

Technical data

# Fluke 9500C High-Performance Oscilloscope Calibrator



## Your key to exceptional signal performance

The 9500C is a dedicated modern oscilloscope calibrator designed for calibration professionals who need to cover workload below 4 GHz accurately, reliably, and efficiently. Improvements over its predecessor, the 9500B, include simultaneous outputs on all channels, which increase test speed and efficiency, and eliminate lead changes. The 9500C also boasts better accuracy, a more robust Active Head, updated hardware and software, and a modern color touch screen interface. The 9500C can be fully automated with MET/CAL software for hands-free operation.

## Full Automation

Oscilloscopes are complex measurement tools, automating the calibration and verification of these tools creates one of the largest productivity gains in any organization. Performed manually, this work requires skilled operators to spend a substantial amount of time performing what are, essentially, repetitive tasks. Semi- or partial automation solutions start to address this issue and free skilled technicians to perform more valuable tasks. However, in practice, these partial solutions present their own problems. Modern Oscilloscopes have increasing numbers of channels or inputs multiplying the work to calibrate each input.

When calibrating these instruments, it is necessary to calibrate and verify each input channel. This can be achieved by physically moving cables requiring operator intervention if you only have a single channel calibration source. In high-performance instruments, this may introduce additional measurement uncertainties as cables and connectors are handled. An alternative is to introduce a switching matrix to route signals, though this may result in problems with signal reflections, poor contacts and path differences that materially impact calibration uncertainties.

## Efficient

- The only commercially available multi-channel oscilloscope calibration system
- Faster throughput
- Fully automated
- Simultaneous output
- Double bandwidth with a dedicated scope calibrator over a multi-product calibrator

## Effective

- More accurate signal to test a wide range of signals and frequencies
- High signal purity
- High bandwidth
- 4 channels plus trigger
- Leveled sine waves up to 4 GHz
- Confidence in your oscilloscope accuracy for a range of applications
- Expand your calibration abilities with performance and flexibility using Active Head Technology™ generating calibration signals right at the oscilloscope input

## Productive

- Easy-to-use updated user interface
- Updated serviceability
- Improved reliability with removed mechanical components and replaceable parts



## Active Heads

The Fluke 9500C addresses these issues and provides true, full automation using its unique active heads. With the 9500C, all the signals required to fully calibrate the oscilloscope are precisely available from the Active heads, remote from the calibrator mainframe. The heads are connected directly to the oscilloscope input without the need for additional cables. All control and switching of waveforms are performed under the control of the mainframe, yet within the head itself—typically only a matter of millimeters away from the oscilloscope input and amplifiers. With each 9500C mainframe able to control up to five heads, all the signals required to calibrate a 4-channel oscilloscope with an external trigger can be supplied, controlled, and switched without operator intervention or the need for external switching.

## Simultaneous Channel Calibration

With a single-channel solution, technicians need to run calibration procedures one channel at a time, duplicating most tests for each independent input on the Scope. Having to calibrate a single channel at a time can be tedious and at worst, time-consuming, creating inefficiencies. Rather than continuing with this method, the Fluke 9500C allows technicians to calibrate all available channels simultaneously, eliminating lead changes, reducing test time, and creating a more efficient and productive process. This simultaneous signal approach can easily reduce calibration time by 30 to 40 percent.

## Protecting Your Investment

Over recent years, oscilloscope technology and performance levels have changed dramatically, a trend set to continue. What was seen as a cutting-edge instrument only a few years ago may now be relegated to the general-purpose pool. The challenge for those chartered with maintaining a calibration facility to support these instruments is how to keep up with this rapid

progress. The Fluke 9500C takes lessons learned from the 9500B and moves the state-of-the-art in multi-channel Oscilloscope forward with modern design and components. The 9500C is designed to take Oscilloscope calibration into the next decade.

If you already need to work with higher performance instruments, you can jump right in at any point. If full automation is not something you need right away, begin with just a few active heads, or just one. As needs change, add more heads until you have the degree of automation and the level of performance that perfectly matches your organization's daily oscilloscope calibration needs. Only the Fluke 9500C Workstation, with its unique 'Active Head Technology™', can provide the upgrade path to secure your investment in calibration equipment.

