FLUKE®

ScopeMeter® Test Tool Innovation

Introducing the complete 190 Series II

Technical Data

190 Series II ScopeMeter Portable Oscilloscopes—the first high-performance scopes built for harsh industrial environments

Introducing the first high-performance portable oscilloscopes with 2 or 4 independently insulated input channels, an IP51 dust- and dripwater proof rating and a CAT III 1000 V/CAT IV 600 V safety rating. Choose from 500 MHz, 200 MHz, 100 MHz or 60 MHz bandwidth models. Now plant maintenance engineers can take a 2- or 4-channel scope into the harsh world of industrial electronics.

190 Series II—a new generation of Fluke ScopeMeter Oscilloscopes

The 190 Series II include these capabilities:

- 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
- Isolated USB host port for direct data storage to a USB memory device; USB device port for easy PC communication
- Easy access battery door for quick battery swaps in the field
- Compact and only 2.2 kg (4.8 lb)
- Security slot: lock down oscilloscope with Kensington® lock while unattended
- 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™ Roll 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

1000 V CAT III
600 V CAT IV

1000 V CAT II
600 V CAT III

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Oscilloscope modes

	190-062	190-102	190-202	190-104	190-204	190-504
Vertical deflection						
Number of channels	2	2	2	4	4	4
Bandwidth	60 MHz	100 MHz	200 MHz	100 MHz	200 MHz	500 MHz
Rise time	5.8 ns	3.5 ns	1.7 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	2 mV/div to 100 V/div, plus variable attenuation					
Bandwidth limiter	User selectable: 10 kHz, or full bandwidth					
Normal/invert/variable	On each input channel, switched separately					
Input voltage	CAT III 1000 V/CAT IV 600 V rated, see General Specifications for further details					
Vertical resolution	8 bit					
Accuracy	± (2.1 % of reading + 0.04 x range/div) @ 5 mV/div to 100 V/div					
Input impedance	1 MΩ ± 1 % // 14 pF ± 2 pF					
Horizontal						
Maximum real-time sample rate (sampled simultaneously)	625 MS/s for each channel	1.25 GS/s for each channel	2.5 GS/s (2ch) for each channel	1.25 GS/s for each channel	2.5 GS/s (2ch) 1.25 GS/s (4ch)	5 GS/s (single channel) or 1.25GS/s per channel
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	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 Slower time/division settings using ScopeRecord™ Roll mode (see 'Recorder mode')					
Maximum record length	10,000 samples per channel in scope mode 30,000 points per channel in ScopeRecord™ Roll mode (see 'Recorder mode')					
Timing accuracy	± (0.01 % of reading + 1 pixel)					
Glitch capture	8 ns peak detect on each channel (using real time sampling and data compression, at any timebase setting)					
Display and acquisition						
Display	153 mm (6 in) full-color LCD with LED backlight					
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 mathematical operation on any 2 input channels: add/subtract/multiply; X-Y-mode Frequency Spectrum using FFT analysis					
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 Connect-and-View™, free run, single shot, edge, delay, dual slope, video, video line, selectable pulsewidth (channel A only), N-cycle					
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.					
Video triggering (on ch. A)	NTSC, PAL, PAL+, SECAM; Includes field 1, field 2 and line select					
High-res, non-interlaced video	Non-interlaced video with line-select, for line frequencies in the range 14 kHz up to 65 kHz					
Pulse width triggering (on channel A)	Pulse width qualified by time 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					

