EGIL

Circuit Breaker Analyzer

User's Manual

Megger

WWW.MEGGER.COM

Art No. ZP-BM01E	Doc. BM0087OE	V04a	2015

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CE

Contents

1 Safety

1.1 General

IMPORTANT

Read the manual and comply with the following instructions before using EGIL.

Always comply with local safety regulations.

Symbols on the instrument

Caution, refer to accompanying documents.

Protective conductor terminal.

WEEE, Waste Electrical and Electronic Equipment. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

1.2 Safety instructions

1. **Read / Follow / Retain all instructions**

   - All safety and operating instructions must be read before using EGIL.
   - All safety and operating instructions for EGIL must be followed.
   - All safety and operating instructions must be retained for future reference.

2. **Connecting**

   - Before connecting or disconnecting EGIL to a high voltage circuit breaker's contacts, make sure the circuit breaker is closed and connected to ground on both sides.
   - Always make certain that the DC system in the substation is disconnected before connecting EGIL.
   - Always ground EGIL.
   - Before connecting EGIL, turn off its master ON/OFF switch.
   - Use caution when working near bare conductors or bus bars. Accidental contact with a conductor may cause electrical shock. At dry locations use caution when working with voltages that exceed 33 V AC and 46 V peak or 70 V DC, such signals pose a shock hazard. At wet locations, use caution when working with voltages that exceed 16 V AC and 22 V peak or 35 V DC. Follow the local safety regulations.
   - Never do any work on a circuit breaker unless the control circuits of the circuit breaker are disconnected from the EGIL control module or remote operation.
   - Unplug EGIL from the mains supply when it is left unattended or not in use.

3. Grounding (Earthing)

- EGIL can be used only in electrical systems with single ground.
- The user must verify before connecting this unit to power, that High Voltage Ground and Low Voltage Protective Ground create a single protective ground with no measurable voltage potential existing between these ground systems. If a voltage potential is found between the ground systems please consult local safety regulations.

4. Mains cord protective conductor

- EGIL is equipped with a power cord with integral safety ground pin.
- The equipment must be connected to a grounded mains outlet. Not doing so may result in fire or electric shock.
- Do not defeat the safety ground in any manner.

5. Separate ground wire

- The EGIL case must also be grounded by the separate protective ground wire with connection to the Protective Conductor Terminal on top of the EGIL. Check the continuity of the protective ground wire before each use. Make sure the connector is fastened properly to the EGIL Protective Conductor Terminal. Make sure the connection point at the ground system is fastened properly. Route the wire so that it is unlikely to be walked on or that it may loosen accidentally by someone or something moving near it.
- The protective ground wire must not be loosened while any input connector is attached to the contacts of a high voltage circuit breaker or another device being subject to inductive or capacitive coupled interference from surrounding high voltage wires.

6. Placement

- EGIL must be situated away from any heat sources such as radiators, heat registers, stoves, or other products that produce heat.
  Do not place the EGIL in areas with excessive dust, mechanical vibration or shock
- Do not use EGIL near water.
- Do not expose the EGIL to rain or moisture.
- Do not touch the plug with wet hands. Doing so may result in electrical shock.

7. Accessories

- Do not use any accessories/cables not recommended by the EGIL manufacturer as they may cause hazards.

8. EMC Warning

- EGIL generates, uses, and can generate radio frequency energy. If not installed and used in accordance with this manual it may cause interference to radio communications. EGIL has been tested and found to comply with the limits for measurement equipment designed to provide reasonable protection against such interference when used in an industrial environment. Operation of EGIL in a commercial or residential area is likely to cause interference, at which case, the user, at his own expense, will be required to take whatever measures that may be required to correct the interference.

9. Cables

- Use only approved mains detachable cable set with EGIL. Main supply cables shall be rated for the maximum current for the equipment and the cable shall meet the requirements of IEC 60227 or IEC 60245. Mains supply cables certified or approved by a recognized testing authority are regarded as meeting this requirement.
- To conform to the CE requirements for high frequency radiation, shielded cables or cables with added ferrite filters must be used for connection to the inputs/outputs.
- Connecting cables must be routed so that they are not likely to be walked on nor pinched by items placed upon or against them. Do not pull on or tie them. Pay particular attention to the connectors.
- To disconnect a cable, unlock the retainer (in case of an XLR connector), grasp the connector firmly and pull.
- If an input- or output cable becomes damaged, stop using it. Use of a damaged cable may result in fire or electric shock.

10. Power sources

- Only connect EGIL to an outlet protected with max 16 A overcurrent protection..
- Use an easily accessible power outlet. This will ensure that you can disconnect the power quickly in case of a problem.
- EGIL should be operated only from the type of power source indicated on its nameplate.

11. Inputs and outputs

- Do not apply voltage to the outputs.
- Do not exceed the specified input voltage limit on any of the EGIL inputs.
- Polarity on AUX 1&2 must be red to + and black to -.

12. Lightning

- For added protection for EGIL during a lightning storm unplug it from the AC outlet and from all cables connected to the inputs. This will prevent damage to the EGIL due to lightning and power supply surges.
- Never touch the plug and power cord if it begins to thunder. Touching them may result in electric shock

13. Cleaning

- Unplug EGIL before cleaning
- Do not use liquid cleaners or aerosol cleaners.
- Use only a damp cloth for cleaning.
- Stubborn stains may be removed with a cloth lightly dampened with a mild detergent solution.

14. Damaged EGIL.

- Do not use EGIL if the test leads appear damaged.
- Do not continue using a damaged EGIL. Using a damaged EGIL may result in fire or electric shock.
- Do not touch a damaged LCD panel directly with bare hands. The liquid crystal, which leaks from the panel, is poisonous if it enters the eyes or mouth. If any part of the skin or body comes in direct contact with the panel, please wash thoroughly. If some physical symptoms result, please consult your doctor.

15. Damage requiring service

Unplug EGIL from all connections and refer servicing to qualified service personnel under the following conditions:

- - When any connector is damaged, including mains plug.
- - If liquid has been spilled into EGIL.
- - If EGIL has been exposed to rain or moisture.
- - If the EGIL does not operate normally (following the operating instructions).
- - If the EGIL has been dropped or damaged in any way.
- - When EGIL exhibits a distinct change in performance. This indicates a need for service.
- If EGIL begins to emit smoke, smells like something is burning or makes strange noise, disconnect all power connections immediately and contact your dealer for advice.

16. Servicing

- Do not attempt to service EGIL yourself; opening or removing covers can expose you to dangerous voltage and other hazards.
- Please refer all servicing to qualified service personnel.
- If you attempt to service EGIL yourself the warranty is no longer valid.

17. Returning

- If, for some reason, you need to return EGIL, please use either the original transport box or one of equivalent strength

2 Introduction

Breaker Analyzer EGIL is intended for use in medium-voltage substations and industrial environments and is designed to test medium-voltage circuit breakers with no more than one main contact per phase. If the main contacts are equipped with parallel pre-insertion resistor contacts, EGIL automatically records the difference between main and resistor contacts. Auxiliary contact timing as well as coil current traces are recorded.

As option, EGIL can be equipped for travel motion recording and with a USB interface for PC-communication.

Options

Option - >

All options in this manual start with lines as above and stop with lines as below.

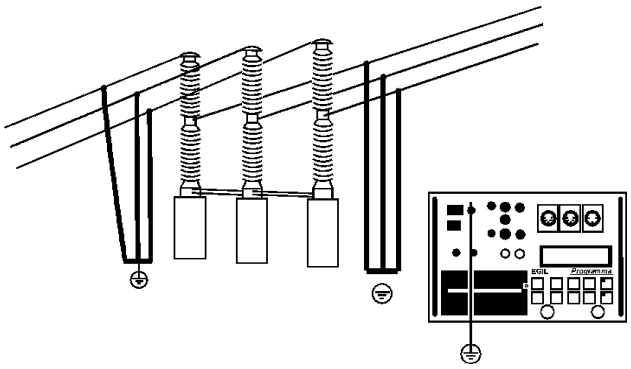
Option - End

3 Quick instructions

3.1 Preparing EGIL for time measurement

IMPORTANT
Read the chapter “Safety” before using EGIL.
Always comply with local safety regulations.

1] Check that EGIL and the breaker are grounded as illustrated below.



2] Connect the power supply cable to EGIL.

3] Connect EGIL to the breaker: Connect the time measurement cable to the main contacts of the breaker and to EGIL TIMING contact.

4] Connect the auxiliary contact measurement cable to the auxiliary contacts in the operating mechanism, and to EGIL AUX1&2 contact.

5] **A)** If the measurement is on wet (AC voltage) auxiliary contacts, set the timing auxiliary inputs to wet mode (LED is off).

B) If the measurement is on wet (DC voltage) auxiliary contacts, set the timing auxiliary inputs to DRY mode (LED is on). The red cable must be connected to the positive side of the auxiliary contact.

C) If the measurement is on dry auxiliary contacts, set the timing auxiliary inputs to DRY mode (LED is on).

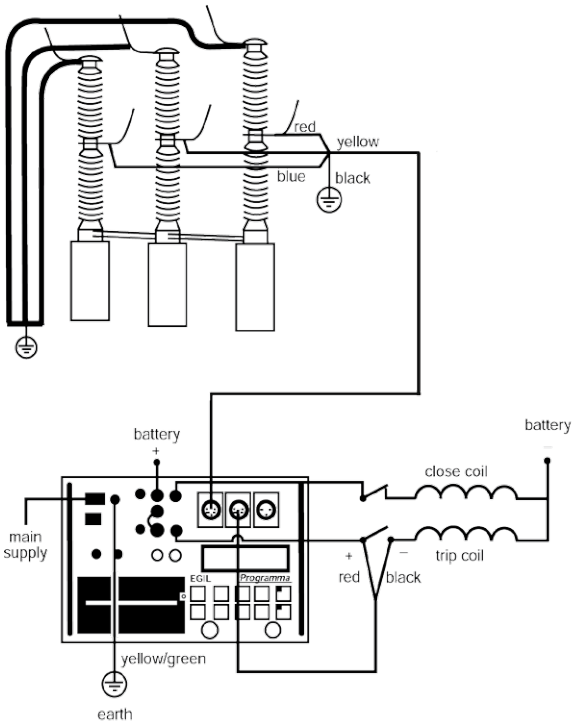
6] Connect the breaker close coil to EGIL close coil output.

7] Connect the breaker trip coil to EGIL trip coil output.

8] Make sure a jumper (if the trip and close coil have the same voltage source) is connected between the trip coil input and the close coil input.

9] Connect the battery + (plus) to EGIL coil input.

10] Remove the ground connections from one side of the breaker as shown in the picture below.



IMPORTANT
When only one side of the breaker is grounded while making the test, special precautions must be observed to protect service personnel and the test equipment from harmful voltages.

11] Turn EGIL power switch to on.
The stored settings in memory 0 (zero) are automatically recalled.

EGIL and the breaker are now ready to operate.

Note *If your time measurement fails, giving an error message in the display: "Incorrect status Press* **ESC***", your EGIL is equipped with an analog channel which is not presently in use. Select "Analog channel" in the main menu. Select "Off". Now your time measurement will work.*

3.2 Preparing EGIL for motion measurement (option)

Option - >

1] Check that EGIL and the breaker are grounded. Connections are made according to the instructions in section 3.1 above.

2] Connect the power supply cable to EGIL

3] Connect EGIL to the breaker: Connect the time measurement and the breaker control circuits according to the instructions in section 3.1 above. Connect the motion measurement cable to the resistive motion transducer and to EGIL MOTION contact. The transducer should be properly fitted to the breaker at the position recommended by the breaker manufacturer.

4] Turn EGIL power switch on.
The stored settings in memory 0 (zero) are automatically recalled. EGIL and the breaker are now ready to operate.

Option - End

3.3 Run a measurement

Operation and connection check

To run the sequence to check connection and operation without measurement, turn the OPERATE knob. The breaker should run according to selected sequence.

If the sequence runs as expected, proceed with a measurement, otherwise check the connections and the pulse length and delay settings in EGIL.

Measurement

To run the sequence with measurement, turn the MEASURE knob. The breaker runs according to the selected sequence and EGIL measures open/close time. In case the optional motion channel is used, velocity and other motion parameters are measured as well.

Note *The sequence can be aborted at any time if you press* **ESC**.

Printing the results

After each complete measurement sequence, the test results are calculated. They are automatically printed if AUTO PRINTOUT is set to ON in the PRINT menu. If the AUTO PRINTOUT is set to OFF, press the PRINT button to print the results.

Note *The printout can be interrupted at any time if you press PRINT or* **ESC**.

3.4 Change measurement parameters

EGIL reads the status of the breaker (closed or open). EGIL automatically sets the built-in sequence module to the next logical single operation.

If multiple operation is desired, perform the following steps:

1] Select the SEQUENCE menu by pressing the SEQ/MENU- button.

2] Select the operation from the menu.

3] Set the appropriate time delay values.

4] Turn the OPERATE and MEASURE knob to initiate operation or measurement.

For more information about menu options and parameters, see Chapter 7 (Menu options and parameter settings).

3.5 Printouts

The first part of the printout shows administrative data and test conditions.

The second part of the printout shows results in numeric and graphic form.

The results are also shown in the **display**.

For more information about printouts and the printer, see Chapter 13 (The printer).

4 System components

4.1 Standard items

EGIL standard unit includes the following	
Item	Art. No.
Basic unit EGIL,	BM-19076
Mains cable, 2.5 m (8.2 ft)	04-00XXX
Breaker control cables, black, 2x2 m (6.6 ft)	04-35030
Breaker control cables, red, 2x2 m (6.6 ft)	04-35032
Fuse, 12A F, 6.3 x 32 mm	33-07147
Cable, Extend, 10 m (32.8 ft)	GA-00150
Cable, TIMING, 5 m (16.4 ft)	GA-00160
Cable, AUX1&2, 2 m (6.6 ft)	GA-00170
Protective cable, 2.5 m (8.2 ft)	GA-00200
Thermal printer paper, 2 rolls	GC-00030
Transport case	GD-00190
EGIL User's guide	ZP-BM01E
Cable tie, 13 x 225 mm (0.5" x 8.8") 9 pcs	19-62200

EGIL extended unit includes the following	
Basic unit EGIL, with MOTION channel and USB interface	BM-19079
Basic unit EGIL, with SDRM, MOTION channel and USB interface	BM-19075
Mains cable, 2.5 m (8.2 ft)	04-00XXX
Breaker control cables, red, 2x2 m (6.6 ft))	04-35030
Breaker control cables, red, 2x2 m (6.6 ft)	04-35032
Fuse, 12A F, 6.3 x 32 mm	33-07147
Cable, 1 m (3.3 ft), XLR - female	GA-00041
Cable, 7.5 m (24.6 ft), XLR	GA-00042
Cable, Extend, 10 m (32.8 ft)	GA-00150
Cable, TIMING, 5 m (16.4 ft)	GA-00160
Cable, AUX1&2, 2 m (6.6 ft)	GA-00170
Cable, USB	HG-00000
Protective cable, 2.5 m (8.2 ft)	GA-00200
Thermal printer paper, 2 rolls	GC-00030
Transport case	GD-00190
EGIL User's guide	ZP-BM01E
Cable tie, 13 x 225 mm (0.5" x 8.8") 11 pcs	19-62200

4.2 Accessories

The following accessories can be ordered	
Accessory	Art. No.
Extension cable Timing & AUX 1&2, 10 m (33 ft)	GA-00150
Transducer TLH 500, 500 mm (19.6") stroke	XB-30020
Transducer TS 150, 150 mm (5.9") stroke	XB-30030
IP6501, rotates through 357°	XB-31010
Assembly kit for TLH, TS or IP6501	XB-51020
For other lengths of TLH, TS. Contact Megger Sweden AB	

5 Description

5.1 Fields of application

EGIL is primarily intended for:

- Time measurement
- Automatic coil current measurement
- Travel motion measurement

Time measurement

There are two time measuring connections:

The TIMING connection with three time channels. Signals can be measured at both main contacts and pre-insertion resistor contacts on the same channel. EGIL automatically senses if there is a pre-insertion resistor connected. No specific settings are necessary.

The AUX1&2 connection with two independent auxiliary inputs. These inputs can be used for contact-sensing or voltage-sensing.

The time for contact operations is measured in several different sequences (open/close).

The maximal measurement time for EGIL is 100 seconds.

Automatic coil current measurement

The breaker coil current is measured by a built-in and fully insulated current sensor during the measured operating sequence.

Breaker operation sequence

A built-in sequencer automatically sets the instrument for the next sequential breaker operation. The operator can select other operation sequences using the arrow keys of the keyboard, see section 9.2.

Other functions

The keyboard is used for entering control parameters via the menu system.

The **display** shows the settings and can also be used for result read-out.