## 9540C Active Head Technology™

The 9540C continues the 9500B's technology of deploying an Active Head to deliver an accurate signal at the input of the Scope. The 9540C is a lightweight module measuring only 9.4 x 4.6 x 2.2 cm. It connects to the 9500C mainframe through two cables—a single coaxial cable and a control umbilical. Within the head is all the circuitry needed to apply signals necessary to calibrate a modern, high-performance oscilloscope. This includes precision DC levels up to  $\pm 220$  V; calibrated amplitude square waves up to 210 V pk-pk from 10 Hz to 100 kHz; leveled sinewaves from 0.1 Hz to 4 GHz; and four different styles of timing marker from 0.2 ns to 50 s.



## Complete Functionality

Enhanced by Active Head Technology™ the 9500C supports full automation, the complementary pair of a workstation and heads come together to provide unrivaled functionality. This allows the user to confidently increase throughput, without compromising accuracy or stability.

New to the 9500C platform is the capability of simultaneously sourcing calibration signals on multiple outputs, providing significant productivity improvements over the 9500B.

## Improved Reliability and Serviceability

Significant attention during the design of the 9540C Active Head will yield improved reliability and serviceability. Serviceability has been improved by making cables and output connectors customer/field replaceable. No longer does the head need to be sent in for service when these components wear during normal usage, the new design allows you to take care of it in the moment.

## Vertical and horizontal deflection bandwidth

Fast return-to-ground edges with amplitudes between 4.44 mV and 3.1 V and rise/fall times of 70 ps, 150 ps, or 500 ps check the pulse response and bandwidth of an oscilloscope's vertical acquisition amplifiers. High-level edges up to 210 V pk-pk check the dynamic performance of input attenuators. Leveled sinewaves up to 4 GHz with an amplitude range of 4.44 mV to 5.56 V pk-pk into 50  $\Omega$  allow direct calibration of oscilloscope bandwidth. They also calibrate Z-axis and horizontal bandwidth. Dual sine outputs calibrate the oscilloscope's trigger sensitivity and any other functions that normally require the insertion of a splitter into the connecting cable.

## Vertical gain

DC levels and 10 Hz to 100 kHz squarewaves are adjustable up to 220 V with 5-digit amplitude resolution at 0.025 % accuracy for dc and 0.05 % for squarewaves—more than sufficient to calibrate the vertical ranges of 12-bit digitizing and 14-bit interpolating oscilloscopes. The 9500C even checks the oscilloscope's input impedance before applying high voltages to protect 50  $\Omega$  input terminations. Automatic switching to 50  $\Omega$  output impedance provides the same waveforms at amplitudes up to 5.56 V.

## Timebase accuracy

Timing markers cover the calibration of timebase ranges from 0.2 ns to 50 s per division. A choice of four styles, plus the ability to highlight every tenth marker by increasing its amplitude, provides optimum visibility on analog and digital storage oscilloscopes. The square and pulse markers can also be used to calibrate timebase jitter. Complete with high-stability crystal reference, the 9500C calibrators have timing accuracy of  $\pm 0.25$  ppm—the level required to calibrate the latest DSOs.

## Auxiliary calibration functions

The 9500C Auxiliary Function capabilities calibrate oscilloscope functions often overlooked on other calibrators.

- DC and squarewave currents up to 100 mA calibrate current probes
- Composite video signals test TV sync separator functions
- Linear ramps calibrate trigger level markers and check DSOs for missing bits
- High current 5 V to 20 V pulses test 50  $\Omega$  terminator protection
- Zero skew accurately aligns pulse edges to evaluate channel delays in multi-channel scopes
- AUX IN routes external calibration waveforms to an active head's BNC/SMA connector
- Resistance and capacitance functions directly measure oscilloscope input impedance
- Short/open circuit outputs allow testing of oscilloscope input leakage current



## Dedicated Oscilloscope Calibration

When higher bandwidths and signal purity are needed, a general-purpose multi-product calibrator simply can't handle the task. The 9500C has a more accurate signal to test a wide range of signals and frequencies across 4 channels for leveled sine waves up to 4 GHz, resulting in double the bandwidth over a multi-product calibrator. Combined with faster throughput and simultaneous output, you can rest assured with confidence in your oscilloscope accuracy for a wide range of applications.

