

FRAX200 Series Sweep Frequency Response Analyser



- Built-in demagnetisation and automatic ground loop check
- Optional FSX200 switchbox enables one-time connection to all phases
- Active clamps for safe, one-hand bushing connection
- High measurement repeatability with shielded cabling and IEC-compliant grounding
- Battery operation with removable pack and flight-mode discharge
- Full sweep with ground check completed in under one minute

DESCRIPTION

The FRAX200 provides high-resolution frequency response measurements to detect mechanical or electrical changes inside power transformers. By injecting a swept sine wave and analysing the response, it identifies core and winding faults with excellent accuracy. The instrument is lightweight and field-ready, featuring USB-C and wireless Bluetooth communication using Bluetooth Low Energy (BLE) technology, intuitive PC software, and options for automation.

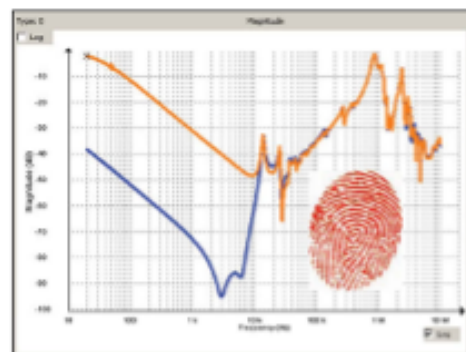
The new, optional, switchbox FSX200 makes it possible to connect to all phases at once for a one-time-connection. This is made possible using active clamps (patent pending). With the active clamps it is possible to disconnect the additional leads at the bushing end thus excluding the measurement influence of all connected cables not used for the phases not part of the current measurement.

Additionally, the FRAX200 comes with a built-in demagnetisation circuit making it possible to perform the demagnetisation of the transformer core before your measurement starts, thus eliminating any uncertainties in the low frequency regions that the magnetised transformer core can add.

Typical problems detected with the sweep frequency method are:

- Winding deformations and displacements
- Shorted turns and open windings
- Broken clamping structures
- Core connection problems
- Partial winding collapse
- Faulty core grounds
- Core movements

Using the Sweep Frequency Response Analysis (SFRA) technique for detecting electro-mechanical problems in power transformers requires comparison to previous data and is often seen as a fingerprint method. Start collecting data for your transformers. This is an easy way to ensure reliability in your transformer fleet and an investment that will save time and money.



Note: Images reflect typical configurations and may vary from delivered products

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APPLICATION

In its standard application, a fingerprint/reference curve for each winding is captured when the transformer is new or when it is in a known, good condition. These curves can later be used as reference during maintenance tests or when there is reason to suspect a problem. The most reliable method is the time-based comparison where curves are compared over time on measurements from the same transformer.

Collection of data is essential for fingerprint comparisons. Always make sure your collected data has as little unknown factors as possible. Here the FRAX200 can help you with:

- Guaranteed repeatability by using superior cabling technology and standardised signal cable grounding technique (IEC 60076-18, Method 1).
- Fulfils international standards for Sweep Frequency Response Analysis (SFRA) measurements: (IEC 60076-18, IEEE C57.149, etc.).
- Highest dynamic range and accuracy in the industry allowing even the most subtle electro-mechanical changes within the transformer to be detected.
- Demagnetising the transformer before the measurements starts with the internal demagnetising functionality. This is done using Megger standard method, adaptive demagnetisation, implemented in numerous other Megger equipment.
- System automatically performs, and stores the result in the data file, ground loop detection not allowing any data collection without proper connection.

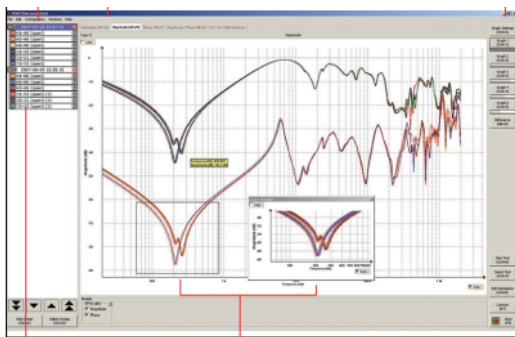


Figure 1: Overview of sweep response curves with interactive display tools

FEATURES

Included software without any licence control, possibility to install for multiple users without any additional requirements for yearly payments.

