

## TECHNICAL DATA

# Fluke 190 Series III ScopeMeter® Test Tools



### SAFETY RATED FOR INDUSTRIAL ENVIRONMENTS

CAT III 1000 V/CAT IV 600 V rate portable oscilloscopes with up to four independent floating isolated inputs

### AUTOMATICALLY CAPTURE, VIEW AND ANALYZE COMPLEX WAVEFORMS

Connect-and-View™ triggering automatically displays waveforms without having to adjust amplitude, timebase and trigger settings.

### EASILY VIEW MEASUREMENTS IN THE FIELD OR ON YOUR PC

Large, bright color display for easy in-the-field viewing and both USB and Wi-Fi data download options for analyzing data with FlukeView® software

## High performance portable oscilloscopes engineered for harsh environments

Fluke 190 Series III ScopeMeter Test Tools are engineered to go where you go, and tackle just about any troubleshooting job along the way. These CAT III 1000 V/CAT IV 600V rated test tools combine rugged portability with the high performance of bench oscilloscopes to help you take on the challenges of installing, commissioning and maintaining industrial machinery, automation and process controls, and power conversion electronics with ease—from DC to 500 MHz.

Choose from two or four channel models with a wide range of bandwidth options. Fast sampling rates up to 5.0 GS/s, 200 ps resolution and deep memory of 10,000 samples per channel allow high-accuracy capture and display of waveform details, noise, and other disturbances. Perform timing or amplitude related measurements on three phases or three-axis control systems, or simply compare and contrast multiple test points in a circuit under test. Features like TrendPlot™ Paperless Recorder, ScopeRecord™ Mode, Connect-and-View™ Triggering and a unique 100-screen Replay function help you quickly diagnose issues to minimize repair costs and downtime. These features make the oscilloscopes easy to use especially when diagnosing the most difficult problems like complex waveforms, induced noise, intermittent events and signal fluctuations or drift.

- Up to four independent floating isolated inputs, up to 1000 V
- Up to 5 GS/s real time sampling (depending on model and channels used)
- Deep memory: 10,000 points per trace waveform capture (scope mode)
- CAT III 1000 V/CAT IV 600 V safety rated instrument for industrial environments
- Up to seven hours of battery operation using BP291
- Large, bright color display is easy to view in nearly any environment
- Easy to store and view historical data and transfer to a PC via USB or Wifi
- Convenient battery access door for quick battery swaps in the field
- IP51 rating, dust and drip-proof
- Connect-and-View triggering for intelligent, automatic triggering on fast, slow and even complex signals
- Frequency spectrum using FFT-analysis
- Automatic capture and REPLAY of 100 screens
- ScopeRecord mode gives 30,000 points per input channel for low frequency signal analysis
- TrendPlot Paperless Recorder mode with deep memory for long-term automatic measurements
- 5,000 count DMM included in the 2-channel models

## Measure from mV to kV safely

Independently isolated inputs allow you to make measurements in mixed circuits having different ground references reducing the risk of accidental short circuits. Conventional bench oscilloscopes without special differential probes and isolation transformers can only reference measurements to line power earth ground. ScopeMeter 190 Series III test tools are engineered to cover a wide application range from mV to kV, so you're ready for anything from microelectronics to heavy-duty higher voltage electrical applications. 190 Series III 60MHz and 100MHz configurations include VPS421 100:1 probes for higher voltage applications, while the 200MHz and 500MHz configurations include VPS410-II 10:1 probes suitable for both microelectronics and higher voltage applications.

## IP-51 rated for harsh environments

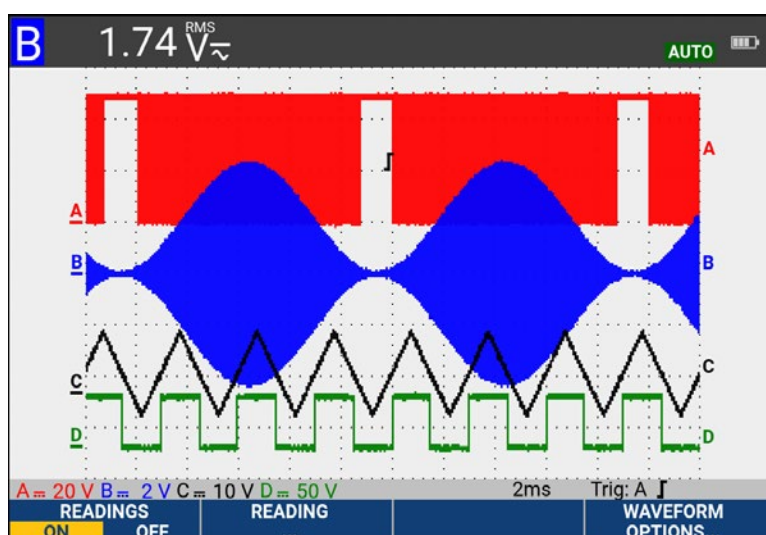
Rugged and shock-proof, ScopeMeter Test Tools are built for dirty, hazardous environments. With its sealed case, it can endure dust, drips, humidity and airborne pollutants. Every time you reach for ScopeMeter Test Tool you can be confident it will work reliably wherever your work takes you.