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	Two 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 any 2 inputs), pulse width (pos./neg.), duty cycle (pos./neg.), temperature °C, temperature °F (not for Japan), dBV, dBm into 50 I and 600 I, V_{PWM} ac and V_{PWM}(ac+dc) for measurement on pulse width modulated motor drives and frequency inverters, V/Hz ration (190-xx2 only)	
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
Advanced functions	mA*s (current-over-time, between cursors) V*s (voltage over time, between cursors) W*s (energy, between cursors)
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
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	190-104	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			Up to 4 simultaneously		
Maximum resolution	5,000 counts			999 counts		
Input impedance	1 MΩ ± 1 % // 14 pF ± 1.5pF			1 MΩ ± 1 % // 15 pF ± 2 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 Add 10 % of specified accuracy for each degree C below 18 °C or above 28 °C					
Voltage						
V dc accuracy	± (0.5 % + 5 counts)			± (1.5 % + 5 counts)		
V ac true rms accuracy 15 Hz to 60 Hz: 60 Hz to 1 kHz: 60 Hz to 20 kHz:	± (1 % + 10 counts) ± (2.5 % + 15 counts)			± (1.5 % + 10 counts) ± (2.5 % + 15 counts)		
V ac+dc true rms accuracy 15 Hz to 60 Hz: 60 Hz to 1 kHz: 60 Hz to 20 kHz:	± (1 % + 10 counts) ± (2.5 % + 15 counts)			± (1.5 % + 10 counts) ± (2.5 % + 15 counts)		
Voltmeter ranges	500 mV, 5 V, 50 V, 500 V, 1,000 V					
Resistance						
Ranges	500 Ω, 5 kΩ, 50 kΩ, 500 kΩ, 5 MΩ, 30 MΩ			—		
Accuracy	± (0.6 % + 5 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 modes

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	190-062	190-102	190-202	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 All channels sampled simultaneously			Any combination of inputs, up to 4 channels All channels sampled simultaneously		
Memory depth	30,000 data points, 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) 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, at any record length					
Memory	Two multiple input ScopeRecord waveforms can be saved internally for later recall and analysis Direct storage on external flash memory drive through USB host port					
ScopeRecord™ Roll mode sample rate and recording timespan						
Time base range	5 ms/div ~ 2 min/div					
Recorded timespan	6 sec ~ 40 hr					
Time/division in 'view all' mode	0.5 s/div ~ 4 h/div					
Glitch capture	8 ns					
Sample rate	125 MS/s					
Resolution	200 µsec ~ 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 measurement. 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					
Recording mode	Continuous recording, starting at 5 s/div with automatic record 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 Direct storage on external flash memory drive through USB host port					
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	190-104	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	CAT III 1000 V/CAT IV 600 V (Maximum voltage between 10:1 probe tip and reference lead)					
Probe input voltage VPS510	CAT III 300 V (Maximum voltage between 10:1 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					
15 waveform memory locations	Stores scope-trace waveform data (2 or 4 traces each) plus screen-copy plus corresponding setup					
Two 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™ Software, or • Direct storage on external flash memory drive (maximum 2 GB) through USB host port					
Screencopies	• On PC, using FlukeView™ Software, or • Internally (in instrument) which can be copied on to external flash memory drive as .BMP-file, through USB host port					
Volatility	Measurement data is initially stored in RAM, which is maintained by the main battery with a 30 seconds back-up when battery is exchanged. When storing data, this is written in non-volatile flash-ROM.					
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 according to MIL-PRF-28800F Class 2					
Display size	127 mm x 88 mm (153 mm/6.0 in diagonal) LCD					
Resolution	320 x 240 pixels					
Contrast and brightness	User adjustable, temperature compensated					
Brightness	200 cd/m^2 typical using power adapter, 90 cd/m^2 typical using battery power					
Mechanical data						
Size	265 mm x 190 mm x 70 mm (10.5 in x 7.5 in x 2.8 in)					
Weight (including battery)	2.1 kg (4.6 lb)			2.2 kg (4.8 lb)		
Power						
Line power	Mains adapter/battery charger BC190 included, version depending of country					
Battery power	Re-chargeable double capacity 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: 2400 mAh [BP291 (4800 mAh) optional]			BP291: 4800 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 four hours using BP290 (included), Up to eight hours using BP291 (optional)			Up to seven hours using BP291 (included)		
Battery charging time	2½ hours using BP290; 5 hours using BP291			Five hours BP291		
Battery power saving functions	Auto 'power down' with adjustable power down time Auto 'Display off' with adjustable power down time On-screen battery power indicator					
Safety						
Compliance	EN61010-1-2001, Pollution Degree 2; CAN/CSA C22.2, No. 61010-1-04, with approval; UL61010B; ANSI/ISA-82.02.01					

