

# DOC Drawout Case Test Plug Reference Handbook

doc-reference-en v.0026



  
**SecuControl**<sup>®</sup>

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## Safety Symbols

The following symbols are located on different parts of the equipment and in this manual:



Paragraphs marked with this symbol contain information which, if not properly followed, may cause damage to the equipment and/or installation, personal injury or even death.

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# 1 Introduction

## The DOC Drawout Case Test Plug

The DOC is a test plug for General Electric (G.E.) type drawout case relays with ten (10 poles), such as General Electric S2 and M1 style cases. It does not fit the 14-pole General Electric c-case. The DOC may also fit 10-pole drawout cases by other manufacturers, if they follow the same design for the test paddle as the GE equivalents (for instance S and M style Basler Electric drawout cases).

The DOC allows for easy insertion into the drawout case in order to redirect the circuits to the front, while not opening any circuits, if no pins have been inserted into the disconnect position of the DOC.

## Applications

The DOC provides a finger-safe interface where operations like measurement of currents can be performed via separate Current Measurement Probes. This concept reduces operational risks that are present in other products, such as exposed metal contacts and the need to pre-wire current short-circuit links in the correct positions before insertion into a drawout case even for the operation of current measurement.

The DOC can also be used with disconnect pins that can either open specific circuits (disconnect voltage or trip circuits), or establish a short-circuit on the system side and disconnect the associated contacts from the device side of the DOC test plug. Available disconnect pins are:

- 1-pole disconnect pin
- 2-pole disconnect pin with integrated shorting bar: C-C



**Functionality and operation of the DOC is described in more detail in the following sections of this document. The complete reference handbook needs to be carefully studied before any use of the DOC in order to be aware of correct operating practices and hazards.**

## Key Features

- Fits General Electric and Basler Electric style 10-pole drawout cases
- Brings internal drawout case contacts out for easier access
- DOC internal contacts are normally closed, if no disconnect pins have been inserted
- Insertion of disconnect pins serves to block trip or voltage circuits (1-pole disconnect pins) and short-circuit current transformer (CT) circuits (2-pole disconnect pins with integrated shorting bridge). ALL DOC positions accept either disconnect or shorting/disconnect pins.
- Finger-safe design increases safety during testing
- Standard banana jacks in the front of the DOC provide easy test access

- Works with SecuControl CT Measurement Probes and Loop Measurement Probes
- Keyed against upside-down insertion
- Color-coded system and device sides (system side: red labels, device side: white labels)
- Clear labeling for access to the bottom (1-10) and the top (11-20) positions of drawout cases
- Low internal resistance ( $\leq 2 \text{ m}\Omega$ )
- Facilitates efficient, standardized testing procedures and big time savings
- Sturdy carrying cases available (optional)

## Unpacking

Unpack the product carefully and check the contents against the packing list. If any of the contents listed are missing, please contact SECUCONTROL immediately (see contact information at the rear cover of this manual). Examine the product for any shipping damage. If the product is damaged, notify the shipping company without delay. Only the consignee (the person or company receiving the unit) can file a claim against the carrier for shipping damage.

## Part Number and Manufacturing Date Location

Part number and manufacturing date are stated on a label on the side of the DOC test plug.

## General Safety Instructions

Operation of the product described in this manual is only to be performed by personnel that has been trained or is knowledgeable in substation protection, automation and control.



**The DOC is a tool that is intended for use by electrically trained and skilled personnel only. Correct and safe use is responsibility of the user. SECUCONTROL does not assume any responsibility or liability for errors, misuse, damages or any kind of harm caused, including but not limited to bodily injury and / or death.**

This instruction manual is an integral part of the scope of delivery and provides basic instructions for operation of the equipment here described. It needs to be carefully studied in full before any use of the DOC. Shall additional information be needed, please contact SECUCONTROL at any of the addresses provided on the rear cover of this document.



**Read and closely follow all instructions and warnings in this reference handbook. In the case of questions contact SECUCONTROL at one of the addresses stated in the back of this document.**

## Product Handling

The DOC must always be handled carefully. It must not be dropped or handled roughly. When not in use, SECUCONTROL highly recommends storing the DOC in a sturdy carrying case to prevent damage.

Carefully inspect the DOC for damages before each use, and use only undamaged DOC Drawout Case Test Plugs. Do not use the DOC if it is chipped, cracked, or in any other way damaged.

Never force the DOC into a drawout case if it does not seem to fit. Check if it is a case that can be used with the DOC. If the case should be compatible but the DOC does not fit, the case may be out of alignment. Check if the contacts in the case can be better aligned so that the DOC will fit without applying force. If it is not possible to align the case accordingly do not use the DOC with it.

Always insert disconnect pins and SecuControl Measurement Probes straight (not angled) and without excessive force.



