Time Electronics
Calibration, Test & Measurement

5025E

Extended Specifications

Revision 2203-2

5025E Specifications

1. **Specifications are stated as ± ppm or % of output + floor, unless otherwise indicated.**
2. **Specifications apply at 23°C ± 5°C**
3. **For temperatures outside this range add 0.2 x specification per °C.**
4. **Specifications include stability, linearity, and traceability of external standards used for calibration.**
5. **For operation outside specified range add 0.25 x specification.**

DC Voltage

Range	Resolution	Output Resistance	Max Burden	Specification 1 Year
0 to 200mV	1µV	10Ω		40ppm + 4uV
0.2 to 2.0V	1µV	0.1Ω	20mA	40ppm + 25uV
2 to 20V	10µV	0.1Ω	20mA	40ppm + 250uV
20 to 200V	1mV	<5Ω	20mA	40ppm + 3mV
200 to 1050V	10mV	<10Ω	10mA	60ppm + 30mV

Specifications are between 0.1Hz and 10Hz bandwidth. Maximum capacitance 1000pF.
The output resistance of the 200mV range is 10Ω. This must be taken into account when loads of 100kΩ or less are being driven.
A 100kΩ load will result in a 0.01% error.

DC Current

Range	Resolution	Compliance Voltage	Max Inductance	Specification 1 Year
0 to 200uA	1nA	10V	50uH	150ppm + 25nA
0.2 to 2mA	10nA	10V	50uH	120ppm + 55nA
2 to 20mA	10nA	10V	50uH	120ppm + 200nA
20 to 200mA	100nA	10V	30uH	120ppm + 8uA
0.2 to 2A	1uA	5V	5uH	400ppm + 100uA
2 to 22A	10uA	4V	2uH	600ppm + 2mA

AC Voltage

Range	Frequency	Resolution	Output Resistance	Max Burden	Specification 1 Year
1 to 200mV	20 to 45Hz	1µV	10Ω		0.07% + 250uV
	45Hz to 1kHz		10Ω		0.05% + 100uV
	1 to 20kHz		10Ω		0.10% + 150uV
0.2 to 2V	20 to 45Hz	10µV	<0.1Ω	20mA	0.07% + 250uV
	45Hz to 1kHz		<0.1Ω		0.04% + 200uV
	1 to 20kHz		<0.1Ω		0.06% + 250uV
2 to 20V	20 to 45Hz	100µV	<5Ω	20mA	0.08% + 4mV
	45Hz to 1kHz		<5Ω		0.06% + 2mV
	1 to 20kHz		<5Ω		0.07% + 3mV
20 to 200V	40Hz to 1kHz	1mV	<5Ω	20mA	0.06% + 25mV
200 to 1050V	40Hz to 1kHz	10mV	<10Ω	10mA	0.09% +100mV

Frequency accuracy 0.01%. Frequency resolution 1Hz.
The output resistance of the 200mV range is 10Ω. This must be taken into account when loads of 100kΩ or less are being driven.
A 100kΩ load will result in a 0.01% error. All AC outputs exclude the DC component.

AC Current

Range	Frequency	Resolution	Compliance Voltage	Specification 1 Year
20 to 200uA	20Hz to 1kHz	10nA	8V RMS	0.07% + 300nA
0.2 to 2mA	20Hz to 1kHz	10nA	8V	0.07% + 300nA
2 to 20mA	20Hz to 1kHz	100nA	8V	0.07% + 3uA
20 to 200mA	20Hz to 1kHz	1µA	8V	0.08% + 30uA
0.2 to 2A	20Hz to 500Hz	10µA	3.5V	0.10% + 0.5mA
2 to 22A	20Hz to 500Hz	100µA	3V	0.20 %+ 6mA

Decade Resistance

Value	Max Rating	Specification 1 Year
10Ω	0.1W	500ppm
100Ω	0.1W	90ppm
1kΩ	0.1W	60ppm
10kΩ	0.1W	60ppm
100kΩ	0.1W	60ppm
1MΩ	200V	150ppm
10MΩ	200V	0.1%
100MΩ	200V	1%
1GΩ	200V	10%

