

# SWITCH ANALYZER SA10A

## USER MANUAL




**ELCON AB**

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Rev 3

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## 1 GENERAL DESCRIPTION.

The **Switch Analyzer SA10A** is a portable instrument, especially designed to analyze Circuit Breakers in the field. Even though **SA10A** is intended for use together with a computer, it can be used stand-alone for some simpler measurements. To be handy in field works, the **SA10A** is built into a small and robust metal carry case. On the cover section of the carry case, a notebook computer can be placed while testing.

The measurements that can be made without a Windows computer are: voltage and current for both motor and coils, time for three independent contacts in, open, close and close-open operations and static resistance of main contacts.

### **Contact time measurements.**

There are three groups, each of four main and two auxiliary contact indication inputs. Main contact max output 30 mA during operations and can also indicate pre-insertion resistors simultaneously. Auxiliary contact inputs can handle both free and live contacts. All contact inputs are of type semi protected banana-jacks and are protected against faulty connections and high voltage discharges.

### **Travel transducers.**

Up to three, digital or analogue, travel transducers, in any combination, can be used for simultaneous measurements.

### **Resistance measurement.**

Main contact resistance measuring can directly be done with an internal 200 Amp current generator. Both static and dynamic measuring is possible. Pre-insertion resistor resistance can be measured with use of a reference resistance

### **Operating coil control.**

With an external power supply connected through this section the operating coils can be fully controlled. The current flow through the coils and the supply voltage are measured.

### **Motor monitoring.**

In the Auxiliary section there is provisions to monitor current and voltage from an external motor supply.

### **Internal sampling.**

Sampling frequency for analogue and digital functions can be programmed for frequencies up to 50 kHz. Note! The PC-software sets the sampling frequency.

### **Power supply**

The SA10A must be powered with an external AC- or DC- power supply.

### **Environmental**

SA10A is built in a small metal carry case designed for rough handling in tough outdoor environments. All connections are protected for any possible type of electrical discharges and disturbances. Some of the inputs are even protected against faulty connections up to 300V peak.

### **PC-Computer**

In most cases a standard windows notebook computer can be used but for tougher environments an outdoor type is recommended. For recommended minimum requirements for the notebook computer. See **BTS11 User manual**

### **PC-software**

See separate manual **BTS11 User manual** for more information.

## 2 SAFETY REGULATIONS



### Important!

This instrument shall only be used by **authorized and educated personnel**.

It is the operator's responsibility to read and follow all operating and safety instructions for connecting and using this instrument. **Always keep the below safety instructions in mind when using the instrument.**

### 2.1 GENERAL SAFETY REGULATIONS.

- **Local safety regulations.**

Always follow local safety regulations for work on high-voltage circuit breakers.

- **Ground connection.**

Always connect the separate ground terminal (green/yellow) on **SA10A** to protective ground before any other connections.

The **SA10A** unit can only be used in electrical system with a single ground.

If there is a High voltage ground and Low voltage ground make sure that there is no potential voltages difference between these grounds. If a voltages difference exists between grounds, consult local safety regulations.

Check that the separate protective ground wire is in good condition before connection.

Make sure that the power socket for mains is a grounded outlet and that the power cable is in good condition before connected the main power to the control unit **SA10A**.

- **Connections.**

Before connecting the **SA10A** to a high-voltage circuit breaker, make sure that the breaker poles are in position **CLOSE**, and disconnected from the power line at both sides. The breaker must also be grounded on at least one side.

Follow local safety regulations for work on high-voltage circuit breakers.

To avoid unintentional breaker operation!

Never do any work on a circuit breaker unless the control circuits of the breaker are disconnected from the **SA10A** control outputs or from any other remote control device.

All cables shall **first be connected to the SA10A** before any connections to the test object.

**Use of touch-protected connectors is required for personal safety.**

Only use original cables for connection and make sure that the cables are in good conditions.

When the **SA10A** is connected to a wall socket, the socket **must be a grounded power outlet**.

Note! The inputs for coils "Uc" and motor "Um" are not fused!

Make sure that the output powers to these inputs are fused with maximum 32A.

Take care when working near bare connectors and bus bars. Contact with a conductor may cause an electrical shock.

Take special care at wet conditions.

- **Testing the circuit breaker**

Make sure that surrounding personal can't touch the breaker during an operation.

If a test sequence shall be running in automatic mode it's **absolutely necessary** to have a security circuit that prevent surrounding personal to touch the test object during the sequence.

The power supplies for coils and motor must be interlocked to a security circuit that cut the power if the security circuit is open.

**Read also additional safety regulations presented in sections below.**

[3.1.1 Safety regulations.](#)   [3.2.1 Safety regulations.](#)

[3.3.1 Safety regulations.](#)   [3.4.1 Safety regulations.](#)

## 2.2 CONNECTION OF SA10A TO MAINS POWER.

The **SA10A** can be powered from any AC source 100-240V or DC source 100-240 VDC (with a ground connection).

When the **SA10A** is connected to a wall socket, the socket **must be a grounded power outlet**.

### IMPORTANT!

The **SA10A** have a separate grounding terminal (green/yellow) that **must be grounded** to the nearest protective earth (ground) with a separate wire.

## 3.0 CONNECTIONS

### 3.1 CONNECTIONS FOR TIME MEASUREMENT.

#### 3.1.1 SAFETY REGULATIONS.

When only one side of the breaker is connected to earth (ground), special precautions must be observed. To protect service personnel and the measuring equipment from surges, two important rules must be followed closely.

- The **SA10A** case must be grounded.
- All circuit breaker connections and disconnection's must be made while the breaker poles are closed and connected to earth (ground) **on least one side**.
- To avoid unintentional breaker operation! Never do any work on a circuit breaker unless the control circuits of the breaker are disconnected from the SA10A control outputs.
- Use of touch-protected connectors.

#### 3.1.2 PRINCIPALS FOR CONNECTIONS TO SA10A.

To get a useful protocol and to fit to the PC-software it is necessary to connect contacts in a certain way:

- Use separate contact groups ("Contacts 1" - "Contacts 3") for separate phases.
- Use contacts "A" - "D" for separate breaker elements in each phase.
- Use contacts "a" and "b" for connection of auxiliary contacts (live or free)

**Note!** Do not exceed the input voltage limit of 250 V AC or 300 V DC.

#### 3.1.3 CONNECTIONS FOR ONE BREAKING UNIT PER PHASE.

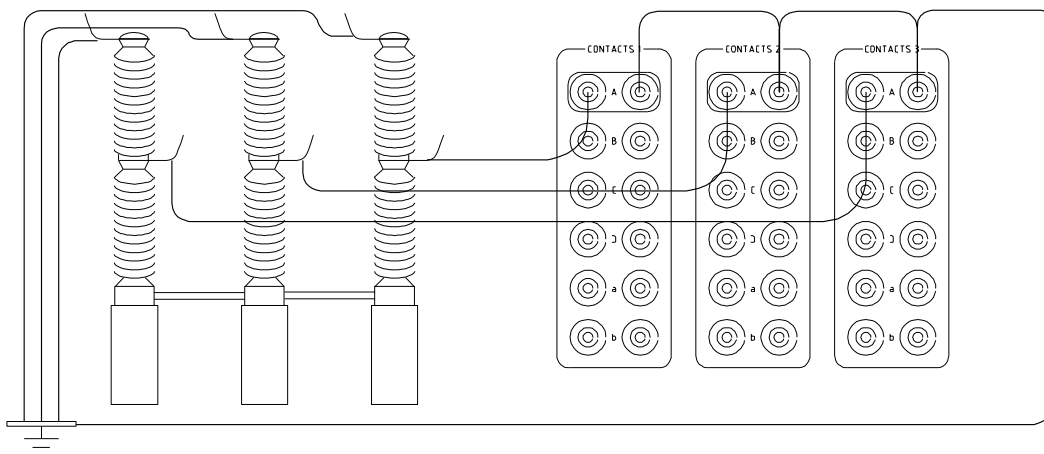


Figure 2.1 Connections for a one breaking unit per phase

3.1.4 CONNECTIONS FOR TWO OR MORE BREAKING UNITS PER PHASE.

**Note!**

Only one phase is shown

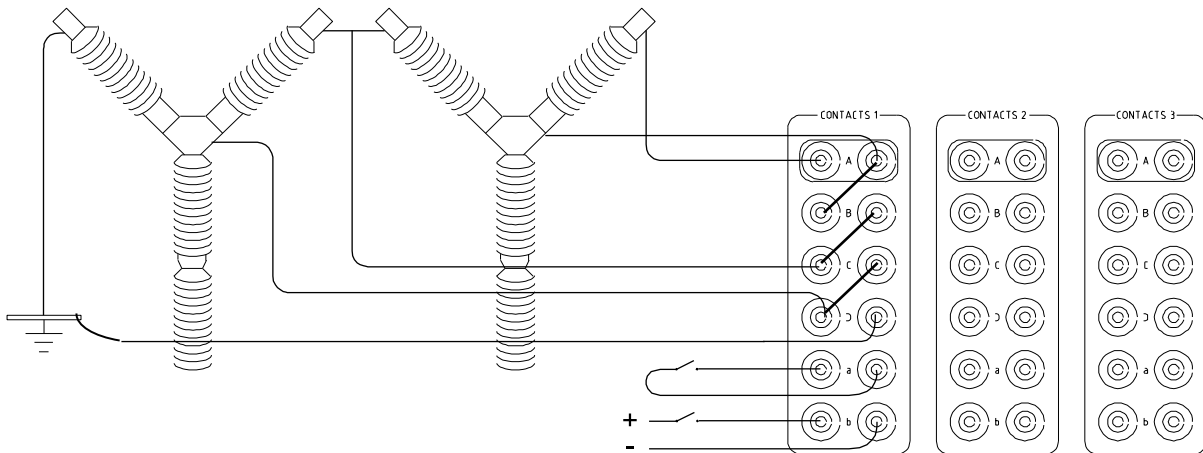


Figure. 2.2 Connections for four breaking units per phase

3.1.5 CONNECTION FOR A BREAKING UNIT WITH A PRE-INSERTION RESISTOR.

The contact inputs "A" -"D" in each contact group have two levels of resistance sensitivity.

There is no difference between connecting a breaker unit with a pre-insertion resistor and connecting a breaker unit without a pre-insertion resistor.

**Note!**

The value of the pre-insertion resistor must be in the range 50 - 5000 ohm

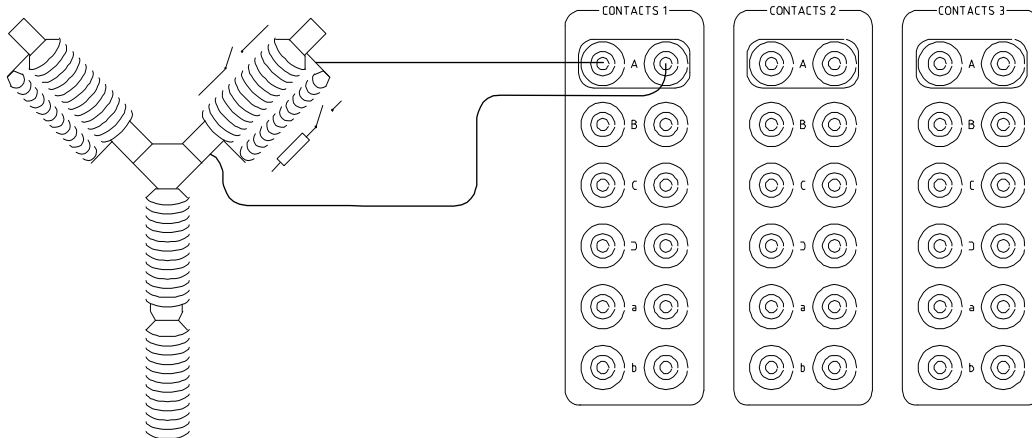


Figure. 2.3 Connections for a breaking unit with a pre-insertion resistor



## 3.2 CONNECTIONS FOR A RESISTANCE MEASUREMENT OF A BREAKING UNIT.

### 3.2.1 SAFETY REGULATIONS.

When only one side of the breaker is connected to earth (ground), special precautions must be observed. To protect service personnel and the measuring equipment from surges, the following important rules must be followed closely.