Test reports can be printed after each measurement sequence.

Option - >

Options

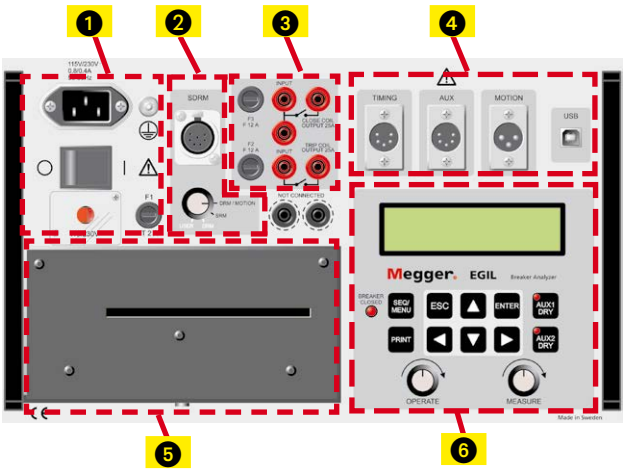
As an option, EGIL can be equipped with a motion measurement input. An analog channel gives you the ability to measure motion (using resistive motion transducers) or for voltage or current measurements.

EGIL can also be equipped with an optional USB interface for communication with a personal computer. This will support communication with the CABA analysis program.

As a third option EGIL can be equipped with SDRM functionality for static and dynamic resistance measurement.

Option - End

5.2 Main blocks of front panel



The main blocks of the front panel are:

1. Main power supply
2. SDRM (option)
3. Sequencer.
4. TIMING/ (MOTION / USB option)
5. Printer
6. Display and keyboard

Chapter 6 (Front panel) describes the panel function.

Main power supply

The power supply block is equipped with a fuse, a main switch, the connector for mains voltage, ground terminal and mains voltage switch 115 V/230 V.

Sequencer

The sequencer block is equipped with fuses for breaker control outputs and close and trip coil inputs/ outputs.

There is also a built-in galvanically isolated analog current transducers to measure the current in the trip and the close circuit. AC and DC current up to 50 A is measured.

Time/motion/USB inputs

The time/motion/USB input block is equipped with inputs for measuring time and motion and a USB communication terminal.

Printer

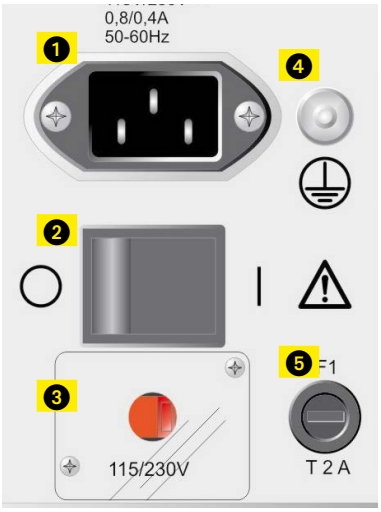
The printer block is equipped with a built-in printer for printing results and test conditions, numeral and graphical.

Display and keyboard

The display shows the settings and test results and the keyboard is used for entering control parameters via the menu system.

6 Control panel

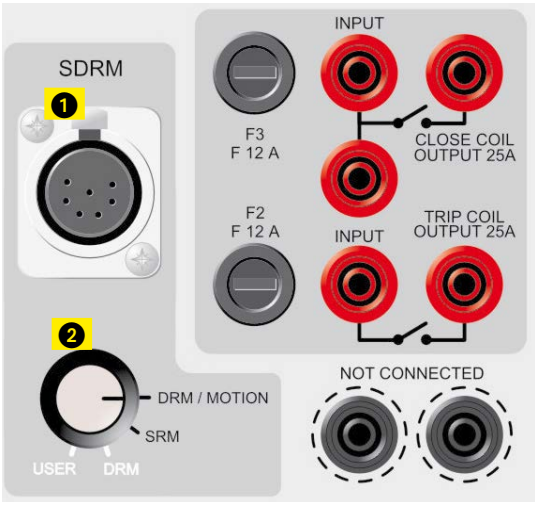
6.1 Power supply



1. Connector for mains voltage
2. Mains voltage ON/OFF
3. Mains voltage switch 115 V 60 Hz or 230 V 50 Hz
4. Ground (earth) terminal
5. F1, Main fuse, 2 A F (quick acting)

6.2 SDRM (option)

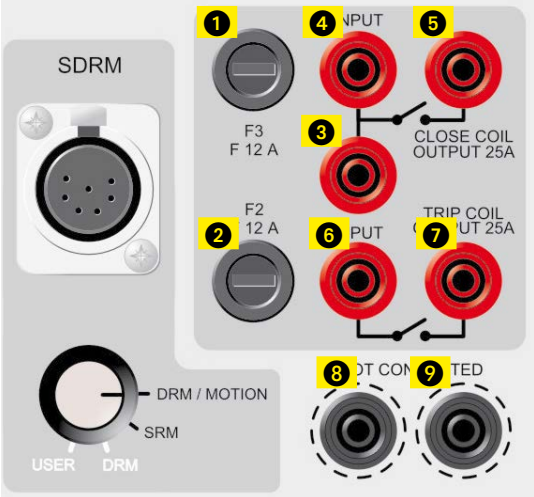
Option - >



1. SDRM input
2. SDRM mode selector
   DRM/MOTION: Dynamic resistance measurement and motion measurement. U and I divided externally.
   SRM: Static resistance measurement. U and I measured and R calculated in CABA Win.
   DRM: Dynamic resistance measurement. For more precise resistance values. U and I are measured and R is calculated in CABA Win. No motion measurement.
   USER: Custom designed option.

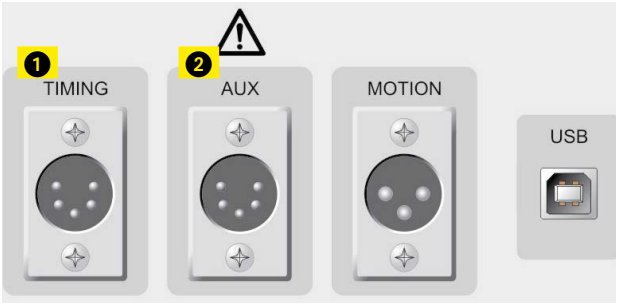
Option - End

6.3 Breaker control outputs



1. Fuse (F2) for breaker control outputs, 15 A F (quick acting)
2. Fuse (F3) for breaker control outputs, 15 A F (quick acting)
3. Close Coil input to internal contact (Close). Makes it possible to connect a jumper between 3 and 6.
4. Close Coil input to internal contact (Close).
5. Close Coil output from current measurement circuit back to the breaker.
6. Trip Coil input to internal contact (Trip).
7. Trip Coil output from current measurement circuit back to the breaker.
8. Not connected terminals for safe disconnection of breaker control wires. Not connected to internal circuits.
9. Same as 8.

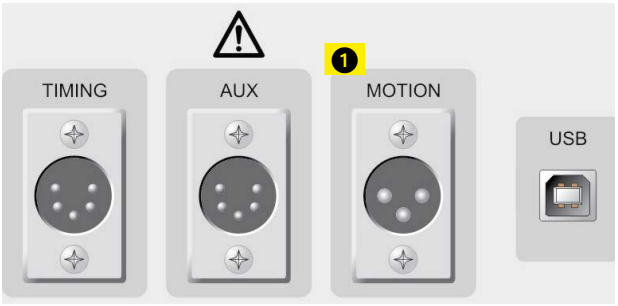
6.4 Timing inputs



1. XLR5 - Three time channels. Signals can be measured at both main contacts and pre-insertion resistor contacts on the same channel.
2. XLR5 - Two galvanically isolated time channels, intended for contact-sensing or voltage-sensing.

6.5 Motion input (option)

Option - >

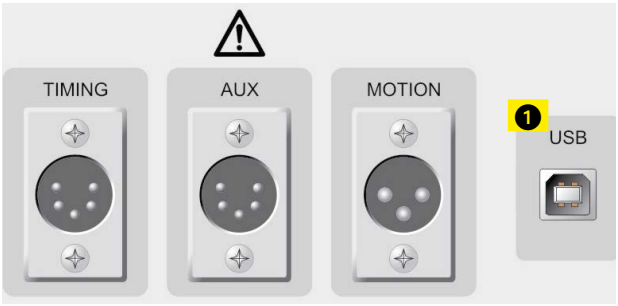


1. XLR3 - Optional analog input channel, intended for measuring travel (motion) or some other analog entity.

Option - End

6.6 USB communication terminal (option)

Option - >



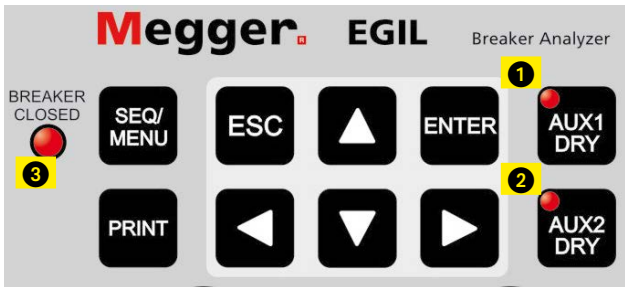
1. USB computer interface port used for data exchanges.

Option - End

6.7 Other

1. Printer
2. Display

6.8 Indicators

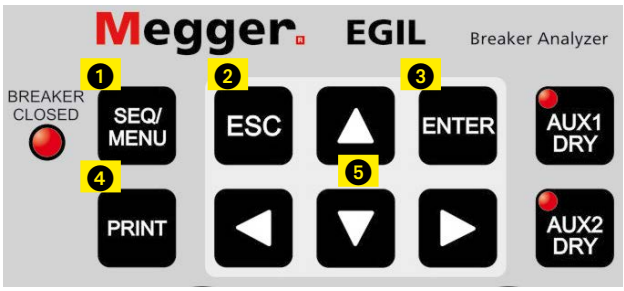


1. Auxiliary input 1 mode button.
2. Auxiliary input 2 mode button.
   The Light Emitting Diode (LED) on the AUX1 DRY or AUX2 DRY buttons show if the auxiliary contact senses contact or voltage (“dry” or “live”).
   The LED is lit if EGIL is in contact mode and delivers 24 V, 25 mA. The LED is off if EGIL is in voltage mode and senses a voltage from 20 V to 250 V independent of the polarity.
   Note: This function is supplied only for the AUX1&2 inputs.
3. The BREAKER CLOSED indicator LED shows the breaker state. When the LED is lit, the breaker is closed and connected. When the LED is off, the breaker is open or not connected.
   Note: This function is only operational when you use the TIMING input.

6.9 Operation knobs

1. OPERATE knob. Runs a breaker operation sequence without measurement.
2. MEASURE knob. Runs a breaker operation sequence, measuring and recording the results.

6.10 Function keys



1. SEQUENCE/MAIN menu key, to select the sequence and to set time parameters.
2. **ESC** button. Used to go back on a menu, or to cancel a measurement or printout.
3. **ENTER** button. Used to validate a choice or to go forward on a menu.
4. PRINT key. Used to run a printout of measurement results.
5. Arrow keys. Used to go to the next or previous choice on the same menu level.

For more information about function keys or menu options, see Chapter 7 (Menu options and parameter settings).

7 Menu options and parameter settings

7.1 Parameter values

There is a default set of parameter values, allowing you to start EGIL and run a complete measurement without changing anything. This set of default values are permanently stored in memory DEFAULT and cannot be changed.

You can define your own parameter values by using either the SEQUENCE menu or the MAIN menu. Up to ten sets of values can be saved for future use, and you can decide which set that should be used as start-up values by storing it in memory number 0 (zero).

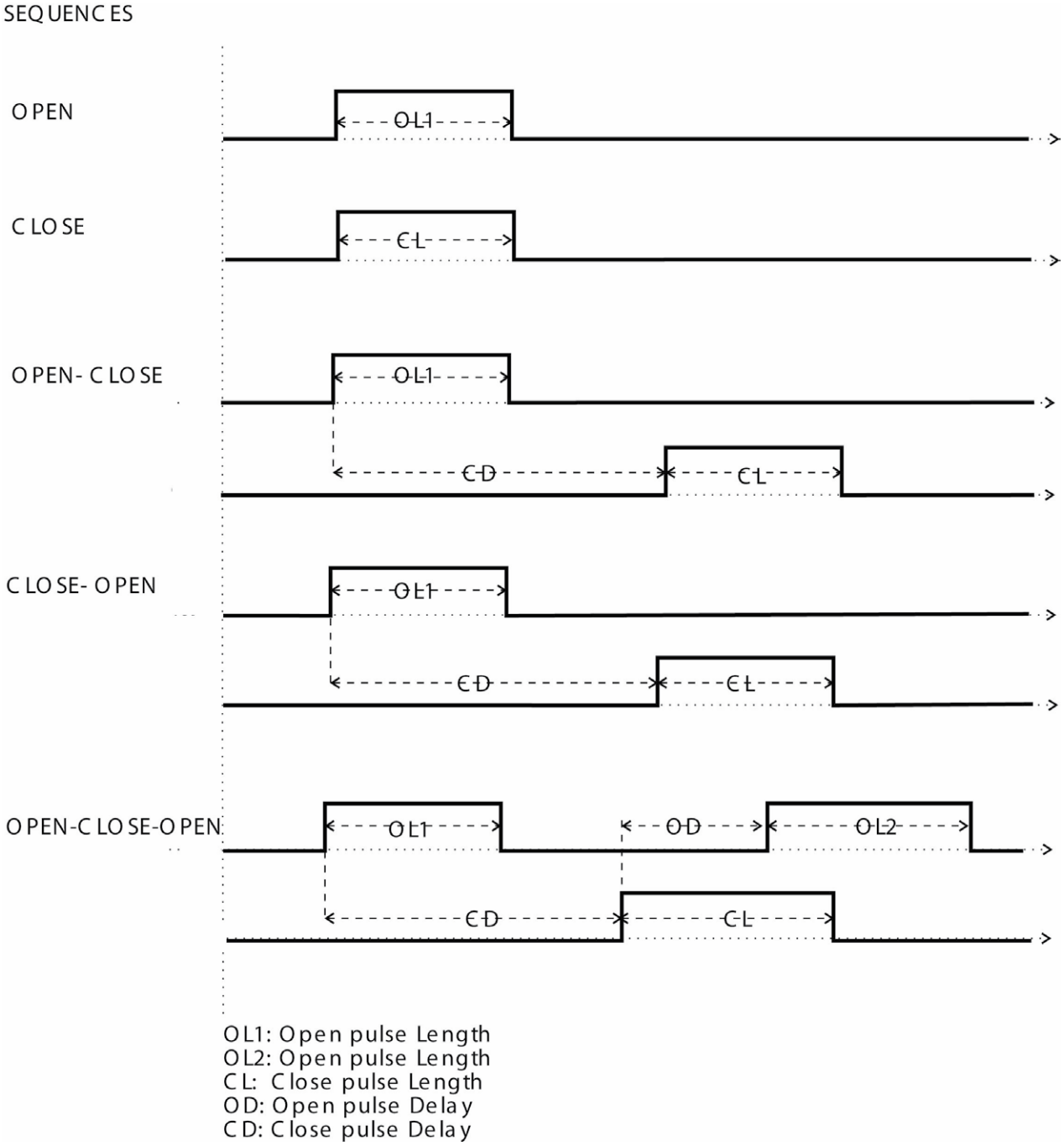
7.2 The SEQUENCE menu

The SEQUENCE menu is displayed when you start EGIL and is used to define functions of the trip/coils on the breaker.

You specify all the time parameters needed to generate a measurement sequence by choosing between the following time parameters. They correspond to the chronogram showed below.

C	Close-pulse
CO	Close-Open pulses
O	Open pulses
OC	Open-Close pulses
OCO	Open-Close-Open pulses

The chronogram below shows how pulses and pulse delays are defined:



The sequence starts when you turn the MEASURE or OPERATE knob. The BREAKER CLOSED indicator, shows the state of the breaker.

During the measurement process the following messages appear in the display:

Be Ready

(EGIL prepares for operation)

Recording...

(EGIL samples measurement data)

Recording...

(EGIL is analyzing measured data)

Set the AUTO PRINTOUTS in the PRINT menu to ON to receive an automatic printout of the results after the measurement sequence.

The results are shown on the printout according to the following:

- Room for administrative information regarding the breaker and the test

- Remarks
- Test prerequisites (e.g. the settings you have chosen from the menus)
- The results on a time-scale graph
- Calculated time and movement parameters
- A graphic presentation of the measured result

Note *The sequence can be aborted if you press* **ESC**. *If a sequence is aborted than the recorded values are not retained. In this case, you will not be able to perform an analysis or print the values.*
The printouts can be aborted if you press **ESC** *or the PRINT-button.*

You can choose between the following parameters on the SEQUENCE menu:

Menu heading	Available settings	Explanation
Close pulse length	time in s or cy	Length for close pulse
Open pulse length	time in s or cy	Length for open pulse
Delay C-O1	time in s or cy	Open pulse delay at CO
Delay O1-C	time in s or cy	Close pulse delay at OC
Delay O1-C C-O2	time in s or cy	Delay of close and open pulse at OCO

Set pulses

To generate the different sequences, a maximum of five time parameters are needed.