Decade Conductance

Value	Max Rating	Specification 1 Year
100mS	0.1W	500ppm
10mS	0.1W	90ppm
1mS	0.1W	60ppm
100uS	0.1W	60ppm
10uS	0.1W	60ppm
1uS	200V	150ppm
100nS	200V	0.1%
10nS	200V	1%
1nS	200V	10%

After subtraction of lead resistance. All resistance specifications are ± 15 mΩ.
Conductance is a mathematical calculation of the resistance functions and therefore does not require calibration.
Note: Specifications are for 1 year and do not apply to the nominal value.

Capacitance

Value	Resolution	Frequency	Max Rating	Specification 1Year
1nF	0.1pF	1kHz	25V	0.2%
10nF	1pF	1kHz	25V	0.2%
20nF	1pF	1kHz	25V	0.2%
50nF	1pF	1kHz	25V	0.2%
100nF	10pF	1kHz	25V	0.2%
200nF	10pF	1kHz	25V	0.2%
500nF	10pF	1kHz	25V	0.2%
1uF	100pF	1kHz	25V	0.2%

All values are ±10pF. Specifications apply to the displayed value, after subtraction of residual capacitance.
Specification based on 4 wire sine-wave measurement technique.

Thermocouples

Type	Range °C	Specification 1 Year	Type	Range °C	Specification 1 Year
J	-210 to -50 -50 to 1200	±0.15°C ±0.2°C	**B**	300 to 800 800 to 1820	±1.5°C ±0.8°C
K	-200 to -100 -100 to 1372	±0.25°C ±0.18°C	**N**	-200 to 0 0 to 600 600 to 1300	±0.4°C ±0.15°C ±0.2°C
T	-200 to 100 100 to 400	±0.2°C ±0.15°C	**E**	-200 to 0 0 to 1000	±0.20°C ±0.12°C
R	-50 to 50 50 to 250 250 to 1768	±1.0°C ±0.7°C ±0.6°C	**S**	-50 to 500 500 to 1768	±0.9°C ±0.6°C

Resolution 0.1°C. Switchable automatic internal cold junction reference, accuracy ±0.5°C (applies to ambient changes of ±1°C)
°F and °K units also selectable. ITS-90.

Simulated Resistance

Range	Resolution	Specification 1 Year	UUT Test Current
40Ω to 400Ω	0.01Ω	0.05% + 50mΩ	1 mA
400Ω to 4000Ω	0.01Ω	0.02% + 1Ω	0.1 mA
4kΩ to 40kΩ	0.01Ω / 1Ω	0.02% + 5Ω	0.1 mA

Specifications apply at the UUT Test Current and suitable for DC currents only. For further information see the 5025x Simulated Resistance application note.
(For firmware prior to version 9.6.9, the simulated resistance ranges are selectable from 40.00Ω to 9999.99Ω or 0.040kΩ to 40.000kΩ)

PT100

Range	Resolution	Specification 1 Year
-140 to 50°C	0.01°C	±0.25°C
50 to 850°C	0.01°C	0.08% + 0.25°C
Alpha = 0.00385, ITS-90		

Digital Frequency

Range	Resolution	Specification 1 Year
0.1Hz to 1kHz	0.01Hz	20ppm
1kHz to 1MHz	1Hz	20ppm
1MHz to 10MHz	10Hz	20ppm

Period

Range	Resolution	Specification 1 Year
100ns to 10s	Fixed Values 1,2,5 Steps	20ppm

Square wave output. Amplitude ~2V peak to peak. Period is a mathematical calculation of the Frequency function and therefore does not require calibration.