## USB and Wi-Fi connectivity

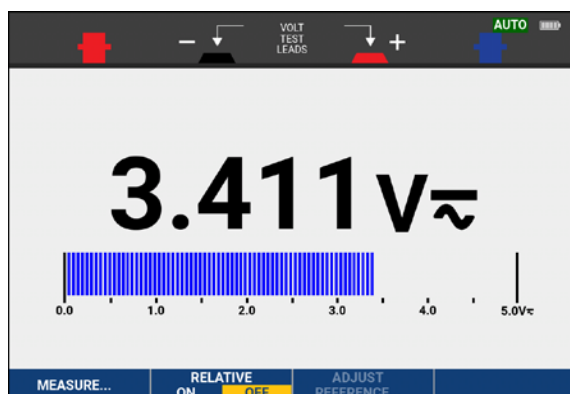
The Fluke 190 Series III offers two USB ports, electrically isolated from measurement input circuits allowing you to quickly and easily transfer data to a PC, archive and share waveforms with OEMs, colleagues and support staff, or store waveforms, screen captures and instrument setups onto USB memory devices for later use. Easily transfer saved files via USB stick, direct connection via the USB interface or optional Wi-Fi connectivity. These files can be used for further data handling or in FlukeView-2 Software to study waveforms in greater detail.

## Connect-and-View triggering

Connect-and-View triggering provides an instant, stable display without the need for adjusting settings. If you've used other scopes, you know how tricky triggering can be. If settings are incorrect, results can be unstable or incorrect. Connect-and-View automatically sets up correct triggering by recognizing signal patterns. Without touching a button, you get a stable, reliable and repeatable display of virtually any signal including motor drive and control signals. It's especially fast and convenient when you're measuring a number of test points in rapid succession.



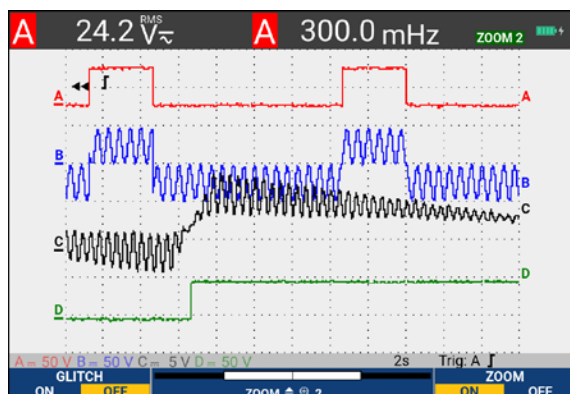
Connect and View captures even the most complex signals without requiring additional setup



The built-in multimeter provides convenient precision measurements

### Built-in digital multimeter

Conveniently switch from waveform analysis to precise multimeter measurements using the built in 5000 count digital multimeter on two channel 190 Series III models. Measurement functions include Vdc, Vac, Vac+dc, resistance, continuity and diode test. Measure current and temperature using suitable shunt, probe or adapter with wide range of scaling factors.

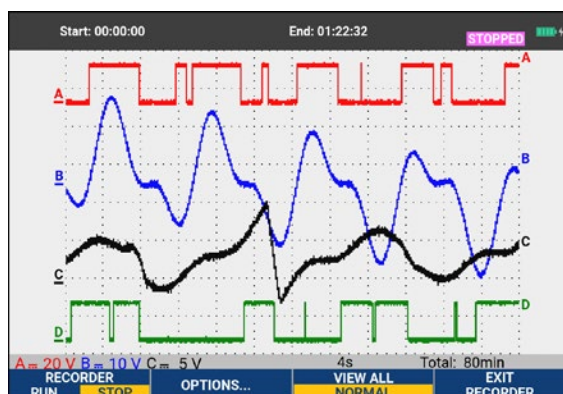


Capture high-resolution waveform details over extended period using ScopeRecord™ mode

### ScopeRecord™ mode for high resolution waveform recording

ScopeRecord memory stores up to 30,000 or more data points per channel, capturing fast intermittent events and glitches as short as 8 ns. (Two sets of multiple channel recordings can be stored to internal memory for later analysis.)

- Records events like UPS, power supply or motor start-up cycles
- With the Stop on Trigger mode, the ScopeMeter Test Tool automatically recognizes a power failure and stores the waveform data preceding it



Trend multiple measurements capturing signal intermittent events, signal drift or fluctuations

### TrendPlot paperless recorder—records up to 11 days to help you find intermittent faults

The toughest faults to find are those that happen only once in a while. These intermittent events can be caused by bad connections, dust, dirt, corrosion, or simply broken wiring or connectors. Line outages, dips, swells and interruptions, or the starting and stopping of a motor can also cause a machine to stop. You may not be around when it happens, but the Fluke 190 Series III ScopeMeter Test Tool will be.

- Plot minimum and maximum peak values and average over time
- Plot any combination of up to four readings including voltages, amps, temperature, frequency and phase for all inputs, all with time and date stamp to pinpoint faults

## FlukeView™ 2 ScopeMeter software for documenting, archiving and analysis

Get more out of your ScopeMeter Test Tool with FlukeView 2 ScopeMeter Software for Windows.

- Documentation—transfer waveforms, screens and data to your PC for printing or importing data into a report
- Add text to ScopeMeter Test Tool settings—give operators guidance when recalling settings
- Archive—create a library of waveforms for easy reference, or waveform comparison
- Analysis—use cursors or export data to another analysis program



