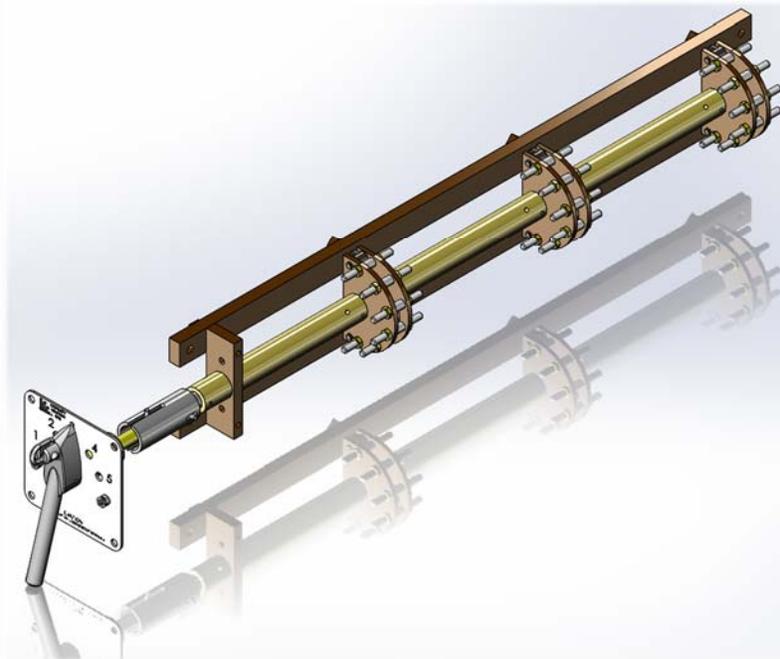
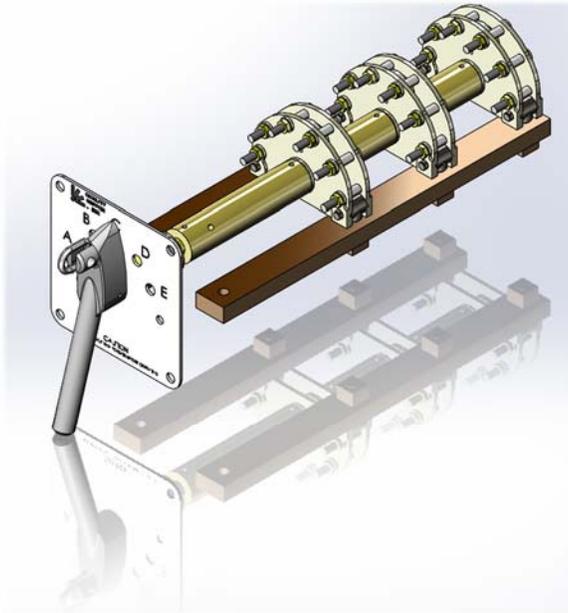


TYPE QS-DRD™ SNAP-ACTION DETC:



**SCOPE:**

This document contains general information about applying and installing the QS-DRD™ snap-action de-energized tap changer. These instructions do not describe all possible issues that may arise during installation, operation, or testing of the tap changer. It also does not describe all of the details and variations of the equipment. Consult the drawings supplied with the order for additional information. In addition, if there is a special application, the switch may be adaptable or customized in some aspects, so please contact Quality Switch for special requests.

**INTRODUCTION:**

The type QS-DRD™ tap changer is one family of the Quality Switch tap changers that is designed for distribution and small power transformers. A de-energized tap changer (DETC) is intended to be connected to the winding of the taps of a transformer. When the DETC is moved from one position to another, the amount of tap winding connected into the circuit is changed. The DETC is typically installed into the high voltage circuit and is generally used to adjust the primary voltage of the transformer within a 10 percent range in 5 steps. The QS-DRD™ snap-action DETC is designed as a bridging type DETC (see Fig.2) with an external operating mechanism. It is commonly used as a 5 position DETC (can be made up to 9 positions) and is made of individual tap decks and chained together using insulated drive tubes. On distribution type transformers the switch is typically mounted off the side tank wall (see Fig.1). The switch is also for small power transformers and can be mounted and secured to super-structure (made of insulating wood or insulating pressboard) built up around the core and coil assembly of the transformer. The tap decks can be mounted in the center of the core and coil assembly which allows the tap leads to be short and avoid long routing of the cable (see Fig.1a).