- The SA10A case must be earthen (grounded).
- All circuit breaker connections and disconnection's must be made only while the breaker poles are closed and connected to earth (ground) on least one side.
- To avoid unintentional breaker operation! Never do any work on a circuit breaker unless the control circuits of the breaker are disconnected from the SA10A control outputs.
- Use of touch-protected connectors is required for personal safety.
- 200A Red Pole of SA10A is connected to chassis ground, and must be connected to the grounded side of the breaking unit. See figure 2.4 below

### 3.2.2 CONNECTION.

Use a connection cable with an area of 25mm<sup>2</sup> or more, to connect from the **SA10A 200A** current generator to the breaking unit that is going to be measured.

#### Important!

**200A Red Pole** of **SA10A** is connected to chassis ground, and must be connected to the grounded side of the breaking unit. See figure 2.4



#### Important!

Keep the two measuring wires connected to **Ur+** and **Ur-** near together (twisted) as long as possible to reduce interference and get a good measuring result.

#### Note!

If there is a current transformer (CT) in the circuit, the 200A current from SA10A shall if possible be connected so that the 200A measuring current not go through the CT. If that not possible, the secondary windings of the CT must be short circuit and the CT must be demagnetized after done test.

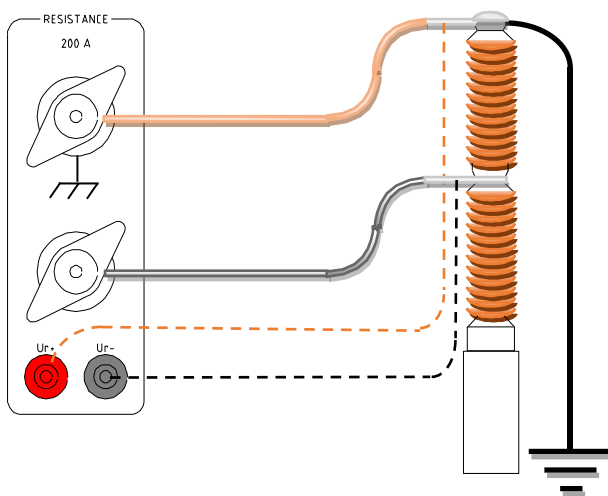


Figure. 2.4 Connections for a resistance measurement of a breaking unit

### 3.3 CONNECTIONS FOR RESISTANCE MEASUREMENT OF A PRE-INSERTION RESISTOR.

#### 3.3.1 SAFETY REGULATIONS.

When only one side of the breaker is connected to earth (ground), special precautions must be observed. To protect service personnel and the measuring equipment from surges, the following important rules must be followed closely.

- The SA10A case must be grounded.
- All circuit breaker connections and disconnection's must be made only while the breaker poles are closed and connected to earth (ground) on least one side.
- To avoid unintentional breaker operation! Never do any work on a circuit breaker unless the control circuits of the breaker are disconnected from the SA10A control outputs.
- The reference resistor itself and connections to the reference resistor **must be well isolated**.
- **Warning!** Do not short-circuit or touch the auxiliary voltages to and from the SA10A. Use of touch-protected connectors is required for personal safety.

#### 3.3.2 PRINCIPAL OF MEASUREMENT.

The auxiliary DC-voltage to the coils are used as a voltage source. The voltage division between the pre-insertion resistor and a reference resistor is used to calculate the resistance of the pre-insertion resistor.

##### Selection of reference resistor.

Select the reference resistor in the same range (or lower) as the pre-insertion resistor. Use a power resistor ( $\geq 10W$ ). Current will flow during a short time i.e. the pulse length set for coils.

The voltage across the reference resistor and the pre-insertion resistor are recommended to be greater than 20VDC and must be less than 300VDC. Try to get as high current as possibly to avoid influence from surrounded capacitive current.

#### 3.3.3 CONNECTION.

See **figure 2.5**. Make sure that the Resistor itself and connections to the reference resistor **are well isolated**.

Connect a wire between **COILS:COM** and **AUX:COM**

Connect a wire between output **COILS:CLOSE** and measuring input **AUX:Uk**.

Connect a reference resistor between output **COILS:CLOSE** and measuring input **AUX:UI**.

Connect the pre-insertion resistor between **AUX:UI"** and **AUX:COM**.

**Connect the breaker coils to the SA10A for a normal CO-operation** (not shown in figure 2.5).

**Note!** Do not connect the motor to SA10A. See [3.4.2 Connection of operating coils](#). for connections.

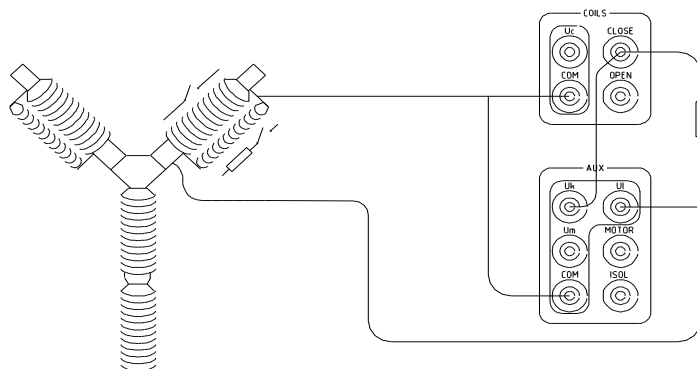


Figure. 2.5 Connections for resistance measurement of a pre-insertion resistor

### 3.4 CONNECTION OF THE BREAKER OPERATING MECHANISM.

#### 3.4.1 SAFETY REGULATIONS.

- The **SA10A** case must be grounded.
- **Warning!** Do not short-circuit or touch the auxiliary voltage.  
Use of touch-protected connectors is required for personal safety.
- The inputs for coils "Uc" and motor "Um" are not fused!  
Make sure that the powers to these inputs are pre-fused **with maximum 32A.**
- **Never** do any work on a circuit breaker unless the control circuits of the breaker are disconnected from the SA10A control outputs. (avoiding unintentional breaker operations)

#### Note!

The white 4 mm panel socket "ISOL" is an isolated connection that can be used to disconnect the control circuits of the breaker.

#### 3.4.2 CONNECTION OF OPERATING COILS.

See figure 2.6

- Connect the input coil voltage to the inputs **Uc** and **COM**.  
Connection to **COM** is optional and is only used for monitoring the voltage.
- Connect the positive connection of the closing coil and the positive connection of the opening coil to the outputs **CLOSE** and **OPEN**.
- Connect the negative connections of the operating coils to the negative connection of the coil voltage.

#### 3.4.3 CONNECTION OF MOTOR.

See figure 2.6

- Connect the auxiliary voltage to the inputs **Um** and **COM**
- Connect the motor connections to the output **MOTOR** and to the negative connection of the auxiliary voltage.

#### Note!

The connection of the motor circuit is optional and is only necessary for monitoring the voltage and current

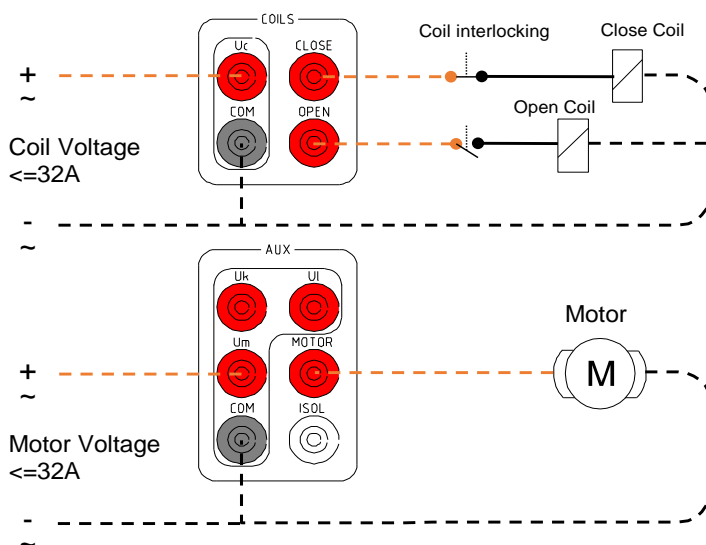


Figure. 2.6 Connection of the breaker operating mechanism

### 3.5 CONNECTION OF TRANSDUCERS.

Up to three pulse- or analog transducers can be connected to the inputs **T1**, **T2**, **T3**.

The connection must be done with a special cable connector:

Connector: LEMO FGG.2K.308.CLCK90

#### Pin Description for a digital pulse transducer.

1	Pulse 1.
2	Pulse 1 inverted.
3	Pulse 2.
4	Pulse 2 inverted
5	+5 VDC
6	Ground.

#### Pin Description for an analog transducer

5	+5 VDC
6	Ground
7	Analogue measurement ( <b>Wipe</b> )
8	Is not used.

Tip!

Use prefabricated cables for connection.



### 3.6 CONNECTION TO WINDOWS PC

Any standard Windows PC with one free RS232, USB 2.0, USB 3.0 port can be connected.


The **SA10A** can be connected with 3 different methods.

- USB Mini to USB cable. (Max 1 meters)
- RS232 9 Pol Male to 9 Pol Female cable. (Max 2 Meters)  
If computer is not equipped with RS232 port an USB to RS232 adapter can be used.
- Bluetooth communication kit

Use a standard straight serial RS232 PC-cable with a 9 pole DSUB Male Female connectors, for connection to **SA10A**.

4 USING SA10A STAND ALONE

The instruction below only handles the operating instruction for using the **SA10A** as a stand-alone instrument. See separate **BTS11 User manual** for use of the PC-software

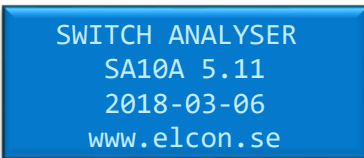
4.1 BEFORE OPERATION  IMPORTANT!

Read chapter [2 Safety regulations](#) before any connections.

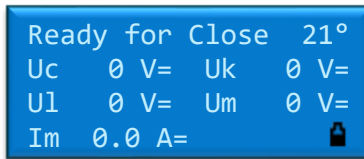
4.2 STANDALONE OPERATION OF SA10A

The SA10A LCD-display and two operation buttons "OPEN" and "CLOSE" for simpler operations and measurements.

Starting up **SA10A** the display will present the version of the internal software.



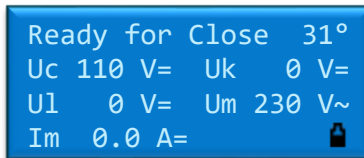
After unit is started **SA10A** the display shows, the next operation that can be done: **Ready for Open** or **Ready for Close**"  
 Voltage value for inputs: **Uc, Uk, Ul, Um.**  
 Current value: **Im** for motor.



Symbol	Voltage type
V=	Volt DC
V~	Volt AC
A=	Ampere DC
A~	Ampere AC

Symbol	Meaning
	Battery fully charged
	Battery charging
	Battery below 10Volt

When the display shows



Pressing Button

- CLOSE:** A close operation is done
- OPEN:** Nothing happens
- CLOSE and OPEN:** A close-open operation is done

**Note!** If enabled in service menu in BTS11 software. Internal temperature is displayed in the top right corner in Celsius.

When the display shows



Pressing Button

- OPEN:** An open operation is done
- CLOSE:** A static resistance measurement is done.

**Note!** Resistance measurement can only be done when the SA10A is powered from a separate AC or DC source.

The results of the operation are automatically displayed after a made operation.

**After a CLOSE, OPEN or CLOSE-OPEN operation.**

Result will display operating times for contacts **1A, 2A, 3A**, in milliseconds. (Ring marked contact inputs on the panel).

Maximum coil current during operation is displayed as **X.XA^**.

## CLOSE

Contact times Close		
A	51.52 ms	2.8A <sup>^</sup>
B	51.50 ms	
C	51.48 ms	

## OPEN

Contact times Open		
A	42.66 ms	2.7A <sup>^</sup>
B	42.64 ms	
C	42.62 ms	

## CLOSE-OPEN

Contact times C-0		
A	45.10 ms	2.8A <sup>^</sup>
B	45.08 ms	
C	45.06 ms	

Pressing any of the operation buttons "CLOSE" or "OPEN" will get you back to monitoring mode where new operations and measurements can be done.

**After static resistance measurement**

Result will display

Resistance		12s
R =	100.0 $\mu\Omega$	
I =	205.5 A	
U =	20.55 mV	

**R** = Resistance measured in micro ohm.  
**I** = Current measured in Amperes.  
**U** = Voltage measured in millivolt.

**Note!** To prevent overheating of the unit and depletion of the batteries. A timer in the top right corner counts down until next resistance measuring can be performed.