## Features you expect from a modern instrument

### Front and rear panel improvements

USB ports are placed both on the front and rear of the unit. Use the port at the front to download internal calibration constants; use the rear port for remote communication with a PC—or choose the LAN, IEEE, or serial interfaces.

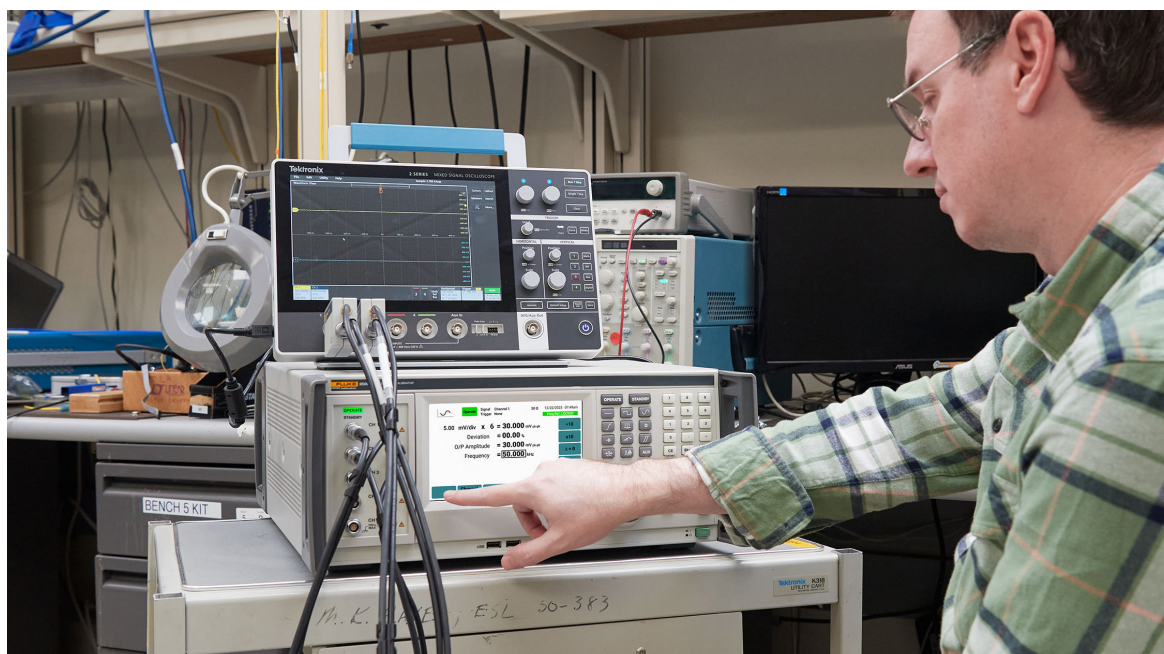
For previous 9500B users, the 9500C maintains many front-panel details that characterize their predecessors, including the calculator-style keyboard for entering values easily, an output dial for varying output, and keys for selecting common parameters with a single touch.