Software includes:

Test object browser – Unlimited number of tests and sweeps. Full user control.

- Quick select tabs – Quickly change presentation view for different perspectives and analysis tools.
- Quick graph buttons – Programmable graph setting lets you change views quickly and easily.
- Sweep/curve settings – Every sweep can be individually turned on or off, change colour, thickness and position.
- Dynamic zoom – Zoom in and move your focus to any part of the curve.
- Operation buttons – All essential functions at your fingertips; select with mouse, function keys or touch screen.
- Automated analysis compares two curves using an algorithm that compares amplitude as well as frequency shift and lets you know if the difference is severe, obvious or light. Pass/fail criteria for shorted measurements.

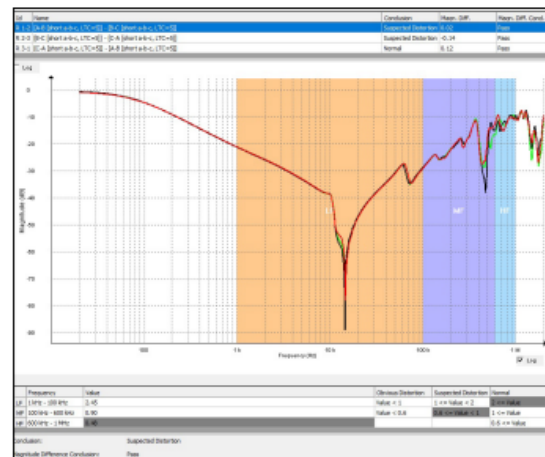
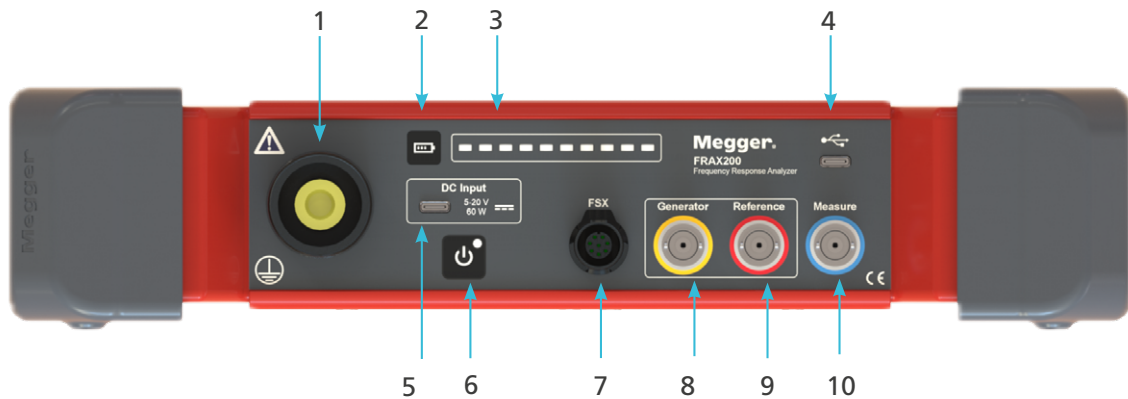