FlukeView-2 ScopeMeter software

## Oscilloscope modes

|                              | 190-062                                                                                                          | 190-102 | 190-202 | 190-502 | 190-104          | 190-204 | 190-504 |
|------------------------------|------------------------------------------------------------------------------------------------------------------|---------|---------|---------|------------------|---------|---------|
| Vertical deflection          |                                                                                                                  |         |         |         |                  |         |         |
| Number of channels           | 2                                                                                                                | 2       | 2       | 2       | 4                | 4       | 4       |
| Bandwidth                    | 60 MHz                                                                                                           | 100 MHz | 200 MHz | 500 MHz | 100 MHz          | 200 MHz | 500 MHz |
| Rise time                    | 5.8 ns                                                                                                           | 3.5 ns  | 1.7 ns  | 0.7 ns  | 3.5 ns           | 1.7 ns  | 0.7 ns  |
| Number of scope inputs       | 2 input channels plus external trigger                                                                           |         |         |         | 4 input channels |         |         |
| Channel architecture         | All inputs fully insulated from each other and from ground. Inputs may be activated in any combination           |         |         |         |                  |         |         |
| Input coupling               | AC or DC, with ground level indicator                                                                            |         |         |         |                  |         |         |
| Input sensitivity            | With 10:1 probe, 20 mV to 1000 V/div<br>With 100:1 probe, 200 mV to 10 kV/div<br>Direct (1:1), 2 mV to 100 V/div |         |         |         |                  |         |         |
| Bandwidth limiter            | 20 MHz and 10 kHz                                                                                                |         |         |         |                  |         |         |
| Polarity                     | Normal, Inverted, Variable                                                                                       |         |         |         |                  |         |         |
| Input voltage                | CAT III 1000 V/CAT IV 600 V rated, see General specifications for further details                                |         |         |         |                  |         |         |
| Vertical resolution          | 8 bit                                                                                                            |         |         |         |                  |         |         |
| Accuracy at 4 s to 10 μs/div | 5 mV/div to 100 V/div, ±(1.5 % + 6 counts)<br>2 mV/div, ±(1.5 % + 10 counts)                                     |         |         |         |                  |         |         |
| Input impedance              | 1 MΩ (± 1 %) // 15 pF (± 2.25 pF)                                                                                |         |         |         |                  |         |         |

## Oscilloscope modes (continued)

|                                                        | 190-062                                                                                                                                                                                                                                                                                           | 190-102                  | 190-202                 | 190-502                                            | 190-104                  | 190-204                        | 190-504                                                 |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------|----------------------------------------------------|--------------------------|--------------------------------|---------------------------------------------------------|
| Horizontal                                             |                                                                                                                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| Maximum real-time sample rate (sampled simultaneously) | 625 MS/s (each channel)                                                                                                                                                                                                                                                                           | 1.25 GS/s (each channel) | 2.5 GS/s (each channel) | 5 GS/s (single channel) or 2.5 GS/s (dual channel) | 1.25 GS/s (each channel) | 2.5 GS/s (2ch) 1.25 GS/s (4ch) | 5 GS/s (single ch) or 2.5 GS/s (2ch) or 1.25 GS/s (4ch) |
| Record length                                          | Up to 10,000 samples per channel                                                                                                                                                                                                                                                                  |                          |                         |                                                    |                          |                                |                                                         |
| Time base range                                        | 10 ns/div to 4 s/div                                                                                                                                                                                                                                                                              | 5 ns/div to 4 s/div      | 2 ns/div to 4 s/div     | 1 ns/div to 4 s/div                                | 5 ns/div to 4 s/div      | 2 ns/div to 4 s/div            | 1 ns/div to 4 s/div                                     |
|                                                        | Time base in a 1-2-4-sequence<br>Slower time/division settings using ScopeRecord™ Roll mode (see ‘Recorder mode’)                                                                                                                                                                                 |                          |                         |                                                    |                          |                                |                                                         |
| Maximum record length                                  | 10,000 samples per channel in scope mode<br>30,000 points per channel in ScopeRecord™ Roll mode (see ‘Recorder mode’)                                                                                                                                                                             |                          |                         |                                                    |                          |                                |                                                         |
| Timing accuracy                                        | ± (0.01 % of reading + 1 pixel)                                                                                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| Glitch capture                                         | 8 ns (10 μs/div to 2 min/div)                                                                                                                                                                                                                                                                     |                          |                         |                                                    |                          |                                |                                                         |
| Display and acquisition                                |                                                                                                                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| Display                                                | 133 mm x 90 mm (5.3 in x 3.5 in) full-color high brightness LCD                                                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| Display modes                                          | Any combination of channels; average on/off; replay.                                                                                                                                                                                                                                              |                          |                         |                                                    |                          |                                |                                                         |
| Visible screen width                                   | 12 divisions horizontally in scope mode                                                                                                                                                                                                                                                           |                          |                         |                                                    |                          |                                |                                                         |
| Digital persistence modes                              | Off, short, medium, long, infinite and envelope mode                                                                                                                                                                                                                                              |                          |                         |                                                    |                          |                                |                                                         |
| Waveform mathematics                                   | One (190-xx2) or two (190-x04) mathematical operations on 2 input channels (A and B, C and D): add, subtract, multiply; X-Y-mode; Frequency Spectrum using FFT                                                                                                                                    |                          |                         |                                                    |                          |                                |                                                         |
| Acquisition modes                                      | Normal, Averaged, Auto, Single Shot, ScopeRecord™ roll, glitch capture, waveform compare with automatic “Pass/Fail testing”; Replay                                                                                                                                                               |                          |                         |                                                    |                          |                                |                                                         |
| Trigger and delay                                      |                                                                                                                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| Source                                                 | Input A, B or External (via meter input)                                                                                                                                                                                                                                                          |                          |                         |                                                    | Input A, B, C or D       |                                |                                                         |
| Modes                                                  | Automatic, Edge, Pulse Width, N-Cycle, External (190-xx2)                                                                                                                                                                                                                                         |                          |                         |                                                    |                          |                                |                                                         |
| Connect-and-View™                                      | Advanced automatic triggering that recognizes signal patterns, automatically sets up and continuously adjusts triggering, time base and amplitude. Automatically displays stable waveforms of complex and dynamic signals like motor drive and control signals. Can be switched off if preferred. |                          |                         |                                                    |                          |                                |                                                         |
| Pulse width triggering (on channel A)                  | Pulse width qualified by time<br>Allows for triggering <t, >t, =t, ≠ t, where t is selectable in minimum steps of 0.01 div or 50 ns                                                                                                                                                               |                          |                         |                                                    |                          |                                |                                                         |
| Time delay                                             | 1 full screen of pre-trigger view or up to 100 screens (=1,200 divisions) of post-trigger delay                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| Dual slope triggering                                  | Triggers on both rising and falling edges alike                                                                                                                                                                                                                                                   |                          |                         |                                                    |                          |                                |                                                         |
| N-cycle triggering                                     | Triggers on N-th occurrence of a trigger event; N to be set in the range 2 to 99                                                                                                                                                                                                                  |                          |                         |                                                    |                          |                                |                                                         |