The following table shows default settings, where applicable.

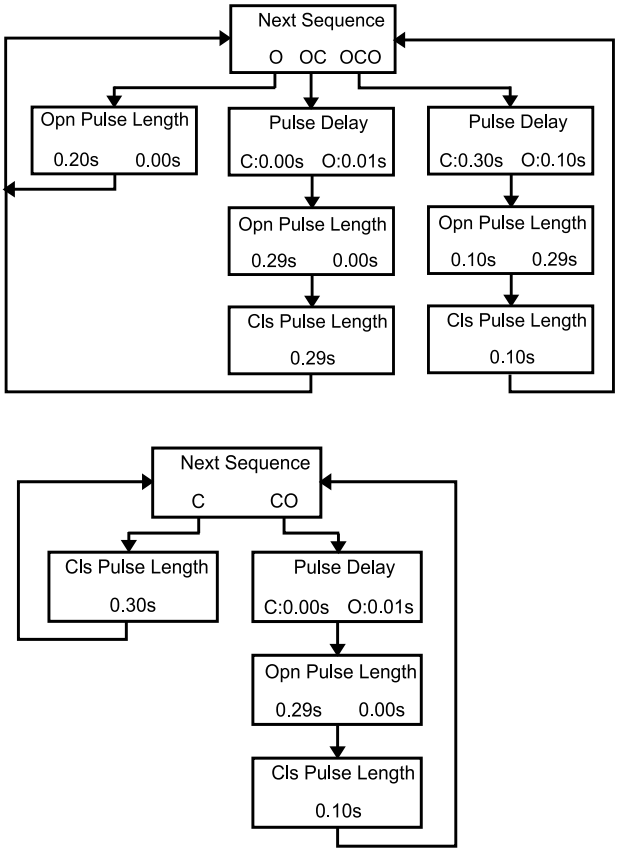
	C	O	CO	OC	OCO
Close pulse delay	-	-	-	0.01s	0.30s
Open pulse delay	-	-	0.01s	-	0.01s
Open pulse length 1	-	0.20s	0.29s	0.1s	0.10s
Open pulse length 2	-	-	-	-	0.29s
Close pulse length	0.20s	-	0.10s	0.29s	0.10s

Remarks

- Values that are impossible to define are marked with a " - ".
- Parameters for each sequence can be viewed and changed only when the sequence has been selected.
- In OCO sequence the open pulse delay plus the close pulse delay must be greater than the open pulse length 1. If this sum is too small, the error message "Pulse errors" is displayed.
- If any pulse length is longer than the set measured time, the error message "Pulse error" is displayed.

7.3 Menu tree for the SEQUENCE menu

Below, is a diagram of the SEQUENCE menu. The pulse lengths and delay times in the example below are taken from the default settings.



7.4 The MAIN menu

From the main menu, you can set general parameters, print settings, save and retrieve settings and calibrate the instrument. If you have an EGIL with the motion channel option, you can also choose analog channel, open speed and close speed settings. To access the main menu, press the SEQ/MENU button.

You can choose between the following menu headings.

Menu heading	Function
Setup	General parameters and options
Print	Print parameters
Save	Save configuration in memory blocks
Recall	Recall configuration from memory
Calibration	Calibration of current/voltage measurements and motion channel

Option - >

Analog Channel	Settings for motion channel
Open Speed	Speed calculation points
Close Speed	Speed calculation points

Option - End

Display	Show data/time on the display
Monitor	Show on-line measurement values

Setup

Here you set general parameters and options for:

Measure Time

Here you can choose between the measure times 1, 2, 5, 10, 20, 50 and 100 seconds. At 1 s, the time resolution is 0.1 ms and at 100 s, the resolution is 10 ms. You choose the unit for measure time in the TIME BASE section.

Note *If you change the measure time, the measurements most recently taken are erased.*

Language

Here you choose between English, German, French, Spanish or Swedish. If you select another language than English and want EGIL to "remember" this next time you start the instrument you must save the setting in memory "0".

Auto Sequence

Here you choose whether or not you want EGIL to detect the breaker position. You may select any breaker operation independent of the breaker position.

Time Base

Here you choose the time unit for measuring. You can choose from milliseconds, 50 Hz cycles (equals periods) or 60 Hz cycles. 1 cy = 20 ms at 50 Hz and 16.67 ms at 60 Hz.

Option - >

Travel Unit

Here you choose the travel unit. You can choose from mm or inch (1 inch = 25.4 mm).

Option - End

Printouts

Here you set parameters for printouts. The maximum length for a printout is 20 squares.

Auto Printouts

Here you choose whether or not you want a report automatically printed out after every measurement. If you not activate this function, you must press the PRINT button after every measurement to get a printed report.

Contents

Here you can choose whether or not you want all pages printed out or just those pages containing graphs.

Compress Time

Here you choose if you want to activate time scale compression during the interval when something can happen on the channels.

Suppress Bounces

Here you choose whether or not you want bounces (10 ms) to be filtered when printing numeric values. This setting does not apply to the graphic printout. Note: All raw data is stored in EGIL's memory. Only the values that are printed are filtered. If the function is activated, the system gives you the time for the first contact connection at circuit closure and the time for last contact separation at circuit disconnection. If the function is not activated, all registered bounces are printed.

Note *All raw data are stored in EGIL's memory. Only the values that are printed are filtered. If the function is activated, the system gives you the time for the first contact touch at closure and the time for last contact separation at open. If the function is not activated, all registered bounces are printed.*

Resistor Contact

Here you choose whether or not you want EGIL to measure resistor contacts. If no, you will only see open or closed main contacts on printouts.

Time Scale

Here you choose the time scale for the printout. The set measure time selections vary according to the table below:

Time	Time base selection							Unit
1s	Auto Region	1	2	5	10	20	50	ms/div
2s	Auto Region	2	5	10	20	50	100	ms/div
5s	Auto Region	5	10	20	50	100	250	ms/div
10s	Auto Region	10	20	50	100	250	500	ms/div
20s	Auto Region	0.02	0.05	0.1	0.25	0.5	1	s/div
50s	Auto Region	0.05	0.1	0.25	0.5	1	2.5	s/div
100s	Auto Region	0.1	0.25	0.5	1	2.5	5	s/div

The table will look different if you choose the time unit cycle instead.

Example: 1 ms/div corresponds to 0.05 cy/div at 50 Hz or 0.06 cy/div at 60 Hz.

If you choose AUTO, the interesting parts of the time scale measurement is automatically enlarged as much as possible.

If you choose REGION, you can enlarge a part of the measurement around a chosen midpoint. The system enlarges 10 squares before and 10 squares after the chosen midpoint. The time scale is automatically set to 1/1000 of the measure time you use. For example: 1 s corresponds to 1 ms/division.

Centre Point

The system displays this menu only when you have chosen the setting REGION from the TIME SCALE menu. Here you enter the midpoint of the area you want to print out. Refer to the section above.

(I) Current Scale(internal current measuring)

Here you set the scaling factor for the internal current axis. If you choose AUTO, the system automatically sets the scale so that axis becomes as large as possible. If you choose not to activate this function, the axis will not be displayed on the printout.

Option - >

Motion Scale

Here you enter the scaling factor for the motion axis. You can only use this setting if you have chosen to measure motion in the ANALOG CHANNEL menu. If you choose AUTO, the system automatically sets the scale so that axis becomes as large as possible. If you choose not to activate this function, the axis will not be displayed on the printout.

(X) Current Scale (external current measuring)

Here you enter the scale for the current axis if you measure current on the analog channel. You can only use this setting if you have chosen to measure current in the ANALOG CHANNEL menu. If you choose AUTO, the system automatically sets the scale so that axis becomes as large as possible. If you choose not to activate this function, the axis will not be displayed on the printout.

Voltage Scale

Here you enter the scale for the voltage axis if you measure current on the analog channel. You can only use this setting if you have chosen to measure voltage in the ANALOG CHANNEL menu. If you choose AUTO, the system automatically sets the scale so that axis becomes as large as possible. If you choose not to activate this function, the axis will not be displayed on the printout.

Option - End

Save in memory

Here you can save the settings in EGIL's memory. You can store an array of settings in each of the 10 storage areas. All of the parameters that can be set in EGIL's menus can be stored in memory with the exception of channel calibration for internal current axis and motion channel. However, the actual measurement results are not stored in memory but are written over by the next measurement or erased when EGIL's power is switched off.

0

Save setting in memory area 0. The array of settings stored in memory area 0 are always activated when you turn on EGIL.

1...9

Save settings in memory areas 1 - 9. You choose the memory area where you will store the settings and press **ENTER** to save.

Recall

Here you recall the settings that you have saved in EGIL's memory.

0...9

Recall settings that have been saved in memory area 0 - 9. Memory 0 is recalled automatically at power on.

Default

Recall default settings.
The default settings are set at the factory. They are stored in memory 0 - 9. If you want to use the default settings every time EGIL is switched on do as follows. Choose RECALL, DEFAULT and SAVE choosing memory 0.

Calibration

Calibration is used for calibrating the internal current axis channel and the motion channel. Refer to instructions on calibrating in chapter 12 "Calibration".

Option - >

Analog channel (option)

Here you can set parameters for measuring motion, among other things.

The analog channel in EGIL is primarily intended for measuring motion but can also be used to measure current via a current shunt. It can also be used to measure voltage directly or via a voltage divider.

The table below shows the possible choices in the ANALOG CHANNEL menu.

Menu heading	Sub menu	Function
Motion	Stroke	Fill in the circuit breaker's estimated stroke. Subsequent measurements use the stroke length method.
	Calibrate	Calibrating transducer via the calibration routine. Subsequent measurements use the stroke length method.
	Transducer length	Fill in transducer's electrical length. Subsequent measurements use the stroke length method..
Current	Current shunt	State the shunt resistance to measure current trough an external shunt.
Voltage	Ext. Voltage divider	State the voltage divider's position to measure voltage using EGIL's MOTION input directly, or via the voltage divider.
Off		"Select ""OFF"" to turn off the analog channel. It is important that it is turned off if it is not in use."

First you choose which type of measurement you want to perform. Choose between MOTION, CURRENT and VOLTAGE.

Note *If you are not using the analog channel, it is important that you deactivate the function by selecting the position "Off". Otherwise, there is a risk that you will get the error message "Not calibrated" since the motion channel expects events during a recording*

Choice MOTION

If you choose MOTION from the ANALOG CHANNEL menu, you have three alternatives: STOKE, CALIBRATING or TRANSD LENGTH. Options STROKE and TRANSD LENGTH represent two different measurement methods. These are described below.

CALIBRATING is used to determine the transducer's electrical length. This is used when you measure according the transducer length methodology.

Measurement Method STROKE

This method is suitable if you cannot directly connect the transducer to the moving contact. The principle behind this method is that you enter the breaker's estimated stroke in EGIL. When the first measurement is taken after EGIL is turned on, (it must be an single operation), EGIL establishes a scaling factor from the difference between close and open position at the transducer and the given stroke. It does not matter if you use a linear or rotating transducer or how much the transducer moves in reality. This measurement method is also named "Relative measurement".

Example:

1] Choose MOTION and STROKE

2] Enter the breaker's estimated stroke when EGIL prompts you to do so. Press **ENTER**. The value you enter will be valid until you enter a new estimated stroke, change measurement method, calibrate a transducer or turn off EGIL.

3] Perform a measurement. The first measurement that is taken must be a single operation.

Measurement Method TRANSDUCER LENGTH

This method works best when you can directly connect the transducer to the moving contact. You enter the transducer's length instead of the breaker's estimated stroke. By using the transducer's length as a reference, EGIL can then measure the breaker's stroke. This measurement method is also named "Absolute measurement".

***Example*:**

1] Choose MOTION and TRANSD LENGTH

2] Enter the transducer's length when EGIL prompts you to do so. Press **ENTER**. The value you enter will be valid until you enter a new estimated stroke, change measurement method, calibrate a transducer or turn off EGIL.

3] Perform a measurement. The first measurement that is taken must be an single operation.

CALIBRATING

We recommend that you calibrate the transducer, because the length that is printed on a transducer does not always correspond to the electrical length. To calibrate, choose the option CALIBRATE. After calibration, EGIL automatically measures according to the TRANSD LENGTH method and the result from the calibration as transducer length.

Tip

Write the calibrated transducer length on the transducer. Then you only have to choose TRANSD LENGTH and enter the calibrated transducer length rather then calibrate the transducer length each time.

***Example*:**

1] Choose MOTION and CALIBRATE

2] Choose TRANS POSITION 1. Move the transducer to a position near the end position. Voltage is shown in the **display** that corresponds to the transducer's set position. If EGIL displays the error message "Out of range", the transducer is too close to the end position. Correct and mark the position on the transducer. Then press **ENTER** to position 2 in EGIL.

3] Choose TRANS POSITION 2. Move the transducer slide to a position near the other end position. Voltage is shown on the display that corresponds to the transducer's position. If EGIL displays the error message "Out of range", the transducer is too close to the end position. Press **ENTER** to read the position 1 in EGIL. If EGIL displays the error message "Too small diff", then the difference in voltage between position 1 and 2 is too small. Start the calibration again from the beginning.

4] Decide DISTANCE POS 1-2. Measure the distance between the two marks on the transducer as accurately as possible. Enter the value in EGIL. Press **ENTER**.

5] EGIL displays the transducer length that resulted from calibrating. Make sure the value seems reasonable and press **ENTER**. The value you enter will be valid until you perform a new calibration, enter a new transducer length, change measurement method or turn off EGIL.

6] Perform a measurement. The first measurement that is taken must be a single operation.

The choice CURRENT

The current in the breaker's close and open loops is automatically registered on the special current channel in EGIL. If you want to measure other currents, you can use EGIL's analog channel. One example of this could be if there are relays in the circuit that makes it impossible to measure the current through the close/trip coil via the control wires. In this case, you can measure current on the analog channel with help of a current shunt that is connected in series with the circuit you will measure current in.

***Example*:**

1] Choose CURRENT from the ANALOG CHANNEL menu.

2] Enter the current shunt's resistance when EGIL prompts you to do so. Press **ENTER**. This value is valid until you enter a new value for current shunt or turn off EGIL.

If you do not know the current shunt's resistance, you can calculate it by dividing total ampere into total millivolt. These values are located on the shunt. For example, if the shunt has the value 20 A/200 mV, that means the resistance is 200/20 = 10 mΩ.

The choice VOLTAGE

The analog channel can also be used to measure voltage. If the voltage is between -4 and 4 V, it can be directly connected to the input. If the voltage is higher, an external voltage divider must be used. Because the voltage divider's ratio is entered in EGIL, EGIL can calculate and present the result with real values.

***Example*:**

Choose VOLTAGE from the ANALOG CHANNEL menu.

Enter the voltage divider's ratio when EGIL prompts you with EXT. VOLT. DIVIDER. The value to the left of the colon represents the input voltage that must be applied to the divider in order to get 1 V out. For example, if the voltage divider used gives 1 V, when 400 V is connected, you enter the value 400:1. If you are

not using a voltage divider, but instead connect the measuring device directly to the channel, the setting must be 001:1.

Open speed (option)

The functions in this menu allow you to input calculation points for open speed calculation.

Note *You must choose MOTION in the ANALOG CHANNEL menu in order to activate the open speed*

The open speed is calculated as an average speed between two points on the motion graph. In order to make this calculation, these two points must be entered in EGIL. You begin by entering the upper point. The upper point can be determined in two different ways:

- as a distance below the breaker's closed position
- as a position - the position of the moving contact at the instant of opening

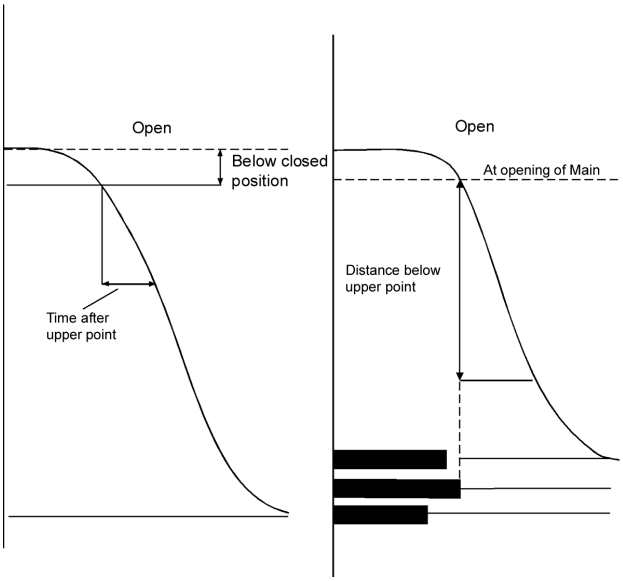
The instant of opening is defined as the last separation of the main contact in the slowest phase.

