# TM1700-series
## Circuit Breaker Analyser System




- **Provides reliable and accurate test results in noisy high voltage substations**
- **Five standard models. Full stand-alone functionality or data acquisition models without user interface.**
- **Fast and safer with DualGround™ testing, both sides of breaker grounded**
- **On-screen assistance with connection diagrams and test template Wizard**
- **All models can be controlled via computer**

## DESCRIPTION

The TM1700 series circuit breaker analysers utilises some of the ground breaking technology from the top of the line version TM1800. There are five models starting from PC-remote controlled to fully stand-alone. All models can be controlled from a computer using the well proven data management and analysing software CABA Win.

The robust design offers powerful technology that assists the user to achieve efficient and reliable circuit breaker testing. All inputs and outputs on the instrument are designed to withstand the challenging environment in high-voltage substations and industrial environments. Galvanically isolated inputs and outputs makes it possible to perform all relevant measurements in one test, eliminating the need for new setup and re-connections.

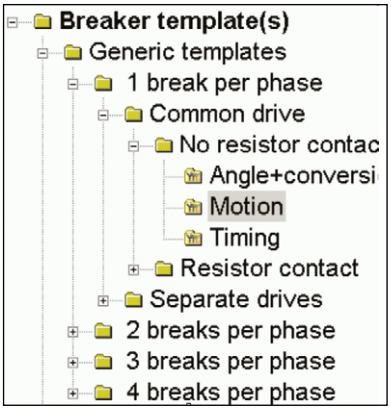
The patented DualGround™ method makes the testing safe and time saving by keeping the circuit breaker grounded on both sides throughout the test.

The timing measurement inputs are using a patented Active Interference Suppression algorithm to ensure correct timing and accurate PIR (Pre-Insertion Resistor) values even at high capacitively coupled interference currents.

The adaptive and easy-to-use software allow the user to perform the test by simply turning the test switch without the need for settings. The operator is only one click away from advanced help functions such as connection diagrams. The 8" color touch screen, with on-screen keyboard, allows the user to efficiently operate this high-level interface.

## SELECT – CONNECT – INSPECT

Working with TM1700 means fast and easy testing. Testing is done with a three-step process.

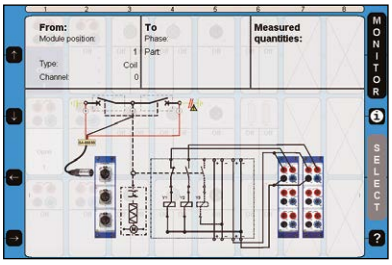



### Select

First step is to select a suitable template from the template library depending on number of contacts per phase, motion or not, resistor contacts and more.

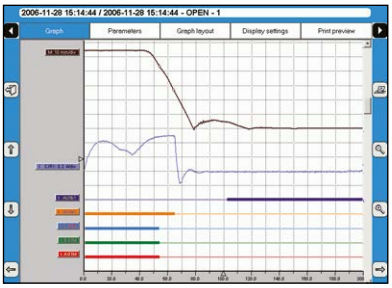
### Connect

Second step is to connect the test leads according to the graphical help screen. Separate help screens for each cable.




### Inspect

Third step is to turn the "Measure" knob. The measurement is performed, analysed and the results displayed on the screen. Magnification and compare functions are available..



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## TESTING WITH DUALGROUND

Electricity deregulation changes the business environment for utilities, switchgear owners and service companies. Deregulation has been shown to lead directly to increased emphasis on efficiency of operations, maintenance and service levels. Internationalisation of business brings new challenges: substantial investments by global corporations will bring with them sharper or new requirements for increased emphasis on health, safety and environmental compliance. Experience has also shown there is less time for testing because the switchgear is less and less available to be taken out of service.

### The safety aspect

Network operators and service companies need to maintain and develop their industry safety record. Eminent International bodies including the IEEE® and IEC®, National Safety agencies and Trade Unions increases the demands on safety. During the deregulation safety regulations have been clarified and the application of existing rules has been tightened. Keeping a good safety record is becoming a crucial asset to attract investors and customers.

In all substations the capacitive coupling from live high voltage conductors induce harmful/lethal currents in all parallel conductors. Grounding both sides of the test object will lead the induced current to earth and provide a safe area for the test personnel. See diagrams below.

### Both sides grounded

The best way to provide safety in circuit breaker testing is to keep both sides of the circuit breaker grounded throughout the test. This will also make the test faster and easier. Testing personnel should spend the minimum time in the substation and their focus should be the test rather than the equipment.

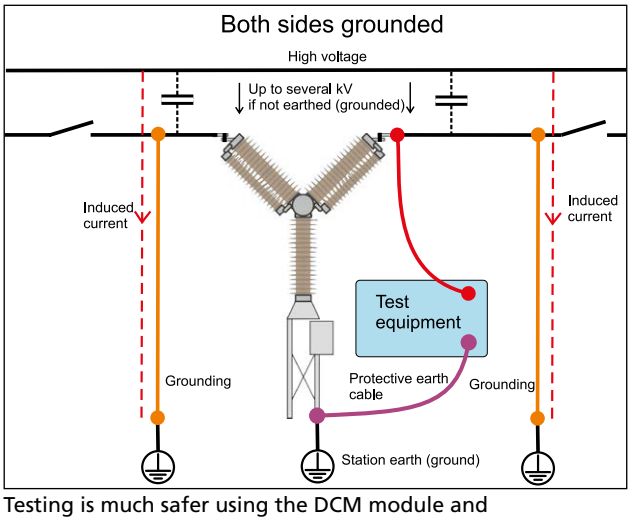
The DualGround™ testing method is available for all tests on all circuit breakers.

| Conventional | vs. DualGround |
|---|---|
| Site preparation (isolate work area, apply safety ground, issue permit to work) | Site preparation (isolate work area, apply safety ground, issue permit to work) |
| Hook up test equipment. Issue sanction for test | Hook up test equipment. Issue sanction for test |
| Authorised person removes the ground | Risky step left out |
| Perform testing | Safe testing with both sides grounded |
| Authorised person applies ground | Risky step left out |
| Cancel sanction for test. Disconnect test equipment | Cancel sanction for test. Disconnect test equipment |
| Site closing (cancel permit to work, disconnect ground) | Site closing (cancel permit to work, disconnect ground) |

