



GOABS(R) Overview

SEECO phase-over-phase GOABS® switches are designed specifically for switching applications in transmission environments. They provide economical sectionalizing, and tap and tie switching points for circuit control. Mounted on a single pole structure in the line, their use can minimize line right-of-way requirements and significantly reduce the costs of land and equipment associated with conventional substation switching.

Phase-over-phase GOABS® utilize side-break style switches, mounted horizontal upright on aluminum support structures. The switch is designed for maintenance-free operation in severe environmental and operating conditions. The operating effort to open and close the switch is minimal, even at higher voltages; no slamming is ever required. The switch is positively toggled when in the fully closed position, so the switch stays closed under adverse conditions, such as excessive pole deflection, vibration, and galloping conductors, without the use of blade locks or other latching devices.

The current-carrying path is all copper with silver contact buttons, which provide a silver to copper current transfer; no aluminum is ever used in the current path. The current ratings are based on a 30 degree temperature rise. Hinge and jaw assemblies are high pressure devices and are permanently sealed, requiring no maintenance over the life of the switch. The design of the jaw (female) contacts is very forgiving, allowing a substantial amount of pole/frame structure movement and deflection without diminishing contact pressure or effectiveness of current transfer. The provision of support frames eliminates the need for pole cross arms or braces, and the use of aluminum provides a beneficial combination of light weight and high strength, which reduces pole structure design requirements and cost. Frames have welded construction which provides a rigid, stable platform to assure proper switch operating performance.

Switches rated 69 kV and below will mount on any suitable structure; switches rated 115 kV and above will mount on steel, concrete, or laminated wood poles.

Tie and Tap Switching

Two-way and three-way phase-over-phase switches employ a multiple-switch concept where individual switch pole units are arranged in an integral design, sharing insulators, interrupters, and other switch components. Because components are shared, the cost of switching becomes proportionally less expensive when compared to other conventional switch configurations. In addition, the combining of two or three switches into one "bundle" provides a single location for tap or tie circuit control, whether local, remote, or automatic. This facilitates the addition and use of automation equipment, such as motor operators, rtu's, and line sensors, which support switch operation through supervisory control or auto-sectionalizing. Like the sharing of switch components, the sharing of automation equipment makes the cost of control proportionally less expensive.





Interruption Devices

High-speed, snap-out arcing horns are standard equipment on all type "G" GOABS®. They are suitable for interruption of limited amounts of line charging and transformer magnetizing currents.

The addition of SEECO MONORUPTR® vacuum interrupters to phase-over-phase switches provides full load-break capabilities, allowing the switch to be operated under conditions that exceed the capabilities of conventional arcing horn devices. One interrupter unit (column) is used per phase and is mounted on the stationary, non-rotating insulator; the interrupter unit is then shared by each way of the switch. Interrupter switches allow breakers to be reserved for their intended duty of fault interruptions, reducing breaker wear, and reducing or eliminating service interruptions for switching purposes.

Construction Details

SEECO phase-over-phase GOABS® switches are designed for maintenance-free operation in severe environmental and operating conditions. The switch components are heavy-duty and rugged in their design, yet the operating effort to open and close the switch is minimal, even at higher voltages; no slamming is ever required. For ultimate reliability, SEECO phase-over-phase switches utilize a unique construction of the current carrying components and an over-toggle adjustment (figure 1) in the control mechanism. This combination of design features and adjustment procedure insures that the switch stays closed under adverse conditions, such as excessive pole deflection, vibration, and galloping conductors, without the use of blade locks or other latching devices. For the harsh, unforgiving conditions in transmission operating environments, it is the most reliable switch available. It is a proven design validated by over 40 years of successful performance.

General

The switch is directly connected to the operating mechanism through the rotating insulators, inter-phase pipe, lever arms, and crank arms (figure 2), and is in positive control throughout the entire opening and closing operation. The control mechanism is designed for efficient transmission of the operating force to the rotating insulator so that opening and closing of the switch can be effected in a smooth, continuous motion with minimal operating effort.

Blade-Clip Assembly (Jaw) Engagement

The clip assemblies are held open (figure 3) at approximately 40 degrees by a clutch and double spring arrangement housed inside the base of the clip assembly. When the blades swing closed, they engage the contact fingers, pulling the clip assemblies into the final, closed position. This simultaneous blade-clip assembly motion enables the high-pressure, large contact deflection to be achieved with minimum operating effort and provides efficient leverage for breaking ice.



Figure 1



Figure 2



Figure 3



Proper alignment of the blade with the clip assembly (jaw) contact fingers is easily accomplished with the rocker bottom feature (figure 4) of the blade-hinge assembly. This feature insures that the blade-end engages the contact fingers in the vertical center of the clip assembly. Compensation for insulator tolerances is accomplished, without using shims, by loosening and tightening two of the four bolts attaching the blade hinge assembly to the insulators. The two bolts that align parallel with the long axis of blade are used for this adjustment, while the other two bolts are used solely to secure the rocker bottom to the insulator cap.

