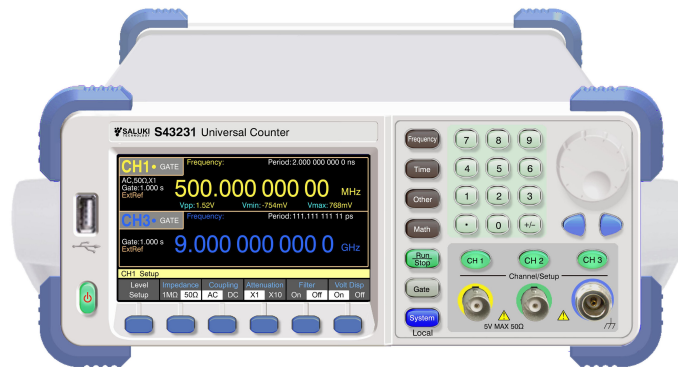




S43231 Series Universal Counter

Datasheet



Saluki Technology Inc.

The document applies to the universal counter of the following models:

- S43231 universal counter (channel A,B: 0.14mHz-500MHz)
- S43231-01 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 100MHz-1.5GHz)
- S43231-02 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 100MHz-2.5GHz)
- S43231-03 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 100MHz-3GHz)
- S43231-04 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 150MHz-6GHz)
- S43231-05 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 500MHz-9GHz)
- S43231-06 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 500MHz-12.4GHz)
- S43231-07 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 500MHz-15GHz)
- S43231-08 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 500MHz-18GHz)
- S43231-09 universal counter (channel A,B: 0.14mHz-500MHz, channel C: 500MHz-20GHz)

Standard Package of the S43231series universal counter:

| No. | Item | Qty. |
|-----|------------------------|------|
| 1 | Universal Counter | 1 |
| 2 | Test Cable (BNC male) | 2 |
| 3 | RS232 Cable | 1 |
| 4 | Power Cord | 1 |
| 5 | Fuse Tube BGXP-1-18-1A | 2 |

Options of the S43231series universal counter:

| Model No. | Item |
|-----------|--|
| S43231-10 | High-stability and Constant- temperature Crystal Oscillator $3 \times 10^{-9}/24H$ |
| S43231-11 | High-stability and Constant- temperature Crystal Oscillator $1 \times 10^{-9}/24H$ |
| S43231-12 | GPIB Interface |
| S43231-13 | Centronics standard printer interface |
| S43231-14 | Test Cable (Type N) |

Preface

Thank you for choosing S43231 series universal counter produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with “superior quality and considerate service”, and are committed to offering satisfactory products and service for our clients.

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Version

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Saluki Technology

Document Authorization

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Product Quality Assurance

The warranty period of the product is three years from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Settings Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

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1. Overview

The S43231 series high-precision universal counter is a high-precision frequency and time measurement instrument developed by our company. It has a frequency resolution of up to 12 digits per second and a single-shot time measurement resolution of up to 30 ps, controlled by a high-performance microcontroller inside. The overall design employs reciprocal counting technology, fitting algorithm technology, and timestamp technology to achieve high-precision measurements. It features measurement functions such as frequency, period, counting, time interval, pulse width, duty cycle, rising edge, falling edge, frequency ratio, and phase, along with powerful mathematical operations and statistical functions (maximum, minimum, average, standard deviation, Allan variance). The instrument offers reliable performance, complete functions, high measurement accuracy, wide frequency and time measurement ranges, high sensitivity, large dynamic range, cost-effectiveness, and ease of use. It is particularly suitable for time measurement in fields such as aerospace, as well as for the time and frequency measurement of oscillators, components, and other scientific research and metrology applications.