The lower point is based on the upper point. It can either be a distance below the upper point or a time after the upper point.

Tip

Calculating points, norms and point adjustments for speed and other parameters vary for different breaker types and must therefore be obtained from the breaker manufacturer. If you do not have access to the breaker manufacturer's speed calculating points specifications, as a general rule you can specify the upper point AT OPN OF MAIN (at main breaker's opening) and the lower point TIME AFTER UPPER: 10 ms (time after upper point). At 60 Hz, it is 8.33 ms or 0.5 cy. These values are based on an assumption that the breaker's speed is constant in the arcing zone. This occurs when the contact opens and continues to the next zero crossing which means at the most a half period ahead in time (10 ms at 50 Hz).

The picture below shows how the open speed calculation points are measured.



Example:

Choose OPEN SPEED from the main menu. Define the speed calculation:

MAIN MENU
< Open speed >

Choose the reference for the upper point speed calculation:

Opn: Upper point
< Below Cls Pos >

Define the distance between the upper point and steady state level.

Below Closed Pos
0050.0mm

You can also choose the option:

Opn: Upper point
< At Opn of Main >

Now you define whether the lower point will be related to the upper point by distance or by time.

Define the distance from the upper point:

Opn: Lower Point
<Distance> Time

Dist. Below Upper
0010.0mm

or define the time after the upper point:

Opn: Lower Point
Distance <Time>

Time After Upper
010ms

Option - >

Close speed (option)

The functions in this menu allows you to input calculating points for close speed calculation.

Note *You must choose MOTION in the ANALOG CHANNEL menu in order to activate the close speed menu.*

Close speed is calculated as an average speed between two points on the motion graph. In order to make this calculation, these two points must be entered in EGIL. You begin by entering the upper point. The upper point can be determined in two different ways:

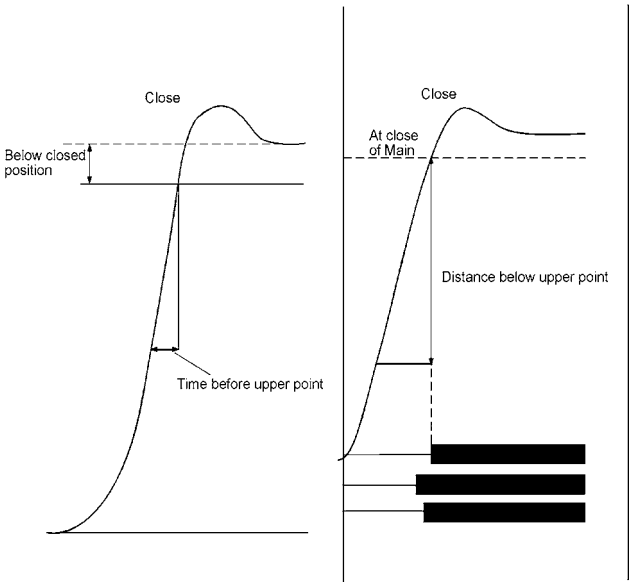
- as a distance below the breaker's stable closed position or
- as a position - the position of the moving contact at the instant of closing.

The moment in time is defined as the first contact touch at the main breaker position in the slowest phase.

The lower point is determined based on the upper point. It can either be a distance below the upper point or a time before the upper point.

Tip
Calculating points, norms and point adjustments for speed and other parameters vary for different breaker types and therefore must be obtained from the breaker manufacturer. If you do not have access to the breaker manufacturer's speed calculating points specifications, as a general rule you can give the upper point AT CLS OF MAIN (at main breaker's closing) and the lower point TIME BEFORE UPP. :10 ms (time before upper point). At 60 Hz, it is 8.33 ms or 0.5 cy. These values are based on an assumption that the breaker's speed is constant in the arcing zone. This occurs before the contact's closing.

The picture below shows how the close speed calculation points are derived.



Example:
Choose CLOSE SPEED from the main menu. Define the speed calculation:

MAIN MENU
< Close speed >

Choose the reference for the upper speed calculation point:

Cls: Upper Point
<Below Cls. Pos>

Define the distance between the upper point and stable closed position.

Below Closed Pos
0050.0mm

You can also choose the option:

Cls: Upper Point
<At Cls of Main>

Now you define whether the lower point will be related to the upper point by distance or by time.

Define the distance from the upper point:

Cls: Lower Point
<Distance> Time

Dist.Below Upper
0010.0mm

or define time before the upper point:

Cls: Lower Point
Distance <Time>

```
Time Before Upp.
010ms
```

Option - End

Display

In this menu, you can view data and calculated parameters from the latest measurement on the display. This can be useful if, for example, you do not want to print a report or you want to perform a thorough analysis of the breaker's state in relation to time. If you access this menu without having performed a measurement, you will get the error message:

```
Memory is empty
```

There are four different values on the display:

- moment in time
- coil current
- measured value on the analog channel
- contact status on the time channel

The time relates to the beginning of the measurement. For each selected time, the corresponding value measured in that instant is shown. By changing the time, you can see the measured values for any time within the used measuring time.

If you press **ENTER**, the calculated parameters are shown. These are the same parameters that are shown in the printout.

***Example*:**

The measured values below are shown in the display menu:

At the selected time displayed in the upper left corner, the following value has been measured for coil current:

```
0041.7ms 1.566A
60.3mm   CCC CO
```

In the lower left corner, you can see the value that you defined to measure with the analog channel. In this case, it is motion. During measurement of motion, the value represents the moving contact's distance from the breaker's stable open position.

```
0041.7ms 1.566A
60.3mm   ORC CO
```

Note *If the analog channel is not activated (position Off), this field is empty.*

Time channel's status:

```
0041.7ms 1.566A
60.3mm   ORC CO
```

Status:

O = open
R = resistor
C = close

Note *If you enter a time that exceeds the measure time used, the* **display** *shows dashes instead of measured values.*

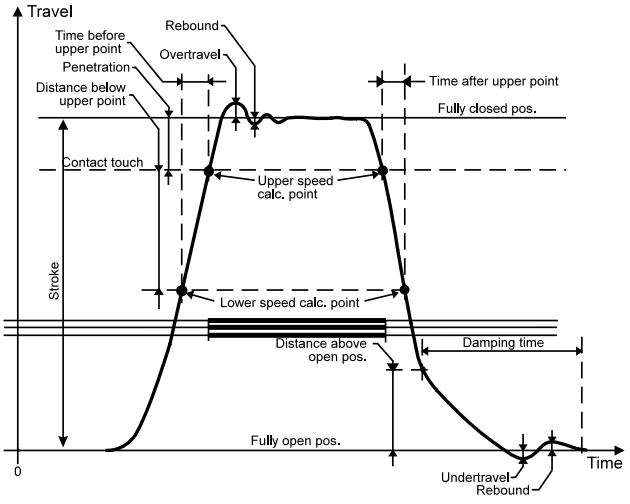
```
1000.1ms ——
——       ——
```

Calculated parameters

Press **ENTER** to see the calculated parameters. By continuing to press **ENTER**, you can step through all the calculated parameters. To view a previously shown parameter, press the **ESC** key.

Note *You must choose MOTION from the ANALOG CHANNEL to display the parameters related to motion measurement.*

The calculated parameters are distinguishable between the different types of operations. The following curve diagram refers to the description of the calculated parameters.



The following ten parameters are calculated for the respective operation:

1. Function time for every phase

Close time is calculated as the first contact touch of the main contact. Open time is calculated as the last separation of the main contact.

Close

```
Closing Time L1
62.4ms
```

Open

Opening Time L1
42.1ms

During an OCO operation, the first and second opening times are shown according to the windows below:

1:Opn. Time L1
43.0ms

2:Opn. Time L1
383.7ms

2. Difference between the phases

This parameter is calculated as the largest difference between the three phases' main contacts.

Close

Cls. Phase Diff
2.2ms

Open

Opn. Phase Diff
1.4ms

During an OCO operation, the difference between the phases at the first and the second opening operations are shown, see below:

1:Opn. Phase Diff
1.9ms

2:Opn. Phase Diff
2.6ms

3. Difference between main contact and resistor contact for each phase

During a close operation, the parameter is calculated as the time difference between the first contact touch of the main contact and the first contact touch of the resistor contact. During an open operation, the parameter is calculated as the time difference between the last separation of the main contact and the last separation of the resistor contact.

Close

Cls. Main-Res L1
3.2ms

Open

Opn. Main-Res L1
0.0ms

During an OCO operation, the difference between the main contact and the resistor contact during first and second open operations are shown according to the windows below:

1:Opn Main-Res L1
0.0ms

2:Opn Main-Res L1
0.0ms

4. Close - open (trip-free) time (only during CO and OCO operations)

This parameter is calculated as the time difference between the first contact touch of the main contact of the fastest phase and the last contact separation of the main contact of the slowest phase.

Time C-O
24.4ms

5. Open - close (dead) time (only during OC and OCO operations)

This parameter is calculated as the time difference between the last contact separation of the main contact of the slowest phase and the first contact touch of the main contact of the fastest phase.

Time O-C
26.3ms

6. Current peak (only during close operation and open operation)

This parameter shows the peak value for coil current measured with EGIL's current channel. If the highest measured value is negative, it is depicted by a minus sign.

Current Peak
1.5A

7. Contact penetration at the main contact for each phase (only during close operation and open operation)

During a close operation, the contact penetration is calculated as the difference in travel between the first contact touch of the main contact and the stable close position of the main contact.

During an open operation, the contact penetration is calculated as the difference in travel between the stable close position of the main contact and the position of the main contact at the instant of the last contact separation. See the curve diagram above.

Penetration L1
38.9mm

8. Over travel (only during close operation and open operation)

This value shows how large a distance the breaker moves outside the stable close and open positions.

During a close operation, the over travel is calculated as the difference in travel between the breaker's stable close position and highest measured position. During an open operation, the over travel is calculated as the difference in travel between the breaker's stable open position and the lowest measured position. This parameter provides a specific measure that indicates the breaker's damping condition.

Overtravel
10.3mm

9. Rebound (only during close operation and open operation)

This value shows how large a distance the breaker bounces back after an operation.

During a close operation, the rebound is calculated as the difference in travel between the lowest measured position that occurs directly after the overtravel, and the breaker's stable closed position. During an open operation, the rebound is calculated as the difference in travel between the highest measured position that occurs directly after the overtravel and the breaker's stable open position.

If the rebound is to large, there is a risk of restriking during an open operation and contact bouncing during a close operation.

Rebound
1.7mm

10. Speed

This value shows the breaker's average speed between the two defined calculation points.

During a close operation, the parameter is calculated as the average speed between two points on the motion graph, which are defined on the menu CLOSE SPEED.

During an open operation, the parameter is calculated as the average speed between two points on the motion graph, which are defined in the menu OPEN SPEED. To input the speed calculation points, see sections "Open speed" and "Close speed" in this chapter.

Closing speed
4.6m/s

Opening speed
7.3m/s

During an OCO operation, the first and second open speed are as shown below:

1:Opening speed
7.2m/s

2:Opening speed
7.9m/s

Monitor

This menu shows the actual status at EGIL's outputs. This can be useful, for example to

- check that the measuring cables are correctly connected
- to adjust the position at a rotating transducer so that the zero point is not exceeded during an operation.

If you access this menu directly after you turn on EGIL's power, the motion transducer's reading is shown as a percentage (providing that you chose to measure MOTION in the ANALOG CHANNEL menu). After the measurement is taken, the moving contact's distance, in relation to the breaker's stable open position, is shown.

The **display** is divided into three parts which show:

- coil current
- the value on the analog channel
- the contact status at the time channel

***Example*:**

The following measuring values can be read out from the display.

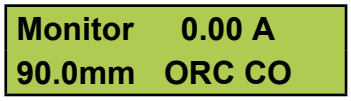
The instantaneous rate at the coil current that is measured with EGIL's internal current channel.

Monitor 0.00 A
90.0mm ORC OC

In the lower left corner, the instantaneous value of the quantity you chose to measure with analog channel is shown. In this case, it is motion. During measurement of motion, this value represents the moving contact's distance from the breaker's stable open position. Before the first measurement, the motion transducer's output is shown as a percentage. This makes it easier to adjust a rotating transducer during mounting. See the example below.

Note *If the analog channel function is not activated (in position Off), this field is empty.*

The time channel's instantaneous status:



Status:
O = open
R = resistive
C = close

Example:

Adjusting a rotating transducer

When you use a rotating transducer like a motion transducer, it is important that it is mounted so that the zero crossing is not exceeded during an operation. Complete the following steps:

1] Mount the rotating transducer on the breaker.

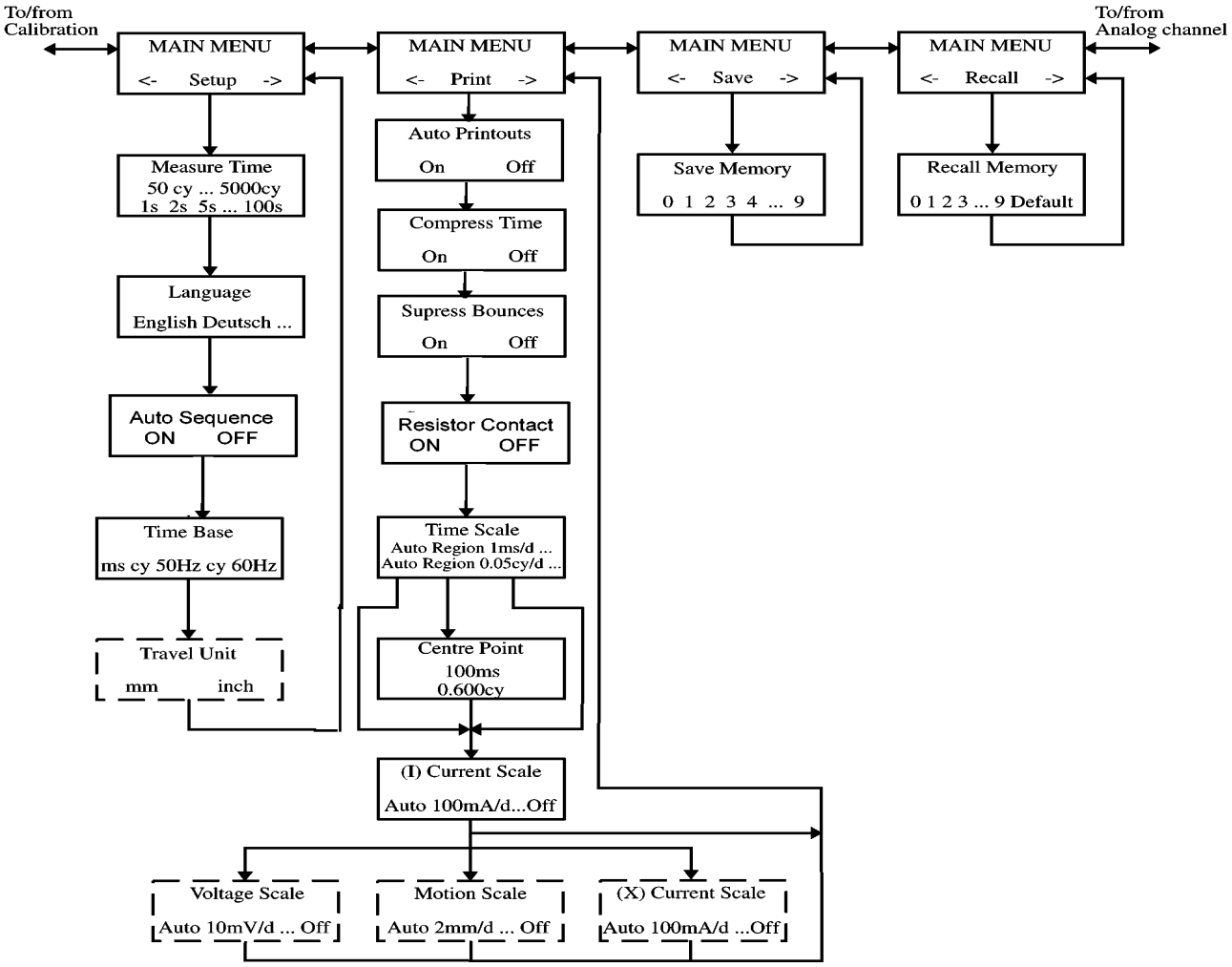
2] Select the MONITOR menu. If a percentage is not shown in the lower left corner, restart EGIL (turn off/turn on) and select the MONITOR menu again.

