THOMSON TECHNOLOGY®
A Subsidiary of Regal-Beloit Corporation
POWER & CONTROL

SUGGESTED SPECIFICATION

STANDARD
AUTOMATIC TRANSFER SWITCHES

TS 890 SERIES
800A – 4000A

Specification No. ES007 - TS 890

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1. SCOPE

Specification writer's notes:

1. This suggested specification is intended for typical automatic transfer switches consisting of the following main characteristics:
    - maximum voltage rating of 660Vac, 50/60Hz
    - maximum amperage rating of 4000Aac
    - break before make transfer logic

For automatic transfer switches of different rating, equipment types or operation modes, contact Thomson Technology for alternate sample specifications as available.

2. Included in this suggested specification are sections identified as **"Alternates"**. These sections provide the specifying engineer many design options which allow for system customizing and possible cost saving opportunities. In general, **"Alternates"** typically provide more cost effective design solutions however the specifying engineer should use discretion based on specific application requirements.

Note:
The following information is provided by Thomson Technology as a guide only for use by specifying engineers in designing automatic transfer switch systems. All system designs and installations must be done in accordance with all applicable electrical regulation codes and practices as required. Please contact Thomson Technology for any additional information.

1.1. AUTOMATIC TRANSFER SWITCH

1.1.1. This Specification covers the supply of a complete operational automatic transfer switch rated ____Amps, ____Volts, ___Phase, ___HZ,___ Pole, for installation by others.

2. GENERAL REQUIREMENTS

2.1. GENERAL

2.1.1. The unit shall be manufactured in accordance with this specification and applicable CSA, IEC, NEMA, UL, and ANSI standards.

2.1.2. Supplier shall be responsible for ensuring the compatibility of all

components of the unit.

2.1.3. The unit shall be free of defects in material and workmanship.

2.2. RELATED INDUSTRY STANDARDS

2.2.1. **CSA-C22.2 No.178-1978** Automatic Transfer Switches

2.2.2. **UL-1008** Automatic Transfer Switches

2.2.3. **NEMA-No ICS 10** Industrial Control and Systems AC Transfer Switch Equipment

2.2.4. **IEC 947-6-1** Automatic Transfer Switching Equipment

Specification writer's note: Remove all non-applicable industry standards as required for the intended location of the equipment.

3. RATINGS & CONSTRUCTION

3.1. AUTOMATIC TRANSFER SWITCH

3.1.1. Rating of the automatic transfer switch shall be minimum _____Amp, _____Vac,__ Phase, ___Hz, __Wire.

3.1.2. The transfer switch shall comprise of ___ switching poles plus a solid neutral.

Specification writer's note: Delete reference to neutral if all poles are switching. (Note: that a switched neutral pole is only required if ground fault protection is provided on both sources.)

3.1.3. The entire enclosed unit shall be rated for 100% continuous operation without de-rating. The current rating shall be based on all classes of load including resistive, and motor loads.

3.1.4. Fault withstand current rating of the complete assembly shall be ____Kamps RMS. This rating shall be obtained with standard upstream molded case circuit breaker protection. Transfer switches requiring upstream protection of fuses located outside the transfer switch shall not be acceptable.

3.1.5. The automatic transfer switch shall be tested and certified as a complete unit in accordance with the following standards and shall bear the applicable certification label:

CSA-C22.2 No.178-1978 Automatic Transfer Switches

UL-1008 Automatic Transfer Switches

3.1.6. Structure: Freestanding, NEMA 1(IP23) rated, 14 gauge (minimum) steel with steel angle or channel framework of adequate strength and rigidity necessary to resist all conditions of use to which it may be subjected and to support all equipment contained therein

Specification writer's note: For optional NEMA 2 (IP30) rated enclosure applications use "Alternate" as required. For optional NEMA 3R rated enclosure applications use "Alternate 2" as required.

"Alternate 1" Freestanding, NEMA 2 (IP30) rated complete with door gasketting and drip hood, 14 gauge (minimum) steel with steel angle or channel framework of adequate strength and rigidity necessary to resist all conditions of use to which it may be subjected and to support all equipment contained therein.