## Oscilloscope modes (continued)

### Automatic capture of 100 screens

When in oscilloscope mode, the instrument ALWAYS memorizes the last 100 screens—no specific user setup required. When an anomaly is seen, the REPLAY button can be pressed to review the full sequence of screen events over and over. Instrument can be set up for triggering on glitches or intermittent anomalies and will operate in “baby-sit” mode capturing 100 specified events.

|                |                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Replay         | Manual or continuous replay. Displays the captured 100 screens as a “live” animation, or under manual control. Each screen has date and time-stamp.                         |
| Replay storage | Ten sets of 100 screens each can be saved internally for later recall and analysis. Direct storage of additional sets on external flash memory drive through USB host port. |

### FFT—frequency spectrum analysis

Shows frequency content of oscilloscope waveform using Fast Fourier Transform

|                  |                                                                                              |
|------------------|----------------------------------------------------------------------------------------------|
| Window           | Automatic, Hamming, Hanning or None                                                          |
| Automatic window | Digitally re-samples acquired waveform to get optimum frequency resolution in FFT resultant. |
| Vertical scale   | Linear/Logarithmic (in volts or amps)                                                        |
| Frequency axis   | Frequency range automatically set as a function of timebase range of oscilloscope            |

### Waveform compare and pass/fail testing

|                   |                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waveform compare  | Provides storage and display of a reference waveform for visual comparison with newly acquired waveforms. Reference is derived from an acquired waveform and can be modified in the oscilloscope. |
| Pass/Fail testing | In waveform compare mode, the oscilloscope can be set up to store only matching (“Pass”) or only non-matching (“Fail”) acquired waveforms in the replay memory bank for further analysis.         |

### Automatic scope measurements

V dc, V ac rms, V ac+dc, Vpeak max, Vpeak min, Vpeak to peak, A ac, A dc, A ac+dc, frequency (in Hz), rise time (using cursors), fall time (using cursors), Power Factor (PF), Watts, VA, VA reactive, phase (between 2 inputs A&B or C&D), pulse width (pos./neg.), duty cycle (pos./neg.), temperature °C, temperature °F (not for Japan), dBV, dBm into 50  $\Omega$  and 600  $\Omega$ , VPWM ac and VPWM(ac+dc) for measurement on pulse width modulated motor drives and frequency inverters, V/Hz ratio;

|                                          |                                                                                                                                                                 |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advanced power and motor drive functions | V/Hz ratio, Power Factor (PF), Watts, VA, VA reactive, V-PWM (ac) and V-PWM (ac+dc) for measurement on pulsewidth modulated motordrives and frequency inverters |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Cursor measurements

|                       |                                                                                                                                                                        |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source                | On any input waveform or on mathematical resultant waveform (excl. X-Y-mode)                                                                                           |
| Dual horizontal lines | Voltage at cursor 1 and at cursor 2, voltage between cursors                                                                                                           |
| Dual vertical lines   | Time between cursors, 1/T between cursors (in Hz), voltage between markers, risetime with markers, falltime with markers; Vrms between cursors, Watts between cursors. |
| Single vertical line  | Min-Max and Average voltage at cursor position; frequency and rms-value of individual frequency component in the FFT Resultant                                         |
| Advanced functions    | mA*s (current-over-time, between cursors); V*s (voltage over time, between cursors); W*s (energy, between cursors)                                                     |
| ZOOM                  | Ranges from full record overview to zoom in up to sample level, at any record length.                                                                                  |

## Meter modes

|                           | 190-062                                                                                                                                                  | 190-102 | 190-202 | 190-502 | 190-104                                             | 190-204 | 190-504 |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|-----------------------------------------------------|---------|---------|
| Meter inputs              | Via 4 mm banana inputs, fully isolated from scope inputs and scope ground                                                                                |         |         |         | Via BNC scope inputs                                |         |         |
| Number of readings        | One at a time via DMM input                                                                                                                              |         |         |         | Up to 4 automatic scope measurements simultaneously |         |         |
| Maximum resolution        | 5,000 counts                                                                                                                                             |         |         |         | ± 999 counts (frequency: 9999 counts)               |         |         |
| Input impedance           | 1 MΩ (± 1 %) // 14 pF (± 1.5 pF)                                                                                                                         |         |         |         | 1 MΩ (± 1 %) // 15 pF (± 2.25 pF)                   |         |         |
| Advanced meter functions  | Auto/manual ranging, relative measurements (Zero reference), TrendPlot™ recording                                                                        |         |         |         |                                                     |         |         |
|                           | The specified accuracy is valid over the temperature range 18 °C to 28 °C<br>Add 10 % of specified accuracy for each degree C below 18 °C or above 28 °C |         |         |         |                                                     |         |         |
| Voltage                   |                                                                                                                                                          |         |         |         |                                                     |         |         |
| V dc accuracy             | ± (0.5 % + 6 counts)                                                                                                                                     |         |         |         | ± (1.5 % + 6 counts)                                |         |         |
| V ac true rms accuracy    |                                                                                                                                                          |         |         |         |                                                     |         |         |
| 15 Hz to 60 Hz            | ± (1 % + 10 counts)                                                                                                                                      |         |         |         | ± (1.5 % + 10 counts)                               |         |         |
| 60 Hz to 1 kHz            | ± (2.5 % + 15 counts)                                                                                                                                    |         |         |         | —                                                   |         |         |
| 60 Hz to 20 kHz           | —                                                                                                                                                        |         |         |         | ± (2.5 % + 15 counts)                               |         |         |
| V ac+dc true rms accuracy |                                                                                                                                                          |         |         |         |                                                     |         |         |
| 15 Hz to 60 Hz            | ± (1 % + 10 counts)                                                                                                                                      |         |         |         | ± (1.5 % + 10 counts)                               |         |         |
| 60 Hz to 1 kHz            | ± (2.5% + 15 counts)                                                                                                                                     |         |         |         | —                                                   |         |         |
| 60 Hz to 20 kHz           | —                                                                                                                                                        |         |         |         | ± (2.5 % + 15 counts)                               |         |         |
| Voltmeter ranges          | 500 mV, 5 V, 50 V, 500 V, 1,100 V                                                                                                                        |         |         |         |                                                     |         |         |
| Resistance                |                                                                                                                                                          |         |         |         |                                                     |         |         |
| Ranges                    | 500 Ω, 5 kΩ, 50 kΩ, 500 kΩ, 5 MΩ, 30 MΩ                                                                                                                  |         |         |         | —                                                   |         |         |
| Accuracy                  | ± (0.6 % + 6 counts)                                                                                                                                     |         |         |         | —                                                   |         |         |
| Other meter functions     |                                                                                                                                                          |         |         |         |                                                     |         |         |
| Continuity                | Beeper on < 50 Ω (± 30 Ω)                                                                                                                                |         |         |         | —                                                   |         |         |
| Diode test                | Up to 2.8 V                                                                                                                                              |         |         |         | —                                                   |         |         |
| Current (A)               | A dc, A ac, A ac+dc using an optional current clamp or shunt Scaling factors: 0.1 mV/A, 1 mV/A to 100 V/A and 400 mV/A                                   |         |         |         |                                                     |         |         |
| Temperature               | With optional accessories. Scale factors 1mV/°C or 1mV/°F                                                                                                |         |         |         |                                                     |         |         |