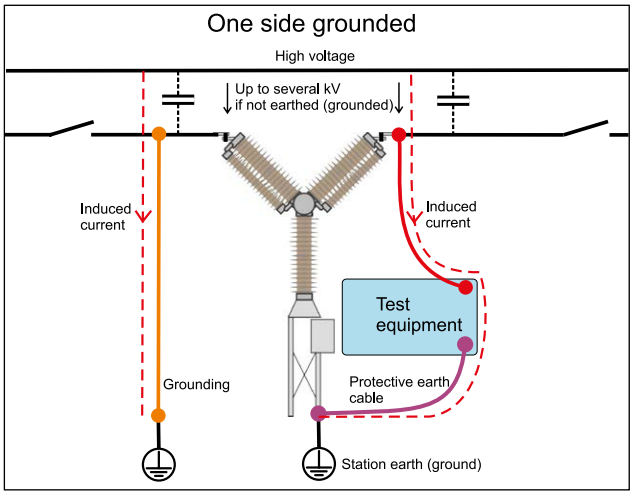
DualGround™ Testing

- Contact resistance — **MJÖLNER / SDRM202**
- Timing — **TM1700 with DCM**
- Motion — **TM1700**
- SDRM — **TM1700 with SDRM202**

Equipment and methods that support DualGround™ testing are associated with the DualGround symbol. This symbol certifies the use of ground-breaking technology and methods that enable a safe, fast and easy workflow with both sides grounded throughout the test.




Testing is much safer using the DCM module and DualGround.

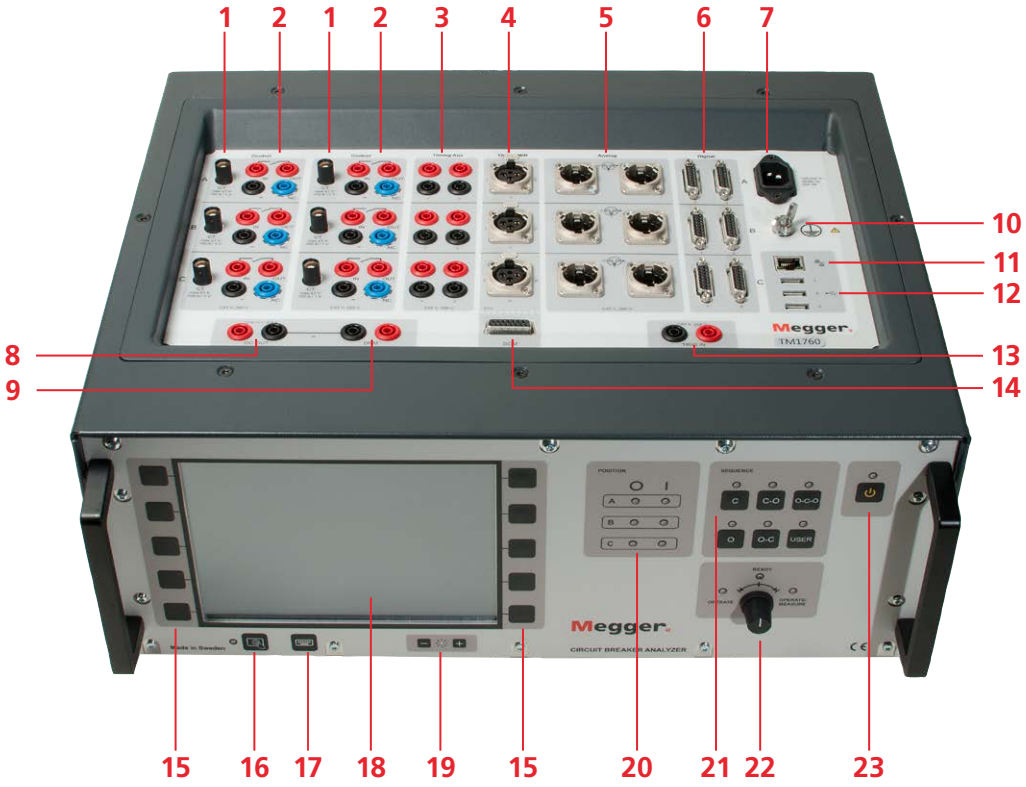



With only one side grounded the induced current can reach values high enough to be harmful or lethal for humans.

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## FEATURES AND BENEFITS

1. Input for external clamp-on CT
2. Control section
   - Three independent contact functions
   - Pre-programmed sequences C, O, C–O, O–C, O–C–O
   - Timing of a and b auxiliary contacts
   - Coil current, voltage and resistance
3. Timing Aux section
   - Six galvanic isolated channels
   - Polarity insensitive
   - Dry and wet auxiliary contacts
4. Timing M/R section
   - Six inputs
   - High resolution 15 µV and up to 40 kHz sampling
   - Main and parallel resistor contact timing
   - Resistance value of parallel resistors
5. Analog section
   - Six channels (three optional)
   - Supports industrial analog transducers
   - Insulated channels, measure up to 250 V whithout volt. div.
   - High resolution 0.3 mV, sampling rate 40 kHz
6. Digital section
   - Six channels
   - Incremental transducers with RS422
   - Up to ±32000 pulses resolution
   - Up to 40 kHz sampling
7. Mains input
8. DC out
   - General voltage source ,12 V
9. DRM
10. Earth (ground) terminal
11. Ethernet port
12. USB ports
13. Trig IN
    - Used for external trig of the unit. Contact make / break or voltage signal.
14. DCM interface
15. Navigation buttons
    - Works in parallell with the touch screen buttons.
    - Most of the CABA Local functions are controlled by the ten navigation buttons.
16. Touch screen On/Off
17. On-screen keyboard On/Off
18. Display (touch screen)
    - High brightness for good visibility in direct sunlight.
19. Brightness setting
20. POSITION
    - Indicates the position of the circuit breaker main contacts if the coil circuit is connected to the control section.
21. SEQUENCE
    - Indicates the next operation of the circuit breaker. If Auto-detect breaker state is enabled in CABA Local or CABA Win, only possible sequences for the circuit breaker are selectable.
22. OPERATE/MEASURE
    - Initiates the selected operation sequence and makes the measurement. Green "READY" LED must be lit before turning the rotary switch. The yellow "OPERATING" LED is lit as long as the sequence is performed.
23. On/Off switch



## APPLICATION EXAMPLES

### First trip measurement

When a fault occurs on a transmission or distribution line, the mission for the circuit breaker is to open the circuit to isolate the fault from the power source. A quick interruption of the current will avoid or limit damage to expensive equipment caused by the high fault currents.