## 5 TECHNICAL SPECIFICATION.

## MAINS SUPPLY

Marked:	<b>MAINS</b>
Input voltage:	100 – 240 V DC / AC 50/60 Hz
Max power:	50W
Connector type:	IEC Inlet Filter
Fuses:	2
Fuse type:	5x20mm
Fuse rating:	T3.15A

## INTERNAL BATTERY

Quantity:	1
Used for:	Static and Dynamic Resistance measurement
Battery type:	Hawker Lead Accumulator 6 V 5 A, 0809-0012 (XMB)
Battery rating	12Volt (2x6V 5A Lead accumulator)
Battery charging:	13.5-14.0V @ 0.5A
Battery float voltage:	13.6V @ 25°C
Life Time:	<= 8 year
Fuses:	1
Fuse Panel mounted:	BUSSMANN BY EATON 25A aM

## MAIN CONTACTS

Marked:	<b>A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, C3, C4.</b>
Inputs:	12 independent.
Function:	Measure contact timing of main and pre-insert resistor contacts
Voltage:	48Vdc
Current:	Max 11 mA when load is between 24-48V Max 30 mA when load is between 0-24V
Timing accuracy:	±20µs at 50 KHz sampling.
Max Voltage between red and black output:	250VAC / ±300VDC

## AUXILIARY CONTACTS

Marked:	<b>1a, 1b, 2a, 2b, 3a, 3b.</b>
Inputs:	6 independent
Function:	Measure contact timing of aux contacts
Voltage:	24Vdc
Current:	Max 11 mA
Timing accuracy:	±20µs at 50 KHz sampling.
Max Voltage between red and black output:	250VAC / ±300VDC

## TRAVEL INPUTS

Marked:	<b>T1, T2, T3.</b>
Inputs:	3 digital or analog.
Digital input receiver:	2 RS422 quadrature inputs
Digital resolution	16bit @ 100Mhz
Digital transducer speed	Max 10 Mbps
Digital accuracy	Depending on transducer resolution
Voltage measure:	<b>W1, W2, W3</b> ± 5 V DC, accuracy ±0,005V DC
Analog min resistance:	100 Ohm.
Analog resolution:	14 bits. Resolution ≈ 0.6mV / Bit
Power output:	+5 VDC 100 mA.

**RESISTANCE MEASUREMENT**

Marked:	<b>Ur, Ir.</b>	
Inputs:	1 analog.	
Outputs:	1 Current generator	200-210 A $\geq$ 4 V DC @ 200ms.
Voltage measure:	<b>Ur</b>	0 - $\pm$ 225 mV DC, Accuracy $< \pm$ 0.2mV DC
Analog resolution:		14 bits. Resolution $\approx$ 0.0275mV / Bit
Current Out	<b>Ir</b>	0 - 240 A DC. Accuracy $< \pm$ 2A DC
Analog resolution:		14 bits. Resolution $\approx$ 15mA / Bit.
Resistance meas.:	<b>Res</b>	0 - 1000 $\mu$ Ohm. Accuracy $< \pm$ 2 $\mu$ ohm.

**COIL INPUTS**

Marked:	<b>Uc, COM.</b>	Not fused, max 300V AC/DC, 32A
Inputs:		1 analog.
Voltage measure:	<b>Uc</b>	Range 0- $\pm$ 300 V DC. Accuracy $< \pm$ 1% or $\pm$ 1V DC Range 0 - 300 V AC. Accuracy $< \pm$ 1% or $\pm$ 1V AC
Analog resolution:		14 bits. Resolution $\approx$ 56mV / Bit.

**COIL OUTPUTS**

Marked:	<b>CLOSE, OPEN, COM.</b>	Supplied from <b>Uc</b>
Outputs:		2 Semiconductor controlled.
Protection:		Short circuit current limit $\geq$ 35A.
Current measure:	<b>Ic</b>	0 - $\pm$ 45A DC. Accuracy $< \pm$ 1% or $\pm$ 0.1A DC 0 - 32A AC. Accuracy $< \pm$ 1% or $\pm$ 0.1A AC
Analog resolution:		14 bits. Resolution $\approx$ 5.7mA / Bit.

**AUXILIARY VOLTAGE INPUTS**

Marked:	<b>Uk, UI, COM.</b>	
Inputs:		2 analog.
Voltage measure:	<b>Uk, UI</b>	Range 0- $\pm$ 300 V DC. Accuracy $< \pm$ 1% or $\pm$ 1V DC Range 0 - 300 V AC. Accuracy $< \pm$ 1% or $\pm$ 1V AC
Analog resolution:		14 bits. Resolution $\approx$ 56mV / Bit.

**MOTOR INPUT**

Marked:	<b>Um, COM.</b>	Not fused, max 300V AC/DC, 32A
Inputs:		1 analog.
Protection:		Internal isolated
Voltage measure:	<b>Um</b>	Range 0- $\pm$ 300 V DC. Accuracy $< \pm$ 1% or $\pm$ 1V DC Range 0 - 300 V AC. Accuracy $< \pm$ 1% or $\pm$ 1V AC
Analog resolution:		14 bits. Resolution $\approx$ 56mV / Bit.

**MOTOR OUTPUT**

Marked:	<b>MOTOR, COM.</b>	Supplied from input <b>Um</b> .
Outputs:		1 constant output
Protection:		Internal isolated.
Current measure:	<b>Im</b>	Not fused, max 300V AC/DC, 32A Range 0- $\pm$ 90A DC. Accuracy $< \pm$ 1% or $\pm$ 0.1 A DC Range 0 - 60A AC. Accuracy $< \pm$ 1% or $\pm$ 0.1 A AC
Analog resolution:		14 bits. Resolution $\approx$ 11.5mA / Bit.



**COMMUNICATION INTERFACE 1**

Marked:	<b>RS-232.</b>
Protection:	Internal isolated
Baud rate	115.2 K baud
Data size	8-bit
Parity	None
Stop bits	1
Flow control	none

**COMMUNICATION INTERFACE 2**

Marked:	<b>USB 1.1 / USB 2.0 full-speed.</b>
Protection:	Internal isolated
Baud rate	115.2 K baud
Data size	8-bit
Parity	None
Stop bits	1
Flow control	none

**DISPLAY**

Type:	LCD Backlit
Characters:	4 rows, 20 characters per row. 5x8 Dots Per Character

**PUSHBUTTONS**

Marked:	<b>CLOSE, OPEN</b>
Close button:	Make a Close operation if breaker is in Open position
Open button:	Make an Open operation if breaker is in Close position
Close + Open button:	Make a Close-Open operation if breaker is in Open position

**INTERNAL SAMPLING**

Max time @ 10 Hz	52428.799	seconds
Max time @ 100 Hz	5242.879	seconds
Max time @ 250 Hz	2097.151	seconds
Max time @ 500 Hz	1048.575	seconds
Max time @ 1000 Hz	524.287	seconds
Max time @ 2500 Hz	209.714	seconds
Max time @ 5000 Hz	104.857	seconds
Max time @ 10000 Hz	52,428	seconds
Max time @ 25000 Hz	20.971	seconds
Max time @ 50000 Hz	10.485	seconds

**DIMENSION AND WEIGHT:**

Dimensions	458*331*153 (With*Height*Depth)
Weight	about 12 kg

**ENVIRONMENT:**

Operating temperature	-20 - 40 °C
Storing temperature	-40 - 40 °C
Transport temperature:	-40 - 40 °C
Relative humidity	20 - 85% non-condensing
Altitude operating	2 000 m
Altitude non-operating	12 000 m

**OVERVOLTAGE CATEGORY:**

II

**MANUFACTURER:**

Elcon AB  
 Hyttrivägen 27  
 770 14 Nyhammar SWEDEN

## 6 MAINTENANCE.

### 6.1 BEFORE USE.

- **Unpacking and handling instructions.**

The transporting case protects the SA10A from being damaged.

The Switch Analyzer is a field-test equipment and is constructed to withstand the handling it requires to fulfil its purposes, although the front panel is sensitive for scratches and other marks. The display is the most sensitive point of the **SA10A**, it will not tolerate harsh management. This should be considered during unpacking and handling of the unit.

- **Charge the battery for at least 10 hours.**

**Note!**

The **SA10A** internal batteries may be need recharging, if it has been stored without charging for some time.

Recharge by connecting the mains power cable for at least 12 hours.

- **Check battery condition.**

By short circuiting the high current cables (2\*10 m, 25 mm<sup>2</sup>) and make a resistance measurement. The measurement current should be >195A.

If the value is lower than 195 A you have to charge the internal battery by connecting the mains input to a wall socket for some hours. Make a new try and check the current value again.

If the value still is lower than 195 A the battery must be replaced.

**Note!** This is important if Resistance measurement shall be done.

### 6.2 AFTER USE.

- Clean the front panel and set the unit to dry.
- Charge battery by connecting the mains input to a wall socket.

### 6.3 STORING THE SA10A.

The **SA10A** should always be stored indoors in a dry place.

The **SA10A** should not be stored in subzero temperatures for a longer period of time.

It should not be stored in extreme environments either.

Storage temperature:       -40 to 40 degrees

Transport temperature:      -40 to 40 degrees

**Note!**











SA10A internal batteries may need recharging if it has been stored for several months.

Recharge by connecting the mains power cable.

### 6.4 EVERY YEAR OR WHEN NECESSARY.

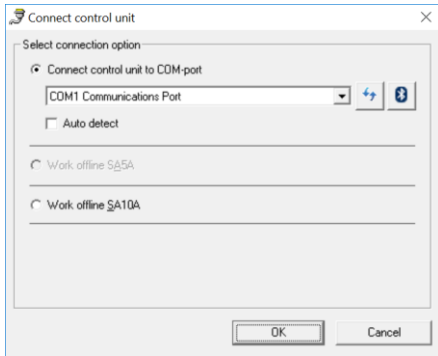
- Check and calibrate the equipment as described in paragraph [7 Adjustments.](#)
- Replace batteries every 5 year. Usually the batteries have a lifespan of about 5-8 years if properly charged.

6.5 BATTERY FUSE

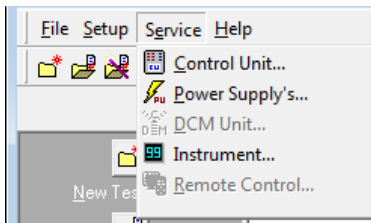
<p><b>IMPORTANT READ THIS FIRST</b></p> <p>Any electrical battery or battery powered device, equipment or vehicle having the potential of dangerous evolution of heat must be prepared for transport so as to prevent:</p> <p><b>(a)</b> a short circuit (e.g. in the case of batteries, by the effective insulation of exposed terminals; or in the case of equipment, by disconnection of the battery and protection of exposed terminals); and</p> <p><b>(b)</b> unintentional activation</p>		
		<p><b>1.</b> To make sure that transport regulations are met, the fuse for the batteries is removed and placed in the accessory box.</p>
		
<p><b>2.</b> Locate the compartment lid.</p>	<p><b>3.</b> Open the compartment lid</p>	<p><b>4.</b> Open the accessory box.</p>
		
<p><b>5.</b> Take out one of the two 25 A aM fuses. (one is spare fuse)</p>	<p><b>6.</b> Locate the battery fuse holder.</p>	<p><b>7.</b> Unscrew the fuse holder cap (turn counterclockwise)</p>
		
<p><b>8.</b> Insert the fuse into the fuse holder cap.</p>	<p><b>9.</b> Insert the fuse with the cap into the fuse holder.</p>	<p><b>10.</b> Screw and tighten the fuse holder. (Turn clockwise)</p>

6.7 UPGRADING SA10A INTERNAL SOFTWARE.

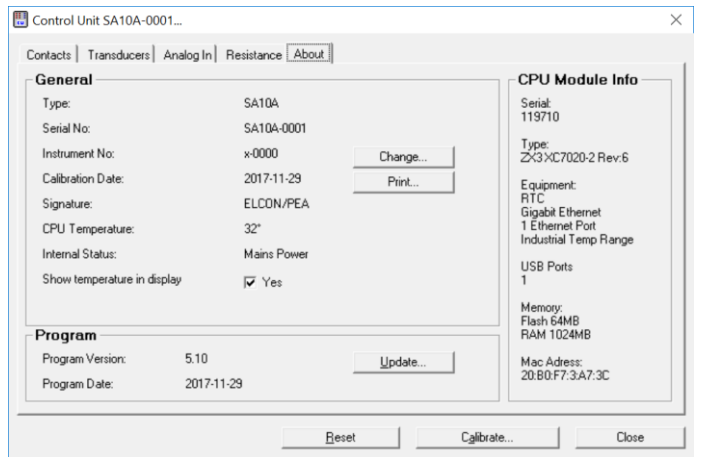
- Run BTS11 setup and install BTS11 software.
- Start BTS11



- Select what comport unit is connected to.
- In menu Service click Control Unit...

