

5025

Extended Specification

V2.6

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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 | 1mV |

| 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 ³ | | 1uV |
| | 45Hz-1kHz | 0.04 + 100uV | 10 Ω ³ | | |
| | 1kHz-10kHz | 0.04 + 150uV | 10 Ω ³ | | |
| | 10kHz-20kHz | 0.05 + 250uV | 10 Ω ³ | | |
| | * 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 | 0.15% + 15mV | | | |
| 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 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 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.

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 °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 +/- 0.5°C (applies to ambient changes of +/- 1°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 |
| 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 +/- 5m Ω .

| 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 +/- 5m Ω

| 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 | | | |
|--------------------------|-----------|-------------|-----------|
| 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 / | 10mA |
| 1.9 mH | 1kHz | 0.1% of previous | |
| 5 mH | 1kHz | calibration value | |
| 10 mH | 1kHz | | |
| 19 mH | 1kHz | 2% of nominal / | |
| 50 mH | 1kHz | 0.1% of previous | |
| 100 mH | 1kHz | calibration value | |
| 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.

3. 1mH to 10mH 1% of nominal value. 19mH to 10H 2% of nominal value

| 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 | | | |
|-----------------------|-----------------------|------------|------------|
| 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. 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 850°C | Accuracy 0.1°C |

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 |
| 2 Wire¹ | |
| 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 850°C | Accuracy 0.1°C |

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 – 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 (%) = $\text{SqrRt}(\text{Vacc}^2 + \text{Iacc}^2 + \text{Phase Correction}^2)$

Where Phase Correction (%) = $100 \times (1 - \text{Cos}(\text{Phase} + \text{PhaseAcc}) / \text{Cos Phase})$.

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.

OPTIONS (continued)

| High Accuracy DC Hi Voltage (DCHV+) | | | | |
|-------------------------------------|-----------------|-------------------|--------------------|------------|
| Range | Accuracy 1 year | Output Resistance | Max Output Current | Resolution |
| 220V* | 15ppm + 1mV | <0.25Ω | 10mA | 100uV |
| 1kV* | 25ppm + 3mV | <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 - 35 °C, Full Spec: 22 °C +/- 3°C. |
| Storage Temperature | -10 °C to 50 °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 |