Figure 2: Frequency band selection view for detailed curve analysis

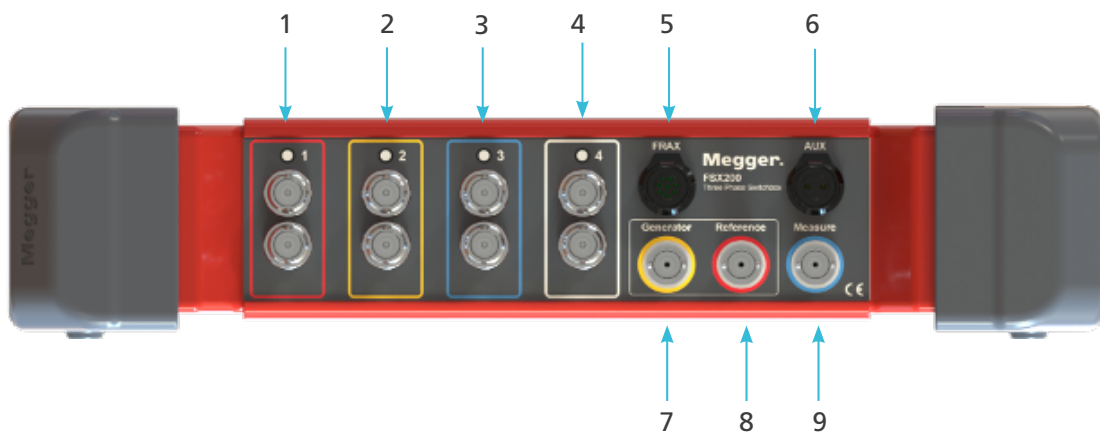
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FRAX200



| Item | Description | Item | Description |
|------|--|------|----------------------------------|
| 1 | Ground (earth) terminal | 6 | On/Off button |
| 2 | Battery charge check push button | 7 | Switchbox Connector (for FSX200) |
| 3 | Device status and battery charge LED indicator | 8 | Generator (Yellow) |
| 4 | USB-C for data transfer | 9 | Reference input (Red) |
| 5 | USB-C for DC-input and charging | 10 | Measure input (Blue) |

SWITCHBOX FSX200



| Item | Description | Item | Description |
|------|--|------|--|
| 1 | Measurement channels 1 | 6 | Connector for auxiliary shorting clamps |
| 2 | Measurement channels 2 | 7 | Connector for Generator (Yellow) connection between FSX200 and FRAX200 |
| 3 | Measurement channels 3 | 8 | Connector for Reference (Red) connection between FSX200 and FRAX200 |
| 4 | Measurement channels 4 | 9 | Connector for Measure (Blue) connection between FSX200 and FRAX200 |
| 5 | Connector for multi-cable between FSX200 and FRAX200 | | |

FRAX200 Series

Sweep Frequency Response Analyser

SPECIFICATIONS

Specifications are valid at fully charged batteries and an ambient temperature of +25 °C, ±3 °C. Specifications are subject to change without notice.

Environment

Application field For use in medium and high-voltage substations and industrial environments.

Temperature
 Operating -20 °C to +55 °C (-4 °F to + 131 °F)
 Storage -40 °C to +70 °C (-40 °F to + 158 °F)
 Relative humidity (%RH) 5% to 95%, non-condensing
 Altitude Operational to 3 000 m

CE-marking

EMC 2004/108/EC
 LVD 2006/95/EC
 Shock IEC 60068-2-27
 Vibration IEC 60068-2-64
 Transport ISTA 2A
 Flammability class V0

General

DC power supply 11 to 16 V DC, USB-C
 Internal battery 58 Wh / 5.2 Ah

Dimensions

Instrument L 330 x W 190 x H 70 mm
 L 13 x W 7.5 x H 2.8 in
 Transport case L 590 x W 460 x H 300 mm
 L 23.2 x W 18.1 x H 11.8 in

Weight

Instrument 2.4 kg (5.3 lbs)
 Transport case with FRAX and accessories, 9 m (30 ft) 16.8 kg (37 lbs)

Measurement section

Test method Sweep Frequency Response Analysis (SFRA)
 Frequency range 0.1 Hz – 30 MHz, user selectable
 Frequency resolution 0.01%
 Frequency accuracy 0.01% (measurement error)
 Level resolution 0.001 dB
 Number of points Default 1046, Up to 32 000 points, user selectable
 Measurement time Default 64 s, fast setting, 37 s (20 Hz – 2 MHz)
 Points spacing Log., linear or both
 Sweep settings Individual settings for customer defined frequency bands. Linear and logarithmic scale or combination of both

