TM1800
Circuit Breaker Analyzer System

- **Stand-alone functionality – one toolbox for all breaker testing**
- **Expandable modular concept**
- **Safer testing – DualGround™, test circuit breakers with both sides grounded**
- **Designed for off-line and on-line measurement**
- **Rugged and reliable for field use**

Description

The TM1800™ is the instrument platform for circuit breaker maintenance, based on more than 20 years' experience of over 4,000 delivered breaker analyzers. The modular construction makes it possible to configure the TM1800 for measurements on all known types of circuit breakers in operation on the world market.

The robust design contains powerful technology that streamlines circuit breaker testing. Sophisticated measurement modules enable great time savings as many parameters can be measured simultaneously, eliminating the need for new setup each time.

The patented DualGround™ testing using the new DCM module makes the testing safe and time saving, by keeping the circuit breaker grounded on both sides throughout the test. The DCM module uses a measuring technology called Dynamic Capacitive Measurement.

Timing M/R is using the patented Active Interference Suppression to obtain correct timing and accurate PIR (Pre-Insertion Resistor) values in high voltage substations.

An adaptive, easy-to-use software suite supports activities from timing, simply turning a knob without the need for presetting, to advanced help functions for hooking up to the test object. A full keyboard and 8" color screen is the front end of the high-level user interface. The Select-Connect-Inspect workflow guides you to fast results in three steps. Testing is made easier to learn and perform.

The system also offers full connection capability to the local network, printers etc.

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. Internationalization 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 demands for shorter time periods for testing, while 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 applicable safety regulations have been clarified and the application of existing rules has tightened. Keeping a good safety record is becoming a crucial asset in attracting 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 figures 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. Minimum time shall be spent in the substation and focus shall be on 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 — **TM1800 with DCM**
- Motion — **TM1800**
- SDRM — **TM1800 with SDRM202**
- Vibration — **CABA Win Vibration / SCA606**

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.

Basic unit

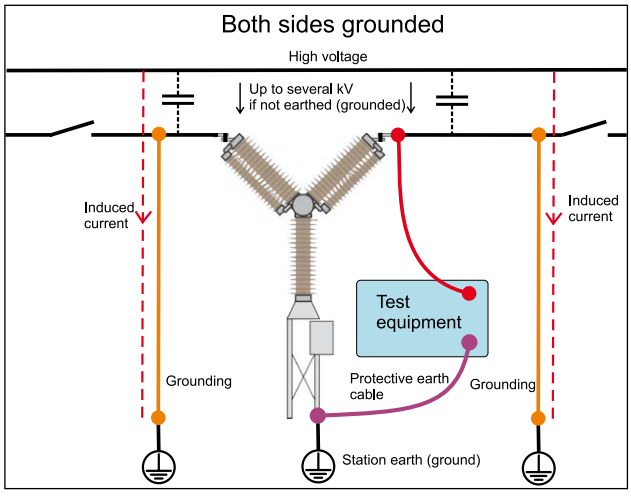
The modularized design makes it very flexible to user needs and enables reconfiguration for new demands and upgrade with new functionality. You can configure TM1800 to a complete test set tailor made for your specific needs. The firmware, CABA Local, guides you to efficient circuit breaker testing. All inputs and outputs on the TM1800 and the modules are designed to withstand the harsh environment in high-voltage substations and industrial environments.

With built-in protection circuits and software-designed protection the TM1800 has a good guard to influences and even failures caused by over-voltages generated in the environment.

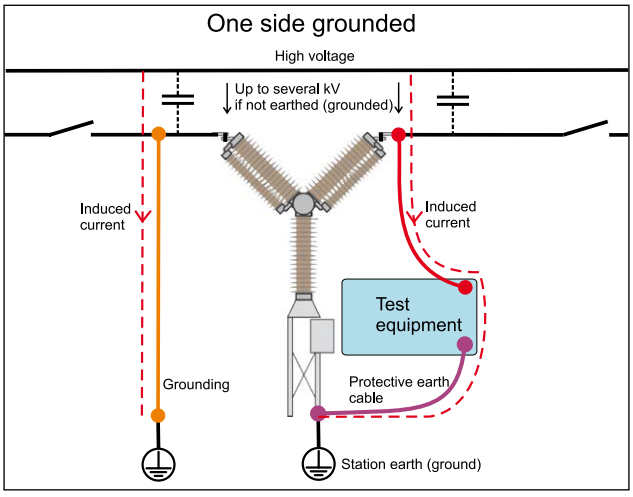
The HDD module is a part of the basic unit and contains the hard drive with all data and software setup. It can easily be removed and changed.

- Eight user configurable slots for modules
- Temperature sensor connection
- Trig inputs and outputs
- Outputs for warning signal and DRM
- Earth (Ground) connection
- Communication interfaces (USB, Ethernet, etc)

The basic unit is only equipped with the HDD module. Add modules to the configuration that supports your needs.