### Why capture first trip

Testing circuit breakers can be done in many ways, but one of the most common is timing of the main contacts, which gives a direct indication of the trip time. A typical procedure for performing a timing test on a circuit breaker is:

1. Open the CB
2. Disconnect the CB by opening the disconnector switches
3. Ground the CB
4. Perform the timing test

Will the timing tests show the true trip time? Well, not necessarily. Consider a circuit breaker that has been in service without operating for many months, even years, before it was taken out of service for testing. It might then be suffering from a lack of or dried grease and maybe corrosion in its bearings. These problems can, and most probably will, slow down the first operation.

The problem with this procedure is that the CB has been operated at least once before the testing procedure begins. This operation might be all it takes to "shake off" any corrosion problems or sticky bearings and bring the breaker's trip time up to standard. So when the actual timing test is performed, no problem exists and the service engineer thinks the breaker is in good shape and no further service is needed. Some moths later the corrosion is back and when a fault occurs the CB does not trip fast enough, or maybe not at all. This is why it is important to capture the first operation to reveal any problems with the CB.

### Methods

The "First Trip" measurement is a part of on-line testing, which means that the circuit breaker is in service. We will focus on three measurements; coil currents, control voltage and contact timing. However, other measurements that are possible on-line are auxiliary contact timing, motor currents and motion.

The coil currents are measured to give indication of any lubrication problems inside the main bearings or in the trip latch. By analysing the coil currents, indication of changes in resistance can also be detected. They are caused by short-circuited windings, burnt coils etc. The coil currents can be measured with either current clamps or with the analysers control module, if the utility allows a local breaker operation.

The control voltage is measured during the operation to give an indication of a weak battery bank. The station's battery voltage before an operation might be in order, and is monitored by the charging units. However, during the operation the power demand might be too great for the bank.

- If the voltage drop is greater than 10 % of the nominal voltage, it might be a sign of a failing battery bank.
- If the circuit breaker has three operating mechanisms, the coil currents and control voltages should be measured in each mechanism.

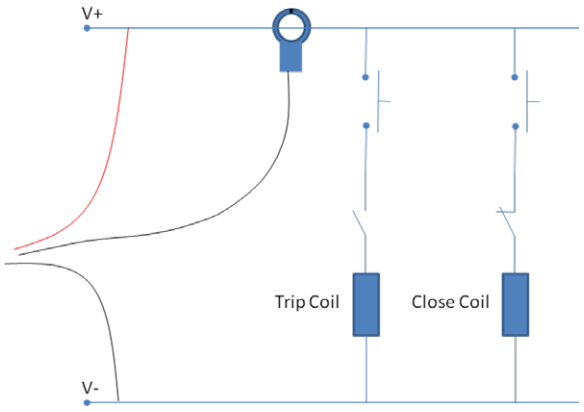



Figure 1 Point for measuring coil current and control voltage

Since the breaker is in service, the conventional way of measuring the times of the main contacts with timing leads across the interrupter cannot be used. Instead of timing leads, three current clamps are used. These current clamps are used on the secondary side of the current transformer for each phase. These show the current flowing through each phase and by looking for the instant when the current stops flowing, the breakers trip time is revealed.

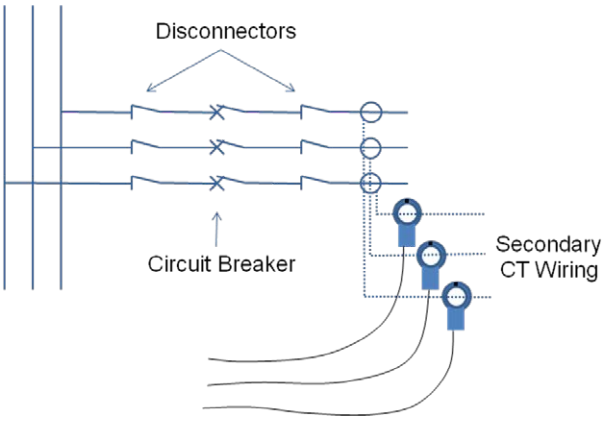



Figure 2 Point for measuring the line currents

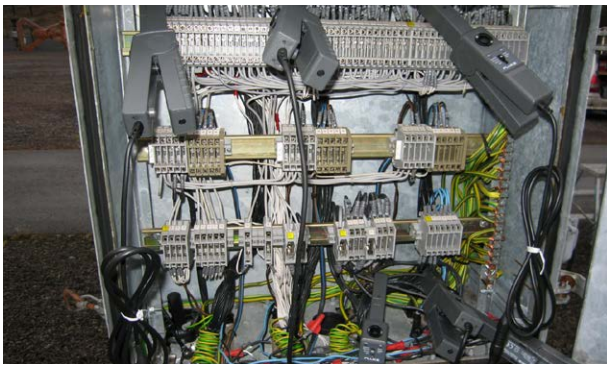


Figure 3 Control cabinet with current clamps

### Equipment

The equipment needed for a first trip measurement depends on the configuration of the circuit breaker. A common denominator for all measurements is the three current clamps for the line current are needed to capture the timing of the individual phases. These do not need to be able to measure DC currents, since they will only measure the alternating line currents. For the coil current, either one or three clamps are needed depending on the number of operating

mechanisms. These need to be able to measure both AC and DC to cover all types of coils, however DC coils being the most common.