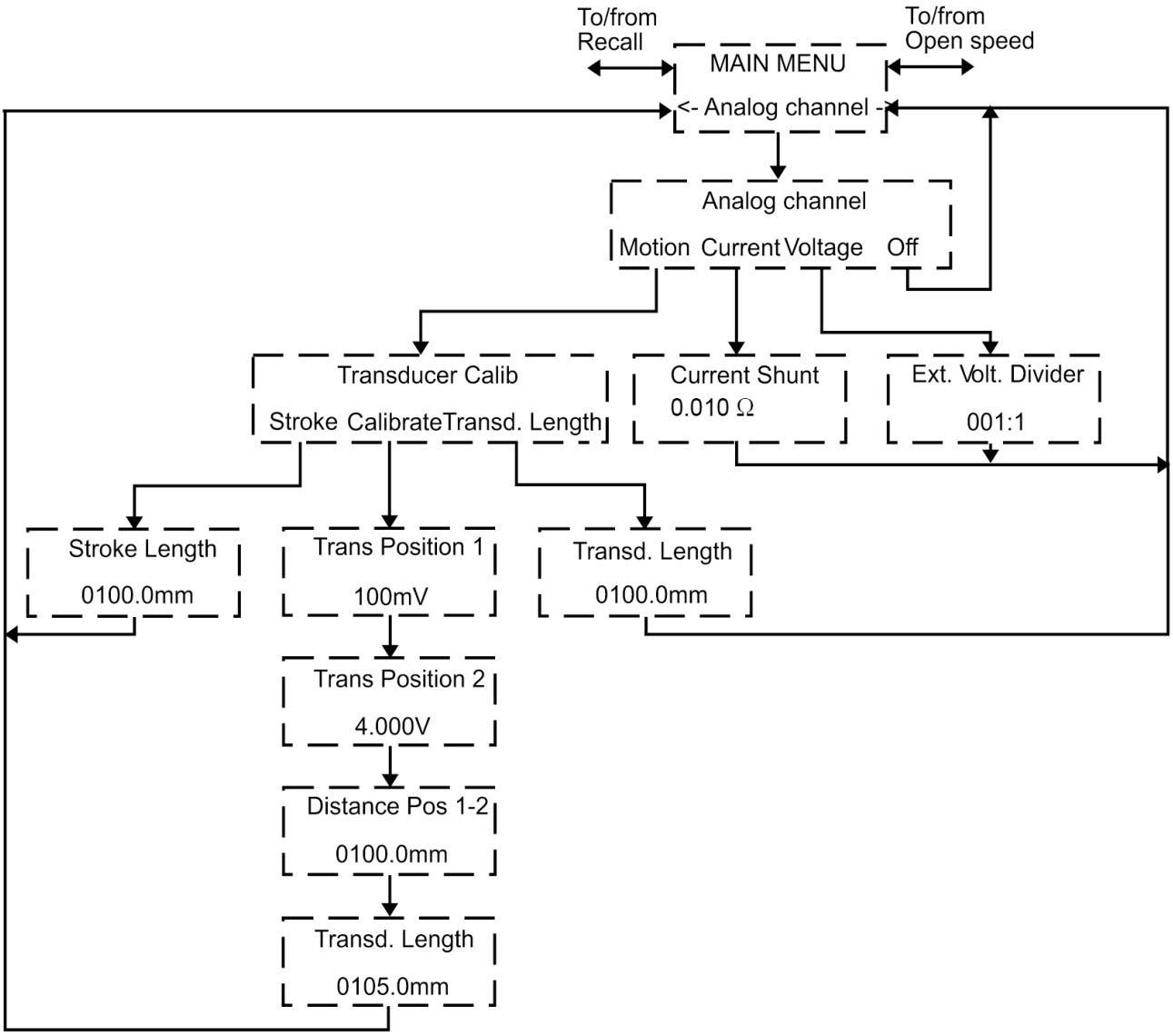
3] Gently loosen the transducer from its holder and turn it until about 50% is shown on the display. Now the transducer is in the middle of the measure region which means that it can rotate almost half way around in each direction without passing the zero crossing.

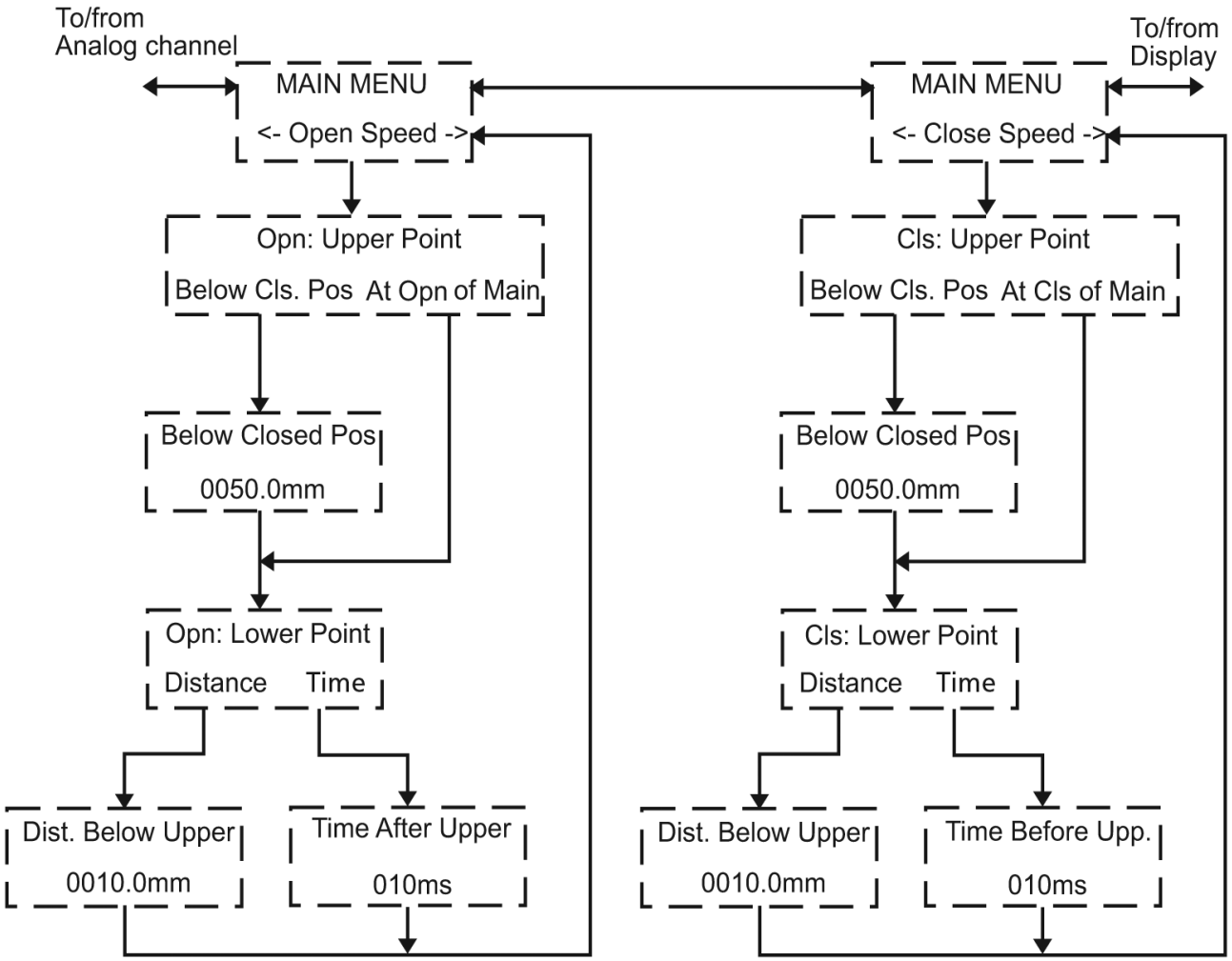
4] Make a measurement.

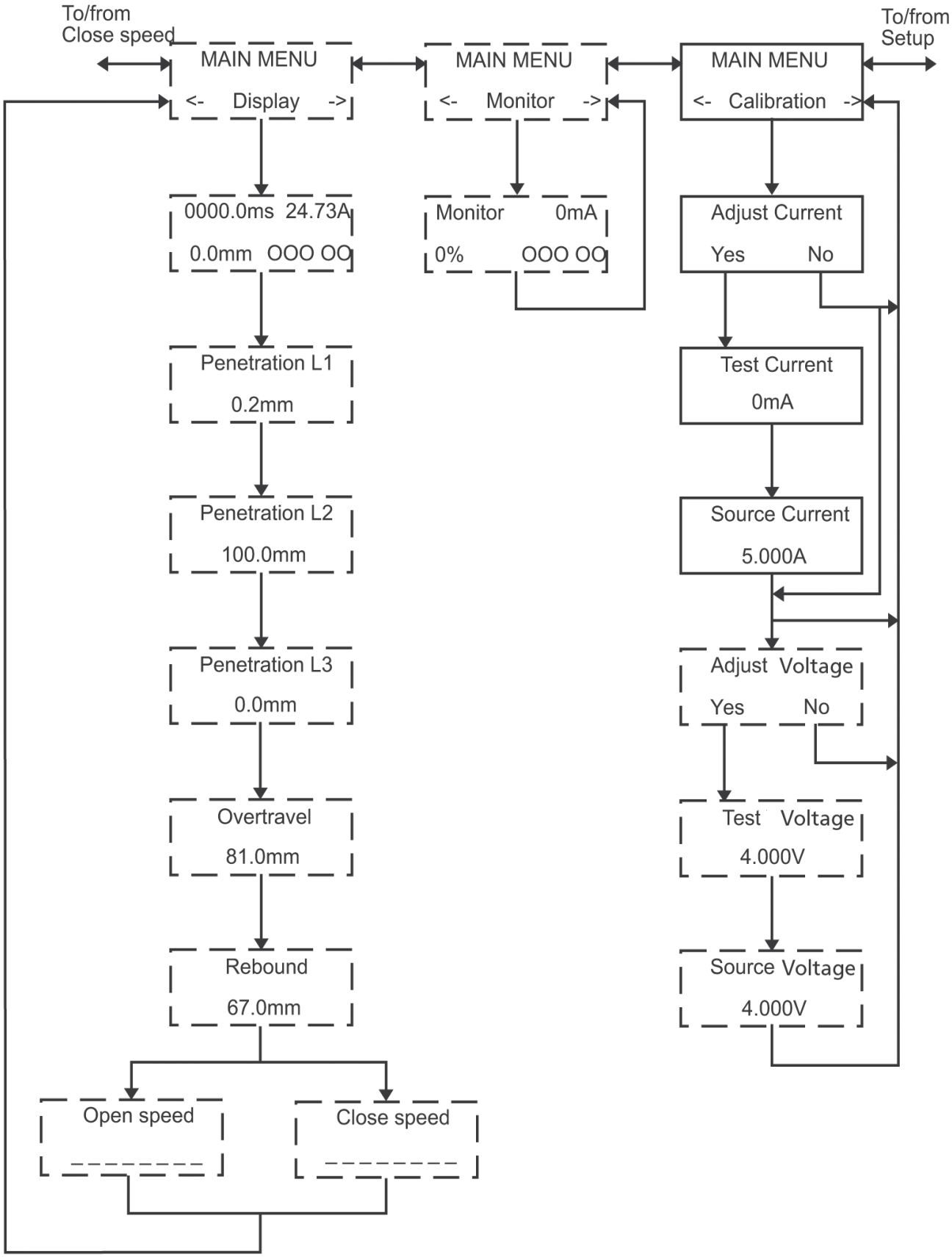
7.5 Menu tree for the MAIN menu

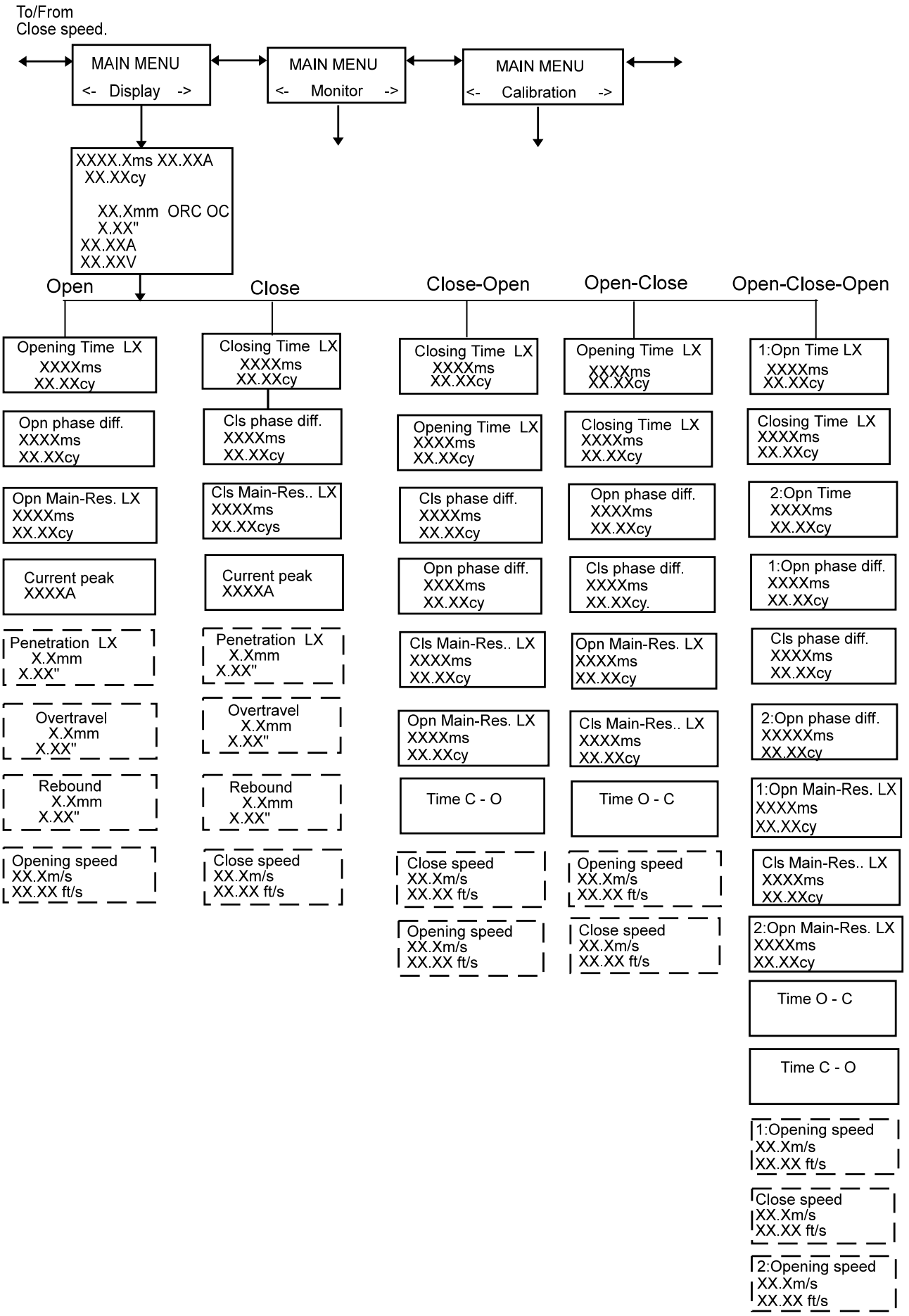
On the following pages, you can see a diagram of the menu headings and parameter settings in the MAIN menu.