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.

Control module

Generates the selected circuit breaker operation sequences accurate and bounce-less. The Control module, with 9 analog channels (3 U + 6 I), also measures important parameters during the test. Coil current, control voltage, coil resistance and auxiliary contact timing are automatically measured for each phase without any additional test lead connections.

- Three independent contact functions per module
- Pre-programmed sequences C, O, C–O, O–C, O–C–O
- Timing of a and b auxiliary contacts
- Coil current, voltage and resistance

Including
3 cable sets, 5 m (16 ft)

Optional accessories
Standard cable sets are used as extension cables: GA-00877

Timing M/R module

The Timing M/R module uses one hook-up for testing all the important timing parameters of a contact without the need of reconnection or special set-ups. One timing M/R module, with 12 analog channels (6 U + 6 I), will time up to six main plus six PIR contacts and measure values of the Pre-Insertion Resistors. With the same hook-up Timing M/R can also perform static and dynamic resistance measurements (using SDRM202). The Timing M/R module is using patented Active Interference Suppression to obtain correct timing and accurate PIR values regardless of interference in high voltage substations.

- Six inputs per module
- High resolution 15µV and up to 40 kHz sampling
- Main and parallel resistor contact timing
- Resistance value of parallel resistors

Including
3 cable sets, 5 m (16 ft) total length, 2 m (6.5 ft) spread

Optional accessories
Extension cable,
10 m (33 ft): GA-00851

DCM module

The DCM module enables DualGround testing. This increases safety and also makes testing easier. Each pair of a Timing M/R and DCM module provides up to six channels. Each channel requires a special DCM cable with integrated electronics. The TM1800 system can be equipped with multiple DCM and Timing M/R module pairs that enable timing measurement on up to 18 contacts.

- Six channels per module
- Timing test using DualGround
- Safe, fast and easy testing
- Two breaks per phase
- GIS breaker testing

Including
DCM-cables, 12 m (39 ft)

Optional accessories
3-channel addition: CG-19180
Extension cables,
10 m (33 ft): GA-00999
See Optional accessories pages for more details.

Analog module

The Analog module measures any analog entity from a transducer mounted on a circuit breaker. It enables measurements of motion, speed, current, voltage, pressure, vibration etc. A motion measurement of a circuit breaker is simple thanks to the flexible and easy to use interface. Universal transducers, specialized transducers and conversion tables are available for numerous circuit breakers. See the accessory section.

- Three channels per module
- Supports industrial analog transducers
- Insulated channels, measure up to 250 V whithout volt. div.
- High resolution 0.3 mV, sampling rate 40 kHz

Including
3 cable sets, 10 m (33 ft)

Optional accessories
Extension cables,
10 m (32.8 ft): GA-01005
Transducers (analog)
Current sensor
See Optional accessories pages for more details.

Digital module

With digital transducers motion and other measurements become even more accurate, faster and easier. The Digital module enables use of incremental rotary or linear transducers, for measuring e.g. motion, velocity and damping characteristics of circuit breakers

- Six channels per module
- Incremental transducers with RS422
- Up to ±32000 pulses resolution
- Up to 20 kHz sampling

Optional accessories
Transducers (rotary digital)
See Accessories pages for more details.

Timing Aux module

Expands the TM1800 system with timing inputs for measuring any auxiliary contact on the circuit breaker. It measures timing, polarity insensitive, of both dry and wet contacts for example timing of spring charging motor, anti-pump relay etc.

- Six channels per module
- Polarity insensitive
- Dry and wet auxiliary contacts

Including
3 cable sets, 5 m (16 ft)

Optional accessories
Standard cable sets are used as extension cables: GA-00870

Printer module

The Printer module offers a convenient and practical way of making printouts of test results in the field. The printouts contain both numerical and graphical results and printer templates delivered pre-installed in the TM1800 are easy to adapt to suit specific needs for a clear and complete report of all tested parameters.

- Thermal printer sensitive line dot method
- Paper width 114 mm (4")
- Printing speed 50 mm/s (400 dot lines/s)

Including
Paper spool (Thermopaper)

Optional accessories
Thermopaper: GC-00040
See Accessories pages for more details.

HDD module

The HDD module is a part of the Basic unit. Storage of all set-up, user customization and measurement data is done in the HDD module. The module is easily replaced e.g. when different users are sharing one TM1800 and want individual setups, data and configurations.

- Change set-up, user customization, measurement data by changing HDD module
- Easy to remove during transportation

Application

Timing measurements

Simultaneous measurements within a single phase are important in situations where a number of contacts are connected in series. Here, 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. Still, the time tolerance is usually specified as less than 2 ms, even for such systems. It should also be noted that breakers that perform synchronized breaking must meet more stringent requirements in both of the previously stated situations.