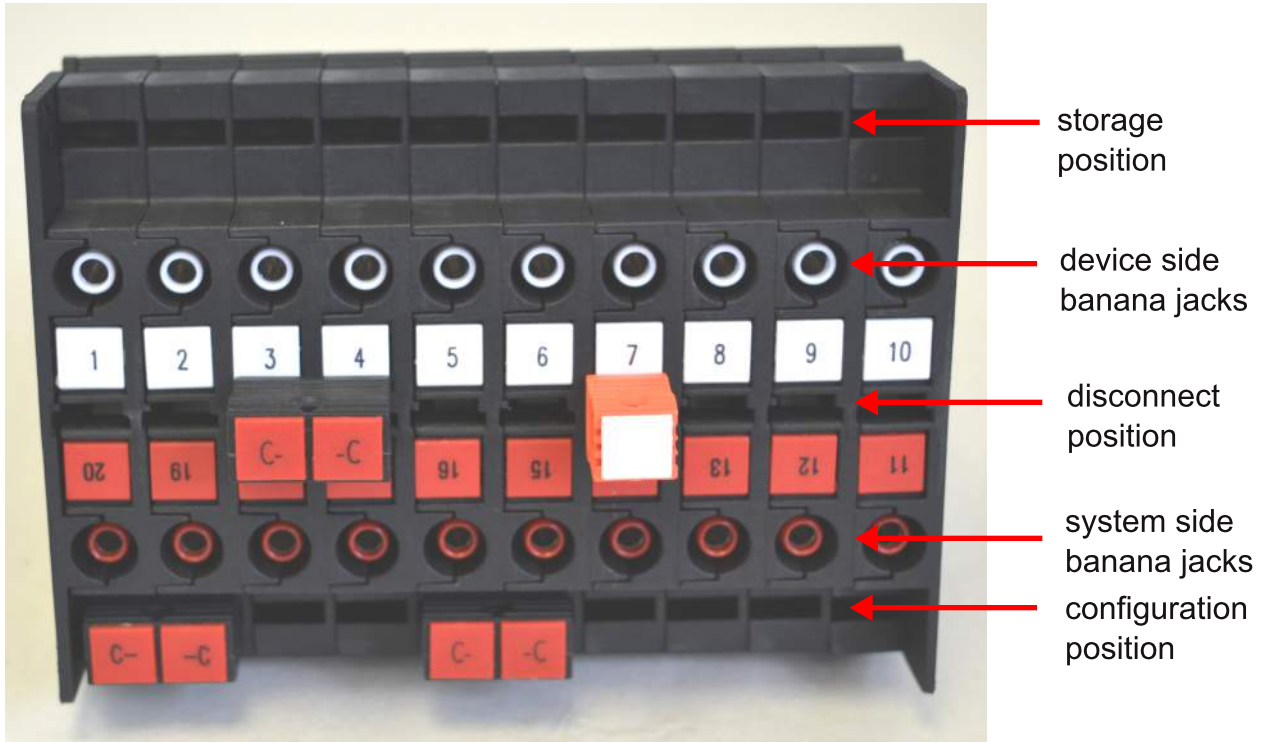
**Do not disassemble the test plug. Correct alignment of internal parts is critical in order to provide insulation and arc-avoidance, and ensure correct functionality.**

**The warranty will be void if the test plug is disassembled (or otherwise handled inappropriately). SECUCONTROL does not assume responsibility for any damages arising out of mishandling of our products, including test blocks / test plugs that have been disassembled by parties other than SECUCONTROL .**

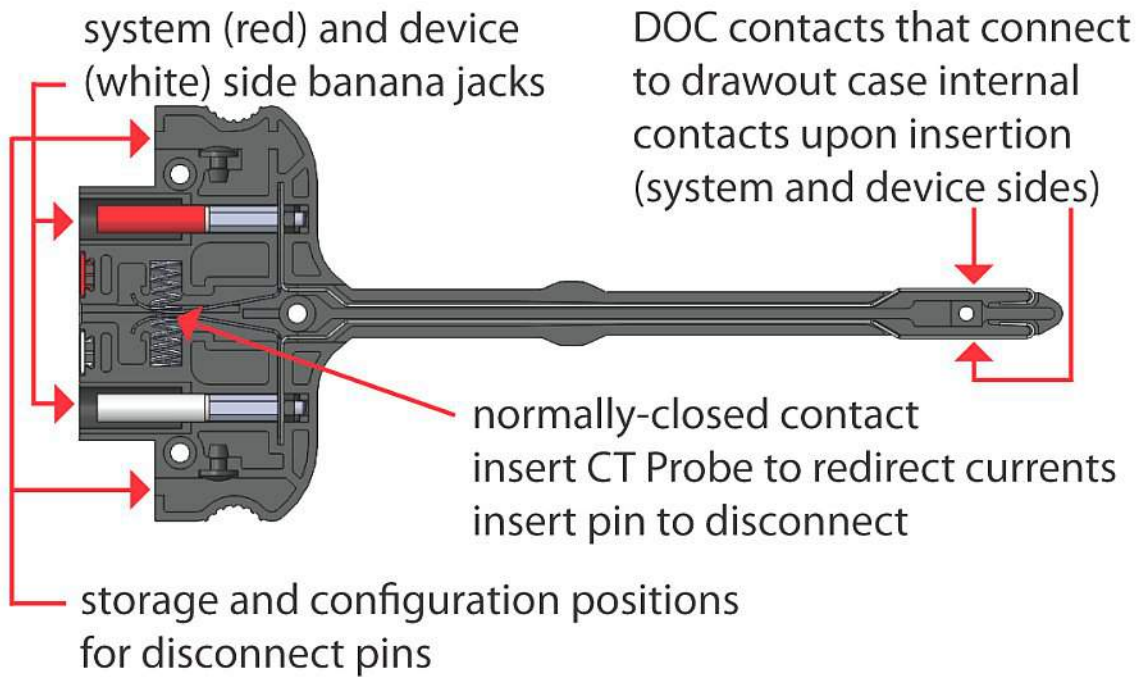
**The DOC must be undamaged to perform all functions safely and as intended. SECUCONTROL does not assume liability for damages arising out of the use of damaged DOC Drawout Case Test Plugs.**

## 2 Principle of Operation

### DOC Front View



### DOC Side View





Internally, the DOC Drawout Case Test Plug provides a normally closed contact in all ten (10) modules, as long as no disconnect pins have been inserted into the disconnect position. This allows for insertion of the DOC into a drawout case without opening any contacts via the DOC test plug.