Figure 1: Side wall mounting

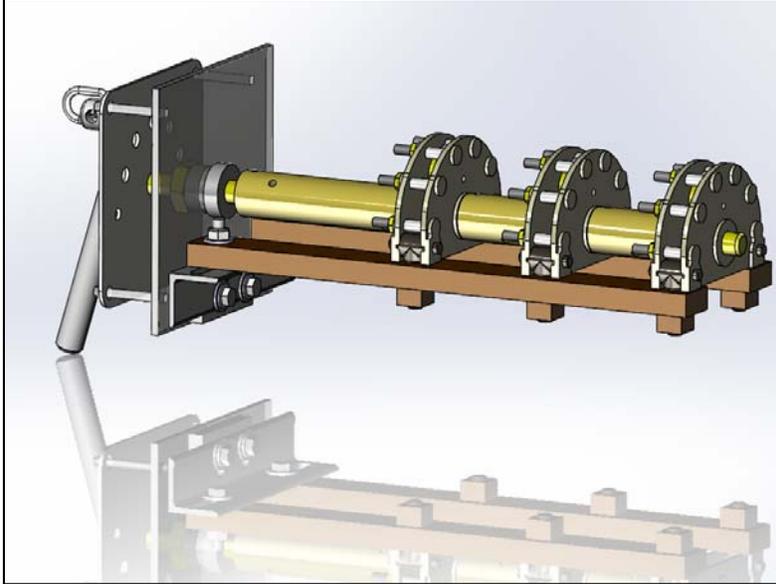
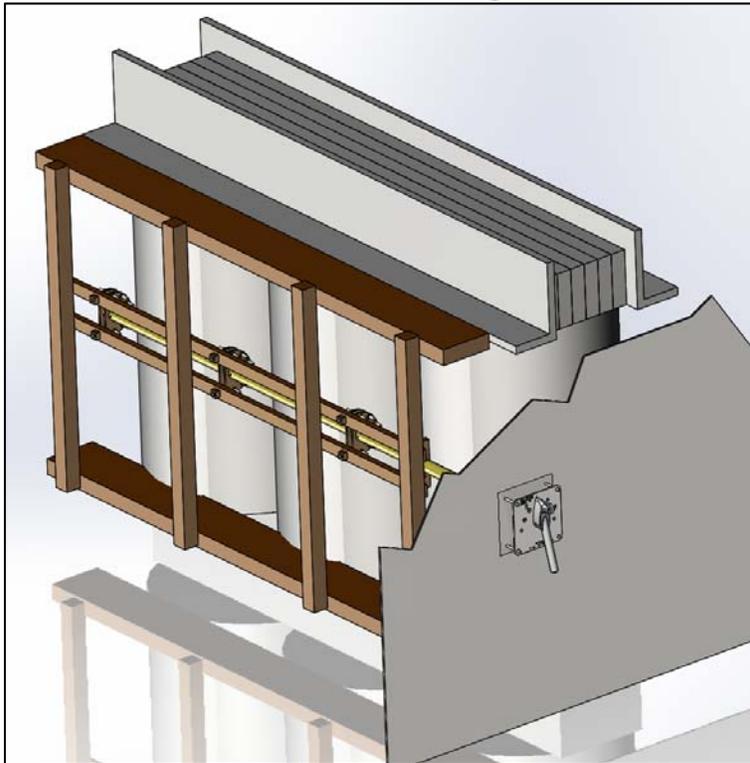
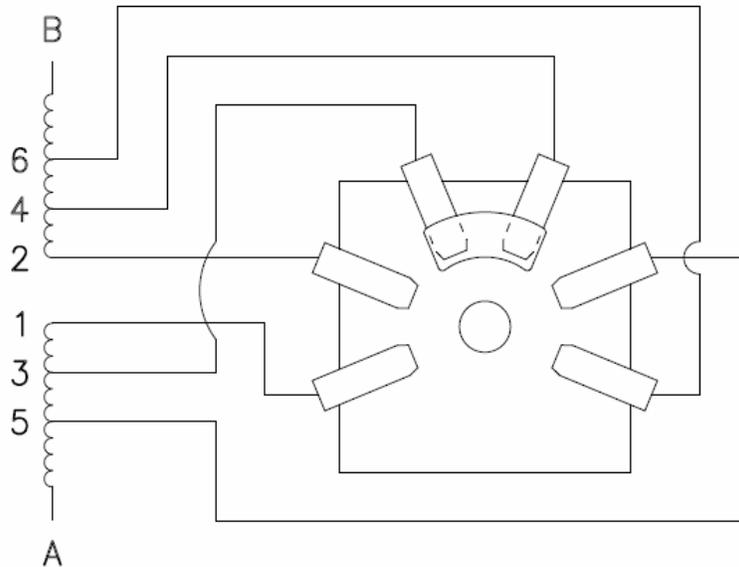