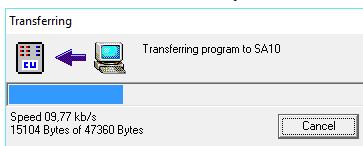


- Select tab **About** and click button **Update...**

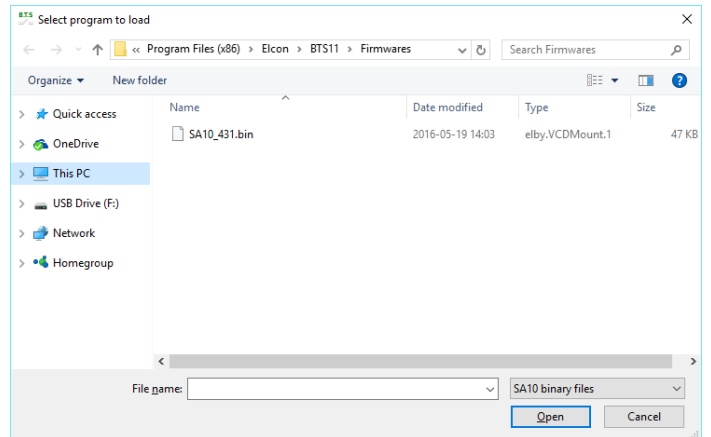
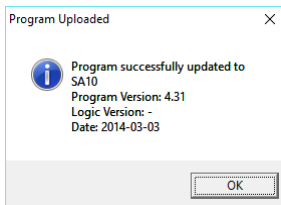


- A dialog will appear to download the software. Select SA10A V5.XX binary files. Select the program. "SA10A\_xxx.bin" Open the file with the command button "Open"

- The new software will now be transferred to the Control unit. This may take a while.



- When finished the following dialog will appear.



## 6.8 SA10A PROGRAM LOADER IN DISPLAY.

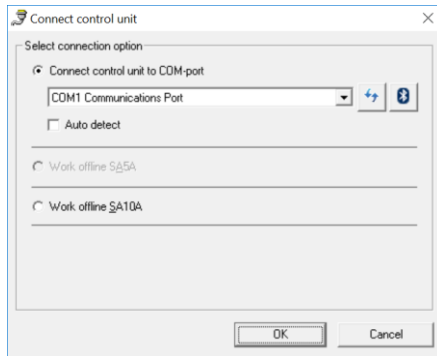
```

PROGRAM LOADER 5.11
2018-03-06
www.elcon.se
CPU = 43° PCB = 30°

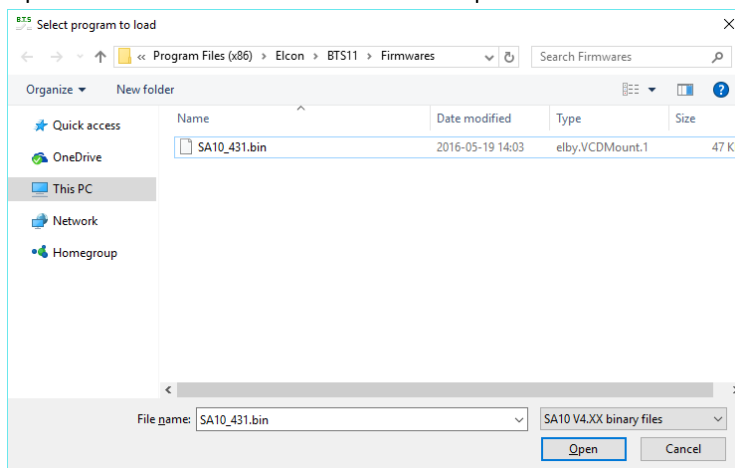
```

When the display shows

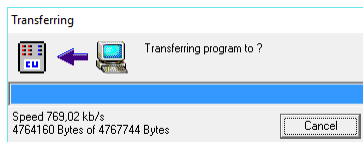
- Something happened to the SA10A that made it lose its program.
- Connect the unit to computer and start BTS11.
- Select what comport unit is connected to.



- A dialog will automatically appear to download the software.  
**IMPORTANT!** Select SA10A V5.XX binary files in the dropdown list.  
Open the file with the command button "Open"



- The new software will now be transferred to the Control unit. This may take a while.



When the display shows the following screen the SA10A is ready to use.

```

Ready for Close 31°
Uc 0 V= Uk 0 V=
Ul 0 V= Um 0 V=
Im 0.0 A=

```

## 7 ADJUSTMENTS.

### 7.1 GENERAL.

The calibration of **SA10A** is done with the software **BTS11**. Refer to **User manual** for operating instructions. All analogue inputs on the **SA10A** are software calibrated. Calibration can easily be done from a calibration guide. All calibration constants and password for changing constants are saved in the **SA10A**.

**Note!** Password at delivery is "elcon"

Principle of calibration. Two points are measured at approximately 10% and 90% of full scale for selected input. The values are measured with both the **SA10A** and a connected reference instrument. With the equation for the straight line, new calibration constants are then calculated.

#### Inputs that shall be calibrated

Coil voltage	<b>U<sub>c</sub></b>
Coil current	<b>I<sub>c</sub></b>
Motor voltage	<b>U<sub>m</sub></b>
Motor current	<b>I<sub>m</sub></b>
Voltage input	<b>U<sub>k</sub>, U<sub>l</sub></b>
Analog transducers	<b>T1, T2, T3</b>
Voltage for resistance	<b>U<sub>r</sub></b>
Current for resistance	<b>I<sub>r</sub></b>

See [5. Technical Specification](#) for input range and accuracy.

---

#### 7.1.1 INSTRUMENT NEEDED.

Stable DC-voltage source 1:	±0-250 V DC	(used for calibration of motor and coil voltage)
Stable DC-voltage source 2:	0 -5 V DC	(used for calibration of transducers analog input)
Stable DC-voltage source 3:	0-200 mV DC	(used for calibration of voltage measurement)
Stable DC-current source:	0-10 A (min)	(used for calibration of motor and coil current)
Calibrated voltage instrument:	0 -300 VDC	accuracy ± 0.2%
Calibrated current instrument:	0 -10 A (min)	accuracy ± 0.2%
Calibrated current shunt:	100 -500 µohm	accuracy 0.5% or better
Computer:	With the software BTS11 installed.	

## 7.2 CALIBRATION AND FUNCTIONAL TEST.

Calibration and functional test is done from the **control unit window** in **BTS11**

To open this window in **BTS11**.

Click function **Control unit** from the menu **Service**.

Select tab **Analog In**.

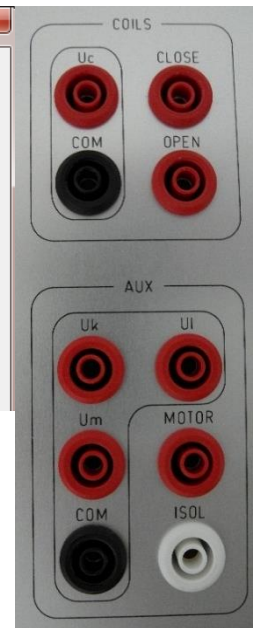
### 7.2.1 CHECK VOLTAGE MEASUREMENT INPUTS UC, UK, UI, UM.

Connect a stable power supply of 200 V DC in parallel to a calibrated reference voltmeter. Described as (Ref.)

To verify positive measurement connect.
DC Supply + → <b>Uc, Uk, UI, Um, +V</b> (Ref.).
DC Supply - → <b>COM (COILS), COM (AUX), COM</b> (Ref.).
To verify negative measurement connect.
DC Supply - → <b>Uc, Uk, UI, Um, +V</b> (Ref.).
DC Supply + → <b>COM (COILS), COM (AUX), COM</b> (Ref.).



Verify in BTS11 that each input is within the specification below.



Voltage measure: Range 0-±300 V DC. Accuracy < ±1% or ± 1V DC  
Range 0 - 250 V AC. Accuracy < ±2% or ± 2V AC

Analog resolution: 12 bits. Resolution about 0.225V DC / Bit.

If the values are near the limit of accuracy, calibration is necessary. See.

[7.3.1 Calibration wizard for voltage measurement inputs Uc, Uk, UI, Um.](#)

### 7.2.2 CHECK CURRENT MEASUREMENT INPUTS **Ic**, **Im**.

Connect a stable DC-current source minimum 10A in series with a calibrated ampere meter.

**Note!** To not blow fuse in instrument use max 10 Volts out on current source.

Check of **Ic** (Coil current)

To verify positive measurement connect.	To verify negative measurement connect.
DC Supply + → <b>Uc</b> . <b>CLOSE, OPEN</b> → <b>+Amp</b> (Ref.). <b>COM</b> (Ref.) → DC Supply -	DC Supply - → <b>Uc</b> . <b>CLOSE, OPEN</b> → <b>+Amp</b> (Ref.). <b>COM</b> (Ref.) → DC Supply +

**Note!** To check **Ic** current measurement, you need to activate the trig output.

Follow the calibration guide to Step 3 to verify the current.

See section [7.3.2 Calibration wizard for current measurement inputs \*\*Ic\*\*, \*\*Im\*\*](#).

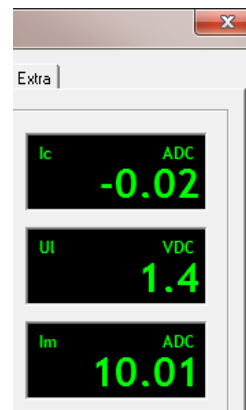
Verify in BTS11 that the input is within the specification below.

Current measure:      0-±32 A DC. Accuracy < ±1% or ± 0.1 A DC  
                                 0 - 32 A AC. Accuracy < ±2% or ± 0.2 A AC

Analog resolution:      12 bits. Resolution about 0.023A DC / Bit.

If the values are near the limit of accuracy, calibration is necessary. See.

[7.3.2 Calibration wizard for current measurement inputs \*\*Ic\*\*, \*\*Im\*\*](#).



Check of **Im** (Motor Current)

To verify positive measurement connect.	To verify negative measurement connect.
DC Supply + → <b>Um</b> . <b>MOTOR</b> → <b>+Amp</b> (Ref.). <b>COM</b> (Ref.) → DC Supply -	DC Supply - → <b>Um</b> . <b>MOTOR</b> → <b>+Amp</b> (Ref.). <b>COM</b> (Ref.) → DC Supply +

Verify in BTS11 that the input is within the specification below.

Current measure:      Range 0-±32 A DC. Accuracy < ±1% or ± 0.1 A DC  
                                 Range 0 - 32 A AC. Accuracy < ±2% or ± 0.2 A AC

Analog resolution:      12 bits. Resolution about 0.048A DC / Bit.

If the values are near the limit of accuracy, calibration is necessary. See.

[7.3.2 Calibration wizard for current measurement inputs \*\*Ic\*\*, \*\*Im\*\*](#).



### 7.2.3 CHECK TRANSDUCER INPUTS T1, T2, T3.

Measure voltage between pin + **5** and - **6** is 5Volt

**5** +5 VDC  $\pm 5\%$   
**6** Ground

Connect power supply 0-5 V DC parallel to reference instrument.

+ To pin **7** Analogue measurement  
- To pin **6** Ground

Verify in BTS11 that each input is within the specification.

Analog measurement: 0 – 5 V DC, accuracy  $\pm 0,005V$  DC

Analog resolution: 12 bits. Resolution about 0.0014V DC / Bit

If not values are in range, recalibration is required. See section.

[7.3.3 Calibration wizard for analogue transducer inputs T1, T2, T3.](#)

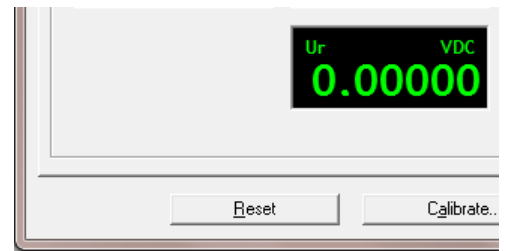


7.2.4 CHECK RESISTANCE MEASURING INPUTS UR, IR.

Check of **Ur** (Voltage measuring for resistance).