There are no generalized time limits for the time relationships between main and auxiliary contacts, but it is still 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 measurements

A high-voltage breaker is designed to interrupt a specific short-circuit current, and this requires operation 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 cools 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 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.

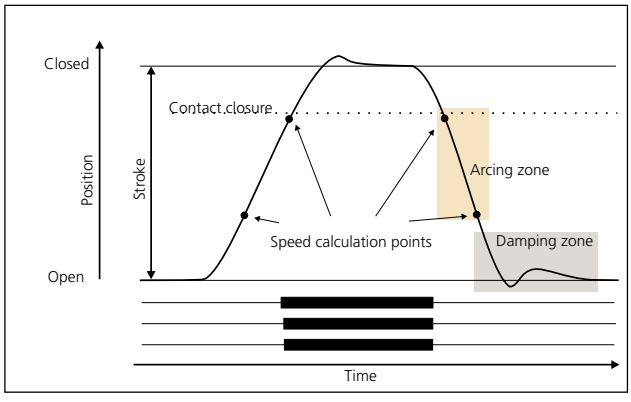
Damping is an important parameter for the high energy operating mechanisms used to open and close a circuit breaker. If the damping device does not function satisfactorily, the powerful mechanical strains that develop can shorten breaker service life and/or cause serious damage. The damping of opening 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

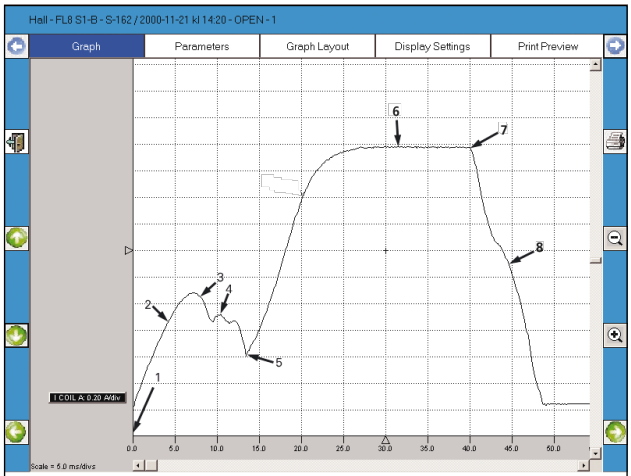
These can be measured on a routine basis to detect potential mechanical and/or electrical problems in actuating coils well in advance of their emergence as actual faults. The coil's maximum current (if current is permitted to reach its highest value) is a direct function of the coil's resistance and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

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, however, that the relationship between the two



Motion diagram and timing graphs for a close-open operation



1	Trip coil energized	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

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 by normal operation as well as when breaking short-circuit currents. If the arcing contact is too short or otherwise in bad condition, then the breaker soon becomes unreliable. Main contact surfaces can be deteriorated by arching, 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 in finding the length of the arcing contact is dismantling the circuit breaker.