Figure 1a: Core & Coil Structure mounting



**Figure 2: Bridging Contacts**

BRIDGING STYLE TAPCHANGER



A & B ARE LINE ENDS.  
MOVING CONTACT "BRIDGES" TWO STATIONARY CONTACTS.

**RATINGS:**

The QS-DRD™ snap-action tap changer is available in two current ratings; 200amps and 400amps. Both the 200amp and 400amp versions yield a 9°C rise over oil at their respective rated currents. The DETC is typically used on transformers rated up to 350 kV BIL. The switch can be applied on a higher BIL transformer if a specific winding arrangement falls within the design limits of the tested values between contacts (typically wye connected with the taps located near the neutral of the winding). In addition, the ratings are dependent on how the DETC is applied to the transformer, i.e. distance to the tank wall and distance between phases. Consideration must be taken to provide adequate clearance to the all metal parts of the drive mechanism which are live parts (see Figure 2).

**Table 1:**

QS-DRD™ 200amp Snap-Action Tested values	
Test	Result
FW Impulse between contacts (1.2X50 μs)	Passed 3 tests at 200kV
60 Hz. Applied Voltage between contacts	50 kV for 1 minute
Temperature Rise in oil	9°C at rated current
*Typical Operating Torque (3 phases)	≤ 15 ft-lbs
**Short Circuit Withstand	12 kA peak

QS-DRD™ 400amp Snap-Action Tested values	
Test	Result
FW Impulse between contacts (1.2X50 μs)	Passed 3 tests at 172kV
60 Hz. Applied Voltage between contacts	65 kV for 1 minute
Temperature Rise in oil	9°C at rated current
*Typical Operating Torque (3 phases)	≤ 15 ft-lbs
**Short Circuit Withstand	12 kA peak

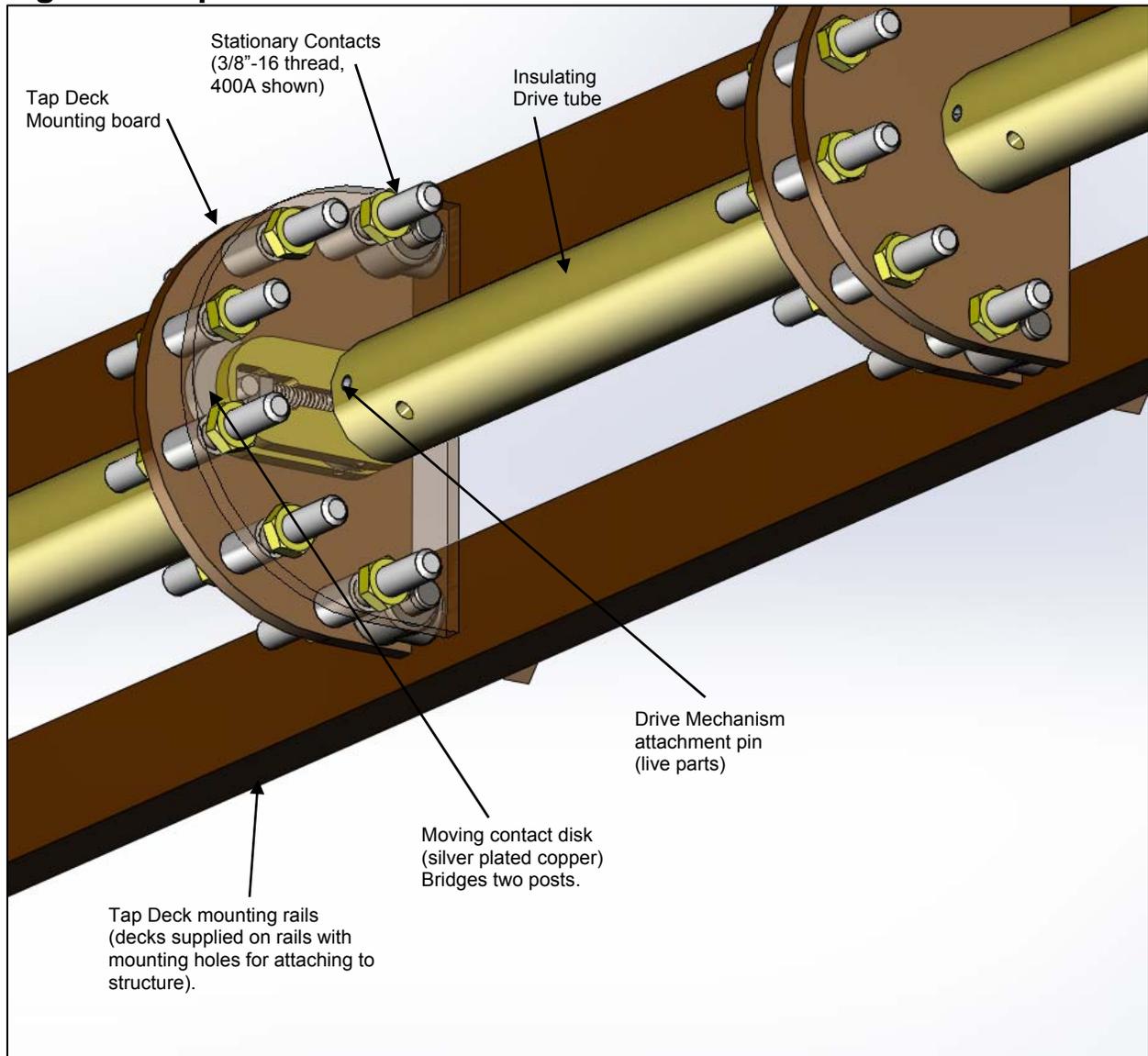
\*Typical Operating torque listed is measured on a workbench. Mounting the switch assembly to a transformer structure may increase the operating torque measurement, but caution should be taken to avoid putting the switch mechanism in a bind due to mechanical mounting stresses.