## Recorder mode

|                                                                                                                                                                       | 190-062                                                                                                                                                                              | 190-102 | 190-202 | 190-502 | 190-104                                                                                                      | 190-204 | 190-504 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|--------------------------------------------------------------------------------------------------------------|---------|---------|
| ScopeRecord™ Roll Mode                                                                                                                                                |                                                                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Dual or multiple input waveform storage mode, using deep memory                                                                                                       |                                                                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Source and display                                                                                                                                                    | Input A, Input B, Dual<br>All channels sampled simultaneously                                                                                                                        |         |         |         | Any combination of inputs, up to 4 channels.<br>All channels sampled simultaneously                          |         |         |
| Memory depth                                                                                                                                                          | 30,000 data points per channel, each holding min/max pair of information                                                                                                             |         |         |         |                                                                                                              |         |         |
| Min/max values                                                                                                                                                        | Min/max values are created at samples that are measured at high sample rate ensuring capture and display of glitches                                                                 |         |         |         |                                                                                                              |         |         |
| Recording modes                                                                                                                                                       | Single sweep, continuous roll; Start-on-Trigger (through external);<br>Stop-on-Trigger (through external)                                                                            |         |         |         | Single sweep, continuous roll; Start-on-Trigger (through any channel); Stop-on-Trigger (through any channel) |         |         |
| Stop-on-trigger                                                                                                                                                       | ScopeRecord mode can be stopped by an individual trigger event, or by an interruption of a repetitive trigger signal, through any input channel (through External on 190-XX2 Series) |         |         |         |                                                                                                              |         |         |
| Horizontal scale                                                                                                                                                      | Time from start, time of day                                                                                                                                                         |         |         |         |                                                                                                              |         |         |
| Zoom                                                                                                                                                                  | Ranges from full record overview to zoom in up to sample level                                                                                                                       |         |         |         |                                                                                                              |         |         |
| Memory                                                                                                                                                                | Two multiple input ScopeRecord waveforms can be saved internally for later recall and analysis.                                                                                      |         |         |         |                                                                                                              |         |         |
| ScopeRecord™ Roll mode sample rate and recording timespan                                                                                                             |                                                                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Time base range                                                                                                                                                       | 4 ms/div to 2 min/div                                                                                                                                                                |         |         |         |                                                                                                              |         |         |
| Recorded timespan                                                                                                                                                     | 4.8 sec to 40 hr                                                                                                                                                                     |         |         |         |                                                                                                              |         |         |
| Time/division in ‘view all’ mode                                                                                                                                      | 0.4 s/div to 4 h/div                                                                                                                                                                 |         |         |         |                                                                                                              |         |         |
| Glitch capture                                                                                                                                                        | 8 ns                                                                                                                                                                                 |         |         |         |                                                                                                              |         |         |
| Sample rate                                                                                                                                                           | 125 MS/s                                                                                                                                                                             |         |         |         |                                                                                                              |         |         |
| Resolution                                                                                                                                                            | 160 psec ~ 4.8 sec                                                                                                                                                                   |         |         |         |                                                                                                              |         |         |
| Trendplot™ Recording                                                                                                                                                  |                                                                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Multiple channel electronic paperless recorder. Graphically plots, displays and stores results of up to four automatic scope measurements or a DMM-reading over time. |                                                                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Source and display                                                                                                                                                    | Any combination of scope measurements, made on any of the input channels, or DMM reading (2-channel instruments)                                                                     |         |         |         |                                                                                                              |         |         |
| Memory depth                                                                                                                                                          | 19,200 points (sets) per recording. Each recorded sample point contains a minimum, a maximum and an average value, plus a date- and time-stamp.                                      |         |         |         |                                                                                                              |         |         |
| Ranges                                                                                                                                                                | Normal view: 5 s/div to 30 min/div; In view-all mode: 5 min/div to 48 hr/div (overview of total record)                                                                              |         |         |         |                                                                                                              |         |         |
| Recorded time span                                                                                                                                                    | Up to 22 days, with a resolution of 102 seconds; up to 5.5 days for 4 readings.                                                                                                      |         |         |         |                                                                                                              |         |         |
| Recording mode                                                                                                                                                        | Continuous recording, starting at 5 s/div with automatic time-scale compression                                                                                                      |         |         |         |                                                                                                              |         |         |
| Measurement speed                                                                                                                                                     | Three automatic measurements per second or more                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Horizontal scale                                                                                                                                                      | Time from start, time of day                                                                                                                                                         |         |         |         |                                                                                                              |         |         |
| Zoom                                                                                                                                                                  | Up to 64x zoom-out for full record overview, up to 10x zoom-in for maximum detail                                                                                                    |         |         |         |                                                                                                              |         |         |
| Memory                                                                                                                                                                | Two multiple input TrendPlot records can be saved internally for later recall and analysis.                                                                                          |         |         |         |                                                                                                              |         |         |
| Cursor measurements—all recorder modes                                                                                                                                |                                                                                                                                                                                      |         |         |         |                                                                                                              |         |         |
| Source                                                                                                                                                                | Any waveform trace in any waveform display mode (Scope, ScopeRecord or TrendPlot)                                                                                                    |         |         |         |                                                                                                              |         |         |
| Dual vertical lines                                                                                                                                                   | Cursors may be used to identify Min, Max or Average value of any datapoint in a record, with time between cursors, time from start or absolute time.                                 |         |         |         |                                                                                                              |         |         |

