Kipp & Zonen

SERVOGOR 500

OSCILLOGRAPHIC RECORDER

GENERAL

The SERVOGOR 520 / 540 are handy, versatile oscillographic recorders. Specially designed for field applications, the small footprint and lightweight housing allows very easy handling for mobile use.

Up to four analog high voltage inputs offer the possibility of direct measurements on mains. Powerful trigger functions such as wave window, edge and time-out trigger make possible the acquisition of mains disturbances, interruptions, unbalance and other abnormalities in the waveform of a commercial frequency power supply.

Additionally the harmonic trigger is a key feature for the simple detection of heat and vibration losses in machines, transformers, installations...

One of the main highlights of the SERVOGOR 520/540 is the automatic fax transfer via modem card or storage on a PC flash card for long-term recording. Stored data are easy to transfer to spread sheet applications.

There are many powerful analysis functions such as Root Mean Square, content and phase angle for harmonic of each order, active power, reactive power .... which are performed automatically.

FEATURES

- **Ergonomically, compact and lightweight, optimized for field applications**
- **2 or 4 analog inputs for AC or DC**
- **Voltage measurements up to 1000 V DC and 500 V RMS**
- **8 additional digital inputs (high voltage probes in option)**
- **Up to 400k samples per channel (11 bits resolution)**
- **Real-time and / or memory recording mode**
- **Harmonic analysis**
- **Powerful trigger functions (wave window trigger...)**
- **Integrated thermo printer**
- **PC card slot supporting flash memory and modem / fax cards**

The SE 520 / 540 is extremely easy to use:

First step -	the recorder measures,
Second step -	the recorder analyses,
Third step -	the recorder saves the results on the PC flash card.

Three different modes are available: real-time, memory and harmonic mode.

TECHNICAL SPECIFICATIONS

Measurement input

Input type	Floating unbalanced input
Input mode	DC, GND, RMS
Measuring ranges (calibrated)	0.1-0.2-0.5-1-2-5-10-20-50-100-200-500-1000 VDC
Accuracy	1% of FSV (After zero calibration following 30 minute warm-up at 23 ±5 °C)
Zero position	variable within the measurement range (null function included)
Frequency range	DC to 40 kHz (+1/-3 dB, typical)
Interference suppression	AC CMR 85 dB (50/60 Hz)
Low-pass filter	5 Hz, 500 Hz, off (-6 dB/octave)
Noise	2.0 mVp-p typical (with filter off, 10 mV/div range input shorted)
AD resolution	12 bits (11 bit internal processing resolution)
Max. sample rate	400 kS/s per channel (80 kS/s wave-window)

OSCILLOGRAPHIC RECORDER

Input impedance	1 MΩ ±1%, 5 pF (at 40 kHz, typical)
Input terminal	Safety terminal (for banana plug)
Max. input & floating voltage	500 Vrms CAT II 300 Vrms CAT III (between H and L input terminals, between H-L input terminal and ground)

MEMORY MODE

Time axis	200, 500 µs/div 1, 2, 5, 10, 20, 50, 100, 200, 500 ms/div 1, 2, 5, 10, 30 s/div 1, 2 min/div
Resolution (Time axis)	80 points/div (measurements period is 1/80 of time axis)
Recording length	10, 20, 50, 100, 200, 400, 800, 1600, 3200*1, 6400*2 div *1: Only works on odd-numbered channel when two channels are connected together. *2: Only works on channel 1 when two channels are connected together.
Memory blocks	32 maximum
Automatic functions	Automatic printing Automatic statistic calculations Automatic saving (to external memory) Automatic dialling (for faxing)
Cursor functions	One cursor: Measurement on all channels displayed simultaneously. Two cursors: Time on all channels, as well as measurement differences or frequencies
Zoom function	Time axis: x2, x1, x1/2 to x-1000 (The reduction ratio varies depending on memory length) Y axis: x5, x2, x1, x1/2
Calculations	max/min/ave/rms for cursor range Surface area of cursor range