\*\*Short circuit withstand listed is the same value for both 200amp and 400amp design. The moving contact assembly is the same in both switches and was tested in the 200amp design.

DESIGN FEATURES & DETAILS:

The QS-DRD™ snap-action DETC is assembled with some basic components shown in Figure 3.

**Figure 3: Tap deck features**



**TAP DECK:**

The QS-DRD™ snap-action DETC tap deck boards are machined of a 1/4" thick high pressure laminate manufactured and specifically tested for high voltage applications. The stationary contacts are silver plated copper threaded posts that aide in containing the moving contact with the tap deck boards (the moving contact is sandwiched between the two tap decks). The stationary contacts are provided with a 5/16"-18 thread for the 200amp version and a 3/8"-16 thread for the 400amp version. The tap lead connections are attached with a ring terminal (not supplied by QS) directly on top of the brass nuts. The 400amp version has threads extending out of either side and the leads can be attached on alternating sides. The tap decks are supplied on a mounting rail that will include holes for either mounting to the transformer wood structure or a bracket for side wall mount units.

**MOVING CONTACT:**

The QS-DRD™ snap-action disc contact is a solid silver plated copper contact that is assembled on an axle and mounted in a spring loaded drive mechanism. The compression springs provide ample contact pressure to withstand blow-off forces under fault conditions. The disc also provides a tactile feel when the tap positions are changed as it will "snap" into position. The contact is self-centering between the stationary posts.

**OPERATING MECHANISM (main drive shaft and external mechanism):**

The side wall mounted switches are supplied with a ridged drive shaft attached to the first tap deck. Once the switch is cabled, this shaft will be pushed thru the sealing flange that is welded into the tank. After the handle shaft is thru the tank, the handle and position plate are secured around the shaft (see Fig.4). The switches that are mounted alongside the core and coil also have a sealing boss to be welded directly to the tank. This method uses a flexible steel coupling on the end of the insulating drive tube to be coupled with a brass shaft that will have a pin. This brass shaft will then be inserted thru the tank wall (from the inside) and sealing mechanism. The handle will then fasten to the shaft with a pin. This method requires four mounting posts be welded to the tank in a bolt pattern to secure the index plate (see Fig.5). An alternative method typically used on small power transformers is a spring loaded coupling that bolts to a gasket flange (not supplied by QS). The coupling and plate are supplied complete with the handle and position plate mounted and will bolt up after the assembly is tanked and couple with the drive pin on the DETC (see Fig. 6).