To/from
Recall
MAIN MENU
To/from
Open speed
<- Analog channel ->
Analog channel
Motion Current Voltage Off
Transducer Calib
Stroke Calibrate Transd. Length
Current Shunt
0.010 Ω
Ext. Volt. Divider
001:1
Stroke Length
0100.0mm
Trans Position 1
100mV
Transd. Length
0100.0mm
Trans Position 2
4.000V
Distance Pos 1-2
0100.0mm
Transd. Length
0105.0mm


To/from
Analog channel
MAIN MENU
<- Open Speed ->
Opn: Upper Point
Below Cls. Pos At Opn of Main
Below Closed Pos
0050.0mm
Opn: Lower Point
Distance Time
Dist. Below Upper
0010.0mm
Time After Upper
010ms
To/from
Display
MAIN MENU
<- Close Speed ->
Cls: Upper Point
Below Cls. Pos At Cls of Main
Below Closed Pos
0050.0mm
Cls: Lower Point
Distance Time
Dist. Below Upper
0010.0mm
Time Before Upp.
010ms


To/from
Close speed
MAIN MENU
<- Display ->
MAIN MENU
<- Monitor ->
MAIN MENU
<- Calibration ->
To/from
Setup
0000.0ms 24.73A
0.0mm OOO OO
Monitor 0mA
0% OOO OO
Adjust Current
Yes No
Penetration L1
0.2mm
Test Current
0mA
Penetration L2
100.0mm
Source Current
5.000A
Penetration L3
0.0mm
Adjust Voltage
Yes No
Overtravel
81.0mm
Test Voltage
4.000V
Rebound
67.0mm
Source Voltage
4.000V
Open speed
Close speed


To/From
Close speed.
MAIN MENU
<- Display ->
MAIN MENU
<- Monitor ->
MAIN MENU
<- Calibration ->
XXXX.Xms XX.XXA
XX.XXcy
XX.Xmm ORC OC
X.XX"
XX.XXA
XX.XXV
Open
Close
Close-Open
Open-Close
Open-Close-Open
Opening Time LX
XXXXms
XX.XXcy
Opn phase diff.
XXXXms
XX.XXcy
Opn Main-Res. LX
XXXXms
XX.XXcy
Current peak
XXXXA
Penetration LX
X.Xmm
X.XX"
Overtravel
X.Xmm
X.XX"
Rebound
X.Xmm
X.XX"
Opening speed
XX.Xm/s
XX.XX ft/s
Closing Time LX
XXXXms
XX.XXcy
Cls phase diff.
XXXXms
XX.XXcy
Cls Main-Res.. LX
XXXXms
XX.XXcys
Current peak
XXXXA
Penetration LX
X.Xmm
X.XX"
Overtravel
X.Xmm
X.XX"
Rebound
X.Xmm
X.XX"
Close speed
XX.Xm/s
XX.XX ft/s
Closing Time LX
XXXXms
XX.XXcy
Opening Time LX
XXXXms
XX.XXcy
Cls phase diff.
XXXXms
XX.XXcy
Opn phase diff.
XXXXms
XX.XXcy
Cls Main-Res.. LX
XXXXms
XX.XXcy
Opn Main-Res. LX
XXXXms
XX.XXcy
Time C - O
Close speed
XX.Xm/s
XX.XX ft/s
Opening speed
XX.Xm/s
XX.XX ft/s
Opening Time LX
XXXXms
XX.XXcy
Closing Time LX
XXXXms
XX.XXcy
Opn phase diff.
XXXXms
XX.XXcy
Cls phase diff.
XXXXms
XX.XXcy.
Opn Main-Res. LX
XXXXms
XX.XXcy
Cls Main-Res.. LX
XXXXms
XX.XXcy
Time O - C
Opening speed
XX.Xm/s
XX.XX ft/s
Close speed
XX.Xm/s
XX.XX ft/s
1:Opn Time LX
XXXXms
XX.XXcy
Closing Time LX
XXXXms
XX.XXcy
2:Opn Time
XXXXms
XX.XXcy
1:Opn phase diff.
XXXXms
XX.XXcy
Cls phase diff.
XXXXms
XX.XXcy
2:Opn phase diff.
XXXXXms
XX.XXcy
1:Opn Main-Res. LX
XXXXms
XX.XXcy
Cls Main-Res.. LX
XXXXms
XX.XXcy
2:Opn Main-Res. LX
XXXXms
XX.XXcy
Time O - C
Time C - O
1:Opening speed
XX.Xm/s
XX.XX ft/s
Close speed
XX.Xm/s
XX.XX ft/s
2:Opening speed
XX.Xm/s
XX.XX ft/s

7.6 Select a menu item or parameter

The display shows the menu name on the first line and the alternatives on the second line. The selected item is indicated by "< >".

Example:

```
MAIN MENU
<  Setup  >
```

or

```
Next Sequence
    <C>        CO
```

1] To select parameters, use the buttons for left-arrow and right-arrow.

2] Press **ENTER** to confirm your choice and to proceed to the next menu level.

3] Press **ESC** to return to the previous menu level.

4] Change a numeric value

5] In some menus a value can be set. Select the digit to be changed by the left and right arrow key.

```
Cls Pulse Length
0.20s
```

6] Use the up and down arrows on the keyboard to set the desired value.

```
Cls Pulse Length
0.50s
```

7] Press **ENTER** to confirm and to continue to the next menu level.

8] Press **ESC** to return to the previous menu level.

7.7 Function keys

Key	Function
ESC	Go back to the previous menu level. If the currently displayed value has been changed, the change is cancelled.
ENTER	Confirm the selected alternative (indicated by "< >"), or confirm a displayed parameter value and proceed to the next function.
▲	Up-arrow key. Increase a value by one increment.
▼	Down-arrow key. Decrease a value by one increment.
►	Right-arrow key. A numeric field is then used to choose the number you will change. You change the value by using the up and down arrows on the keyboard. This key is also used to choose an option from a menu. The option you have chosen is shown within < >.
◄	Left-arrow key. See right -arrow key above.

8 How to make a time measurement

For control panel references, see Chapter 6 (Control panel).

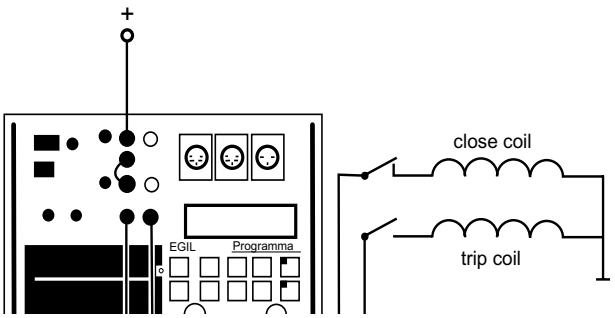
Important
Read the chapter “Safety” before using EGIL.
Always comply with local safety regulations.

Warning
Do not short-circuit or touch the auxiliary voltage. Use of “touch-proof” connectors is recommended.

Both breaker sides must be grounded when making connections to the breaker.

Always disconnect the breaker control circuit from EGIL control output, before doing any work on the breaker.

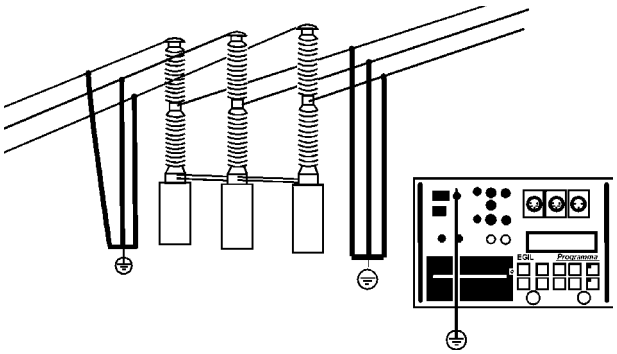
To avoid unintentional breaker operations while working on the breaker, connect the breaker control circuit to EGIL blind terminals as illustrated below.



The breaker control circuit connected to EGIL blind terminals

8.1 Connecting the device

9] Make sure that EGIL and the breaker are grounded as illustrated below.



1] Connect the power supply cable to EGIL.

2] Connect EGIL to the breaker.
Connect the time measurement cable to the breaker main contacts and to EGIL TIMING contact.

3] Connect the auxiliary contact measurement cable to the auxiliary contacts in the operating mechanism and to EGIL AUX1&2 contact.

4] **a).** If the measurement is on **wet (AC voltage)** auxiliary contacts, set the timing auxiliary inputs to wet mode (LED is off).
b). If the measurement is on **wet (DC voltage)** auxiliary contacts, set the timing auxiliary inputs to DRY mode (LED is on). **The red cable must be connected to the positive side of the auxiliary contact.**
c). If the measurement is on **dry** auxiliary contacts, set the timing auxiliary inputs to DRY mode (LED is on).

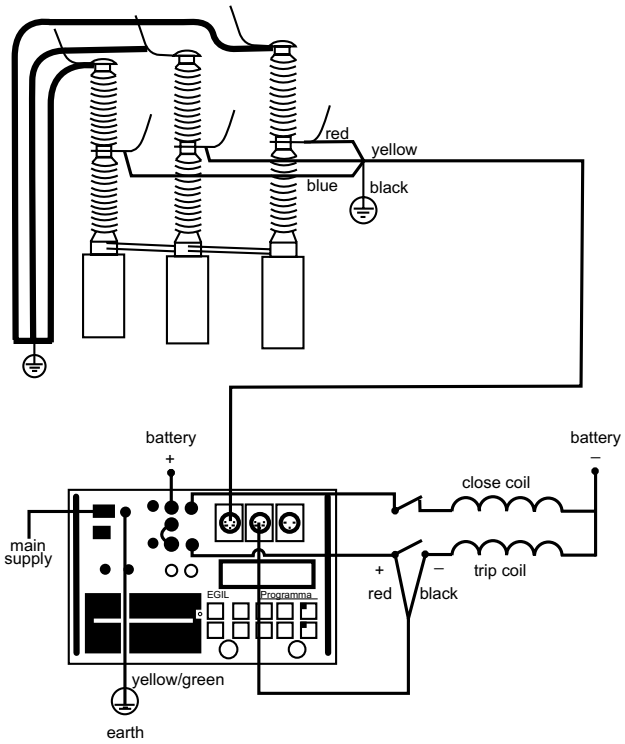
5] Connect the breaker close coil to EGIL close coil output.

6] Connect the breaker trip coil to EGIL trip coil output.

7] Make sure a jumper is connected between the trip coil input and the close coil input, (if the trip and close coil have the same voltage source).

8] Connect the battery plus (+) to EGIL coil input.

9] Remove the ground connections from one side of the breaker as shown in the picture below.



Important
When only one side of the breaker is grounded while making the test, special precautions must be observed to protect service personnel and the test equipment from harmful voltages.

10] Turn EGIL power switch on.
EGIL is now ready to operate.

8.2 Setting parameters

EGIL reads the status of the breaker (closed or open). The built-in sequence module is automatically set to the next logical single operation.

If multiple operation is requested, perform the following steps:

1] Select a sequence operation from the SEQUENCE menu by pressing the arrow-keys. 2.

2] Press **ENTER** to set pulse delay times and pulse length values if needed and press **ENTER** to confirm your settings.

For more information about parameters, see Chapter 6 (Menu options and parameter settings).

8.3 Running a measurement

Running a single close (C) or open (O) operation.

1] Connect the breaker as shown in section 8.1 above.

2] Run a breaker operation without measurement by turning the OPERATE knob. This tests the connection. Run the operation with measurement by turning the MEASURE knob.

Running an Open-Close-Open (O-C-O) operation.

1] Connect the breaker as shown in section 8.1 above.

2] Select O-C-O (open-close-open) operation in the SEQUENCE menu by using the arrow keys.

3] Press **ENTER** to set the close and open delay values. The default value is 300 ms (0.30 s) for close pulse delay and 10 ms (0.01 s) for opening pulse delay. Press **ENTER** to continue.

4] Set the pulse length values if needed. Press **ENTER** to confirm your settings.

5] Run a breaker operation without measurement by turning the OPERATE knob. This tests the connection. Run the operation with measurement by turning the MEASURE knob.

Note *The first measurement must be a single close or open operation.*

8.4 Reading the printouts

For more information about the printer, see Chapter 13 (The printer).

The first part of the printout shows administrative data and test conditions.

The second part of the printout shows the result in numeric and graphic form.

You can also view the results on the display if you activate the DISPLAY option on the MAIN menu.

9 How to make a motion measurement (option)

Option - >

For control panel references, see Chapter 6 (Control panel).

Important
Read the chapter “Safety” before using EGIL.

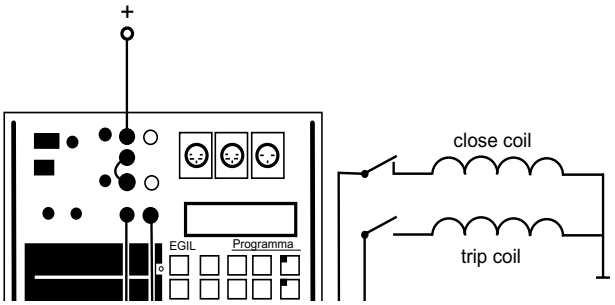
Always comply with local safety regulations.

Warning
Do not short-circuit or touch the auxiliary voltage. Use of “touch-proof” connectors is recommended.

Both breaker sides must be grounded when making connections to the breaker.

Always disconnect the breaker control circuit from EGIL control output, before doing any work on the breaker.

To avoid unintentional breaker operations while working on the breaker, connect the breaker control circuit to EGIL blind terminals (13 and 14) as illustrated below.

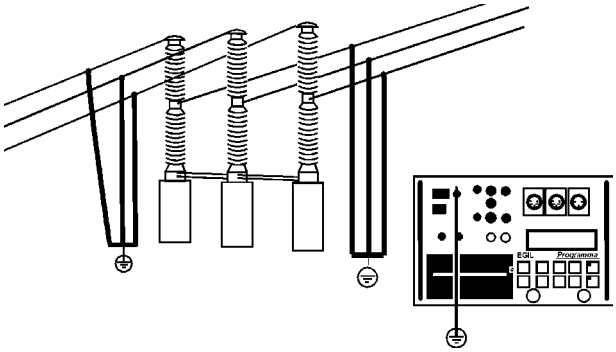


The breaker control circuit connected to EGIL blind terminals

Important
If only one side of the breaker is grounded while making the test, special precautions must be observed to protect service personnel and the test equipment from harmful voltages.

9.1 Connecting the device

1] Make sure that EGIL and the breaker are grounded as illustrated below:



2] Connect the power supply cable to EGIL.

3] Attach the transducer to the breaker rod or to the operating mechanism.

4] Connect the motion transducer cable to the MOTION connector.

5] Connect EGIL to the breaker.
Connect the time measurement cable to the breaker main contacts and to EGIL TIMING contact (15).

6] Connect the auxiliary contact measurement cable to the auxiliary contacts in the operating mechanism and to EGIL AUX1&2 contact.

a). If the measurement is on **wet (AC voltage)** auxiliary contacts, set the timing auxiliary inputs to wet mode (LED is off).

b). If the measurement is on **wet (DC voltage)** auxiliary contacts, set the timing auxiliary inputs to DRY mode (LED is on). **The red cable must be connected to the positive side of the auxiliary contact**.

c). If the measurement is on **dry** auxiliary contacts, set the timing auxiliary inputs to DRY mode (LED is on).

7] Connect the breaker close coil to EGIL close coil output.

8] Connect the breaker trip coil to EGIL trip coil output.

9] Make sure a jumper is connected between the trip coil input and the close coil input.

10] 10. Connect the auxiliary voltage plus (+) to the coil input on EGIL.

11] Turn EGIL power switch on.

Select measurement method

1] Select MOTION from the ANALOG CHANNEL menu.

2] Choose the measurement method.

If you use a rotating transducer or a linear transducer that is not directly mounted on the moving contact, select measure method STROKE LENGTH. Enter the moving contact's nominal stroke length and press **ENTER**. For more information, see section 7.4 "Analog Channel".

If you use a linear transducer that is directly mounted on moving contact, select measure method TRANSD LENGTH. Enter the transducer's length and press **ENTER**. If the exact length of the transducer is unknown, you can find out what it is by calibrating the transducer. For more information, see section 7.4 "Analog Channel".

EGIL is now ready for motion measurement. Remember that the first operation must be a single close or open operation.

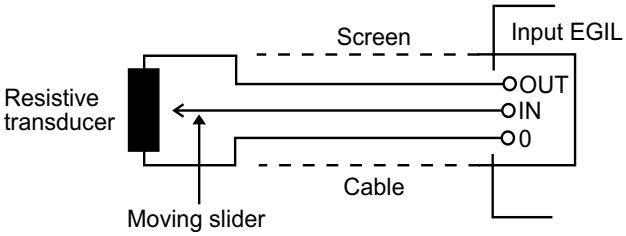
Connect the transducer

1] Connect the OUT terminal to one end of the position transducer (potentiometer).

2] Connect the IN terminal to the slide of the transducer.

3] Connect the 0 terminal to the other en of the transducer.

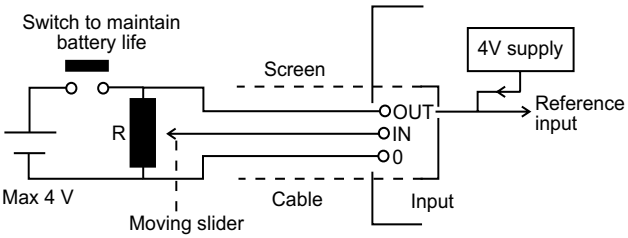
4] The cable shield should not be grounded on the transducer side.



Resistive position transducer with very low resistance

When the resistance is below 100 ohm, an external power supply has to be used, e.g. two torch (flash-light) batteries in series. Connect them across the transducer as shown below.

Except for extra power supply there is no difference in the way a low resistance position transducer is used.