RECORDING

Recording paper	Thermal paper roll (111 mm (width) x 10 metres), effective recording width: 104 mm
Precision of Advance	± 3 %
Chart speed	2, 5, 10, 30 s/div; 1, 2, 5, 10, 30 min/div; 1 hour/div

RECORDING FORMATS

Y-T-recording	4 analog and 8 logic channels (logic can be turned on/off separately for each bit)
Digital recording	measurements are recorded as digital values
X-Y recording	X1-Y1, Y2, Y3. X-axis is always 1 channel only. Recording size: 8 div x 8 div (80 x 80 mm)
Recording format options	Dots, lines
Recording length	20 div, 200 div, 800 div continuous
Recording line types	three line thickness (analog waveforms)

PRINTING FUNCTIONS

Printed information	List (settings), scale (units), time print marker, chart speed, chart speed modification point marker, trigger sensing position, grid (thin line, baseline, off), channel number, TAG etc.
Comments	Character string (20 characters per channel) or channel information printed in 100 mm intervals
Channel number	Channel number or TAG name (7 character per channel) printed on waveform.

REAL-TIME & MEMORY

Description	Normally memory sampling starts when trigger is detected during real-time recording.

NORMAL TRIGGER

Trigger sources	Analog channels, 1-4, logic A and B External trigger input, manual, timer
Trigger modes	Free, Single, Repeat
Trigger conditions	AND/OR
Analog trigger types	Rise, fall, high, low, slope, level window (in, out)
Trigger level	1% FS increments (setting)
Trigger filter	Filter or time-out (except when slope is set)
Trigger delay	-100% to 100% (in increments of 1%)

WAVE-WINDOW TRIGGER

Trigger modes	Single, repeat, free
Frequencies	50 Hz, 60 Hz
Trigger conditions	and/or on each analog channel
Reference wave-form	Automatically generated from current input or specified parameters
Reference wave-form parameters:	Amplitude, tolerance, offset (1% increments for each), phase (in increments of 1°)
Trigger delay	-100% to 100 % (in increments of 10%) (PRE/POST-trigger)
Sampling rates	80 kS/s (1 ms/div), 40 kS/s (2 ms/div), 16 kS/s (5 ms/div), 8 kS/s (10 m/div)
Memory length	Memory cannot be linked; maximum memory length for each channel is one-half that of normal triggers. Maximum memory length: 800 div

DISPLAY

Screen	5.7 inch LCD, 480x320 dots, contrast adjustable
Back light	Display can be turned on/off manually
Display languages	English, French, German, Japanese

HARMONIC ANALYSIS MODE

Fundamental wave	50 Hz, 60 Hz or automatic (45.0 Hz to 65.0 Hz; Automatic Analysis mode only)
Sample rates	25600 Hz (50 Hz), 30720 Hz (60 Hz)
Data points	512 (for analyse)
Analysis orders	Fundamental wave to 40th order
Analysis modes	Waveform Analysis, Automatic Analysis
Sample length	5-250 cycles, max. 1000 cycles (4 channels linked)
Anti-aliasing filter	Cutoff frequency 7.5 kHz, -30 dB/oct Effect on analysed range caused by aliasing: -40 dB or less
Amplitude accuracy (voltage, current)*1	Fundamental wave to 20th order ± (1.5% of rdg + 1.5% of FS) 21st to 40th orders ± (1.5% of rdg + 2% of FS)
Phase accuracy	voltage and current to fundamental wave phase tolerance) *1 *2 2nd order to 10th order ± 5°, 11th order to 40th order ± 15°
	*1 : In 50/60 Hz fixed mode (not including current clamp accuracy) *2 : Harmonica amplitude: At FS/100 to FS
Analysed frequency range	45 to 2.6 kHz (65 Hz x 40)

