

Three Cycle vs. Series Rated ATS's

Information Sheet # 06

1.0 Introduction

Automatic transfer switches (ATS) are a set of contactors (See Diagram 1) that enable the load to be switched between the primary and back-up power sources, usually a diesel or gas-driven generator set. Most importantly, these contactors are mechanically and electrically interlocked to ensure the two power sources are isolated with no current flow possible from one to the other. One set of contactors will always break before the other makes contact.

This information sheet discusses the issues a system designer must take into account when selecting a 3-Cycle rated over a Series rated ATS and the merits of one type over the other.

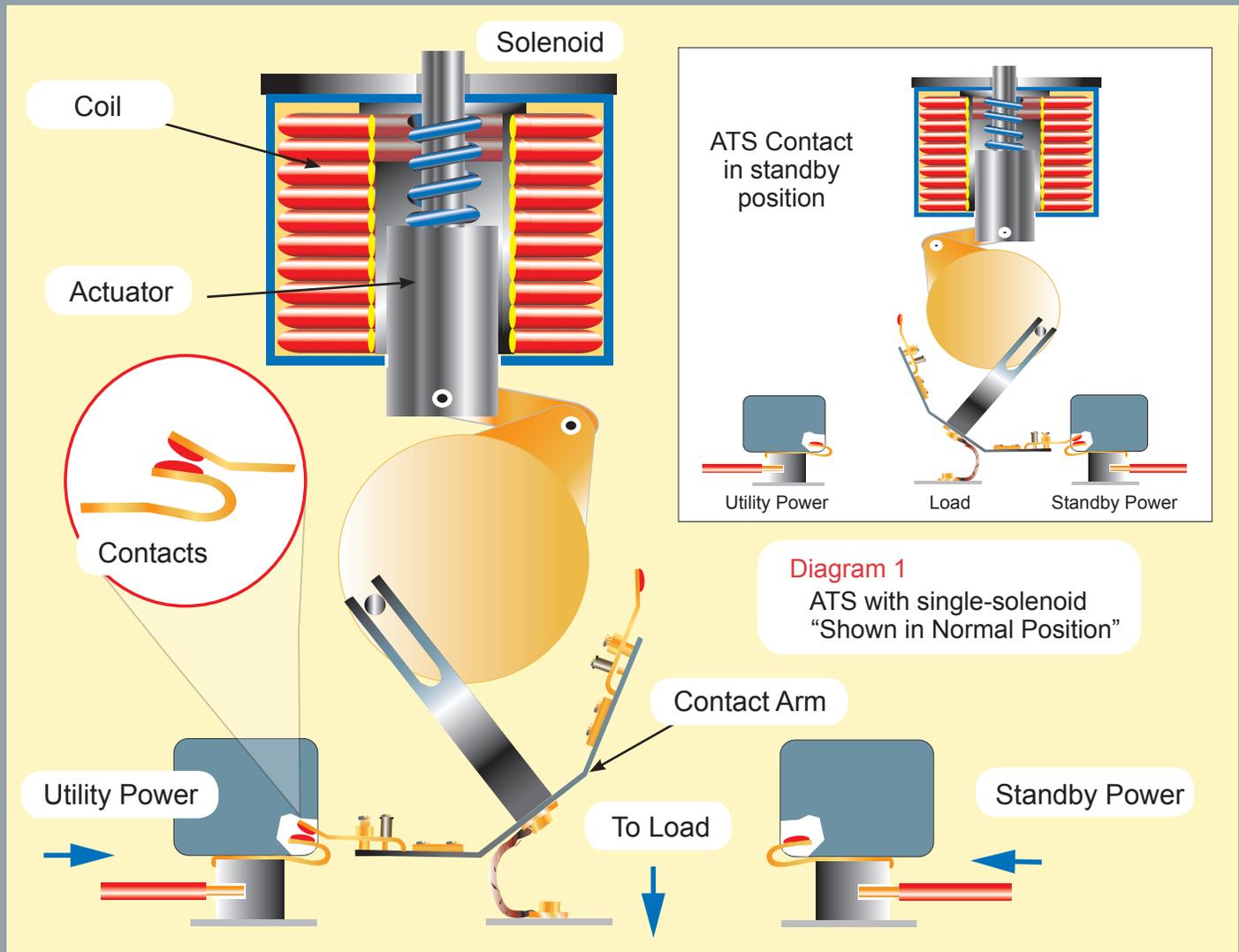


Diagram 1
ATS with single-solenoid
"Shown in Normal Position"

To fulfill our commitment to be the leading supplier and preferred service provider in the Power Generation Industry, the Kinsley Group team maintains up-to-date technology and information standards on Power Industry changes, regulations and trends. As a service, our Information Sheets are circulated on a regular basis, to existing and potential Power Customers to maintain awareness of changes and developments in engineering standards, electrical codes, and technology impacting the Power Generation Industry.

The installation information provided in this information sheet is informational in nature only, and should not be considered the advice of a properly licensed and qualified electrician or used in place of a detailed review of the applicable National Electric Codes and local codes. Specific questions about how this information may affect any particular situation should be addressed to a licensed and qualified electrician.

