand and operational ratings as the other poles and shall be arranged to break last and make first to minimize neutral switching transients. Add-on or accessory poles that are not of identical construction and withstand capability will not be considered.

D. The contact structure shall consist of a main current carrying contact, which is a silver alloy with a minimum of 50% silver content. The current carrying contacts shall be protected by silver tungsten arcing contacts on all sizes above 400 Amps.

E. The transfer switch manufacturer shall submit test data for each size switch, showing it can withstand fault currents of the magnitude and the duration necessary to maintain the system integrity. Minimum UL listed withstand and close into fault ratings shall be as follows:

Size (Amps)	Coordinated Breaker	Any Breaker	Current Limiting Fuse
40 - 225	30,000	10,000	200,000
260	35,000	10,000	200,000
400 – 600	50,000	35,000	200,000
800	65,000	50,000	200,000
1000 - 1200	85,000	50,000	200,000
1600 – 2000	100,000	65,000	200,000
2600 - 3000	100,000	100,000	200,000

F. A dielectric test at the conclusion of the withstand and closing tests shall be performed.

G. The automatic transfer switch manufacturer shall certify sufficient arc interrupting capabilities for 50 cycles of operation between a normal and emergency source that are 120 degrees out of phase at 480 volts, 600% of rated current at .50 power factor. This certification is to ensure that there will be no current flow between the two isolated sources during switching.

H. All relays shall be continuous duty industrial type with wiping contacts. Coils, relays, timers and accessories shall be readily front accessible. The control panel and power section shall be interconnected with a harness and keyed disconnect plugs for maintenance.

I. Main and arcing contacts shall be visible without major disassembly to facilitate inspection and maintenance.

J. A manual handle shall be provided for maintenance purposes with the switch de-energized. An operator disconnect switch shall be provided to defeat automatic operation during maintenance, inspection or manual operation.

K. Switches composed of molded case breakers, lighting contactors or components thereof will not be acceptable.

L. The current rating shall be a continuous rating when the switch is installed in an enclosure, and shall conform to NEMA temperature rise standards.

M. The unit shall be rated based on all classes of loads, i.e., resistive, tungsten, ballast and inductive loads. Switches rated 400 amperes or less shall be UL listed for 100% tungsten lamp load.

N. Temperature rise tests in accordance with UL 1008 shall have been conducted after the overload and endurance tests to confirm the ability of the units to carry their rated currents within the allowable temperature limits.

O. Unless specified otherwise on the drawings, the switch shall be mounted in a NEMA 1 enclosure.

2.2 Control

A. The control panel shall be opto-isolated from electrical noise and provided with the following inherent control functions and capabilities:

1. Easy-to-view 4x20 LCD display with long lasting LED indicators.
2. Control panel shall display voltage and frequency of both sources.
3. The user shall be able to view the last 16 recorded events.
4. Capability for external communication and network interface.
5. Adjustments to all settings shall be made from the front of the panel without opening the door.

B. 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, source availability, sequence indication and diagnostics.

C. All programmable and control functions shall be pass code protected and accessible through the keypad.

D. The control panel shall be provided with a simple user interface for transfer switch monitoring, control and field changeable functions and settings.

E. Touch pad test switch with Fast Test/Load/No Load selection capability to simulate a normal source failure.

F. The controller shall provide digital timer adjustments with 1-second resolution. Voltage and Frequency shall be adjustable to 1% resolution to facilitate accurate transfer.

G. To ensure reliable and consistent user operation the controls must be equipped with nonvolatile memory and allow automatic daylight savings time adjustment.

H. The automatic transfer switch must be equipped with a solenoid protection scheme that removes any attempts of operating the solenoids after (3) consecutive trials until manual intervention by an operator.

2.3 Disconnecting and Overcurrent Protection

A. The Transfer System shall be service entrance rated with the normal connection supplied with a fully rated molded case circuit breaker, 2 or 3 pole as specified on the drawings.

B. For equipment of 1000 amps and above, the normal connection shall be fitted with a fully rated insulated case circuit breaker capable of providing Long-Time, Short-Time, Instantaneous, and Ground Fault protection as required.

