

CX1100 Series

Current and Differential Sensors



- CX1101A Current Sensor, Single Channel
- CX1102A Current Sensor, Dual Channel
- CX1103A Current Sensor, Low Side
- CX1104A Current Sensor, Selectable Resistive Sensor Head
- CX1105A Differential Sensor, Single Channel
- CX1211A, CX1212A, CX1213A, CX1214A, CX1215A, CX1216A Resistive Sensor Head

Specification and supplemental characteristics

Warranted specifications are denoted by **, and all others are supplemental characteristics. Specifications are valid after a 30-minute warm-up and 23 ± 5 °C. All these characteristics are defined by the 14-bit acquisition resolution of the CX3300 mainframe unless otherwise stated. See “Device Current Waveform Analyzer” data sheet (publication number: 5992-1430EN) for the mainframe characteristics.

Overview of measurement accuracy

Measurement accuracy can be affected by RF electro-magnetic field having the strengths greater than 3 V/m in the frequency range of 80 MHz to 2 GHz or 1 V/m in the frequency range of 2 GHz to 2.7 GHz. The extent of this effect depends upon how the instrument is positioned and shielded.

CX1101A Performance Characteristics

Table 1. CX1101A characteristics overview

| | Range | R_{IN}^2 | Noise (rms) ³ | Maximum bandwidth (-3 dB) ⁴ |
|----------------------------------|--------|--------------------|--------------------------|----------------------------------------|
| Current measurement ¹ | 10 A | 15 mΩ (typ) | 10 mA | 3 MHz ⁵ |
| | 1 A | | 2 mA | 100 MHz |
| | 200 mA | 410 mΩ (typ) | 0.2 mA | 100 MHz |
| | 20 mA | 550 mΩ (max) | 20 μA | 100 MHz |
| | 2 mA | | 3 μA | 100 MHz |
| | 200 μA | | 500 nA ⁷ | 500 kHz ⁷ |
| | | 50 Ω (typ) | 400 nA ⁶ | 25 kHz |
| | 20 μA | 77 Ω (max) | 150 nA ⁷ | 500 kHz ⁷ |
| | | 40 nA ⁶ | 25 kHz | |

1. Sensor Head used to measure the characteristics: CX1206A for 10 A range and CX1203A for all other ranges.
2. The slide switch of CX1203A to be set to “0 Ω”.
3. 20 MHz noise bandwidth measured with mainframe.
4. Standalone bandwidth. The effective measurement bandwidth when connected to mainframe can be estimated by the following equation.

$$BW_{\text{effective}} = \frac{1}{\sqrt{\left(\frac{1}{BW_{\text{sensor}}}\right)^2 + \left(\frac{1}{BW_{\text{mainframe}}}\right)^2}}$$

5. -4 dB bandwidth.
6. The sensor built-in low pass filter is ON.
7. To enable these ranges, the CX1101A's firmware version must be 2.0 or later.

Table 2. CX1101A DC measurement accuracy¹

| Range | | Standalone | With mainframe | $T_{\text{USERCAL}} \pm 3$ °C, 24 hrs ² |
|--------|-----------------------------------------------|-----------------|--------------------|----------------------------------------------------|
| | | 23 ± 5 °C | 23 ± 5 °C | |
| 10 A | | ± (5% + 5%) | ± (5.7% + 5.9%) | N/A |
| 1 A | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (1.8% + 0.4%) |
| 200 mA | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.7% + 0.4%) |
| 20 mA | Gain [% of readings] + Offset [% of range] | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.6% + 0.3%) |
| 2 mA | | ± (2% + N/A) ** | ± (2.7% + N/A) ** | ± (0.7% + 1.1%) |
| 200 μA | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.7% + 0.3%) |
| 20 μA | | ± (2% + N/A) ** | ± (2.7% + N/A) ** | ± (0.7% + 1.1%) |

1. Accuracy is defined at VCM = 0 V (zero Common Mode input voltage at either $+I_{IN}$ or $-I_{IN}$). Add 0.7% typical to Offset error for Vcm up to 40 V. The “reading” is defined as measured value. DC measurement condition: 20 ms averaged.
2. After executing the User Calibration (both gain and offset) with mainframe.