Connect a stable dc power supply of 0.2 V DC parallel to a calibrated reference voltmeter, described as (Ref.)

To verify positive measurement connect.
DC Supply + → <b>Res+</b> , <b>+V</b> (Ref.).
DC Supply - → <b>Res-</b> , <b>COM</b> (Ref.).
To verify negative measurement connect.
DC Supply - → <b>Res+</b> , <b>+V</b> (Ref.).
DC Supply + → <b>Res-</b> , <b>COM</b> (Ref.).



Verify in BTS11 that the input is within the specification.

Voltage measure: **Ur** 0 - ±225 mV DC, Accuracy < ±0.0002V DC

Analog resolution: 12 bits. Resolution about 0.000111V DC / Bit

Check of **Ir** (Current measuring for resistance).

Connect a calibrated current shunt 100 -500 µohm, accuracy 1% to

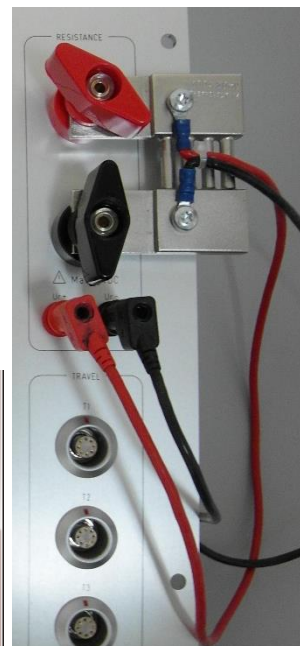
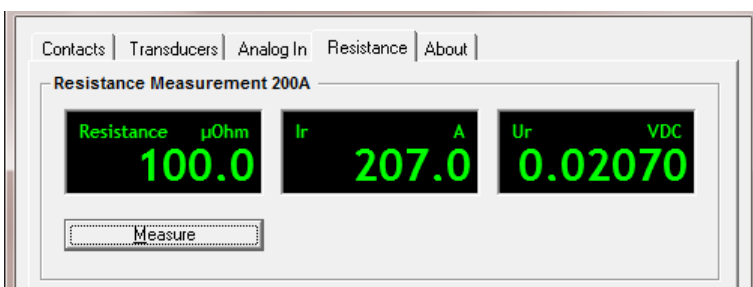
To verify positive measurement connect.	To verify negative measurement connect.
Current shunt + → <b>Res+</b>	Current shunt - → <b>Res+</b>
Current shunt - → <b>Res-</b>	Current shunt + → <b>Res-</b>

Verify in BTS11 that the input is within the specification.

Current measure **Ir** 0 - 240 A DC. Accuracy < ± 2A DC

Analog resolution: 12 bits. Resolution about 0.07A DC / Bit.

Resistance measure: **Res** 0 - 1000 µohm. Accuracy < ± 2µohm.



## 7.2.5 GROUNDING.



Resistance between from power inlet ground pin to Ground spade terminal  $< 0.5\Omega$



Resistance between from power inlet ground pin to 200A + spade terminal  $< 0.5\Omega$



Resistance between power inlet ground pin to D-Sub shield RS232  $< 0.5\Omega$

## 7.2.6 CHECK MAIN CONTACT INPUTS.

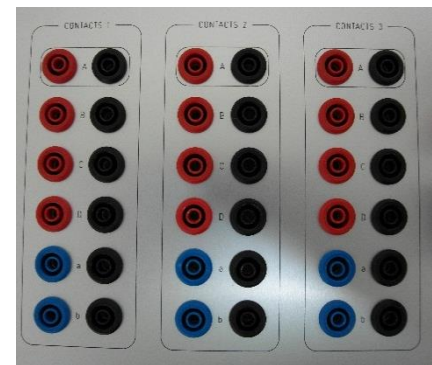
**1A,1B,1C,1D,2A,2B,2C,2D,3A,3B,3C,3D.**

Connect ampere meter + to Red banana jack on contact.

Connect ampere meter - to Black banana jack on contact.

Test current for all main contacts should be 25 - 35mA.

Indication in service menu for each contact should be seen.

7.2.7 CHECK AUXILIARY CONTACT INPUTS. **1A, 1B, 2A, 2B, 3A, 3B.**

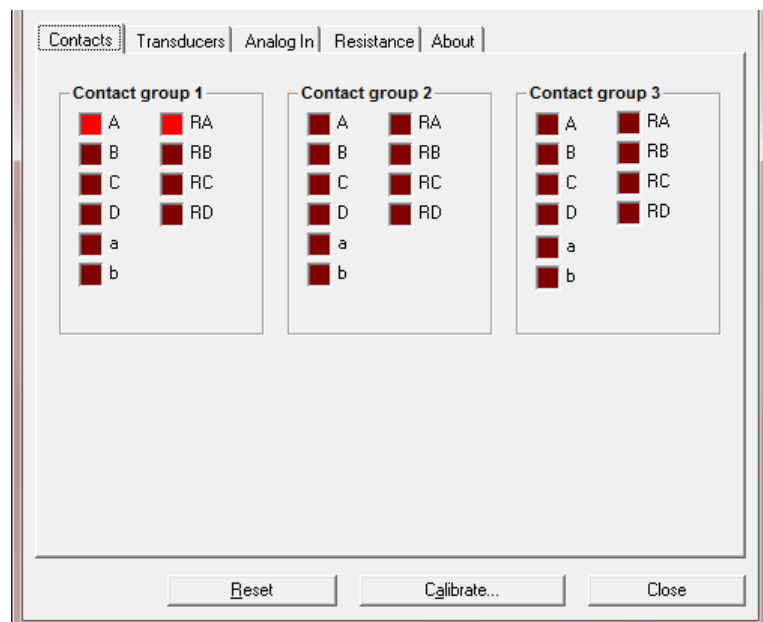
Connect ampere meter + to Blue banana jack on contact.

Connect ampere meter - to Black banana jack on contact.

Test current for all auxiliary contacts should be 8 - 12mA.

Indication in service menu for each contact should be seen.

To open this window in **BTS11**.



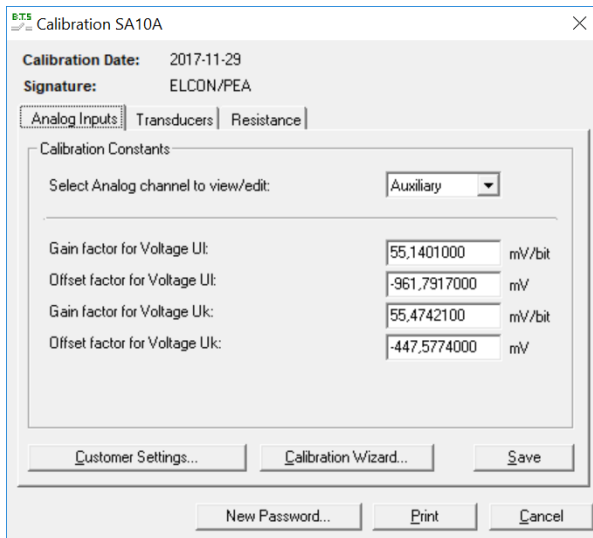
Click function **Control unit** from the menu **Service**.

Select tab **Contacts**.

### 7.3 RECALIBRATION PROCEDURE.

- Click function "Control unit" from the menu "Service"
- Click command button "Calibrate"

The following window is displayed:



Note!

Typing new values in the text boxes to change the calibration constants is not recommended!

Use the command button **Calibration wizard** instead.

The dialogue box has three tabs for different types of inputs.

The calibration constants for selected inputs are displayed.

For tab **Analog Inputs** the inputs is selected from a dropdown list box.

#### Command buttons

- |                            |  |
|----------------------------|--|
| <b>New Password.</b>       | Change of current password (The password is saved in SA10A).   |
| <b>Customer settings.</b>  | With this button you can change the instrument number assigned to the unit. The instrument number is printed with the calibration. |
| <b>Calibration wizard.</b> | Start a calibration guide for selected inputs.   |
| <b>Print.</b>              | Printout all calibration constants for SA10A on a connected printer.   |
| <b>Save.</b>               | Saves all calibration constants to SA10A.  |
| <b>Cancel.</b>             | Close the dialog box.  |

The calibration procedure is almost the same for all inputs.

- Select tab for inputs to calibrate
- Click the command button **Calibration wizard...** to starting the calibration guide.
- Follow the instructions for each dialogue box in the wizard.

#### **Tab Analog Inputs**

[7.3.1 Calibration wizard for voltage measurement inputs U<sub>c</sub>, U<sub>k</sub>, U<sub>l</sub>, U<sub>m</sub>.](#)

[7.3.2 Calibration wizard for current measurement inputs I<sub>c</sub>, I<sub>m</sub>.](#)

#### **Tab Transducers**

[7.3.3 Calibration wizard for analogue transducer inputs T1, T2, T3.](#)

#### **Tab Resistance**

[7.3.4 Calibration of resistance measurement input U<sub>r</sub>.](#)

[7.3.5 Calibration of resistance measurement input I<sub>r</sub>.](#)

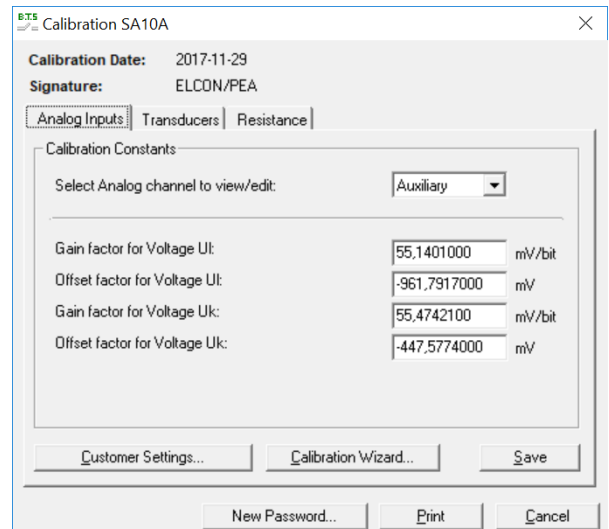
7.3.1 Calibration wizard for voltage measurement inputs **Uc, Uk, Ul, Um**.

To open window **Calibration SA10A** see [7.3 Recalibration procedure](#).

Select tab **Analog inputs** in the window **Calibration SA10A**.

Click on button **Calibration wizard**.

The following window is displayed.

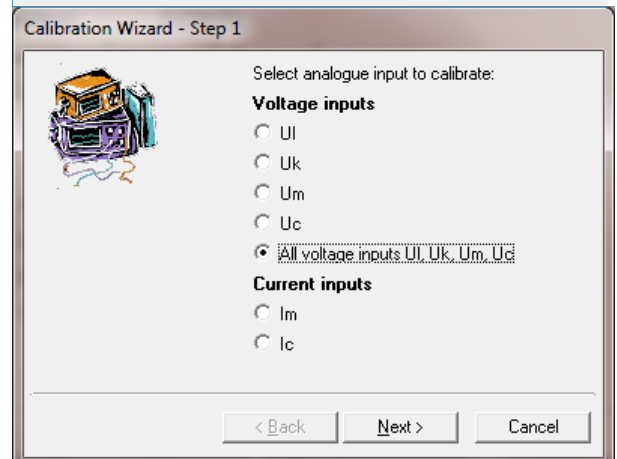


- Calibration wizard. Step 1.

Select a single analogue input or all analogue inputs to calibrate with the option buttons

If all voltage channels shall be calibrate at the same time the same voltage source must be connected to all selected voltage inputs

Press the command button "Next".



- Calibration wizard. Step 2

Connect a stable DC-voltage source and a voltage instrument to the selected inputs.

For more information about connections see.

[7.2.1 Check voltage measurement inputs Uc, Uk, Ul, Um.](#)

Click the command button. **Next**.



- **Calibration wizard. Step 3**

**Note!**

The instrument box shows the voltage value from selected channel measured by the control unit **SA10A**

Set the voltage source to about -200 V.

Enter the value (V) from the reference instrument.

Click the command button. **Next**.

