

# INSIDE THE AR SWITCH

*Pint-size interrupter has giant capability to make loadbreak possible*

## 'SHOCK-ABSORBER' FUNCTION

**A**bsolute elegance of design is not too strong a description of the AR Switch Interrupter. It is the "shock absorber" that performs the load break function in the AR's three-phase switching action.

Without it, Distribution Automation could not advance at the needed pace.

### A CLOSE-UP LOOK AT THE INSIDES

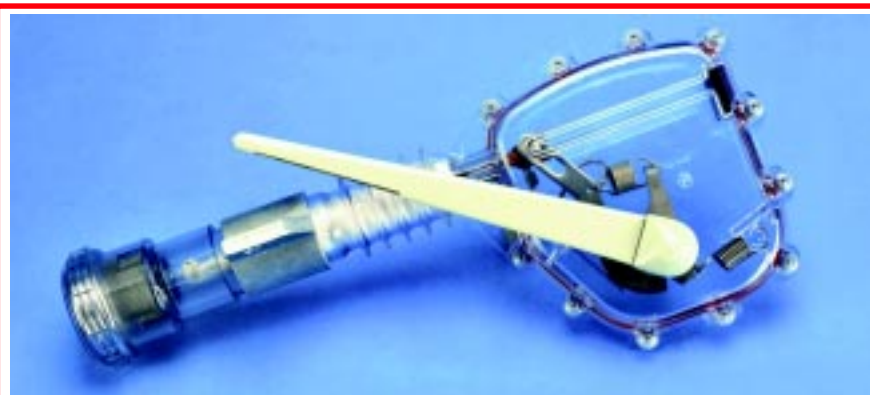
To see how the interrupter delivers all this benefit takes a view inside the interrupter. Simple but precise, its design entails the careful form, fit and function of every select component.

By design, the interrupter provides circuit interruption for the AR Switch without external arc or flame. The arc-quenching trailer and liner are designed to coordinate with the

housing and muffler geometries. These components develop the de-ionizing gases during load breaking which are required for dielectric recovery.

For lasting strength and corrosion resistance, all parts of the operating mechanism are of stainless steel. Current transfer efficiency is assured with secure connections (other than

*... continued on next page ...*



the moving contact). Designed for durability and high performance, the current-breaking contacts are of silver-tungsten.

#### EXTERNAL ATMOSPHERIC PROTECTION

AR Switch interrupter housings are manufactured from a high strength polyurethane material for strength, weatherability and resistance to ultraviolet radiation. The housing design integrates multiple functions. The enclosure is sealed from the outdoor environment by gaskets at each mating interface.

#### BUILT AND TESTED FOR DEPENDABILITY

The interrupter incorporates a self

resetting mechanism to ensure that the interrupter is in the circuit and ready to operate for each switch opening.

Extensive testing has been conducted to ensure proper operation under a variety of circuit conditions, as well as varying environmental conditions.

#### OPERATING SEQUENCE

When the AR Switch is in the closed position, current flow is through the copper switch blade and the silver-to-silver contacts. There is no current flow through the interrupter.

As the switch is opened, current is transferred to the interrupter. This

transfer is accomplished before the main contacts fully separate. As the switch continues to be opened, the interrupter contacts are driven apart. Arc interruption is accomplished by thermal interaction of the arc on the specifically designed arc trailer and liner within the interrupter. This interaction creates de-ionizing gases, that along with the unique interrupter housing design ensures a high rate of recovery of the internal dielectric strength for rapid, positive, circuit interruption. The exhaust following current interruption is quietly vented through the specially designed muffler.

*... continued on next page ...*

## Opening Sequence: Switch Blade and Interrupter

**1** Switch blade in closed position



**2** As switch blade is opened, current is transferred to the Interrupter before the main contacts fully separate



**3** Current is fully transferred to the Interrupter and arc interruption is accomplished by thermal interaction of the arc on the specifically designed arc trailer and liner within the interrupter



**4** Switch is fully opened and the Interrupter self-resets





## Interrupter Application Information for AR Switch

NOTE: Capacitor Switching for Grounded-Wye Banks or Ungrounded Banks is Not Applicable.