Table 3. CX1101A other characteristics

| | | |
|--------------------------------------------------|-----------------------------------|-------------------------|
| Rise time (10% to 90%) | 0.35/Bandwidth | |
| Input common mode impedance ¹ | 750 M Ω // 31 pF (Nominal) | |
| Measurable over range | 10% of range | |
| Burden voltage | R_{IN} * measured current | |
| Maximum input voltage (common mode) ² | Peak voltage (DC + AC) limit | ± 40 V |
| | AC voltage limit | ± 5 V above 1 MHz |
| Absolute maximum input current | Range | Protection ⁴ |
| | 10 A | 11 A |
| | 1 A | |
| | 200 mA | 1.5 A ³ |
| | 20 mA | |
| | 2 mA | |
| 200 μ A | 50 mA | |
| 20 μ A | | |

1. Measured with a CX1201A. Both inputs has this same input impedance. When using a CX1203A sensor head, the minus (-) terminal is internally connected to the circuit common through a 10 M Ω resistor.
2. For all current measurement ranges.
3. CX1203A with 50 Ω setting: 125 mA.
4. See "CX1100 User's Guide" (CX1100-90000) for more information.

Table 4. CX1101A general information¹

| | |
|-------------------------------|-------------------------------------------------------------------------------|
| Cable length | Sensor cable: 1.5 m, GND lead: 16 cm |
| Dimension ² | 46.8 mm (W), 31.9 mm (H), 205.3 mm (D) |
| Weight | 400 g |
| Furnished accessories | 1 each Coaxial Termination Adapter Sensor Head (CX1203A) |
| | - 1 each Coaxial Cable, SMA plug to open, 100 mm (8121-2773) ³ |
| | - 1 each Coaxial Cable, SMA plug to MHF plug, 100 mm (8121-2774) ³ |
| | - 1 each MHF pullin tool (8710-2791) ³ |
| | - 5 each Coaxial Cable, MHF plug, shorted, 21 mm (8121-2780) ³ |
| | - 5 each RF Connector, MHF jack straight SMT (1250-3656) ³ |
| | 1 each SMA(P) to BNC(J) 50 Ω Coaxial Adapter (1250-3975) |
| 1 each GND lead (C1101-61711) | |

1. Refer to mainframe's "Environmental and general" part for other information.
2. CX1203A sensor head is included. Cable and adapter are not included.
3. CX1203A's accessories.

CX1102A Performance Characteristics

Table 5. CX1102A characteristics overview

| | Range | | R_{IN}^2 | Noise (rms) ³ | | Maximum bandwidth (-3 dB) ⁴ |
|----------------------------------|-----------------|-------------------|--------------------------|----------------------------|-------------------------------|----------------------------------------|
| | Primary channel | Secondary channel | | Primary channel | Secondary channel | |
| Current measurement ¹ | 1 A | 20 mA | 410 mΩ (typ) | 2 mA | 20 μA | 100 MHz |
| | 200 mA | 2 mA | 550 mΩ (max) | 0.2 mA | 3 μA | |
| | 20 mA | 200 μA | 50 Ω (typ) 77 Ω (max) | 20 μA 8 μA ⁵ | 500 nA 400 nA ⁵ | 500 kHz 90 kHz ⁵ |
| | 2 mA | 20 μA | 50 Ω (typ) 77 Ω (max) | 2 μA 1 μA ⁵ | 200 nA 40 nA ⁵ | 500 kHz 25 kHz ⁵ |

1. Sensor Head used to measure the characteristics: CX1203A.
2. The slide switch of CX1203A to be set to "0 Ω".
3. 20 MHz noise bandwidth measured with mainframe.
4. Standalone bandwidth. The effective measurement bandwidth when connected to mainframe can be estimated by the following equation.

$$BW_{\text{effective}} = \frac{1}{\sqrt{\left(\frac{1}{BW_{\text{sensor}}}\right)^2 + \left(\frac{1}{BW_{\text{mainframe}}}\right)^2}}$$