"Alternate 2" Freestanding, NEMA 3R rated complete with inner and outer doors, gasketting, drip hood, 14 gauge (minimum) steel with steel angle or channel framework of adequate strength and rigidity necessary to resist all conditions of use to which it may be subjected and to support all equipment contained therein.

3.1.7. Finish: All steel parts shall be cleaned, sealed and painted with one coat rust resistant primer and two coats of ASA #61 grey enamel or polyester powder coat finish inside and out. Interior sub-panels shall be similarly painted gloss white.

Specification writer's note: Specifiers to provide details of special finishing as required.

3.1.8. Dimensions: Overall height, maximum 91 5/8" (2330mm) (including base channels). Individual cubicle width, maximum 36" (915mm) for transfer switches rated up to 3000A. Transfer switches rated at 4000A shall have individual cubicle width of 48" (1219mm). Overall structure depth shall not exceed_____ inches/(millimeters).

3.1.9. The rear section shall contain bussing and provisions for customer incoming and outgoing line and load cables. Access shall be by removable rear covers, side and rear.

3.1.10. Busbars: The load bus shall be either tin plated round-edge high conductivity copper and be sized for 100% continuous load rating of the complete system, in accordance with NEMA, CSA and UL guidelines. The short circuit withstand rating of the completed bus assembly shall be not less than the short circuit fault current of the system.

3.1.11. Ground Bus: Full length copper ground bus bonded to the frame conforming to NEMA, CSA and UL guidelines.

3.1.12. Cable Connections: Provision shall be made to terminate all incoming and outgoing power cables and grounding conductors. Connections shall be via screw type cable lugs.

Specification writer's note: Alternate or special connection requirements shall be detailed by the specifier.

3.1.13. The automatic transfer switch shall be constructed to accommodate top (Alternate: bottom) entry of incoming generator power cables, incoming utility power cables and top (Alternate: bottom) exit of outgoing load cables. Cable type will be _____.

Specification writer's note: Specifiers to provide details of incoming and outgoing power cabling. For applications requiring bus-duct entry or exit of the utility/generator or load, specify details as required.

3.1.14. The Power Switching units shall be fix-mounted, utilize fully enclosed contacts and their interrupting and closing rating shall be equal to or exceed the required withstand rating of the complete mechanism.

Specification writer's note: For applications requiring optional Draw-out (DO) Power Switching units use "Alternate" as required.

"Alternate" The Power Switching units shall be of draw-out construction, utilize fully enclosed contacts and their interrupting and closing rating shall be equal to or exceed the required withstand rating of the complete mechanism.

3.1.15. All materials and parts used in the unit shall be new, of current manufacture, of best industrial grade, and free from defects and imperfections.

3.1.16. The transfer switch mechanism shall provide a simple means of manual operation using only components which are permanently affixed in the operating position.

3.1.17. The unit shall permit manual operation of the transfer switch while the system is energized and carrying rated load. Transfer switches which require all sources of power to be de-energized prior to manual load transferring shall not be acceptable.

3.1.18. All internal control devices used in the automatic transfer switch shall be cable of being de-energized and isolated from the system by use of an accessible isolation plug for servicing procedures as required.

3.1.19. The automatic transfer switch design shall provide front accessible components and wiring for easy serviceability. Control connections which are not readily serviceable while the transfer switch is mounted in its enclosure are not acceptable.

3.1.20. All power contacts used shall be stored energy type and shall operate in a quick-make / quick-break manner, the speed of which shall be independent of supply voltage and / or speed of operation of manual means.

4. FUNCTIONAL REQUIREMENTS

4.1. GENERAL DESCRIPTION

The automatic transfer switch shall automatically transfer the load to the generator supply in the event of a utility supply failure and return the load to the utility supply upon restoration. The automatic transfer switch power switching devices shall be mechanically and electrically interlocked to prevent the utility and generator supplies from being interconnected.

4.2. SEQUENCE OF OPERATION

Note: For specific device settings refer to section 4.3 “CONTROL FEATURES."

4.2.1. When the voltage on any phase of the utility supply is below preset levels of rated voltage for a preset time delay, a contact shall close to initiate starting of the generator set.

4.2.2. The load shall transfer to the generator supply when the generator voltage and frequency have reached acceptable preset levels and the warm-up time delay has expired.

