

# SUGGESTED SPECIFICATION

For

## Series 300 Automatic Transfer Switches (3ATS)

### PART 1 GENERAL

#### 1.01 Scope

Furnish and install automatic transfer switches (3ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

#### 1.02 Acceptable Manufacturers

Automatic transfer switches shall be ASCO Series 300 (3ATS). Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification.

#### 1.03 Codes and Standards

The automatic transfer switches and accessories shall conform to the requirements of:

- A. UL 1008 - Standard for Automatic Transfer Switches
- B. CSA C22.2 No.178 – 1978
- C. NFPA 70 - National Electrical Code
- D. NFPA 99 – Health Care Facilities
- E. NFPA 110 - Emergency and Standby Power Systems
- F. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- G. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
- H. NEC Articles 700, 701, 702
- I. International Standards Organization ISO 9001: 2008
- J. IEC 60947 – 6 – 1

### PART 2 PRODUCTS

#### 2.01 Mechanically Held Transfer Switch

- A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include over current disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

- B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.
- E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- F. Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.
- G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

## **2.02 Group 'G' Controller with Integrated User Interface Panel**

- A. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.
- B. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, inherent serial communications capability, and the ability to communicate via the Ethernet through optional communications module
- C. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to  $\pm 1\%$  of nominal voltage. Frequency sensing shall be accurate to  $\pm 0.1\text{Hz}$ . Time delay settings shall be accurate to  $\pm 0.5\%$  of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to + 70 degrees C, and storage from -55 to + 85 degrees C.
- D. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards.
- E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
  1. IEEE C37.90
  2. IEC 60947 – 6 - 1, 61000-4
    - a. IEC 61000 – 4 - 2 Electrostatic Discharge Immunity
    - b. IEC 61000 – 4 - 3 Radiated RF Field Immunity
    - c. IEC 61000 – 4 - 4 Electrical Fast Transient/Burst Immunity

- d. IEC 61000 – 4 - 5 Surge Immunity
  - e. IEC 61000 – 4 – 6 Conducted RF Immunity
3. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

**2.03 Enclosure**

- A. The 3ATS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.
- B. Provide strip heater with thermostat for Type 3R enclosure requirements.
- C. Controller shall be mounted on, visible, and operational through enclosure door.

**PART 3 OPERATIONS**

**3.01 Controller Display and Keypad**

A. A 128\*64 graphical LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller.

- 1. Nominal line voltage and frequency
- 2. Single or three phase sensing on normal, and single phase sensing on emergency
- 3. Transfer operating mode configuration, (open transition, or delayed transition)

All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

**3.02 Voltage and Frequency Sensing**

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip settings capabilities (values shown as % of nominal unless otherwise specified).

<u>Parameter</u>	<u>Sources</u>	<u>Dropout/Trip</u>	<u>Pickup/Reset</u>
Undervoltage	N & E	70 to 98%	85 to 100%
Overvoltage	N & E	102 to 115%	2% below trip
Undervoltage	N & E	85 to 98%	90 to 100%
Overfrequency	N & E	102 to 110%	2% below trip

- B. Repetitive accuracy of all settings shall be within 1% at +25C
- C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.
- D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases, and frequency.

- E. The backlit 128\*64 graphical display shall have multiple language capability. Languages can be selected from the user interface.

### **3.03 Time Delays**

- A. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.
- B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.
- C. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.
- D. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
- E. A cooldown time delay shall be provided on shutdown of engine generator, Adjustable 0 to 60 minutes 59 seconds.
- F. All adjustable time delays shall be field adjustable without the use of special tools.
- G. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:
  - 1. Prior to transfer only.
  - 2. Prior to and after transfer.
  - 3. Normal to emergency only.
  - 4. Emergency to normal only.
  - 5. Normal to emergency and emergency to normal.
  - 6. All transfer conditions or only when both sources are available.
- H. In the event that the alternate source is not accepted within the configured Failure to Accept time delay, the common alert indication shall become active.
- I. The controller shall also include the following built-in time delay for delayed transition operation.
  - 1. A time delay for the load disconnect position for delayed transition operation adjustable 0 to 5 minutes 59 seconds.

### **3.04 Additional Features**

- A. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.

- B. A set of contacts rated 2 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down. setting, regardless of whether the normal source restores before the load is transferred.
- C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed when the ATS is connected to the emergency source.
- D. A single alarm indication shall light up the alert indicator and de – energize the configured common alarm output relay for external monitoring.
- E. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
- F. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.
- G. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.
- H. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).

***The following features shall be built – in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:***

- I. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- J. A variable window inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be equal to ASCO feature 27.
- K. An engine generator exercising timer shall be provided to configure weekly and bi-weekly automatic testing of an engine generator set with or without load for 20 minutes fixed. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.

