SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS

No two power transformers are alike. Equipment Outline drawings only tell part of the story. In order to properly and accurately size slip-over BCTs (SBCT) to assure a trouble-free installation, Meramec's Engineering strongly recommends doing the following:

1. **Submit the original OEM bushing drawings, and**
2. **Perform a site survey, and**
3. **Complete the dimensional forms at the end of this manual (pages 7-8 as required).**

Bushing drawings provide many needed measurements. Older OEM drawings may lack some of the critical information needed which can be obtained during a site survey. If terminals have a mixture of bushings due to some previous field replacement, it is important that each bushing drawing be made available.

The site survey provides knowledge of the surrounding area for each terminal bushing. This should only be done with the equipment de-energized. Digital photos are an excellent tool to provide Meramec Engineering a visual record of the bushing. Capturing measurements digitally assists in scaling other objects near by. Overhead shots looking down onto the bushing, as well as looking into the bushing from the tank top plane, are excellent points of view. High resolution pictures are preferred for zooming purposes. Often there are many objects on the tank top that are not dimensioned, or even shown on the OEM equipment drawings. Some of these objects, such as manhole covers, pressure gauges, conduit pipes and junction boxes, can restrict the placement and sizing of the SBCT, which may affect the design performance and installation.

The forms on pages 7-8 help tabulate the most important dimensions. The most common items are indicated on the form but not all. Figures 6 and 9 demonstrate examples of obstructions that may hinder the placement of the SBCT.

Meramec Engineering will design the SBCT to meet the accuracy requirements based on the space available, and propose the best mounting solution. We offer a standard bracket kit, which consists of two mounting clips per all-threaded rod with associated hardware. The amount of clips and rods are dependent on the physical size of the SBCT and its weight. The standard kits are typically available in 3, 4, 6 and 8 clips in either Aluminum or Stainless Steel. Figure 1 shows a typical makeup. They are adjustable in height. The rod length is 14".

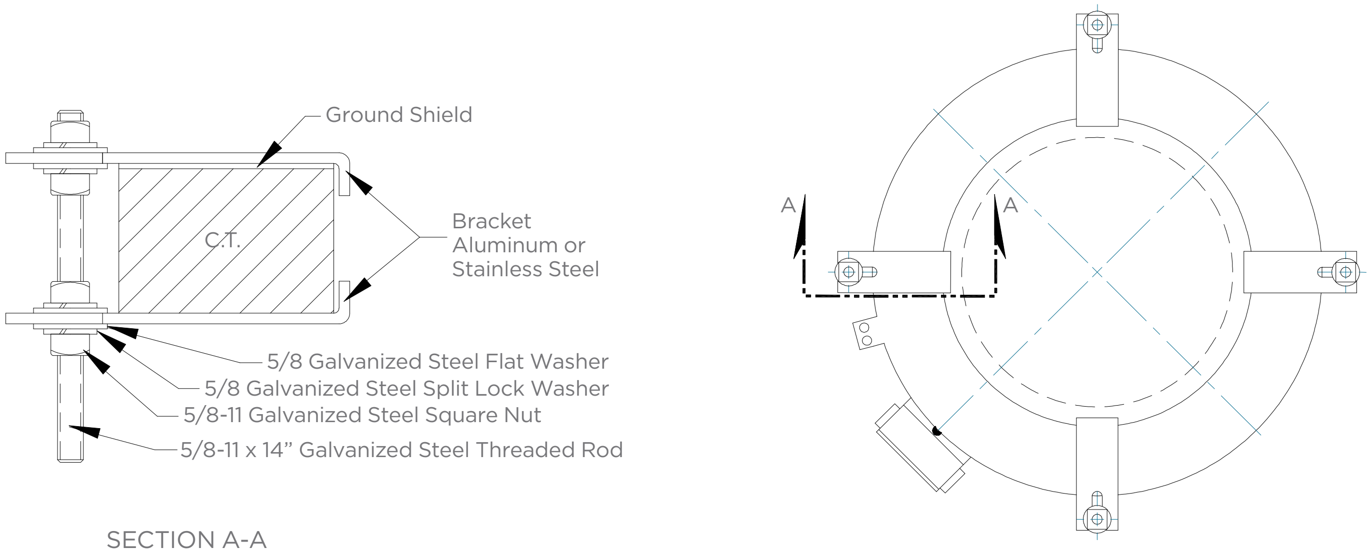


Figure 1 – Standard Mounting Brackets

SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS

We also offer custom mounting solutions where the brackets are engineered to attach the SBCT to the specific bushing it will be installed on. Typically the bottom bracket is flat and the top bracket captures the SBCT and ground shield, and attaches to the bushing flange bolt as shown in Figure 2.