4.2.3. When the utility supply is restored to above preset levels of rated voltage on all phases, the load shall be retransfer to the utility supply following expiry of the utility return timer. When the transfer occurs, the generator transfer breaker shall trip open, and then following the neutral delay period, the utility transfer breaker shall close to compete the retransfer sequence.

4.2.4. The load shall immediately retransfer to the utility supply (if within

acceptable limits) should the generator supply fail prior to expiry of the utility transfer delay.

4.2.5. The generator set shall continue to operate following a load transfer for a cooldown delay period, then a contact shall open to stop the generator set.

4.2.6. An “on load” test mode may be initiated which shall cause a simulated utility failure condition and transfer the load to the generator set as per the normal sequence.

4.2.7. The load shall immediately retransfer to the utility supply (if within acceptable limits) should the generator supply fail during a test mode.

4.3. CONTROL FEATURES

4.3.1. Transfer switch control power must be obtained from the source being transferred to. The controls shall not require any connection to external power sources. Transfer switches requiring power from the engine starting (or other) battery are not acceptable.

4.3.2. A control circuit isolation plug shall be provided to isolate all control circuitry inside the transfer switch to facilitate maintenance procedures. When isolated, there shall be no voltage present on the control circuitry.

4.3.3. The transfer switch controller shall be microprocessor based and shall contain all voltage and frequency sensing, timing functions, and metering.

4.3.4. The transfer switch controller software program shall include a 3 level security password system for access to all programming functions. Specific password levels shall be provided for “read only”, “read/write” and “master”. All programming set points for voltage, frequency and time delays shall be software programmable from the front panel mounted keypad, and all parameters shall be displayed in alpha numeric format.

4.3.5. The transfer switch controller shall include an operator interface liquid crystal display (LCD) which is door mounted. The LCD shall display the following information:

System Time
Transfer switch position
Utility supply metering – 3 phase voltage and frequency

Generator supply metering – 3 phase voltage and frequency
Timer countdown display
Test mode operation indication

Specification writer's note: For applications requiring optional extended temperature range transfer switch controller display (VFD option), use "Alternate" as required.

"Alternate" The transfer switch controller shall include an operator interface vacuum florescent display (VFD) for extended temperature range application which is door mounted. The VFD shall the display the following information:

System Time
Transfer Switch position
Utility supply metering – 3 phase voltage and frequency
Generator supply metering – 3 phase voltage and frequency
Timer countdown display

4.3.6. Digital metering provided by the transfer switch controller shall have an accuracy of +-1% for all voltage and frequency readings. Frequency shall be displayed to at least one decimal. Three phase line to line voltages shall be displayed for both generator and utility supplies.

4.3.7. Three phase under voltage sensing shall be provided for both utility and generator supplies. The under voltage sensing function shall be programmable as follows:
–under voltage pick-up 70–100% of nominal, factory set at 90%.
–under voltage dropout 70–100% of nominal, factory set at 80%.
–under voltage delay 0–10 seconds, factory set at 1 second.

4.3.8. Frequency sensing shall be provided for the generator supply to permit load transfer to the generator supply if within nominal limits. The generator frequency sensing function shall be programmable as follows:

–under frequency 40.0–60.0HZ, factory set at 57.0HZ
–under frequency time delay 0–10 seconds, factory set at 5 seconds.
–over frequency 50.0–70.0HZ, factory set at 63.0HZ
–over frequency time delay 0–10 seconds, factory set at 5 seconds.

4.3.9. An engine start contact shall be provided which shall close to initiate starting of the engine. The engine start contact shall be rated 10A, 120VAC, 28VDC resistive (maximum).

4.3.10. A time delay on engine start shall be provided to delay the engine

start signal after failure of the utility source. The time delay shall be programmable 0–60 seconds, factory set at 2 seconds.

4.3.11. A time delay for engine warm-up shall be provided which permits transfer to the generator supply after generator voltage and frequency exceed acceptable limits. The time delay shall be programmable 0–1800 seconds, factory set at 2 seconds.

4.3.12. A time delay for retransfer to utility shall be provided which permits transfer to the utility supply only after stable voltage conditions exist for the specified time period. The time delay shall be programmable 0–30 minutes, factory set at 2 minutes.