## Analysis

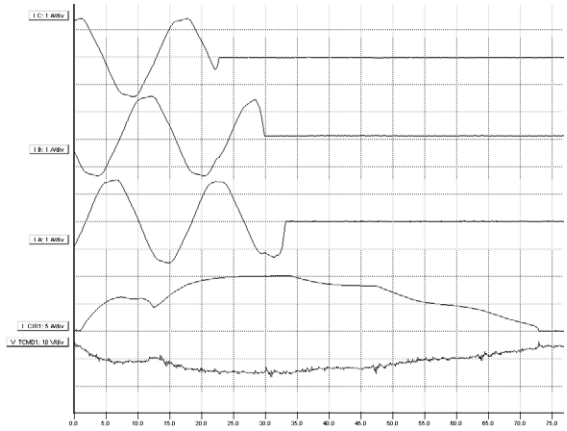


Figure 4 Example of measurement result

In figure 4, we see an example of a measurement that covers the three phases, one coil current and the control voltage.

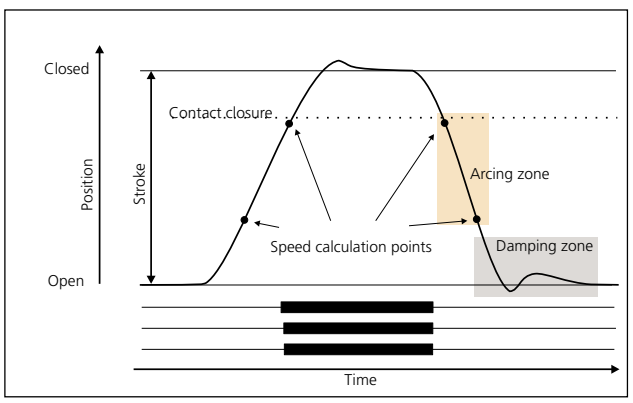
## Timing measurements

Simultaneous measurements within a single phase are important in situations where a number of contacts are connected in series. The breaker becomes a voltage divider when it opens a circuit. If the time differences are too great, the voltage becomes too high across one contact, and the tolerance for most types of breakers is less than 2 ms.

The time tolerance for simultaneous measurements between phases is greater for a 3-phase power transmission system running at 50 Hz since there is always 3.33 ms between zero-crossovers. Even so the time tolerance is usually specified as less than 2 ms for such systems. It should also be noted that breakers that perform synchronised breaking must meet more stringent requirements.

There are no generalised time limits for the time relationships between main and auxiliary contacts, but it is important to understand and check their operation. The purpose of an auxiliary contact is to close and open a circuit. Such a circuit might enable a closing coil when a breaker is about to perform a closing operation and then open the circuit immediately after the operation starts, thereby preventing coil burnout.

The "a" contact must close well in advance of the closing of the main contact. The "b" contact must open when the operating mechanism has released its stored energy in order to close the breaker. The breaker manufacturer will be able to provide detailed information about this cycle.




Motion diagram and timing graphs for a close-open operation

## Motion measurements

A high-voltage breaker is designed to interrupt a specific short-circuit current, and this is required to operate at a given speed in order to build up an adequate cooling stream of air, oil or gas (depending on the type of breaker). This stream quenches the electric arc sufficiently to interrupt the current at the next zero-crossover. It is important to interrupt the current in such a way that the arc will not re-strike before the breaker contact has entered the so-called damping zone.

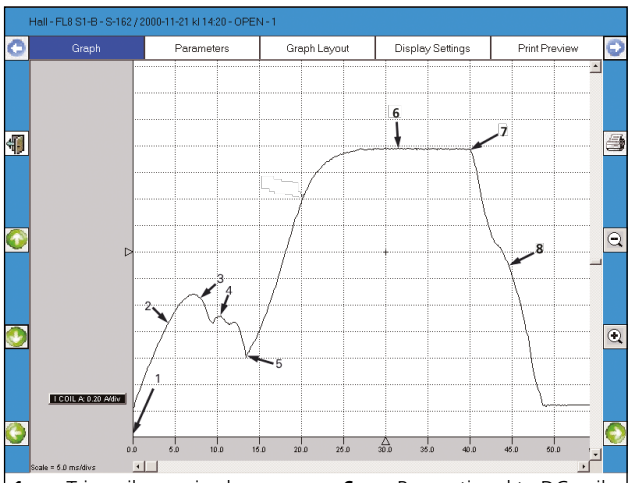
Speed is calculated between two points on the motion curve. The upper point is defined as a distance in length, degrees or percentage of movement from a) the breaker's closed position, or b) the contact-closure or contact-separation point. The lower point is determined based on the upper point. It can either be a distance below the upper point or a time before the upper point. The time that elapses between these two points ranges from 10 to 20 ms, which corresponds to 1-2 zero-crossovers.

The distance throughout which the breaker's electric arc must be extinguished is usually called the arcing zone. From the motion curve, a velocity or acceleration curve can be calculated in order to reveal even marginal changes that may have taken place in the breaker mechanics.

Damping is an important parameter for the high energy operating mechanisms used to open and close a circuit breaker. If the damping device does not function satisfactorily, the powerful mechanical strains that develop can shorten breaker service life and/or cause serious damage. The damping of opening operations is usually measured as a second speed, but it can also be based on the time that elapses between two points just above the breaker's open position.

## Coil currents

These can be measured on a routine basis to detect potential mechanical and electrical problems in the actuating coils well in advance of their emergence as actual faults. The coil's maximum current (if the current is permitted to reach its highest value) is a direct function of the coil's resistance and actuating voltage. This test indicates whether or not a winding has been short-circuited.




| | | | |
|---|---|---|---|
| **1** | Trip coil energised | **6** | Proportional to DC coil resistance |
| **2-5** | Armature travel | **7** | Auxiliary contact opens |
| **3-4** | Armature operates trip latch | **8** | Current decay |
| **4-5** | Armature completes its travel | | |
| **5** | Armature hits stop | | |

Example of coil current on circuit breaker

When you apply a voltage across a coil, the current curve first shows a straight transition whose rate of rise depends on the coil's electrical characteristic and the supply voltage (points 1-2). When the coil armature (which actuates the latch on the operating mechanism's energy package) starts to move, the electrical relationship changes and the coil current drops (points 3-5). When the armature hits its mechanical end position, the coil current rises to the current proportional to the coil voltage (points 5-7). The auxiliary contact then opens the circuit and the coil current drops to zero with a current decay caused by the inductance in the circuit (points 7-8).