**The DOC has normally-closed contacts, if no pins have been inserted into the disconnect position of the DOC. The DOC must always be inserted into the drawout case without pins inserted into the disconnect position to ensure the continuity of all circuits and avoid the danger of inadvertently opening current transformer (CT) circuits. The DOC does NOT include automatic short-circuiting of current transformer (CT) circuits.**

Upon insertion of the DOC into a drawout case, the drawout case and the relay/meter remain connected, if no pins have been inserted into the disconnect position of the DOC. In this case, the DOC only redirects the circuits outside of the drawout case, without opening any circuits. All conducting parts of the DOC are finger-safe enclosed. Current measurements can easily be taken via SECUCONTROL Current Measurement Probes.

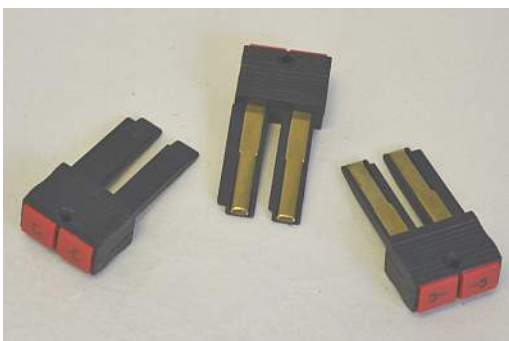
Once the DOC is inserted into the drawout case, the included disconnect pins can also be used to open individual contacts to disconnect system and device, and to short-circuit currents in specific positions (2-pole disconnect pins with shorting bridges). **Special care must be taken not to accidentally open current transformer circuits without prior short-circuiting.**

## Disconnect Pins



Individual disconnect pins:  
serve to open individual contacts, to disconnect system from device

**Individual disconnect pins can be inserted into ALL positions of the DOC - special care must be taken not to enter them into any current transformer circuit!**



2-pole disconnect / shorting pins:  
serve to establish a short-circuit on the system side, and then disconnect system from device.

2-pole disconnect / shorting pins are keyed so that they can only be inserted into the DOC with the shorting on the system side. Never force a 2-pole disconnect pin into the DOC - instead check if it is oriented correctly. The 2-pole disconnect / shorting pins fit into ALL positions of the DOC.



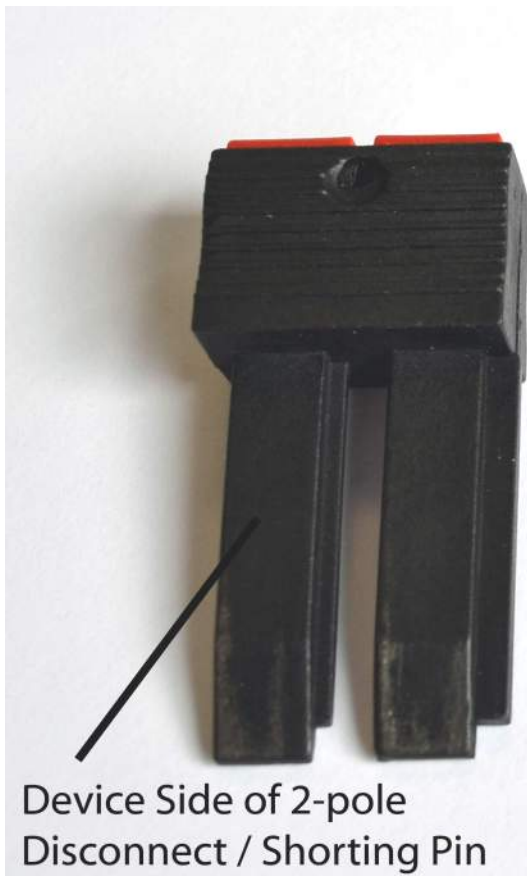
1-pole disconnect pins and 2-pole current-shorting pins can be inserted into ANY of the DOC's position, since currents may be located in different positions depending on the drawout case model.

If using the DOC with disconnect pins, it is imperative that the user verify the exact location of all circuits before use.

In order to prevent accidental opening of current transformer circuits, the user must:

- ensure that current shorting pins are entered into the correct positions of the DOC
- ensure that 1-pole disconnect pins are not entered into any positions of the DOC that correspond to a current transformer circuit in the drawout case

2-pole shorting / disconnect pins have a shorting bridge running through the pin as indicated below, on the system side of the pin only.