5. The sensor built-in low pass filter is ON.

Table 6. CX1102A DC measurement accuracy¹

| Range | | Standalone | With mainframe | $T_{\text{USERCAL}} \pm 3^\circ\text{C}, 24 \text{ hrs}^2$ |
|------------------|------------------------|-------------------------------|---------------------------------|------------------------------------------------------------|
| | | $23 \pm 5^\circ\text{C}$ | $23 \pm 5^\circ\text{C}$ | |
| 1 A primary | | $\pm (2\% + 2\%)^{**}$ | $\pm (2.7\% + 2.9\%)^{**}$ | $\pm (1.8\% + 0.4\%)$ |
| 200 mA primary | | $\pm (2\% + 2\%)^{**}$ | $\pm (2.7\% + 2.9\%)^{**}$ | $\pm (0.6\% + 0.4\%)$ |
| 20 mA secondary | | $\pm (2\% + 2\%)^{**}$ | $\pm (2.7\% + 2.9\%)^{**}$ | $\pm (0.6\% + 0.4\%)$ |
| 2 mA secondary | Gain [% of readings] + | $\pm (2\% + \text{N/A})^{**}$ | $\pm (2.7\% + \text{N/A})^{**}$ | $\pm (0.6\% + 0.9\%)$ |
| 20 mA primary | Offset [% of range] | $\pm (2\% + 2\%)^{**}$ | $\pm (2.7\% + 2.9\%)^{**}$ | $\pm (0.6\% + 0.3\%)$ |
| 2 mA primary | | $\pm (2\% + 2\%)^{**}$ | $\pm (2.7\% + 2.9\%)^{**}$ | $\pm (0.7\% + 0.3\%)$ |
| 200 μA secondary | | $\pm (2\% + 2\%)^{**}$ | $\pm (2.7\% + 2.9\%)^{**}$ | $\pm (0.6\% + 0.4\%)$ |
| 20 μA secondary | | $\pm (2\% + \text{N/A})^{**}$ | $\pm (2.7\% + \text{N/A})^{**}$ | $\pm (0.7\% + 0.9\%)$ |

1. Accuracy is defined at VCM = 0 V (zero Common Mode input voltage at either $+I_{IN}$ or $-I_{IN}$). Add 0.9% typical to Offset error for Vcm up to 12 V. The "reading" is defined as measured value. DC measurement condition: 20 ms averaged.
2. After executing the User Calibration (both gain and offset) with mainframe.

Table 7. CX1102A other characteristics

| | | |
|--------------------------------------------------|------------------------------------|-------------------------|
| Rise time (10% to 90%) | 0.35/Bandwidth | |
| Input common mode impedance ¹ | 750 M Ω //18 pF (Nominal) | |
| Measurable over range | 10% of range | |
| Burden voltage | R _{IN} * measured current | |
| Maximum input voltage (common mode) ² | Peak voltage (DC + AC) limit | ± 12 V |
| Absolute maximum input current | Range | Protection ⁴ |
| | 1 A primary | 1.5 A ³ |
| | 200 mA primary | |
| | 20 mA secondary | |
| | 2 mA secondary | 50 mA |
| | 20 mA primary | |
| | 2 mA primary | |
| | 200 μ A secondary | |
| 20 μ A secondary | | |

1. Measured with CX1201A.
2. All current measurement ranges.
3. CX1203A with 50 Ω setting: 125 mA
4. See "CX1100 User's Guide" (CX1100-90000) for more information.

Table 8. CX1102A general information¹

| | |
|-------------------------------|-------------------------------------------------------------------------------|
| Cable length | Sensor cable: 1.5 m, GND lead: 16 cm |
| Dimension ² | 46.8 mm (W), 31.9 mm (H), 215.3 mm (D) |
| Weight | 600 g |
| Furnished accessories | 1 each Coaxial Termination Adapter Sensor Head (CX1203A) |
| | - 1 each coaxial cable, SMA plug to open, 100 mm (8121-2773) ³ |
| | - 1 each coaxial cable, SMA plug to MHF plug, 100 mm (8121-2774) ³ |
| | - 1 each MHF pullin tool (8710-2791) ³ |
| | - 5 each coaxial cable, MHF plug, shorted, 21 mm (8121-2780) ³ |
| | - 5 each RF connector, MHF jack straight SMT (1250-3656) ³ |
| | 1 each SMA(P) to BNC(J) 50 Ω coaxial adapter (1250-3975) |
| 1 each GND lead (C1101-61711) | |

1. Refer to mainframe's "Environmental and general" part for other information.
2. CX1203A sensor head is included. Cable and adapter are not included.
3. CX1203A's accessories.

CX1103A Performance Characteristics

Table 9. CX1103A characteristics overview

| | Range | R _{IN} | Noise (rms) ¹ | Maximum bandwidth (-3 dB) ² | DC offset range and resolution |
|---------------------|--------|--------------------|--------------------------|----------------------------------------|--------------------------------|
| Current measurement | 20 mA | 50 Ω typ, 55 Ω max | 5 μA | 200 MHz | ± 20 mA |
| | 2 mA | (50 Ω input ON) | 1.5 μA | 75 MHz | 0.8 μA resolution |
| | 200 μA | | 150 nA | 9 MHz | ± 200 μA |
| | 20 μA | 4 Ω typ, 6 Ω max | 25 nA | 2.5 MHz | 8 nA resolution |
| | 2 μA | (50 Ω input OFF) | 1.5 nA | 250 kHz | ± 2 μA |
| | 200 nA | | 150 pA | 100 kHz | 80 pA resolution |

