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# ZSI

## Zone Selectivity

## Interlock



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Before starting

## Before starting

The following slides are valid for Emax 2, XT7, and XT5 touch trip units.



# Before starting

1 Provide power to the Ekip Supply module (using 110-240V AC/DC or 24-48Vdc), or directly connect to the secondary terminal using 24Vdc (terminals K1 (+/L) and K2 (-/N)).

2 Below are the terminal positions for ZSI control wiring:

- Szc – Common pin
- Szi – input for short time and/or instantaneous
- Szo– output for short time and/or instantaneous
- Gzi – input for ground fault
- Gzo – output for ground fault





# Before starting

Please note: version depicted below is a fixed type CB.  
The same identification is found on an adjustable metal plate just below the secondary disconnect on the cassette.



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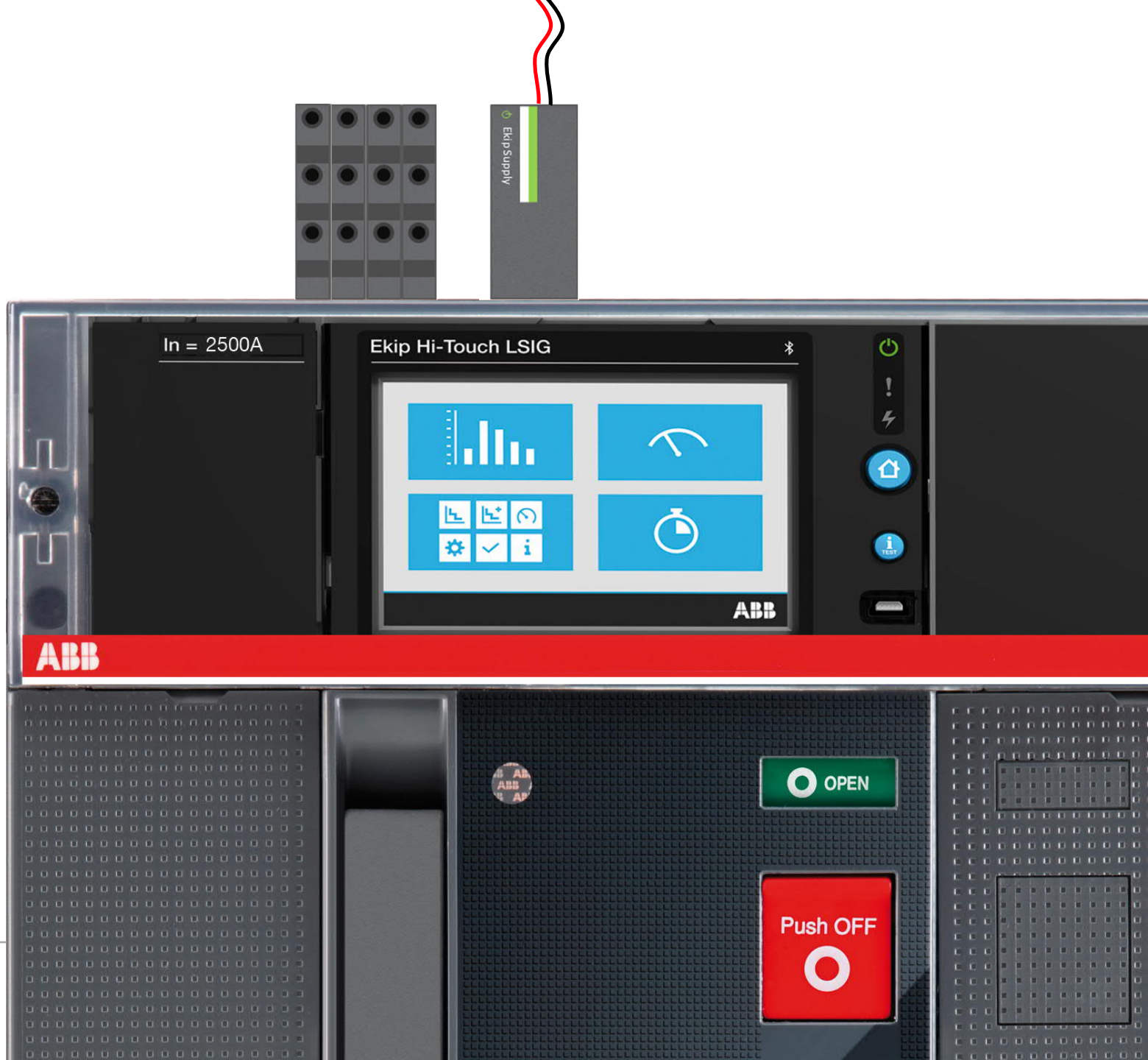
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# Protection settings



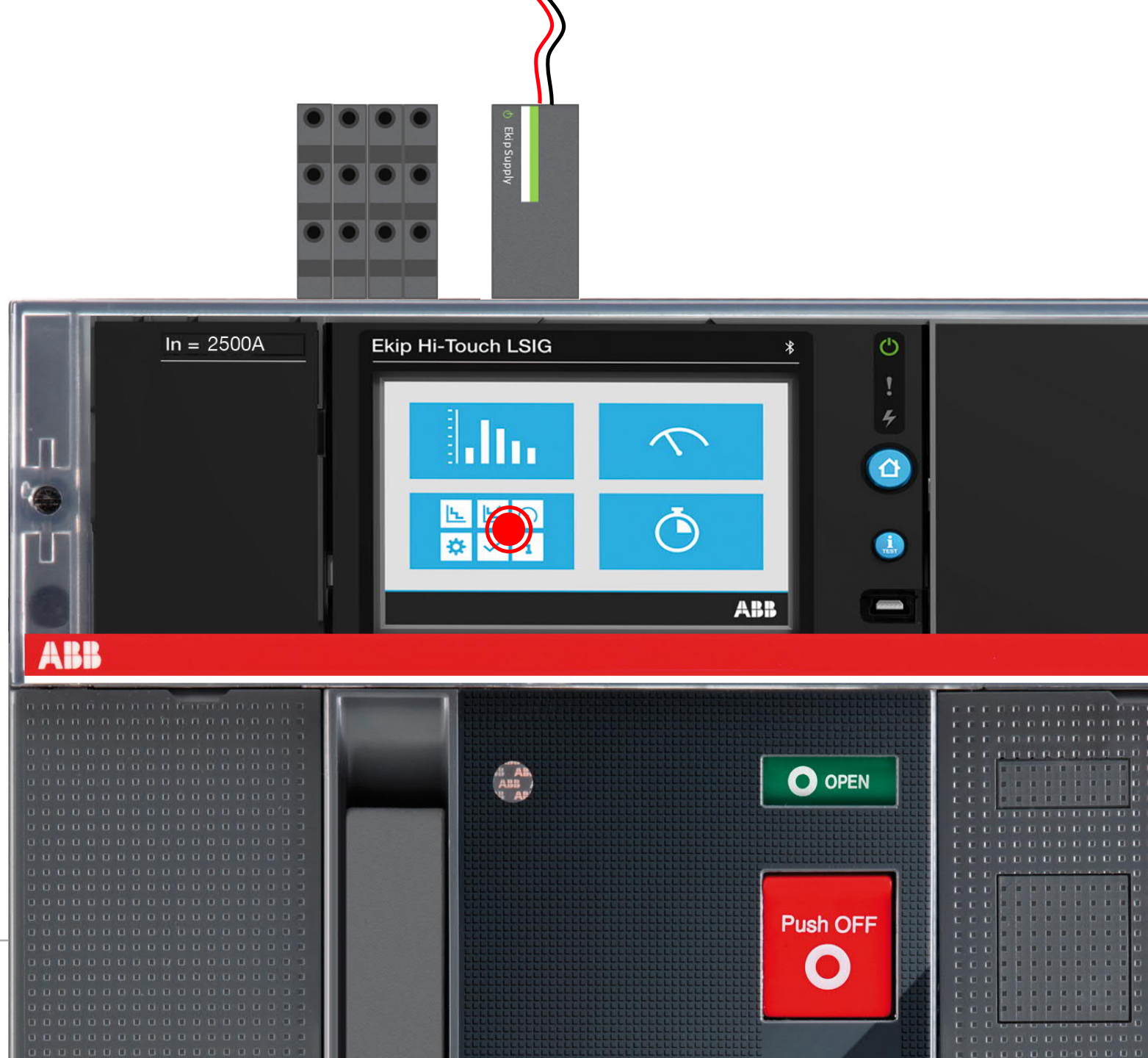
# Protection settings

## How to set ZSI for S protection

Enable the S protection inside the Protections menu.

Enable the Zone Selectivity function

Set the protection timings based on your system requirements.