There is a variation of this style where the brackets are inverted which allows the SBCT to drop below the flange.

And of course the last version would be a partial rise and drop.

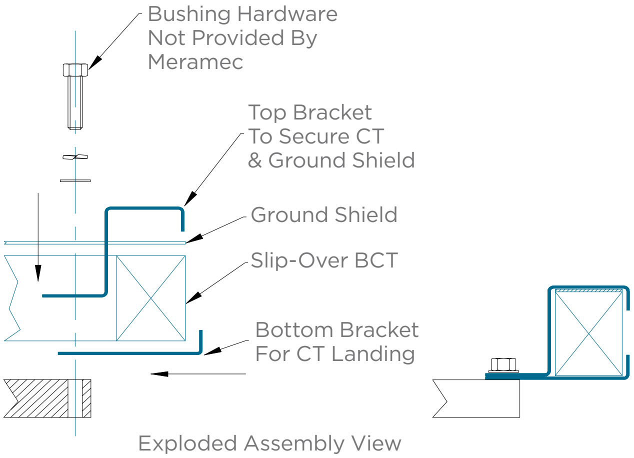


Figure 2 – Captive Bracket System

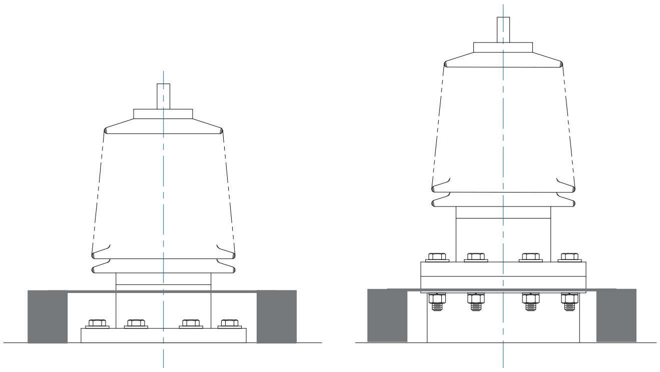
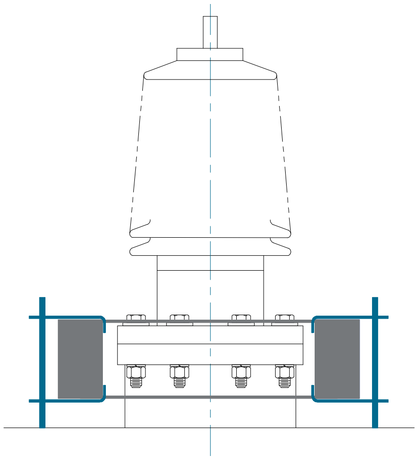


Figure 3 – Tank top mounting without brackets

INSTALLATION:

The simplest installation is without brackets at all. In some cases the SBCT can rest directly on the tank top without the need for any brackets as shown in Figure 3. We do offer special pads which can be adhered to the bottom of the SBCT with a silicon adhesive RTV. This will raise the SBCT above the tank and allow moisture from rain to drain off. When ground shields are used without brackets, they must be adhered to the top of the BCT with a silicon RTV.

Using the standard bracket system (as outlined in Figure 1) will allow the SBCT to be adjusted vertically as shown in Figure 4. This bracketing system requires the installer to either apply weld nuts to the tank top, or tack weld the rod directly to the tank top. Either will secure the rods in place. If securing with weld nuts, a circular template made of cardboard cut to the same size of the SBCT can be placed around the bushing to pre-locate the rods. The rods are secured first, then the bottom clamps to the desired height. The SBCT is then carefully lowered over the bushing and onto the clamps. After positioning the ground shield, the top clamps are attached and secured. If the rods are to be tack welded to the tank top, then the clamps and rods can be secured to the SBCT first, and then the entire assembly is lowered onto the tank top over the bushing. Excess rod length should be cut off.



SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS

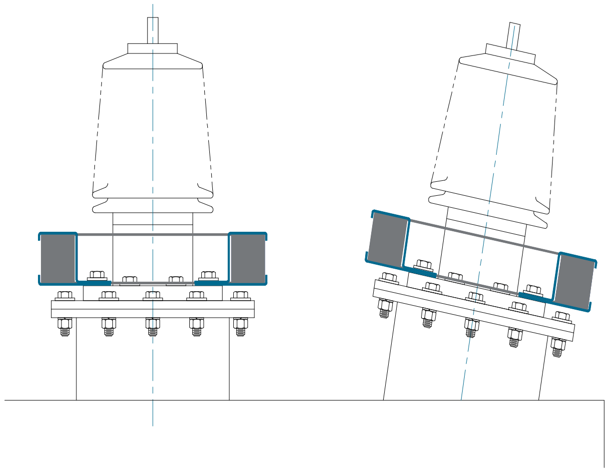


Figure 4 – Custom bracket installation mounted to and above the bushing flange

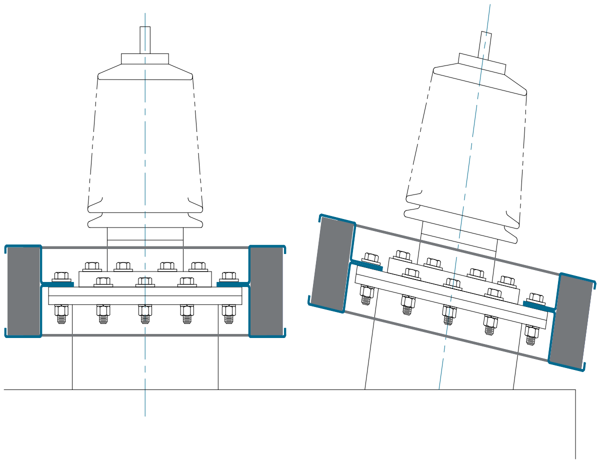


Figure 5 – Custom bracket installation mounted to and partially below the turret flange

Custom captive mounting brackets (as outlined in Figure 2) are engineered for the SBCT to attach to a specific bushing. In this method, the flange bolts must be long enough to accommodate two bracket thicknesses, and should be determined prior to installation. A template of the SBCT cut out of rigid cardboard is recommended for this installation. Since this assembly requires removal of the flange bolts, only one at a time is recommended. The OEM should be consulted on the proper removal of bolts and the recommended tightening torques.

All bottom brackets must be attached first. Using a template assures the brackets are in the correct position to accept the SBCT. In some instances the bracket may require trimming to properly fit, especially if it's near a lifting eye or test plug (see Figure 8 for example). Once all bottom brackets are secured in place, the SBCT is carefully lowered over the bushing onto the brackets. Any adjustments should be made at this time. Once the SBCT is firmly in place, the ground shield should be positioned on top. Then the top brackets must be installed, again one at a time.

There are modifications of this method. In some cases the brackets may be inverted where the SBCT is completely dropped below the flange and the top bracket is flat. And there may be instances where the SBCT may be partially above and below the flange as shown in Figure 5.

So far the discussion has been about the bushing without consideration of the surroundings near the bushing. All power transformers are covered with potential obstacles that may restrict how the SBCT is mounted, and can also force accuracy restrictions on the SBCT design. Figure 6 demonstrates this point.

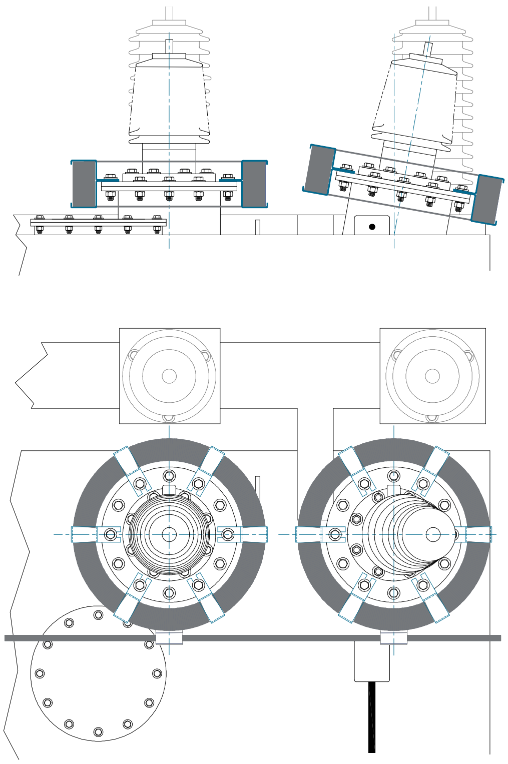


Figure 6 – Custom installation on transformer

SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS

GROUND SHIELD:

The purpose of the ground shield, or arc shield, is to establish the surface plane above the SBCT as ground. Should a flash-over occur from the live terminal to ground, the shield would bypass any current flow away from the SBCT. Our ground shields are contoured to the shape of the SBCT and come with a NEMA 2-hole pattern for attachment of a compression lug. The routing of the ground lead is critical and dependent on the bracket system used to install the SBCT. The key here is looking at the common point of the top and bottom brackets. With the standard bracket kits as shown in Figure 7, the all thread rod is the common point, and since it is external to the SBCT, the ground lead must be routed external. With custom captive brackets as shown in Figure 8, the common point is at the flange bolt, which is internal to the SBCT. In this case the ground lead must be routed back through the window of the SBCT then to ground. The reason for this is to avoid creating an electrical shorted turn around the SBCT core, which will cause the SBCT to malfunction. Incorrect grounding can usually be found while performing field tests such as turns ratio and secondary excitation.

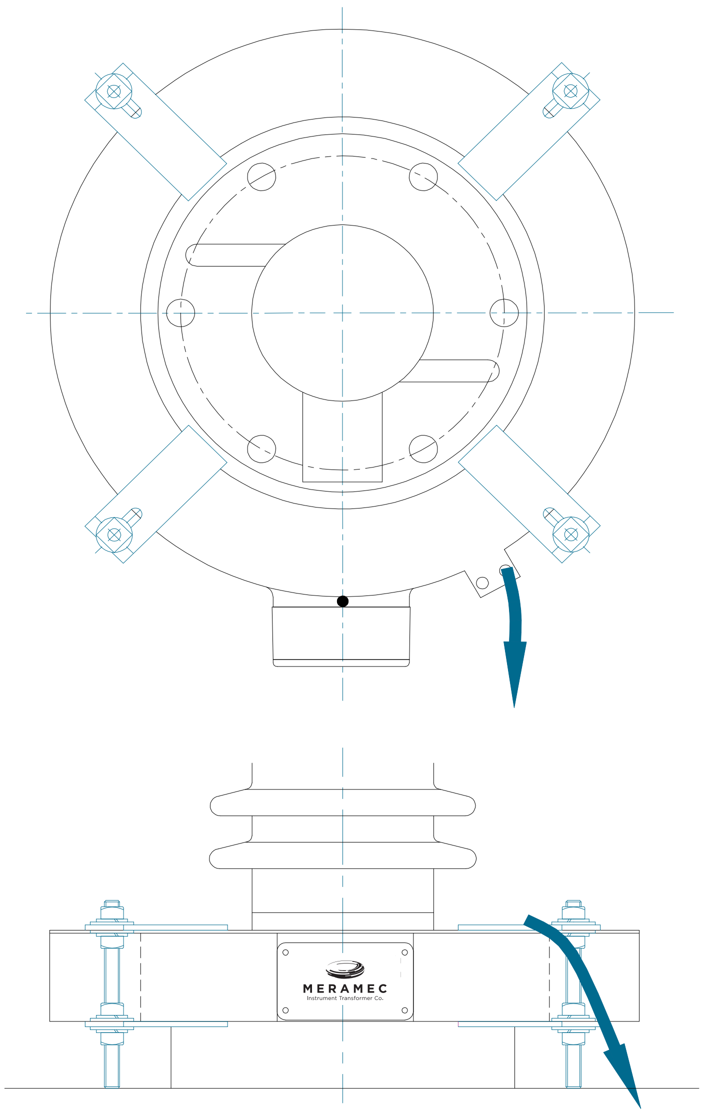


Figure 7 – Ground shield with standard brackets

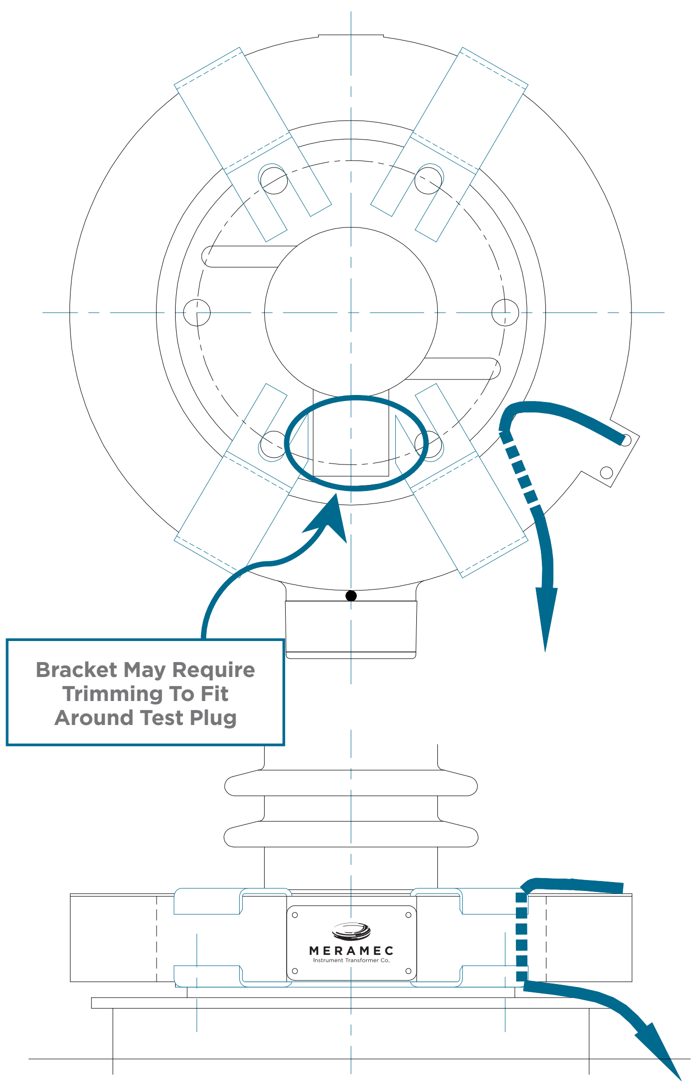
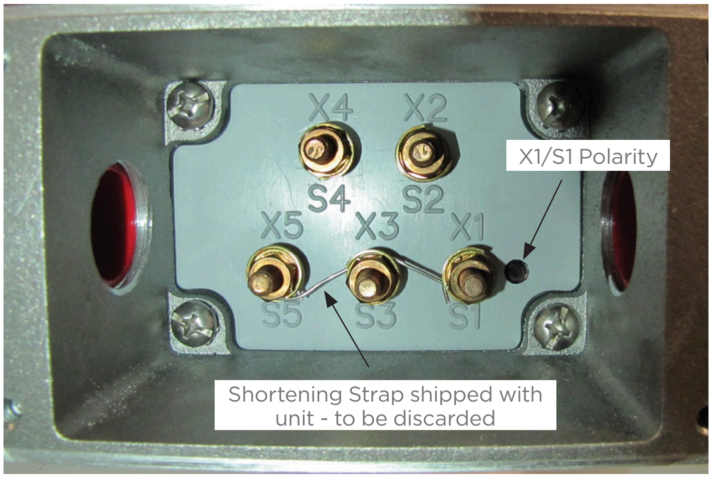


Figure 8 – Ground shield with custom brackets

For product inquiries, please contact your Hubbell sales representative or customer service at InstrumentTransformers@Hubbell.com or (573) 885-2521.