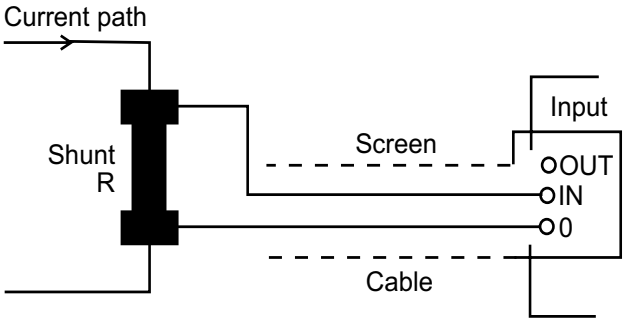


Measuring current with a external current shunt

Current shunt:

1] Choose a current shunt (resistor) with appropriate current capacity. Low resistance gives low voltage drop. High resistance gives higher resolution because of higher measuring voltage.

2] Connect voltage sensor wires to the IN terminal and to the 0 terminal.



For currents between 0 - 10 A, a 100 mΩ shunt is appropriate. For currents between 10 - 25 A, a 10 mΩ shunt is appropriate. Remember, that the current over the shunt should never exceed 4 V.

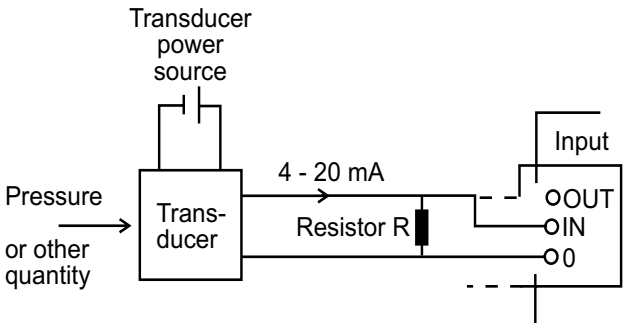
Make your setting in the ANALOG CHANNEL.

Choose CURRENT and set the shunt value.

For information about specific settings, see Chapter 7 (Menu options and parameter settings).

Measuring other quantities

4-20 mA transducer (for pressure or other quantity)



1] Connect the resistor across the input terminals IN and 0.

2] Connect the transducer across the resistor.

3] Make settings in the menu "Analog Channel".
Select voltage and set "Ext.Volt.Divider" to 001:1.

9.2 Setting parameters

EGIL reads the status of the breaker (closed or open). The built-in sequence module is automatically set to the next logical single operation.

If multiple operation is requested, perform the following steps:

1] Select a sequence operation from the SEQUENCE menu by pressing the arrow-keys.

2] Press **ENTER** to set pulse delay times and pulse length values if needed and press **ENTER** to confirm your settings.

For more information about parameters, see Chapter 6 (Menu options and parameter settings).

9.3 Running a measurement

Running a single close (C) or open (O) operation

1] Connect the breaker as described in section 9.1 above.

2] Run a breaker operation without measurement by turning the OPERATE knob. This tests the connection. Run the operation with measurement by turning the MEASURE knob.

Running an Open-Close-Open (O-C-O) operation

1] Connect the breaker as described in section 9.1 above.

2] Select O-C-O (open-close-open) operation in the SEQUENCE menu by using the arrow keys.

3] Press **ENTER** to set the close and open delay values. The default value is 300 ms (0.30 s) for close pulse delay and 10 ms (0.01 s) for opening pulse delay. Press **ENTER** to continue.

4] Set the pulse length values if needed. Press **ENTER** to confirm your settings.

5] Run a breaker operation without measurement by turning the OPERATE knob. This tests the connection. Run the operation with measurement by turning the MEASURE knob.

Note *The first measurement must be a single close or open operation.*

9.4 Reading the printouts

For more information about the printer, see Chapter 12 (The printer).

The first part of the printout shows administrative data and test conditions.

The second part of the printout shows the result in numeric and graphic form.

You can also view the results on the display if you activate the DISPLAY option on the MAIN menu.

Option - End

10 Connecting EGIL to a computer (option)

Option - >

If EGIL is equipped with a connector marked USB. EGIL can be connected to a computer in which the CABA Breaker Analysis program has been installed. This enables you to:

- store settings and test parameters for individual breakers in the computer
- make quick evaluations and comparisons
- print out reports
- store test results in the computer

The communication proceeds via the computer's USB port and the USB cable which is included when you purchase CABA for EGIL.

Note *If you do not use the included USB cable, make sure that the cable you use instead is a standard USB cable.*

The version R03B or a later version of the CABA Breaker Analysis program must be installed in the computer.

10.1 Connecting the computer

Note *A driver for the USB port on the EGIL must be installed before you can use the USB port. The USB driver is on the CABA Win CD ROM.*

To connect EGIL to the computer you must take the following steps in the sequence shown below:

1] Connect the cable included with CABA for EGIL between EGIL's USB port and the computer's USB port.

2] Start the computer.

3] Turn on power to EGIL.

4] Start CABA.

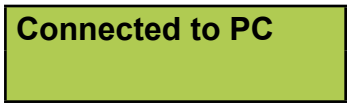
10.2 Operating EGIL while running CABA

For detailed information and guidance, see the CABA User's Manual.

Note *In the CABA menu headed "6.2 Computer Configurations", check to see that the correct serial port is selected and that the baud rate is set to 19200. Note, however, that 38400 will also work in some situations.*

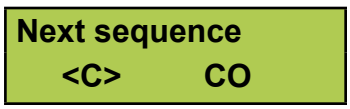
1] You create the breaker in the computer using the regular procedure, with one restriction: The test plan you select must be intended for EGIL.

When the computer establishes a connection with the breaker analyzer, the program checks whether an EGIL or another type of breaker analyzer is present, then adapts the on-screen information accordingly. When the communication between the computer and EGIL has started, a message reading "Connected to PC" appears in EGIL's **display**.



Note *You cannot perform any operations or make any settings via the control panel on EGIL while this message appears in the* **display**.

2] After you have selected "Measure" in CABA (found at the bottom of the connection list), the message in EGIL **display** changes to "Next sequence".



3] If the breaker is in the wrong state (open or closed) it can now be operated with the OPERATE knob. In EGIL's SEQUENCE menu, you can select the desired sequence, set pulse duration and set delay times for the close and trip pulses using the same procedures as those set forth in Chapter 7 (Menu options and parameter settings), see sections 7.2 and 7.3.

4] Turn the MEASURE knob in the usual way to execute the measurement, whereupon EGIL takes measurements and sends the results to the computer.

Option - End

11 Troubleshooting

11.1 General

The display does not show anything

Possible cause Fuse F1 may be broken.

Remedies Check that the mains voltage selector switch is set in an accurate position. Also check the mains voltage with a volt meter. Reset the fuse.

Breaker control circuits malfunctions

Possible cause The 12 A F fuses are broken.

Remedy Check the fuses and replace them.

The printer does not print and no message on the display

Possible causes Problems with the paper (incorrectly turned paper roll, the thermo sensitive side - outside of roll - must face towards the operator, bad quality, wrong size, etc.). Internal fault in EGIL.

Remedies Use the paper recommended by Megger Sweden AB, and turn it correctly. Contact Megger Sweden AB or your EGIL service representative.

When CABA is started with EGIL connected, CABA displays a message reading “Communication error”.

Possible cause Wrong cable used for connection. Wrong communication port set in CABA.

Remedy Use the cable delivered with CABA for EGIL as described in Chapter 9 (Connecting EGIL to a computer).
Check the CABA menu headed “6.2 Computer Configurations”, to see if the correct communication port has been set (normally COM1) and that the baud rate setting is correct (normally 19200).

You are unable to print from CABA on EGIL’s internal printer

Possible cause Wrong printer port set in CABA. Wrong printer selected in CABA.

Remedy Set the printer port to TM1600/EGIL in the CABA menu headed “6.2 Computer Configurations”.
Select one of the TM1600/EGIL printers in the CABA menu headed “6.3 Printer List”.

11.2 Displayed values

Reading — Strange result

Possible cause Something is wrong with your settings.
The settings are correct, but you have started the preparations for the next measurement too soon.

Remedies Check the parameter settings.
Restore the old settings. For more information about parameters, see Chapter 6 (Menu options and parameter settings).

Reading — Dashed lines instead of values

Possible cause In DISPLAY mode: The time set exceeds the established measuring time.
On the motion part of the test report: EGIL was not able to compute the speed because the points were not located. (The difference between the time values is too short, for example).

Remedies Set a new value located inside the measurement interval. Check your settings and change them if necessary.

Reading — Motion: Speed calculation failed

Possible cause EGIL was not able to find the points specified by your settings.

Remedy Change your settings. For more information about parameters, see Chapter 6 (Menu options and parameter settings).

11.3 Error messages

Message **Incorrect Status, Check hook-up, Set analog off**

Possible cause: The motion transducer is not moving or moving less than 5%, but the time input detects a change of state.

Remedy: Check the connection & mounting of the Motion transducer.

Message **Not calibrated, Adjust current, Adjust voltage**

Possible cause: The unit has a new EPROM, and the calibrations data are not found.

Remedy: Calibrate the current & voltage input.

Message **EPROM conflict**

Possible cause: Mixing of EPROM versions between the Master & the 1st or 2nd slave EPROMs.

Remedy: Contact your Megger representative.

Message **ROM ERROR**

Possible cause: Internal fault in EGIL, checksums of ROM do not match.

Remedy: Turn off the power. Contact your Megger Sweden AB representative.

Message **Not calibrated (showed at start-up)**

Possible cause: Calibration data are missing.

Remedy: Calibrate the unit by choosing CALIBRATION from the MAIN menu. For more information, see Chapter 11 (Calibration).

Message **Memory corrupted**

Possible cause: The settings which you try to recall are corrupt.

Remedy: Press **ESC**. If you just turned on the power, the default settings will be loaded, otherwise try to recall the default or another setting. If you cannot correct this, contact your Megger Sweden AB representative.

Message **Memory is empty**

Possible cause: The memory is empty because you have not recorded any data or you have interrupted the last recording process.

Remedy: Press **ESC**. Run a measurement.

Message **Printer Error**

Possible cause: The printer is out of paper or the head lever is up.

Remedy: Press **ESC**. Load new paper or close the head lever.

Message **Setting changed**

Possible cause: For CENTRE POINT - EGIL is not able to take your value as the centre point of the plot. EGIL has made its own proposal. For TIME AFTER UPPER & TIME BEFORE UPPER - due to round-off errors, the location of the lower point is slightly shifted.

Remedy: Press **ESC** to see the value proposed by EGIL. You can keep the value or change it. Press **ESC** to see the recalculated value. You can keep it or set another one.

Message **Pulse errors**

Possible cause: In OCO sequence open delay pulse + close pulse delay are shorter than open pulse length No. 1 (i.e. opening pulses are overlapping).

Remedy: Press **ESC**, change the parameters and start a new measurement.

Motion option

Option - >

Message **Overflow**

Possible cause: Motion calculation failed because the value is greater than 1000 mm (39.4”).

Remedy: Press **ESC** and check the calibration.

Message: **Not calibrated, press ESC (showed at measurement)**

Possible cause: Motion calculations failed because of wrong conditions.

Remedy: Press **ESC**.
Make a new measurement with a single sequence.
Switch off the analog channel if only time measurement is needed.

Message: **Motion analysis failed**

Possible cause: The motion analysis is not possible because the breaker did not operate or it did not reach its final position determined by the sequence setting.

Remedies: Repeat the measurement. Check the settings. Check that the breaker is in right position and that springs are charged before the measurement.

Message: **Out of range**

Possible cause: For analog channel parameters: The parameter value is out of the allowed range for this parameter. See corresponding specification. For TRANS POS1 & 2: The transducer piston is to close to the end of course (inside the 50 mV zone from the end).

Remedies: Press **ESC**. The setting which was valid before the incorrect input appears once more. You can set a new value.
Move the transducer piston out of the 50 mV zone.

Message: **Too small diff.**

Possible cause: For TRANS POS 2: The transducer piston has not moved enough, between the position 1 and 2 (less than 400 mV).

Remedy: Press **ESC** and move the piston to another position.

Option - End

12 Calibration

You can calibrate EGIL by adjusting the current and the voltage measurement. The zero adjustment is made automatically at the start-up of EGIL. The scale adjustment is defined as described below.

Calibration is recommended to be performed at least once a year.

IMPORTANT
Only qualified personnel should perform the calibration function.

If the calibration is performed in an improper way EGIL turns into a state where calibration is impossible and EGIL has to be sent to the factory for resetting the calibration value.

1] Select CALIBRATION in the MAIN menu:

```
MAIN MENU
< Calibration >
```

12.1 Coil current measurement

Confirm that you want to continue calibrating the current scale.

```
Adjust Current
  <Yes>      No
```

Note *Only qualified personnel should perform the calibration function.*

EGIL as an Ampere meter

1] Connect a stabilized DC current source with a calibrated ampere meter in series to the close coil input and output.

2] Turn the OPERATE or MEASURE knob to close the contacts.

3] Adjust the current to around 5 A. Note: If the test current is too low, the display will indicate “out of range!”

```
Test Curren
xxA
```

4] Press **ENTER** to continue.

Loading the precise current value

5] Enter the correct current value that was generated during the calibration procedure, red out from the ampere meter.

```
Source Current
xxA
```

6] Press **ENTER** to finish the current calibration.

Note *During the calibration most of the keys and knobs are disabled.*

12.2 Voltage measurement (Motion channel)

Confirm that you want to continue with the calibration of the voltage scale.

```
Adjust Voltage
  <Yes>      No
```

Note *This action changes the scale factor and must be done by qualified personnel only.*

EGIL as a Volt meter

1] Connect a stabilized voltage source with a calibrated volt meter in parallel to the motion input, pin 1 and 3.

2] Adjust the voltage in the motion circuit to about 4 V. Note: If too low or too high voltage is applied, the display will indicate “out of range!”.

```
Test Voltag
xxV
```

3] Press **ENTER** to continue.

Loading the precise voltage value

4] Enter the correct value of the voltage used during the calibration procedure red out from the volt meter.

```
Source Voltage
xxV
```

5] Press **ENTER** to finish the calibration process.

Note *During the calibration most of the keys and knobs are disabled.*

12.3 EGIL as a timer

1] Connect the start input of a calibrated frequency counter to the close coil input/output of EGIL.

2] Connect the stop input of the frequency counter to the open coil input/output of EGIL.

3] Set the delay time of open to 500 ms.

4] Select a C-O operation.

5] Connect timing channels L1/L2/L3 to the open input/output.

6] Turn the MEASURE knob.

7] Compare the timing result of EGIL with the result of the frequency counter.

Note *This is a verification of the timing accuracy. There are no possibilities of adjustments.*

13 The printer

13.1 General information

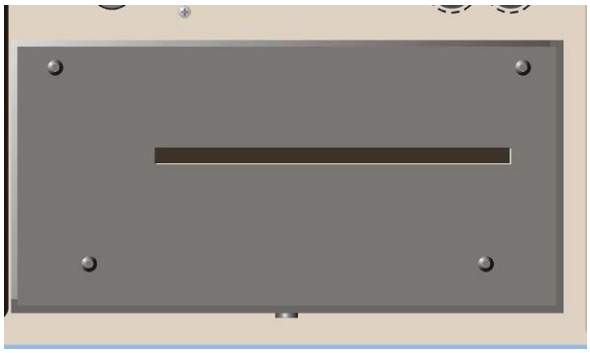
The printer is a high-speed text/graphic thermal printer. This technology gives a silent operation, long life, and a good contrasted printing.

It uses heat sensitive paper with a width of 114 mm (4.488 in.) maximum.

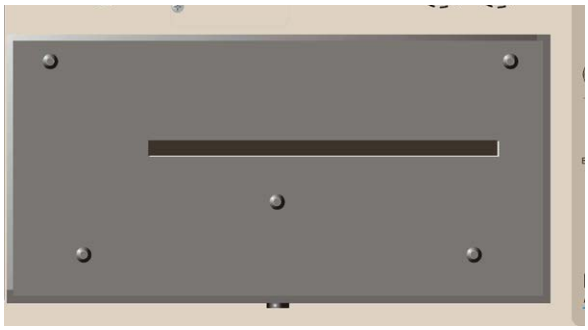
Important

Only use the specified type of paper.

The new version of the printer is not exchangeable for a printer in an older EGIL because they have unlike cable connectors. You can also see the difference on the top cover, see images below.