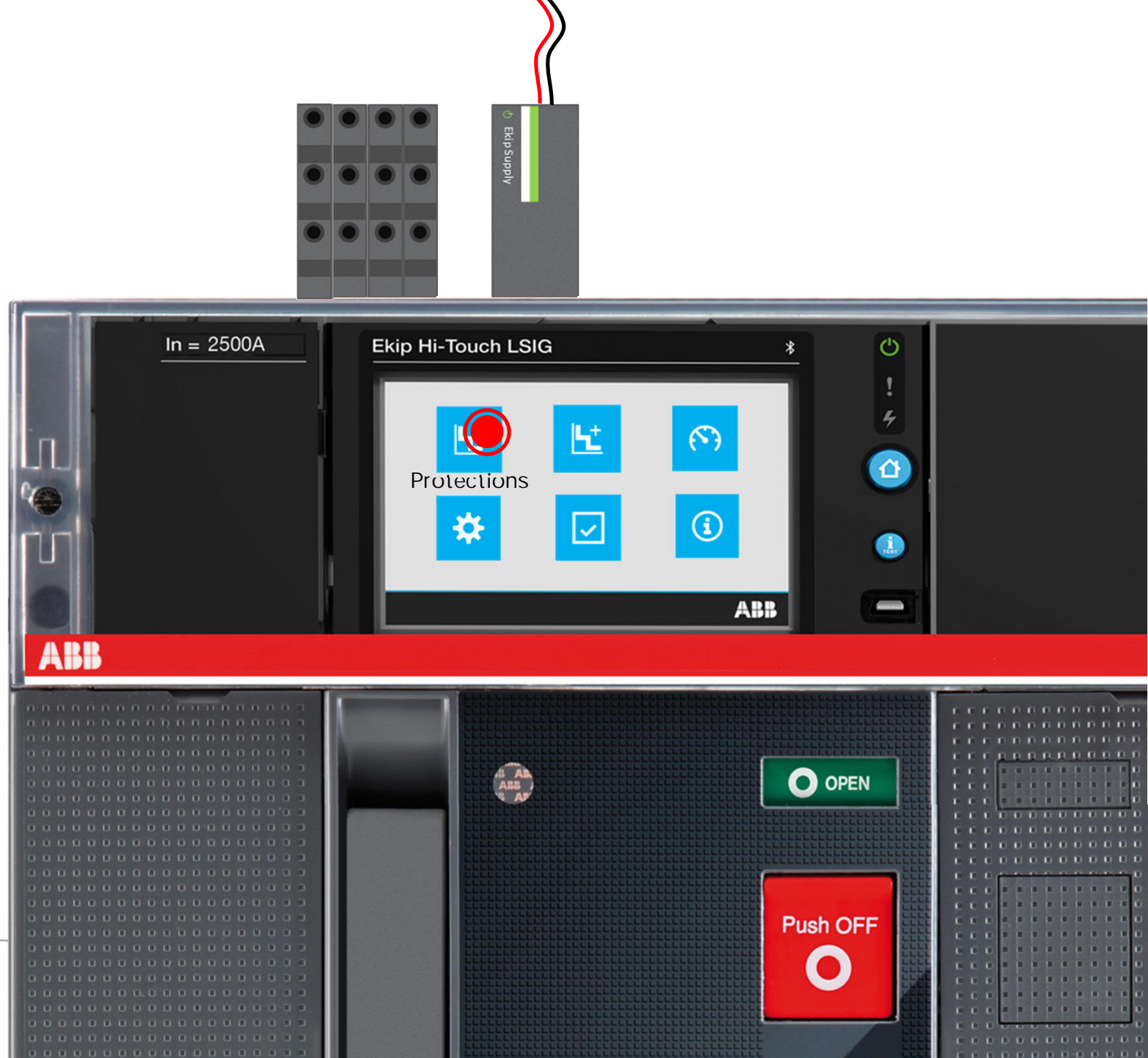
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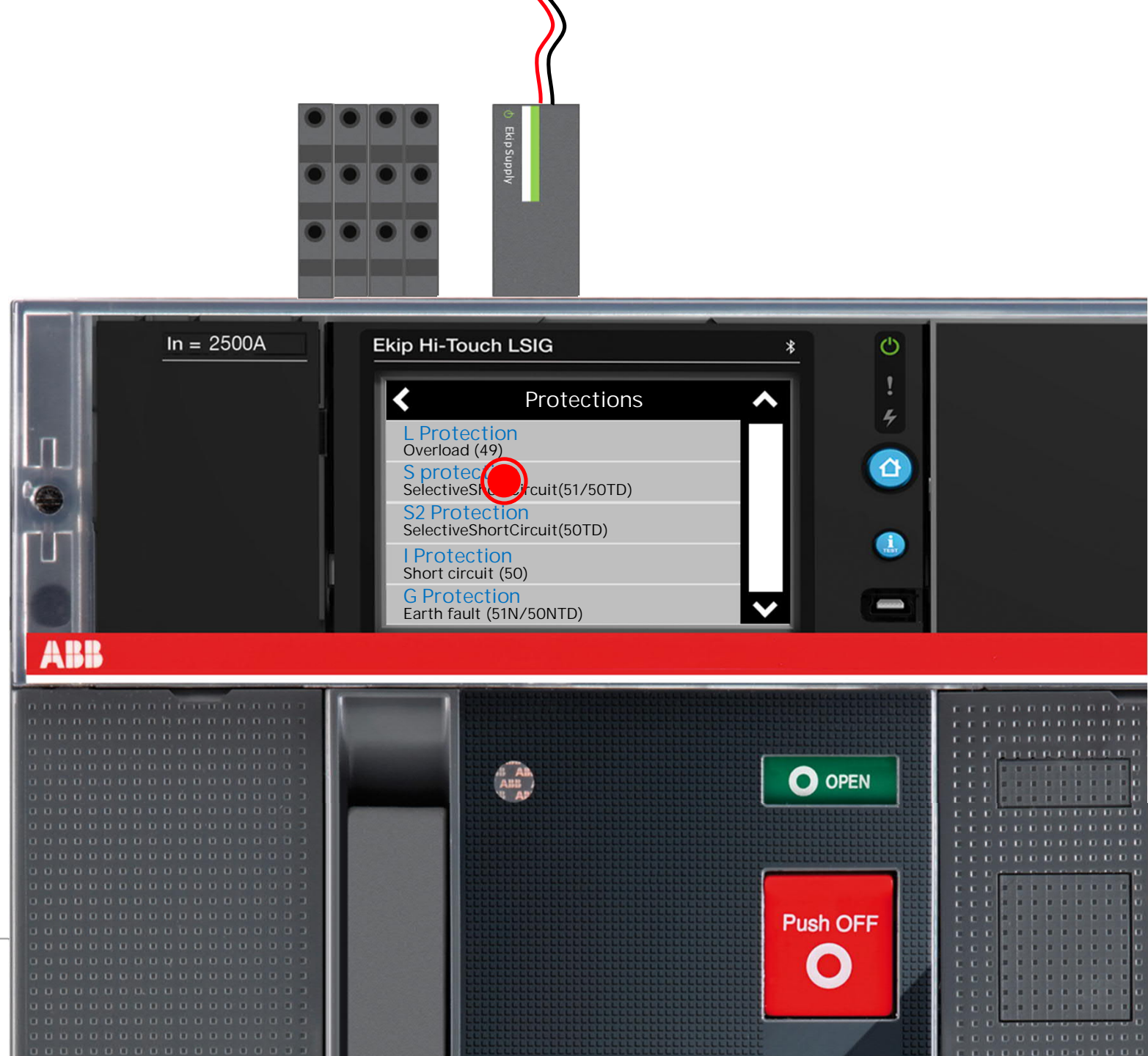
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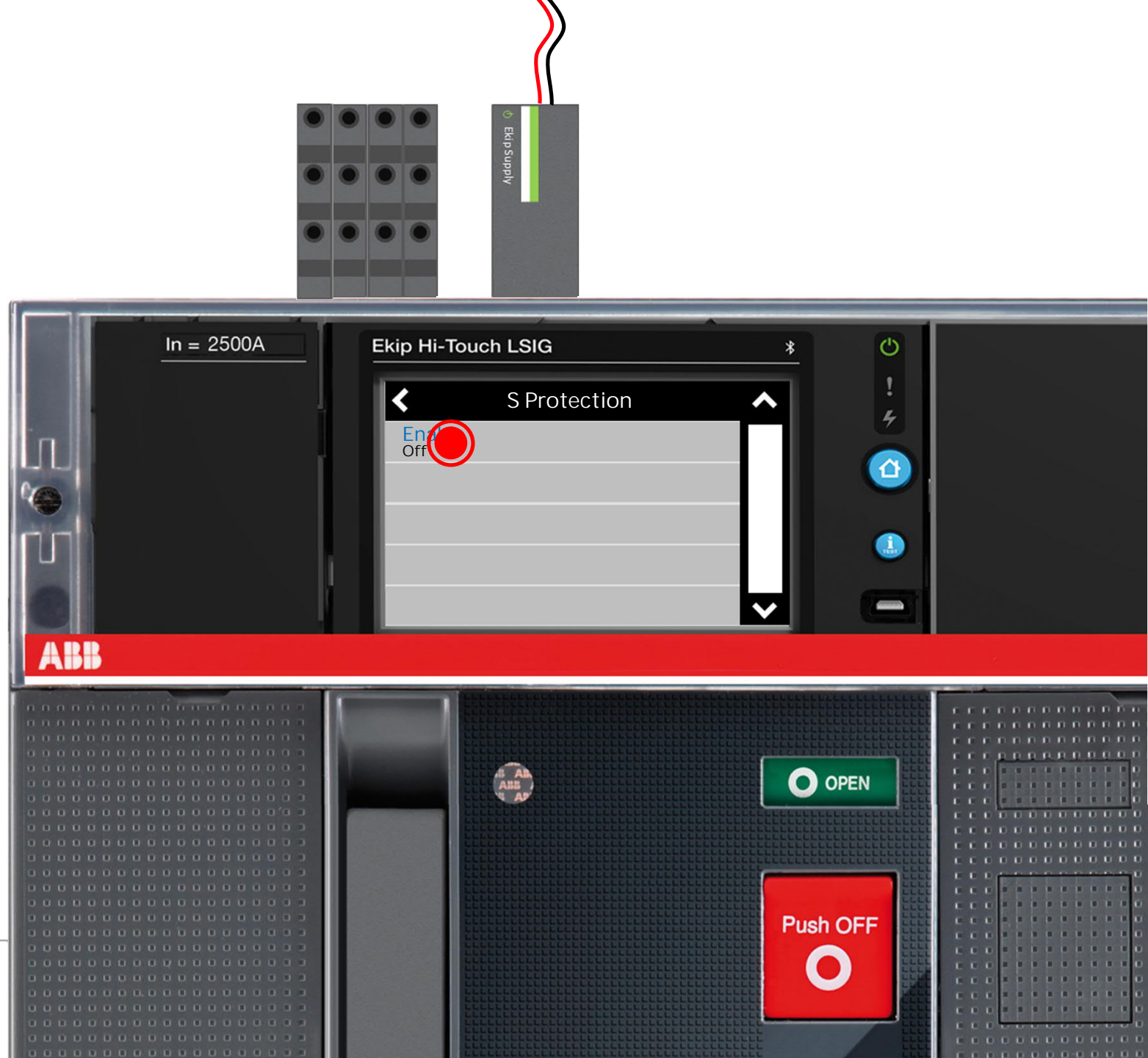
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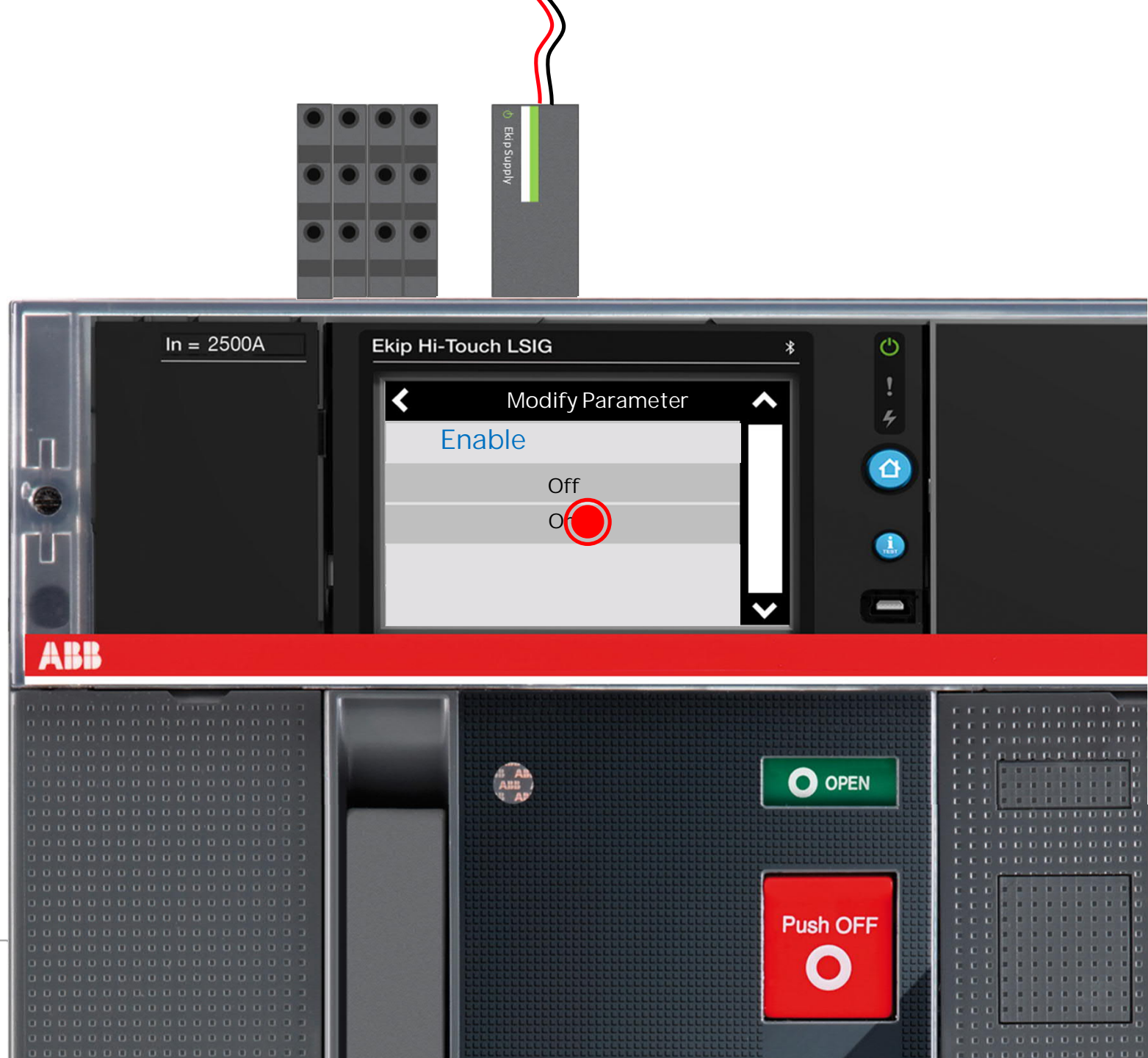
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# Protection settings

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Enable the S protection inside the Protections menu

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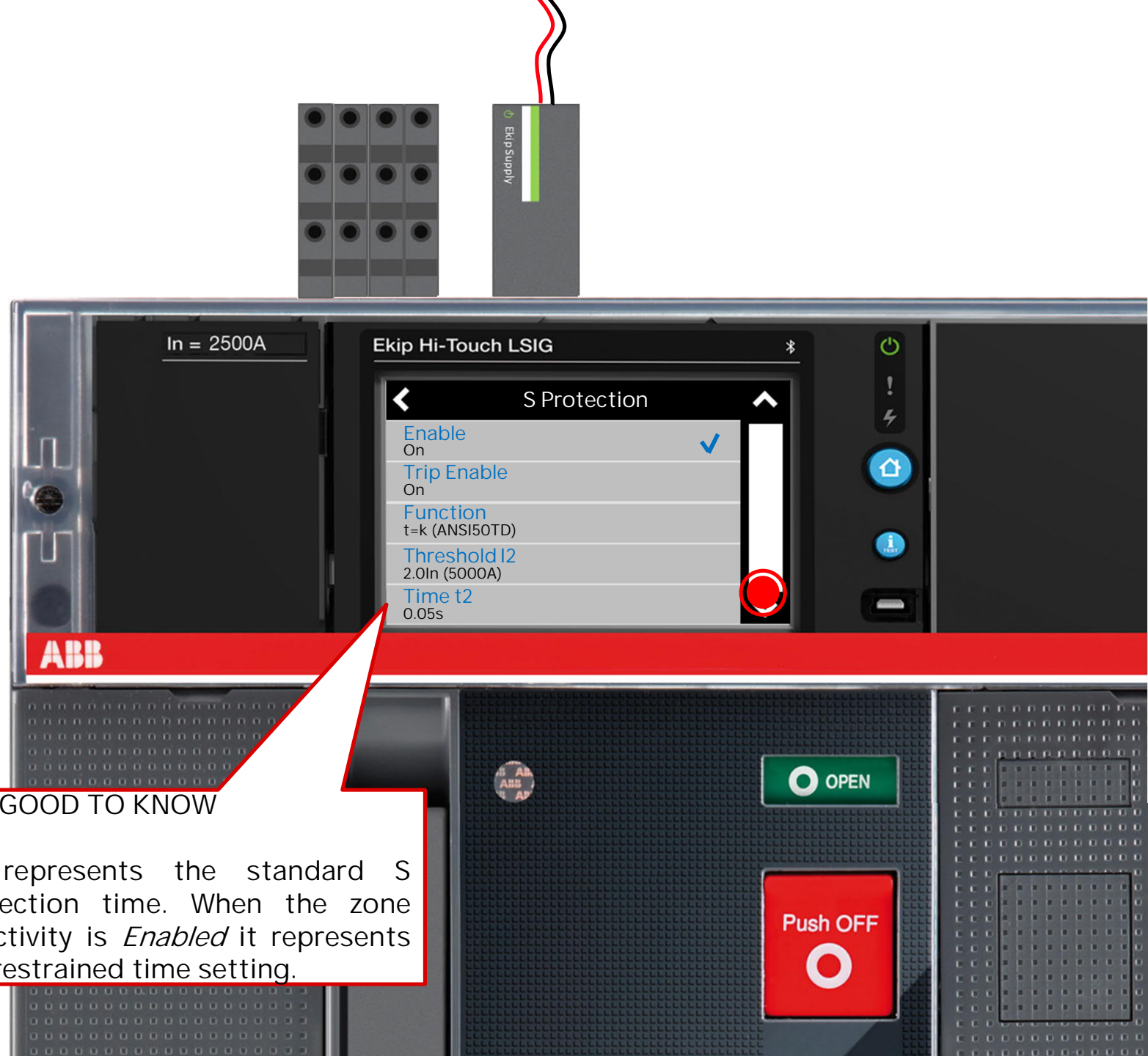
(see slide # for how to set up ZSI for I and G protections)

$t=k$  (ANSI50TD) function must be selected



### GOOD TO KNOW

$T_2$  represents the standard S protection time. When the zone selectivity is *Enabled* it represents the restrained time setting.



