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# IKALOGIC SQ Series 4 Channels 200 MSPS Logic Analyzer and Pattern Generator User Manual

**Augmented Instruments**
SQ Series User Manual
SQ25/SQ50/SQ100/SQ200 4 channels, 200 MSPS logic
analyzer and pattern generator

**Contents**

## SQ Series overview

SQ devices are a series of 4 channels logic analyzers and digital pattern generators. They have an integrated memory (up to 4M points per channel) and a high speed USB interface to transfer signals from/to the host computer. A free application (ScanaStudio) is provided to analyze captured signals or create patterns to be

generated. Generated signals may be arbitrarily created signals, or alternatively, user may play back previously captured signals



Figure 1: SQ Series logic analyzer devices (From left to right: SQ200, SQ100, SQ50, SQ25)

SQ devices oer an intuitive way of analyzing logic signals, backed with exciting features like enhanced ±35V input protection, adjustable input threshold, direct connection to RS232/485, CAN and LIN buses, ability to trigger on specific protocols (like a UART word or an I2C address). The signal generator was designed to be very versatile: Precise control over loop point can be achieved as well as the ability to generate arbitrary signals on any number of channels while recording the result on the others. SQ series' input/output stage is fully protected while oering flexible options like Open Drain outputs and configurable pull up/down resistors. Furthermore, the digital signal generator has an adjustable output voltage from 1.8V to 5V, which covers most TTL, CMOS and LVCMOS applications. SQ Series is composed of four devices: SQ25, SQ50, SQ100 and SQ200. All have 4 channels that can be used to capture and/or generate logic signals. The table below shows the mains dierences between models:

|  | SQ25 | SQ50 | SQ100 | SQ200 |
|---|---|---|---|---|
| Sampling rate | 25 MHz | 50 MHz | 100 MHz | 200 MHz |
| Sampling depth (Max per channel) | 256 Kpts | 1 Mpts | 2 Mpts | 4 Mpts |
| Trigger options | Edge, level, pulse | Edge, level, pulse arbitrary pattern, serial protocol | Edge, level, pulse arbitrary pattern, serial protocol | Edge, level, pulse arbitrary pattern, serial protocol |
|  | SQ25 | SQ50 | SQ100 | SQ200 |
| Dierential input pairs | 0 | 0 | 1 | 2 |

## Typical applications

By combining logic analyzer and pattern generator capabilities in a single low price device, SQ is a perfect solution for students and small design houses. For more channels and more performances, check SP series logic analyzers.

- Embedded systems
- Firmware development and debugging
- Educational work
- Serial protocols analysis, like I2C, SPI, UART or 1-Wire (non exhaustive list)
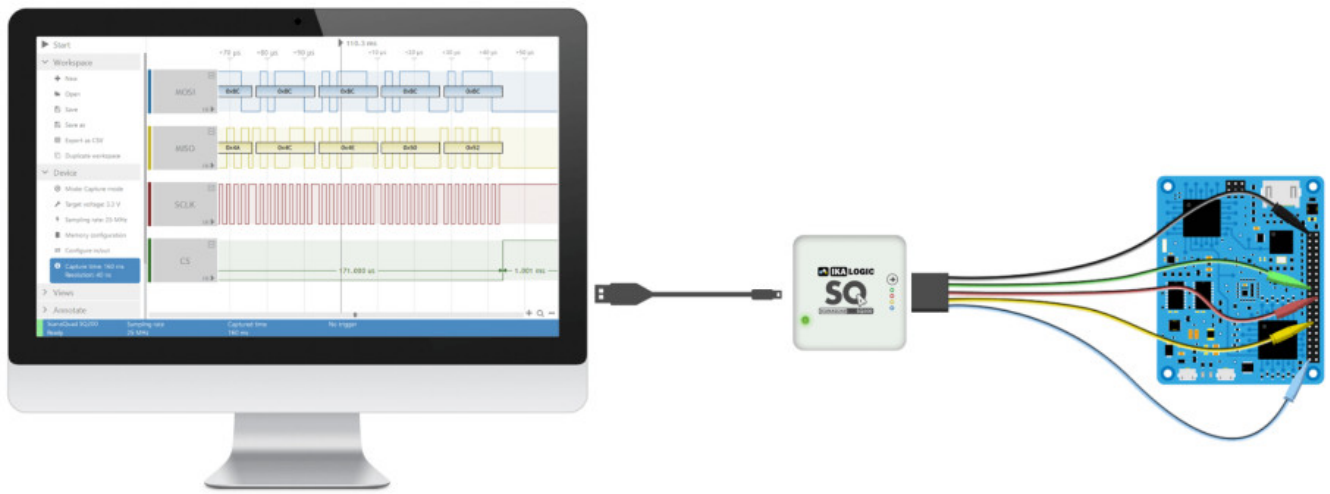- Reverse engineering