C. All NEMA 3R rated transfer switches shall be secure and protected from the elements. The main building disconnect shall be opened via a keyed selector switch from the front of the enclosure. This switch shall also prevent the transfer switch from starting and transferring to emergency power. An indicating lamp will illuminate the position of this selector. Those switches using a double door design shall not be acceptable.

PART 3 – OPERATION

3.1 Sequence of Operation

A. The Automatic Transfer Switch shall incorporate adjustable three phase under voltage sensing on the normal source.

B. When the voltage of any phase of the normal source is reduced to 80% of nominal voltage, for a period of 0-10 seconds (programmable) a pilot contact shall close to initiate starting of the engine generator.

C. The ATS shall incorporate adjustable under voltage and under frequency sensing on the emergency source.

D. When the emergency source has reached a voltage value of 90% of nominal and achieved frequency within 95% of the rated value, the load shall be transferred to the emergency source after a programmable time delay.

E. 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 60 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.

F. 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.

3.2 Standard Accessories

A. Adjustable time delay to override momentary normal source failure prior to engine start. Field programmable 0-10 seconds factory set at 3 seconds.

B. Adjustable time delay on retransfer to normal source, programmable 0-60 minutes factory set at 30 minutes. If the emergency source fails during the retransfer time delay, the transfer switch controls shall automatically bypass the time delay and immediately retransfer to the normal position.

C. A time delay on transfer to emergency, programmable 0-5 minutes, factory set at 1 second.

D. An in-phase monitor shall be provided. The monitor shall compare the phase angle difference between the normal and emergency sources and be programmed to anticipate the zero crossing point to minimize switching transients.

E. An exerciser timer with momentary test pushbutton shall be incorporated within the microprocessor and shall be capable of starting the engine generator set and transferring the load (when selected) for exercise purposes on a daily, weekly or monthly basis. The exerciser shall contain a battery for memory retention during an outage.

F. Provide a momentary pushbutton to bypass the time delays on transfer and retransfer and programmable commit/no commit control logic.

G. The controller shall accept a remote peak shave or test input to signal the transfer switch to the emergency position.

H. A set of customer contacts shall be provided to indicate both emergency and normal source position.

The following optional Exerciser Package shall be included ***(specifier to select)***:

A. Additional Auxiliary Contact (A3) - Closed when the transfer switch is in Source 2 position.

B. Additional Auxiliary Contact (A4) - Closed when the transfer switch is in Source 1 position.

C. Programmable Clock Exerciser (CDP) – This will replace the timer exerciser and allow for a 365 day cycle.

D. Voltage Imbalance Monitor (VI) - Three Phase sensing shall detect an imbalance and initiate a transfer to the alternate source. Adjustable 5-20% of nominal with a time delay of 10-30 seconds for nuisance conditions.

The following additional accessories shall be included ***(specifier to select)***:

A. Heater and Thermostat (HT) – Recommended for NEMA 3R applications.

B. Elevator pre-signal (T3/W3) – Contact Opens 0-60 seconds prior to transfer in either direction, re-closes after transfer.

C. Universal Motor Load Disconnect (UMD) - Auxiliary contacts opens 0 – 5 minutes prior to transfer in either direction, re-closes after transfer. Can be configured for pre-transfer, post transfer or both.

D. Sequential Universal Motor Load Disconnect (A62) – Multiple auxiliary contacts open prior to transfer in either direction, re-closes after transfer. Can be configured for pre-transfer, post transfer or both.

E. Communications interface card (ENETM) – RS-485 Modbus

F. Test Switch (6A) - Maintained

G. Digital Meter (M80) - Measures and displays true RMS volts, amps and frequency in a three-phase power system.

I. Digital Multifunction Power and Energy Meter:

Furnish Digital Multifunction Power and Energy Meters at locations shown to monitor all functions specified below.

A. The Digital Multifunction Power and Energy meter shall be UL, cUL and CE marked.

B. Power meter shall be able to be stored in -40 to +85°C.

1. Operating temperature shall be -30 to +70°C.

2. NEMA 12 faceplate rating shall be available for the Digital Multifunction Power and Energy meter.

C. The Digital Multifunction Power and Energy meter shall meet the accuracy requirements of IEC687 (class 0.2%) and ANSI C12.201 (class 0.2%). The meter shall have an accuracy of ± 0.1% or better for Volts and Amps, and 0.2% for Power and Energy functions.

