

5025

Extended Specification

V2.7

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SPECIFICATIONS DETAILS

1. Accuracies are shown as ppm or % of output + floor.
2. Specifications apply for settings between 10% and 100% of range.
3. Specifications apply at ambient temp of 22°C ± 3°C
4. For temperatures outside the above range apply 0.2 x specification per °C
5. Calibrator warm up time at least 1 hour.
6. All values are relative to calibration standards.
7. Accuracies quoted are for 1 year.

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

DC VOLTAGE				
Range	Accuracy ppm	Output Resistance	Max Output Current	Resolution
20mV ¹	100 + 4uV	10 Ω ³	-	100nV
200mV ¹	30 + 6uV	10 Ω ³	-	1uV
2V ¹	15 + 20uV	< 0.1 Ω	20mA	1uV
20V ¹	15 + 150uV	< 0.1 Ω	20mA	10uV
200V ¹	30 + 6mV	< 5 Ω	20mA	1mV
1050V	50 + 30mV	< 10 Ω	10mA	10mV

AC VOLTAGE (sine-wave) (* 9771 AC Hi Frequency Option Required)					
Range RMS	Frequency ²	Accuracy %	Output Resistance	Max Output Current	Resolution
20mV ¹	10Hz to 45Hz	0.05 + 250uV	10 Ω ³		1uV
	45Hz to 1kHz	0.05 + 100uV	10 Ω ³		
	1kHz to 10kHz	0.05 + 150uV	10 Ω ³		
	10kHz to 20kHz	0.05 + 250uV	10 Ω ³		
	* 20kHz to 100kHz	0.05% + 0.1mV	50 Ω		
* 100kHz to 300kHz	0.1% + 0.5mV	50 Ω			
200mV ¹	10Hz to 45Hz	0.05 + 250uV	10 Ω ³	20mA	1uV
	45Hz to 1kHz	0.04 + 100uV	10 Ω ³		
	1kHz to 10kHz	0.04 + 150uV	10 Ω ³		
	10kHz to 20kHz	0.05 + 250uV	10 Ω ³		
	* 20kHz to 100kHz	0.1% + 0.5mV	50 Ω		
* 100kHz to 300kHz	0.1% + 1mV	50 Ω			
2V ¹	10Hz to 45Hz	0.08 + 500uV	< 0.1 Ω	20mA	10uV
	45Hz to 1kHz	0.03 + 170uV	< 0.1 Ω		
	1kHz to 10kHz	0.03 + 250uV	< 0.1 Ω		
	10kHz to 20kHz	0.08 + 500uV	< 0.1 Ω		
	* 20kHz to 100kHz	0.05% + 1mV	< 0.5 Ω		
* 100kHz to 300kHz	0.1% + 5mV	< 0.5 Ω			
* 300kHz to 1MHz	1% + 10mV	< 0.5 Ω			
20V ¹	10Hz to 45Hz	0.08 + 4mV	< 5 Ω	20mA	100uV
	45Hz to 1kHz	0.03 + 2mV	< 5 Ω		
	1kHz to 10kHz	0.03 + 3mV	< 5 Ω		
	10kHz to 20kHz	0.08 + 4mV	< 5 Ω		
	* 20kHz to 100kHz	0.15% + 15mV			
200V ¹	40Hz to 1kHz	0.06 + 20mV	< 5Ω	20mA	1mV
1050V	40Hz to 1kHz	0.08 + 90mV	< 10 Ω	10mA	10mV

1. Over-Range 10%

2. The frequency accuracy for standard AC ranges is 0.01% and is crystal controlled. The setting resolution is 1Hz.

3. The output resistance on the 20mV and 200mV ranges is 10 Ω. This must be taken into account when loads of 100 kΩ ohms or less are being driven. A 100 kΩ load will result in a 0.01% error.

All AC outputs exclude the DC component.