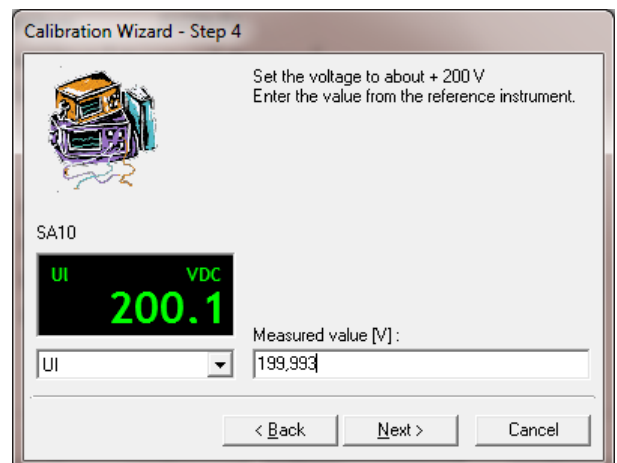


- **Calibration wizard. Step 4**

Set the voltage source to about +200 V.

Enter the value in **Volt** from the reference instrument.

Press the command button. **Next**.



- **Calibration wizard. Step 5**

New calibration constants are now calculated

Click button **Save** to save the new calculated calibration constants.

Select button "Cancel" to cancel the guide without updating the calibration constant.

- **Calibration wizard. Step 6.**

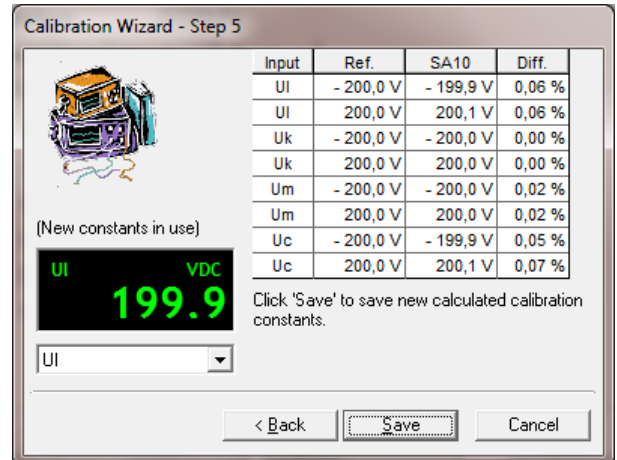
Enter password and calibration signature.

See [7.3.6 Enter Password](#).

- **Calibration wizard. Step 7.**

Check that the measured value compared to the reference instrument is within the accuracy for the input. If not Click **Re-calibrate** button.

If correct click **Cancel** button to exit Calibration Wizard.



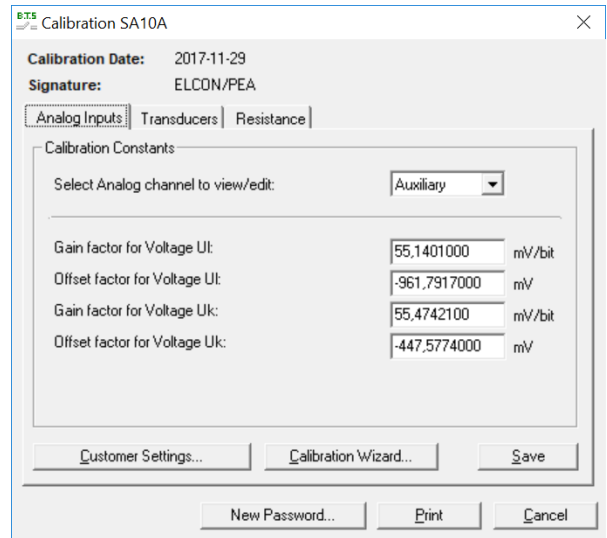
7.3.2 CALIBRATION WIZARD FOR CURRENT MEASUREMENT INPUTS **IC**, **IM**.

To open window **Calibration SA10A** see [7.3 Recalibration procedure](#).

Click tab **Analogue Inputs** in window **Calibration SA10A**.

Click on button **Calibration wizard**.

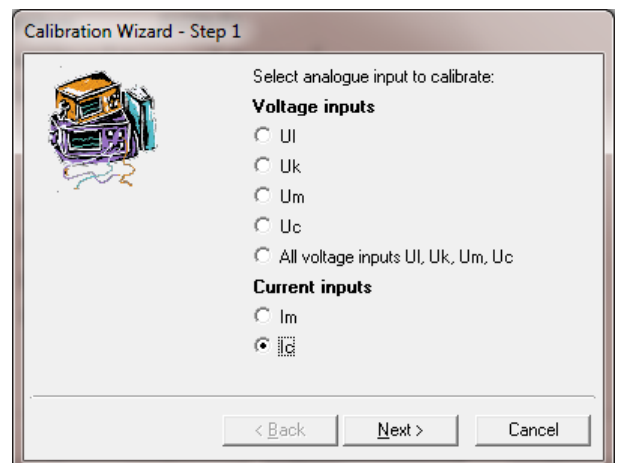
The following window is displayed.



- **Calibration wizard. Step 1.**

Select current input to calibrate with the option button.

Click the command button. **Next**.

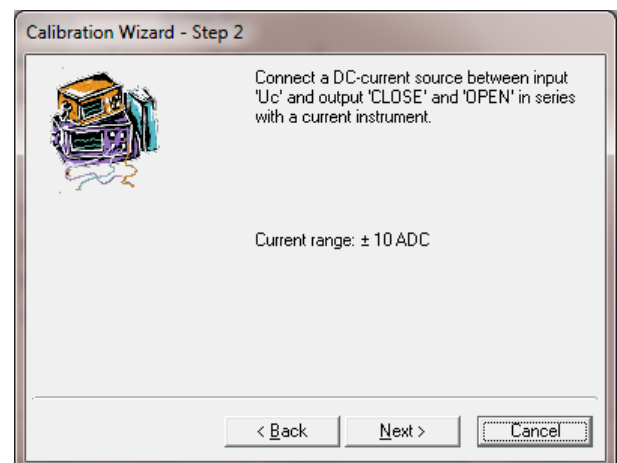


- **Calibration wizard. Step 2.**

Connect a DC-current source to input **Uc** and to outputs **CLOSE** and **OPEN** in series with a current instrument.

For more information about connections see.  
[7.2.2 Check current measurement inputs Ic, Im.](#)

Click the command button. **Next**.

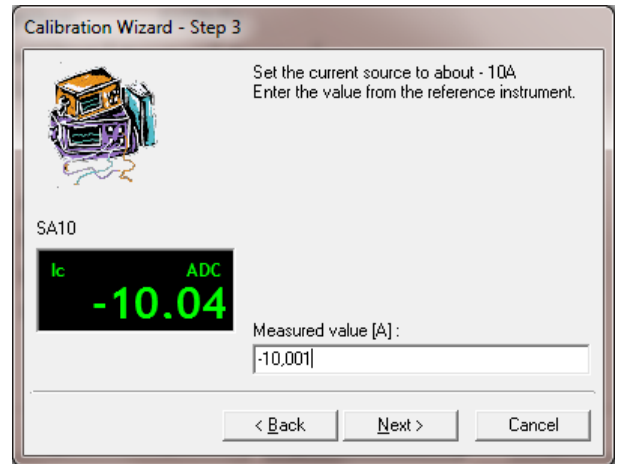


- **Calibration wizard. Step 3.**

Set the current source to about -10A.

Enter the value (A) from the reference instrument.

Click the command button. **Next.**

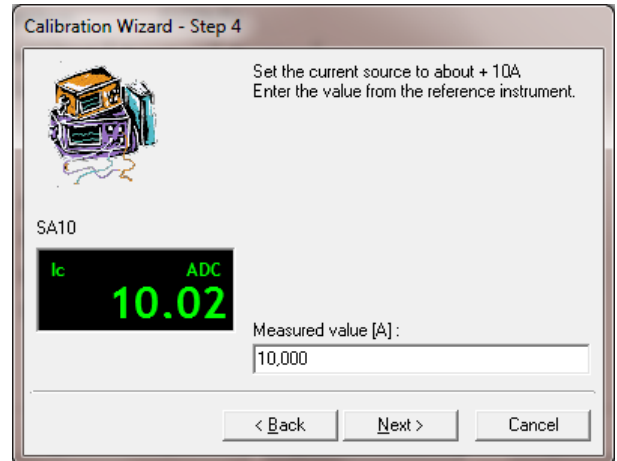


- **Calibration wizard. Step 4.**

Set the current source to about +10A.

Enter the value (Ampere) from the reference instrument in the measured value box.

Click the command button. **Next.**



- **Calibration wizard. Step 5.**

New calibration constants are now calculated  
Click button **Save** to save the new calculated calibration constants.

Click button **Cancel** to cancel the guide without updating the calibration constant.

- **Calibration wizard. Step 6.**

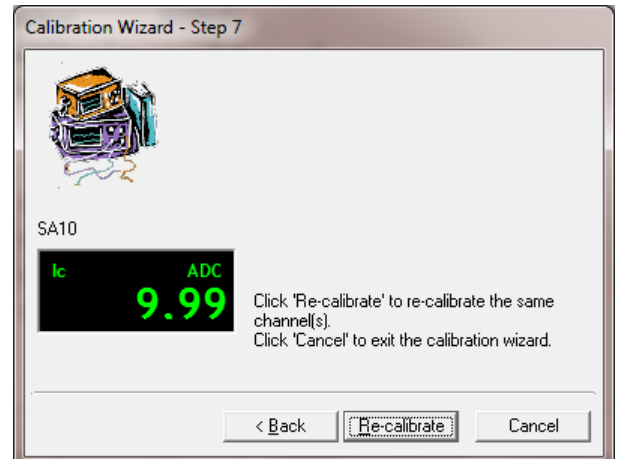
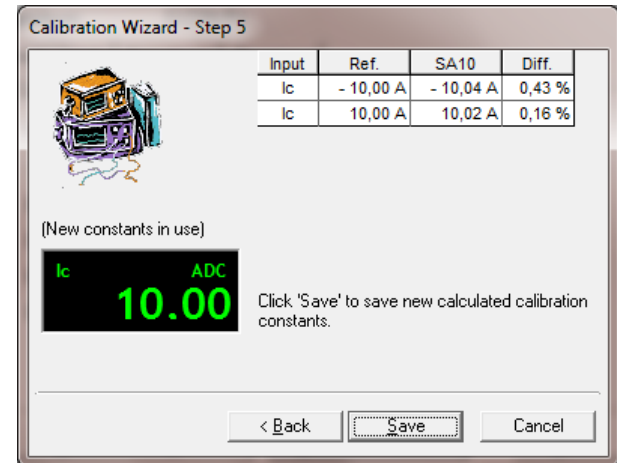
Enter password and calibration signature.

See [7.3.6 Enter Password.](#)

- **Calibration wizard. Step 7.**

Check that the measured value compared to the reference instrument is within the accuracy for the input. If not Click **Re-calibrate** button.

If correct click **Cancel** button to exit Calibration Wizard.





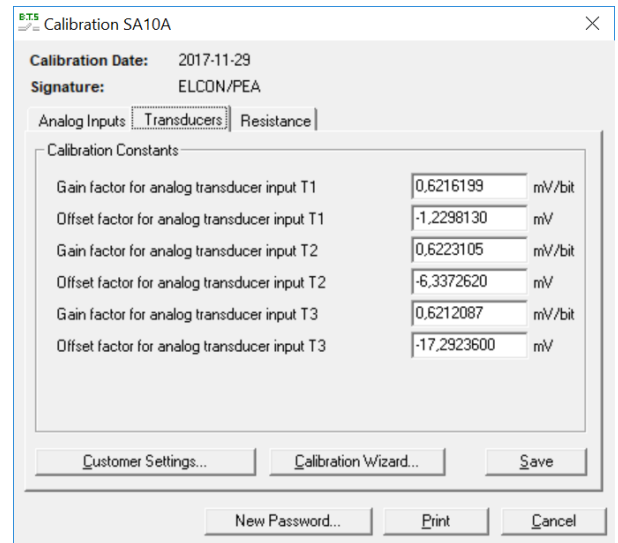
## 7.3.3 CALIBRATION WIZARD FOR ANALOGUE TRANSDUCER INPUTS T1, T2, T3.

To open window **Calibration SA10A** see [7.3 Recalibration procedure](#).

Click tab **Transducers** in window **Calibration SA10A**.

Click on button **Calibration wizard**.

The following window is displayed.