Maximum System <sup>1</sup> Three-Phase Voltage	Interrupting <sup>3</sup> Life (Operations)		Line Charging (Amps)		Cable Charging (Amps)		Loop <sup>6</sup> Switching (Amps)	Magnetizing <sup>7</sup> Current (KVA)
	600 A	900 A	Grounded <sup>4</sup>	Ungrounded	Shielded <sup>5</sup>	Unshielded <sup>4</sup>		
17.1 kV	50	10	10	N/A	20	10	600	2500
29 kV	20	10	10	N/A	20	10	600	2500
38 kV <sup>2</sup>	20	10	10	N/A	10 <sup>4</sup>	10	600	2500

<sup>1</sup> This chart applies to the Hubbell Type AR Switch and interrupter for application on these maximum system voltages. Ratings established by testing to IEEE 1247.

<sup>2</sup> For application on three-phase 4-wire solidly grounded wye systems with wye connected loads only.

<sup>3</sup> Rated number of load switching operations at the specified currents.

<sup>4</sup> Maximum recovery voltage of 24.4kV.

<sup>5</sup> Maximum recovery voltage of 16.7kV.

<sup>6</sup> Maximum recovery voltage of 5.8kV (20% of 29kV).

<sup>7</sup> Will switch up to 2500 KVA based on load current testing per IEEE 1247.

<sup>8</sup> Switching combinations of capacitor banks, unloaded lines and cables is *not recommended*.

<sup>9</sup> *N/A means not available at time of printing or not applicable. Consult factory.*

## It is the "shock absorber" that performs the load break function!

The AR Switch closing sequence assures that current is picked up by the copper-tungsten fault-closing contacts on the blade and stationary contacts. Current is never picked up by the main current carrying contacts, or by the interrupter. The interrupter is self re-setting and the interrupter pick up arm is simply moved into proper position during blade closing.

### AR SWITCH APPLICATION FLEXIBILITY

The Hubbell AR (Automation-Ready) Switch was designed to meet today's needs and the growth of Distribution Automation.

It's available for 14.4kV, 25kV and 34.5kV (grounded wye) systems. And in four mounting configurations: Horizontal, vertical, phase-over-phase and delta, to meet a variety of distribution feeder line configurations. All AR Switches are fully rated for 900 ampere continuous current and 900

ampere interrupting current.

The switch has a one-time fault-closing rating of 25,000 amperes rms asymmetrical and a three-time duty rating of 20,000 amperes rms asymmetrical.

### BEST OPERATING EASE, ICE BREAKING

The AR Switch takes *the lowest torque required in the industry to open and close a switch of this kind* — no more than 50 ft.-lb. for one of the torsional operating varieties! This is an advantage of the AR's unique four-link overtoggle operating mechanism. It also speeds field installation by eliminating any need to adjust the control assembly. And it gives the operator a "snap" feedback, positive assurance of blade closing.

For switches installed in icy weather conditions, AR Switch mechanical and electrical operation is ensured,

even with ice buildup of up to  $\frac{3}{4}$  inch — *the highest level in the industry.*

### AUTOMATION-READY DESIGN

The AR Switch can be purchased as a standard switch and upgraded for Distribution Automation in the future, or ordered as a complete automated switch today. Bracket extensions are available for mounting line sensors (sensors can be provided as specified by the user).

The Chance Motor Operator is available in rotating and reciprocating models. It can be provided with a mounting panel for an RTU and communication package or complete with the user-specified RTU/communication package, fully installed and tested. For more information, refer to Chance catalog section 14C. ■

NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.



POWER  
SYSTEMS, INC.

<http://www.hubbellpowersystems.com>  
573-682-5521 Fax 573-682-8714

TIPS & NEWS View from Vol. 6, No. 1  
JAN 2000

14-2001WB