Contact Fingers (Jaw)

High-pressure, self-wiping, silver-to-copper contacts give superior conductivity without contact abrasion and provide ample mechanical and electrical security to meet industry standard high-current test requirements. The four contact fingers (figure 5) are hard-drawn copper with silver button-contacts. Large contact deflection is provided by separate fatigue-resistant backup springs to maintain high contact pressure under the extreme conditions of outdoor service. The main current path is through the hard-drawn copper fingers, not through the backup springs.

The in-line arrangement (figure 6) of the contact fingers relative to the blade provides increased contact forces when the switch is subjected to high-current surges. Each contact finger and backup spring is attached to the jaw-hinge casting with two bolts, which provides a means for accurately setting contact pressure in assembly.

Blade Assembly

The tubular blade is rigid, hard-drawn copper (figure 6) with a bronze guide at the blade end. The silver contact buttons engage the blade, allowing the current to pass directly from the jaw contact to the blade. Straight-line current transfer from blade to clip fingers provides the additional advantage of a blade-gripping action under high fault current conditions.

Main Bearing Assemblies

The main bearing, which supports the rotating insulator, consists of upper and lower greaseless ball bearing assemblies, utilizing stainless steel balls and races. Bearing assemblies are permanently sealed and maintenance free for the life of the switch.

On switches with 3-inch bolt circle insulators (ratings 15-69 kV), the bearings are assembled in high-strength aluminum housings (figure 7). The bearing housings for 5-inch bolt circle switches (ratings 115-161 kV) are of galvanized steel (figure 8). The 5-inch bolt circle bearings include four leveling screws to facilitate insulator alignment after assembly onto the switch.



Figure 4

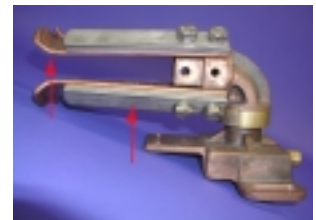


Figure 5

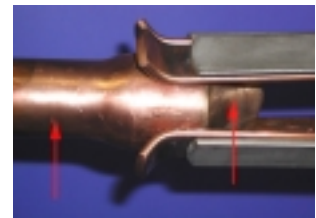


Figure 6



Figure 7



Figure 8



Structural Aluminum Frames

Frames are rigid structural-aluminum units, assembled and welded to form level, stable platforms for mounting the switch components. Truss-type construction eliminates unnecessary weight and provides the strength and rigidity to maintain alignment under the loads, tensions, and operating forces of transmission environments.

Frames for switches rated 15 - 69 kV are of one-piece construction, requiring no field assembly. Frames for switches rated 115 kV and up consist of three main assemblies, which are match-marked after factory assembly and shipped disassembled for convenience in shipping and handling.

Control Mechanism

Control components incorporate features to minimize installation time and to maintain ease of operation. They are designed to withstand the extra force required to break ice and to insure that the operating force is delivered effectively to the switch. Control components typically include pipe couplers, outboard bearings, levers, cranks, clevises, control rod guides, locking assemblies, swing handles, and ground straps.

Outboard bearing assemblies (figure 9), which support the vertical pipe column, are of a greaseless, maintenance-free design and employ stainless steel ball bearings. The number of outboard bearings supplied for each vertical pipe column is based on the run length and weight of unsupported pipe. At least one outboard bearing will be supplied per column, and two may be supplied as the application warrants.

Cranks, clevises, and levers (figure 10) are heavy-duty castings of high-strength bronze. For maximum mechanical strength and durability, each component has a large material cross-section and many incorporate additional ribbing and enlarged embosses. Hardware (bolts, washers, hex nuts, etc) is structural-grade galvanized steel.

Pipe couplers (figure 11) are manufactured from thick wall mechanical steel tube rather than thin wall pipe sleeves used by other manufacturers. Combined with self-piercing set screws, they insure that pipe connections are secure and that switch phases cannot slip out of synchronization.

Adjustable control rod guides are furnished between the bottom phase and the locking assembly. The control rod guides and locking assembly are slotted for quick, easy alignment with the vertical control rod.

The locking assembly (figure 12) is stamped with "open" and "closed" position markings and has provisions for padlocking in either position. The individual lock segments are heavy-duty castings of high-strength bronze, and are slotted for easy adjustment and alignment. A galvanized steel mounting bracket and hardware are also part of this assembly.

Ground strap assemblies (figure 13) include a flexible tinned copper braid, a tinned ground connector, and a pipe clamp.



Figure 9



Figure 10



Figure 11



Figure 12

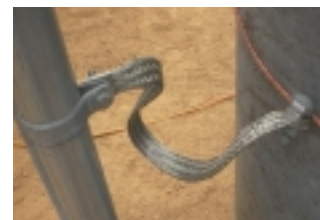


Figure 13