DC CURRENT			
Range	Accuracy ppm	Compliance Voltage	Resolution
200uA ¹	150 + 15nA	11V	1 nA
2mA ¹	100 + 40nA	11V	10 nA
20mA ¹	80 + 200nA	11V	10 nA
200mA ¹	80 + 3uA	11V	100 nA
2A ¹	250 + 40uA	5V	1 uA
20A ¹	600 + 2mA	4V	10 uA

1. Over-Range 10%.

AC CURRENT (sine-wave)				
Range	Frequency	Accuracy %	Compliance Voltage rms	Resolution
200uA ¹	20Hz to 1kHz	0.07 + 300nA	8V	10nA
2mA ¹	20Hz to 1kHz	0.05 + 300nA	8V	10nA
20mA ¹	20Hz to 1kHz	0.05 + 3uA	8V	100nA
200mA ¹	20Hz to 1kHz	0.05 + 30uA	8V	1uA
2A ¹	20Hz to 500Hz	0.1 + 0.5mA	3.5V	10uA
20A ¹	20Hz to 500Hz	0.2 + 5mA	3V	100uA

1. Over-Range 10%.

THERMOCOUPLE SIMULATION		
Thermocouple Type	Temperature Range °C	Accuracy °C
J	-210 to -50	0.3
	-50 to 1200	0.18
K	-200 to -150	0.3
	-150 to 1250	0.2
T	-200 to -150	0.4
	-150 to 0	0.3
	0 to 400	0.2
R	-50 to 50	1.5
	50 to 250	0.8
	250 to 1750	0.6
S	-50 to 300	1.5
	300 to 1750	0.8
B	100 to 800	1.8
	800 to 1800	0.8
N	-200 to -100	0.8
	-100 to 500	0.3
	500 to 1300	0.2
E	-200 to -100	0.5
	-100 to 0	0.2
	0 to 1000	0.15

Cold Junction Compensation $\pm 0.5^{\circ}\text{C}$ (applies to ambient changes of $\pm 1^{\circ}\text{C}$)

The accuracy of the thermocouple simulation is determined by the accuracy of the 5025's DC Voltage function and the accuracy of the standard thermocouple tables (BS EN 60584-1) published by the British Standards Institute.

The 5025 uses precise digital interpretation of the tables to output voltage levels that are within the accuracies specified in the table above.

DECADE RESISTANCE ¹		
Value	Accuracy	Max Rating
1 Ω	800 ppm	0.1W
10 Ω	70 ppm	0.1W
100 Ω	30 ppm	0.1W
1 kΩ	20 ppm	0.1W
10 kΩ	20 ppm	0.1W
100 kΩ	30 ppm	0.1W
1 MΩ	150 ppm	200V
10 MΩ	0.1%	200V
100 MΩ	1%	200V
1 GΩ	10%	200V

1. Resistance specifications are $\pm 5m\Omega$.

CONDUCTANCE		
Value	Accuracy	Max Rating
1 S	800 ppm	0.1W
100m S	70 ppm	0.1W
10m S	30 ppm	0.1W
1m S	20 ppm	0.1W
100u S	20 ppm	0.1W
10u S	30 ppm	0.1W
1u S	150 ppm	200V
100n S	0.1%	200V
10n S	1%	200V
1n S	10%	200V

1. Conductance specifications are $\pm 5m\Omega$.

10MHz DIGITAL FREQUENCY
Variable Values 0.1Hz to 10MHz, ~2V pk-pk square wave. Accuracy 20ppm

PERIOD
Fixed Values (1, 2, 5 steps) 100nS to 10S, ~2V pk-pk square wave. Accuracy 20ppm

OPTIONS

CAPACITANCE ^{1 2}			
Value	Frequency	Accuracy ³	Max volts
1 nF	1kHz	0.5% + 10pf	100V
10 nF	1kHz	0.5% + 10pf	
100 nF	1kHz	0.5%	
1 uF	1kHz	0.25%	
10 uF	1kHz	0.5%	
100 uF	100Hz	0.5%	

