FLUKE®

ScopeMeter® 190 Series II

Technical Data

ScopeMeter 190 Series II – 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 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.

New

190 Series II – a new generation of ScopeMeter

The 190 Series II include these capabilities:

- Up to four independent floating isolated inputs, up to 1000 V
- High-speed sampling: Up to 2.5 GS/sec on 2 channels simultaneously
- Deep memory: 10,000 points per trace waveform capture (scope mode)
- CAT III 1000 V/CAT IV 600 V safety rated 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
- IP 51 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

FLUKE ISO 9001

Oscilloscope Modes

	190-062	190-102	190-202	190-104	190-204
Vertical deflection					
Number of channels	2	2	2	4	4
Bandwidth	60 MHz	100 MHz	200 MHz	100 MHz	200 MHz
Rise time	5.8 ns	3.5 ns	1.7 ns	3.5 ns	1.7 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: 20 kHz, 20 MHz 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)	1.25 GS/s for each channel	2.5 GS/s (2ch) 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	5 ns/div to 4 s/div	2 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 ScopeMeter
Pass/Fail Testing	In waveform compare mode, the ScopeMeter 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	
Vdc, Vac rms, Vac+dc, Vpeak max, Vpeak min, Vpeak to peak, Aac, Adc, Aac+dc, frequency (in Hz), risetime (using cursors), falltime (using cursors), phase (between any 2 inputs), pulsewidth (pos./neg.), dutycycle (pos./neg.), temperature °C, temperature °F (not for Japan), dBV, dBm into 50 Ω and 600 Ω	
Advanced power and motor drive functions	V/Hz ratio (190-x02 only), 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
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 ± 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					
Vdc accuracy	± (0.5 % + 5 counts)			± (1.5 % + 5 counts)	
Vac 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)	
Vac+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, 1,000 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)	Adc, Aac, Aac+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 1 °C/mV or 1 °F/mV				

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Recorder Modes

	190-062	190-102	190-202	190-104	190-204
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	
Bandwidth	20 MHz or 20 kHz, user selectable				
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 ~ 48 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	18,000 points (sets) per measurement Each recorded sample point contains a minimum, a maximum and an average value, plus a date- and timestamp				
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	3 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
Input voltage range					
Rated maximum floating voltage	CAT III 1000V/CAT IV 600V (maximum voltage between any contact and earth-ground voltage level)				
Maximum probe voltage	CAT III 1000V/CAT IV 600V (maximum voltage between standard 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 1000V/CAT IV 600V (safety designed banana input connectors)			—	
Memory save and recall					
Memory locations (internal)	15 waveform memories plus 2 recording 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 IEC529				
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 typ. using power adapter, 90 cd/m^2 typical using battery power				
Mechanical data					
Size	265 mm x 190 mm x 70 mm (10.4 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				

	190-062	190-102	190-202	190-104	190-204
Environmental					
Operating temperature	0 °C ~ +40 °C; +40 °C ~ +50 °C excl. 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 (one red, one blue)			VPS410 (one red, one grey, one blue, one green)	
Test leads	TL175 (one red, one black) with test pins			(N/A)	
Other	Handstrap affixed to instrument; hangstrap (user selectable for left- or righthand use); multi-language users manuals on CD-ROM; FlukeView® demo package (with restricted functionality); USB interface cable for PC connectivity				

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Ordering Information

Models

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

C290	Hard shell protective carrying case for 190 Series II
HH290	Hanging Hook for 190 Series II instruments
SCC290	FlukeView Software package (full version) and C290 Carrying Case kit for 190-series II
VPS410-R	Voltage Probe set, 10:1, 300 MHz, one set red
VPS410-G	Voltage Probe set, 10:1, 300 MHz, one set grey
VPS410-B	Voltage Probe set, 10:1, 300 MHz, one set blue
VPS410-V	Voltage Probe set, 10:1, 300 MHz, one set green
VPS420-R	High voltage probe set 150 MHz, 100:1, CAT III 2000V (1000V to earth)
BC190	Mains adapter/battery charger
EBC290	External battery charger for BP290 and BP291
TL175	TwistGuard™ safety designed Test Leads set (1 red, 1 black)
BP290	Li-Ion battery pack, 2400 mAh
BP291	Li-Ion battery pack, 4800 mAh
SW90W	FlukeView Software for Windows (full version)
AS400	Accessory Extension Set
RS400	Probe Accessory Replacement Set

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Fluke Corporation
PO Box 9090, Everett, WA 98206 U.S.A.

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or
Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or
Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or
Fax (905) 890-6866
From other countries +1 (425) 446-5500 or
Fax +1 (425) 446-5116
Web access: http://www.fluke.com

Printed in U.S.A. 4/2011 3801685B A-EN-N

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