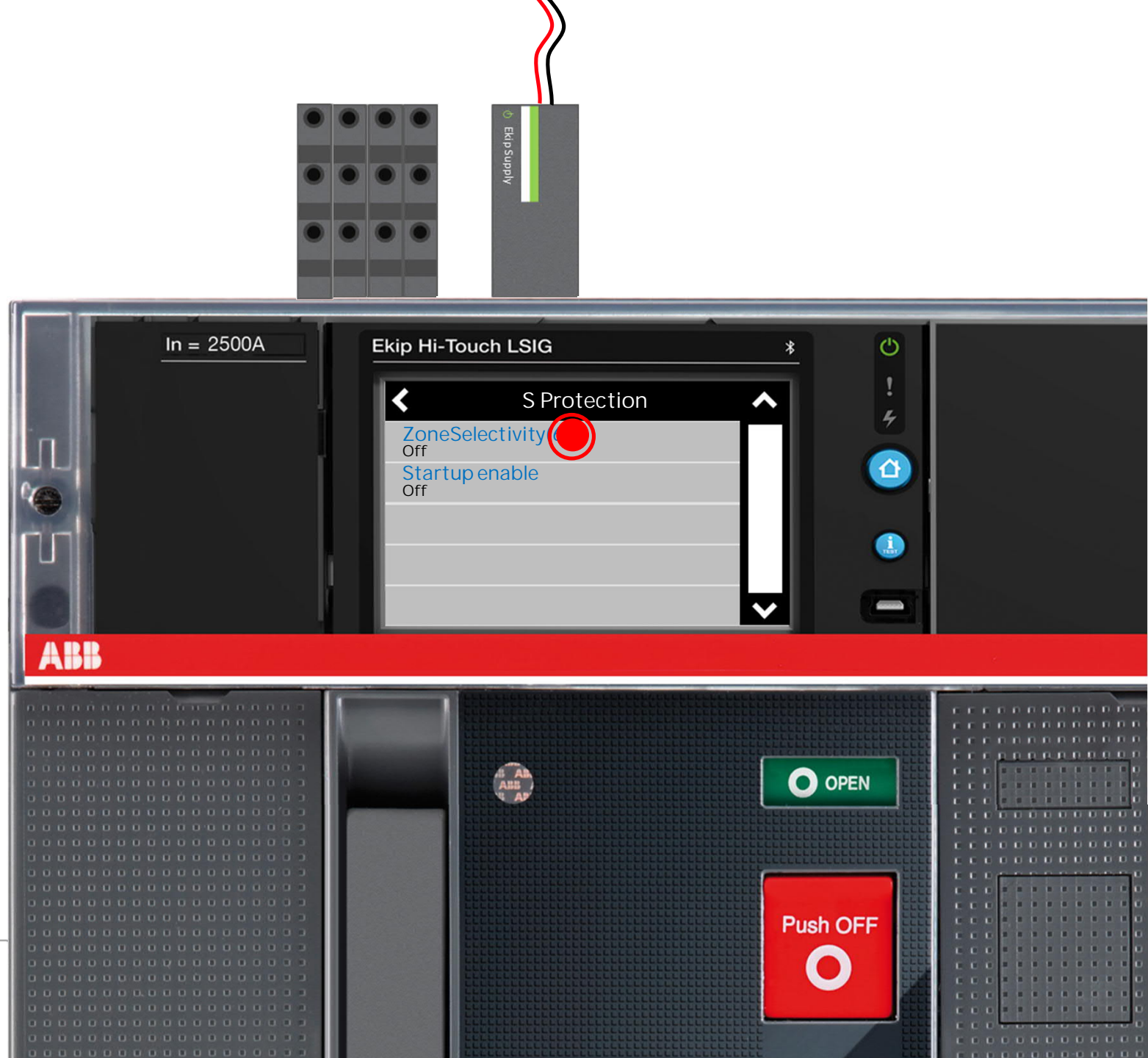
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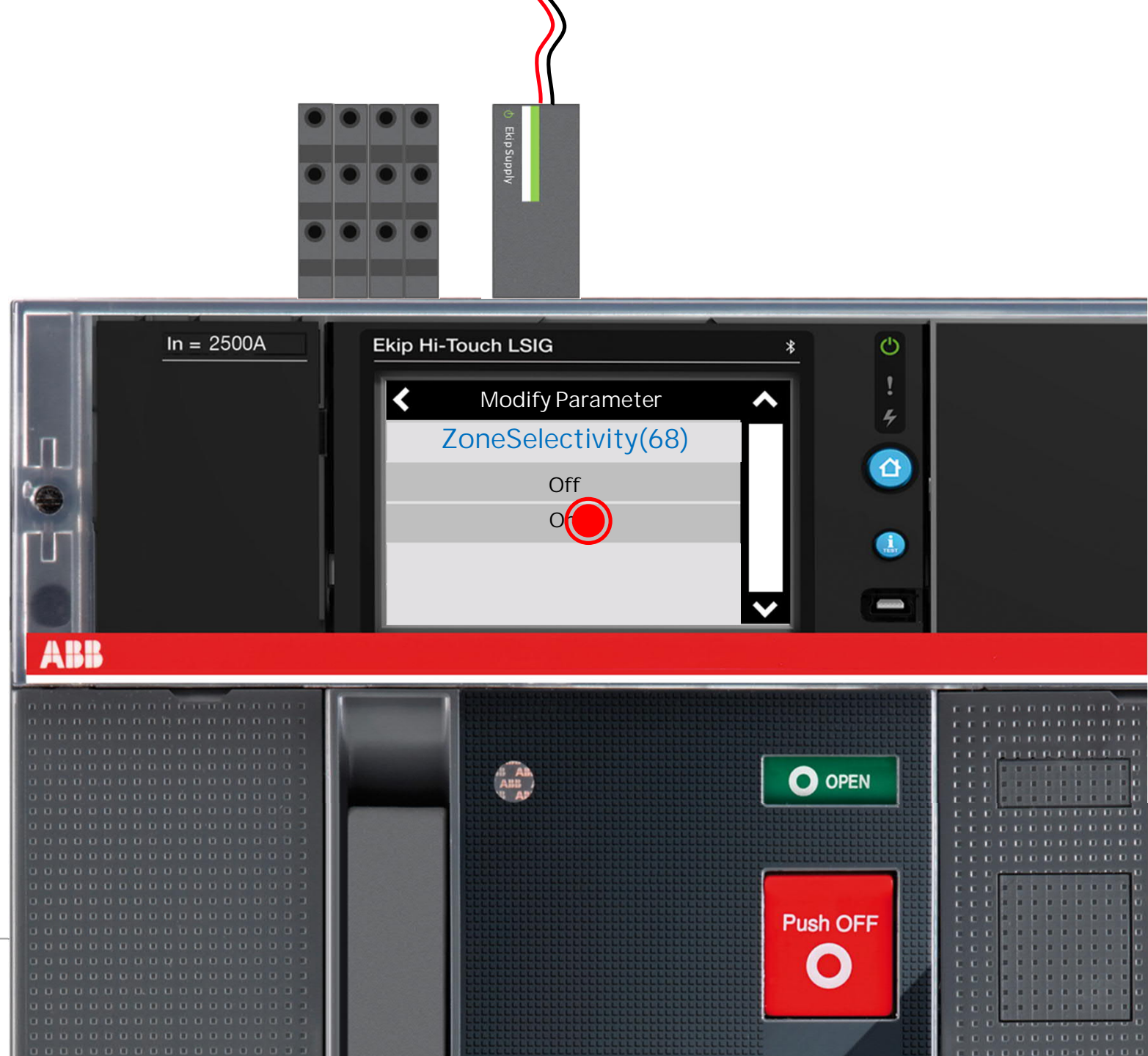
# Protection settings

## How to set ZSI for S protection

Enable the S protection inside the Protections menu

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# Protection settings

## How to set ZSI for S protection

Enable the S protection inside the Protections menu

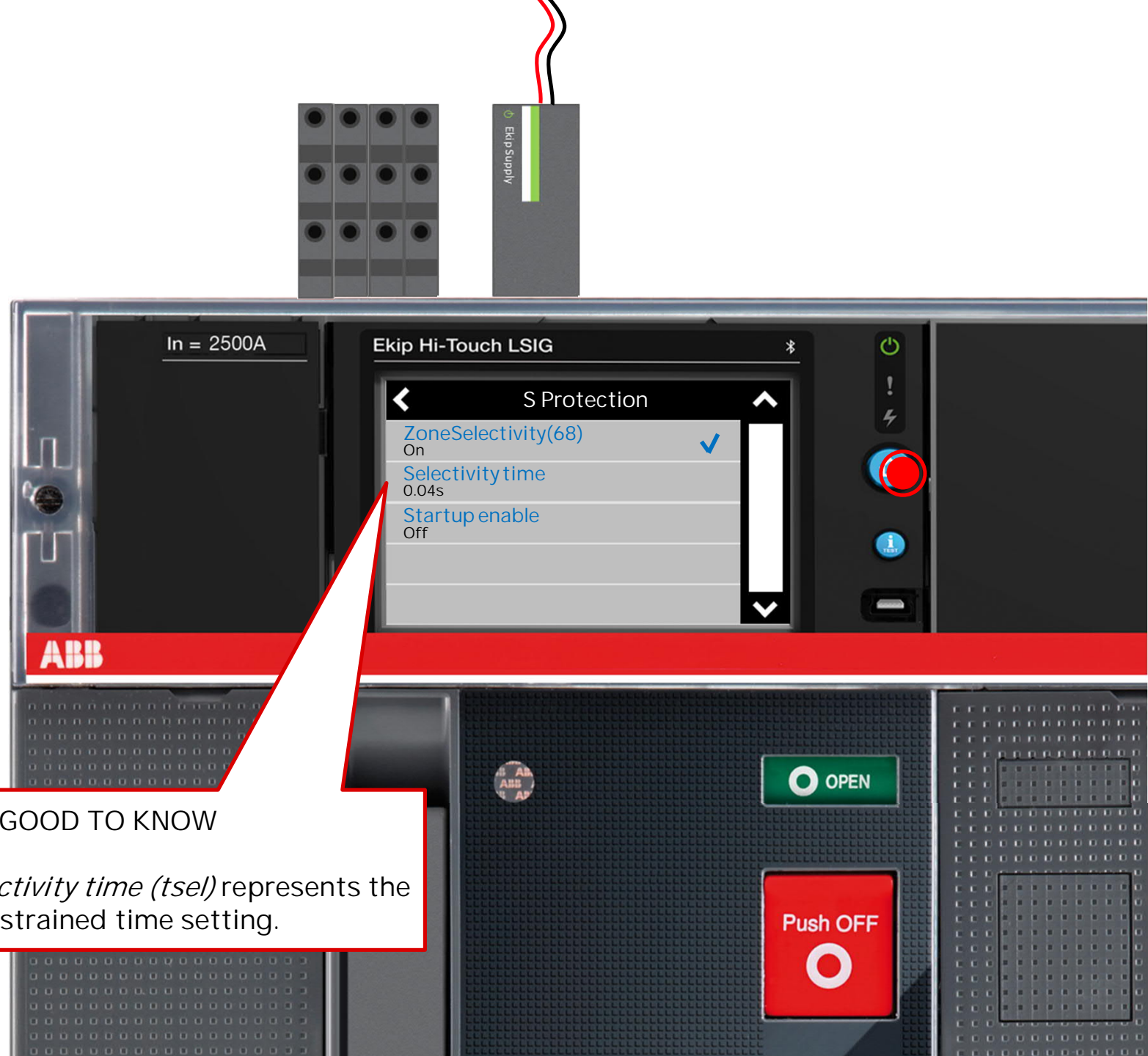
Enable the Zone Selectivity function

Set the protection timings based on your system requirements.



GOOD TO KNOW

*Selectivity time ( $t_{sel}$ )* represents the unrestrained time setting.