- 20 MHz noise bandwidth measured with mainframe.
- Standalone bandwidth. The effective measurement bandwidth when connected to mainframe can be estimated by the following equation.

$$BW_{\text{effective}} = \frac{1}{\sqrt{\left(\frac{1}{BW_{\text{sensor}}}\right)^2 + \left(\frac{1}{BW_{\text{mainframe}}}\right)^2}}$$

Table 10. CX1103A DC measurement accuracy¹

| Range | | Standalone | With mainframe | T _{USERCAL} ± 3 °C, 24 hrs ² |
|--------|------------------------|----------------|--------------------|--------------------------------------------------|
| | | 23 ± 5 °C | 23 ± 5 °C | |
| 20 mA | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.6% + 0.3%) |
| 2 mA | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.6% + 0.4%) |
| 200 μA | Gain [% of readings] + | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.6% + 0.4%) |
| 20 μA | Offset [% of readings] | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (0.6% + 0.4%) |
| 2 μA | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (1.3% + 0.4%) |
| 200 nA | | ± (2% + 2%) ** | ± (2.7% + 2.9%) ** | ± (1.3% + 0.3%) |

- Accuracy is defined at DC offset = 0 A. The “reading” is defined as measured value. DC measurement condition: 20 ms averaged.
- After executing the User Calibration with mainframe. Supplemental characteristics.

Table 11. CX1103A other characteristics

| | |
|--------------------------------------------------|------------------------------------|
| Rise time (10% to 90%) | 0.35/Bandwidth |
| Measurable over range | 10% of range |
| Burden voltage | R _{IN} • measured current |
| Maximum input voltage (common mode) ¹ | Input 50 Ω OFF |
| | Input 50 Ω ON |
| Absolute maximum input current ² | 125 mA |

- All current measurement ranges.
- See “CX1100 User’s Guide” (CX1100-90000) for more information.

Table 12. CX1103A general information¹

| | |
|-----------------------|----------------------------------------------------------|
| Cable length | Sensor cable: 1.5 m, GND lead: 16 cm |
| Dimension | 45.8 mm (W), 28.1 mm (H), 163.1 mm (D) |
| Weight | 300 g |
| Furnished accessories | 1 each SMA(P) to BNC(J) 50 Ω coaxial adapter (1250-3975) |
| | 1 each GND lead (C1101-61711) |

- Refer to mainframe’s “Environmental and general” part for other information.

CX1104A Performance Characteristics

Table 13. CX1104A characteristics overview

| Resistive sensor head | Range (Upper/Lower) | Typical R_{IN}^1 | Noise (rms) at 20 MHz NBW | Noise (rms) at 2.5 kHz NBW ² | Maximum bandwidth (-3 dB) ³ |
|-----------------------|---------------------|--------------------|---------------------------|-----------------------------------------|----------------------------------------|
| CX1211A | 15.0 A | 5.5 mΩ | 48 mA | 1.6 mA | 20 MHz |
| | 10.0 A | | 8.8 mA | 160 μA | |
| CX1212A | 10.0 A | 8.0 mΩ | 24 mA | 800 μA | |
| | 5.0 A | | 4.4 mA | 80 μA | |
| CX1213A | 5.0 A | 23 mΩ | 6.0 mA | 200 μA | |
| | 1.25 A | | 1.1 mA | 20 μA | |
| CX1214A | 3.0 A | 53 mΩ | 2.4 mA | 80 μA | |
| | 500 mA | | 440 μA | 8.0 μA | |
| CX1215A | 2.0 A | 103 mΩ | 1.2 mA | 40 μA | |
| | 250 mA | | 220 μA | 4.0 μA | |
| CX1216A | 250 mA | 1.0 Ω | 120 μA | 4.0 μA | |
| | 25 mA | | 22 μA | 400 nA | |

- R_{IN} includes both current sensing resistance and parasitic resistance in the sensor head. The sensing resistance is calibrated.
- High resolution mode is enabled.
- Standalone bandwidth is measured at the sensor head connectors. The effective measurement bandwidth when connected to the mainframe can be estimated by the following equation.

$$BW_{\text{effective}} = \frac{1}{\sqrt{\frac{1}{BW_{\text{sensor}}^2} + \frac{1}{BW_{\text{mainframe}}^2}}}$$