## Graphical user interface optimized for touchscreen use

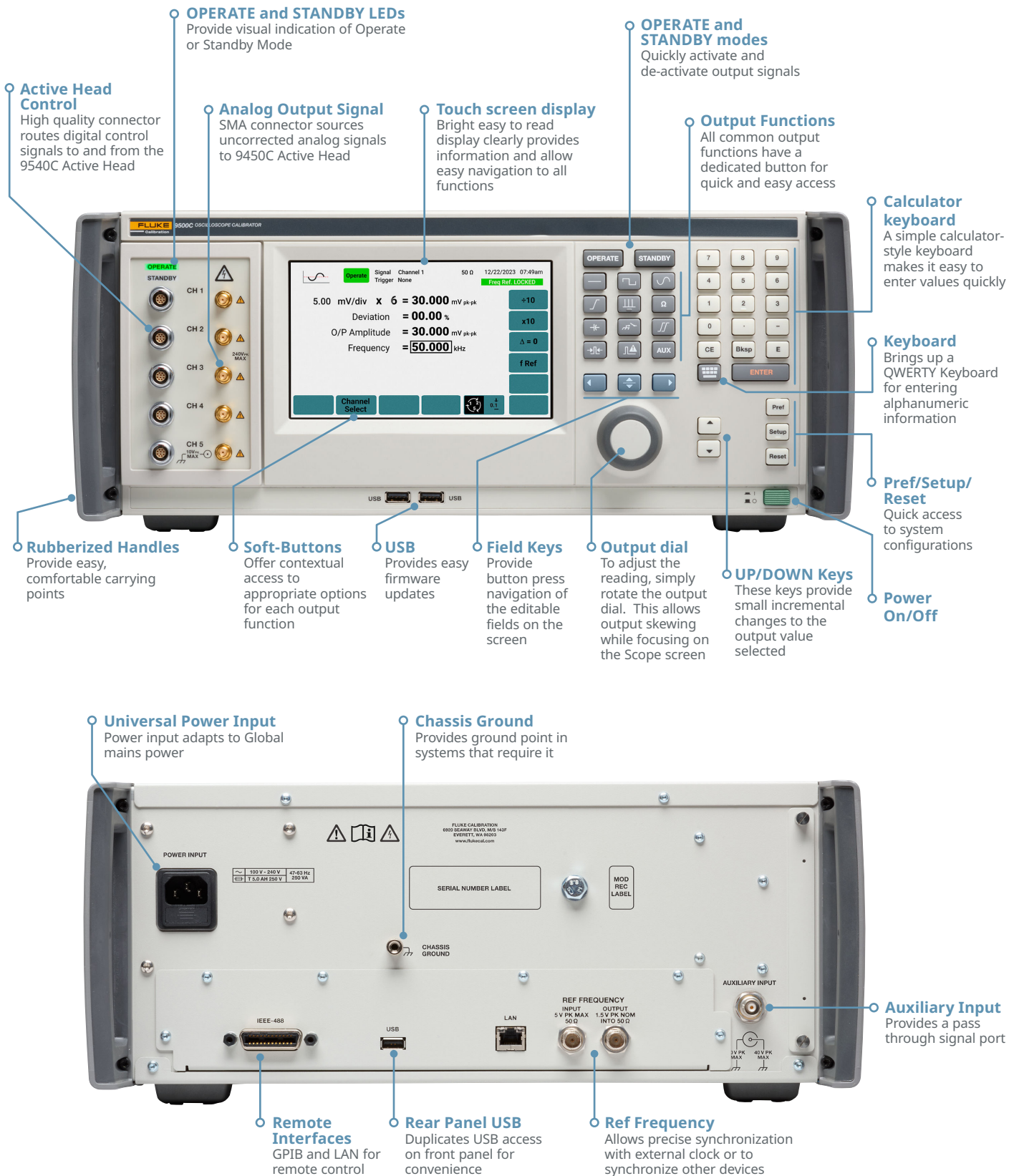
A 17.8-centimeter (7-inch) graphical user interface offers intuitive menus that are not only easy to navigate and read, but also significantly brighter than the previous 9500B model. The new display also provides access to common functions with the touch of a finger and eliminates the menu scrolling that was previously required.

The screen displays all the information you need for each parameter you're calibrating, with color-coded fields that make it easy to see where you enter data. The menu is simplified, and functions are laid out consistently so that once you learn how to operate one you know how to operate them all. Training new users just became much easier.

Status indicators for OPERATE, STANDBY, and HAZARDOUS VOLTAGE appear on the screen in bright letters or icons you can recognize from across the calibration lab.



# Fluke 9500C control diagram





## MET/CAL™ automation increases throughput and efficiency

Quality standards impose stringent requirements for documenting, reporting, and controlling calibration processes and results. MET/CAL™ Calibration Management Software helps you meet these requirements while increasing throughput and streamlining voltage calibration, resistance calibration, and current calibration processes. MET/CAL is a powerful application for creating, editing, and testing calibration procedures and collecting and reporting results on a wide variety of instruments. As the industry-leading software for automated calibration, thousands of calibration procedures have been written to automate a vast array of calibrations around the world.