## General specifications

|                                | 190-062                                                                                                                                                                       | 190-102 | 190-202 | 190-502 | 190-104         | 190-204 | 190-504 |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|-----------------|---------|---------|
| Input voltage range            |                                                                                                                                                                               |         |         |         |                 |         |         |
| Rated maximum floating voltage | CAT III 1000 V / CAT IV 600 V (maximum voltage between any contact and earth-ground voltage level)                                                                            |         |         |         |                 |         |         |
| Probe input voltage VPS410-II  | CAT III 1000 V / CAT IV 600 V (Maximum voltage between standard 10:1 probe tip and reference lead)                                                                            |         |         |         |                 |         |         |
| Probe input voltage VPS421     | CAT III 1000V / CAT IV 600V (Maximum voltage between probe tip or reference lead to GND, 2000V max between probe tip and reference lead)                                      |         |         |         |                 |         |         |
| Maximum BNC input voltage      | CAT IV 300 V (maximum voltage on BNC input directly)                                                                                                                          |         |         |         |                 |         |         |
| Maximum voltage on meter input | CAT III 1000 V / CAT IV 600 V (safety designed banana input connectors)                                                                                                       |         |         |         | —               |         |         |
| Memory save and recall         |                                                                                                                                                                               |         |         |         |                 |         |         |
| Memory locations (internal)    | 30 waveform memories plus 10 recording memories plus 9 screen copy memories                                                                                                   |         |         |         |                 |         |         |
| 30 waveform memories           | Each memory can contain up to 2 or 4 waveforms plus corresponding setups.                                                                                                     |         |         |         |                 |         |         |
| 10 recording memories          | Each may contain: a 100 Screen Replay sequence, or a ScopeRecord Roll-mode recording (2 or 4 traces), or a TrendPlot recording of up to 4 measurements                        |         |         |         |                 |         |         |
| External data storage          | On PC, using FlukeView™-2 Software, or direct storage on external flash memory drive (maximum 32 GB) through USB host port                                                    |         |         |         |                 |         |         |
| Screencopies                   | On PC, using FlukeView™-2 Software, or internally (in instrument) which can be copied on to external flash memory drive as .BMP-file, through USB host port                   |         |         |         |                 |         |         |
| Volatility                     | Saving is done in non-volatile Flash-ROM and all data is secured, independent of battery or power status.                                                                     |         |         |         |                 |         |         |
| Real-time clock                | Provides date and time stamp information for ScopeRecord, for 100 Screen Replay sequences and for TrendPlot recordings.                                                       |         |         |         |                 |         |         |
| Case                           |                                                                                                                                                                               |         |         |         |                 |         |         |
| Design                         | Rugged, shock-proof with integrated protective holster. Handstrap and hangstrap included as standard. Kensington lock supported to lock down instrument when left unattended. |         |         |         |                 |         |         |
| Drip and dust proof            | IP 51 according to IEC60529                                                                                                                                                   |         |         |         |                 |         |         |
| Shock and vibration            | Shock 30 g, vibration (sinusoidal) 3 g / 0.03 g²/Hz (Random), according to MIL-PRF-28800F Class 2                                                                             |         |         |         |                 |         |         |
| Display size                   | 133 mm x 90 mm (5.3 in x 3.5 in) LCD                                                                                                                                          |         |         |         |                 |         |         |
| Resolution                     | 1120 pixels x 765 pixels                                                                                                                                                      |         |         |         |                 |         |         |
| Brightness                     | User-adjustable, up to 300 cd/m²                                                                                                                                              |         |         |         |                 |         |         |
| Mechanical data                |                                                                                                                                                                               |         |         |         |                 |         |         |
| Size                           | 265 mm x 192 mm x 70 mm (10.5 in x 7.6 in x 2.8 in)                                                                                                                           |         |         |         |                 |         |         |
| Weight (including battery)     | 2.1 kg (4.6 lb)                                                                                                                                                               |         |         |         | 2.2 kg (4.8 lb) |         |         |