***The following feature shall be built – into the controller, but capable of being activated through keypad programming, communications interface port, or additional hardware.***

- L. Terminals shall be provided for a remote contact to signal the ATS to transfer to emergency. This inhibit signal can be enabled through the keypad or serial port.
- M. System Status - The controller LCD display shall include a “System Status” screen which shall be readily accessible from any point in the menu by depressing the “ESC” key. This screen shall display a clear description of the active

operating sequences and switch position. For example,

**Normal Failed**  
**Load on Normal**  
**TD Normal to Emerg**  
**2min15s**

Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual are not permissible.

- N. Self Diagnostics** – The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- O. Communications Interface** – The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.). Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.
- P. Data Logging** – The controller shall have the ability to log data and to maintain the last 300 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non – volatile memory.

1. Event Logging

- 1. Data and time and reason for transfer normal to emergency
- 2. Data and time and reason for transfer emergency to normal
- 3. Data and time and reason for engine start
- 4. Data and time engine stopped
- 5. Data and time emergency source available
- 6. Data and time emergency source not available

2. Statistical Data

- 1. Total number of transfers
- 2. Total number of transfers due to source failure
- 3. Total number of day’s controller is energized
- 4. Total number of hours both normal and emergency sources are Available
- 5. Total time load is connected to normal
- 6. Total time load is connected to emergency
- 7. Last engine start
- 8. Last engine start up time
- 9. Input and output status

**4.01 Optional Features** *(The following section is optional and should be deleted if not required)*

**A. Accessory Package** - An accessory bundle shall be provided that includes:

- 1. A fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without load on a daily weekly, bi – weekly, or monthly basis.

2. Event log display that shows event number, time and date of events, event type, and reason (if applicable). A minimum of 300 events shall be stored.
3. RS – 485 communications port enabled.
4. Common alarm output contact.

(This feature shall be equal to ASCO accessory 11BE, and shall be capable of being activated for existing switches through optional accessory dongle).

- B. Controller Power Supply** - A backup power UPS shall be provided to allow controller to run for 3 minutes minimum without AC power. (This feature shall be equal to ASCO accessory 1UP, and shall be capable of being added to existing switches without modification).
- C. Expansion Module** - A relay expansion module (REX) is a standard feature when delayed transition transfer is specified. A REX module shall also be provided for open transition transfer that includes one form C contact for source availability of the normal (18G) and emergency (18B) sources. Additional output relay shall be provided to indicate a common alarm. The REX module shall have the capability of being daisy chained for multiple sets of contacts. (This feature shall be equal to ASCO accessory 18RX, and shall be capable of being added to existing switches without modification).
- D. Current Sensing Card** - A load current metering card shall be provided that measures either single or three phase load current. It shall include current transformers (CT's) and shorting block. Parameters shall be able to be viewed via the user interface. (This feature shall be equal to ASCO accessory 23GA (single phase), 23GB (three phase), and shall be capable of being added to existing switches without modification).
- E. Communication Interface** - A Quad – Ethernet module shall be provided to allow several different serial devices that communicate at different baud rates and with different protocols to a common Ethernet media. The module shall be used to connect Series 300 and ASCO ATS Annunciators to the standard Ethernet network. It shall include (2) RJ – 45, (2) RS – 485, (2) TTL, and (2) CAN ports. The module shall be designed to communicate with multiple clients such as Web Browsers, and *PowerQuest®* systems simultaneously over the Ethernet connection. (This feature shall be equal to ASCO accessory 72EE, and shall be capable of being added to existing switches without modification).
- F. Transfer Alarm** - An audible alarm with silencing feature shall be provided to signal each time transfer to emergency occurs. (This feature shall be equal to ASCO accessory 62W).
- G. Enclosure Heater** - A 125 watt enclosure heater with transformer and thermostat (adjustable from 30° to 140 ° F) shall be provided for outdoor installations where type 3R, 4, are specified. (This feature shall be equal to ASCO accessory 44G, and shall be capable of being added to existing switches).
- H. Surge Suppression** – A TVSS with a surge current rating of 65kA shall be provided with individually matched fused metal oxide varistors (MOVs). It shall include LED status indication of normal operation, under voltage, power loss, phase loss or component failure. Shall include form C dry contacts for external alarm or monitoring. The unit shall be enclosed in a Noryl housing rated NEMA 4, 12, and 4X. Shall comply with UL 1449 3<sup>rd</sup> edition (This feature shall be equal to ASCO accessory 73, and shall be capable of being added to existing switches).