Figure 4: Side Wall mount Installation

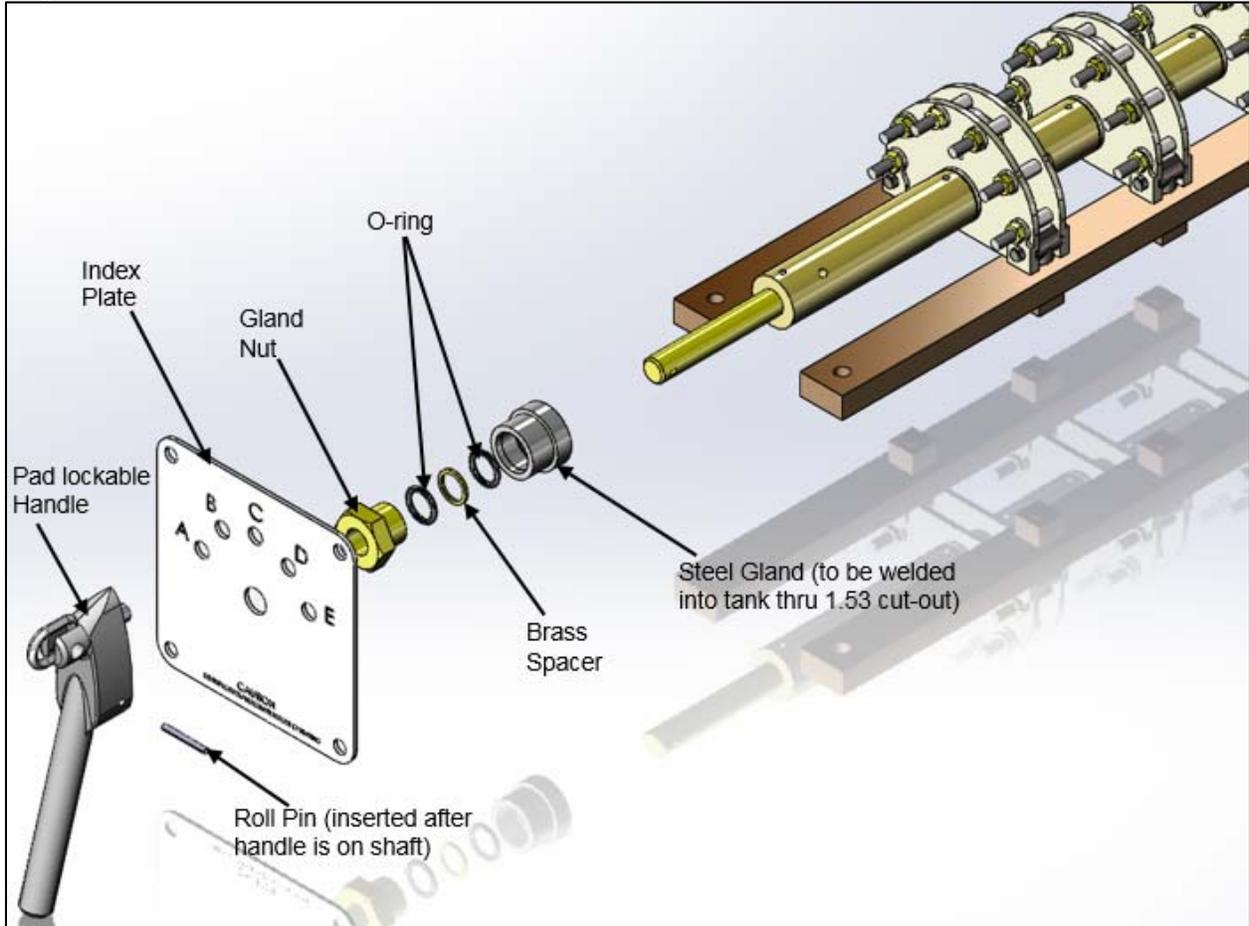