1. After Subtraction of residual capacitance.

2. Specification based on 4 wire sinewave measurement technique.

3. Accuracy of previous calibration value or displayed value.

INDUCTANCE ^{1 2}			
Value	Frequency	Accuracy	Max current
1 mH	1kHz	0.1% of previous calibration value or displayed value	10mA
1.9 mH	1kHz		
5 mH	1kHz		
10 mH	1kHz		
19 mH	1kHz		
50 mH	1kHz		
100 mH	1kHz		
190 mH	1kHz		
500 mH	1kHz		
1H	1kHz		
10H	100Hz		

1. After Subtraction of residual inductance.

2. Specification based on 4 wire sinewave measurement technique.

OSCILLOSCOPE 100MHz	
FREQUENCY 0.1Hz to 10MHz accuracy 0.1ppm* 20, 50, 100MHz accuracy 20ppm	PERIOD 100nS to 10S accuracy 0.1ppm* 50, 20, & 10nS accuracy 20ppm
* Fitted with Oven-Controlled Frequency Reference. Otherwise - 20ppm. 1.5V pk-pk - 0.1Hz to 100kHz. 1V pk-pk - 100kHz to 100MHz (sine-wave at 100MHz) Fixed outputs in 1, 2, 5 steps. Deviation function is not available.	
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.	
OSCILLOSCOPE AMPLITUDE 1kHz square-wave	
Range	Accuracy
200mV	0.2%
200mV 50Ω	0.25%
2V 50Ω	0.25%
20V	0.05%
200V	0.05%
OSCILLOSCOPE FAST RISE	< 850ps. Bandwidth Checking up to 400 MHz

2.2GHz-LEVELLED SWEEP ¹ 0.5V, 1V, 1.5V pk-pk Sine-Wave, 50Ω Output.	
Range	Amplitude Accuracy
100 MHz to 200 MHz	1%
200 MHz to 500 MHz	4%
500 MHz to 1 GHz	10%
1 GHz to 2.2 GHz	20%

1. Max frequency at 1.5V is 2GHz

OPTIONS (continued)

FULL RANGE RESISTANCE (Replaces Decade & Simulated Resistance)			
Range	Accuracy ¹	Resolution	Max Rating
1Ω to 20Ω	0.01% + 7mΩ	1Ω	0.1W
20Ω to 99.999Ω	0.01% + 7mΩ	1mΩ /5mΩ*	0.1W
100Ω to 999.999Ω	0.01% + 5mΩ	1mΩ	0.1W
1kΩ to 9.999kΩ	0.02% + 20mΩ	1Ω	0.1W
10kΩ to 99.999kΩ	0.01% + 1Ω	1Ω	0.1W
100kΩ to 999.99kΩ	0.01% + 10Ω	10Ω	0.1W
1MΩ to 9.9999MΩ	0.02% + 100Ω	100Ω	0.1W
10MΩ to 120MΩ	0.1% + 1kΩ	1kΩ	0.1W

1. After subtraction of lead resistance. End resistance variation $\pm 2.5m\Omega$

* Output resolution is 5mΩ below 50Ω

PRT SIMULATION (Uses Full Range Resistance)		
PRT Type	Range °C	Accuracy °C
PT100 DIN (Alpha Coeff 0.003850)	-180 to 200	0.07
	200 to 850	0.15

It should be noted that the accuracy of the PRT simulation is determined by the accuracy of the PRT tables (BS EN 60751) published by the British Standards Institute. The 5025 uses precise digital interpretation of the tables to output resistance values that are within the accuracies specified in the table above.

SIMULATED RESISTANCE	
RANGE	ACCURACY ¹
40Ω (min 10Ω)	0.15% of setting + 20mΩ
400Ω	0.02% of setting + 30mΩ
4kΩ	0.02% of setting + 1Ω
40kΩ	0.02% of setting + 10Ω
400kΩ	0.02% of setting + 100Ω
4MΩ	0.05% of setting + 1kΩ
40MΩ	0.2% of setting + 10kΩ

1. After subtraction of lead resistance.

Maximum measure current allowed in simulated resistance mode is 20mA. Simulated resistance mode is suitable for DC only, i.e. only DC current may be passed through the simulated resistance.