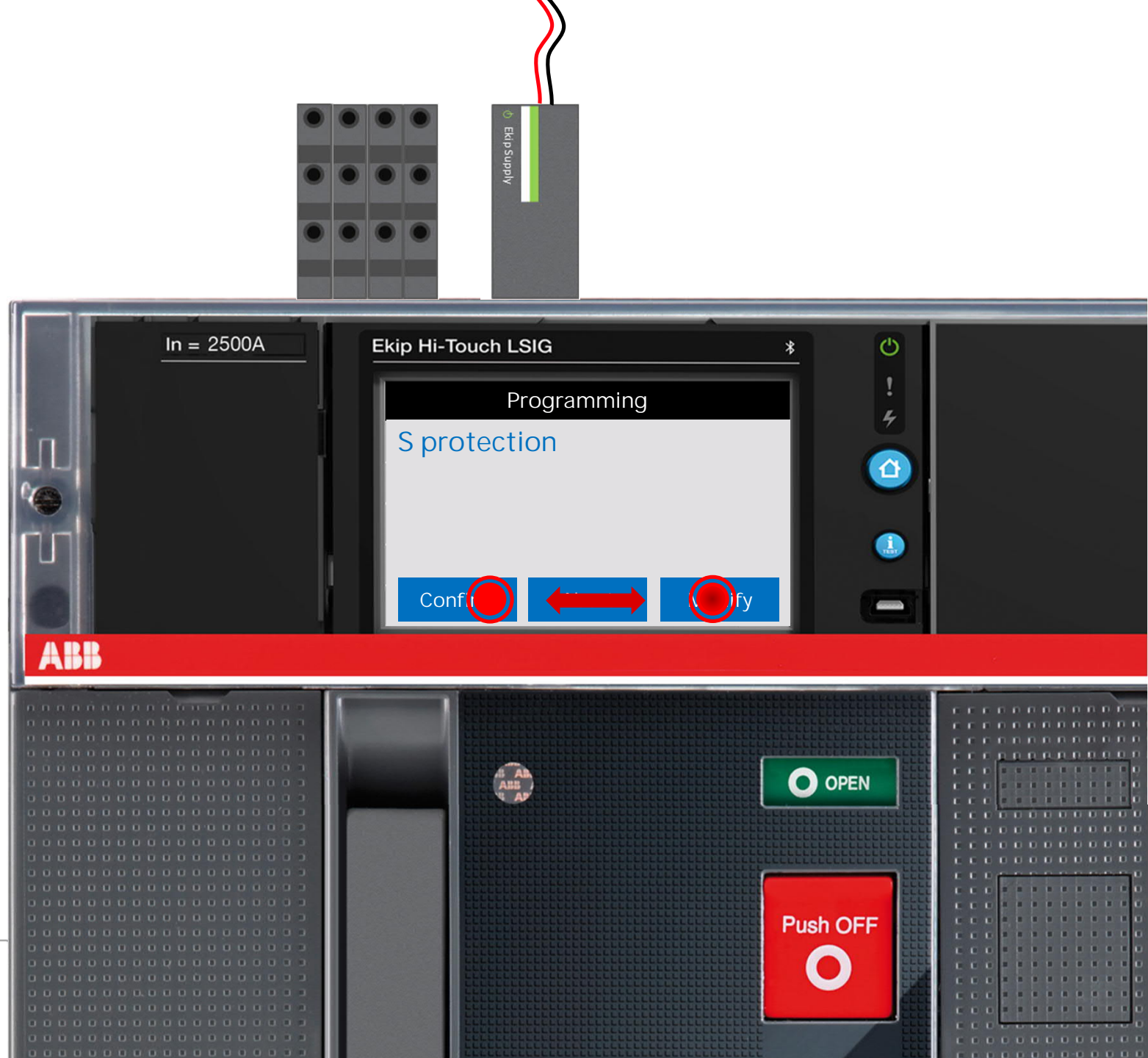
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## How to set ZSI for S protection

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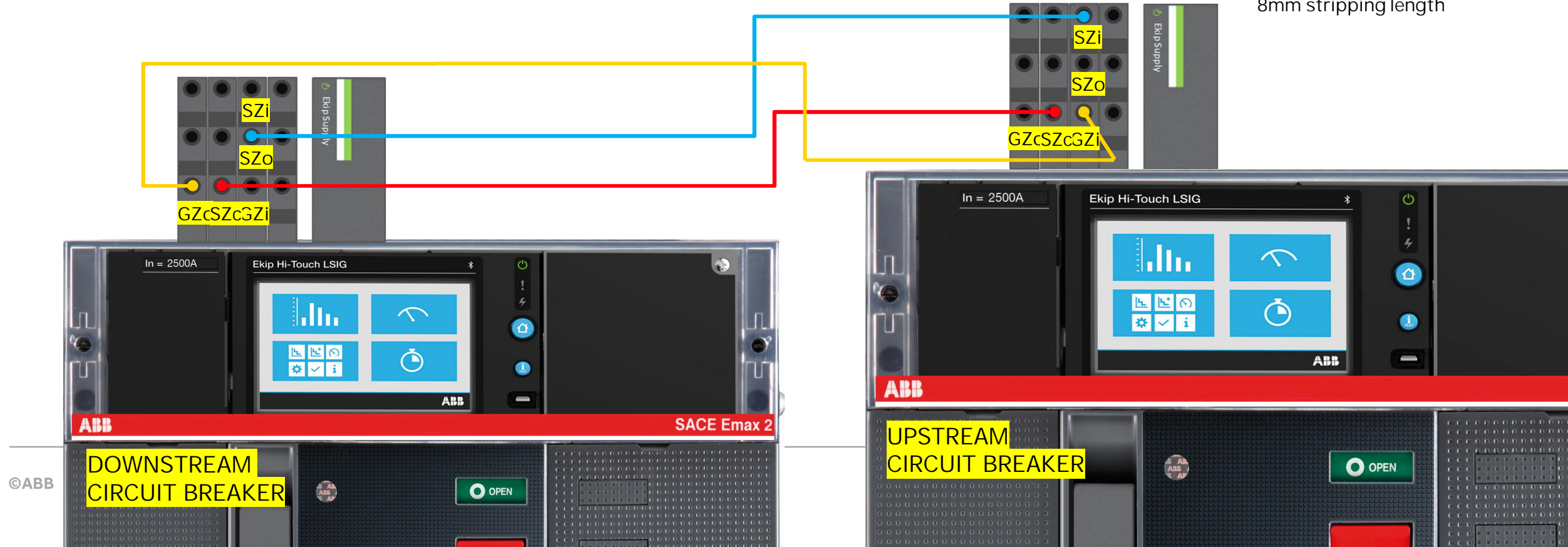
# ZSI circuit breaker cabling

# ZSI circuit breaker cabling

Direct cable from outputs to the downstream circuit breaker to the input of the upstream circuit breaker. SZc is the common pin.

In the next slides, we will test S ZSI so wiring for G is optional.

Cabling Requirements:  
300 meters max between devices  
22-14 AWG with rigid wires  
22-16 with flexible wires  
8mm stripping length



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# Input and output testing

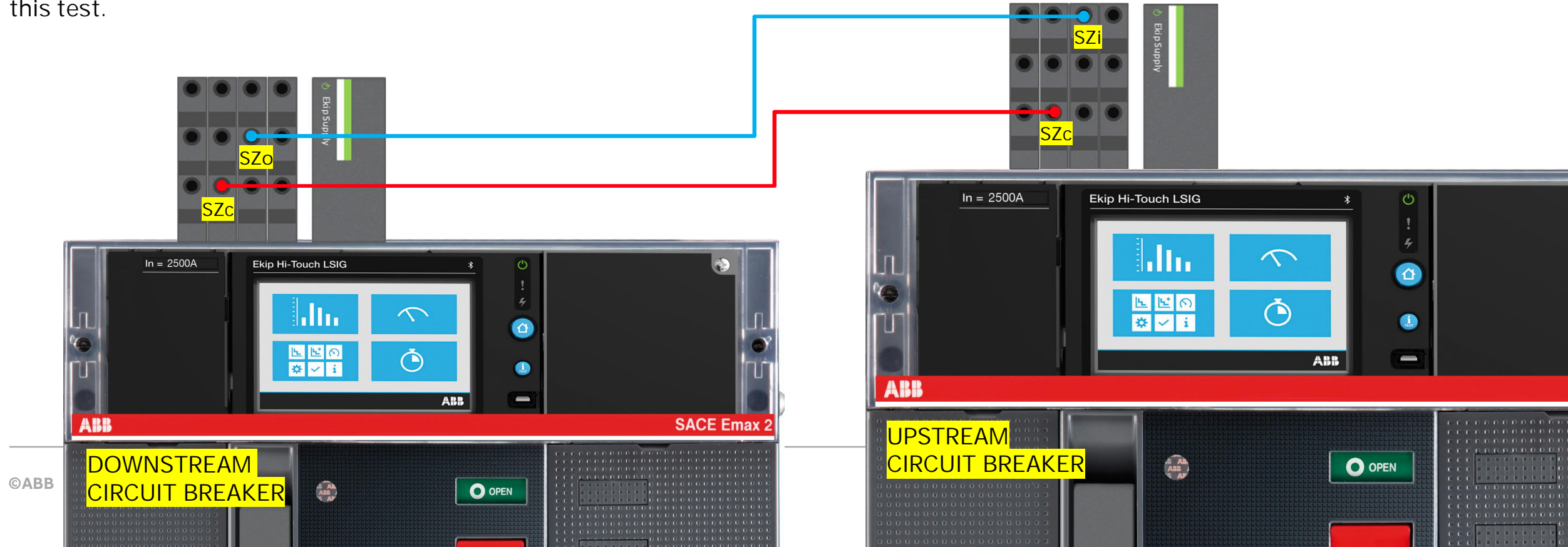


# Input and output testing

## Cabling for two circuit breakers

Connect the outputs of the downstream circuit breaker to the inputs of the upstream circuit breaker. SZc is the common pin.

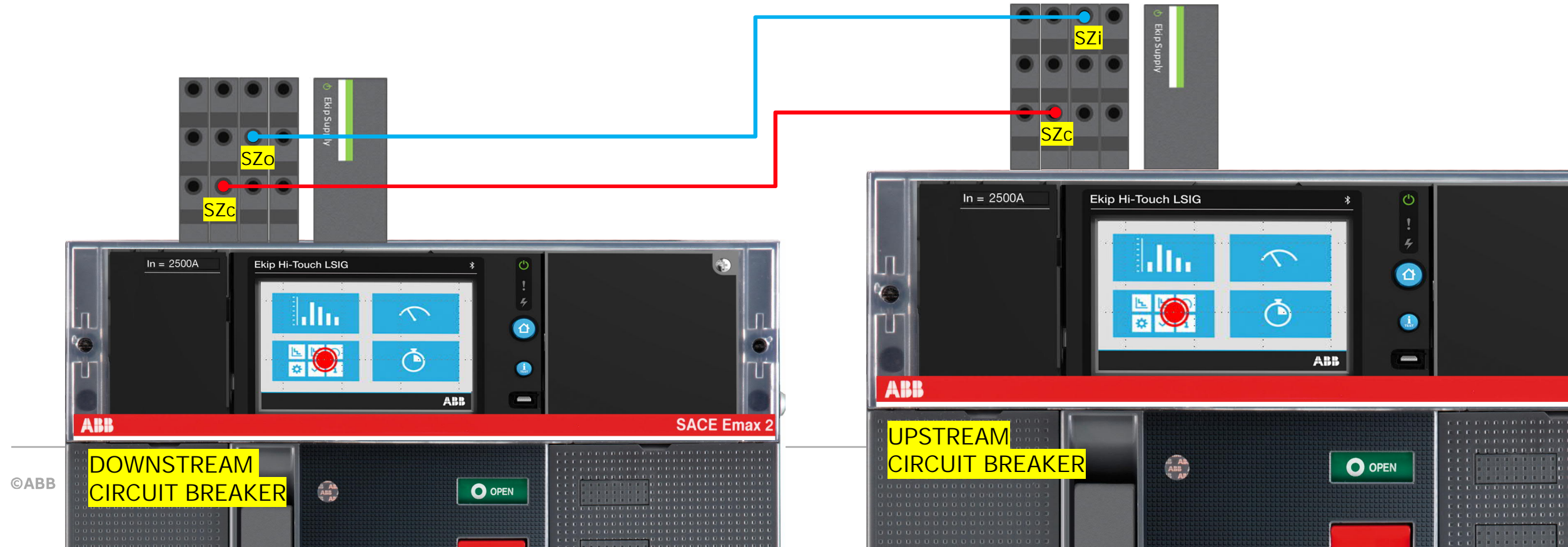
Please ensure the circuit breaker is open before proceeding with this test.



# Input and output testing

## Test the cabling

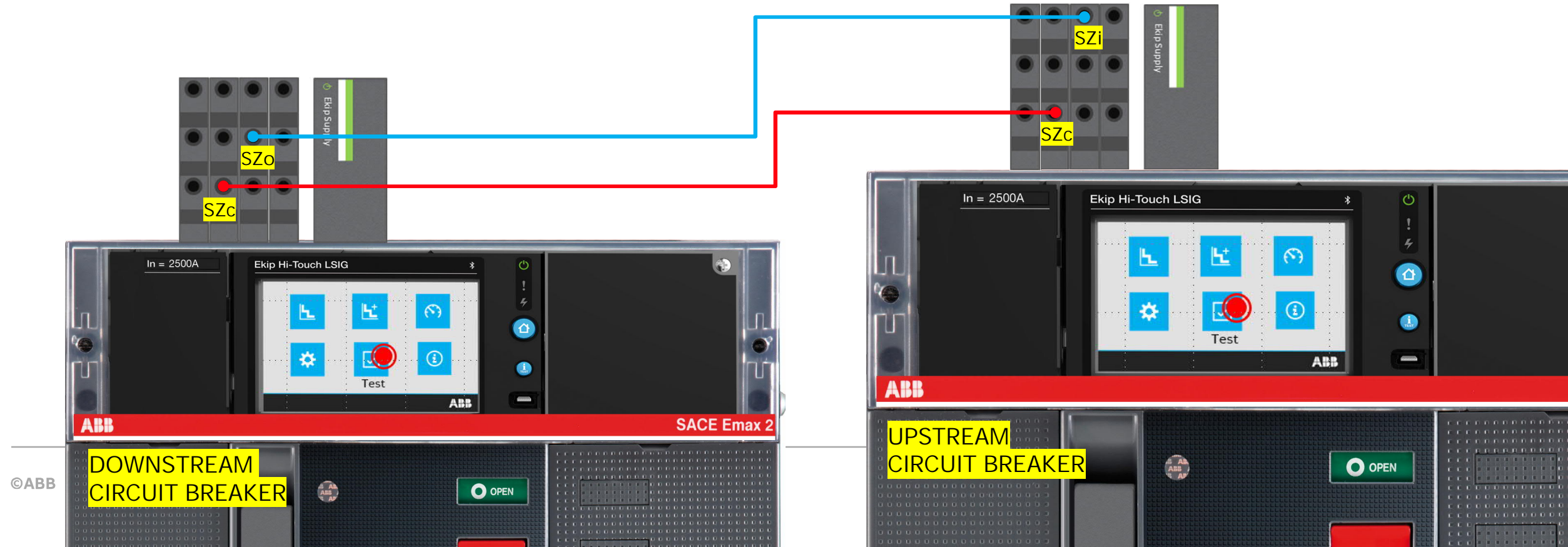
Enter the Test menu and find the Zone Selective test submenu.