Internal noise level < -140 dB (average 20 Hz to 2 MHz)
 Dynamic range²⁾ >150 dB
 Accuracy (measurement error) ±0.1 dB from +10 dB down to -50 dB
 ±0.5 dB from -51 dB down to -100 dB
 IF bandwidth User selectable, default <10%

Communication

PC communication USB-C
 Bluetooth Yes

Software

FRAX Software for Windows
 Standards / guides Fulfils requirements in IEC 60076-18, IEEE C57.149-2012, CIGRE Technical Brochure 342, DLT 911-2004, as well as other international standards and recommendations

Other

Ground loop detection Yes, automatic
 Demagnetisation Yes, Adaptive 2A current
 Analog output channels 1

Compliance voltage

Generator output 0.20 – 24 V p-p
 Measurement voltage at 50 Ω 0.1 – 12 V p-p, default set at 10 V p-p
 Output impedance 50 Ω
 Protection Short-circuit protected
 Frequency range 0.1 Hz – 30 MHz
 Sweep direction Low to high or high to low

Analog input

Channels 2
 Sampling Simultaneous
 Frequency range 0.1 Hz – 30 MHz
 Input impedance 50 Ω
 Sampling rate 100 MS/s

FSX200 SWITCHBOX

Analog output

Channels 4
 Input-/output impedance 50 Ω
 AUX output 32 V, active short circuit clamps, max three in series

Dimensions

Instrument: FSX200 L 330 x W 190 x H 70 mm
 L 13 x W 7.5 x H 2.8 in
 Transport case L 520 x W 460 x H 220 mm
 L 20.5 x W 18.1 x H 8.7 in

Weight

Instrument 1.8 kg (4 lbs)
 Transport case with FSX and accessories, 9 m (30 ft) 19.0 kg (42 lbs)
 Transport case L 590 x W 460 x H 300 mm
 L 23.2 x W 18.1 x H 11.8 in

Measurement section

Frequency range 0.1 Hz – 2 MHz
 Internal noise level < -140 dB (average 20 Hz to 2 MHz)
 Dynamic range¹⁾ >150 dB
 Accuracy (measurement error) ±0.2 dB from +10 dB down to -50 dB
 ±0.5 dB from -51 dB down to -100 dB

IF bandwidth User selectable, default <10%

Service and calibration








Factory-calibrated with certificate.
 Recommended recalibration interval: 1–3 years. Service and calibration available via Megger-authorized centres.

1) Max battery temperature is 60°C, internal shut off during long operation times

2) Dynamic range is defined from +10 dB to internal noise in the unit







FRAX200 Series Sweep Frequency Response Analyser

INCLUDED ACCESSORIES

| Picture | Part Number | Description | FRAX200 | FSX200 | FRAX200 + FSX200 |
|---|---------------------------|--------------------------------------|---------|--------|------------------|
|  | | Active clamp | | | |
| | GC-80054 | yellow | 1 | | 1 |
| | GC-80056 | blue | 1 | | 1 |
| | GC-80052 | red | | 1 | 1 |
| | GC-80059 | white | | 1 | 1 |
|  | | FRAX generator cable | | | |
| | GC-30040 | Red/Yellow, 9 m (30 ft) | 1 | | 1 |
| | GC-30044 | Yellow/Yellow, 9 m (30 ft) | | 1 | 1 |
| | GC-30046 | Blue/Blue, 9 m (30 ft) | | 1 | 1 |
| | GC-30049 | White/White, 9 m (30 ft) | | 1 | 1 |
| | GC-30042 | Red/Yellow, 18 m (60 ft) | 1 | | 1 |
| | GC-30054 | Yellow/Yellow, 18 m (60 ft) | | 1 | 1 |
| | GC-30056 | Blue/Blue, 18 m (60 ft) | | 1 | 1 |
| | GC-30059 | White/White, 18 m (60 ft) | | 1 | 1 |
| GC-30043 | Red/Yellow, 30 m (100 ft) | 1 | | 1 | |
|  | | FRAX measure cable | | | |
| | GC-30050 | 9 m (30 ft) | 1 | | 1 |
| | GC-30052 | 18 m (60 ft) | 1 | | 1 |
| | GC-30053 | 30 m (100 ft) | 1 | | 1 |
|  | GC-80060 | Ground clamp | 2 | 2 | 4 |
|  | GC-30033 | Ground braid insulated, 3 m (10 ft) | 2 | 2 | 4 |
|  | GC-30036 | Ground braid extension, 3 m (10 ft) | 2 | 2 | 4 |
|  | GC-30037 | Ground braid 0.3 m (1 ft) with clamp | 2 | 2 | 4 |