2. Main Characteristics

- Employs timestamp technology, achieving a frequency measurement resolution of up to 12 digits per second and a time measurement resolution of 50 ps.
- Capable of simultaneously performing frequency, period, single-period, duty cycle, and pulse width measurements, as well as counting, on signals from two channels.
- Supports gap-free frequency and period measurements on a single input signal.
- Utilizes a high-performance microcontroller, large-scale integrated circuits, and FPGA devices to ensure high instrument reliability.
- Channel 3 supports frequency measurements up to 20 GHz.
- Capable of measuring single-shot time intervals and single-shot pulse widths.
- Features limit checking and mathematical calculation functions.
- Provides graphical display functions including rulers, histograms, and trend charts.
- Offers statistical calculation functions including multiple averaging, maximum/minimum values, standard deviation, Allan variance, and five types of scaling functions.
- Counting measurement features include counting within a fixed gate time and manual counting modes.
- The counter can store up to 10 measurement states.
- Comes standard with RS232 universal serial, USB Device, and LAN interfaces.
- Includes a standard USB Host interface, allowing measurement data to be written directly to a USB flash drive.
- Supports an optional Centronics standard printer interface.
- Supports an optional IEEE488 (GPIB) general-purpose programmable interface.
- Features a 4.3-inch color TFT LCD display with a user-friendly and intuitive interface, supporting English languages

3. Technical Specifications

3.1. Input Characteristics

Channel A and B:

| | |
|-------------------------------|--|
| Frequency range | 0.14mHz to 500MHz (DC coupling below 1kHz) |
| Dynamic range | 50 mVrms to 10 Vrms (<100 kHz) Sine Wave; 50mVrms to 1.5Vrms sine wave (100kHz to 400MHz); 100mVrms to 1.5Vrms pulse wave (400MHz to 500MHz) |
| Input impedance | 1MΩ 45pF or 50Ω |
| Coupling mode | AC or DC |
| Trigger mode | Rising edge or falling edge |
| Input attenuation | ×1 or ×10 |
| Low-pass filter | Cutoff frequency about 100kHz |
| Trigger level | -5V to +5V any setting |
| Crosstalk interference | Not less than 500mVrms |

Channel A and B can adapt to the input signal with modulation degree $\leq 30\%$, and the enveloping valley value shall satisfy the input sensitivity.

In order to prevent high-frequency components in the low frequency signal measured, the low-pass filter shall be opened for during low frequency measurement below 100kHz. When low frequency measurement below 100Hz is conducted, the trigger level shall be set manually.

Channel C:

| | |
|------------------------|---|
| Model | S43231-01/02/03 |
| Frequency range | S43231-01: 100MHz-1.5GHz, S43231-02: 100MHz-2.5GHz, S43231-03: 100MHz-3GHz |
| Dynamic range | 30mVrms - 1.5Vrms sine wave |
| Input impedance | 50Ω |
| Coupling mode | AC |

| | |
|------------------------------------|---|
| Model | S43231-04 |
| Frequency range | 150MHz-6GHz |
| Power range and sensitivity | 150MHz-500MHz: -17dBm to +13dBm, 500MHz-6GHz: -25dBm to +13dBm |
| Damage level | +20dBm |
| Input impedance | 50Ω |
| Coupling mode | AC |

| | |
|------------------------------------|---|
| Model | S43231-05 |
| Frequency range | S43231-05: 500MHz-9GHz |
| Power range and sensitivity | 500MHz-2GHz: -25dBm to +7dBm, 2GHz-6GHz: -25dBm to +13dBm 6GHz-9GHz: -20dBm to +13dBm |
| Damage level | +25dBm |
| Input impedance | 50Ω |
| Coupling mode | AC |
| Standing wave ratio | < 2.5:1 |

| | |
|------------------------------------|--|
| Model | S43231-06/07/08/09 |
| Frequency range | S43231-06: 500MHz-12.4GHz; S43231-07: 500MHz-15GHz; S43231-08: 500MHz-18GHz; S43231-09: 500MHz-20GHz; |
| Power range and sensitivity | -20dBm ~ +10dBm |
| Damage level | +25dBm |
| Input impedance | 50Ω |
| Coupling mode | AC |

External trigger input:

| | |
|--------------------------------|---|
| Signal input range | TTL level |
| Pulse width | > 50ns |
| Outer Gate Signal | Positive Pulse (Frequency and Period Measurement) |
| External Trigger Signal | Rising Edge / Falling Edge |

Note: The input signal shall not exceed the damage level of the channel. Otherwise, the input signal will be damaged, leading to instrument damage!