## General specifications (continued)

|                                                   | 190-062                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 190-102 | 190-202 | 190-502                              | 190-104 | 190-204 | 190-504 |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|--------------------------------------|---------|---------|---------|
| Power                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |         |                                      |         |         |         |
| Line power                                        | Universal mains adapter/battery charger BC190/830 included, with detachable 2-wire power cords<br>100 Vac to 240 Vac, ±10 %, 50-60 Hz                                                                                                                                                                                                                                                                                                                                                                                  |         |         |                                      |         |         |         |
| Battery power                                     | Re-chargeable Li-Ion battery (included). Battery swappable through easily accessible battery door at the rear of the instrument                                                                                                                                                                                                                                                                                                                                                                                        |         |         |                                      |         |         |         |
| Battery type (incl.) and capacity [+opt. battery] | BP290: 10.8V, 2500 mAh<br>[BP291 (5000 mAh) optional]                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         | BP291: 10.8V, 5000 mAh               |         |         |         |
| Battery charge indicator                          | Battery has built-in status indicator for use with external charger, next to battery status indicator on instrument screen.                                                                                                                                                                                                                                                                                                                                                                                            |         |         |                                      |         |         |         |
| Battery operating time (with backlight low)       | Up to 3.5 using BP290 (included),<br>up to 7 hours using BP291 (optional)                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |         | Up to 7 hours using BP291 (included) |         |         |         |
| Battery charging time                             | 2½ hours using BP290; 5 hours using BP291                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |         | Five hours for BP291                 |         |         |         |
| Battery power saving functions                    | Auto ‘power down’ with adjustable power down time.<br>Automatic ‘display off’ with adjustable power down time.<br>On-screen battery power indicator                                                                                                                                                                                                                                                                                                                                                                    |         |         |                                      |         |         |         |
| Safety                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |         |                                      |         |         |         |
| Compliance                                        | EN61010-1-2001, Pollution Degree 2;<br>IEC 61010-2-030: CAT IV 600 V / CAT III 1000 V                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |                                      |         |         |         |
| Environmental                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |         |                                      |         |         |         |
| Operating temperature                             | Battery discharging: 0 °C to 40 °C (32 °F to 104 °F)<br>Battery charging: 0 °C to 40 °C (32 °F to 104 °F)                                                                                                                                                                                                                                                                                                                                                                                                              |         |         |                                      |         |         |         |
| Storage temperature                               | -20 °C to 60 °C (-4 °F to 140 °F)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |         |                                      |         |         |         |
| Humidity                                          | 0 °C to 10 °C (32 °F to 50 °F): noncondensing<br>10 °C to 30 °C (50 °F to 86 °F): 95 % (±5 %)<br>30 °C to 40 °C (86 °F to 104 °F): 75 % (±5 %)<br>40 °C to 50 °C (104 °F to 122 °F): 45 % (±5 %)                                                                                                                                                                                                                                                                                                                       |         |         |                                      |         |         |         |
| Maximum operating altitude                        | CAT IV 600 V, CAT III 1000 V: up to 2000 m (6 600 feet)<br>CAT IV 300 V, CAT III 600 V, CAT II 1000 V: up to 4000 m (13 000 feet)                                                                                                                                                                                                                                                                                                                                                                                      |         |         |                                      |         |         |         |
| Maximum storage altitude                          | 12 km (40,000 ft)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |         |                                      |         |         |         |
| Electro-Magnetic Compatibility (EMC)              | IEC 61326-1: Industrial;<br>CISPR 11: Group 1, Class A;<br>Korea (KCC): Class A Equipment (Industrial Broadcasting and Communication Equipment):<br>USA (FCC): 47 CFR 15 subpart C.                                                                                                                                                                                                                                                                                                                                    |         |         |                                      |         |         |         |
| Interfaces                                        | Two USB-ports provided. Ports are fully insulated from instrument’s floating measurement circuitry. USB-host port directly connects to external flash memory drive (up to 32 GB) for storage of waveform data, measurement results, instrument settings and screen copies. Alternatively, this USB-A port may be used to connect a WiFi Adapter for wireless PC connectivity. A mini-USB-B is provided which allows for interconnection to PC for remote control and data transfer under PC-control using FlukeView-2. |         |         |                                      |         |         |         |
| Probe calibration output                          | Dedicated probe-cal output with reference contact provided, fully insulated from any measurement input channel.<br>Generator Output: 1.225 Vpp / 500 Hz square wave                                                                                                                                                                                                                                                                                                                                                    |         |         |                                      |         |         |         |
| Warranty                                          | 3 years on main instrument, 1 year on battery and accessories                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |         |                                      |         |         |         |