Device Side of 2-pole Disconnect / Shorting Pin

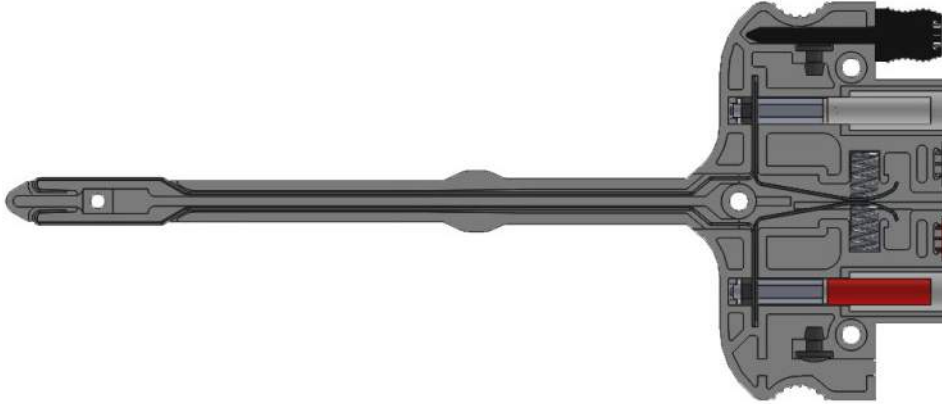


CT Shorting Path on System Side of 2-pole Disconnect / Shorting Pin

### 3 Application

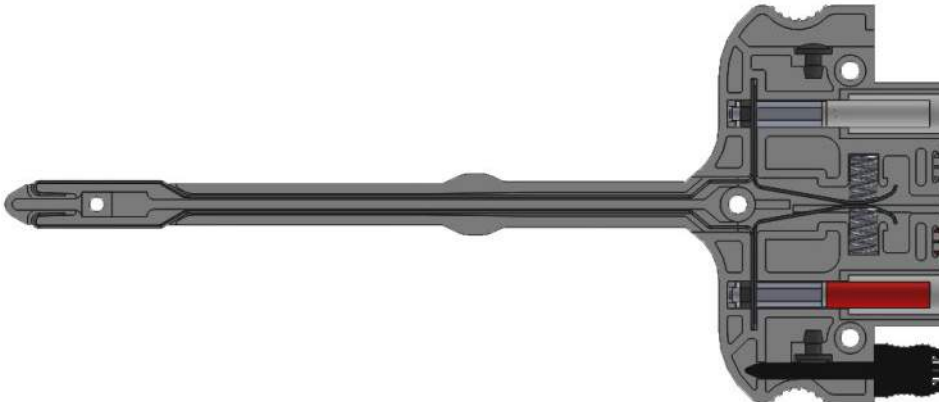
#### **DOC OPERATION STEP 1: Storage Position for Disconnect Pins**

In preparation for testing, the disconnect pins needed for the procedure should be stored in the upper parking position, or STORAGE POSITION, of the DOC.



#### **DOC OPERATION STEP 2: Moving Pins to CONFIGURATION Position**

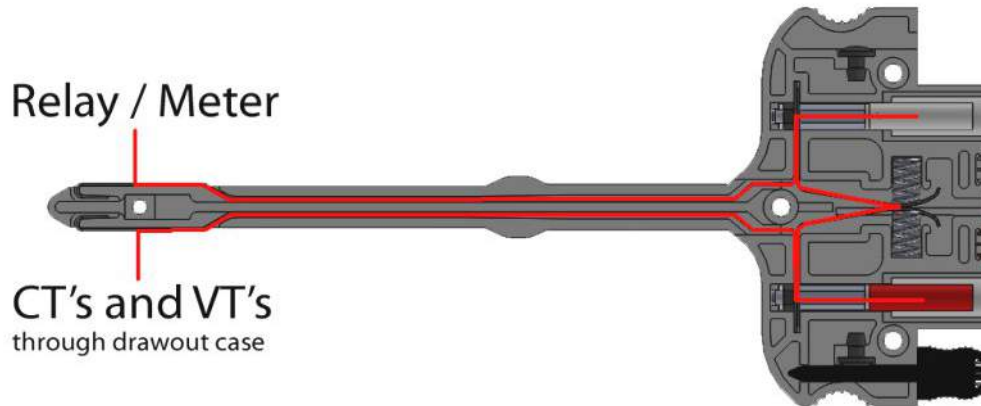
In a second step, the disconnect pins should be moved to the lower parking position, or CONFIGURATION POSITION, of the DOC, where they need to be arranged in the correct contact position for the particular drawout case.



**Great care must be taken to assemble the disconnect pins in the correct positions to ensure that they are later on used in the correct positions of the DOC, to avoid the danger of opening a current transformer circuit. It is the responsibility of the user to review all technical information regarding the drawout case used to fully understand where current circuits are located.**

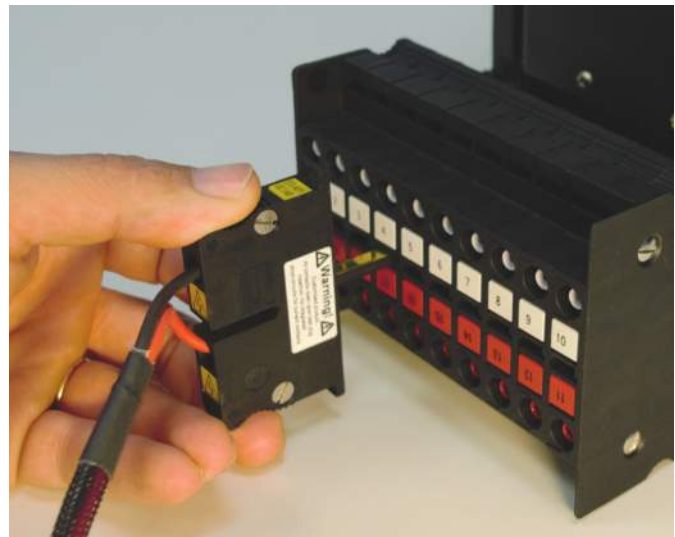
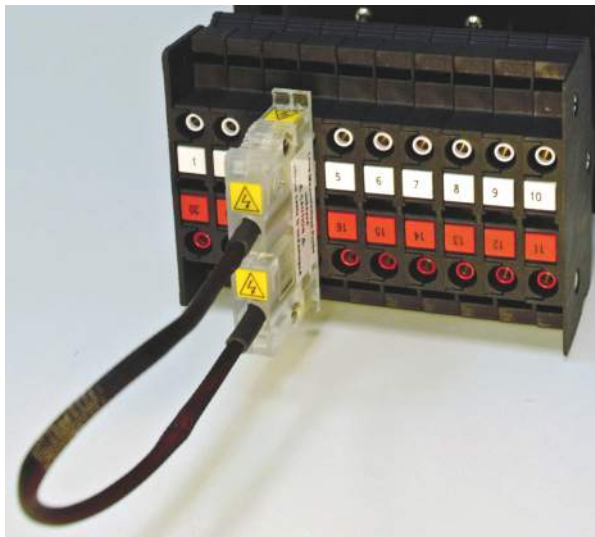
### DOC OPERATION STEP 3: Insertion of the DOC Into the Drawout Case