1. The Digital Multifunction Power and Energy meter shall provide true RMS measurements of voltage, phase-to-neutral and phase-to-phase, current, per phase.

2. The Digital Multifunction Power and Energy meter shall provide sampling at 400+ samples per cycle on all channels measured readings simultaneously.

3. The Digital Multifunction Power and Energy meter shall utilize 24 bit Analog to Digital conversion.

4. The Digital Multifunction Power and Energy meter shall support power supply of 90 to 265 VAC, 100 to 370 VDC, and 50 to 60Hz.

5. Digital Multifunction Power and Energy meter power supply shall accept burden of 10VA max.

6. Digital Multifunction Power and Energy meter shall provide update rate of 100msec for Watts, VAR and VA. All other parameters shall be 1 second.

E. Digital Multifunction Power and Energy meter shall be designed for Multifunction Electrical Measurement on 3-phase power systems.

1. Digital Multifunction Power and Energy meter shall support 3-element wye, 2.5-element wye, 2-element delta, and 4-wire delta systems.

2. The Digital Multifunction Power and Energy meter shall accept universal voltage input.

3. Surge withstand shall conform to IEEE C37.90.1

4. The Digital Multifunction Power and Energy meter shall be user programmable for voltage range to any external potential transformer (PT) ratio.

5. Digital Multifunction Power and Energy meter shall accept a burden of up to 0.36VA per phase, Max at 600V, 0.014VA at 120 Volts.

6. The Digital Multifunction Power and Energy meter shall accept a voltage

input range of up to 416 Volts Line-to-Neutral, and a range of up to 721 Volts Line-to-Line without the use of external potential transformers (PTs).

F. Digital Multifunction Power and Energy meter shall use a dual input method for current inputs. Method one shall allow the current transformer (CT) to pass directly through the meter without any physical termination on the meter, ensuring the meter cannot be a point of failure on the CT circuit. The second method shall provide additional termination pass-through bars, allowing the CT leads to be terminated on the meter. The meter shall support both termination methods.

1. *Digital Multifunction Power and Energy meter fault current withstand shall be 100 Amps for 10 seconds, 300 Amps for 3 seconds, and 500 Amps for 1 second.*
2. *Digital Multifunction Power and Energy meter shall be programmable for current to any CT ratio. DIP switches or other fixed ratios shall not be acceptable*
3. *Digital Multifunction Power and Energy meter shall accept burden of 0.005VA per phase, Max. at 11 Amps.*
4. *Digital Multifunction Power and Energy meter shall begin reading at a 5mA pickup current.*
5. *Pass through wire gauge dimension of 0.177"/4.5 mm shall be available.*
6. *All inputs and outputs shall be galvanically isolated to 2500 VAC.*
7. *The Digital Multifunction Power and Energy meter shall accept current inputs of class 10: (0 to 11Amp), 5 Amp Nominal Secondary, and class 2: (0 to 2Amp), 1 Amp Nominal Secondary.*

G. All Digital Multifunction Power and Energy meter parameter settings shall be stored in non-volatile memory and retained in the event of a control power interruption to the meter.

1. *Parameter settings shall be password protected.*
2. *Password shall be 4-digit user selectable.*

H. Digital Multifunction Power and Energy meter shall include 2 independent communications ports, with one in the back and one at the faceplate, standard. Meters with external communication modules for the functions described below are not acceptable.

1. One port shall provide RS485, half-duplex, open communication protocol using Modbus ASCII/RTU, and DNP 3.0 through the meter back plate. Port shall be capable of interfacing to a master communications network to allow for information to be sent and received by a remote location for display, analysis, logging and control functions. Port shall be capable of interfacing to 3rd party Modbus slave module(s).
2. Baud rates shall be user selectable from 9,600 baud to 57,600 baud.
3. Second port shall provide an optical IrDA interface (through faceplate) open communication protocol using Modbus ASCII. IrDA port shall allow the unit to be set up and programmed using a remote laptop without need for a communication cable.

4. Digital Multifunction Power and Energy meter shall have 8-bit, No parity default communication parameters (field adjustable).