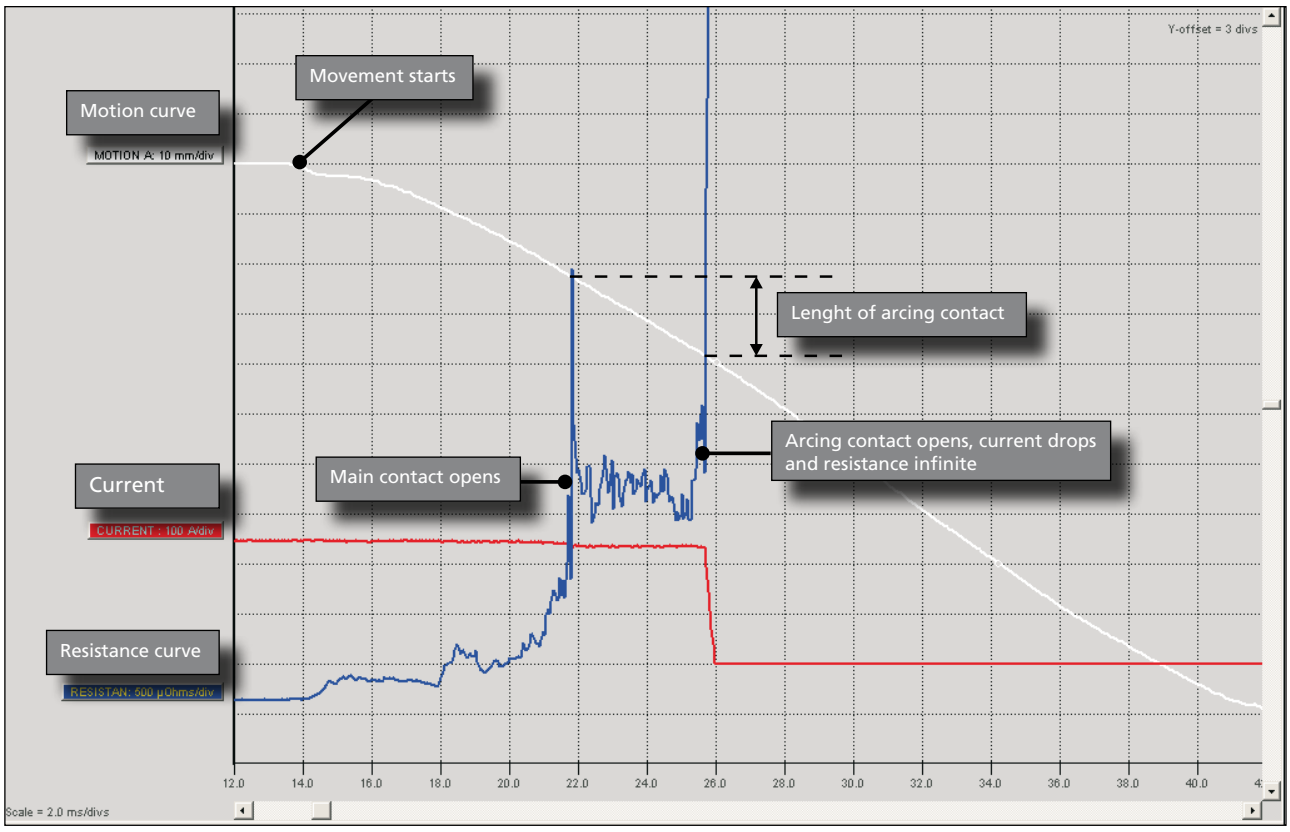
A reliable DRM interpretation requires high test current and a circuit breaker analyzer with good measurement resolution.

Vibration analysis

Vibration analysis is a noninvasive method using an acceleration sensor without moving parts. The breaker can stay in service during the test. An Open-Close operation is all that is required for the measurement. The first operation can be different compared to the second and third because of corrosion and other metal to metal contact issues. Vibration is an excellent method to capture the first operation after long time in the same position.

The analysis compares the vibration time series with earlier taken reference. The vibration method detects faults that can hardly be indicated with conventional methods. But if conventional data such as contact time, travel curve, coil current and voltage are available in addition to the vibration data even more precise condition assessment is possible. The vibration data is stored together with available conventional data.

The Vibration method is published in CIGRÉ and IEEE® papers. Since about 15 years is it utilized in the industry for testing all kind of breakers from 400 kV distribution to industrial sites. The method was first established on the Scandinavian market. Vibration can be performed under very safe manners for the test technician as both sides can be grounded throughout the test. Also less climbing is required since no access to the breaker contact system is needed, the acceleration sensor is easily mounted on the breaker.



DRM is a reliable method to estimate the length/wear of the arcing contact. The SDRM202 provides high current and the TM1800 gives an accurate measurement with very good resolution. Besides, it is possible to use DualGround testing.

Select – Connect – Inspect

Working with TM1800 means fast and easy testing. Testing is done with a three-step process.

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.

Second step is to connect the test leads according to the graphical help screen.

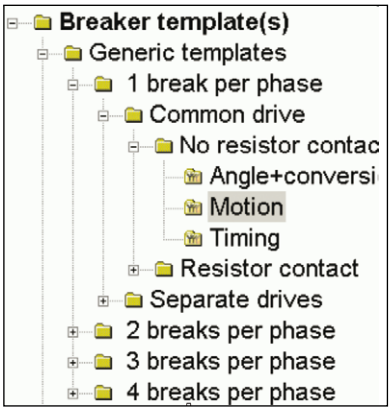
Third step is to turn the "Measure" knob. The measurement is performed, analyzed and the results will be displayed on the screen. Magnification and compare functions are available.

For more advanced setup there is still the opportunity to control all the details in the measurement. The large number of general purpose templates cover most circuit breakers found around the world. It is also possible to select a tailor made template with special adaptions. You can edit templates yourself or with assistance from our customer support. This is a very powerful tool to customize TM1800 for fast and easy work according to your needs in every detail. Increase the level of detail as you learn.

After the test it is possible to print a test report, either from the TM1800 printer module or using CABA Win on a PC. With CABA Win you can make a more advanced analysis of the data. CABA Win is also the archive for common test data and interface to CBEX. With CBEX the test is stored in a database.

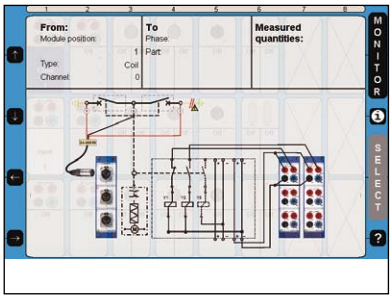
Select

Select the template suitable for the test and circuit breaker from the library.



