5025

Extended Specification

V2.3f

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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	-	100nV
200mV [1]	30 + 6uV	10 Ω	-	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	1mV

1. Over-Range 10%.

AC VOLTAGE (sine-wave). *(* 9771 AC Hi Frequency Option Required)*

Range RMS	Frequency [2]	Accuracy %	Output Resistance	Max Output Current	Resolution
20mV [1]	10Hz-45Hz	0.05 + 250uV	10 Ω [3]		1uV
	45Hz-1kHz	0.05 + 100uV	10 Ω [3]		
	1kHz-10kHz	0.05 + 150uV	10 Ω [3]		
	10kHz-20kHz	0.05 + 250uV	10 Ω [3]		
*	*20kHz-100kHz*	*0.05% + 0.1mV*	50 Ω		
*	*100kHz-300kHz*	*0.1% + 0.5mV*	50 Ω		
200mV [1]	10Hz-45Hz	0.05 + 250uV	10 Ω		1uV
	45Hz-1kHz	0.04 + 100uV	10 Ω		
	1kHz-10kHz	0.04 + 150uV	10 Ω		
	10kHz-20kHz	0.05 + 250uV	10 Ω		
*	*20kHz-100kHz*	*0.1% + 0.5mV*	50 Ω		
*	*100kHz-300kHz*	*0.1% + 1mV*	50 Ω		
2V [1]	10Hz-45Hz	0.08 + 500uV	< 0.1 Ω	20mA	10uV
	45Hz-1kHz	0.03 + 170uV	< 0.1 Ω		
	1kHz-10kHz	0.03 + 250uV	< 0.1 Ω		
	10kHz-20kHz	0.08 + 500uV	< 0.1 Ω		
*	*20kHz-100kHz*	*0.05% + 1mV*	< 0.5 Ω		
*	*100kHz-300kHz*	*0.1% + 5mV*	< 0.5 Ω		
*	*300kHz-1MHz*	*1% + 10mV*	< 0.5 Ω		
20V [1]	10Hz-45Hz	0.08 + 4mV	< 5 Ω	20mA	100uV
	45Hz-1kHz	0.03 + 2mV	< 5 Ω		
	1kHz-10kHz	0.03 + 3mV	< 5 Ω		
	10kHz-20kHz	0.08 + 4mV	< 5 Ω		
*	*20kHz-100kHz*	*0.1% + 10mV*			
200V [1]	40Hz-1kHz	0.06 + 20mV	< 5Ω	20mA	1mV
1050V	40Hz-1kHz	0.08 + 90mV	< 10 Ω	10mA	10mV

1. Over-Range 10%
2. The frequency accuracy for 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 ohms. This must be taken into account when loads of 100K ohms or less are being driven. A 100K load will result in a 0.01% error.

All AC outputs exclude the DC component. Less than 0.1% THD.

It is recommended that for very high accuracy low level AC calibration a precision attenuator with known characteristics is used. This can be driven from the 5025's 2V or 20V ranges and with proper screening of the attenuator the signal to noise ratio of the resulting output can be improved significantly. A 1000:1 screened precision attenuator is available from Time Electronics.

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 – 1kHz	0.07 + 300nA	8V	10nA
2mA [1]	20Hz – 1kHz	0.05 + 300nA	8V	10nA
20mA [1]	20Hz – 1kHz	0.05 + 3uA	8V	100nA
200mA [1]	20Hz – 1kHz	0.05 + 30uA	8V	1uA
2A [1]	20Hz – 500Hz	0.1 + 0.5mA	3.5V	10uA
20A [1]	20Hz – 500Hz	0.2 + 5mA	3V	100uA

1. Over-Range 10%.

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

Cold Junction Compensation +/- 0.5ºC (applies to ambient changes of +/- 1ºC)

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
1K Ω	20 ppm	0.1W
10K Ω	20 ppm	0.1W
100k Ω	30 ppm	0.1W
1M Ω	150 ppm	200V
10M Ω	0.1%	200V
100M Ω	1%	200V
1G Ω	10%	200V

1. Resistance specifications are +/- 1mΩ.

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 +/- 1mΩ

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

PERIOD
Variable Values 100nS to 10S, ~2V pk-pk square wave. Accuracy 20ppm

OPTIONS

CAPACITANCE [1]			
Value	**Frequency**	**Accuracy %**	**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.