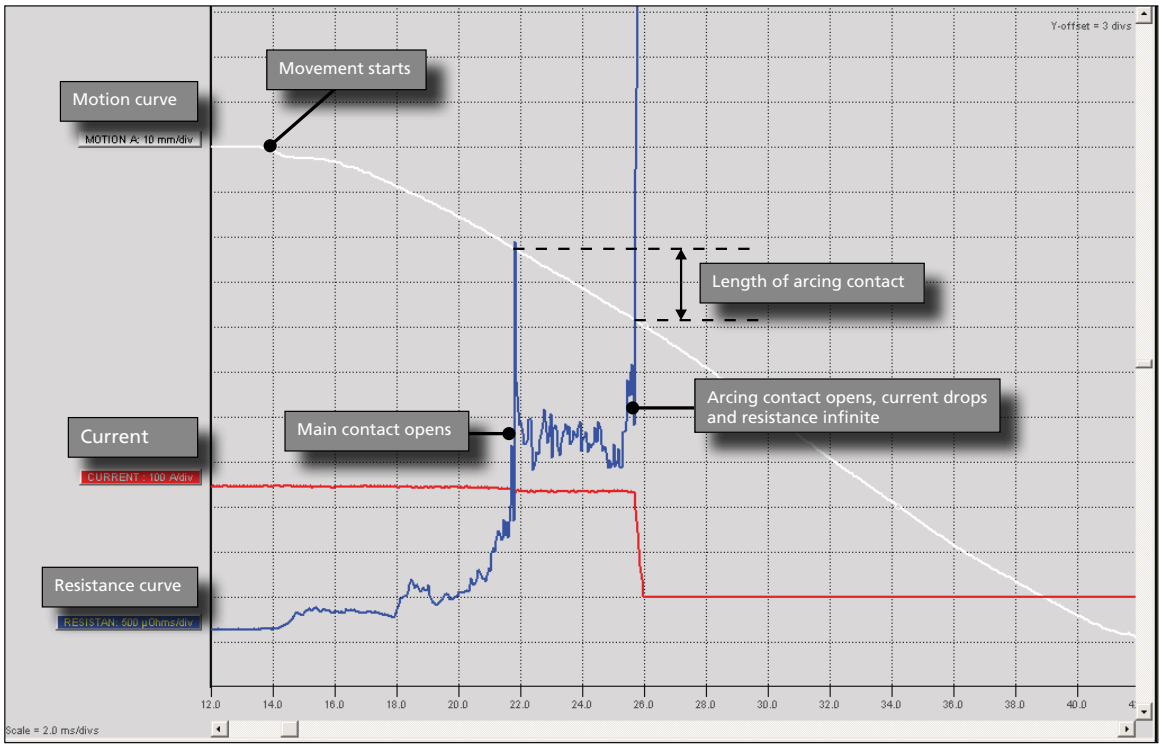
The peak value, of the first lower current peak, is related to the fully saturated coil current (max current), and this relationship gives an indication of the spread to the lowest tripping voltage. If the coil was to reach its maximum current before the armature and latch start to move, the breaker would not be tripped. It is important to note that the relationship between the two current peaks varies, particularly with temperature. This also applies to the lowest tripping voltage.

## Dynamic resistance measurement (DRM)

A circuit breaker will have arcing contact wear from normal operation as well as from breaking short-circuit currents. If the arcing contact is too short or in bad condition the breaker soon becomes unreliable. Main contact surfaces can be deteriorated by arcing, resulting in increased resistance, excessive heating and in worst-case explosion.

The main contact resistance is measured dynamically over an open or close operation in DRM. With DRM measurement the arcing contact length can be reliably estimated. The only real alternative to finding the length of the arcing contact is dismantling the circuit breaker.

A reliable DRM interpretation requires high test current and a circuit breaker analyser with good measurement resolution.




DRM is a reliable method to estimate the length/wear of the arcing contact. The SDRM202 provides high current and the TM1700 gives an accurate measurement with very good resolution. Besides, it is possible to use DualGround testing.

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## SPECIFICATIONS TM1700-SERIES

Specifications are valid after 30 minutes warm up time.
System time base drift 0.001% per year.
Specifications are subject to change without notice.

### Environment

| | |
|---|---|
| *Application field* | For use in high-voltage substations and industrial environments |
| *Temperature* | |
| *Operating* | -20°C to +50°C (-4°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 input (nominal)* | 100 – 240 V AC, 50/60 Hz<br>125 – 340 V DC |
| *Power consumption* | 200 VA (max) |
| *Dimensions* | 500 x 185 x 410 mm (19.7" x 7.3" x 16.1") |
| *Weight* | 12 kg (26.5 lbs) |

### External input

**TRIG IN**

**Voltage mode**

| | |
|---|---|
| *Input range* | 0 – 250 V AC/DC<br>0 – 350 V DC |
| *Threshold level* | User configurable in software in steps of 1 V |

**Contact mode**

| | |
|---|---|
| *Open circuit voltage* | 30 V DC ±15% |
| *Short circuit current* | 10 – 40 mA |
| *Threshold level* | 1 – 2 kΩ |

### External outputs

**DC OUT**

| | |
|---|---|
| *General voltage source* | 12 V ±10%, short circut protection 1.7 A |

**DRM only for SDRM202 and DRM1800**

**Voltage mode**

| | |
|---|---|
| *Output Voltage* | 12 V DC ±10% |
| *Short circuit protection* | PTC 750 mA |
| *Switching current* | <750 mA, resistive load |

### Communication interfaces

| | |
|---|---|
| *USB* | Universal Serial Bus ver. 2.0 |
| *Ethernet* | 100 base-Tx Fast Ethernet |