I. Digital Multifunction Power and Energy meter shall include a 3-line, bright red, 0.56" LED display. Externally mounted displays shall not be acceptable.

1. The Digital Multifunction Power and Energy meter shall fit in both DIN 92mm and ANSI C39.1 round cutouts.

2. The Digital Multifunction Power and Energy meter must display a % of Load Bar on the front panel to simulate an analog display. The % Load bar shall have not less than 10 segments.

3. The Digital Multifunction Power and Energy meter shall communicate using Modbus TCP/IP using and external Ethernet connectivity module. Module to interface to meter RS485 port located on the meter back plate. This connection shall allow for monitoring of metered readings, event logs, and status inputs, as well as control of status outputs and set point acknowledgements. Ethernet connectivity module shall interface to 3rd party applications.

J. Digital Multifunction Power and Energy meter shall include virtual measurement upgrade packs, which shall allow user to future upgrade in the field without removing installed meter.

1. Virtual upgrade packs must be able to be updated without physically removing the installed meter.

2. Digital Multifunction Power and Energy meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.

K. Digital Multifunction Power and Energy meter shall provide user configured fixed window or rolling window demand. This shall allow user to set up the particular utility demand profile.

1. Readings for kW, kVAR, kVA and PF shall be calculated using utility demand features.

2. All other parameters shall offer max and min capability over the user selectable averaging period.

3. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag measured by the meter.

L. The Digital Multifunction Power and Energy meter shall have a standard 1-year warranty.

M. The following metered readings shall be viewable from the Digital Multifunction Power and Energy meter front faceplate. All readings shall provide indication of which source is being measured.

1. Voltage, phase-to-phase and phase-to-neutral (real time, maximum, and minimum)

2. Current, per phase (real time, average, maximum, and minimum)

3. Real power (Watts), 3-phase total (real time, average, maximum, and minimum)
4. Apparent power (VA), 3-phase total (real time, average, maximum, and minimum)
5. Reactive power (VAR), per phase and 3-phase total (real time, average, maximum, and minimum)
6. Power factor (PF), per phase and 3-phase total (real time, average, maximum, and minimum)
7. Frequency (real time, maximum, and minimum)
8. Positive Watt-Hours (Wh), real time
9. Negative Watt-Hours (Wh), real time
10. Net Watt-Hours (Wh), real time
11. Positive VAR-Hours (VARh), real time
12. Negative VAR-Hours (VARh), real time
13. Net VAR-Hours (VARh), real time
14. Voltage % Total Harmonic Distortion (THD), phase-to-neutral (real time, maximum, and minimum)
15. Current % Total Harmonic Distortion (THD), per phase (real time, maximum, and minimum)
16. Current phase angle (degrees), per phase (real time)
17. Voltage phase angle (degrees), phase-to-phase (real time)
18. % of Load Bar (simulates an analog display with no less than 10 segments)

I. The following metered readings shall be communicated over the Digital Multifunction Power and Energy meter communications network interface using Modbus protocol:

1. Meter name

2. Meter serial number
3. Meter software firmware version
4. Modbus Map version
5. Meter configuration
6. Meter status
7. Time since meter reset
8. Voltage, phase-to-phase and phase-to-neutral (real time, maximum, and minimum)
9. Current, per phase (real time, average, maximum, and minimum)
10. Current average demand, per phase (minimum, maximum)
11. Real power (Watts), 3-phase total (real time, average, maximum, and minimum)
12. Real Power (Watts) average (minimum, maximum) demand, three phase (positive, negative)
13. Apparent power (VA), 3-phase total (real time, average, maximum, and minimum)
14. Apparent Power (VA) average (minimum, maximum) demand, three phase (minimum)
15. Reactive power (VAR), per phase and 3-phase total (real time, average, maximum, and minimum)
16. Reactive Power (VAR) average (minimum, maximum) demand, three phase (positive, negative)
17. Power factor (PF), per phase and 3-phase total (real time, average, maximum, and minimum)
18. Power Factor (PF) average (minimum, maximum) demand, three phase (positive, negative)
19. Frequency (real time, maximum, and minimum)
20. Watt-Hours (Wh), received, delivered, net, average, total
21. VAR-Hours (VARh), positive, negative, net, average, total
22. VA-Hours (VAh), average, total
23. Voltage % Total Harmonic Distortion (THD), phase-to-neutral (real time, maximum, and minimum)
24. Current % Total Harmonic Distortion (THD), per phase (real time, maximum, and minimum)

25. Current phase angle (degrees), per phase (real time)

26. Voltage phase angle (degrees), phase-to-phase (real time)

O. Displaying each of the Digital Multifunction Power and Energy meter quantities shall be accomplished through the use of menu scroll buttons.