Table 14. CX1104A DC current measurement accuracy^{1,3}

| Resistive sensor head | Range | | Standalone | With mainframe | |
|-----------------------|--------|-----------------------|----------------------|----------------------|---------------------------------------------------------|
| | | | 23 ±5 °C | 23 ±5 °C | $T_{\text{USERCAL}} \pm 3 \text{ °C}, 24 \text{ hrs}^2$ |
| CX1211A | 15 A | | ± (3.3 % + 1.0 %) ** | ± (4.0 % + 7.1 %) ** | ± (4.0 % + 2.0 %) |
| | 10 A | | ± (3.5 % + 0.2 %) ** | ± (4.2 % + 1.1 %) ** | ± (4.2 % + 0.3 %) |
| CX1212A | 10 A | | ± (3.3 % + 0.8 %) ** | ± (4.0 % + 5.3 %) ** | ± (4.0 % + 1.5 %) |
| | 5 A | | ± (3.5 % + 0.2 %) ** | ± (4.2 % + 1.1 %) ** | ± (4.2 % + 0.3 %) |
| CX1213A | 5 A | | ± (1.9 % + 0.4 %) ** | ± (2.6 % + 2.7 %) ** | ± (2.6 % + 0.8 %) |
| | 1.25 A | Gain [% of reading] + | ± (2.1 % + 0.2 %) ** | ± (2.8 % + 1.1 %) ** | ± (2.8 % + 0.3 %) |
| CX1214A | 3 A | Offset [% of range] | ± (1.0 % + 0.3 %) ** | ± (1.7 % + 1.8 %) ** | ± (1.7 % + 0.5 %) |
| | 500 mA | | ± (1.3 % + 0.2 %) ** | ± (2.0 % + 1.1 %) ** | ± (2.0 % + 0.3 %) |
| CX1215A | 2 A | | ± (1.6 % + 0.2 %) ** | ± (2.3 % + 1.3 %) ** | ± (2.3 % + 0.4 %) |
| | 250 mA | | ± (1.8 % + 0.2 %) ** | ± (2.5 % + 1.1 %) ** | ± (2.5 % + 0.3 %) |
| CX1216A | 250 mA | | ± (1.5 % + 0.2 %) ** | ± (2.2 % + 1.1 %) ** | ± (2.2 % + 0.3 %) |
| | 25 mA | | ± (1.7 % + 0.2 %) ** | ± (2.4 % + 1.1 %) ** | ± (2.4 % + 0.3 %) |

- Accuracy is defined at $V_{CM} = 0 \text{ V}$ (zero Common Mode input voltage at either $+I_{IN}$ or $-I_{IN}$). The “reading” is defined as measured value. DC measurement condition: 20 ms averaged.
- After executing User Calibration with the mainframe. High resolution mode is enabled.
- The accuracy is derived from the combined accuracy specifications for the sensor and the resistive sensor head tabulated in Table 15 and Table 25.

Table 15. CX1104A DC voltage measurement accuracy ^{1, 2}

| Range | | Standalone 23 ± 5 °C | With mainframe 23 ± 5 °C | T _{USERCAL} ± 3 °C, 24 hrs ³ |
|----------------------|------------------------|-------------------------|-----------------------------|--------------------------------------------------|
| 250 mV (Upper range) | Gain [% of readings] + | ± (0.58 % + 0.15 %) ** | ± (1.28 % + 1.05 %) ** | ± (NA + 0.3 %) |
| 25 mV (Lower range) | Offset [% of range] | ± (0.84 % + 0.15 %) ** | ± (1.54 % + 1.05 %) ** | ± (NA + 0.3 %) |

- Accuracy is defined at V_{CM} = 0 V (zero Common Mode input voltage at either +I_N or -I_N). The "reading" is defined as measured value. DC measurement condition: 20 ms averaged.
- CX1104A alone is a voltage sensor and has a voltage measurement accuracy specification tabulated above.
- After executing User Calibration with the mainframe. High Resolution mode enabled.

Table 16. CX1104A other characteristics

| | | |
|------------------------------------------|--------------------------|---------------|
| Rise time (10% to 90%) | 0.35/Bandwidth | |
| Input common mode impedance ¹ | 20 MΩ // 32 pF (Nominal) | |
| Overdrive recover time ² | 100 ns | |
| Maximum input voltage (common mode) | DC peak | ± 40 V |
| | DC to 0.4 Hz | Linear change |
| | 0.4 Hz to 100 MHz | ± 6 V |
| CMRR | 1 kHz | 110 dB |
| | 1 MHz | 50 dB |
| | 10 MHz | 40 dB |

- See "CX1100 User's Guide" (CX1100-900000) for more information.
- Time to settle to within 10% of Range full scale when driven by square pulse input having amplitude of Vmax_ND (± 280 mV for upper range, ± 75 mV for lower range).