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	190-062	190-102	190-202	190-104	190-204	190-504
Environmental						
Operating temperature	0 °C ~ +40 °C; 0 °C ~ +50 °C excluding battery					
Storage temperature	-20 °C ~ +60 °C					
Humidity	+10 °C ~ +30 °C: 95 % RH non-condensing +30 °C ~ +40 °C: 75 % RH non-condensing +40 °C ~ +50 °C: 45 % RH non-condensing					
Maximum operating altitude	Up to 2,000 m (6666 ft) for CAT IV 600 V/CAT III 1000 V Up to 3,000 m (10,000 ft) for CAT III 600 V/CAT II 1000 V					
Maximum storage altitude	12 km (40,000 ft)					
Electro-Magnetic-Compatibility (EMC)	EN 61326 (2005-12) for emission and immunity					
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 2 GB) for storage of waveform data, complete datasets in which data and setup information is included, instrument settings and screen copies A mini-USB-B is provided which allows for interconnection to PC for remote control and data transfer under PC-control.					
Probe calibration output	Dedicated probe-cal output with reference contact provided, fully insulated from any measurement input channel.					
Warranty	Three years (parts and labor) on main instrument, one year on accessories					
Included accessories						
Battery charger/mains adapter	BC190					
Li-Ion battery pack	BP290 (2400 mAh)			BP291 (4800 mAh)		
Voltage probe sets (Each set includes ground lead, hook clip, ground spring and probe tip insulation sleeve)	VPS410-x (one red, one blue)			VPS410-x (one red, 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), Hangstrap, Handstrip (user selectable for left- or right hand use), Multi-language users manuals on CD-ROM, FlukeView® demo package (with restricted functionality), and USB interface cable for PC connectivity					

Ordering information

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Models

Fluke 190-504	Color ScopeMeter, 500 MHz, 4 channels
Fluke 190-504/S	Color ScopeMeter, 500 MHz, 4 channels with SCC-290 kit included
Fluke 190-204	Color ScopeMeter, 200 MHz, 4 channels
Fluke 190-204/S	Color ScopeMeter, 200 MHz, 4 channels, with SCC-290 kit included
Fluke 190-104	Color ScopeMeter, 100 MHz, 4 channels
Fluke 190-104/S	Color ScopeMeter, 100 MHz, 4 channels, with SCC-290 kit included
Fluke 190-202	Color ScopeMeter, 200 MHz, 2 channels plus DMM/Ext.input
Fluke 190-202/S	Color ScopeMeter, 200 MHz, 2 channels plus DMM/Ext.input, with SCC-290 kit included
Fluke 190-102	Color ScopeMeter, 100 MHz, 2 channels plus DMM/Ext.input
Fluke 190-102/S	Color ScopeMeter, 100 MHz, 2 channels plus DMM/Ext.input, with SCC-290 kit included
Fluke 190-062	Color ScopeMeter, 60 MHz, 2 channels plus DMM/Ext.input
Fluke 190-062/S	Color ScopeMeter, 60 MHz, 2 channels plus DMM/Ext.input, with SCC-290 kit included

Accessories

BC190	Mains adapter/battery charger
BP290	Li-ion battery pack, 2400 mAh
BP291	Li-ion battery pack, 4800 mAh
EBC290	External battery charger for BP290 and BP291 (uses BC190 mains adapter)
HH290	Hanging Hook for 190 Series II 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-G	Industrial Voltage Probe set, 10:1, one set grey
VPS410-R	Industrial Voltage Probe set, 10:1, one set red
VPS410-B	Industrial Voltage Probe set, 10:1, one set blue
VPS410-V	Industrial Voltage Probe set, 10:1, one set green
VPS420-R	High working voltage ruggedized probe set, 100:1, 150 MHz (bicolored, red/black)
VPS420-G	High working voltage ruggedized probe set, 100:1, 150 MHz (bicolored, grey/black)
VPS420-B	High working voltage ruggedized probe set, 100:1, 150 MHz (bicolored blue/black)
VPS420-V	High working voltage ruggedized probe set, 100:1, 150 MHz (bicolored green/black)
SW90W	FlukeView ScopeMeter Software package (full version)
C290	Hard shell protective carrying case for 190 Series II
SCC290	FlukeView ScopeMeter Software package (full version) and C290 Carrying Case kit for 190 Series II
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 VPS400-series probes
RS400	Probe Accessory Replacement Set for VPS400-series probes
RS500	Probe Accessory Replacement Set for VPS500-series probes

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