# Input and output testing

## Test the cabling

Enter the Test menu and find the Zone Selective test submenu.

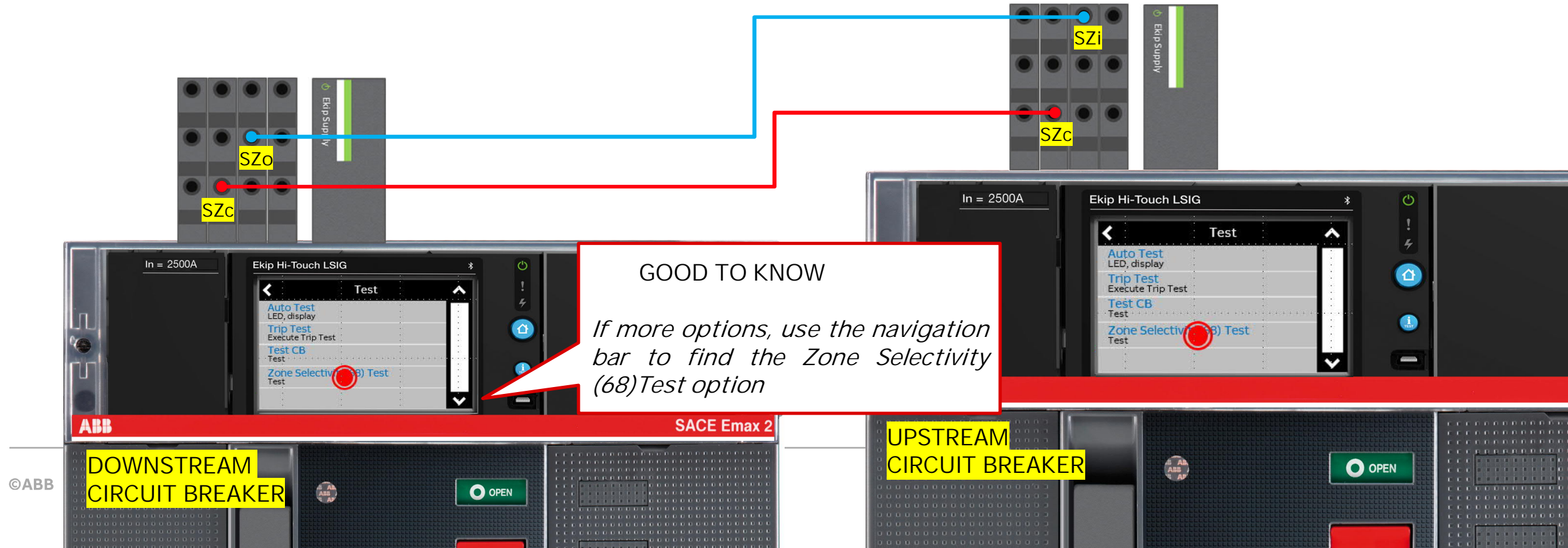




# Input and output testing

## Test the cabling

Enter the Test menu and find the Zone Selective test submenu.

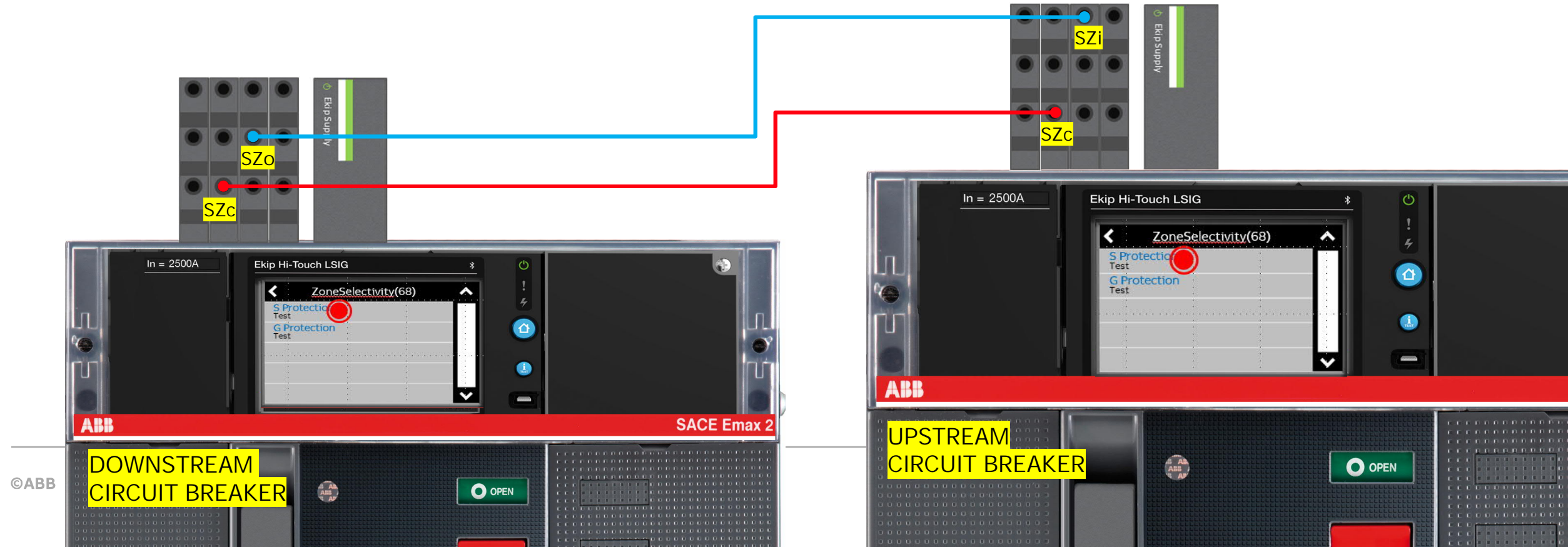




# Input and output testing

## Test the cabling

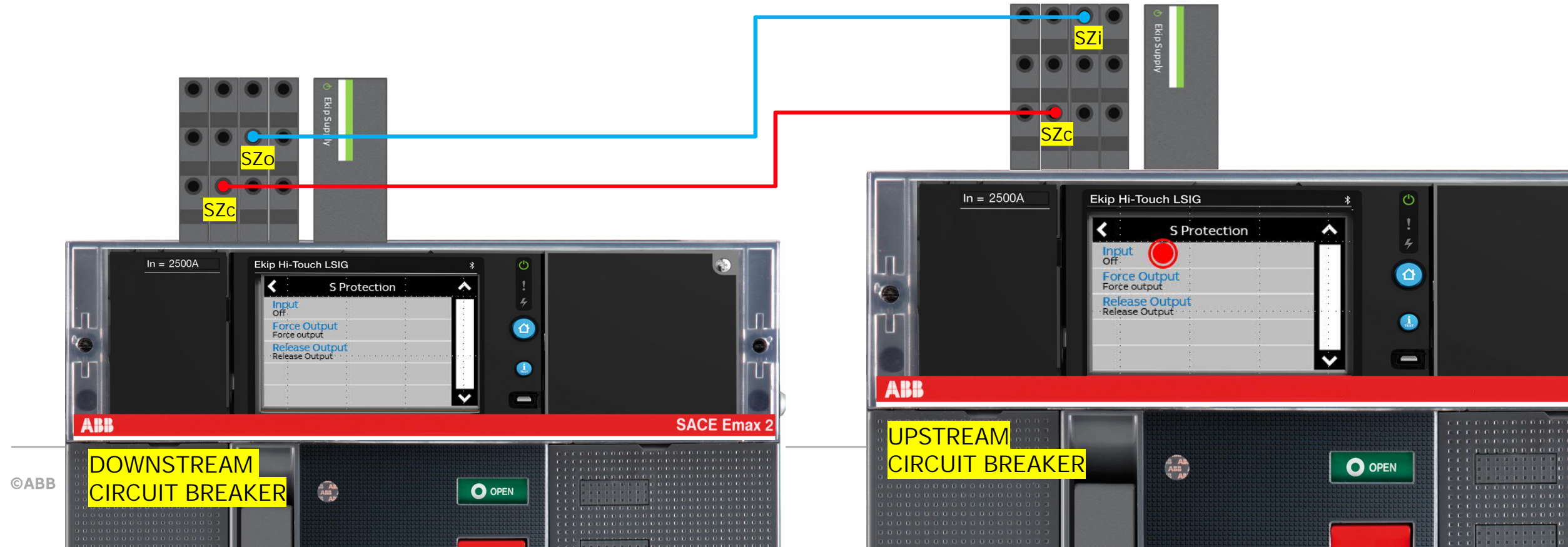
Find in the Zone Selective test submenu the S Protection option.



# Input and output testing

## Test the cabling

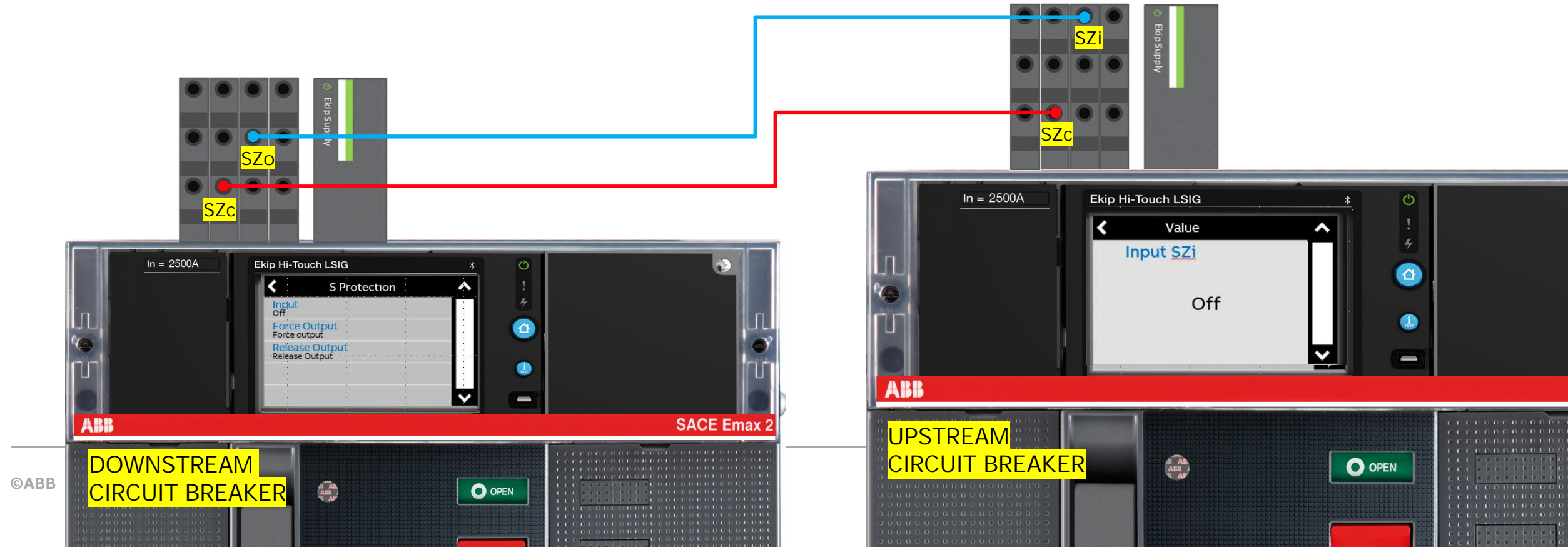
Verify the input status of the logic discrimination in the upstream device.



# Input and output testing

## Test the cabling

Verify the input status of the logic discrimination in the upstream device.