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| Picture | Part Number | Description | FRAX200 | FSX200 | FRAX200 + FSX200 |
|---|-------------|--|---------|--------|------------------|
| | GA-00925 | Switchbox interconnection cable, 0.3 m (1 ft) | | 1 | 1 |
| | GA-30025 | BNC cable 0.25 m RG58 | | 3 | 3 |
| | GA-00935 | Cable, AUX > Shorting clamp 3 m (10 ft) | | 2 | 2 |
| | GA-00945 | Cable, AUX > Shorting clamp 10 m (33 ft) | | 1 | 1 |
|  | GC-80070 | FSX200 Shorting clamp | | 3 | 3 |
|  | GC-30080 | Ground cable, green/yellow 10 m (33 ft) | 1 | | 1 |
|  | HC-04290 | AC/DC Adapter, USB-C, 60 W | 1 | | 1 |
| | HG-00240 | USB-C cable | 1 | | 1 |
| | AA-00015 | IEC 60320 C7 mains lead | 1 | | 1 |
|  | AC-90060 | FRAX Field Test Box FTB-101 | 1 | | 1 |
|  | GD-30000 | Transport case FRAX200 maxi *Depending on FRAX200 + FSX200 combination | 1 | | 1* |
|  | GD-30005 | Transport case FSX200 mini *Depending on FRAX200 + FSX200 combination | 1 | | 1* |

FRAX200 Series

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| Picture | Part Number | Description | FRAX200 | FSX200 | FRAX200 + FSX200 |
|---|-------------|--|---------|--------|------------------|
|  | GD-30015 | Transport case FSX200 mini *Depending on FRAX200 + FSX200 combination | 1 | | 1* |
|  | 2012-180 | Cable backpack | | 1 | 1 |
| | SA-AC101 | PC software for FRAX | | | |

OPTIONAL ACCESSORIES

| Picture | Part Number | Description | FRAX200 | FSX200 | FRAX200 + FSX200 |
|---|-------------|-----------------------|---------|--------|------------------|
|  | AC-90020 | Calibration set | 1 | | 1 |
|  | AC-90050 | FRAX demo box FDB 101 | 1 | | 1 |

FRAX200 Series

Sweep Frequency Response Analyser

ORDERING INFORMATION

| Description | Part number |
|--|-------------|
| FRAX200 ADV 9 m | AC-49090 |
| FRAX200 ADV 18 m | AC-49092 |
| FRAX200 ADV 30 m | AC-49094 |
| FSX200 3 x 9 m | AC-49190 |
| FSX200 3 x 18 m | AC-49192 |
| FRAX200 ADV + FSX200 9 m with maxi case | AC-40090 |
| FRAX200 ADV + FSX200 18 m with maxi case | AC-40092 |
| FRAX200 ADV + FSX200 9 m with mini case | AC-40094 |
| FRAX200 ADV + FSX200 18 m with mini case | AC-40096 |

POSTAL ADDRESS
Megger Sweden AB
Box 724
SE.182 17 Danderyd
T. +46 (8) 510 195 00
E. seinfo@megger.com

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