WIRING AND COMMISSIONING:

Once the SBCT is installed and secure, the ground shield should be properly connected to ground.



The SBCT secondary conduit box is a weather-tight junction box with two 1”-11.5 NPT hubs. The secondary terminals are ¼”-20 silicon bronze studs with hex nuts and washers. Each terminal has a permanent embossed mark adjacent to the terminal. The X1/S1 terminal is identified by an embossed colored dot signifying its instantaneous relative polarity with respect to H1/P1. When supplied from the factory, the terminals are provided with a shorting strap. Upon wiring, this strap should be removed and discarded. The conduit box is metallic, but not connected to any internal ground point. It may be grounded externally if desired. It is suitable for liquid tight flexible or rigid conduit. All secondary terminals should be connected to a terminal block residing in some enclosed control box. Any testing of the SBCT should be performed from this point. Grounding of the SBCT secondary circuit should be in accordance with IEEE C57.13.3.

In the event a SBCT is to be taken out of service but not physically removed from the bushing, the secondary terminals MUST be shorted across the full winding at either the terminal block or directly at the CT terminals.

Under no circumstance should a SBCT be operated with its secondary winding in open circuit – a very high and sometimes lethal voltage can be developed which can cause damage to the SBCT, its pilot wiring, and be harmful to personnel.