Upon insertion of the DOC test plug, the drawout case and the relay/meter are still connected, if no pins have been inserted into the disconnect position of the DOC. In this case, the DOC only redirects the circuits outside of the drawout case, without opening any circuits. All conducting parts of the DOC are finger-safe enclosed.



### DOC OPERATION STEP 4: CT Measurement with Current Measurement Probes

Measurements in current transformer (CT) circuits can be performed using SecuControl Current Measurement Probes, which are inserted into the DOC to redirect the circuits. Compare the "Accessories" section of this document for additional product information.



**SECUCONTROL's Current Measurement Probe with fixed cable connections redirects the circuit from the drawout case via hardwired cables. It does not short-circuit the current transformer upon insertion. The Current Measurement Probe must be correctly connected to a measurement device before insertion into the DOC to avoid the danger of opening a current transformer circuit. It should be used by properly trained personnel only.**

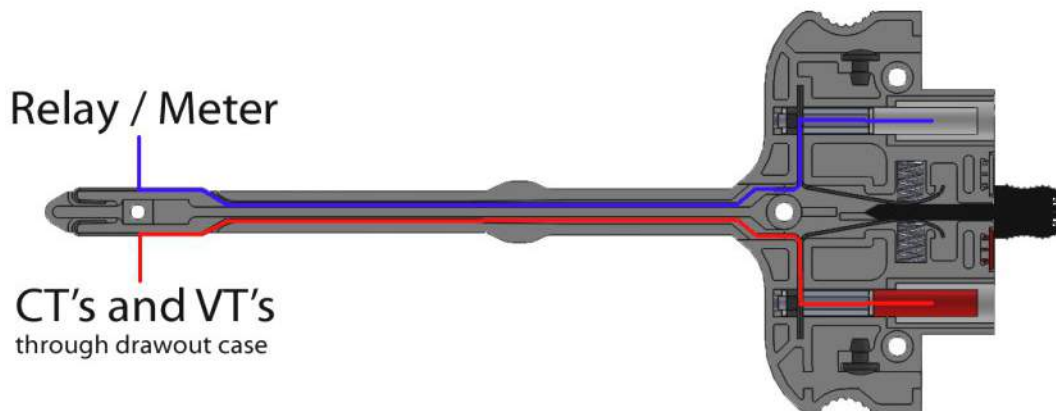
SECUCONTROL's Loop Measurement Probe redirects the circuit from the drawout case through a cable loop, where it can safely be measured with a clamp-on meter. SECUCONTROL recommends using the Loop Measurement Probe rather than the Current Measurement Probe with Hardwired Cables where possible.



**Current measurements in the DOC should ONLY be performed with SECUCONTROL Current Measurement Probes (Loop or Fixed Cable). SecuControl Loop Measurement Probes are built so that the circuit cannot be opened. SecuControl Current Measurement Probes with Fixed Cables are built with C-hook adapters in order to prevent accidental pulling out of the connection.**

### DOC OPERATION STEP 5: Operation with Disconnect Pins

Once the DOC is inserted in the drawout case, the included disconnect pins can be used to open individual contacts to disconnect system and device. **Special care must be taken not to accidentally open current transformer circuits without prior short-circuiting.**



The integrated banana jacks allow access to both the system and the device sides for a variety of test applications.



**The DOC has normally-closed contacts, if no pins have been inserted into the disconnect position of the DOC. The DOC must always be inserted into the drawout case without pins inserted into the disconnect position to ensure the continuity of all circuits and avoid the danger of inadvertently opening current transformer (CT) circuits.**



**1-pole disconnect pins and 2-pole current-shorting pins can be inserted into ANY of the DOC's position, since currents may be located in different positions depending on the drawout case model.**

**If using the DOC with disconnect pins, it is imperative that the user verify the exact location of all circuits before use.**

**In order to prevent accidental opening of current transformer circuits, the user must:**

- ensure that current shorting pins are entered into the correct positions of the DOC**
- ensure that 1-pole disconnect pins are not entered into any positions of the DOC that correspond to a current transformer circuit in the drawout case**

### **Current Transformer Disconnection**

For disconnecting current circuits of the device (meter or relay) from the system, the included 2-pole shorting / disconnect pins can be used. Great care must be taken to identify the correct positions in the drawout case where currents are located, and therefore where the 2-pole shorting pins need to be inserted into the DOC.



**Current shorting should NOT be performed via jumper cables attached to banana jacks, since these connections can be pulled out accidentally, and cause a dangerous open CT condition.**

### **Contact Opening**

Included 1-pole disconnect pins can be used to open individual contacts inside the DOC test plug. Special care must be taken not to accidentally open current transformer circuits, since the individual disconnect pins do not short-circuit automatically.