Simulated resistance limitations

It should be noted that the 5025's simulated resistance circuitry has a 2V voltage compliance. This means that the simulation is only valid if the measure current multiplied by required resistance is less than 2V. For example, if the measure current is 1mA, the maximum simulated resistance will be 2K ohms. The user should be aware of the measure currents being used by the instrument being calibrated in order to prevent incorrect simulated resistance being output by the 5025.

It should also be noted that some DMMs use measuring currents which are outside the 5025 simulated resistance limits. If in doubt over the validity of the 5025's output it is recommended that the voltage across the output terminals is checked – it should be less than 2V for correct operation.

PRT SIMULATION (Using Simulated Resistance)		
PRT Type	Range °C	Accuracy °C
PT100 DIN (Alpha Coeff 0.003850)	-180 to 850	0.15 ¹

1. From 50 to 850°C allow an additional 0.03% of setting

It should be noted that the accuracy of the PRT simulation is determined by the accuracy of the 5025's simulated (active) resistance function and the accuracy of the PRT tables (BS EN 60751) published by the British Standards Institute. The 5025 uses precise digital interpretation of the tables to output resistance values that are within the accuracies specified in the table above.

POWER CALIBRATION							
DC Current	Accuracy	Compliance	Resolution	AC Current 45-400Hz	Accuracy	Compliance	Resolution
0.2 to 2.2A	0.03 + 500uA	5V	100uA	0.2 to 2.2A	0.1% + 2mA	3.5V	100uA
2.2 to 22A	0.05 + 6mA	4V	1mA	2.2 to 22A	0.1% + 20mA	3V	1mA
DC Voltage	Accuracy	Output Current	Resolution	AC Voltage 45-400Hz	Accuracy	Output Current	Resolution
1 to 22V	0.01 + 500uV	20mA	100uV	1 to 22V	0.03% + 2mV	20mA	100uV
22 to 220V	0.02 + 30mV	20mA	1mV	22 to 220V	0.06% + 30mV	20mA	1mV
220 to 1050V	0.05 + 50mV	10mA	10mV	220 to 1050V	0.08% + 90mV	10mA	10mV
Phase	Accuracy	Range	Resolution	Power Factor		Range	Resolution
45 to 99Hz	0.3 deg	+/-90deg	0.1 deg	45 to 99Hz		0.00 – 1.00	0.01
100Hz to 400Hz	1.0 deg	+/-90deg	0.1 deg	100Hz to 400Hz		0.00 – 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 Acc (%) = $\sqrt{V_{acc}^2 + I_{acc}^2 + \text{Phase Correction}^2}$. Where Phase Correction (%) = $100 \times (1 - \cos(\text{Phase} + \text{Phase Acc}) / \cos(\text{Phase}))$.

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.

OPTIONS (continued)

High Accuracy DC Hi Voltage (DCHV+)				
Range	Accuracy 1 year	Output Resistance	Max Output Current	Resolution
220V*	15ppm + 2mV	<0.25Ω	10mA	100uV
1kV*	25ppm + 4mV	<1Ω	1mA	1mV

*Minimum Load 20kΩ

GENERAL

POWER SUPPLY	
Mains Voltage	100 - 230V AC 50/60 Hz.
Fuse Ratings	3.15A anti-surge
Connector	IEC Plug
Power Consumption	120W typical, 200W Max.
MAXIMUM ALLOWABLE VOLTAGE BETWEEN TERMINALS	
Between V+ and V- terminals	< 1500V Peak
Between V- and Earth	< 75V Peak
Between Main, Aux and Earth	< 75V
ENVIRONMENTAL	
Operating Temperature	15 to 35°C, Full Specification 22°C ±3°C.
Storage Temperature	-10°C to 50°C
Humidity	Operating < 80%
Altitude	0 to 3km. Non-operating 3km to 12km
Warm Up Time	1 hour to full accuracy
MECHANICAL	
Dimensions	Width 447mm, Height 152, Depth 470mm
Weight	16.5kg
	19" Rack Mounting Kit Available
REMOTE OPERATION	
Interfaces	GPIB, RS232 and USB (external adaptor)
Command Set	Standard SCPI