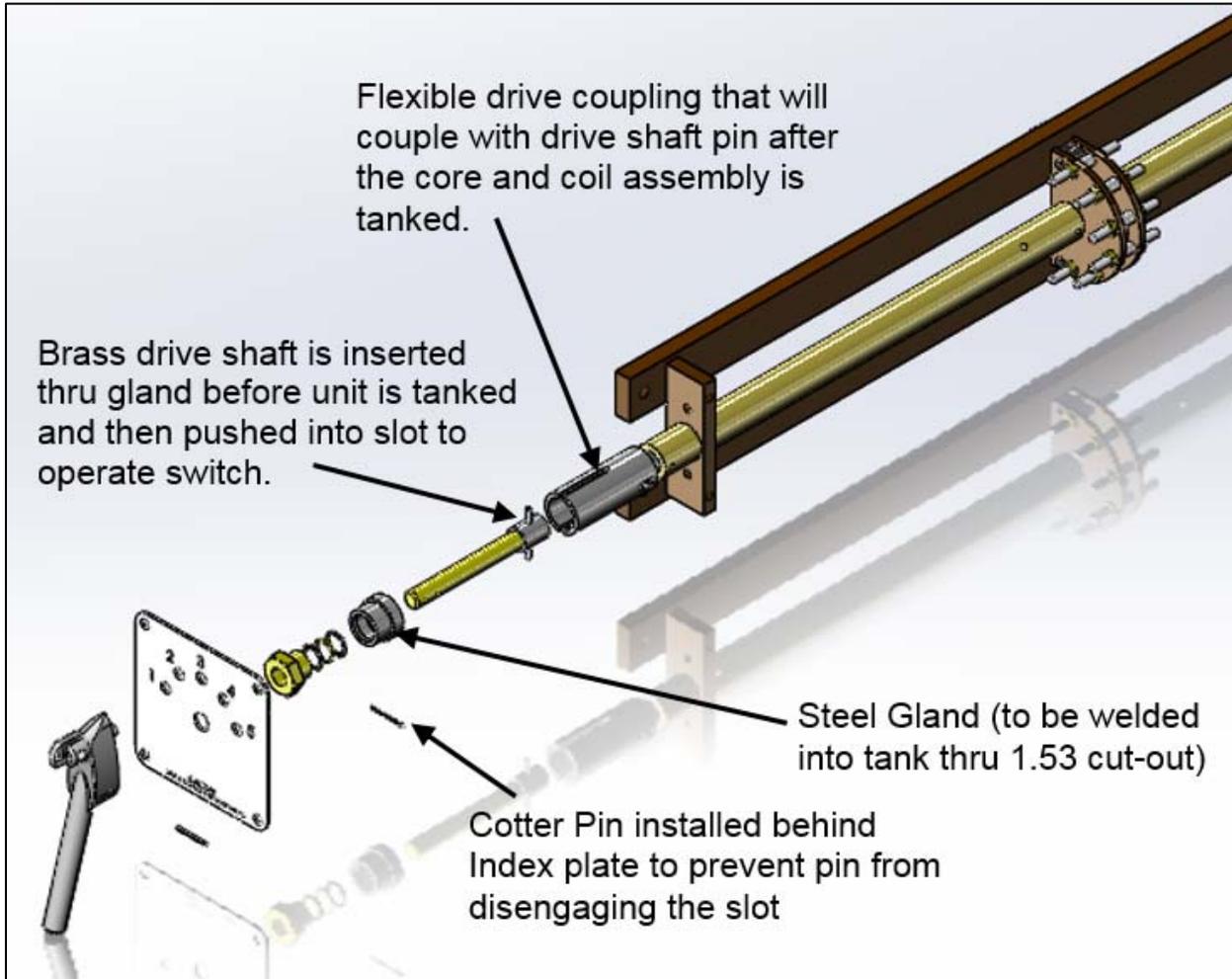
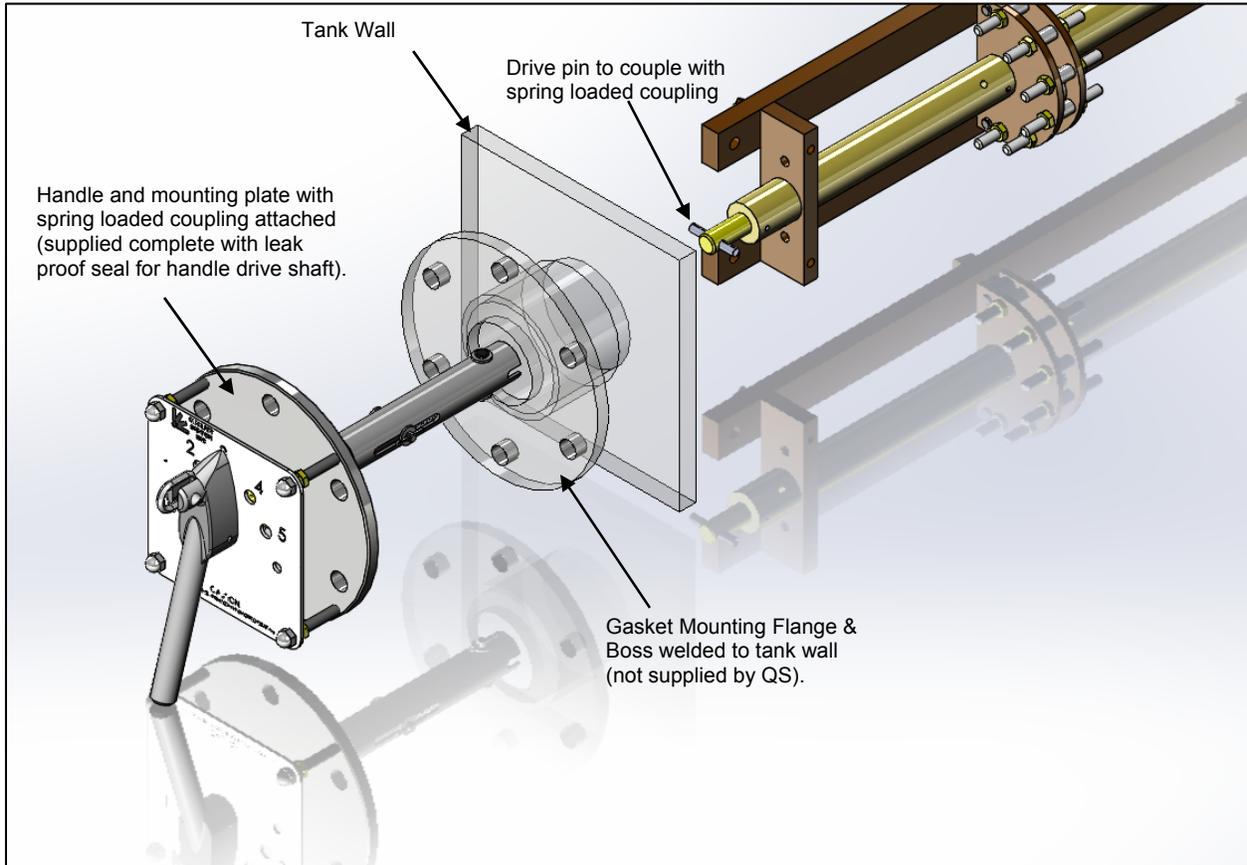