### HMI, Human-Machine interface

| | |
|---|---|
| **CABA Local** | Circuit breaker analysing software |
| *Available languages* | English, French, German, Russian, Spanish, Swedish. Translation kit available |
| *Display* | High brightness SVGA 800x600, Touch screen |
| *Diagonal size* | 21 cm (8") |
| *Keyboard* | On screen |

### Control section (1 or 2)

**General**

| | |
|---|---|
| *No. of channels* | 3 |
| *Time base inaccuracy* | ±0.01% of reading ±1 sample interval |
| *Max. sample rate* | 40 kHz |
| *Measurement time* | 200 s at 10 kHz sample rate, |

**Non-bouncing switch**

| | |
|---|---|
| *Max current* | 60 A AC/DC, pulse ≤ 100 ms |
| *Duration* | User configurable in steps of 1 ms |
| *Delay* | User configurable in steps of 1 ms |

**Current measurement**

| | |
|---|---|
| *Measurement range* | 0 to ±80 A AC/DC |
| *Resolution* | 16 bits |
| *Inaccuracy* | ±2% of reading ±0.1% of range |

**External current measurement**

**CT**

| | |
|---|---|
| *Max input* | ±1 $V_{peak}$ |
| *Scaling* | 100 A / 1 V |
| *Range* | ±80 A / ±0.8 V |

**Voltage measurement**

| | |
|---|---|
| *Measurement range* | 0 – 250 V AC, 0 to ±300 V DC |
| *Resolution* | 12 mV |
| *Inaccuracy* | ±1% of reading ±0.1% of range |

### Timing M/R section (1)

**General**

| | |
|---|---|
| *No. of channels* | 6 |
| *Time base inaccuracy* | ±0.01% of reading ±1 sample interval |
| *Min. resolution* | 0.05 ms |
| *Max. sample rate* | 40 kHz |
| *Measurement time* | 200 s at 10 kHz sample rate |

**Timing of main and resistive contacts**

| | |
|---|---|
| *Open circuit voltage* | 6 V or 26 V ±10% (Toggling at every second sample) |
| *Short cicuit current* | 9.7 mA or 42 mA ±10% |

**Status threshold**

| | |
|---|---|
| *Main* | Closed < 10 Ω < Open |
| *Main and Resistor* | Main < 10 Ω <PIR < 10 kΩ < Open |

**PIR resistance measurement**

| | |
|---|---|
| *Supported PIR types* | Linear PIR |
| *Measurement range* | 30 Ω – 10 kΩ |
| *Inaccuracy* | ±10% of reading ±0.1% of range |

**Voltage measurement**

| | |
|---|---|
| *Measurement ranges* | ±50 $V_{peak}$, ±15 $V_{peak}$, ±0.5 $V_{peak}$ |
| *Resolution* | 16 bits |
| *Inaccuracy* | ±1% of reading ±0.1% of range |

### Analog section (none, 1 or 2)

**General**

| | |
|---|---|
| *No. of channels* | 3 isolated channels |
| *Time base inaccuracy* | ±0.01% of reading ±1 sample interval |
| *Max. sample rate* | 40 kHz |
| *Measurement time* | 200 s at 10 kHz sample rate |
| *Transducer resistance* | 500 Ω – 10 kΩ at 10 V output |

**Output**

| | |
|---|---|
| *Voltage output* | 10 V DC ±5%, 24 V DC ±5% |
| *Max. output current* | 30 mA |

**Current measurement**

| | |
|---|---|
| *Measurement range* | ±22 mA |
| *Resolution* | 16 bits |
| *Inaccuracy* | ±1% of reading ±0.1% of range |

**Voltage measurement**

| | |
|---|---|
| *Input voltage range* | 0 – 250 V AC, 0 to ±300 V DC |
| *Measurement ranges* | ±10 V, ±400 V |
| *Resolution* | 16 bits |
| *Inaccuracy* | |
| *250 V range* | ±1% of reading ±0.1% of range |
| *10 V range* | ±0.1% of reading ±0.01% of range |

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## Digital section

### General

| | |
|---|---|
| *No. of channels* | 6 |
| *Supported types* | Incremental transducers, RS422 |
| *Time base inaccuracy* | ±0.01% of reading ±1 sample interval |
| *Max. sample rate* | 40 kHz |
| *Measurement time* | 200 s at 10 kHz sample rate |

**Output**

| | |
|---|---|
| *Voltage* | 5 V DC ±5% or 12 V DC ±5% |
| *Max. output current* | 700 mA |

**Digital input**

| | |
|---|---|
| *Range* | ±32000 pulses |
| *Resolution* | 1 pulse |
| *Inaccuracy* | ±1 pulse |

## Timing Aux section

**General**

| | |
|---|---|
| *No. of channels* | 6 isolated channels |
| *Time base inaccuracy* | ±0.01% of reading ±1 sample interval |
| *Max. sample rate* | 40 kHz |
| *Measurement time* | 200 s at 10 kHz sample rate |

**Voltage Mode**

| | |
|---|---|
| *Input voltage range* | 0 – 250 V AC, 0 to ±300 V DC |
| *Status threshold* | ±10 V |
| *Inaccuracy* | ±0.5 V |

**Contact mode**

| | |
|---|---|
| *Open circuit voltage* | 25 – 35 V DC |
| *Short circuit current* | 10 – 30 mA DC |
| *Status threshold* | Closed < 100 Ω, Open > 2 kΩ |

## DCM module (Optional)

**General**

| | |
|---|---|
| *No. of channels* | 6 |
| *Weight* | 1.4 kg (3.1 lbs) |
| *Dimensions* | 145 x 160 x 70 mm (5.7" x 6.3" x 2.6") |