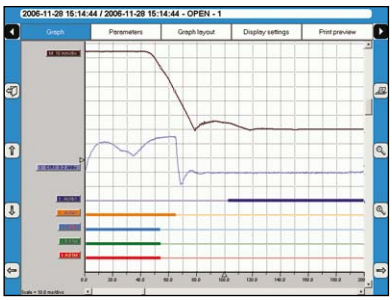
Connect

Connect test leads and cables according to display. Separate help screen per cable.



Inspect

Turn the knob and the measurement is displayed on the screen ready for inspection.



Application examples

6 Timing and 3 Motion

Circuit breaker: Any CB with two contacts per phase and separate drives

TM1800 configuration: TM1800 Expert

1. **Select** breaker template: Generic templates / 2 breaks per phase / Separate drives / Two Control modules / No resistor contact / Motion
2. **Connect** cables according to "Analyzer view" in CABA Local. Turn the OPERATE/MEASURE knob.
3. **Inspect** the result on screen.

Note:
Coil current and auxiliary contacts are measured and displayed automatically.
If TM1800 is configured with a DCM module the test can be made using DualGround.

Specifications TM1800

General

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	0°C to +50°C (32°F to +122°F)
Storage & transport	-55°C to +70°C (-67°F to +158°F)
Humidity	5% – 95% RH, non-condensing

CE-marking

EMC	2004/108/EC
LVD	2006/95/EC

Basic unit

General

Mains input (nominal)	100 – 240 V AC, 50/60 Hz
Power consumption	250 VA (max)
Dimensions	515 x 173 x 452 mm (20.3" x 6.8" x 17.8")
Weight	11.5 kg (25.4 lbs)

HDD module

Weight	0.6 kg (1.3 lbs)
Temperature, storage	-55°C to +70°C (-67°F to +158°F)

External input

TRIG IN

Voltage mode

Input range	0 – 250 V AC/DC
Threshold level	User configurable in software in steps of 1 V

Contact mode

Open circuit voltage	35 V DC ±20%
Short circuit current	10 – 40 mA
Threshold level	1 – 2 kΩ

External outputs

TRIG OUT

Pulse duration	1 – 999 ms, user configurable in steps of 1 ms

Voltage mode

Open circuit voltage	12 V DC ±5%
Voltage at 0.5 A	9 V DC ±10%
Max. short circuit current	1.5 A

Contact mode

Max. switching current	0.5 A at 12 V and resistive load
Voltage drop at 0.5 A	4.5 V DC ±10%
Max. short circuit current	1.5 A

DRM only for SDRM202 and DRM1800

WARNING

Relay	For lamp or horn
Pre-operation warning	0 – 999 s, user configurable in steps of 1 s

Voltage mode

Output Voltage	12 V DC ±10%
Short circuit protection	Fuse 1 A DC fast acting type (F1H250V)

Contact mode

Max. switching currrent	1 A at 12 V and resistive load

Communication interfaces

USB	Universal Serial Bus ver. 1.1
Ethernet	100 base-Tx Fast Ethernet
External screen	SVGA, up to 800 x 600 at 24 bit color, 32 MB SDRAM

HMI, Human-Machine interface

CABA Local	Circuit breaker analyzing software
Available languages	English, French, German, Spanish, Swedish. Translation kit available
Display	Transreflecting to increase visibility in direct sunlight
Diagonal size	21 cm (8")
Keyboard	Built-in

Modules

Control module

General

No. of channels	3
Time base inaccuracy	±0.01% of reading ±1 sample interval
Max. sample rate	10 kHz
Measurement time	19 s at 10 kHz sample rate, 39 s at 5 kHz sample rate, 200 s at 10 kHz sample rate using data compression
Weight	1.0 kg (2.2 lbs)

Non-bouncing switch

Max current	60 A AC/DC, pulse ≤ 100 ms
Fuse	15 A DC
Duration	User configurable in steps of 1 ms
Delay	User configurable in steps of 1 ms

Current measurement

Measurement range	0 – 60 A AC/DC
Resolution	16 bits (15 bits at data compression)
Inaccuracy	±2% of reading ±0.1% of range

Voltage measurement

Measurement range	0 – 250 V AC/DC
Resolution	20 mV (40 mV at data compression)
Inaccuracy	±1% of reading ±0.1% of range

Timing M/R module

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	16 s at 20 kHz sample rate, 32 s at 10 kHz sample rate, 200 s at 10 kHz sample rate using data compression Data compression is available at sample rates up to 20 kHz
Weight	0.8 kg (1.8 lbs)