When shorting an unused SBCT the full winding should be shorted to prevent the SBCT from possibly over heating. While shorted and with primary current flowing, secondary current will circulate in the secondary winding, which is not at all harmful to the SBCT.

When wiring a multi-ratio SBCT, only connect to the desired tap and leave all other unused taps alone – do not short any unused tap.

Each SBCT has been electrically tested at the factory prior to shipment, in accordance with all required routine tests per IEEE C57.13. Additional testing performed after installation should be done in accordance with IEEE C57.13.1. Caution should be used if performing any DC reisistance measurements on the secondary winding as the core must be properly demagnetized. In some cases field equipment may not adequately demagnetize the core. If the coil is a multi-ratio winding, lower taps may be used to demagnetize the core. Lower taps may also be used to qualify the SBCT for its protection class as the secondary voltage is directly proportional to turns. When performing applied tests or Megger tests, short the entire secondary winding. Do not apply more than 3kV/60 Hz between the shorted secondary winding and ground.

SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS

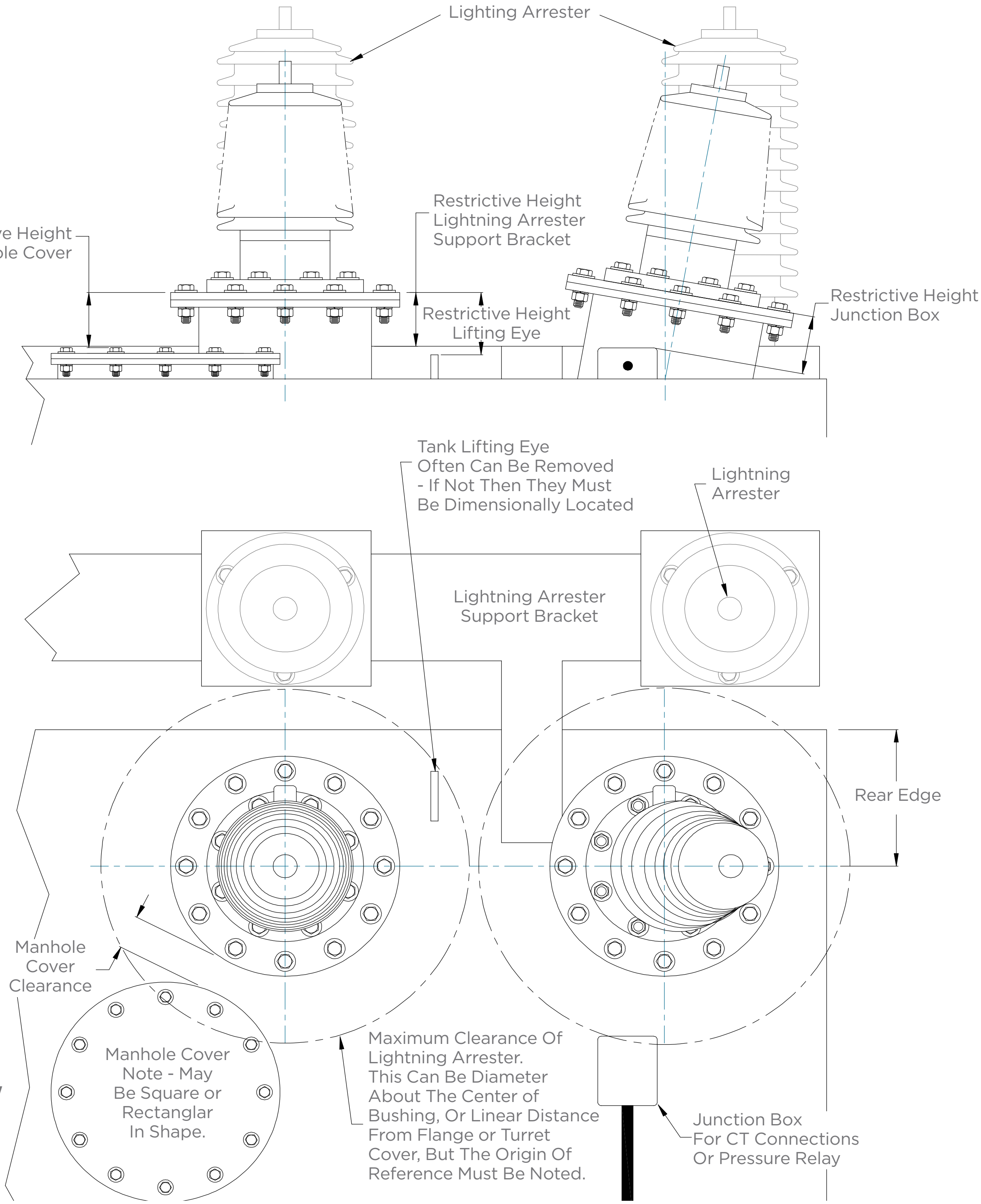
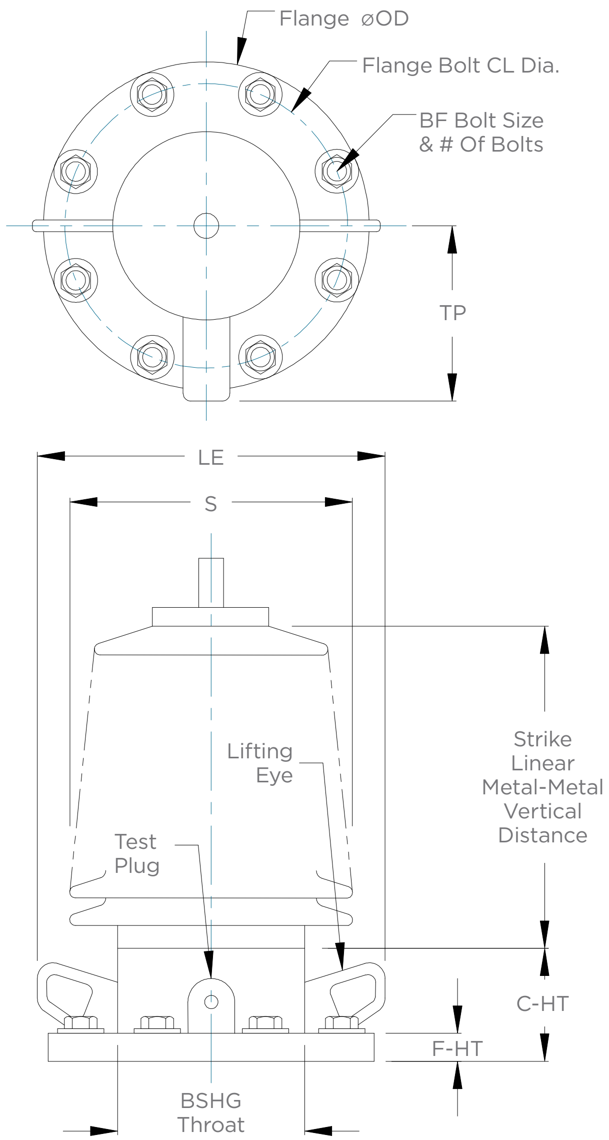