**Output**

| | |
|---|---|
| *Voltage* | 0 - 5 V rms AC |
| *Current* | 0 - 70 mA rms AC |

## OPTIONAL ACCESSORIES

| Item | Description | Art. No. |
|---|---|---|
| **Software and application kits** | | |
| **CABA Win – Circuit Breaker analysis software** | | |
| *CABA Win* | incl. Ethernet cross-over cable | CG-8000X |
| *CABA Win upgrade* | Upgrade from R04 and earlier to latest version. Including Test Plan Editor (TPE) | CG-8040X |
| **Synchronised Switching Relay test kit** | | |
| *SSR kit* | Incl. accessories, software and cables (delivered in transport case) | CG-91200 |
| **1:st trip kits** | For single operating mechanism | BL-90700 |
| | For three operating mechanisms | BL-90710 |
| **DCM (Dynamic Capacitance Measurement)** | | |
| **DCM1700** | The DCM1700 is used for timing using the DualGround™ method. Safe testing with both sides grounded. | |
| *DCM1700 3 ch* | Kit for 3-channels DualGround™ Timing | BL-59190 |
| *DCM1700 6 ch* | Kit for 6-channels DualGround™ Timing | BL-59192 |
| **SDRM (Static and Dynamic Resistance Measurement)** | | |
| *SDRM202* | The SDRM202 uses new technology, patent pending, with ultra capacitors. The current output is up to 220 A from a box that weighs only 1.8 kg (4 lbs). The weight of the current cables is also low because the SDRM202 is placed very close to the circuit breaker. Timing M/R measurement can be done with the same hook-up | CG-90200 |
| *SDRM202 Pack of 3 units* | Pack for CB with 2 Breaks / Phase | CG-90230 |
| *Extension cable SDRM202* | 10 m (33 ft) | GA-12812 |
| **Transducers** | | |
| **Linear – Analog** | | |
| *TLH 500* | 500 mm (20") travel Incl. cable 0.5 m (20") | XB-30020 |
| *LWG 225* | 225 mm (9") travel Incl. cable 0.5 m (20") | XB-30117 |
| *TS 150* | 150 mm (5.9") travel Incl. cable 1.0 m (3.3 ft) | XB-30030 |
| *TS 25* | 25 mm (1") travel Incl. cable 1.0 m (3.3 ft) | XB-30033 |

The above transducers are also available in other lengths, please contact Megger for information.

# TM1700-series
# Circuit Breaker Analyser System

| Item | Description | Art. No. |
|---|---|---|
| **Rotary - Analog** | | |
| *Novotechnic IP6501* | Incl. cable 1 m (3.3 ft), 6 mm Flex coupling, Hexagon wrench | XB-31010 |
| *Flex coupling* | For IP6501, shaft diam. 6 mm | XB-39030 |
| **Rotary – Digital** | | |
| *Baumer* | EIL<br>Incl. cable 10 m (33 ft), 10/6 mm Flex coupling, Hexagon wrench | XB-39130 |
| **Transducer mounting kits** | | |
| **Universal kits** | | |
| *Rotary transducer mounting kit* | For transducers XB-31010 and XB-39130 | XB-51010 |
| *Universal transducer mounting kit* | For linear and rotary transducers | XB-51020 |
| **Circuit breaker specific kits** | | |
| *LTB Kit (ABB)* | Incl. mounting kit XB-51010, Software conversion table BL-8730X | XB-61010 |
| *HPL/BLG Kit (ABB)* | Incl. mounting kit XB-51010, Software conversion table BL-8720X | XB-61020 |
| *AHMA 4/8 (ABB)* | Incl. 3 transducers | XB-61030 |
| *HMB 4/8 (ABB)* | Incl. 3 transducers | XB-61040 |
| **Ready-to-use kits – Rotary – Analog** | | |
| *1-phase kit* | Incl. transducer XB-31010, mounting kit XB-51010 | XB-71010 |
| *3-phase kit* | Incl. 3 x 1-pase kits XB-71010 | XB-71013 |
| **Ready-to-use kits – Rotary – Digital** | | |
| *1-phase kit* | Incl. transducer XB-39130, mounting kit XB-51010 | XB-71020 |
| *3-phase kit* | Incl. 3 x 1-pase kits XB-71020 | XB-71023 |
| **Transducer mounting accessories** | | |
| *Universal support* | | XB-39029 |
| *Switch magnetic base* | | XB-39013 |
| *Thread adapter kit* | Metric to Imperial TLH / TP1 | XB-39036 |
| **Cables** | | |
| *DCM 3-channel addition* | 3 DCM cables, 10 m (33 ft, 6 clamps (DualGround timing) | CG-19180 |
| *DCM 3-channel extension cable* | 3 DCM extension cables, 10 m (33 ft) GA-00999 (DualGround timing) | CG-19181 |
| *Span extension* | Cable to extend the span in the TM1700/1800 DCM BNC / BNC, 2 m (6.6 ft | GA-00720 |

| Item | Description | Art. No. |
|---|---|---|
| *Cable reel 20 m (65.5 ft), 4 mm stackable safety plugs* | Black | GA-00840 |
| | Red | GA-00842 |
| | Yellow | GA-00844 |
| | Green | GA-00845 |
| | Blue | GA-00846 |
| *Extension cables, XLR female to male* | For analog input, 10 m (33 ft) | GA-01005 |
| | For Timing M/R modules, 10 m (33 ft) | GA-00851 |
| *Open analog cable* | For customised analog transducer connection | GA-01000 |
| *XLR to 4 mm safety plugs* | For customised analog transducer connection | GA-00040 |
| *Digital transducer extension cable* | RS422, 10 m (33 ft) | GA-00888 |
| *Open digital cable* | For customised digital transducer connection | GA-00885 |
| *L & L digital cable* | For using Leine & Linde 530 digital transducer | GA-00890 |
| *Doble cable* | Adapter for Doble transducer | GA-00867 |
| *Siemens cable* | Adapter for Siemens transducer | GA-00868 |
| *Vanguard cable* | Adapter for Vanguard transducer | GA-00869 |
| *Digital transducer cable, new* | For Baumer EIL rotary transducer and SIKO touchless linear transducer, new type, DSUB15 male / neutriCON female, 10 m (33 ft). | GA-00899 |
| *Digital transducer cable, old* | For Baumer EIL rotary transducer and SIKO touchless linear transducer, old type, DSUB15 male / M12-8 female, 10 m (33 ft) | GA-00889 |
| *Ethernet cable, network* | Cable for connection to network/LAN | GA-00960 |
| **Other** | | |
| *Current sensor* | Current sensor kit 1 channel CA E27 incl. cable GA-00140) | BL-90600 |
| | Current sensor kit 3 channels CA E27 incl. cables GA-00140) | BL-90610 |
| *Transport case* | | GD-00025 |
| *Cable organiser* | Velcro straps, 10 pcs. | AA-00100 |