Old printer, four screws on top



The new version of printer has five screws on top

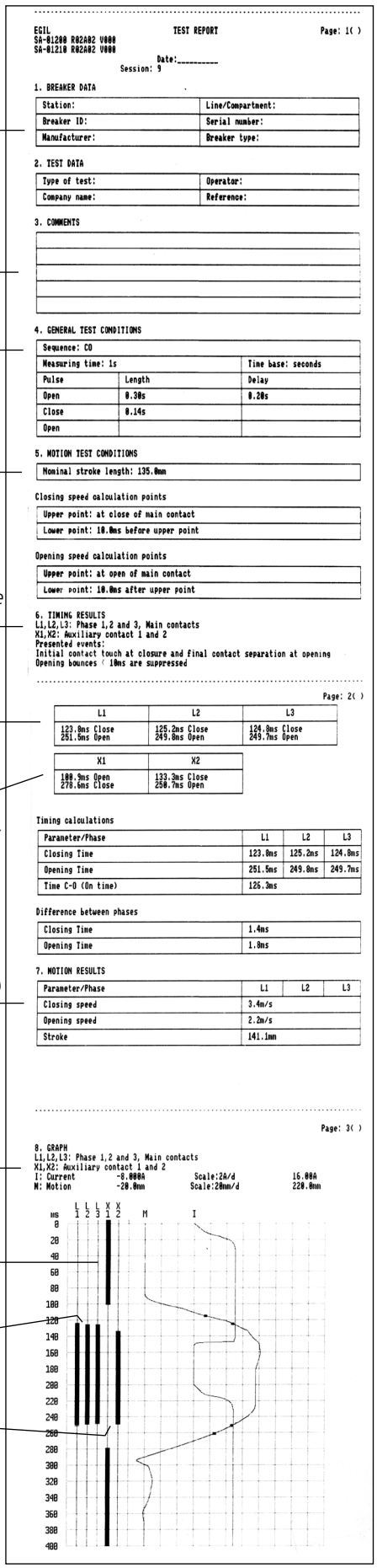
13.2 Printouts

The page of the printout is divided in 4 main parts:

- The general text part (part 1, 2, 3)
- The test conditions part (part 4, 5)
- The test results part (part 6, 7)
- The graphical printout (part 8)

Note *Parts 5 and 7 are used in the motion option which is not part of the basic package.*

Parts 1 - 7 are illustrated below.



Space for your report data

Space for your comments

Parameters you have selected for breaker operation

Parameters you have selected for travel (motion) measurement

Filtering you have selected for time results

Tabular printout of time measurements at main contacts

Tabular printout of time measurements at auxiliary contacts

Tabular printout of travel (motion) calculations

Graphical printout

Auxiliary contact, close circuit

Main contacts

Auxiliary contact, trip circuit

The graphical printout

The graphical printout shows the current, the motion and the contact events in relation to the measured time.

The timing printout matrix is 3 x 20, and the current/ motion matrix is 12 x 20 divisions.

The printout scale for the current and voltage is 5 x 5 mm. This gives a possibility to copy the graph on a copying machine by a factor 2, to enlarge the result on a A4 format page. The scale of the graph will then be 10 x 10 mm (1 x 1 cm).

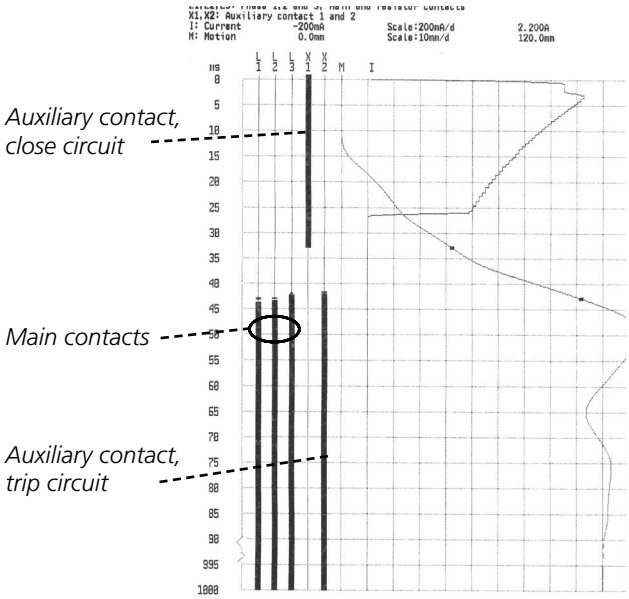
The contact events (3 timing inputs and 2 auxiliary inputs) in relation to time are shown on the first five lines. The 3 timing inputs sense the type of contact and is printed as follows:

Type of contact	Input values	Printed line
No contact - Open	∞ Ω	Fine line
Resistor contact closed	10 Ω to 3000 Ω	1 mm line
Main contact closed	< 10 Ω	2 mm line

The scale for the current is written on the second part of the graph: for example 10 A/div.

The scale for the motion (option) is written on the same graph as the current: for example 50 mm/div.

Part 8 is illustrated below:



Auxiliary contact, close circuit

Main contacts

Auxiliary contact, trip circuit

13.3 Paper reload

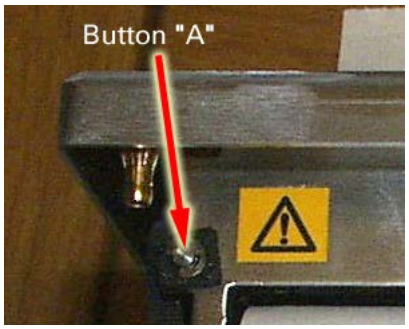
Proceed as follows to reload paper:

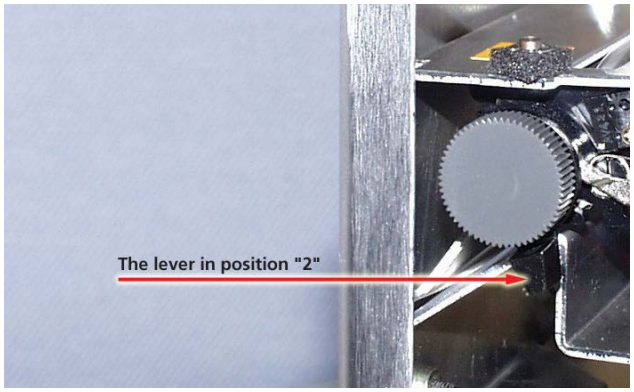
1] Release the printer locking mechanism with the button on the front of the printer cover.

2] Pull the printer straight out and place it on the top panel.

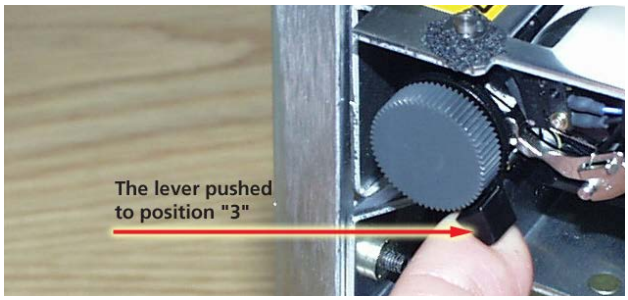
Note *Do not disconnect any cables.*

3] Push the button "A", the lever below will snap to position "2".



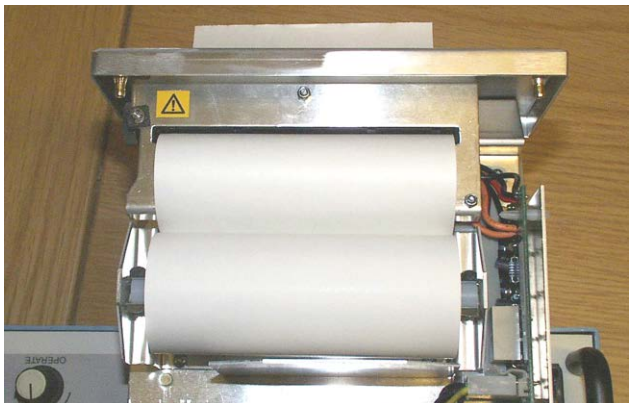


4] Push the lever from "2" to position "3".

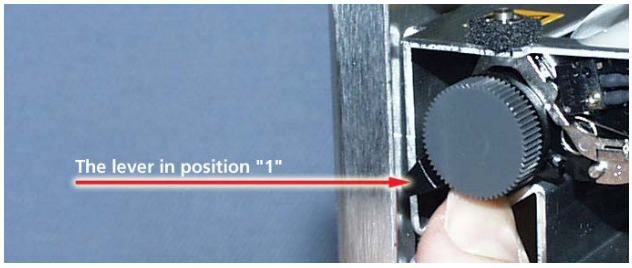


5] Insert the new paper roll into the slot with the printing surface facing down, see image below.

6] Pull the paper out about 20 cm (8 inches) and tear of excess.



7] Push back the lever to position "1".



Important
Make sure that the cables are properly connected

8] Put the printer back into its holder and make sure that it is securely locked.

14 Specifications

14.1 Specifications EGIL

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment	
Application field	The instrument is intended for use in medium-voltage substations and industrial environments up to 130 kV.
Temperature	
Operating	0°C to +50°C (32°F to +122°F)
Storage & transport	-40°C to +70°C (-40°F to +158°F)
Humidity	5% – 95% RH, non-condensing
CE-marking	
EMC	2004/108/EC
LVD	2006/95/EC
General	
Mains voltage	115/230 V AC (switchable), 50/60 Hz
Power consumption	100 VA (max)
Dimensions	
Instrument	360 x 210 x 190 mm (14.2" x 8.3" x 7.5")
Transport case	420 x 300 x 230 mm (16.5" x 11.8" x 9.0")
Weight	6.3 kg (14 lbs). 10 kg (22 lbs) with accessories and transport case
Display	LCD
Available languages	English, German, French, Spanish, Swedish
Measurement section	
Time measurement	
Measurement time	1 to 100 s
Resolution	0.1 to 10 ms
Number of channels	3 with common ground
Time base inaccuracy	0.05% of the reading ± resolution
Status thresholds	
Closed	< 10 Ω ±20%
Resistor	10 Ω ±20% to 3 kΩ ±20%
Open	> 3 kΩ ±20%
Open circuit voltage	24 V ±20%
Short circuit current	100 mA ±20%
AUX 1&2	
Number of channels	2, galvanically isolated
Contact-sensing (Dry)	
Status thresholds	
Closed	< 600 Ω ±30%
Open	> 600 Ω ±30%
Open circuit voltage	20 V ±20% DC
Short circuit current	25 mA ±20%
Voltage sensing (Wet)	
Status thresholds	
Open indication	< 8 V (polarity insensitive)
Close indication	> 13 V (polarity insensitive)
Working voltage	250 V AC/DC
Current measurement	
Range	±25 A per channel
Resolution	25 mA
Inaccuracy	1% of the reading ±100 mA
Working voltage	250 V AC/DC
Breaker operation	
Sequences	C, O, C-O, O-C, O-C-O
Continuous current	5 A
Max current	25 A during 300 ms, rest time 1 min
Contact function	Two independent control functions
Contact characteristics	Non bouncing, closing time max. 0.1 ms
Make/Break capacity	25 A, 250 V (AC or DC) per contact function
Start breaker operation	By rotary switch
Pulse length	Adjustable in steps of 10 ms
Pulse delay	Adjustable in steps of 10 ms
Working voltage	250 V AC/DC
Motion (optional)	
Number of channels	1 independent
Max cable length	10 m (33 ft)
Input	
Range	-4 V to +4 V
Resolution	2 mV
Inaccuracy	1% of the measurement range
Transducer resistance	1 kΩ to 5 kΩ
Input impedance	150 kΩ
Output	
Open circuit voltage	4,095 V ±4 mV
Short circuit current	115 mA

SDRM (optional)

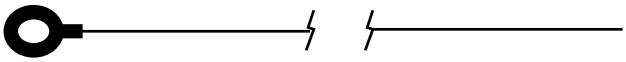
Pin	Signal	Maximum rating
1	Current sense input	-12 V < U < 12 V
2	Common	N/A
3	+15 V supply output	18 V DC, 100 mA DC
4	-15 V supply output	-18 V DC, 100 mA DC
5	Voltage sense input	-12 V < U < 12 V
6	Trig output	15 V DC, 10 mA
7	Relay input	18 V, 90 mA

USB interface for PC (optional)	
Type	USB
Printout	
Type of printout	Graphic and numeric
Printer	Thermal printer with fixed print head
Graphic resolution	8 dots/mm – 203 dpi
Paper width	114 mm (4.5")

14.2 Cables

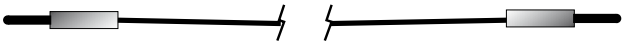
Mains power supply
Suited for respectively region/country
Standard cable length

Earth (ground)
Art. No. GA-00200
Cable length 3 m (9.8 ft) green/yellow cable with round or U-end terminal



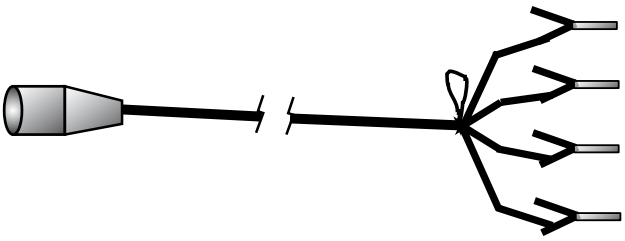
Breaker control cables
Art. No. 04-35030
Cable length 2x2 m (6.6 ft)
Banana contacts (black) in each end

Breaker control cables
Art. No. 04-35032
Cable length 2x2 m (6.6 ft)
Banana contacts (red) in each end



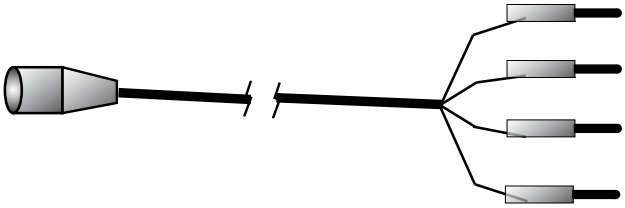
Cable for measuring main contacts (TIMING)
Art. No. GA-00160
Cable length 5 m (16.4 ft)5-pin XLR contact (female) to 4 crocodile clamps.

1x black	Ground GND
1x red	L1
1x red	L2
1x red	L3

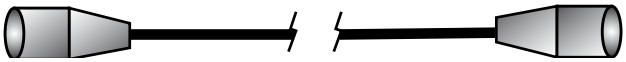


Cable for time measuring of auxiliary contacts (AUX1&2)
Art. No. GA-00170
Cable length 2 m (6.6 ft)
5-pin XLR contact (female) to 4 banana contacts (male)

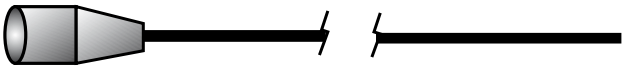
1x black	AUX1 GND
1x red	AUX1
1x black	AUX2 GND
1x red	AUX2



Extension cable for above cables (TIMING and AUX1&2), (extra accessories)
Art. No. GA-00150
Cable length 10 m (32.8ft)
5-pin XLR contact (female) to
5-pin XLR contact (male).



Connection cable for motion transducer (MOTION) (extra accessories)
Art. No. GA-0041
Cable length 1 m (3.2 ft)
Shielded, 3-pin XLR contact (female) in one end, unconnected in the other end.



Extension cable for motion transducer (extra accessories)
Art. No. GA-00042
Cable length 7.5 m (24 ft)
Shielded, 3-pin XLR contact (female) to 3-pin XLR contact (male)

14.3 Connections

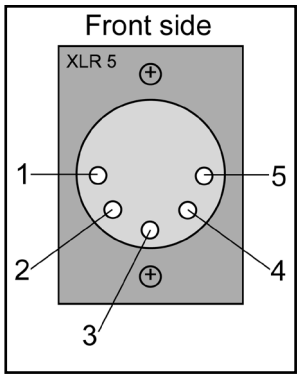
TIMING input

1: Channel L1 signal	L1
2: Channel L2 signal	L2
3: Common ground	GND
4: Channel L3 signal	L3
5: Not connected	

AUX1&2 inputs

1: Channel AUX1 ground	GND1
2: Channel AUX1 signal	AUX1
3: Channel AUX2 ground	GND2
4: Channel AUX2 signal	AUX2
5: Not connected	

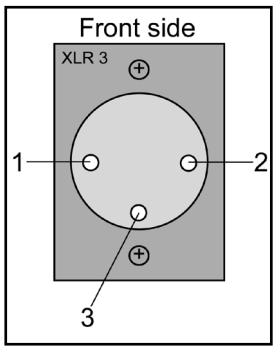
The XLR5 plug, used for both TIMING and AUX1&2 inputs is illustrated below:



Motion input (option)

1: Ground	GND
2: Out	OUT
3: In	IN

The XLR3 plug, used for the MOTION input is illustrated below:



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- Line Testing Equipment
- Low Resistance Ohmmeters
- Motor & Phase Rotation Test Equipment
- Multimeters
- Oil Test Equipment
- Portable Appliance & Tool Testers
- Power Quality Instruments
- Recloser Test Equipment
- Relay Test Equipment
- T1 Network Test Equipment
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Subject to change without notice. Printed matter No. ZP-BM01E | Doc. BM0087OE | V04a | 2015