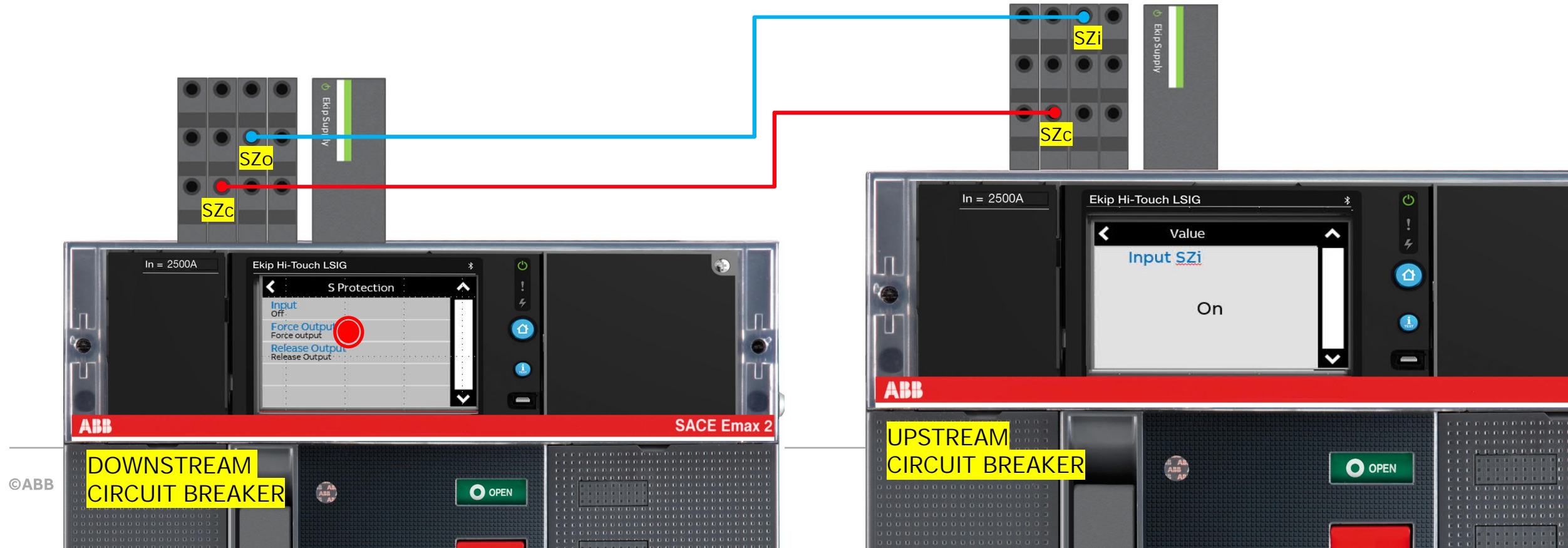




# Input and output testing

## Test the cabling

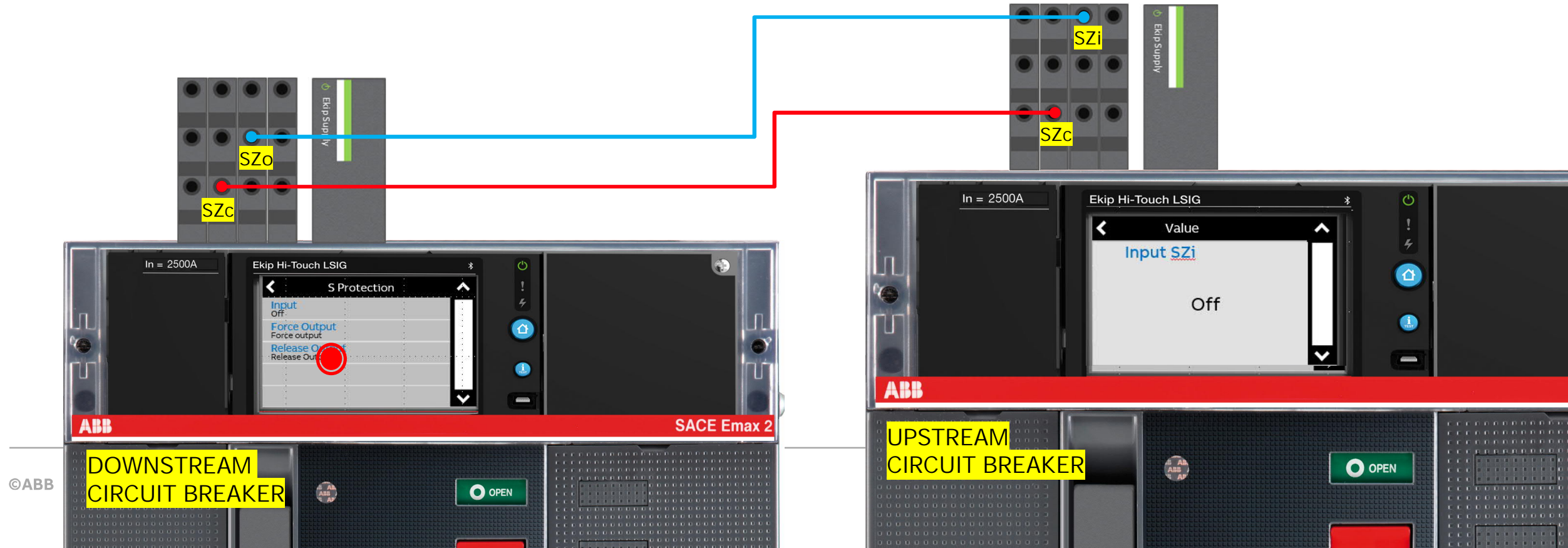
Now click on Force Output; at this point the status of the input should change from Off to On. If the status changes, then the output and input are correctly configured.



# Input and output testing

## Test the cabling

Click on Release Output and this should result in the status of the input to change from On to Off. If the status changes, then the output and input are correctly configured



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# Protection Testing

Using Ekip Connect



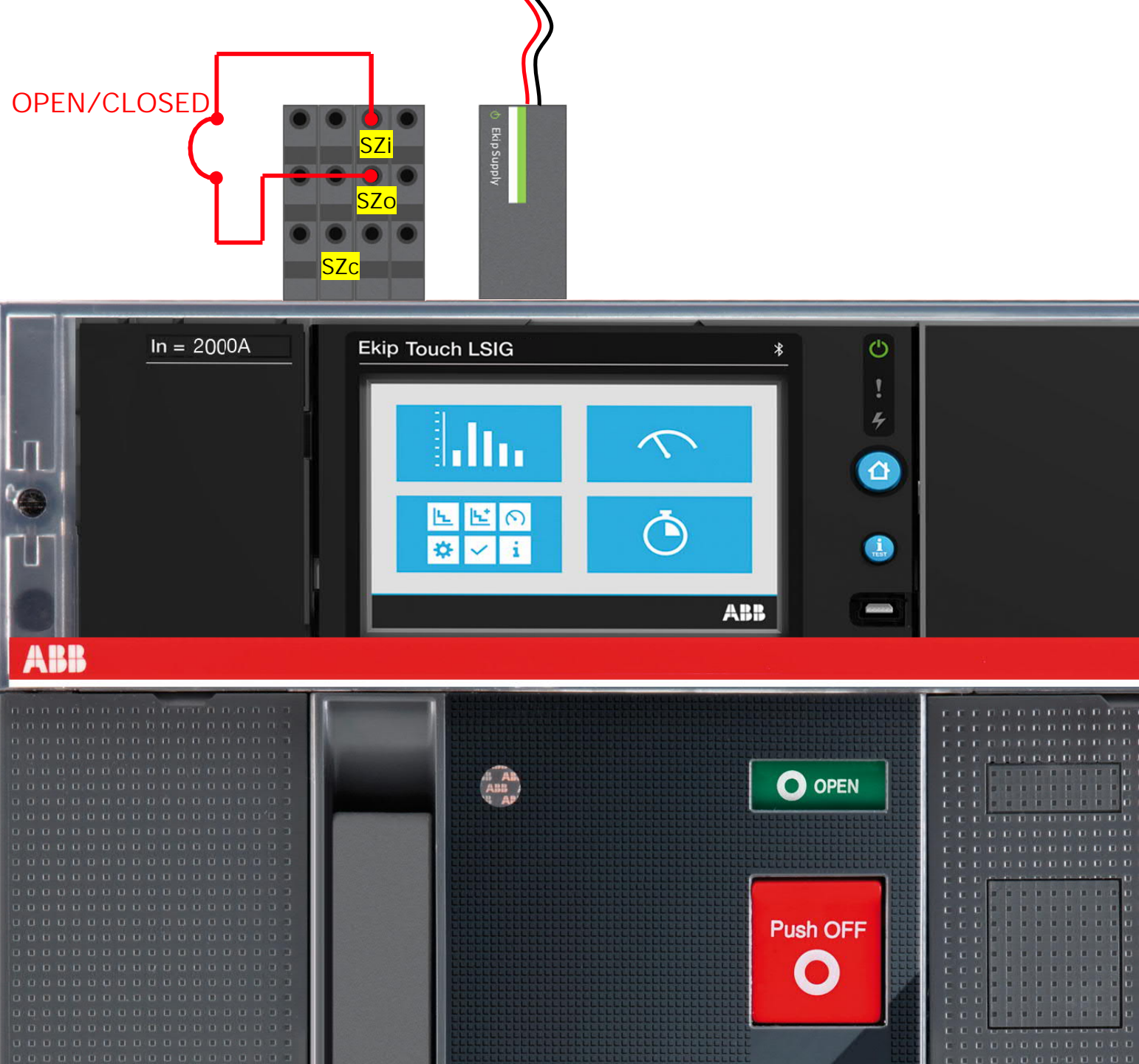
# Protection Testing

## With just one circuit breaker

Connect the input Szi to the output Szo.

In this way, the circuit breaker will be able to self restrain itself when the contact is closed.

This procedure will demonstrate the capability of sending and receiving a restrained signal.



# Protection testing

With just one circuit breaker

Set the S protection

*Example ( $I_n = 2000A$ ):*

Threshold  $I_2 = 0.6I_n$  (1200A)

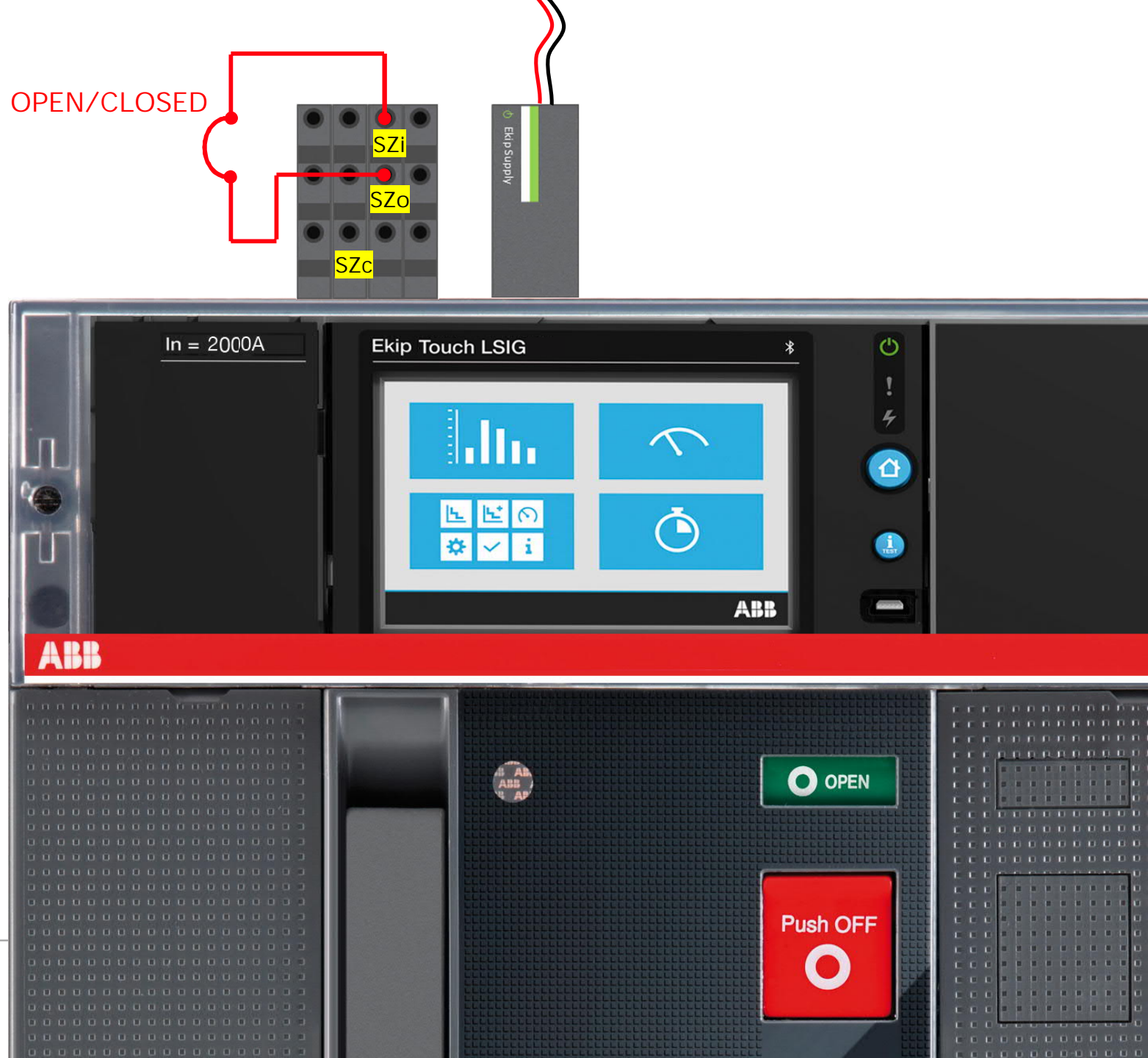
Function  $t = k$

Time  $t_2 = 0.10s$  (restrained time setting)

Zone selectivity ON

Selectivity time  $t_{sel} = 0.06s$  (unrestrained time setting)

All the other protections must be either disabled or set to a higher time setting.