For more information about optional accessories please contact Megger Sweden AB

# TM1700-series
# Circuit Breaker Analyser System



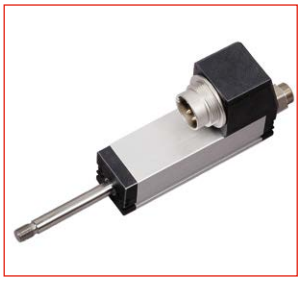
Rotary transducer, Novotechnic IP6501 (analog)



Rotary transducer, Baumer EIL (digital)



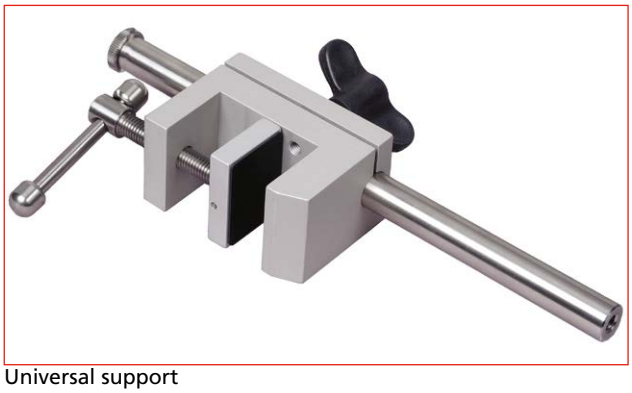
Linear transducer, LWG 150



Linear transducer, TS 25



Switch magnetic base



Universal support



Linear transducer, TLH 225



Rotary transducer mounting kit, XB-51010




SDRM202



SDRM Cable

# TM1700-series
## Circuit Breaker Analyser System



Cable XLR, GA-00760



Extension cable XLR, GA-01005



Cable reels, 20 m (65.5 ft), 4 mm stack-able safety plugs




DCM1700, for timing using the DualGround™ method. Safe testing with both sides grounded.

# TM1700-series
# Circuit Breaker Analyser System

## TM1700 – MODELS

### TM1710







**Including:**
- Control 3 ch. (Auxiliary 3 ch.)
- Timing M/R 6 ch.
- Digital 6 ch.
- CABA Win

**Optional:**
- Analog 3 ch., DCM 6 ch.

### TM1720







**Including:**
- Control 6 ch. (Auxiliary 6 ch.)
- Auxiliary 6 ch.
- Timing M/R 6 ch.
- Digital 6 ch.
- CABA Win

**Optional:**
- Analog 3 ch., DCM 6 ch.

### TM1740





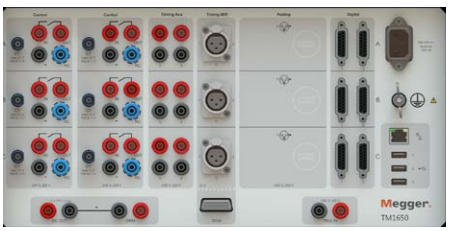


**Including:**
- Control 3 ch. (Auxiliary 3 ch.)
- Timing M/R 6 ch.
- Digital 6 ch.
- CABA Win

**Optional:**
- Analog 3 ch., DCM 6 ch.

### TM1750




**Including:**
- Control 6 ch. (Auxiliary 6 ch.)
- Auxiliary 6 ch.
- Timing M/R 6 ch.
- Digital 6 ch.
- CABA Win

## TM1760







### Including:

- Control 6 ch. (Auxiliary 6 ch.)
- Auxiliary 6 ch.
- Timing M/R 6 ch.
- Digital 6 ch.
- Analog 3
- CABA Win

### Optional:

- Analog 3 ch., DCM 6 ch.

## ORDERING INFORMATION

| Item | Art. No. |
|---|---|
| **TM1710** | BL-49090 |
| With Analog option incl. analog cables, 10 m (33 ft) | BL-49092 |
| **TM1720** | BL-49094 |
| With Analog option incl. analog cables, 10 m (33 ft) | BL-49096 |
| **TM1740** | BL-49190 |
| With Analog option incl. analog cables, 10 m (33 ft) | BL-49192 |
| **TM1750** | BL-59090 |
| **TM1760** | BL-59094 |
| With Analog option incl. analog cables, 10 m (33 ft) | BL-59096 |

### Included accessories

Soft case
Timing clamps and cables, 5 m (16 ft)
Control cables, 5 m (16 ft)
Protective earth (ground) cable
Mains cable
Bag for cables
USB memory stick
Ethernet cable
CABA Win
User's manual

| Item | Art. No. |
|---|---|
| **Optional accessories** | |
| **DCM1700 3 ch**<br>Kit for 3-channels DualGround™ Timing | BL-59190 |
| **DCM1700 6 ch**<br>Kit for 6-channels DualGround™ Timing | BL-59192 |
| **Keyboard** | HC-01090 |
| **Flight Case TM1700-series** | GD-00025 |
| **Circuit breaker transducer kits** | |
| **AHMA 4/8 (ABB / Hitachi) 3-phase kit** | XB-61030 |
| **AHMA 4/8 (ABB / Hitachi) 1-phase kit** | XB-61050 |
| **HMB 4/8 (ABB / Hitachi) 3-phase kit** | XB-61040 |
| **HMB 4/8 (ABB / Hitachi) 1-phase kit** | XB-61060 |
| **HMC (ABB / Hitachi) 1-phase kit** | XB-61065 |
| **GL314-GL318 (GE) ELK-04 (ABB / Hitachi) 3-phase kit** | XB-39270 |
| **GL314-GL318 (GE) ELK-04 (ABB / Hitachi) 1-phase kit** | XB-39272 |
| **First trip kits** | |
| **For single operating mechanism** | BL-90700 |
| **For three operating mechanisms** | BL-90710 |

See, Circuit breaker testing accessories brochure, for more information.

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