Table 17. CX1104A general information ¹

| | |
|------------------------|--------------------------------------------------------|
| Cable length | Sensor cable: 1.5 m, GND lead: 16 cm, USB cable: 15 cm |
| Dimension ² | 30.0 mm (W), 20.5 mm (H), 205.2 mm (D) |
| Weight | 300 g |
| Furnished accessories | 1 each USB Type-C Cable (C1104-61701) |
| | 1 each Banana Adapter (C1210-60001) |
| | 1 each Ground Lead (C1101-61711) |

- Refer to the mainframe's "Environmental and general" part for other information.
- Cable and adapter are not included.

CX1105A Performance Characteristics

Table 18. CX1105A characteristics overview

| Range | Noise (rms) at 20 MHz NBW | Noise (rms) at 2.5 kHz NBW ¹ | Maximum bandwidth (-3 dB) ² |
|--------|---------------------------|-----------------------------------------|----------------------------------------|
| 2.5 V | 1100 μ V | 200 μ V | 100 MHz |
| 1 V | 1100 μ V | 200 μ V | |
| 250 mV | 45 μ V | 3.0 μ V | |
| 100 mV | 24 μ V | 1.3 μ V | |
| 25 mV | 20 μ V | 400 nV | |

1. High resolution mode is enabled.
2. The effective measurement bandwidth when connected to the mainframe can be estimated by the following equation.

$$BW_{\text{effective}} = \frac{1}{\sqrt{\frac{1}{BW_{\text{sensor}}^2} + \frac{1}{BW_{\text{mainframe}}^2}}}$$

Table 19. CX1105A DC measurement accuracy ¹

| Range ^{2,3} | | Standalone 23 \pm 5 $^{\circ}$ C | With mainframe 23 \pm 5 $^{\circ}$ C | T _{USERCAL} \pm 3 $^{\circ}$ C, 24 hrs ³ |
|----------------------|----------------------------------------------|---------------------------------------|-------------------------------------------|----------------------------------------------------------------|
| 2.5 V | Gain [% of reading] + Offset [% of range] | \pm (0.8 % + 1.0 %) ** | \pm (1.5 % + 2.2 %) ** | \pm (1.5 % + 0.6 %) |
| 1 V | | \pm (0.8 % + 2.1 %) ** | \pm (1.5 % + 3.3 %) ** | \pm (1.5 % + 0.8 %) |
| 250 mV | | \pm (0.7 % + 0.2 %) ** | \pm (1.4 % + 1.1 %) ** | \pm (1.4 % + 0.3 %) |
| 100 mV | | \pm (0.7 % + 0.2 %) ** | \pm (1.4 % + 1.1 %) ** | \pm (1.4 % + 0.3 %) |
| 25 mV | | \pm (0.7 % + 0.2 %) ** | \pm (1.4 % + 1.1 %) ** | \pm (1.4 % + 0.3 %) |

1. Accuracy is defined at V_{CM} = 0 V (zero Common Mode input voltage at either +V_{IN} or -V_{IN}). The “reading” is defined as measured value. DC measurement condition: 20 ms averaged.
2. 2.5 V and 1 V Range V_{cm}; common mode input voltage at either input of +Vin or -Vin. Add 0.2 % to Offset error for V_{cm} up to 40 V.
3. After executing the User Calibration with the mainframe. High resolution mode is enabled.

Table 20. CX1105A input impedance

| Range | Input impedance at 23 \pm 5 $^{\circ}$ C | |
|--------|--------------------------------------------|-------------------------|
| | Common | Differential |
| 2.5 V | 2 M Ω //9.5 pF | 3.9 M Ω //4.8 pF |
| 1 V | | |
| 250 mV | 21 M Ω //24 pF (+IN) | 42 M Ω //16 pF |
| | 21 M Ω //27 pF (-IN) | |
| 100 mV | 21 M Ω //24 pF (+IN) | |
| | 21 M Ω //27 pF (-IN) | |
| 25 mV | 21 M Ω //24 pF (+IN) | |
| | 21 M Ω //27 pF (-IN) | |