Figure 5: Flexible slotted drive coupling



**Figure 6: Mounting Flange with spring loaded coupling**



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## HANDLING, INSTALLATION AND MOUNTING:

Receiving the Type QS-DRD™ Snap-Action DETC:

- Upon receiving the type QS-DRD™ snap-action DETC, check for visible damage. Notify Quality Switch if any damage is found.
- Verify that the shipment is complete and contains all loose components. Several smaller components (i.e. handles, position plates, drive shafts) will be wrapped individually for protection during shipping, so take caution not to discard them with the packing material in container. These components will be listed in the description of the item on the packing list provided with the shipment and will be marked with sticker labels stating "Parts Enclosed".
- Check that the packing list matches the order numbers and part numbers included on the order acknowledgement. A serial number will be engraved on the tap deck mounting rails that shall correspond with a sales order number found on the order information.

Preparation required by Customer:

- Prior to installing the DETC, appropriate mounting in the transformer tank is required. Depending on the operating mechanism, a steel boss will need to be welded (gas tight) into the tank, or a mounting flange with the appropriate bolt pattern and gasket seal is required. The mounting flange welded to the tank is not supplied by QS. The appropriate dimensions and specifications will be included on the outline and/or detail drawings of the DETC.
- The transformer structure needs to be prepared with holes appropriate for mounting the type QS-DRD™ DETC. The hole patterns are also shown on the DETC outline drawing. Hardware to secure the switch to the structure is not supplied with the switch, but can be ordered separately if required. This must be non-metallic hardware.
- Only standard tools are required for installation.