Triggers	Same as trigger functions in Waveform Analysis mode (but trigger sensing rate depends on sampling rate). Triggers available in Automatic Analysis mode: Synchronized channel and level trigger settings, distortion factor and content of specified order
Analysis types	Root mean square value, content and phase angle for harmonic component of each order; and active power*, power content*, and phase angle* *: *The following power measurement method is used (only works in Automatic Analysis mode; voltage output from a clamp probe is scaled to current values): Single-phase two-wire method (in the 4-channel model, two single phase tow-wire systems can be measured), single-phase three-wire method, three-phase three-wire method*
PC Card	Analysis results can be saved to a flash ATA memory card
Data format	CSV
Saving methods	Manual and automatic (for saving continuous trends at specified intervals)
Trend saving parameters	Root mean square value, content, phase angle, overall root mean square value, overall distortion factor, active power, apparent power, reactive power, and power factor. Analysis trends and number of orders for saving trends to PC card can be selected separately for each channel
Trend saving intervals	1 minute, 10 minutes, 30 minutes, 1 hour, 24 hours

REAL-TIME RMS MEASUREMENTS

Frequency ranges	DC, 40 Hz to 1 kHz
Measurement range	100 mV RMS to 500 V RMS
Accuracy	As shown below for 50/60 Hz, sine wave 100 mV FS to 2 V FS ± (2% of FS + 1 mV) 5 V FS to 50 V FS: ±(2% of FS + 1mV) 100 V FS to 1000 V FS: ±(2% of FS + 0.1V)
Response rate	(for 0-100% of FS step input) Rise (0–90% of FS): 200 ms (typical) Fall (140–10% d FS): 310 ms (typical)
Crest factor	2 (measurable range for crest factor 2 is RMS value of no more than 90% crestfactor

EXTERNAL I/O INTERFACE

Terminal	Screwless terminal
Ext. trigger input	TTL level or contact (pulse width of 2 µs or greater) Depending on settings, can be used as input for external sampling clock (up to 100 kHz) or for starting/stopping measurement
Ext. trigger output	TTL level (pulse width of 10 ms or greater; for parallel operation)

RS-232 INTERFACE

Connector	9 pin DSUB connector (male)
Transfer rates	1200, 2400, 4800, 9600, 19200 bps

PC CARD INTERFACE

Supported card	Flash ATA memory card (made by ScanDisk Corporation or equivalent)
Supported card size	Up to 40 MB
Function	Saving settings data, measurement data and graphical images (BMP)
Saving formats	ASCII, binary, BMP

MODEM COMMUNICATIONS

Supported card	Fax/modern card
Transmission rate	19200 bps maximum
Fax control	Class 2 card must be used
Functions	Sending measurements data, receiving setting commands, automatic transmission of measurement data (fax only)

PC CARDS REFERENCE

Flash ATA memory card	
I/O DATA	PCFCS-10MS, 20MS, 40MS
Epson	FLASH - PACKER Series FP2MB to FP40MB
Panasonic	BN-002AAP3 to 040AAP3
Fax/modem cards	
TDK	DF3314ES
U.S. Robotics	XJ4336, XJ1560
Psion	Gold card V34 + Fax
Xicrom	CREDIT CARD MEMO 33.6

LOGIC PROBES

	LOGIC PROBE	HIGH VOLTAGE LOGIC PROBE
Input type	4-channel, TTL or contact input; common input in the same probe	4-channel, voltage input, insulation between channels
Max. allowable input voltage	± 35 VDC	± 250 VRMS
Input impedance	Approx. 10 kΩ	Approx. 100 kΩ
Threshold level	Approx. +1.4 V	Sensed: 60 – 250 VAC, ±30 – ±250 V DC Not sensed: 0 – 10 VAC, 0 – ±10 DC
Withstand voltage	500 VDC 1 minute (between probe and case)	1.5 kV AC, 1 minute (between channels) 1.5 kV DC, 1 minute (between probe and case)

GENERAL SPECIFICATIONS

Measurement	Memory, Real-Time Recorder, Real-time Recording & Memory, Harmonica Analysis
Channels	Analog: 2 channels or 4 channels Logic: 8 bits (maximum of 2 four-bit probes can be connected)
Internal memory capacity	128 K data per channel (or 256 K data per two linked channels, 512 K data per four linked channels
Internal memory	SRAM (battery backup)
Power supply	Commercially available AA alkaline dry cells or special AC adapter, special DC converter for external DC power source. When both the AC Adapter and batteries are connected, the AC adapter is used first
AC adapter (option)	Rated supply voltage: 100 to 240 VAC Permissible supply voltage fluctuation range: 90 to 264 VAC Rated supply frequency: 50/60 Hz Permissible supply frequency fluctuation range: 48 to 62 Hz Maximum consumed power: 70 to 90 VA AC adapter rated output voltage: 12 V DC AC adapter rated max. output current: 2.6A