Table 21. CX1105A maximum input voltage

| Range | Maximum input voltage (Differential mode) | Maximum input voltage (Common mode) | | 3 Hz to 100 MHz |
|--------|----------------------------------------------|-------------------------------------|---------------|-----------------|
| | | DC peak | DC to 3 Hz | |
| 2.5 V | ± 40 V | ± 40 V | Linear change | ± 5 V |
| 1 V | | | | |
| 250 mV | +4 V/-1.8 V | ± 6 V | Linear change | ± 0.5 V |
| 100 mV | | | | |
| 25 mV | | | | |

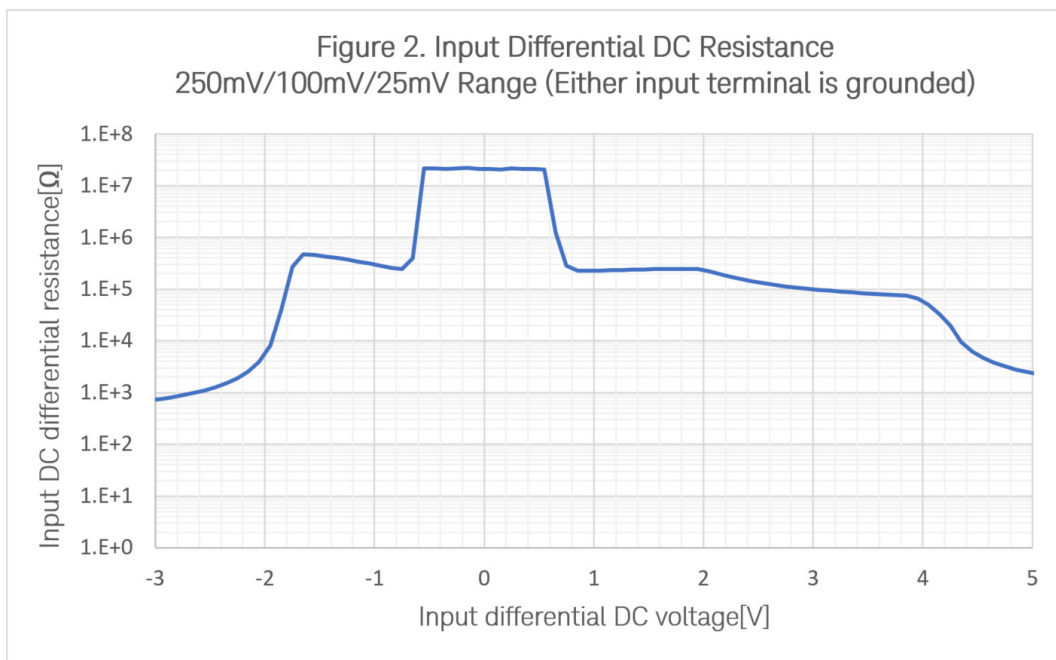
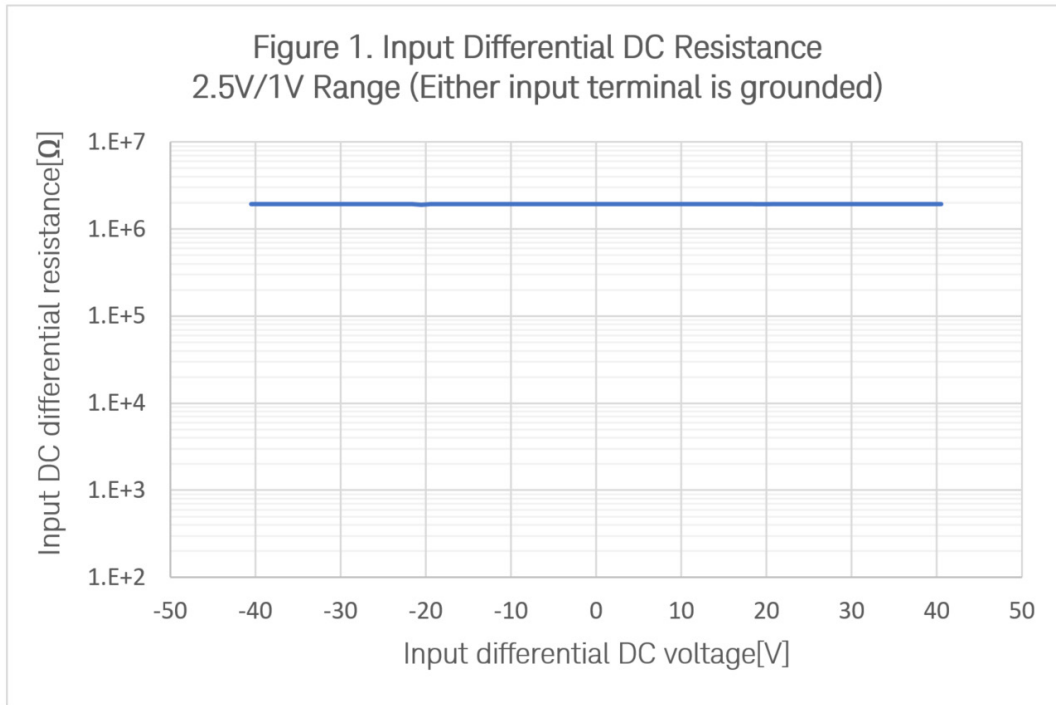