**1-pole disconnect pins and 2-pole current-shorting pins can be inserted into ANY of the DOC's position, since currents may be located in different positions depending on the drawout case model.**

**If using the DOC with disconnect pins, it is imperative that the user verify the exact location of all circuits before use.**

**In order to prevent accidental opening of current transformer circuits, the user must:**

- ensure that current shorting pins are entered into the correct positions of the DOC**
- ensure that 1-pole disconnect pins are not entered into any positions of the DOC that correspond to a current transformer circuit in the drawout case**

## Performing Relay or Meter Testing with the DOC

The DOC is equipped with disconnect and shorting pins. When the DOC is held horizontally and when the signage 1-10 is legible (meaning the DOC is not held upside down), the disconnect and shorting pins are in the top row. Here they don't perform any function. They are in a storage position. Disconnect pins are single pins made entirely of plastic. Shorting pins come as twos and have a metal shorting bar, that connects and shorts inside of the plastic and insulated pin handle.

Before operating the DOC and opening any contacts, it is imperative that the user studies the actual configuration of the relay (or meter) in front of him. Current, voltage and trip circuits need to be identified through the drawing of the actual installation. We strongly recommend that the user assembles the actual configuration of the relay in the bottom row of the DOC.

**Secucontrol assumes no responsibility for errors occurring through false insertions of disconnect and shorting pins.**

When the pins have been staged on the lower side of the DOC, the actual process of disconnecting the relay can begin. Insert the pins into the central row of contact openings of the DOC. Always disconnect trip circuits first (single disconnect plastic pins), to prevent the relay from accidental tripping. Next disconnect current circuits (double pins with metal shorting bar) and voltages (single disconnect plastic pins). The user has to use his/her best judgement depending on the installation in order to perform this sequence. Only when all pins are inserted in the central row of contacts, the relay (/ meter) is safe and ready for testing. When all pins are inserted, the relay (/ meter) is fully disconnected from the system.



**Danger! While the shorting pins cannot be inserted the wrong way around, the contact openings are deliberately not keyed against each other (unlike in other Secucontrol products). It is possible to insert disconnect and shorting pins in all positions. This had to be allowed to make the DOC as universally usable as possible.**

**Danger! Insertion of a disconnect pin into a current circuit can result in an open CT. The usage of the DOC relies fully and solely on the best judgement of the user. Secucontrol assumes absolutely no responsibility for errors occurring through the false insertion of disconnect and shorting pins.**

In order to reconnect the relay to the system, follow the reverse sequence: withdraw voltage and current pins first and put them back into the storage position. Lastly remove trip pins and put them back into the storage position.



**Danger! There may be relay settings and configurations that don't allow for the simple shorting of the CT. In such a case, make sure your test set is already connected on the relay side of the DOC, and is already providing a secondary current. Always study the relay settings and circuit design before utilizing the DOC. Secucontrol does not assume any liability for errors occurring through misreadings or misapplications of actually existing relay settings and circuit designs.**

The central contact row of the DOC (disconnect position) can also be used for measurement. SECUCONTROL recommends only the use of measurement probes produced by SECUCONTROL. The user has to make sure that the measurement probe is properly connected to the measurement device before insertion. False insertion of a disconnected measurement probe can lead to an open CT and is potentially dangerous. SECUCONTROL does not assume any liability for the false insertion of a measurement probe.



**Disclaimer: The DOC was designed to provide a user friendly interface of all contacts of a draw-out case electromechanical relay at the front of the panel. All aspects of the use, measurement, secondary injection, and other manipulations of the circuits are at the sole discretion of the user. Secucontrol does not assume any liability for the actual usage of the DOC.**

## **DOC Usage In Cases With Two Insertion Slots**

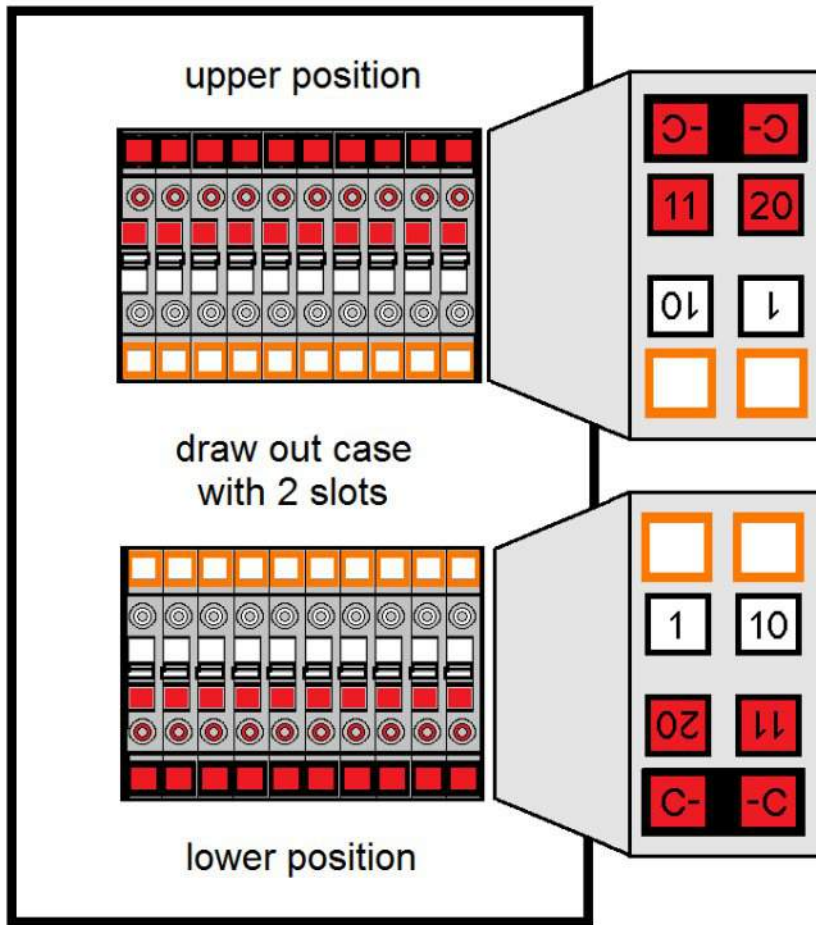
Some drawout cases have two insertion slots into which the DOC can be inserted, a lower and an upper position. No matter which insertion slot is used in these kinds of cases, the white labeled side of the DOC will face the device side and the red labeled side of the DOC will face the system side.