Figure 2: Example usage of SQ Logic Analyzer to capture, decode or generate logic signals

**Benefits**

- Get quick insight into your serial communication application.
- Soware lets you view decoded signals in many dierent levels of abstractions (Packets or detailed bits and bytes)
- Device performance do not depend on USB connection bandwidth
- Soware running on Windows, macOS and Linux.
- Soware is intuitive and very easy to use.
- Generate test patterns to stimulate a system without any other equipment.

**Warning**
Read safety information section carefully before using this instrument.

## Main characteristics

### Operating conditions

| Model | SQ25/SQ50/SQ100/SQ200 |
|---|---|
| Temperature | 10°C to 40°C |
| Relative humidity | < 80% non condensing |
| Altitude | <2000m |

### Timing and measurements

|  | SQ25 | SQ50 | SQ100 | SQ200 |
|---|---|---|---|---|
| Sampling rate | 25 MHz | 50 MHz | 100 MHz | 200 MHz |
| Fastest measurable digital signal | 6 MHz | 12 MHz | 25 MHz | 50 MHz |
| Maximum output frequency (generator mode) | 6 MHz | 12 MHz | 25 MHz | 50 MHz |
| Sampling Period (Max. at sampling frequency = 1MHz) | 256 ms | 1 s | 2 s | 4 s |

**Inputs specifications**

|  | SQ25 | SQ50 | SQ100 | SQ200 |
|---|---|---|---|---|
| Input resistance to ground | 100 KO | 1 MO | 1 MO | 1 MO |
| Optionnal pull up/down resistor | N/A | N/A | 10K0 | 10K0 |
| Input voltage range (continuous) | OV to 5.5V | ± 5V | ± 15V | ± 15V |
| Input voltage range (10 ms pulse) | ± 12V | ± 12V | ± 50V | ± 50V |

|  | SQ25 | SQ50 | SQ100 | SQ200 |
|---|---|---|---|---|
| Low level input voltage (Max) | 0.8V | Adjustable | Adjustable | Adjustable |
| High level input voltage (Min) | 2V | Adjustable | Adjustable | Adjustable |
| Input threshold hysteresis | 100mV | 350mV | 350mV | 350mV |

**Outputs specifications**

| | SQ25 | SQ50 | | SQ100 | | SQ200 | |
|---|---|---|---|---|---|---|---|
| Output series resistance | 2700 | 2700 | | 2700 | | 2700 | |
| Output current (Max. per channel) | 10mA 20mA 20mA | 20mA | | | | | |
| Output high level voltage (Typ.) | 3.3V (Fixed) | 1.65V, 2.8V, 5V | 3.3V, | 1.65V, 2.8V, 5V | 3.3V, | 1.65V, 2.8V, 5V | 3.3V, |
| Output driver configuration | Push-Pull | Push-Pull, open-drain | | Push-Pull, open-drain | | Push-Pull, open-drain | |

**Power requirements**

| Input power connector | Micro USB female |
|---|---|
| Input current (Max) | 350 mA |
| Input voltage | 5 V ± 0.25 V |