Enhanced Performance Pack (Option 9702)

Extended Capacitance

Value	Resolution	Frequency	Max Voltage	Specification
				1 Year
1nF	0.1pF	1kHz	25V	0.2%
10nF	1pF	1kHz	25V	0.2%
20nF	1pF	1kHz	25V	0.2%
50nF	1pF	1kHz	25V	0.2%
100nF	10pF	1kHz	25V	0.2%
200nF	10pF	1kHz	25V	0.2%
500nF	10pF	1kHz	25V	0.2%
1uF	100pF	1kHz	25V	0.2%
10uF	1nF	1kHz	25V	0.5%
20uF	1nF	1kHz	25V	0.5%
50uF	1nF	1kHz	25V	0.5%
100uF	10nF	100Hz	25V	0.5%

All values are ±10pF. Specifications apply to the displayed value, after subtraction of residual capacitance.
Specification based on 4 wire sine wave measurement technique.

Extended AC Voltage Frequency

Range	Frequency	Resolution	Output Resistance	Specification
				1 Year
1 to 200mV	20 to 100kHz	1uV	50Ω	0.05% + 1000µV
0.2 to 2V	20 to 100kHz	10uV	<0.5Ω	0.09% + 900µV
2 to 20V	20 to 100kHz	100uV	<0.5 Ω	0.15% + 15mV

Full Range Resistance

Resistance

Range	Resolution	Max Rating	Specification
			1 Year
1Ω – 20Ω	1Ω	0.1W	100ppm + 15mΩ
20Ω – 99.999Ω	1mΩ /5mΩ*	0.1W	100ppm + 15mΩ
100Ω – 999.999Ω	1mΩ	0.1W	100ppm + 15mΩ
1kΩ – 9.999kΩ	1Ω	0.1W	200ppm + 25mΩ
10kΩ – 99.999kΩ	1Ω	0.1W	100ppm + 1Ω
100kΩ – 999.99kΩ	10Ω	0.1W	100ppm + 10Ω
1MΩ – 9.9999MΩ	100Ω	0.1W	200ppm + 100Ω
10MΩ – 120MΩ	1kΩ	0.1W	0.1% + 1kΩ

RTD

Range	Resolution	Specification
		1 Year
Pt100		
-180 to 200°C	0.01°C	±0.07°C
200 to 850°C	0.01°C	±0.15°C
Pt200		
-180 to 0°C	0.01°C	±0.05°C
0 to 850°C	0.01°C	0.02% + 0.05°C
Pt500		
-180 to 200°C	0.01°C	0.02% + 0.05°C
200 to 850°C	0.01°C	0.1% + 0.3°C
Pt1000		
-180 to 0°C	0.01°C	±0.05°C
0 to 850°C	0.01°C	0.1% + 0.3°C

After subtraction of external lead resistance. * Output resolution is 5mΩ below 50Ω
The Full Range Resistance option uses real resistors and replaces the Simulated Resistance function.
RTD Function: Alpha = 0.00385. (ITS-90). IEC 60751.

Extended Thermocouples

Type	Range °C	Specification
		1 Year
U	-200 to 100	±0.25°C
	100 to 600	±0.1°C
L	-200 to 900	±0.2°C

Type	Range °C	Specification
		1 Year
C	0 to 1100	±0.2°C
	1100 to 1900	±0.35°C
	1900 to 2315	±0.5°C

Resolution 0.1°C. Switchable automatic internal cold junction reference. Accuracy ±0.5°C (applies to ambient changes of ±1°C). °F and °K units also selectable.
Type U & L based on tables published in DIN 43710 (ITPS68). Type C based on tables published in ASTM E230/E230M – 12 (ITS-90)

Oscilloscope Calibration (Option 9770)

Amplitude

Range	Resolution	Specification
		1 Year
2 to 200mV	10µV	0.20% + 10uV
0.2 to 20V	1mV	0.05% + 25uV
1 to 200V	10mV	0.05% + 100uV
1mV to 200mV (50Ω)	100µV	0.25% + 20uV
0.2 to 2V (50Ω)	1mV	0.25% + 20uV

Selectable DC or 1kHz chopped DC voltage. Accuracy applies to the top line measurement relative to ground.