This means that if the DOC is inserted into the lower position insertion slot of these cases, the numbering 1 through 10 is shown correctly (while 11 through 20 is upside down). If the DOC is inserted into the upper position insertion slot of these cases, it has to be turned around by 180 degrees, so that the numbering 11-20 shows correctly (while 1 through 10 is upside down). Compare the illustration shown on the following page.

In the upper position, the C-C labeling on the 2-pole disconnect / shorting pins is also turned around by 180 degrees. In the upper position, the pins must be inserted into the disconnect position turned around by 180 degrees (just like the DOC) to short the system side properly (in that situation: on the top side of the case). The keying in the C-C disconnect / shorting pins prevents errors.



However, users must exercise particular caution when using the DOC in the upper position of drawout cases, since in this situation the pins are located in different positions than usual, from the users point of view - and the storage and configuration positions of the DOC now appear on opposite sides than usual.



**Since the DOC has to be turned around by 180 degrees for insertion into the upper position of a 2-insertion slot case, the storage position and the configuration position of the DOC are on opposite sides than usual in this situation.**



**When using the DOC in cases with two insertion slots, users need to be especially careful in their use of the DOC, and in particular to insert all disconnect pins correctly!**

## 4 Technical Specifications

### Electrical

Current Withstand:	30 A continuously 500 A for 1 second
Maximum Voltage:	600 V
Contact Resistance:	$\leq 2 \text{ m}\Omega$
Dielectric Withstand:	5.0 kV RMS for 1 minute between adjacent contact pairs and between any contact pair and other metal parts 4.0 kV RMS for 1 minute between open contacts when test pin is inserted
Voltage Impulse:	3 positive and 3 negative impulses of 5 kV peak, 1.2/50 $\mu\text{s}$ , 0.5 J between adjacent contact pairs and between all contact pairs and other metal parts

UL94 Flammability Class: V-0

DOC has been classified as electromagnetically benign by the Guide for the EMC Directive 2004/108/EC and is, therefore, excluded from the scope of the EMC Directive.

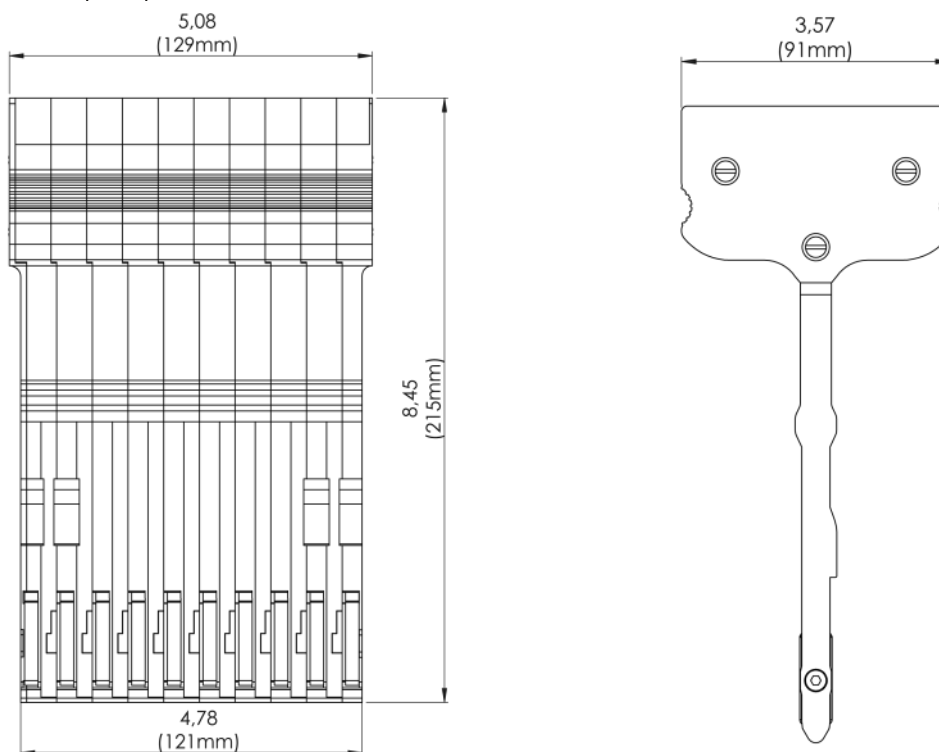
DOC meet or exceed all requirements from ANSI / IEEE C37.90-2005.