The 9500C works with MET/CAL, including hundreds of automated calibration procedures to improve throughput consistently and dramatically. MET/CAL includes a Function Select Code (FSC) that enables you to add the 9500C seamlessly to your existing calibration operations.

MET/CAL is available for purchase alongside MET/TEAM™, a specialized asset management system designed to offer a comprehensive software solution for professionals in calibration. Should you already have an existing calibration asset management system, MET/CAL offers compatibility, allowing for seamless integration into your current workflow through MET/CONNECT™ Calibration Integration Software. MET/CONNECT is the hub of a

fast-growing community of mainline calibration software providers that have partnered with Fluke Calibration to support MET/CAL automation. Whatever calibration management system you use, MET/CONNECT unlocks calibration and workflow automation in your lab.

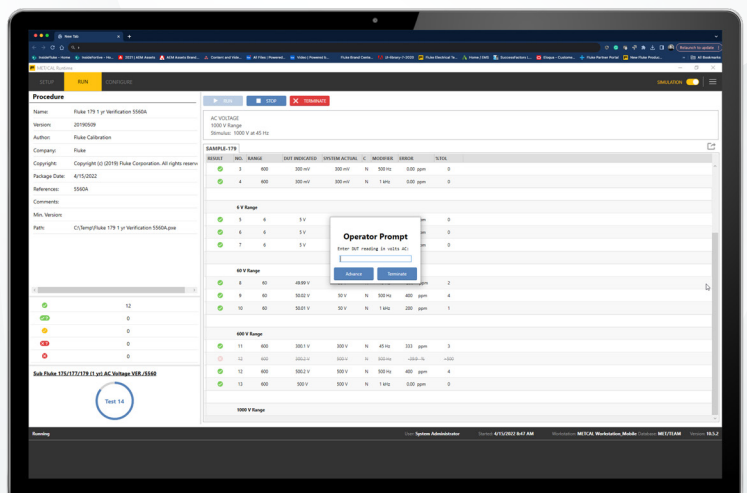
## Priority software support helps you stay productive

MET/SUPPORT™ Gold is an annual membership program offering premium support and services to help you stay as productive as possible with MET/CAL software. Services include free software updates and upgrades, free access to the Fluke MET/CAL Warranted Procedures Library, priority technical support, plus discounts on training and custom procedure development. Members also receive invitations to regular calibration software web seminars and user group meetings. Use only a few of the Gold services and you can easily recover more than the cost of your membership fee.

MET/TEAM™

MET/CONNECT™

MET/SUPPORT™ Gold





## Your choice of specifications

### How often to calibrate? You decide.

The 9500C includes 90-day and 1-year specifications. You can manage the cost of ownership and maximize uptime by keeping the calibrator in service as long as possible based on your unique specification requirements.

### Metrology training builds team skills

Calibration and metrology training from Fluke Calibration improves the knowledge of you and your colleagues in a wide variety of disciplines. Instructor-led classroom training is available for general topics in metrology that include both hands-on training and training in measurement uncertainty, as well as classes on how to use Fluke Calibration software. On-site training is available for teams with specific training needs. Instructor-led and self-paced online courses are available as well.

Fluke Calibration also offers web seminars, events, and road shows on a wide variety of topics. To stay informed about these events, register online and subscribe to our e-news.

### Calibration and repair services keep you up and running

Fluke Calibration offers extensive calibration support and services to ensure long-term customer satisfaction and return on investment. Our worldwide network of service centers offers accredited calibration traceable to national standards. We provide fast, quality repair services and full support in setting up your calibration lab.



Calibration and metrology training includes a variety of offerings including classroom, online, and on-site.