Frequency

Range	Resolution	Specification
		1 Year
0.1Hz to 10MHz	Fixed values	0.1ppm*
20, 50, 100MHz	1,2,5 sequence	20ppm

Deviation function is not available.
* Fitted with Oven-Controlled Frequency Reference (option 9783). Otherwise - 20ppm.
1.5V pk-pk - 0.1Hz to 100kHz. 1V pk-pk - 100kHz to 100MHz (sine wave at 100MHz)

Period

Range	Resolution	Specification
		1 Year
100ns to 10s	Fixed values	0.1ppm*
50, 20, 10ns	1,2,5 sequence	20ppm

Duty Cycle

3 frequencies, 100Hz, 1kHz, 10kHz.
Duty cycle settable from 0 to 100%
Setting resolution 0.01% at 100Hz, 0.1% at 1 kHz, 1% at 10 kHz
Deviation function is not available.

Fast Rise

Into 50Ω Load	Specification
	1 Year
400ps	±150ps

Oscilloscope 2.2 GHz Levelled Sine (Option 9769)

Range	Resolution	Amplitude	Specification
			1 Year
50 MHz to 200 MHz	0.1MHz	0.5V, 1V, 1.5V	1%
200 MHz to 500 MHz	0.1MHz		2%
500 MHz to 1 GHz	0.1MHz		4%
1 GHz to 2.2 GHz	0.1MHz		6%

Sine-Wave, 50 Ω Output. From 50 to 499.9 MHz an additional error of 0.5% of range applies. Frequency Accuracy 50ppm. Specifications are relative to calibration standards.

Power (Option 9797)

DC Current	Specification 1 Year	Compliance	Resolution	AC Current (45 to 400Hz)	Specification 1 Year	Compliance	Resolution
0.02 to 2A	0.03% + 500uA	5V	100uA	0.1 to 2A	0.1% + 2mA	3.5V	100uA
2 to 22A	0.05% + 6mA	4V	1mA	2 to 22A	0.1% + 20mA	3V	1mA
DC Voltage	**Specification 1 Year**	**Output Current**	**Resolution**	**AC Voltage (45 to 400Hz)**	**Specification 1 Year**	**Output Current**	**Resolution**
0.1 to 20V	0.01% + 500uV	20mA	100uV	0.1 to 20V	0.03% + 2mV	20mA	100uV
20 to 200V	0.02% + 30mV	20mA	1mV	20 to 200V	0.06% + 30mV	20mA	1mV
200 to 1050V	0.05% + 50mV	10mA	10mV	200 to 1050V	0.08% + 90mV	10mA	10mV
Phase	**Specification 1 Year**	**Range**	**Resolution**	**Power Factor**		**Range**	**Resolution**
45 to 99Hz	0.3 °	±90 °	0.1 °	45 to 99Hz		0.00 to 1.00	0.01
100Hz to 400Hz	1.0 °	±90 °	0.1 °	100Hz to 400Hz		0.00 to 1.00	0.01

The accuracy of the power is complex and is determined by using a formula, which combines the errors due to Voltage, Current, and Phase.
Power Specification (%) = $\sqrt{(V_{spec}^2 + I_{spec}^2 + \text{Phase Correction}^2)}$. Where Phase Correction (%) = 100 x (1 - Cos(Phase + Phase_{spec})/Cos Phase).
The current and voltage terminals must be isolated. A current transformer or clamp meter adaptor must be used if instrument under test has a common negative.
Settling time < 15 seconds.

General Specifications

Mains Voltage	100 to 260V AC 50/60 Hz.
Fuse Ratings	3.15A anti-surge
Connector	IEC Plug
Power Consumption	120W typical, 200W Max.
Operating Temperature	10 to 40ºC
Storage Temperature	-10°C to 50°C
Operating Humidity	< 80%
Altitude	0 to 3km. Non-operating 3km to 12km
Warm Up Time	30 minutes to full accuracy
Dimensions	Width 447mm, Height 152, Depth 470mm
Weight	16.5kg
Interfaces	RS-232 and USB
Command Set	Standard SCPI

Due to continuous development Time Electronics reserves the right to change specifications without prior notice.