**SQ device Interfaces**

SQ logic analyzer and pattern generator ports and interfaces are shown in the diagram below:
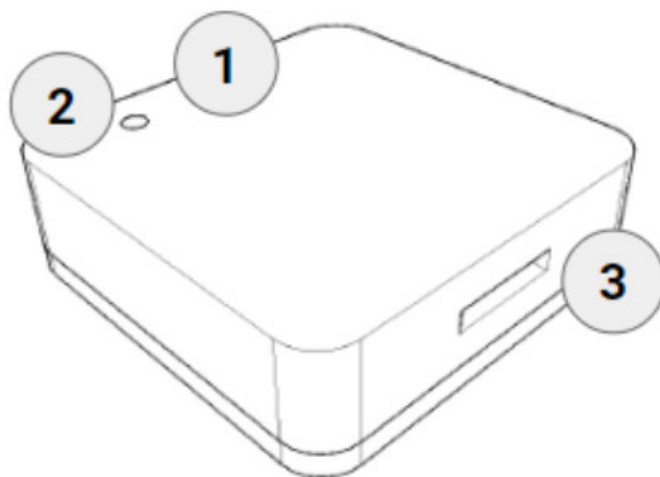


Figure 3: SQ logic analyzer and generator interfaces

1. USB port (mini B)
2. Status LED
3. 4 channel probes connector

**Principle of operation**

ScanaQuad is also able to generate captured signals (play back), or build genuine arbitrary test patterns, like UART, SPI or I2C packets. It can also be used to compose and generate Frequency modulation (FM) signals and pulse width modulation (PWM) signals. Thanks to the mixed mode, SQ devices can even capture and generate digital signals simultaneously. Mixed mode is specifically designed to allow engineers to stimulate a circuit with test signals and capture its response.

**Embedded memory**

SQ series logic analyzers come with an embedded memory to store captured samples, as well as the patterns to be generated. Hence, SQ devices do not live-stream captured signals over USB. This has one big advantage: the performance do not depend on the host computer USB port performance

**Versatile trigger system**

SQ series oer a state of the art trigger system. It's composed of one FlexiTrig®trigger engines, each FlexiTrig engine can be used in one of those modes:

- Edge trigger

- Pulse trigger (with minimum and maximum pulse width)

- Timed logic sequence

- Protocol based trigger (e.g. I2C bus address or serial UART character)

Finally, an external trigger input and output is available via an accessory called TrigBox.

**What's in the box**

SQ series is shipped with the following items:

1. SQ device

2. USB cable (mini-B to A)

3. 5 leads hook probes set (4 signals + 1 ground)

## Unpacking and first usage

We recommend the user to start by identifying all the dierent components that are provided. To turn ON the SQ device, connect it to a free USB port of your computer using the provided USB cable 1 . The LED should glow according to the table in the Status LEDs behavior section. To switch o the device, simply disconnect the USB cable.

**Status LEDs behavior**

Status led can be in one of 3 states:

| Status LED | Meaning |
|---|---|
| O | Device not powered (not correctly connected to a USB port). |
| Orange | Either the device was just plugged in USB but not recognized by so ware, or device is in generator mode. |
| Green | Device is recognized by ScanaStudio soware and operational. |

**Soware Quick Start guide**

Start by downloading the latest version of ScanaStudio soware **www.ikalogic.com** and following instructions to install both soware and provided drivers. It is recommended to restart your computer

1 Do not connect SQ device to anything else than a computer's USB port or to a TrigBox hub. Never connect the SP209 to a USB charging adaptor.

after the soware and drivers have been installed.

Once the soware is installed, run it, and create a new workspace by selecting the model that match your SQ device from the list of possible choices.

Note: if at the point the device is not recognized by your computer, the ScanaStudio workspace is created as a demo workspace or the status LEDs stays orange even aer creating a ScanaStudio workspace, please follow these steps:

- Ensure the USB port used can deliver at least 500mA.
- Try switching to another machine if one is available.
- If all of the above fails, please contact Ikalogic support.