Figure 9 – Typical transformer tank top

SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS



Bushing Dimension Legend

Bushing Maker : ____________________

Bushing DWG No. : ____________________

Date : ____________________

BUSHING DETAILS

Customer : ____________________

Project Name : ____________________

Contact Person : ____________________

Phone : ____________________

Email : ____________________

Terminal name (position) : ____________________

Terminal Rating : __________ **kV** __________ **kV BIL**

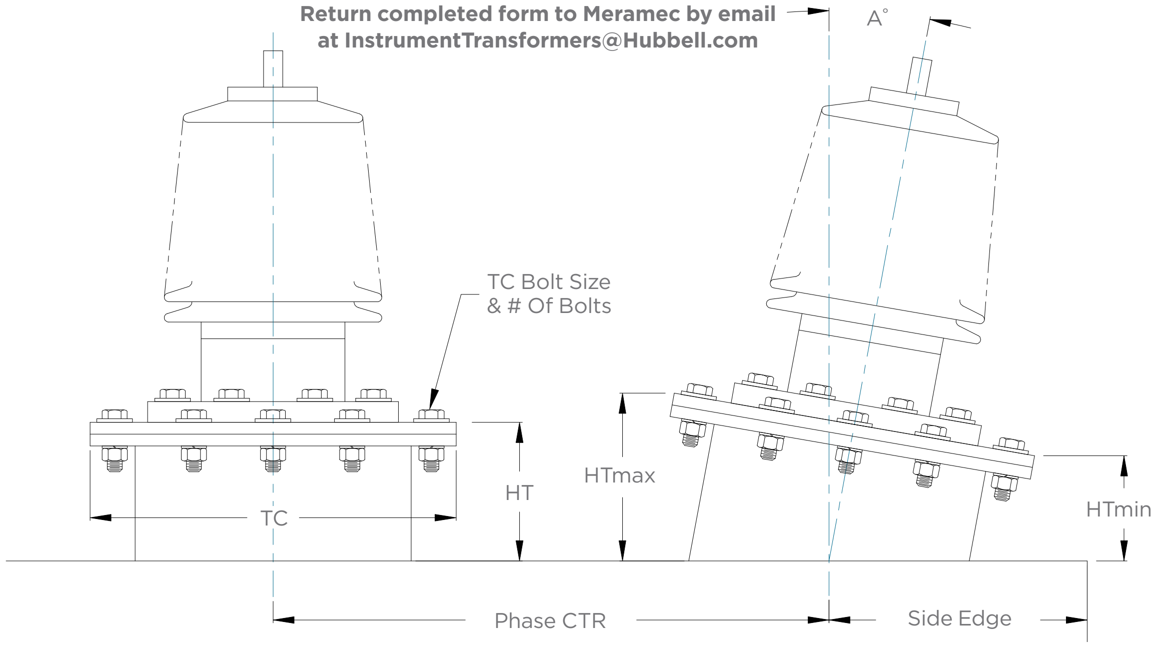
NOTE: If OEM bushing drawing is provided, only provide those dimensions below that are NOT indicated on the OEM drawing.
*Required for custom brackets

MEASUREMENT (see legend)

FLANGE OD	
* FLANGE BOLT CL DIA.	
* FLANGE BOLT SIZE	
* NUMBER OF FLANGE BOLTS	
* FLANGE MTG PLATE [F-HT]	
* COLLAR DIAMETER [BSHG THROAT]	
FLANGE COLLAR HT [C-HT]	
MAX. SKIRT DIAMETER [S]	
LIFTING EYE SPAN [LE] (IF > FLANGE OD)	
TEST PLUG RECEPTICLE [TP] (IF > FLANGE OD)	
LIVE PART TO CLOSEST GROUND	

Return completed form to Meramec by email at InstrumentTransformers@Hubbell.com

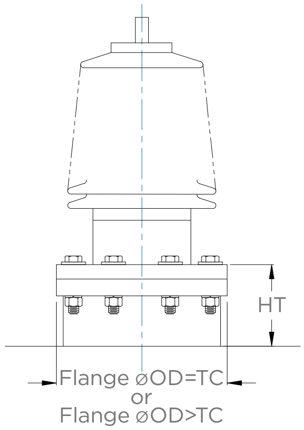
SIZING AND INSTALLING THE SLIP-OVER BCT ON POWER TRANSFORMERS



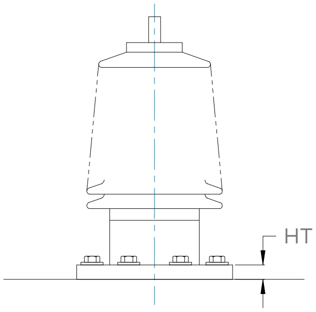
TRANSFORMER TANK DETAILS

For clarity, please label any pictures by its terminal name

HT = HTmax = HTmin



HT = HTmax = HTmin



HT = F - HT

MEASUREMENT (refer to Legend this page)	OUTER LEFT in	CENTER in	OUTER RIGHT in
TERMINAL NAME (H1, X1, H0, etc...)			
TURRET COVER DIAMETER, [TC] IF SQUARE, REPORT L x W			
TURRET COVER BOLT SIZE			
NUMBER OF TURRET COVER BOLTS			
PHASE-PHASE AT TANK, [PHASE CTR]			
CENTER TO OUTER EDGE, [SIDE-EDGE]			
CENTER TO REAR EDGE, [REAR-EDGE] pg.6			
TOP OF TURRET FLANGE TO TANK, [HT]			
MAXIMUM TOP OF TURRET FLANGE TO TANK, [HTmax]			
MINIMUM TOP OF TURRET FLANGE TO TANK, [HTmin]			
ANGLE OF BUSHING OFF VERTICAL, [A°]			

Note: If a dimension is same for all terminals, record in column 1 and strike line thru remaining columns. If a dimension does not apply, report "N/A".

Note: Define obstruction locations on a separate sheet w/ diagram or pictures.