4.3.13. A time delay for engine cooldown shall be provided which delays the engine stop signal after load has re-transferred to the utility source until the time delay period expires. The time delay shall be programmable 0–30 minutes, factory set at 2 minutes.

4.3.14. Provision for operator-initiated system test modes shall be provided. Test modes shall be programmable for “off load” testing (load does not transfer to generator) or “on load” testing (load does transfer to generator).

4.3.15. An automatic exercise time function shall be provided for generator testing. A 24hour, 7 day, single occurrence programmable time clock shall be provided. The time clock shall be programmable for test start and stop times (i.e. “day of week”, “hour of day”, and “minute of day”, and type of test (e.g. ”on load” or “off load”).

4.3.16. Control logic shall be provided for immediate transfer to the utility supply (if within acceptable limits) should the generator set fail during any activated test mode.

4.3.17. Pilot lights shall be provided with mimic bus to indicate load on utility status (green) and load on generator status (red). Pilot lights to be long life LED type.

4.3.18. Diagnostic LED’s shall be provided on the transfer switch controller to allow simple visual indication of transfer switch operating condition. Individual LED’s shall be provided for the following functions;

–Watchdog (CPU running)
–Transfer to Utility supply signal initiated
–Transfer to Generator supply signal initiated
–Engine start signal initiated

4.3.19. The transfer switch controller shall provide a lamp test function to test all LED lights display.

4.3.20. The transfer switch shall include a solid neutral block, fully rated with suitably rated cable connection lugs.

Specification writer's note: Neutral block is <u>not</u> required on 4 pole transfer switches or 3 phase, 3 wire applications.

4.3.21. Neutral Position Delay (NDT)

A neutral position delay time function shall be provided to minimize the effect of out-of-phase transfer due to connected motor load. The time delay shall be programmable 0–60 seconds, factory set at 3 seconds.

Specification writer's note: A Neutral time delay function is typically required for motor loads greater than 100HP. (Refer to separate literature.)

4.3.22. Multi-Voltage Operation

The transfer switch shall be capable of being re-configured for any standard operational voltage without the addition of new components or significant wiring changes. Standard operational voltages shall include 208v, 240v, 480v and 600v. The Multi-voltage feature shall apply to all 3 pole standard ATS models excluding models rated for a maximum of 240Vac.

Specification writer's note: Select the following *<u>optional</u>* *<u>control</u>* features as required for the specific application:

4.3.23. Four Function Test Switch (FTS4)

A four function test switch shall be provided on the door of the transfer switch. The switch positions shall provide the following control functions:

AUTO	The engine/generator shall automatically operate during a utility power failure condition as per the sequence of operation.
ENGINE START	The engine/generator set shall immediately start and operate unloaded. Note: the load shall automatically transfer to the generator should a utility power failure condition occur.
TEST	The engine/generator set shall immediately start and shall transfer on load upon expiration

of the warm-up delay. Note: The transfer switch shall automatically retransfer the load back to the utility supply should the generator set fail on load.

OFF — The generator set shall be disabled from automatic starting due to a utility power fail condition.

4.3.24. Utility Supply Auxiliary Contacts (AUX-U)

Auxiliary contacts shall be provided which operate when the utility source is on load. A Quantity of __ auxiliary contacts shall be supplied with a rating of 10A, 120VAC resistive Form-C.

4.3.25. Generator Supply Auxiliary Contacts (AUX-G)

Auxiliary contacts shall be provided which operate when the generator is on load. A Quantity of __ auxiliary contacts shall be supplied with a rating of 10A, 120VAC resistive Form-C.

4.3.26. Load Disconnect Contact (LDC)

Control logic shall be provided to signal an external load (e.g. elevator) of an impending transfer to and from the generator supply. An output contact rated 10A, 120VAC resistive, shall close prior to a transfer and remain closed until the transfer is completed and the post transfer delay time has expired. A pre transfer delay function shall be provided, programmable 0–30 seconds, factory set at 10 seconds. A post transfer delay function shall be provided, programmable 0–30 seconds, factory set at 10 seconds.

4.3.27. Over Voltage Sensing (OVS)

Three phase over voltage sensing shall be provided for both utility and generator supplies. The voltage sensing function shall be programmable as follows:

–over voltage pickup 100–130% of nominal, factory set at 110%.
–over voltage dropout 100–130% of nominal, factory set at 108%.
–over voltage time delay 0–10 seconds, factory set at 5 seconds.