Table 22. CX1105A other characteristics

| | |
|------------------------------------|-----------------|
| Rise and fall times (10 % to 90 %) | 0.35/Bandwidth |
| CMRR at 1 MHz | 60 dB |
| Input coupling | DC, AC (550 Hz) |

Table 23. CX1105A general information ¹

| | |
|------------------------|-----------------------------------------------------------------|
| Cable length | Sensor cable: 1.5 m, GND lead: 16 cm |
| Dimension ² | 30.0 mm (W), 20.5 mm (H), 203.4 mm (D) |
| Weight | 300 g |
| Furnished accessories | 1 each Test Lead (n = 5, 5959-9334) |
| | 1 each Twisted Pair Cable Soldering Model (100 mm, C1105-61702) |
| | 1 each Twisted Pair Cable Socket Model (100 mm, C1105-61701) |
| | 1 each Test Adapter (C1105-66602) |
| | 1 each Adjustment Tool (8710-2831) |
| | 1 each Tool Grabber Clip (1400-3652) |
| | 1 each Grabber Mini (n = 2, 1400-1422) |
| | 1 Each Ground Lead (C1101-61711) |

1. Refer to the mainframe's "Environmental and general" part for other information.
2. Cable and adapter are not included.

CX1211A/CX1212A/CX1213A/CX1214A/CX1215A/CX1216A Performance Characteristics

Table 24. CX121xA maximum current

| Resistive sensor head | Maximum DC/RMS current | Peak current |
|-----------------------|------------------------|--------------|
| CX1211A | 15 A ** | 15 A ** |
| CX1212A | 10 A ** | 15 A ** |
| CX1213A | 5 A ** | 10 A ** |
| CX1214A | 3 A ** | 5 A ** |
| CX1215A | 2 A ** | 2.5 A ** |
| CX1216A | 0.25 A ** | 0.25 A ** |

Table 25. CX121xA sense resistor accuracy ¹

| Resistive sensor head | Typical R_{IN} | Nominal sense resistor value | Standalone accuracy at 23 ± 5 °C | | |
|-----------------------|------------------|------------------------------|----------------------------------|-------------------|---------------------|
| | | | Accuracy within I_{SPEC} | I_{SPEC} | Full-scale accuracy |
| CX1211A | 5.5 mΩ | 2.5 mΩ | ± 2.7 % ** | 10 A ² | ± 3.3 % |
| CX1212A | 8 mΩ | 5 mΩ | ± 2.7 % ** | 10 A ² | ± 2.9 % |
| CX1213A | 23 mΩ | 20 mΩ | ± 1.3 % ** | 1.5 A | ± 1.4 % |
| CX1214A | 53 mΩ | 50 mΩ | ± 0.5 % ** | 1.5 A | ± 0.5 % |
| CX1215A | 103 mΩ | 100 mΩ | ± 1.0 % ** | 1.0 A | ± 1.0 % |
| CX1216A | 1 Ω | 1 Ω | ± 0.9 % ** | 0.25 A | ± 0.9 % |

1. Accuracy is defined at $V_{CM} = 0$ V (zero Common Mode input voltage at either $+I_{IN}$ or $-I_{IN}$). The "reading" is defined as measured value. DC measurement condition: 20 ms averaged.
2. Specified by pulsed measurement: Pulse width = 1 ms, duty = 0.1 %.

Table 26. CX121xA general information ¹

| | |
|-----------------------|-----------------------------------------------------|
| Dimension | 30.0 mm (W), 14.0 mm/21.5 mm (H), 48.7 mm (D) |
| Weight | 20 g |
| Furnished accessories | 1 each Wire Set (red and black, n = 5, C1104-68001) |

1. Refer to the mainframe's "Environmental and general" part (publication number: 5992-1430EN) for other information.

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