**Capturing your first signal**

To capture your first logic signals, please follow these steps:

1. Connect the device via USB
2. Launch ScanaStudio and create an SQ compatible workspace.
3. Connect the probes to SQ device and to your signals source
4. Ensure the ground probe is connected correctly
5. Hit the start button in ScanaStudio and wait until signals are captured and displayed on the screen.

You can adjust the capture duration by adjusting the number of samples in the device configuration tab.

**Mechanical data**

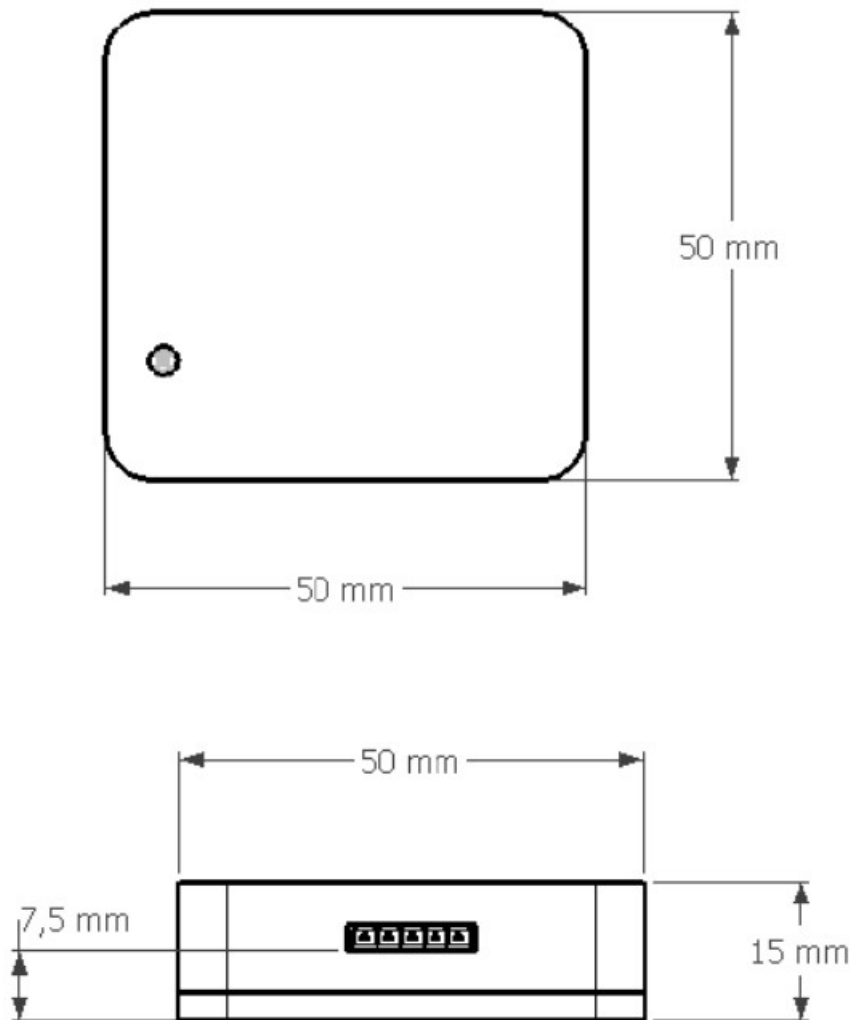Weight: 80g (± 5g depending on model)

Figure 4: SQ device dimensions (mm)

## Soware technical requirements

Download ScanaStudio soware on **www.ikalogic.com** so you can use your device on your favorite platform. SQ devices and ScanaStudio were tested to supports the following platforms:

- Windows 7/8/10
- Mac OS 10.9 or later
- Ubuntu 14.04 or later

### Ordering information and customer support
For ordering information, please check for nearest distributor on **www.ikalogic.com** or contact us for any inquiry at **contact@ikalogic.com**.

## Accessories and maintenance

Accessories and maintenance services (probes replacement) are available on our website: **www.ikalogic.com** or by contacting customer support ( **support@ikalogic.com** ).