Timing of main and resistive contacts

Open circuit voltage	6 V or 26 V ±10% (Toggling at every second sample at sample rates from 10 kHz and upwards.)
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	10 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

DCM module

General

No. of channels	6
Weight	0.6 kg (1.3 lbs)

Output

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

Analog module

General

No. of channels	3
Time base inaccuracy	±0.01% of reading ±1 sample interval
Max. sample rate	40 kHz
Measurement time	10 s at 40 kHz sample rate, 20 s at 20 kHz sample rate, 200 s at 10 kHz sample rate using data compression
Transducer resistance	500 Ω – 10 kΩ at 10 V output
Weight	0.8 kg (1.8 lbs)

Output

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

Current measurement

Measurement range	0 – 20 mA DC
Resolution	16 bits (15 bits at data compression)
Inaccuracy	±1% of reading ±0.1% of range

Voltage measurement

Input voltage range	0 – 250 V AC/DC
Measurement ranges	±10 V DC, 0 – 250 V AC/DC
Resolution	16 bits (15 bits at data compression)
Inaccuracy	
250 V range	±1% of reading ±0.1% of range
10 V range	±0.1% of reading ±0.01% of range

Digital module

General

No. of channels	6
Supported types	Incremental transducers, RS422
Time base inaccuracy	±0.01% of reading ±1 sample interval
Max. sample rate	20 kHz
Measurement time	16 s at 20 kHz sample rate, 32 s at 10 kHz sample rate, 200 s at 10 kHz sample rate using data compression
Weight	0.7 kg (1.5 lbs)

Output

Voltage	5 V DC ±5% or 12 V DC ±5%
Max. output current	200 mA

Digital input

Range	±32000 pulses
Resolution	1 pulse
Inaccuracy	±1 pulse

Timing Aux module

General

No. of channels	6
Time base inaccuracy	±0.01% of reading ±1 sample interval
Max. sample rate	20 kHz
Measurement time	15 s at 20 kHz sample rate, 30 s at 10 kHz sample rate, 200 s at 10 kHz sample rate using data compression
Weight	0.8 kg (1.8 lbs)

Voltage Mode

Input voltage range	0 – ±250 V AC/DC
Status threshold	±10 V
Inaccuracy	±0.5 V

Contact mode

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

Printer module

General

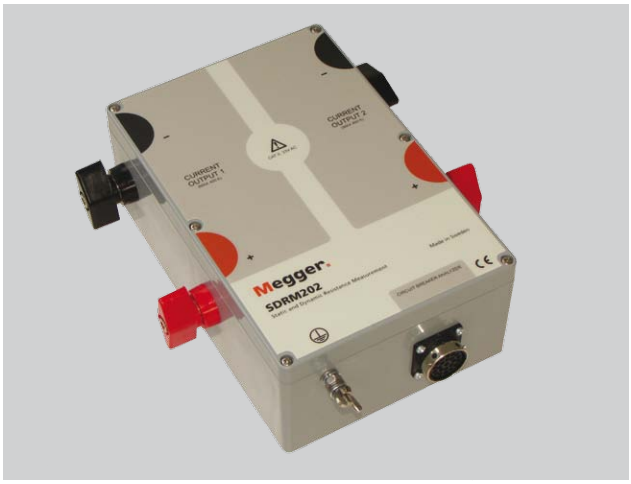
Printer type	Thermal printer
Paper type	Thermal 114 mm
Storage and transport temperature	-20°C to +60°C (-4°F to +140°F)
Weight	0.8 kg (1.8 lbs)