## General specifications (continued)

|                                                                                                                                                      | 190-062                                                                                                                                                                                                                                                                                                                                                                                     | 190-102 | 190-202                                                                    | 190-502                 | 190-104                                                                                     | 190-204                                                                                         | 190-504 |
|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------|
| Included accessories                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                             |         |                                                                            |                         |                                                                                             |                                                                                                 |         |
| Battery charger/<br>mains adapter                                                                                                                    | BC190/830                                                                                                                                                                                                                                                                                                                                                                                   |         |                                                                            |                         |                                                                                             |                                                                                                 |         |
| Li-Ion battery<br>pack                                                                                                                               | BP290 (10.8V, 2500 mAh)                                                                                                                                                                                                                                                                                                                                                                     |         |                                                                            | BP291 (10.8V, 5000 mAh) |                                                                                             |                                                                                                 |         |
| Voltage probe<br>sets Each set<br>includes ground<br>lead, hook clip;<br>ground spring<br>and probe<br>tip insulation<br>sleeve with<br>VPS410-II-x. | 2 pcs VPS421-x, ruggedized<br>industrial-grade probes, 100:1,<br>150MHz with shrouded 4mm<br>banana tip and large jaw alligator<br>clips (one red, one blue)                                                                                                                                                                                                                                |         | 2 pcs VPS410-II-x, 10:1 voltage<br>probes, 500 MHz, (one red,<br>one blue) |                         | 4 pcs VPS421-<br>x, ruggedized<br>probes, 100:1,<br>150 MHz,<br>(red, blue, grey,<br>green) | 4 pcs VPS410-II-x, 10:1 voltage<br>probes, 500 MHz, (one red,<br>one grey, one blue, one green) |         |
| Test leads                                                                                                                                           | TL175 (one red, one black) with test pins                                                                                                                                                                                                                                                                                                                                                   |         |                                                                            |                         | —                                                                                           |                                                                                                 |         |
| Other                                                                                                                                                | Li-Ion battery (BP290 or BP291, see above), Battery charger (BC190) with universal power cord set, Hangstrap, Handstrap (user selectable for left- or right hand use), download information for user manual and FlukeView®-2 demo package (with restricted functionality), and USB interface cable for PC connectivity. Feedthrough cable terminator, 50 Ω (one per channel, 190-50x only). |         |                                                                            |                         |                                                                                             |                                                                                                 |         |
| Optional<br>configuration                                                                                                                            | Each model is available as a ‘boxed’ version, described above, or with the optional SCC293 set included. SCC293 comprises: CXT293 rugged protective carrying case, full-version FlukeView PC software (activation code) and a WiFi dongle for wireless PC-connectivity using FlukeView-2 software.                                                                                          |         |                                                                            |                         |                                                                                             |                                                                                                 |         |
| Optional<br>accessories                                                                                                                              | SCC293, VPS101 - 1:1 voltage probe; VPS510-x - wide bandwidth compact probes; i400s—current clamp; HH290—hanging hook; CXT293—protective carrying case; TRM50—BNC Feedthrough cable terminator, 50 Ω, safety designed; EBC290—battery charging bay                                                                                                                                          |         |                                                                            |                         |                                                                                             |                                                                                                 |         |



## Ordering information

**Fluke 190-504-III** Color ScopeMeter, 500 MHz, 4 channels  
**Fluke 190-504-III-S** Color ScopeMeter, 500 MHz, 4 channels, with SCC-293 kit included  
**Fluke 190-204-III** Color ScopeMeter, 200 MHz, 4 channels  
**Fluke 190-204-III-S** Color ScopeMeter, 200 MHz, 4 channels, with SCC-293 kit included  
**Fluke 190-104-III** Color ScopeMeter, 100 MHz, 4 channels  
**Fluke 190-104-III-S** Color ScopeMeter, 100 MHz, 4 channels, with SCC-293 kit included  
**Fluke 190-502-III** Color ScopeMeter, 500 MHz, 2 channel plus DMM/Ext. input  
**Fluke 190-502-III-S** Color ScopeMeter, 500 MHz, 2 channel plus DMM/Ext. input, with SCC-293 kit included  
**Fluke 190-202-III** Color ScopeMeter, 200 MHz, 2 channels plus DMM/Ext. input  
**Fluke 190-202-III-S** Color ScopeMeter, 200 MHz, 2 channels plus DMM/Ext. input, with SCC-293 kit included  
**Fluke 190-102-III** Color ScopeMeter, 100 MHz, 2 channels plus DMM/Ext. input  
**Fluke 190-102-III-S** Color ScopeMeter, 100 MHz, 2 channels plus DMM/Ext. input, with SCC-293 kit included  
**Fluke 190-062-III** Color ScopeMeter, 60 MHz, 2 channels plus DMM/Ext. input  
**Fluke 190-062-III-S** Color ScopeMeter, 60 MHz, 2 channels plus DMM/Ext. input, with SCC-293 kit included

## Accessories

**BC190** Mains adapter/battery charger  
**BP290** Li-ion battery pack, 2500 mAh  
**BP291** Li-ion battery pack, 5000 mAh  
**EBC290** External battery charger for BP290 and BP291 (uses BC190 mains adapter)  
**CXT293** Rugged Protective Carrying Case, IP67 rated  
**HH290** Hanging Hook for 190 Series II and III instruments  
**VPS510-R** Electronic Voltage Probe set, 10:1, 500 MHz, one set red  
**VPS510-G** Electronic Voltage Probe set, 10:1, 500 MHz, one set grey  
**VPS510-B** Electronic Voltage Probe set, 10:1, 500 MHz, one set blue  
**VPS510-V** Electronic Voltage Probe set, 10:1, 500 MHz, one set green  
**VPS410-II-G** Industrial Voltage Probe set, 10:1, one set grey  
**VPS410-II-R** Industrial Voltage Probe set, 10:1, one set red  
**VPS410-II-B** Industrial Voltage Probe set, 10:1, one set blue  
**VPS410-II-V** Industrial Voltage Probe set, 10:1, one set green  
**VPS421-R** High working voltage ruggedized probe set, 100:1, 150 MHz, (bicolored, red/black)  
**VPS421-G** High working voltage ruggedized probe set, 100:1, 150 MHz, (bicolored, grey/black)  
**VPS421-B** High working voltage ruggedized probe set, 100:1, 150 MHz, (bicolored blue/black)  
**VPS421-V** High working voltage ruggedized probe set, 100:1, 150 MHz; (bicolored green/black)  
**MP1-MAGNET PROBE 1**—Magnet Probes for 4 mm banana, Set of 4  
**SCC293** FlukeView-2 ScopeMeter Software package (full version) with CXT293 Carrying Case and WiFi dongle  
**TL175** TwistGuard™ safety designed test leads set (1 red, 1 black)  
**TRM50** BNC Feedthrough 50 Ω terminator (set of 2 pieces, black)  
**AS400** Probe Accessory Extension Set for VPS410-series probes  
**RS400** Probe Accessory Replacement Set for VPS410-series probes  
**RS421** Probe accessory replacement set for VPS421-series series probes  
**RS500** Probe Accessory Replacement Set for VPS500-series probes  
**FlukeView-2** Software for ScopeMeter 190 Series III Test Tools

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