NiMH battery pack (Option)	2100 mAh, 7.2 V Number of charges (cycle life): approx. 300 (varies depending on usage environment)
Running time (NiMH battery)	Approximately 3.5 hours (on trigger standby without options) Approximately 3 hours (when recording 1 Hz cycle waveform in 2 S/div)
Charging function	Charged in the recorder, connect the dedicated AC adapter and turn off the power which to enter charge mode. Charging time is approximately 1.5 hours
AA/R6 dry cells	Six AA/R6 alkaline dry cells (JIS, IEC model name: LR6)
Running time (AA/R6 dry cells)	Approximately 2 hours (on trigger standby without options) Approximately 1/2 hour (when reordering 1 Hz cycle waveform in 2 S/div
DC converter (Option)	Input voltages: 9-18 V DC 18-36 V DC
Output voltage	12 V ± 5 %
Power consumption	Approximately 25 VA max. Terminal type: Screw terminal (lead wire approx. 5 metres long included)
Power consumption	AC adapter: 25 VA maximum Batteries: 20 VA maximum
Warm-up time	30 minutes
Test voltage	Between recorder and special AC adapter power line: 2kV AC for 1 minute Between recorder and analog input terminal: 2kV AC for 1 minute
Insulation resistance	Between recorder and special AC adapter power line: Minimum 10 MΩ at 500 DC Between recorder and analog input terminal: Minimum 100 MΩ at 500 V DC Between input terminals: Minimum 100 MΩ at 500 V DC
Source resistance	500 Ω max.
Operating and temperature and humidity	5 to 40 °C, 35 to 80% RH (Note: Wet-bulb temperature of 29 °C or less, no condensation)
Storage temperature and humidity	-20 to 60 °C, 90% RH (Note: Wet-bulb temperature of 29 °C or less, no condensation; NiMH battery and alkaline dry cells not included)
Clock accuracy	±100 ppm (typical)
Battery backup	Lithium battery for backing up settings, waveform data and clock
Life of lithium battery	Approximately 5 years for backup (at room temperature)
Safety/EMC Performance	CSA-C22.2 No. 1010-92 approved Declaration of compliance with EN 61010-1
Dimensions (H x W x D)	Approximately 256 x 190 x 46 mm
Weight SERVOGOR 520 (2-channel model):	Approximately 1.4 kg (without battery and chart)
SERVOGOR 540 (4-channel model):	Approximately 1.5 kg (without battery and chart)

ORDERING INFORMATION

Please indicate the order code for each instrument and accessory.

RECORDER	ORDER CODE
SERVOGOR 520 (2-channel-recorder)	A 2500 102 11
SERVOGOR 540 (4-channel-recorder)	A 2500 104 11

SCOPE OF DELIVERY:

Operating manual
1 Measurement cable for each analog input
1 Thermosensitive roll paper

OPTIONS

Option package consisting of 1), 2), 3)	A 6500 011 10
AC adapter 1)	A 6500 021 10
NiMH battery pack 2)	A 6500 031 10
4 channel logic probe	A 6500 041 10
4 channel high voltage logic probe	A 6500 051 10
Carry case 3)	A 6500 061 10
Small carrying case	A 6500 081 10
DC adapter 9 - 18V	on request
DC adapter 18 - 36V	on request

MAINS CABLE

(for AC adapter)

230 V / CEE-7-VII	P1	E 4380 000 10
115 V / UL 498	P2	E 4380 000 20
240 V / BS 1363 A	P3	E 4380 000 11

RECORDING ACCESSORIES

Thermosensitive roll paper (111 mm x 10 metres)	A 6500 091 10

DOCUMENTATION

Operating Manual:	
German	A 2500 21 GA 1D
English	A 2500 11 GA 1E
French	A 2500 21 GA 1F

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