### Mechanical

Number of poles:	10
DOC weight:	0.9 kg / 2.0 lbs

### Dimensional Drawing

inches (mm)



## 5 Accessories

### Rugged Cases for DOC Drawout Case Test Plug and Additional Equipment



SECUCONTROL offers the DOC individually or in sets which include a rugged carrying case with customized cutouts and optionally additional equipment such as SECUCONTROL Current Measurement Probes.

Ordering information can be found in the back of this document.

### Loop Measurement Probe



The Loop Measurement Probe serves to redirect the circuit from the drawout case through a cable loop, where it can safely be measured with a clamp-on meter. It is available in an unkeyed version or in a keyed version. Both versions work with all modules of the DOC. Insertion is possible in both directions, so the user has to take care to insert the probe correctly for the intended measurement. The unkeyed version also works in

all modules of SECUCONTROL Test Switches. The keyed version only works in C-C keyed modules of SECUCONTROL Test Switches. Ordering information can be found in chapter 7 of this document.



**Always insert SecuControl disconnect pins or Measurement Probes straight (not angled) and without excessive force. In the case of a contact showing resistance to insertion do not force the disconnect pin or Measurement Probe inside. Pull out the disconnect pin or Measurement Probe and carefully re-attempt insertion. Do NOT apply excessive force, as this could damage the correct alignment of the internal contacts and DOC functionality.**

## Current Measurement Probe with Fixed Cables



This special test probe allows the connection of current measurement device or a shunt. The AWG 13 (2.5 mm<sup>2</sup>) connection cable has a length of 118.11 inch (3 meters). The test probe is built with gold-plated C-hook terminals. It is available in an unkeyed version or in a keyed version. Both versions work with all modules of the DOC. Insertion is possible in both directions, so the user has to take care to insert the probe correctly for the intended measurement. The unkeyed version

also works in all modules of SECUCONTROL Test Switches. The keyed version only works in C-C keyed modules of SECUCONTROL Test Switches. Ordering information can be found in the back of this document.



**The Current Measurement Probe is a special tool that is built for current measurement purposes. It does NOT automatically short-circuit current transformer circuits upon insertion into the DOC Drawout Case Test Plug. Instead, current circuits are opened and redirected via the attached cables once the probe is entered into the DOC. The probe must always be correctly connected to a measurement instrument or a shunt before insertion into the DOC to prevent the creation of an open current transformer circuit. The Current Measurement Probe should be used by properly trained personnel only.**

Please contact SECUCONTROL for custom products that are not listed in this document.

## 6 Spare Parts

### Disconnect Pins

<i>Part #</i>	<i># of Poles</i>	<i>Type</i>	<i>Labeling</i>	<i>Label Color</i>
DOCDP01V	1	Individual Disconnect Pin (orange)	(blank)	white
DOCDP02C	2	Short-Circuit/Disconnect Pin	C- -C	red

## 7 Ordering Information

### **DOC Drawout Case Test Plug**

<b>Part #</b>	<b># of Poles</b>	<b>Description</b>
DOC001AA	10	DOC Drawout Case Test Plug with disconnect pins (10 x V, 5 x C-C)

### **Loop Measurement Probe**

<b>Part #</b>	<b># of Poles</b>	<b>Description</b>
UTPC3ST00	1	Loop Measurement Probe, with fixed cable loop, see-through, unkeyed

for the keyed version (fits into all DOC modules, and into C-C keyed modules of SecuControl test blocks / test switches), the part number ending changes to -C5

### **Current Measurement Probe (Fixed Cables)**

<b>Part #</b>	<b># of Poles</b>	<b>Description</b>
UTPC1ST00	1	Current Measurement Probe with Fixed Leads, C-hook connectors, see-through, unkeyed

for the keyed version (fits into all DOC modules, and into C-C keyed modules of SecuControl test blocks / test switches), the part number ending changes to -C5

### **Carrying Cases**

<b>Part #</b>	<b>Description</b>
CAS001	Sturdy Carrying Case for 1 DOC and Accessories (case only)
CAS002	Sturdy Carrying Case for 2 DOC and Accessories (case only)

### **DOC Sets**

Part numbers for popular combinations are shown on the following page. Additional options may be available upon request - please contact SecuControl with your requirements.

<b>Part #</b>	<b>Description</b>
DOCSET111	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 1 x UTPC3ST00 Loop Measurement Probe
DOCSET113	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 1 x UTPC1ST00 Current Measurement Probe with Fixed Leads
DOCSET121	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 2 x UTPC3ST00 Loop Measurement Probe
DOCSET123	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 2 x UTPC1ST00 Current Measurement Probe with Fixed Leads
DOCSET131	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 3 x UTPC3ST00 Loop Measurement Probe
DOCSET133	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 3 x UTPC1ST00 Current Measurement Probe with Fixed Leads
DOCSET150	1 x CAS001 Carrying Case for 1 DOC and Accessories 1 x DOC001AA Drawout Case Test Plug 3 x UTPC3ST00 Loop Measurement Probe 1 x UTPC1ST00 Current Measurement Probe with Fixed Leads
DOCSET250	1 x CAS002 Carrying Case for 2 DOC and Accessories 2 x DOC001AA Drawout Case Test Plug 3 x UTPC3ST00 Loop Measurement Probe 1 x UTPC1ST00 Current Measurement Probe with Fixed Leads
DOCSET260	1 x CAS002 Carrying Case for 2 DOC and Accessories 2 x DOC001AA Drawout Case Test Plug 3 x UTPC3ST00 Loop Measurement Probe 2 x UTPC1ST00 Current Measurement Probe with Fixed Leads

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