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 sinewave 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.

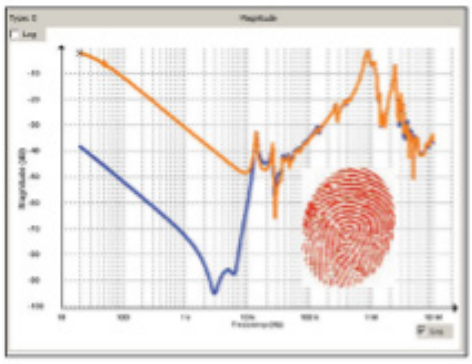
The new, optional, switchbox FSX200 makes it possible to connect to all phases at once for a one-time-connection. This is made possible using active clamps (patent pending). With the active clamps it is possible to disconnect the additional leads at the bushing end thus excluding the measurement influence 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.

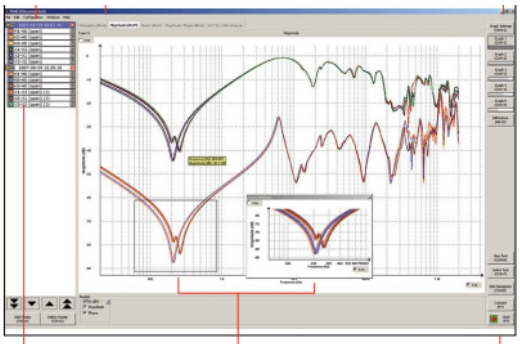

Figure 1: Overview of sweep response curves with interactive display tools

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.

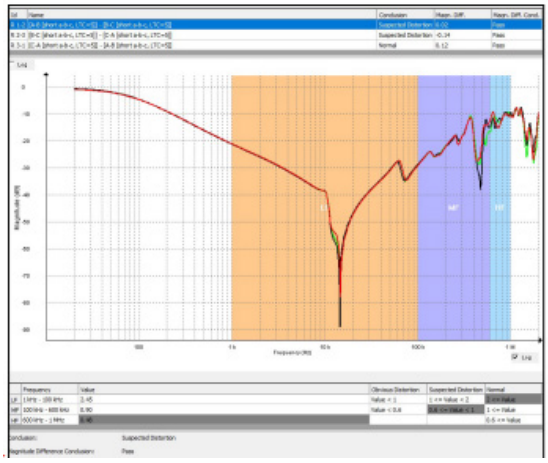

Figure 2: Frequency band selection view for detailed curve analysis

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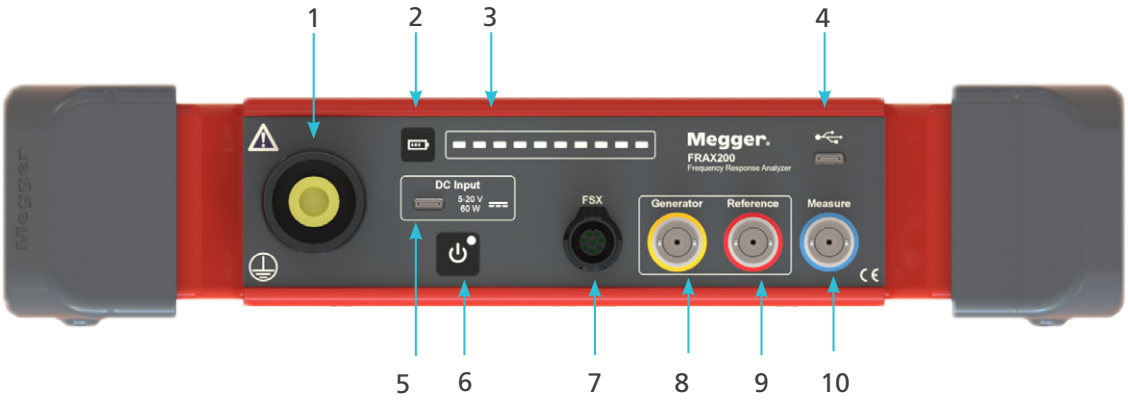
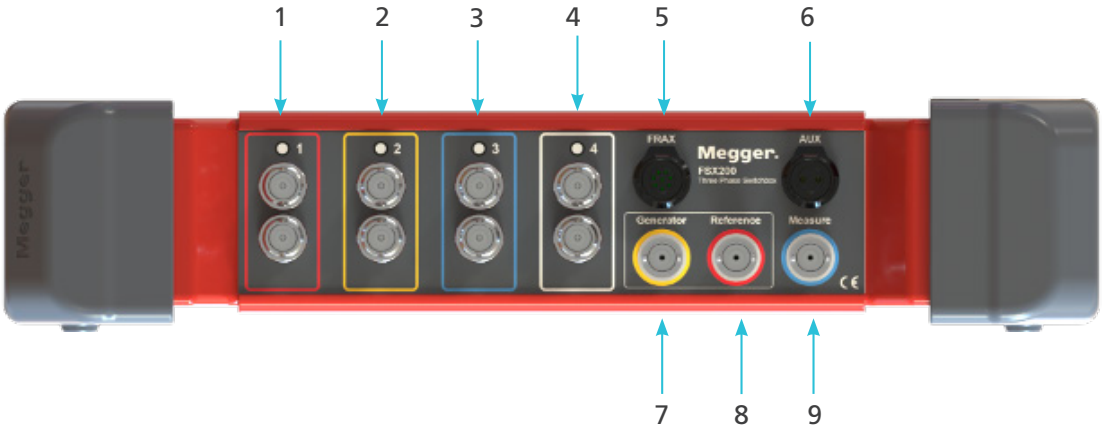
FRAX200



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

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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 range[2)]	>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, DL/T 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 H11.8 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-authorised 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

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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
	GA-30044	Yellow/Yellow, 9 m (30 ft)		1	1
	GA-30046	Blue/Blue, 9 m (30 ft)		1	1
	GA-30049	White/White, 9 m (30 ft)		1	1
	GC-30042	Red/Yellow, 18 m (60 ft)	1		1
	GA-30054	Yellow/Yellow, 18 m (60 ft)		1	1
	GA-30056	Blue/Blue, 18 m (60 ft)		1	1
	GA-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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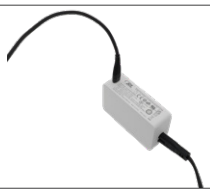
Picture	Part Number	Description	FRAX200	FSX200	FRAX200 + FSX200
	GA-00925	Switchbox interconnection cable, 0.3 m (1 ft)		1	1
	GA-30025	BNC cable 0.25 m RG58		3	3
	GA-00935	Cable, AUX > Shorting clamp 3 m (10 ft)		2	2
	GA-00945	Cable, AUX > Shorting clamp 10 m (33 ft)		1	1
	**GC-80070**	FSX200 Shorting 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 FRAX200 mini *Depending on FRAX200 + FSX200 combination	1		1*

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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	1		1

OPTIONAL ACCESSORIES

Picture	Part Number	Description	FRAX200	FSX200	FRAX200 + FSX200
	**AC-90050**	FRAX demo box FDB 101	1		1

FRAX200 Series
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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

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