Optional accessories

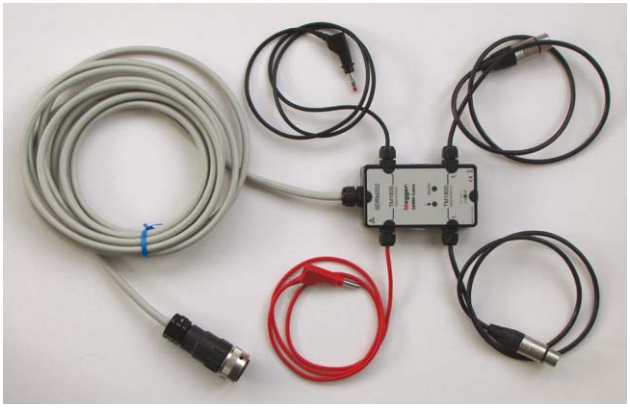
Item	Description	Art. No.
Software and application kits		
CABA Win – Circuit Breaker analysis software		
CABA Win	incl. Ethernet cross-over cable	CG-8000X
CABA Win upgrade	Upgrade to latest version	CG-8010X
Vibration analysis		
Vibration kit	The Vibration kit extends TM1800 and CABA Win with the equipment and software required for recording and analyzing vibration signals at a circuit breaker. The kit includes the signal conditioning unit SCA606, the software CABA Win Vibration and one vibration channel. The vibration solution can be extended up to 6 channels.	BL-13090
Vibration channel	Additional vibration channel to be used together with the Vibration kit. Each Vibration channel includes accelerometer, accelerometer adapter, cables to SCA606 and cables to TM1800.	XB-32010
Synchronized Switching Relay test kit		
SSR kit	Incl. accessories, software and cables (delivered in transport case)	CG-91200
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	7.5 m (24 ft)	GA-12815
	10 m (33 ft)	GA-12810
Transducers		
Linear		
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 (39")	XB-30030
TS 25	25 mm (1") travel Incl. cable 1.0 m (39")	XB-30033
The above transducers are also available in other lengths, please contact Megger for information.		
Rotary - Analog		
Novotechnic IP6501	Incl. cable 1 m (39"), 6 mm Flex coupling, Hexagon wrench	XB-31010
Flex coupling	For IP6501, shaft diam. 6 mm	XB-39030
Rotary - Digital		
Baumer	BDH16.05A3600-LO-B Incl. cable 10 m (33ft), 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
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
Cables		
TM1800 DCM 3-channel addition	3 DCM cables, 12 m (39 ft, 6 Clamps	CG-19180
TM1800 DCM 3-channel extension cable	3 DCM extension cables, 10 m (33 ft) GA-00999	CG-19181
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 (32.8 ft)	GA-01005
	For Timing M/R modules, 10 m (32.8 ft)	GA-00851
Open analog cable	For customized analog transducer connection	GA-01000
XLR to 4 mm safety plugs	For customized analog transducer connection	GA-00040
Digital transducer extension cable	RS422, 10 m (33 ft)	GA-00888
Open digital cable	For customized digital transducer connection	GA-00885
L & L digital cable	For using Leine & Linde 530 digital transducer	GA-00890
Baumer digital cable	For using Baumer digital transducer	GA-00895

Item	Description	Art. No.
Ethernet cable, network	Cable for connection to network/LAN	GA-00960
Other		
Current sensor	Current sensor kit 1 channel (Fluke 80i-110s incl. cable GA-00140)	BL-90600
	Current sensor kit 3 channels (Fluke 80i-110s incl. cables GA-00140)	BL-90610
Temperature sensor	With the temperature sensor the ambient temperature is automatically recorded with each measurement and stored together with the test result. The temperature becomes a parameter in CABA Win. The temperature sensor shall be placed in the shade. Suitable cable is the Analog cable, 10 m GA-01005. Range: -20°C to +50°C (-4°F to +122°F), Resolution: 0.5°C (0.9°F)	CG-90070
Thermopaper	114 mm, Ø 40 mm	GC-00040
Soft case	Made from sturdy nylon fabric	GD-00340
Cable organizer	Velcro straps, 10 pcs.	AA-00100

For more information about optional accessories please contact Megger Sweden AB



SDRM202



SDRM Cable

Rotary transducer, Novotechnic IP6501 (analog)

Rotary transducer, Baumer BDH (digital)

Linear transducer, LWG 150

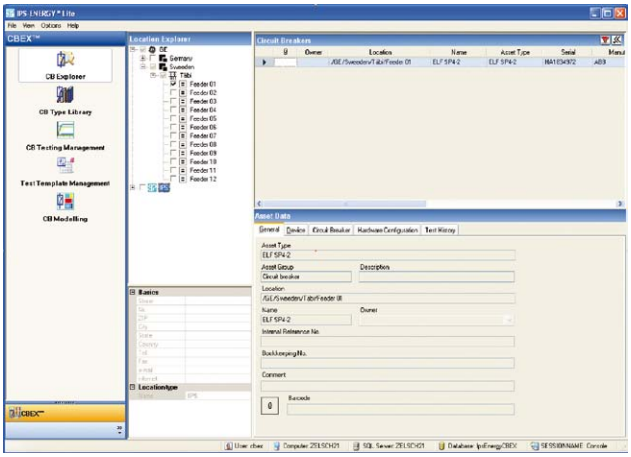
Linear transducer, TLH 225

Linear transducer, TS 25

Switch magnetic base

Vibration kit, BL-13090 Includes: SCA606, CABA Win Vibration software and one Vibration channel

Rotary transducer mounting kit, XB-51010



IPS-CBEX, database

Cable XLR, GA-00760

Extension cable XLR, GA-01005

Temperature sensor

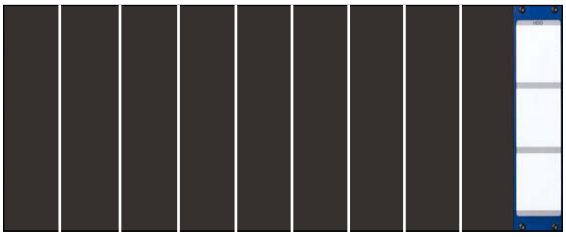
Universal support

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

Soft case

TM1800 – Configurations

Art. No.