3. 2. Time Base

| | | |
|------------------------------------|-------------------|--|
| Internal crystal oscillator | Nominal frequency | 10MHz |
| | Daily aging rate | 5×10 ⁻⁹ /24H (Standard) 3×10 ⁻⁹ /24H (Option) 1×10 ⁻⁹ /24H (Option) |
| Time-based input | Frequency | 5MHz or 10MHz |
| | Amplitude | ≥ 1Vp-p |
| Time-based output | Frequency | 10MHz |
| | Amplitude | ≥ 1Vp-p |

3. 3. Measurement Indicator

Frequency measurement:

| | |
|--------------------------|--------------------------------------|
| Valid bits | 12 bits/second |
| Gate time | 1μs to 1000s, external gate optional |
| Measurement error | |

Periodic measurement:

| | |
|--------------------------------------|--|
| Measuring range | 2ns to 7000s |
| Display least significant bit | 50ps |
| Trigger signal | Internal automatic trigger or external trigger |
| System error | ±50ps |
| Measurement error | ±System error±Decoding error±Time base error |

Time interval measurement:

| | |
|--|---|
| Measurement range | 2ns to 7000s |
| Display least significant digit LSD | 50ps |
| Trigger signal | Internal automatic trigger or external trigger |
| Measurement error | ±LSD±decoding error±time base error×time interval |
| System error | ±50ps |

Frequency ratio measurement:

| | |
|-------------------|----------------|
| Valid bits | 12 bits/second |
|-------------------|----------------|

Pulse width measurement:

| | |
|--|---|
| Measurement range | $\geq 500\text{ps}$, period $< 100\text{s}$ |
| Display least significant digit LSD | 50ps |
| Trigger signal | Internal automatic trigger or external trigger |
| Measurement error | $\pm \text{LSD} \pm \text{decoding error} \pm \text{time base error} \times \text{time interval}$ |
| System error | $\pm 50\text{ps}$ |

Rising edge / falling edge measurement:

| | |
|--------------------------------------|---|
| Measurement range | 2ns to 1000s |
| Input channel | Channel 1 |
| Display least significant bit | 50ps |
| Trigger signal | Internal automatic trigger or external trigger |
| System error | $\pm 50\text{ps}$ |
| Measurement error | $\pm (\text{time base error} \times \text{time interval} + \text{trigger error} + \text{system error})$ |

Phase measurement:

| | |
|--|---|
| Input signal frequency range | 1Hz -100MHz |
| Input signal amplitude | $\geq 2\text{Vp-p}$ |
| Measurement range | -180° to $180^\circ/0^\circ$ to 360° |
| Display least significant digit LSD | 0.1° |
| Measurement error | $\pm 3^\circ \pm \text{Error caused by signal noise}$ |

Duty ratio measurement:

| | |
|--|---|
| Measurement range | 1 to 99% (pulse width $\geq 20\text{ns}$, period $< 100\text{s}$) |
| Display least significant digit LSD | 0.1% |
| Trigger signal | Internal automatic trigger or external trigger |

Counting measurement:

| | |
|--------------------------|--|
| Measurement range | 0 - 1×10^{19} |
| Resolution | ± 1 counting |
| Gate time | AUTO, 1 μs ~1000s, external gate optional |

3. 4. Other Characteristics

| | |
|---------------------------------|--|
| Remote control interface | Standard: USB (Device, Host supports USB read and write), RS232, LAN Optional: Print port, GPIB |
| Power Supply | AC 100 to 240V, 50Hz~60Hz |
| Dimension | 260mm W \times 105mm H \times 290mm D |
| Weight | About 2.5kg |

- End of Document -