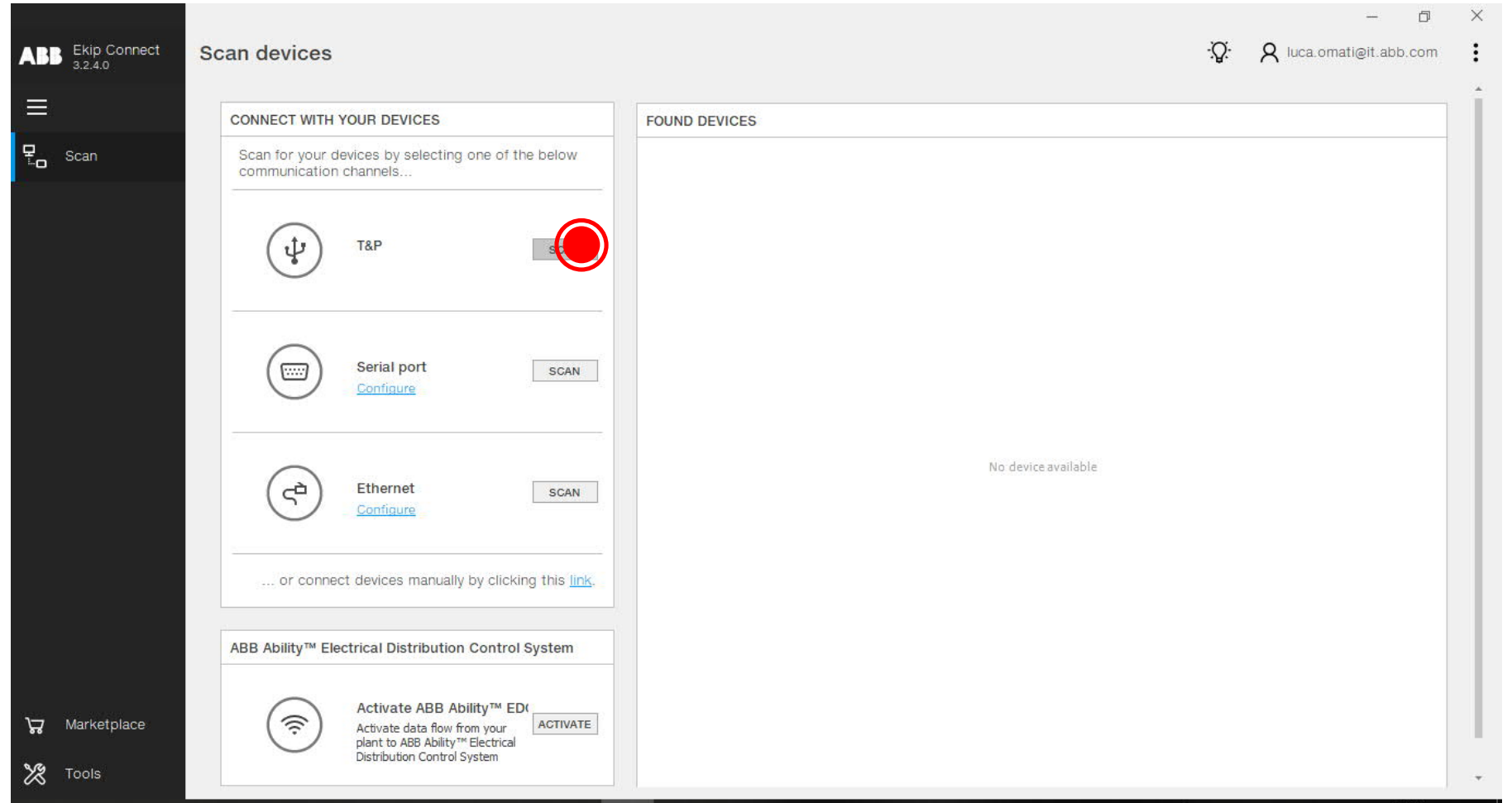


# Protection testing

## Ekip Connect Software

Connect the circuit breaker to a PC using the Ekip T&P.

Press Scan in order to find the connected circuit breaker.





# Protection testing

## Ekip Connect Software

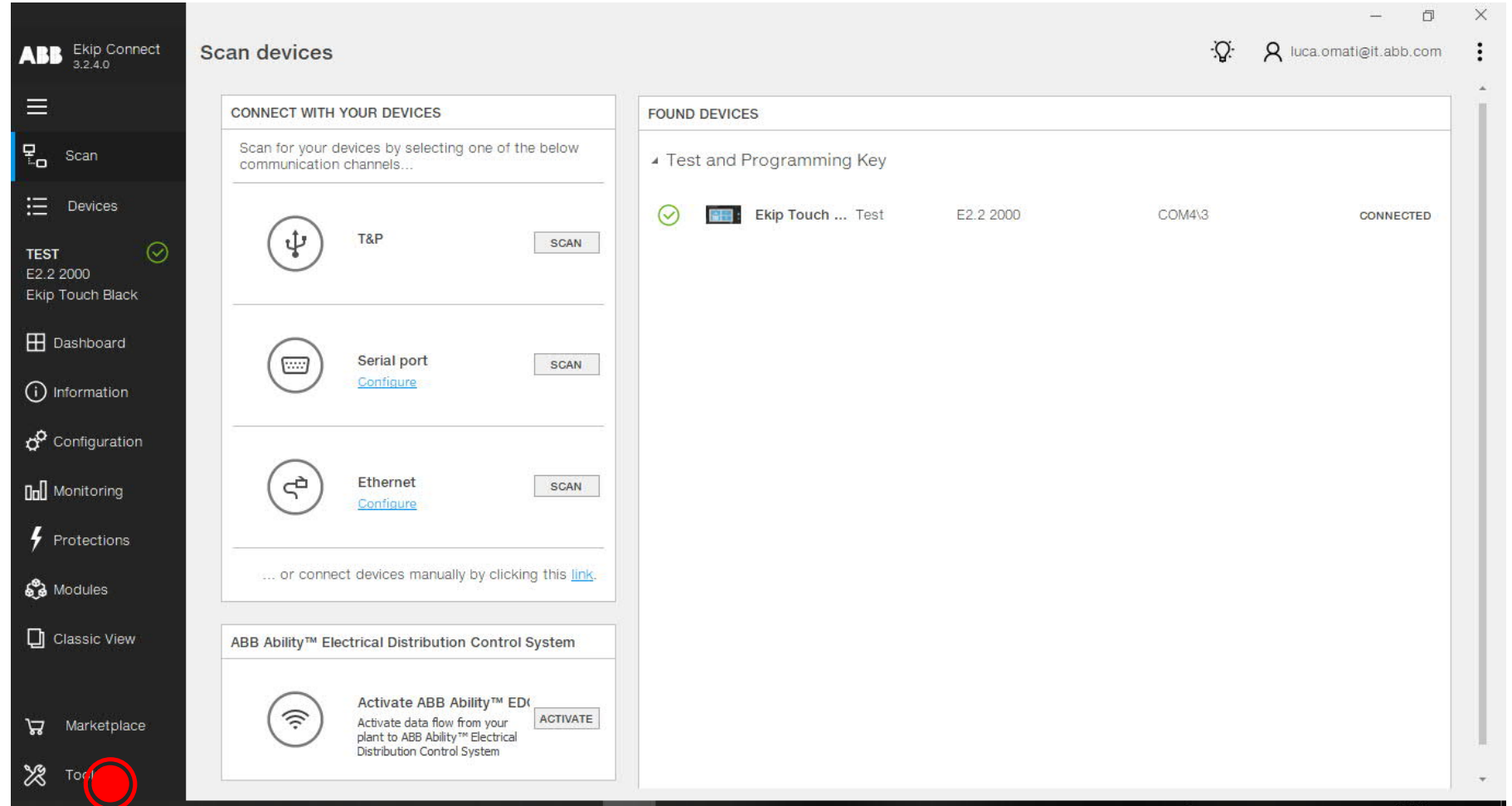
Open the Tools menu and click the Test Area icon.

Add a new test.

Enable the phases where you want to simulate the test and define a proper value

*Example*

Fault on IL1 with 1600A



# Protection testing

## Ekip Connect Software

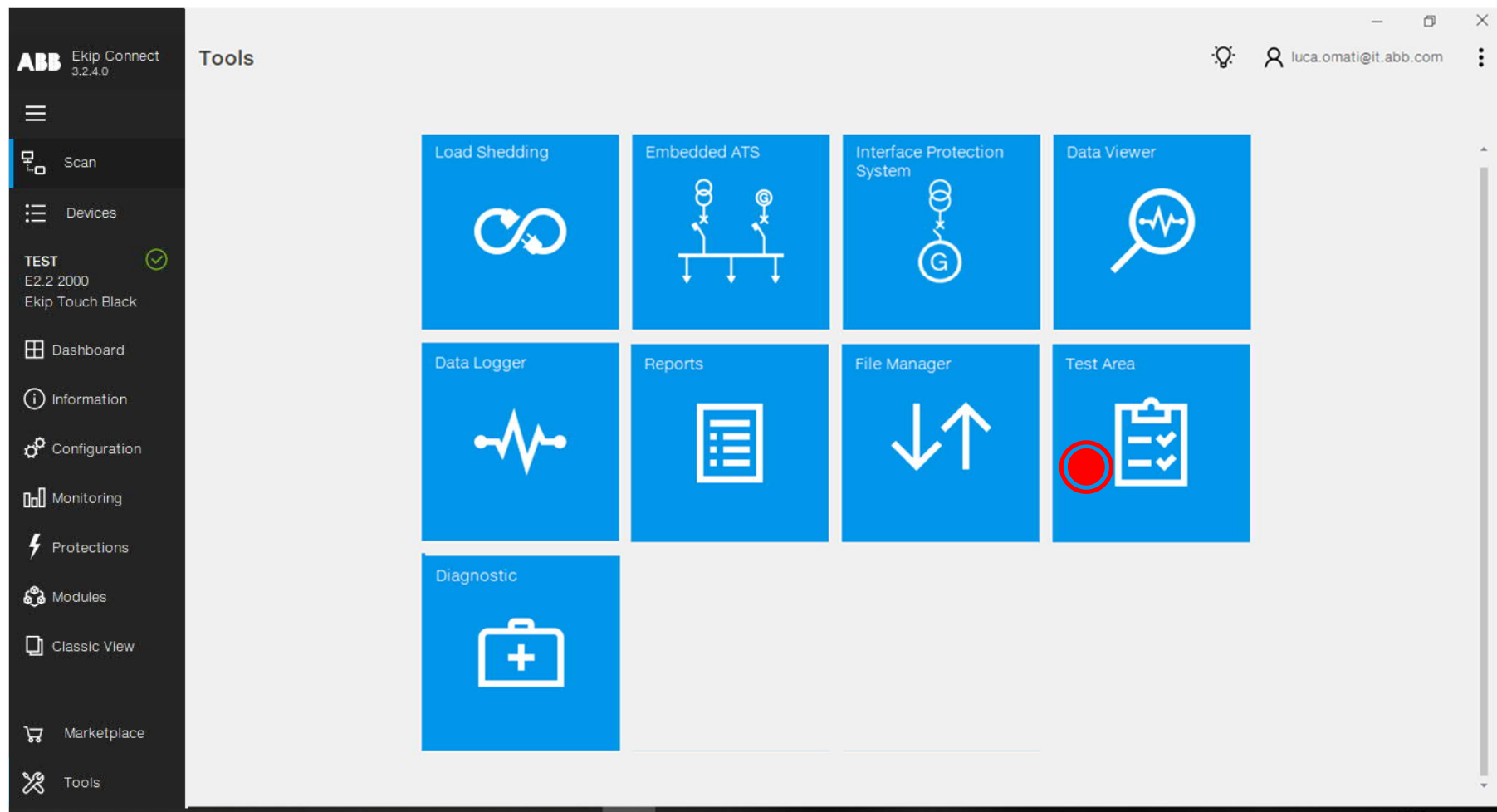
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# Protection testing

## Ekip Connect Software

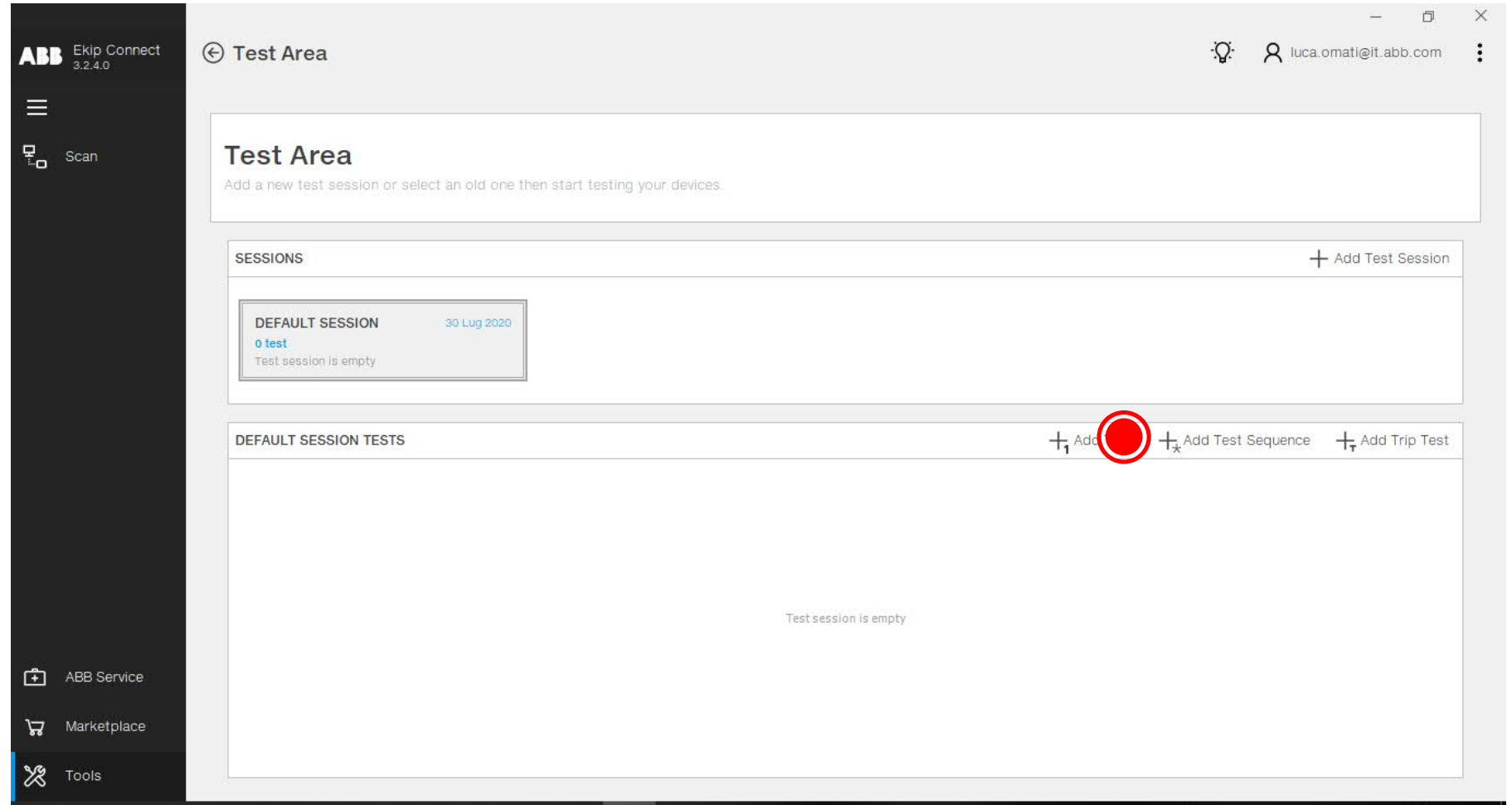
Open the Tools menu and click the Test Area icon.