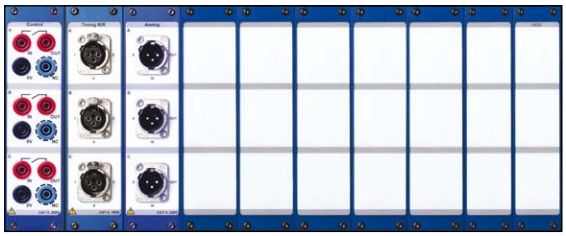


TM1800 Basic Unit

CG-19090

CB testing example

- No testing is possible. Modules has to be ordered separately.

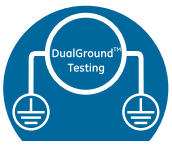


TM1800 Standard

CG-19290

CB testing example

- One common operating mechanism
- Two breaks per phase
- One travel motion



DCM-cables x 6

TM1800 Standard – for DualGround

CG-19292

CB testing example

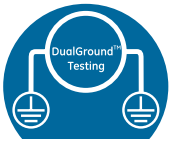
- With both sides grounded
  - One common operating mechanism
  - Two breaks per phase
  - One travel motion

TM1800 Expert

CG-19294

CB testing example

- Three operating mechanisms
- 6 auxiliary, 6 coil currents, 6 station battery voltages
- Four breaks per phase
- Three travel motions
- 6 independent auxiliary contacts



DCM-cables x 12

TM1800 Expert – for DualGround

CG-19296

CB testing example

- With both sides grounded
  - Three operating mechanisms
  - 6 auxiliary, 6 coil currents, 6 station battery voltages
  - Four breaks per phase
  - Three travel motions
  - 6 independent auxiliary contacts

Ordering information

Item	Art. No.
TM1800 – Separate items	
TM1800 Basic Unit	CG-19090
Complete with: HDD module, CABA Local, Transport case, USB Memory	
Control Module (3 independent contacts)	CG-19030
Including: 3 cable sets, 5 m (16 ft), GA-00877	
Timing M/R Module (6 channels + 6 PIR)	CG-19080
Including: 3 cable sets, 5 m (16 ft) total length, 2 m (6.5 ft) spread, GA-00850	
DCM Module	CG-19190
Including: 3 DCM-cables, 12 m (39 ft)	
DCM Module	CG-19192
Including: 6 DCM-cables, 12 m (39 ft)	
Analog Module (3 channels)	CG-19000
Including: 3 cable sets, 10 m (33 ft), GA-01005	
Digital Module (6 channels)	CG-19040
Timing Aux Module (6 channels)	CG-19060
Including: 3 cable sets, 5 m (16 ft), GA-00870	
Printer Module	CG-19050
Including: Paper spool, GC-00040	
Optional accessories	
See Optional accessories, pages 10- 11	
CABA Win	
See separate datasheet for CABA Win.	
IPS-CBEX	
IPS CBEX is a database for circuit breakers and can be purchased as a stand alone SW or as a server version and also as a nice priced package together with TM1800 Expert. For more information please visit our web site or contact customer service.	

Item		Art. No.
TM1800 – Configurations		
TM1800 Standard		CG-19290
Including:		
CG-19090	TM1800 Basic Unit	1
CG-19030	TM1800 Control Module	1
CG-19080	TM1800 Timing M/R Module	1
CG-19000	TM1800 Analog Module	1
CG-8000X	CABA Win - TM1800	1
TM1800 Standard – for DualGround testing		CG-19292
Including:		
CG-19090	TM1800 Basic Unit	1
CG-19030	TM1800 Control Module	1
CG-19080	TM1800 Timing M/R Module	1
CG-19192	TM1800 DCM Module	1
CG-19000	TM1800 Analog Module	1
CG-8000X	CABA Win - TM1800	1
TM1800 Expert		CG-19294
Including:		
CG-19090	TM1800 Basic Unit	1
CG-19030	TM1800 Control Module	2
CG-19080	TM1800 Timing M/R Module	2
CG-19000	TM1800 Analog Module	1
CG-19060	TM1800 Timing AUX Module	1
CG-8000X	CABA Win - TM1800	1
TM1800 Expert – for DualGround testing		CG-19296
Including:		
CG-19090	TM1800 Basic Unit	1
CG-19030	TM1800 Control Module	2
CG-19080	TM1800 Timing M/R Module	2
CG-19192	TM1800 DCM Module	2
CG-19000	TM1800 Analog Module	1
CG-19060	TM1800 Timing AUX Module	1
CG-8000X	CABA Win - TM1800	1

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