Mounting:

- The type QS-DRD™ DETC side wall mounted requires a bracket support to fasten the mounting rails. This is typically welded or bolted to a threaded pad that is welded to the tank. For the switches mounted on the core and coil assembly, a support structure constructed of appropriate insulating material to secure the mounting rails is required. The switch can be mounted on top or alongside the assembly. The holes are provided in the mounting rails can be customized to match structure. The structure is typically the same structure that supports the HV leads in the transformer design. Also, support is required if the front insulating tube extends a large distance from the first tap deck to couple with the drive handle.
- Refer to the switch outline drawing for specific mounting dimensions for your switch.

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Installation Steps for side wall mount (in general):

- 1) The side wall mount will typically be fitted to the support after the tap lead connections are made to the DETC. Take care to allow enough lead length to pull the DETC up to the mounting on the side wall and insert the brass shaft thru the sealing boss that is welded to the tank.
- 2) Once the shaft is installed thru the sealing boss, loosely install the hardware to fasten the mounting rails to the support bracket (similar to Fig.1). Ensure no mechanical stresses are on the switch from the cable connections or a bind is on the shaft thru the sealing boss and then proceed to tighten the hardware. If during this process a bind is put on the switch, loosen all the hardware and re-fit the switch.
- 3) After the switch is installed thru the sealing boss and secured to the bracket, the position plate can then be mounted. Slide it over the brass shaft and secure it to 4 mounting posts on the tank (not supplied by QS). The position plate should have a minimum of 1.5" to the tank wall (see switch outline drawing for specific details).
- 4) The handle is then secured to the brass drive shaft using the spring (roll) pin provided. Slide the handle over the brass shaft and align the hole in the handle with the hole in the brass shaft. Be sure the switch is in the same position as the handle is installed into the position plate. Also provide support on the opposite side of the handle that the pin is being installed. The pin can be installed using a standard hammer to tap it thru the handle and shaft.
- 5) After the dry-out process all non-metallic hardware will need to be re-tightened (finger tight, which is typically 5-9 ft-lb range max). Basically the same process involved with the transformer structure hardware should be followed with the switch mounting hardware. After re-tightened, Glyptal™ or some equivalent form of electrical epoxy should be applied to prevent the hardware from vibrating loose.

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Installation Steps for mounting on transformer structure (in general):

- 1) The switch assembly will attach to the transformer structure via mounting holes provided in the rails that chain the tap decks together (see outline drawing for pattern arrangement). Attach the switch to the structure using non-metallic hardware (not supplied by QS unless specified before shipment).
- 2) After the switch is mounted to the structure, the tap leads can be connected to the threaded terminals. Care should be taken to form the lead runs to the switch in a manner that no additional mechanical stresses are put on the terminals. The maximum recommended tightening torque on the threaded post is 6 ft-lbs for the 200amp versions (5/16"-18 threads) and 12 ft-lbs for the 400amp version (3/8"-16 threads). The terminals (not supplied by QS) are attached on top of the brass nut supplied on the tap deck (additional connection hardware can be supplied upon request for an additional charge).
- 3) Once the switch is on the transformer core and coil assembly and lowered into the tank, the handle shaft can then be coupled. On units that have the steel sealing boss welded directly to the tank, the brass drive shaft needs to be installed from the inside of the tank before the core and coil assembly are lowered into the tank (see Fig. 5). After tanking, then the brass shaft is pushed into the coupling and the drive pin should go into the slot. Ideally the pin will be at the half-way point of the slot, but the coupling does allow for slight misalignment between the switch and the shaft after tanking.
  - a. If the sealing boss is supplied by QS already welded to a mounting plate and it will be bolted to a flange on the tank (see Fig.6), then the entire mounting assembly will be bolted onto the tank and the spring loaded coupling will mate up with a drive pin on the switch assembly.
- 4) For units with the sealing boss welded on the tank, after the brass shaft is coupled with the switch drive shaft, the index plate is to be mounted to four mounting posts. The spacing shall be a minimum of 1.5" from the tank wall (see outline drawing for details).
- 5) After the index plate is mounted, a cotter pin shall be installed thru a hole in the brass shaft to prevent the coupling from becoming detached inside the tank. The handle will then be placed on the shaft and the spring (roll) pin supplied with the handle will fasten the handle to the brass shaft. The pin can be installed using a standard hammer to tap it thru the handle and shaft.
- 6) See step 5 of side wall mount for final adjustment after dry-out.



TYPE QS-DRD™  
SNAP-ACTION DETC

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**\*\*\*DISCLAIMER\*\*\***

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