**I. Power Meter** (This feature shall be equal to ASCO accessory 135L).

1. Furnish Power Meters at locations shown to monitor all functions specified below.
2. The Power Meters shall be listed to UL3111-1, CSA, CE Mark, and industrially rated for an operating temperature range of -20°C to 60°C.
3. The Power Meter shall be accurate to 1% measured, 2% computed values and display resolution to 1%. Voltage and current for all phases shall be sampled simultaneously to assure high accuracy in conditions of low power factor or large waveform distortions (harmonics).
4. The Power Meter shall be capable of operating without modification at nominal Frequencies of 45 to 66Hz and over a control power input range of 9 – 36VDC.
5. Each Power Meter shall be capable of interfacing with an optional communications module to permit information to be sent to central location for display, analysis, and logging.
6. The Power Meter shall accept inputs from industry standard instrument transformers (120 VAC secondary PTs and 5A secondary CTs). Direct phase voltage connections, 600 VAC and under, shall be possible without the use of PTs.
7. The Power Meter shall be applied in single, 3 phase, or three & four wire circuits. A fourth CT input shall be available to measure neutral or ground current.
8. All setup parameters required by the Power Meter shall be stored in non – volatile memory and retained in the event of a control power interruption.
9. The following metered readings shall be communicated by the Power Meter, via serial communication, when equipped with optional serial communications module.
  - a) Current, per phase RMS and neutral (if applicable)
  - b) Current Unbalance %
  - c) Voltage, phase – to – phase and phase – to – neutral
  - d) Voltage Unbalance %
  - e) Real power (KW), per phase and 3 – phase total
  - f) Apparent power (KVA), per phase and 3 – phase total
  - g) Reactive power (KVAR), per phase and 3 – phase total
  - h) Power factor, 3 – phase total & per phase
  - i) Frequency
  - j) Accumulated Energy, (MWH, MVAH, and MVARH)
  - k) Total Harmonic Distortion

The following energy readings shall be communicated by the Power Meter:

- a) Accumulated real energy KWH
- b) Accumulated reactive energy KVAH
- c) Accumulated apparent energy KVARH

*Note: For real reactive energy reported values, separate total for energy flow from each source shall be stored, including the arithmetic sum.*



**\*Note Spec Writer: The following section is optional and should be deleted if not used.**

The Power Meter shall flush mount to an enclosure

1. The Power Meter shall be equipped with an optional continuous duty, long life, 4 line x 20 character LCD backlit display to provide local access to the following metered quantities:
  - a) Current per phase RMS and neutral (if applicable)
  - b) Current Unbalance %
  - c) Voltage, phase – to – phase and phase – to – neutral
  - d) Voltage Unbalance %
  - e) Real power, per phase and 3 – phase total
  - f) Apparent power, per phase and 3 – phase total
  - g) Reactive power, per phase and 3 – phase total
  - h) Power factor, 3 – phase total & per phase
  - i) Frequency
  - j) Accumalted Energy, (MWH,MVAH, and MVARH)
  - k) Total harmonic distortion
2. Displaying each of the Power Meter quantities shall be accomplished through the use of menu scroll buttons.
3. For ease in operator viewing, the display shall remain on continuously, with no detrimental effect on the life of the Power Meter.
4. Setup for system requirments shall be allowed from the front of the Power Meter. Setup provisions shall include:
  - a) CT rating (xxxxx:5)
  - b) PT rating (xxxxxxx:120) (if applicable; 24000V maximum)
  - c) System type (single; three phase; 3 and 4 wire)
  - d) Communication parameters
5. Reset of the following electrical parameters shall also be allowed from the front of the Power Meter:
  - a) Real energy (MWH), apparent energy (MVAH) and reactive energy (MVARH).
6. All reset and setup functions shall have a means for protection against unauthorized/accidental changes.

## **J. Power Monitoring and Control**

A PowerQuest<sup>®</sup> PC based Automatic Transfer Switch (ATS) remote monitoring and control system designed to communicate with other ATSs located in remote locations shall be provided. System shall utilize serial communications capability inherent with the ATS microprocessor based control panel offering. Refer to separate Suggested Specification.

A SiteWeb<sup>™</sup> remote monitoring and control system that is accessible from any network connected pc. It shall be an internet browser based system that can be configured to remotely monitor and control from a pc connected to the internet. Refer to separate Suggested Specification.

## PART 5 ADDITIONAL REQUIREMENTS

### 5.01 Withstand and Closing Ratings

- A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. WCR ATS ratings shall be as follows when used with specific circuit breakers:

ATS Size	Withstand & Closing Rating MCCB (480v/60hz)	W/CLF
30	10,000A	100,000
70 - 200	22,000A	200,000
230	22,000A	100,000
260 – 400	42,000A	200,000
600	50,000A	200,000
800 – 1200	65,000A	200,000
1600 – 2000	85,000A	200,000
2600 – 3000	100,000A	200,000

### 5.02 Tests and Certification

- A. The complete 3ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
- B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
- C. The ATS manufacturer shall be certified to ISO 9001: 2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001: 2008.

### 5.03 Service Representation

- A. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.
- C. For ease of maintenance, the transfer switch nameplate shall include drawing numbers and serviceable part numbers.