**High-Performance Oscilloscope Calibrator  
9500C Mainframe with 9540C Head**

## Specifications

| Oscilloscope Functions           | Range   | Best Performance                                     |
|----------------------------------|---|--|
| DCV                              | 1 mV to 200 V into 1 MΩ;<br>1 mV to 5 V into 50 Ω                                   | ± (0.01% + 10 μV)                                    |
| Square Wave                      | 40 μV to 200 Vp-p into 1 MΩ;<br>40 μV to 5 Vp-p into 50 Ω;<br>10 Hz to 100 kHz      | ≥ 1 mV: ± (0.1 % + 10 μV)<br>< 1 mV: ± (1 % + 10 μV) |
| Edge                             | 5 mV to 3 Vp-p into 50 Ω;<br>5 mV to 3 Vp-p into 50 Ω or 1 MΩ                       | 125 ps<br>500 ps                                     |
| Leveled Sine Frequency           | 0.1 Hz to 4.2 GHz   | ± (0.15 μHz/Hz + 1 μHz)                              |
| Leveled Sine Amplitude           | 0.1 Hz to 2.1 GHz<br>2.1 GHz to 3.2 GHz<br>3.2 GHz to 4.2 GHz                       | 5 mV to 5 Vp-p<br>5 mV to 3 Vp-p<br>5 mV to 2 Vp-p   |
| Leveled Sine Flatness            | 0.1 Hz to 550 MHz<br>550 MHz to 1.1 GHz<br>1.1 GHz to 2.1 GHz<br>2.1 GHz to 4.2 GHz | ± 1.5 %<br>± 2 %<br>± 3 %<br>± 4 %                   |
| Timing Marker                    | 250 ps to 50 s  | ± 0.15 μs/s  |
| Pulse Width                      | 1 ns to 100 ns  | < ± (5% + 500 ps)                                    |
| Resistance & Capacitance Measure | 10 Ω to 12 MΩ<br>1 pF to 95 pF  | ± 0.1 %<br>± (2 % + 0.25 pF)                         |
| Overload Pulse                   | 0.2 s to 100 s  | 5 V to 20 V into 50 Ω                                |
| General Specifications           |   |  |
| Communication Interfaces         | IEEE 488.2; USB; Ethernet   | Standard   |
| Specification Interval           |   | 90d, 1yr, 2yr  |
| Specification Confidence         |   | 99% (k=2.78) and 95% (k=1.96)                        |
| Touchscreen                      |   | 17.8 cm (7 in.) Graphical User Interface             |
| Transport Case (w/ Wheels)       |   | Included Standard                                    |





## Ordering information

| Models                            | Description   |
|-----------------------------------|---|
| 9500C                             | High-Performance Oscilloscope Calibrator<br><br>*includes full Accredited 17025 Calibration Certificate traceable to international standards with data. |
| Optional accessories              | Description   |
| 9540C                             | 4 GHz Active Head with 150 pS edge  |
| Priority Gold Instrument CarePlan | Premium Instrument Service Plan (where available)   |
| Software accessories              | Description   |
| MET/CAL-SERIAL                    | Optional Closed Loop Procedure Serial Connectivity Kit  |
| MET/SUPPORT Gold                  | Product Support Program (where available)   |
| Warranted Procedures              | Optional calibration procedures for MET/CAL Calibration Software  |
| Software                          | Description   |
| MET/CAL/TEAM                      | Software, MET/CAL w/MET/TEAM  |
| MET/CAL-TL                        | License, Additional MET/CAL (TEAM)  |
| MET/TEAM-L                        | License, Additional MET/TEAM  |
| MET/CAL/TEAMXP                    | Software, MET/CAL with MET/TEAM Express   |
| MET/TEAMXP-L                      | License, Additional MET/TEAM Express  |
| MET/TEAM MOBILE-L                 | License, Additional MET/TEAM Mobile   |
| MET/TEAM PORTAL                   | Module, MET/TEAM Customer Portal  |
| MET/TEAM PORT-L100                | License, additional MET/TEAM Customer Portal (pack of 100)  |
| MET/TEAM COMMERCE                 | Module, MET/TEAM Commerce   |
| MET/CONNECT                       | Calibration Integration Software  |

**Fluke Calibration.** *Precision, performance, confidence.™*

Electrical | RF | Temperature | Humidity | Pressure | Flow | Software

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