P. For ease in operator viewing, the meter display shall remain on continuously, with no detrimental effect on the life of the Digital Multifunction Power and Energy meter.

Q. Programming configuration for system requirements shall be allowed from the front of the Digital Multifunction Power and Energy meter. Configuration mode shall be accessed through password protection. Configuration settings shall include:

1. CT primary and secondary rating (ppppp:s)

2. PT primary and secondary rating (ppppppp:sss)

3. System connection type (2.5-element wye, 3-element wye, 2-CT Delta)

4. Communication port address

5. Communication port baud rate (9600, 10200, 38400, 57600)

6. Communication port protocol (Modbus RTU, Modbus, ASCII, DNP 3.0)

R. Reset of all stored minimum and maximum electrical parameters shall be allowed from the front of the Digital Multifunction Power and Energy meter. Reset shall be accessed through password protection.

S. The Digital Multifunction Power and Energy meter shall have the ability to display entries from the Setup log on the LCD display. It shall also have the ability to clear the Setup log database from the display.

T. The Digital Multifunction Power and Energy meter shall have the ability to display entries from the Event log both locally on the LCD display and remotely over the communications interface. It shall also have the ability to clear the Event log database from the display.

M. All reset and setup functions shall have a means for protection against unauthorized/accidental changes using password protection.

J. Additional Auxiliary Contacts (A3) - Closed when the transfer switch is in Source 2 position.

K. Additional Auxiliary Contacts (A4) - Closed when the transfer switch is in Source 1 position.

L. Alarm panel (CTAP) – Alarm on transfer to emergency w/silence button & light

M. Disconnect Switch (DS) - Inhibits transfer in either direction when in inhibit. (Std on 800A and above)

N. Extended warranty (ATGEW) - annual parts and labor warranty (1-4 years for a

total of 5 years max.)

O. Protective Cover (OCVR) - Lockable see-through microprocessor and meters cover for NEMA 3R or 12.

P. Battery Charger (BC) – 12 volt or 24 volt 3 amp DC output with terminal block for easy customer connection.

Q. Surge Suppressor (TVSSN) – 100kA per mode, installed on Normal side of service (maximum quantity of two may be installed per system).

R. Surge Suppressor (TVSSE) – 100kA per mode, installed on Emergency side of service (maximum quantity of two may be installed per system).

S. Surge Suppressor (TVSSL) – 100kA per mode, installed on Load side of service (maximum quantity of two may be installed per system).

T. Shunt Trip External Disconnect (STS) – Keyed selector switch to disconnect service equipment, including annunciation light. Standard on NEMA 3R applications.

U. Circuit Breaker Auxiliary Contacts (BB) - Auxiliary contacts installed on main circuit breaker. Available in 1 Form C and 2 Form C options. Contact ratings: 5A @ 240 Vac / .5 A @125 Vdc.

V. Ground Fault Protection (GFP) - Ground Fault Protection on 800A and below rated equipment. Standard on 1000A and above.

W. Integral Load Center (LC) – 22 KAIC, max. 240 VAC load center panel installed. Available in single phase and three phase configurations.

PART 4 – EXECUTION

4.1 General

A. The transfer switch shall be installed as shown on the plans, in accordance with the manufacture's recommendations and all applicable codes.

4.2 Factory Tests

A. The transfer switch manufacturer shall perform a complete functional test on the switch, controller and accessories prior to shipping from the factory. A certified test report shall be available upon request.

4.3 Service

A. The manufacturer shall maintain a national service organization that is factory

trained and certified for transfer switch equipment. In addition, the service organization shall be available 24 hours per day, 365 days per year.

4.4 Warranty

A. The automatic transfer switch shall be warranted against defective workmanship for a period of one year, including both parts and labor. Extended warranties shall be available upon request or as specified herein.