4.3.28. Utility Frequency Sensing (UOF)

Frequency sensing shall be provided for the utility supply to permit load transfer to the utility supply if within acceptable limits. Utility frequency sensing shall be programmable as follows:
–under frequency 40.0–60.0HZ, factory set at 57.0HZ
–under frequency time delay 0–10 seconds, factory set at 5 seconds.
–over frequency 50.0–70.0HZ, factory set at 63.0HZ
–over frequency time delay 0–10 seconds, factory set at 5 seconds.

4.3.29. Utility Available Light (UAL)

A pilot light shall be provided to indicate the availability of the utility supply condition. Pilot light is to be green, LED type.

4.3.30. Generator Available Light (GAL)

A pilot light shall be provided to indicate the availability of the generator supply condition. Pilot light is to be green, LED type.

4.3.31. Utility Power Available Contacts (UPA)

Auxiliary contacts shall be provided which operate when utility power is available. A Quantity of __ auxiliary contacts shall be supplied with a rating of 10A, 120VAC resistive Form-C.

4.3.32. Generator Power Available Contacts (GPA)

Auxiliary contacts shall be provided which operate when generator power is available. A Quantity of __ auxiliary contacts shall be supplied with a rating of 10A, 120VAC resistive Form-C.

4.3.33. Remote Communication Port (COM)

A remote communication port shall be provided to remotely monitor and control the transfer switch. The communication port shall be RS 422 with type RJ 45 connection. Communication port can be used in conjunction with external communication interface module (CIM) with multiple ports, protocol and modem, or it may be used independently with customer supplied equipment.

4.3.34. Remote Communication Module (CIM)

A remote communication module shall be provided to remotely monitor and control the transfer switch with direct telephone system interconnection via internal modem or to communicate remotely via RS232 or RS 485 type signal. Communication module is to be provided with remote communication software operable on current version of Windows™ software. Communication module shall provide Modbus™ protocol for interface with external communication systems of same type.

4.3.35. Fail to Transfer Contacts (FTT)

Auxiliary contacts shall be provided which shall activate when the transfer switch mechanism fails to operate within a specified time delay. The time delay shall be programmable 0–60 seconds, factory set at 15 seconds. A Quantity of __ auxiliary contacts shall be supplied with a rating of 10A, 120VAC resistive Form-C.

4.3.36. Negative Sequence Voltage Relay (NSV)

Negative sequence voltage relay shall be provided to protect against re-generative voltage from large motors or transformers during single phasing conditions.

4.3.37. Service Entrance Rated (SE)

The transfer switch shall be supplied to permit use as a Service Entrance Rated device. This option shall include the following key features or components:

–An overcurrent trip device in the utility transfer breaker rated at _____ AMPS.

Specification writer's note: The trip unit will require a ground fault trip element for applications which are solidly grounded and have a trip rating of 1000 amps (or above) and a system voltage of greater than 240Vac.

–Padlockable control switch to select the "disconnected" mode.

–Visual indicator for "disconnected" mode.

–Additional grounding lugs as required per code requirements.

–Enclosure with key lockable door for authorized ATS access only

4.3.38. Phase Controlled Transfer (PCT)

Phase control transfer system logic shall be provided to allow "in-phase" power transfers. The Phase control transfer system shall monitor the voltage phase relationship between two sources prior to transfer and shall only permit a transfer sequence if the voltage phases are within preset limits.

4.3.39. Overload Trip-Utility (UTR)

An overcurrent trip unit of rating ____AMPS shall be provided for the utility supply transfer breaker.

Specification writer's note: This option is not required when the transfer switch is protected by an upstream circuit breaker.

4.3.40. Overload Trip-Generator (GTR)

An overcurrent trip unit of rating ____AMPS shall be provided for the generator supply transfer breaker.

Specification writer's note: This option is not required when the transfer switch is protected by an upstream circuit breaker.

Specification writer's note: If Ground fault protection is required, it may be added to the specific power switching units trip unit however the type of ground fault relay, connection and zone of protection is dependent upon system neutral grounding method and may require coordination with other system equipment.

Acceptable model will be a ***Thomson Technology TS 890*** series automatic transfer switch.