INDUCTANCE [1] [2]			
Value	**Frequency**	**Accuracy**	**Max current**
1 mH	1kHz	1% of nominal OR 0.1% of previous calibration 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, 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	< 300ps. Bandwidth Checking up to 600 MHz

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

1. Max frequency at 1.5V is 2GHz

OPTIONS (continued)

FULL RANGE RESISTANCE			
Range	**Accuracy[1]**	**Resolution**	**Max Rating**
1Ω – 20Ω	0.01% +/- 7mΩ	1Ω	0.1W
20Ω – 99.999Ω	0.01% +/- 7mΩ	1mΩ /5mΩ*	0.1W
100Ω – 999.999Ω	0.01% +/- 5mΩ	1mΩ	0.1W
1kΩ – 9.999kΩ	0.02% +/- 20mΩ	1Ω	0.1W
10kΩ – 99.999kΩ	0.01% +/- 1Ω	1Ω	0.1W
100kΩ – 999.99kΩ	0.01% +/- 10Ω	10Ω	0.1W
1MΩ – 9.9999MΩ	0.02% +/- 100Ω	100Ω	0.1W
10MΩ – 120MΩ	0.1% +/- 1kΩ	1kΩ	0.1W

1.After subtraction of lead resistance. Add end resistance variation +/- 2.5mΩ
* Output resolution is 5mΩ below 50Ω

PRT SIMULATION (Uses Full Range Resistance option)			
Pt100 DIN	Alpha Coeff 0.003850	Range -180 to 850ºC	Accuracy 0.1ºC

It should be notes 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**
2 Wire[1]	
40 ohms (min 10 ohms)	0.15% of setting +/- 20 milliohms
400 ohms	0.05% of setting +/- 0.05% of range
4K ohms	0.02% of setting +/- 0.05% of range
40K ohms	0.02% of setting +/- 0.05% of range
400K ohms	0.02% of setting +/- 0.05% of range
4M ohms	0.05% of setting +/- 0.05% of range
40M ohms	0.2% of setting +/- 0.05% of range

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 active 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 (Uses Simulated Resistance option)			
Pt100 DIN	Alpha Coeff 0.003850	Range -180 to 850ºC	Accuracy 0.1ºC

It should be notes 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 – 2.2A	0.03 + 500uA	5V	100uA	0.2 – 2.2A	0.1% + 2mA	3.5V	100uA
2.2 - 22A	0.05 + 6mA	4V	1mA	2.2 - 22A	0.1% + 20mA	3V	1mA
DC Voltage	**Accuracy**	**Output Current**	**Resolution**	**AC Voltage 45-400Hz**	**Accuracy**	**Output Current**	**Resolution**
1- 22V	0.01 + 500uV	20mA	100uV	1 - 22V	0.03% + 2mV	20mA	100uV
22 – 220V	0.02 + 30mV	20mA	1mV	22 – 220V	0.06% + 30mV	20mA	1mV
220 – 1050V	0.05 + 50mV	10mA	10mV	220 – 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	0.001
100Hz to 400Hz	1.0 deg	+/-90deg	0.1 deg	100Hz to 400Hz		0.00 – 1.00	0.001

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 (%) = SqrRt (Vacc^2 + Iacc^2 + Phase Correction^2)
Where Phase Correction (%) = 100x(1-Cos(Phase+PhaseAcc)/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.

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 - 25 ^{0}C, Full Spec: 22 ^{0}C +/- 3^{0}C.
Storage Temperature	-10 ^{0}C to 50 ^{0}C
Humidity	Operating < 80%
Altitude	0 - 3km. Non Operating 3Km - 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 optional USB
Command Set	Standard SCPI