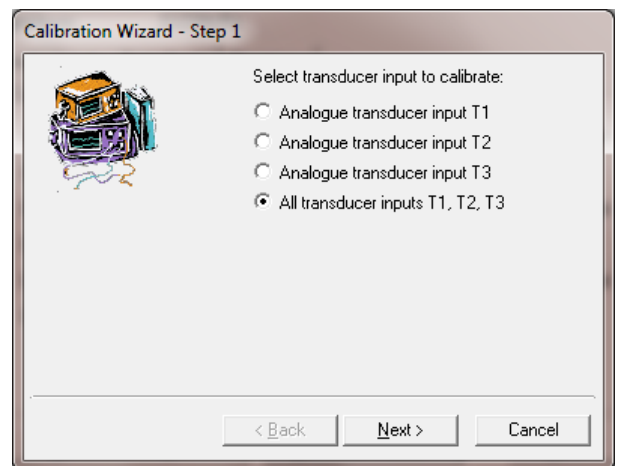


- **Calibration wizard. Step 1**

Select a single transducer input or all transducer inputs to calibrate with the option buttons.

If all transducer inputs shall be calibrate at the same time the same voltage source must be connected to all transducer inputs.

Click the command button. **Next**.



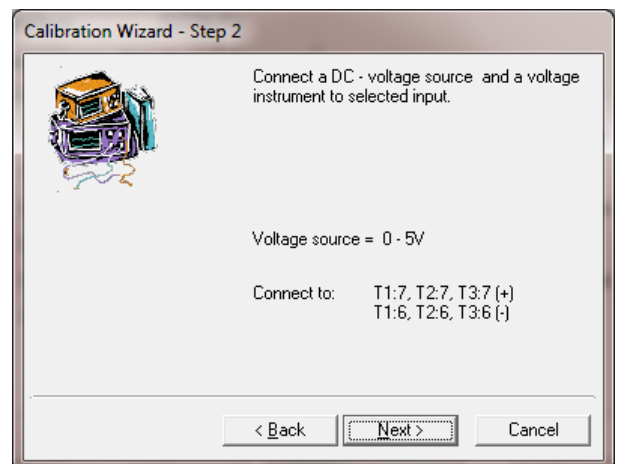
- **Calibration wizard. Step 2.**

Connect a stable DC-voltage source (0-5V) and a voltage instrument to the selected input.

For more information about connections see.

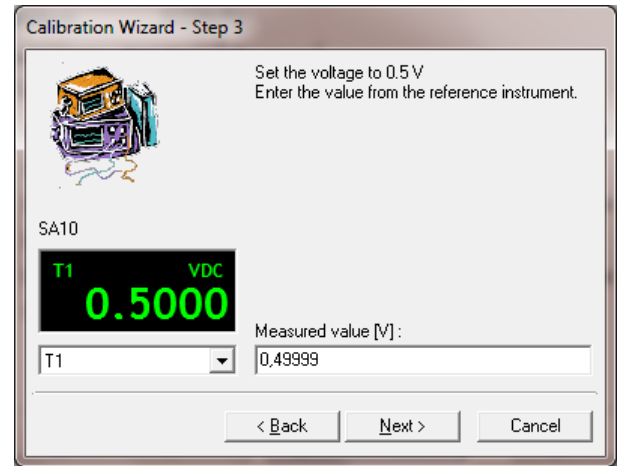
[7.2.3 Check transducer inputs T1, T2, T3.](#)

Click the command button. **Next**.



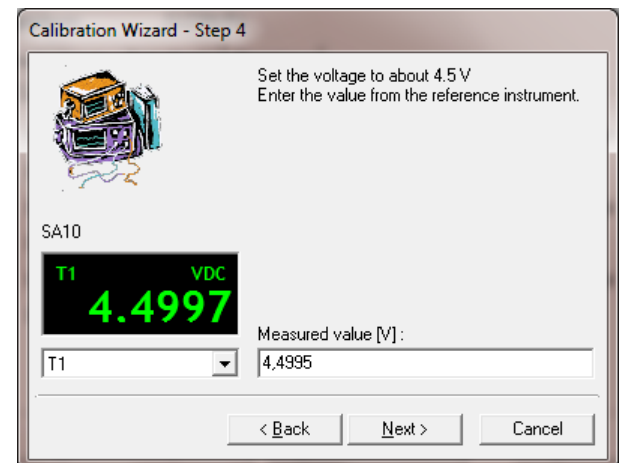
- **Calibration wizard. Step 3.**  
Set the voltage source to about 0.5 V.  
Enter the value in Volt from the reference instrument.

Click the command button. **Next**.



- **Calibration wizard. Step 4.**  
Set the voltage source to about 4.5 V  
Enter the value (mV) from the reference instrument.

Click the command button. **Next**.



- **Calibration wizard. Step 5.**  
New calibration constants are now calculated

Click button **Save** to save the new calculated calibration constants.

Click button **Cancel** to cancel the guide without updating the calibration constant.

- **Calibration wizard. Step 6.**

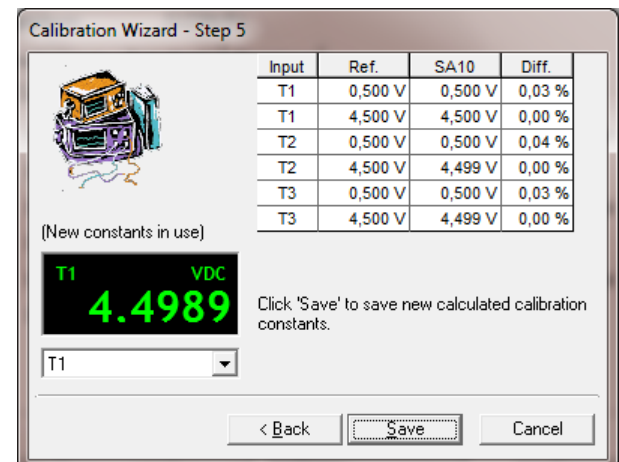
Enter password and calibration signature.

See [7.3.6 Enter Password](#).

- **Calibration wizard. Step 7.**

Check that the measured value compared to the reference instrument is within the accuracy for the input. If not Click **Re-calibrate** button.

If correct click **Cancel** button to exit Calibration Wizard.



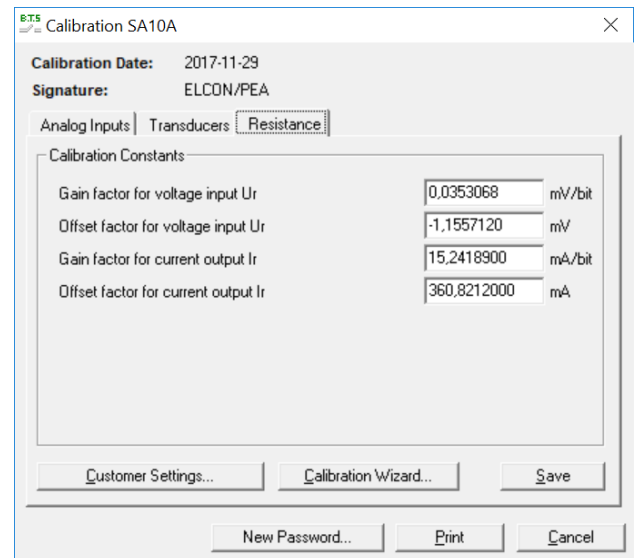
7.3.4 CALIBRATION OF RESISTANCE MEASUREMENT INPUT **Ur**.

To open window **Calibration SA10A** see [7.3 Recalibration procedure](#).

Click tab **Resistance** in window **Calibration SA10A**.

Click on button **Calibration wizard**.

The following window is displayed.



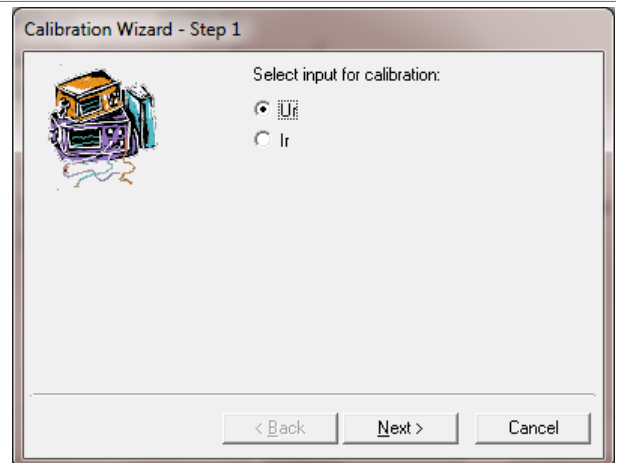
- **Calibration wizard. Step 1.**

Calibration of voltage input **Ur**.

### Important!

Calibration of input **Ur** must be done **before** the calibration of the current measuring **Ir**.

This input is used as a reference instrument when the current **Ir** is calibrated.

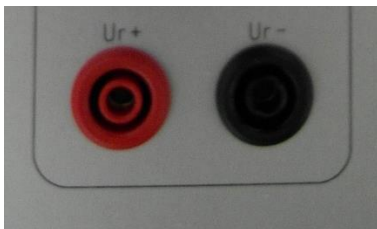


- **Calibration wizard. Step 2.**

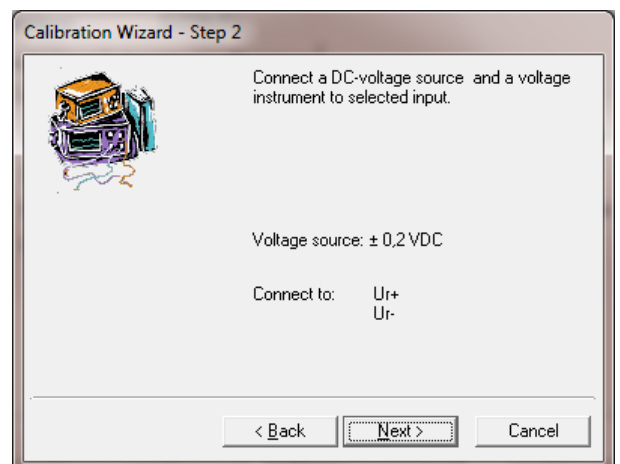
Connect a stable DC-voltage source (-0.2000 - +0.2000V) parallel with and a voltage instrument to the selected input.

For more information about connection see.

[7.2.4 Check resistance measuring inputs \*\*Ur\*\*, \*\*Ir\*\*](#).



Click the command button. **Next**.

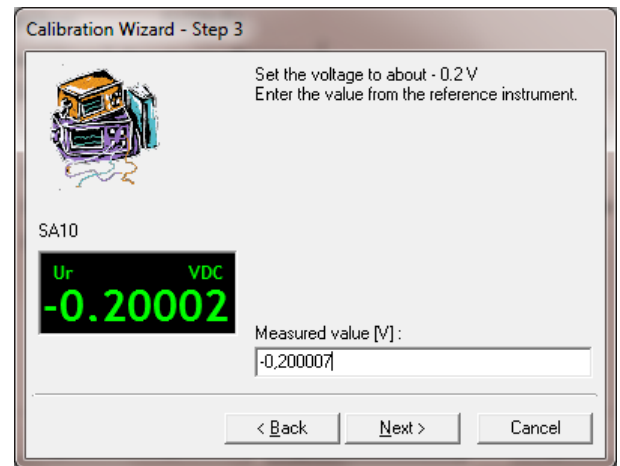


- **Calibration wizard. Step 3.**

Set the voltage source to about -0.2 V.

Enter the value in Volt from the reference instrument.

Click the command button. **Next**.

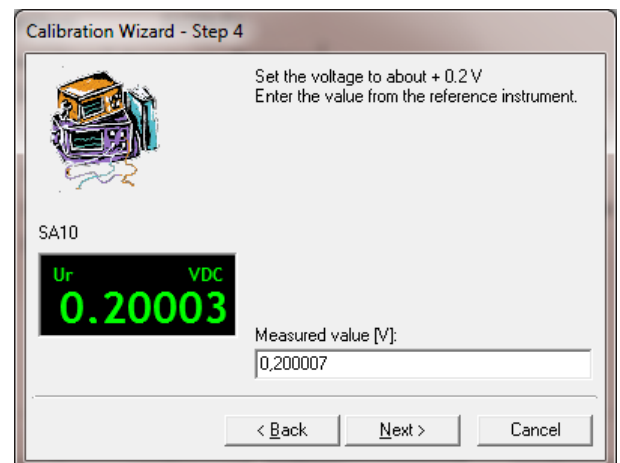


- **Calibration wizard. Step 4.**

Set the voltage source to about +0.2 V.