Add a new test.

Enable the phases where you want to simulate the test and define a proper value

*Example*

Fault on IL1 with 1600A





# Protection testing

## Ekip Connect Software

Open the Tools menu and click the Test Area icon.

Add a new test.

Enable the phases where you want to simulate the test and define an amplitude value higher than the S protection setting.

### Example

Fault on IL1 with 1600A

The screenshot displays the ABB Ekip Connect 3.2.4.0 software interface. The left sidebar contains a menu with icons for Scan, Devices, TEST (selected), Dashboard, Information, Configuration, Monitoring, Protections, Modules, Classic View, ABB Service, Marketplace, and Tools. The main window is titled 'Test Area' and shows the configuration for a 'Default session > TEST 1'. The 'SIGNALS' tab is active, displaying a phasor diagram and a table of signal parameters.

**Test Area > Default session > TEST 1**  
Edit signal properties and start testing device.  
Open Save

**SIGNALS**

Phase Change Mode: Free  
Power Factor: 0.9  
Power Factor Type: Inductive  
Neutral Current Mode: Free

☐ Show Relative Amplitudes ☐ Same Amplitude for Currents ☐ Same Amplitude for Voltages

**Phasor Diagram:** A circular diagram showing the relative amplitudes and phases of the signals. The diagram includes labels for IL1, IL2, IL3, V1, V2, V3, and INe. The values are: IL1: 800.0 A, 0.0°; IL2: 800.0 A, 240.0°; IL3: 800.0 A, 120.0°; V1: 230.9 V, 0.0°; V2: 230.9 V, 240.0°; V3: 230.9 V, 120.0°; INe: 0.0 A, 0.0°.

**Signal Table:**

Enabled	Signal	Amplitude	Relative	Phase
<input checked="" type="checkbox"/>	IL1	800.00 A	0.40 In	0.00°
<input checked="" type="checkbox"/>	IL2	800.00 A	0.40 In	240.00°
<input checked="" type="checkbox"/>	IL3	800.00 A	0.40 In	120.00°
<input type="checkbox"/>	INe	0.00 A	0.00 In	0.00°
<input type="checkbox"/>	V1	230.94 V	1.00 Un	0.00°
<input type="checkbox"/>	V2	230.94 V	1.00 Un	240.00°

**Currents:** A graph showing the current waveforms for IL1, IL2, IL3, and INe. The x-axis represents time, and the y-axis represents current in Amperes (A). The waveforms are sinusoidal and phase-shifted relative to each other.

**Voltages:** A graph showing the voltage waveforms for V1, V2, and V3. The x-axis represents time, and the y-axis represents voltage in Volts (V). The waveforms are sinusoidal and phase-shifted relative to each other.

**Start**

# Protection testing

## Ekip Connect Software

Open the Tools menu and click the Test Area icon.

Add a new test.

Enable the phases where you want to simulate the test and define an amplitude value higher than the S protection setting.

### Example

Fault on IL1 with 1600A

The screenshot displays the ABB Ekip Connect 3.2.4.0 software interface. On the left is a dark sidebar with a menu containing: Scan, Devices, TEST (highlighted with a checkmark), Dashboard, Information, Configuration, Monitoring, Protections, Modules, Classic View, ABB Service, Marketplace, and Tools. The main window is titled 'Test Area' and shows the breadcrumb 'Test Area > Default session > TEST 1'. Below this is a sub-header 'SIGNALS' and a 'Harmonics' tab. The configuration area includes dropdowns for 'Phase Change Mode' (Free), 'Power Factor' (0.9), 'Power Factor Type' (Inductive), and 'Neutral Current Mode' (Free). There are also checkboxes for 'Show Relative Amplitudes', 'Same Amplitude for Currents', and 'Same Amplitude for Voltages'. A phasor diagram on the left shows three phases (V1, V2, V3) with V1 at 0°, V2 at 120°, and V3 at 240°. A fault is configured on IL1 with an amplitude of 1600.0 A and a phase of 0.0°. A table on the right lists the signals and their properties:

Enabled	Signal	Amplitude	Relative	Phase
<input checked="" type="checkbox"/>	IL1	1600.0 A	0.80 In	0.00°
<input type="checkbox"/>	IL2	800.00 A	0.40 In	240.00°
<input type="checkbox"/>	IL3	800.00 A	0.40 In	120.00°
<input type="checkbox"/>	INe	0.00 A	0.00 In	0.00°
<input type="checkbox"/>	V1	230.94 V	1.00 Un	0.00°
<input type="checkbox"/>	V2	230.94 V	1.00 Un	240.00°

On the right side, there are two waveforms: 'Currents' showing IL1 as a green sine wave and 'Voltages' showing V3 as a green sine wave. A 'Start' button is located at the bottom right.

# Protection testing

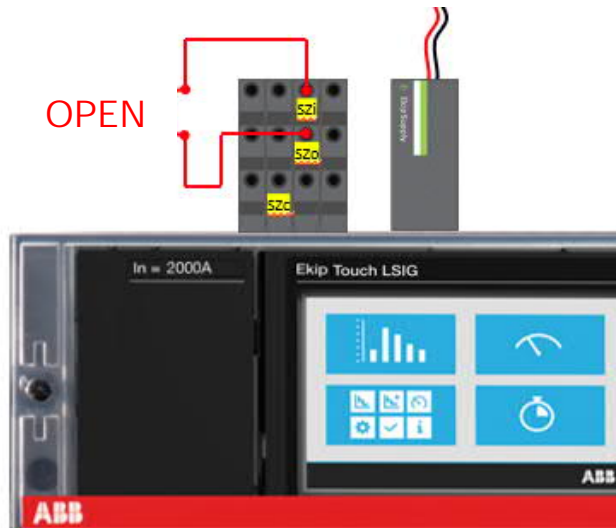
## Ekip Connect Software

### TESTING UNRESTRAINED CONDITION

Open the circuit SZo/Szi

Press Start<sup>1</sup>

Expected trip in tsel (0.06s)



**ABB Ekip Connect 3.2.4.0**

- Scan
- Devices
- TEST** (checked)
  - E2.2 2000
  - Ekip Touch Black
- Dashboard
- Information
- Configuration
- Monitoring
- Protections
- Modules
- Classic View
- ABB Service
- Marketplace
- Tools

### Test Area

< Back

#### Test Area > Default session > TEST 1

Edit signal properties and start testing device.

Open Save

Signals

Harmonics

#### SIGNALS

Phase Change Mode: Free Power Factor: 0.9 Power Factor Type: Inductive Neutral Current Mode: Free

☐ Show Relative Amplitudes ☐ Same Amplitude for Currents ☐ Same Amplitude for Voltages

Enabled	Signal	Amplitude	Relative	Phase
<input checked="" type="checkbox"/>	IL1	1600.0 A	0.80 In	0.00°
<input type="checkbox"/>	IL2	800.00 A	0.40 In	240.00°
<input type="checkbox"/>	IL3	800.00 A	0.40 In	120.00°
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<input type="checkbox"/>	V1	230.94 V	1.00 Un	0.00°
<input type="checkbox"/>	V2	230.94 V	1.00 Un	240.00°

Currents

Voltages

Start



# Protection testing

## Ekip Connect Software

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Open the circuit SZo/Szi

Press Start<sup>1</sup>

Expected trip in tsel (0.06s)

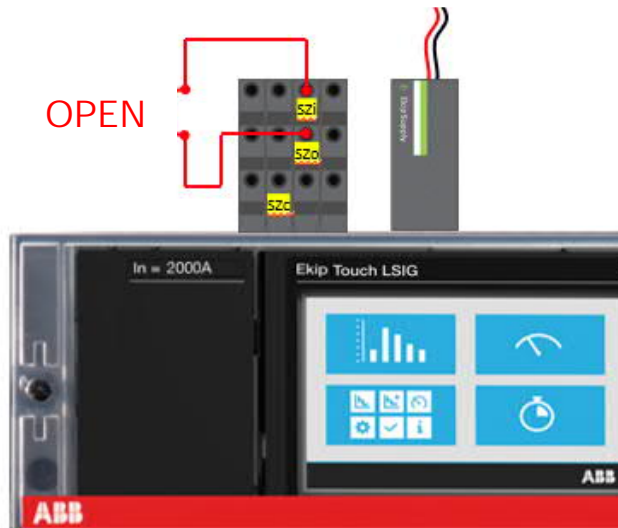


ABB Ekip Connect 3.2.4.0

Test Area

Test Area > Default session > TEST 1

Completed

30 Lug 2020

15:44:41	✓	Evaluating test preconditions...
15:44:42	✓	Open test session.
15:44:43	✓	Injecting signal waveforms...
15:44:43	✓	Start test.
15:44:44	✓	Protection S tripped in 62 ms.
15:44:44	✓	Stop test.
15:44:44	✓	Close test session.

Test completed. S tripped in 62 ms.

Repeat Test View Test Report Close

SIGNALS

Phase Change M

Free

Show Relativ

V1 230.94 V 1.00 Un 0.00°

V2 230.94 V 1.00 Un 240.00°

Start

# Protection testing

## Ekip Connect Software

### TESTING RESTRAINED CONDITION

Close the circuit SZo/Szi

Press Start<sup>1</sup>

Expected trip in t2 (0.10s)



**ABB Ekip Connect 3.2.4.0**

**Test Area**

Test Area > Default session > TEST 1

Edit signal properties and start testing device.

Open Save

**SIGNALS**

Phase Change Mode: Free Power Factor: 0.9 Power Factor Type: Inductive Neutral Current Mode: Free

☐ Show Relative Amplitudes ☐ Same Amplitude for Currents ☐ Same Amplitude for Voltages

**Enabled Signal Amplitude Relative Phase**

Enabled	Signal	Amplitude	Relative	Phase
<input checked="" type="checkbox"/>	IL1	1600.0 A	0.80 In	0.00°
<input type="checkbox"/>	IL2	800.00 A	0.40 In	240.00°
<input type="checkbox"/>	IL3	800.00 A	0.40 In	120.00°
<input type="checkbox"/>	INe	0.00 A	0.00 In	0.00°
<input type="checkbox"/>	V1	230.94 V	1.00 Un	0.00°
<input type="checkbox"/>	V2	230.94 V	1.00 Un	240.00°

**Currents**

**Voltages**

**Start**

# Protection testing

## Ekip Connect Software

### TESTING RESTRAINED CONDITION

Close the circuit SZo/Szi

Press Start<sup>1</sup>

Expected trip in t2 (0.10s)



The screenshot shows the Ekip Connect software interface. On the left is a sidebar with navigation options: Scan, Devices, TEST (selected), Dashboard, Information, Configuration, Monitoring, Protections, Modules, Classic View, ABB Service, Marketplace, and Tools. The main area is titled 'Test Area' and shows a 'Default session > TEST 1'. A 'Completed' dialog box is overlaid on the screen, displaying a list of test steps with timestamps and status indicators (blue checkmarks). The steps are: Evaluating test preconditions... (15:57:46), Open test session. (15:57:46), Injecting signal waveforms... (15:57:47), Start test. (15:57:48), Protection S tripped in 103 ms. (15:57:49), Stop test. (15:57:49), and Close test session. (15:57:49). Below the list, it says 'Test completed. S tripped in 103 ms.' and provides buttons for 'Repeat Test' and 'View Test Report'. A 'Close' button is also present. The background shows a 'SIGNALS' section with a phase change diagram and a 'Start' button at the bottom right.

Timestamp	Status	Action
15:57:46	✓	Evaluating test preconditions...
15:57:46	✓	Open test session.
15:57:47	✓	Injecting signal waveforms...
15:57:48	✓	Start test.
15:57:49	✓	Protection S tripped in 103 ms.
15:57:49	✓	Stop test.
15:57:49	✓	Close test session.

Test completed. S tripped in 103 ms.

Buttons: Repeat Test, View Test Report, Close



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# Documentation

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# Documentation



Emax 2 IEC Catalogue

[LINK](#)



Emax 2 UL catalogue

[LINK](#)



Technical paper

[LINK](#)



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Emax 2 Installation Manual

[LINK](#)



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