## Certifications and regulations

This device complies with the following applicable European Directives: Electromagnetic Compatibility (EMC)

Directive 2004/108/EC, Low-Voltage Directive 2006/95/EC, IEC 61326-2.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**CAN ICES-3 (B) / NMB-3 (B)**

RoHS Compliant 2011/65/EC. This device does not contain any of the substances in excess of the maximum concentration values ("MCVs") defined in the EU RoHS Directive.

**CE  RoHS  NOTE:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or televisionreception which can be determined by turning the equipment o and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit dierent from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## Safety information

This product complies with safety standards IEC NF/EN 61010-1: 2010, IEC NF/EN 61010-2-030 and UL 61010-1: 2015 To prevent possible electrical shock, fire, personal injury, or damage to the product, read all safety information before you use the product. The following international symbols are used on the product and in this manual.

**Symbols definitions**

⚠ Figure 5:Risk of Danger. Important information. See Manual.

🗑 Figure 6: WEEE logo. This product complies with the WEEE Directive (2002/96/EC) marking requirements. The aixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 Do not dispose of this product as unsorted municipal waste.

**CE** Figure 7:CE Logo. Conforms to European Union directives.

**Important safety notes**

⚠ **Warning: To avoid electrical shock or fire:**

- Carefully read all instructions.
- Use the product only as specified, otherwise the protection supplied by the product can be compromised.
- Do not use the product if it operates incorrectly.
- Before use, inspect device casing, probes, test leads and accessories for mechanical damage and replace if damaged.
- Never attempt to repair a defective device. Contact aer-sale service.
- Do not use the product or its accessories in case of any damage.
- Remove all probes, test leads and accessories that are not in use.

- Never use the device for measuring mains circuits.

- Never use the device for measuring circuits which are not isolated from mains.

- Do not touch electrical wires with bare hands.

- Keep away from children's sight or from animals.

- Do not expose to water, heat or moisture.

- The device's ground connection through the USB cable is for measurement purposes only. The logic analyzer does not have a protective safety ground.

- Ensure there is no significant voltage between device ground and the point to which you intend to connect it.

- Do not apply more than the rated voltage (±25V), between the terminals or between each terminal and ground.

- Do not apply input voltages above the rating of the instrument (±25V).

- Measure a known voltage first to make sure that the product operates correctly.

- Do not work alone.

- Comply with local and national safety codes. Use personal protective equipment (approved rubber gloves, face protection, and flame resistant clothes) to prevent shock.

- Do not use the device in wet or damp conditions, or around explosive gas or vapor.

- Do not operate the product with covers removed or the case open. Hazardous voltage exposure is possible.

- Do not use in a system in which the failure of the product might result in personal injury.

**Limited warranty & limitation of liability**

Each Ikalogic product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is three years for the test tool and two year for its accessories. This warranty extends only to the original buyer or end-user customer of an Ikalogic authorized reseller, and does not apply to fuses, disposable batteries or to any product which, in Ikalogic's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling.

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not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not aect the validity or enforceability of any other provision.

## Document Revisions

| 1-Aug-19 | Updated this document to latest layout format. |
|---|---|
| 6-Sep-17 | Added information about TrigBox. |
| 22-November-2014 | Fixed spelling mistakes. |
| 5-Nov-14 | Initial release of this document. |

The information in this document is subject to change without notice.

**www.ikalogic.com**
**support@ikalogic.com**

## Documents / Resources

**IKALOGIC SQ Series 4 Channels 200 MSPS Logic Analyzer and Pattern Generator** [pdf] User Manual
SQ Series 4 Channels 200 MSPS Logic Analyzer and Pattern Generator, SQ Series, 4 Channels 200 MSPS Logic Analyzer and Pattern Generator, Logic Analyzer and Pattern Generator, Analyzer and Pattern Generator, Pattern Generator, Generator

## References

- ⏛ **Ikalogic - Logic analyzers and portable oscilloscopes**

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