Enter the value in Volt from the reference instrument.

Click the command button. **Next**.



- **Calibration wizard. Step 5.**

New calibration constants are now calculated

Click button **Save** to save the new calculated calibration constants.

Click button **Cancel** to cancel the guide without updating the calibration constant.

- **Calibration wizard. Step 6.**

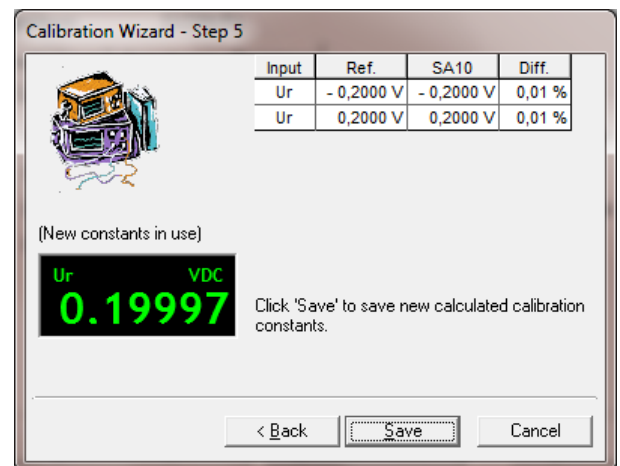
Enter password and calibration signature.

See [7.3.6 Enter Password](#).

- **Calibration wizard. Step 7.**

Check that the measured value compared to the reference instrument is within the accuracy for the input. If not Click **Re-calibrate** button.

If correct click **Cancel** button to exit Calibration Wizard.



### 7.3.5 CALIBRATION OF RESISTANCE MEASUREMENT INPUT IR.

Calibration of the current for resistance measurement is done by using the input **Ur** as a voltage reference instrument and a current shunt as a reference resistor.

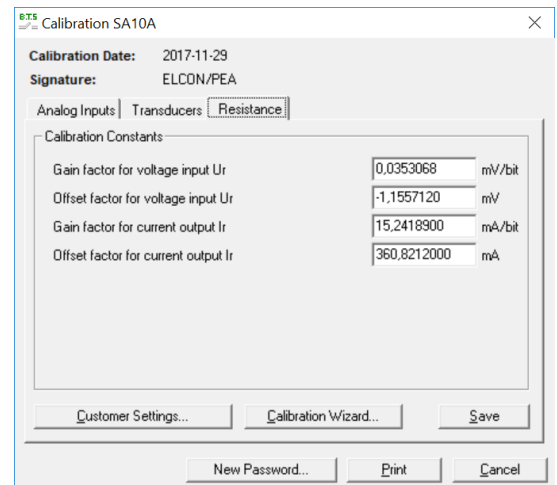
To open window **Calibration SA10A** see [7.3 Recalibration procedure](#).

Click tab Resistance in window Calibration SA10A.

Click command button

**Calibration wizard.**

The following dialogue box is displayed.



- **Calibration wizard. Step 1.**

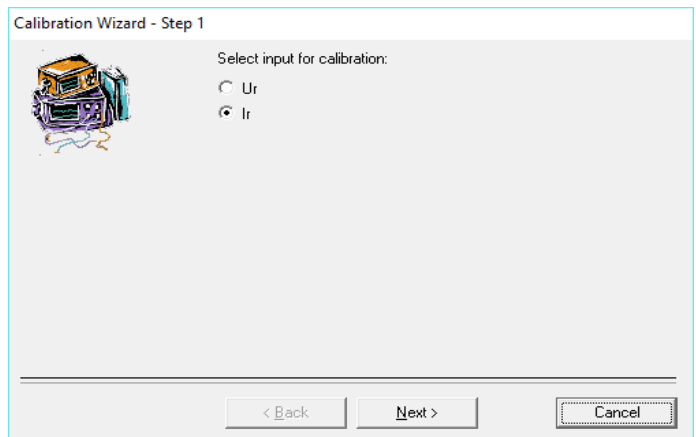
Select input "Ir" for calibration of source current at resistance measurement.

**Note!**

Calibration of voltage measuring input **Ur** must be done **before** the calibration of the current measuring **Ir**.

Input **Ur** is used as a reference instrument when the current **Ir** is calibrated.

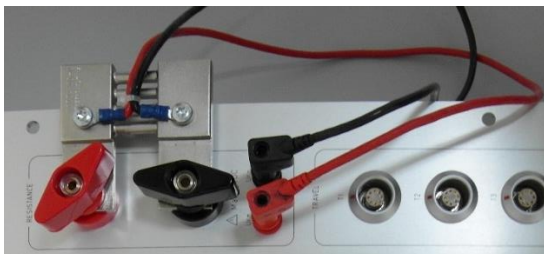
Click the command button. **Next.**



- **Calibration wizard. Step 2.**

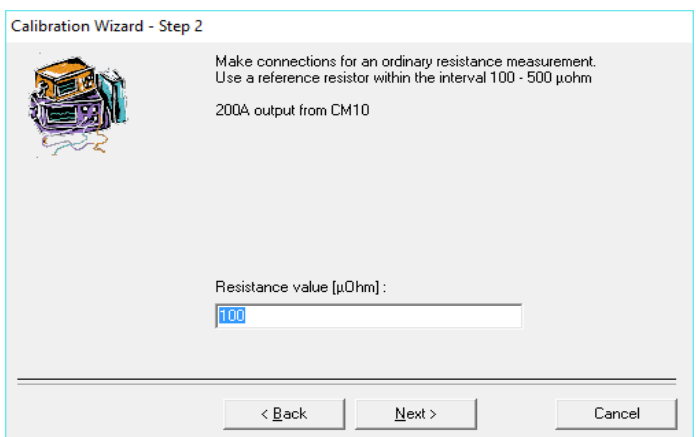
Connect a reference resistance shunt with value 100 - 500  $\mu\text{ohm}$  to the **Ir 200A** current output on the SA10A.

Connect the voltage measurement cables to input **Ur**.



For more information about connections see.

[6.2.4 Check resistance measuring inputs Ur, Ir.](#)



The measurement shall be done with the "4-terminal" principal.

Click the command button. **Next** to execute a measurement.

- **Calibration wizard. Step 5.**

New calibration constant is now calculated

Click button **Save** to save the new calculated calibration constants.

Click button **Cancel** to cancel the guide without updating the calibration constant.

- **Calibration wizard. Step 6.**

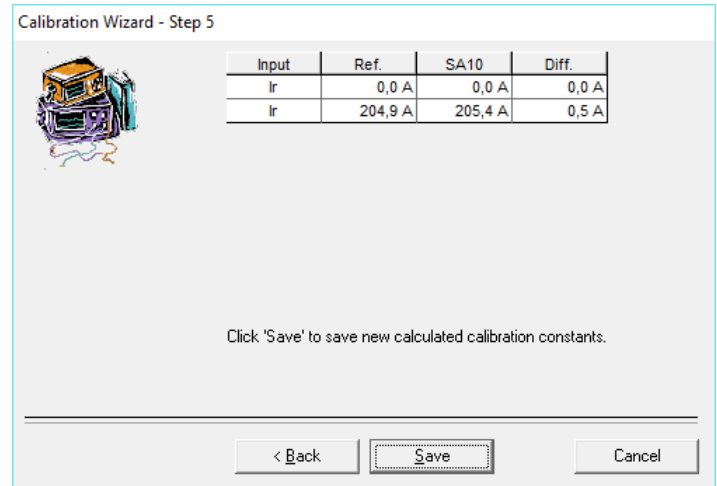
Enter password and calibration signature.

See [7.3.6 Enter Password.](#)

- **Calibration wizard. Step 7.**

Check that the measured value compared to the reference instrument is within the accuracy for the input. If not Click **Re-calibrate** button.

If correct click **Cancel** button to exit Calibration Wizard.



### 7.3.6 ENTER PASSWORD.

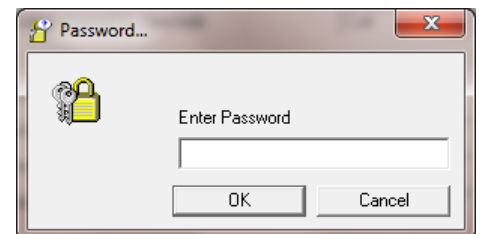
When saving for the first time a dialog will appear to enter password.

Default password from factory is **elcon**

Note!

This dialog will only appear once.

BTS11 will keep the password in memory.



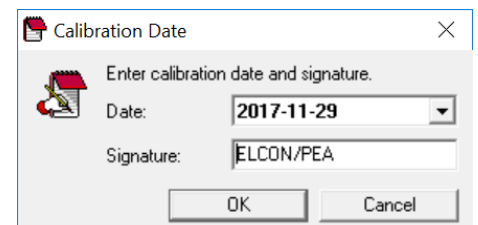
After successful have entered the password.

This dialog appears.

Date: Today's date is displayed.

Signature: Enter the Company/Your signature.

Click **OK** to save calibration or **Cancel** to abort.



## 8 TRANSPORTATION/SCRAPPING/RECYCLING.

Before transportation remove all cables from the SA10A unit when moving/transportation the equipment. Put the **SA10A** and the cables in intended locations in a transporting case (can be ordered from ELCON AB)

Scrapping/Recycling of replaced components shall be done according to local rules and laws.

**Note:** The **SA10A** contains a **Lead-acid battery** that must be take care off according to local rules and laws.

## 9 SA10A ACCESSORIES.

All accessories can be ordered directly from **ELCON AB**

Contact us and give us the below information depending on which spare part you are interested in.

Item /Description	Order Number
SA10A Unit	S02
Black insulated clips	S102-B
Red insulated clips	S102-R
Black jumper cable	S104
Accessories kit including the following 1 x Accessories box 4 x black insulated clips 4 x red insulated clips 4 x black jumpers 3 x Test peg XRKA black 8 x Test peg XRKA red 2 x Fuses 3,15AT	S107-A
Digital transducer RSI503 2500 pulses	S108-B
Analogue transducer TLH150	S109
Analogue transducer TLH225	S110

Transporting case with wheels	S113
Shunt 100 $\mu\Omega$ $\pm$ 0.5% for 200A Calibration.	S115
Cable for Mains (2.0m)	S201
RS232 Communication cable, SA10-PC (2.0m)	S202
USB Mini to USB cable (1m)	S202-H
USB to RS232 converter	S202-E
Cables for Motor (5m)	S203
Cables for Coils (5m)	S204
Cable for digital transducer (10m).	S205
Cable for analogue transducer (10m).	S206
Current cables for resistance measurement (10m)	S207
Cable for Main Contacts (16m)	S208-A
Grounding cable	S210
25A Spare battery fuse	S107-5
SA10A/BTS11 Basic training 2 days	S701
SA10A/BTS11 Advanced training 1 day	S702

For orders regarding different transducers as well as transducer cables, please contact **ELCON AB** for the solution that fits your needs.

E-Mail: [info@elcon.se](mailto:info@elcon.se)  
 Phone: +46(0)240-641120  
 Fax: +46(0)240-641319

## 10 CE-DECLARATION.

**Declaration of conformity**  
According to the  
EMC Directive 2004/108/EC  
Low Voltage Directive 2006/95/EC

Type of equipment

Test equipment for test of HV-circuit breakers in field

Brand name or trade mark

Switch Analyzer SA10A

Type designation(s)/Model no(s)

SA10A

Manufacturer's name, address, telephone & fax no

Elcon AB

Hyttrisvägen 27

SE-770 14 Nyhammar, SWEDEN

Tel: +46 240 641110, Fax +46 240 13 19

The following standards and/or technical specifications, which comply with good engineering practice in safety matters in force within the EEA, have been applied:

**Standard EMC**

EN 61326-1:2013

EN 61000-6-2:2005

EN 61000-6-4:2007+A1

FCC Part 15 Subpart B

**Standard LVD**

EN 61010-1:2010

Overvoltage category II

Pollution degree II

We assure that relevant technical documentation (TCF) has been established and can be made available by: Lars-Göran Eriksson, Product manager

Additional information

The product is CE-marked in 2018

As manufacturer/ the manufacturer's authorized representative established within EEA, we declare under our sole responsibility that the equipment follows the provisions of the Directives stated above

Date and place of issue  
person

Nyhammar 2018-01-10

Signature of authorized



Name & Position

Peter Johansson, Chairman