2.0 Selecting a Transfer Switch

When selecting the size of ATS, two amperage loads have to be taken into account. The first is the load amperage the ATS contactors will bear under normal conditions. The second is the contactor's ability to withstand an amperage spike induced by an overload or short circuit fault.

To be code compliant, all circuits must include either a fuse or circuit breaker that will trip out the power source in the event of an overload or short circuit. Of concern is the time an ATS's contactors are exposed to the fault amps before the trip device operates. For the system designer to select an ATS, the industry offers two levels of rating, 3-Cycle and Series.

3.0 Assigning a Rating for an ATS

Assigning a rating for the maximum amperage the ATS contactors can withstand under load without damage is straight forward to specify and test for. However, the contactor's ability to withstand a fault induced amperage spike is a factor of the time the contact is exposed to the amperage spike. The longer the trip time, the more robust the contactor has to be.

The ATS industry, along with UL, developed the UL 1008 test that assigns a robust and lighter duty rating. Robust is the 3-Cycle rating and lighter duty the Series rating. In testing a contactor, its "withstand rating", the maximum amperage a contactor will carry over a defined time period before it is destroyed, is determined. (For further details visit UL site <http://ulstandardsinfontet.ul.com/scopes/1008.html>)

4.0 UL1008 Pertaining to ATS's

UL 1008 approvals are provided using two specific tests. They are:

1. 3-CYCLE: Withstand and closing rating for 3 electrical cycles.
2. SERIES: Withstand and closing rating for specific breakers.

5.0 3-Cycle ATS

This is the most demanding of the UL 1008 tests. In the 60hz system, 3 cycles represents 0.05 seconds. (This is a long period for a trip device.) An example of a 3-Cycle rating would be a 100 amp contactor (continuous rated) that has a withstand rating of 10,000 amps for 3 cycles. (See diagram 2 for sample ATS ratings)

Characteristics of 3-Cycle rating - for normal emergency application

- UL tested with the slowest interruptive device
- Allows fault current to flow for 3 cycles
- More severe test than Series rated test allowing both fuses and circuit breakers
- Contactors are more robust

In selecting a 3-Cycle rated switch, the system designer is getting an ATS with contactors rated to manage any current spike before a manufactured-to-code fuse or circuit breaker operates. If the full details of the trip devices are not known the designer should choose a 3-Cycle rated ATS.

6.0 Series ATS

The Series rated ATS assumes contactors rated for lighter duty with a much faster trip. For example a 100 amp contactor (continuous rating) is rated to manage a withstand/closing rating of 22,000 amps with a specific circuit breaker. (See diagram 1 for sample ATS ratings)

Characteristics of Series rating - for light duty residential and small business application

- UL tested with a specific (quick to interrupt) breaker
- Fault current only allowed to flow for a short period of time (Less than 3-Cycle)
- Less severe test than a 3-Cycle test
- Design may require a "Short Circuit and Coordination Study" to ensure system is adequately protected and trip devices will operate as required
- More economic (Usually 15 to 20% less than the 3-Cycle cost)

A Series rated ATS should only be selected when trip devices are well defined and trip times are known to be within the UL 1008 testing for a Series rated ATS. Series rated ATSs are seen more in residential than industrial applications.

Diagram 2 - Typical Ratings Given by a Transfer Switch Supplier for UL 1008 ATS Tested 3-Cycle and Series					
Amperage Rating of Transfer Switch	UL 1008 Tested Withstand and Close-on Ratings @ 480 Volts				
	Current Limiting Fuse Rating	Max. Fuse Type Amps		Specific Breaker Series Rated Amps	Any Breaker 3-Cycle Rated Amps
30	100,000	60	J	10,000	10,000
70, 100, 150	200,000	200		22,000	
230	100,000	300		42,000	
260, 400	200,000	600	L	65,000	50,000
600, 800, 1000, 1200		1,600		100,000	100,000
1600, 2000		3,000		100,000	100,000
3000		4,000			
4000		6,000			

Notes:

- 1) For ATSs in the 70 to 400 amp Series tested allows twice the "withstand" amps on the contactor
- 2) The Series rated ATS is only offered when a circuit breaker is the trip device
- 3) When a 3-Cycle tested breaker is selected the user knows the contactor is more robust for fault induced amps



Corporate Headquarters
14 Connecticut South Drive
East Granby, CT 06026

Albany Location
60 Loudonville Road
Albany, NY 12204

Syracuse Location
605 Cambridge Avenue
Syracuse, NY 13208

Buffalo Location
2205 Kenmore Avenue, Suite 104
Tonawanda, NY 14207

Westchester County Location
310 Guinea Road
Brewster, NY 10509

Toll Free: (800) 255.3503
Local: 860.844.6100
Fax: 860.844.6136

Toll Free: (800) 255.3503
Local: (518) 458.8614
Fax: (518) 458.1738

Toll Free: (800) 255.3503
Local: (315) 455.8440
Fax: (315) 455.8069

Toll Free: (800) 255.3503
Local: (716) 876.2324/2325
Fax: (716) 876.2326

Main Number: (914) 218.9940
Fax Number: (914) 218.9941

www.kinsley-group.com