



# Haven Automation Limited

## SPEC CAL<sup>®</sup> ECLIPSE II

### MULTI-FUNCTION PROCESS CALBRATOR

#### Features

- Accuracy 0.007% of reading
- Simultaneous measurement and generation of mV, mA, V and  $\Omega$
- Measures and simulates 12 different thermocouple types and 7 RTD signals to selectable international standards (BS/JIS/DIN/ANSI)
- Unique RTD emulation capability - precision RTD simulation whether used with DC, AC or pulsed waveform excitation currents
- Automatic remote cold junction compensation
- Multi-lingual - operates in 5 different selectable languages.
- Integral 24 V DC supply
- Portable and panel mounted versions available
- Supplied complete with UKAS calibration certificate recognised to ISO/IEC 17025:2017 – mutually accepted in Europe through EAL (ILAC)\*
- The Haven Spec-Cal<sup>®</sup> Eclipse II Multi-Function Process Calibrator represents a culmination of over 40 years of experience in calibrator design and manufacture.



The Spec-Cal<sup>®</sup> Eclipse II measures and simulates 12 thermocouple types to any of four selectable international standards (BS, JIS, DIN and ANSI) as well as simultaneously measuring or generating mV, mA or Volts. In addition, the Spec-Cal<sup>®</sup> Eclipse II measures and generates ohms, and measures and simulates 7 different RTD types.

The hand-held, battery powered Spec-Cal<sup>®</sup> Eclipse II is protected by a tough, EMC shielded, aluminium case with a durable, splash-proof, polycarbonate keypad which has excellent tactile and audible feedback, a high contrast LED display and switchable backlight. It is also available as a panel mounted version, mains powered with a permanently backlit display.

Our UKAS Accreditation is limited to the Calibration activities listed on our Schedule, which can be viewed at [www.ukas.com](http://www.ukas.com)

\*EAL- European co-operation for Accreditation of Laboratories - International acceptance and mutual recognition agreements of UKAS calibration certificates.

## **Simple to Operate Yet Powerful**

The Spec-Cal® Eclipse II Calibrator is menu-driven for ease of use, the sequence of options is simple, logical and intuitive. The non-volatile memory will store up to 50 ramp programs and 500 calibration values, even when your Spec-Cal® Eclipse II is switched off or the batteries removed. For each ramp program you can enter values for units, step time and increment and define high and low limits. The program can be manually stepped or auto-cycled. Three modes of cold junction compensation are available, including Haven's patented external remote CJ measurement system, eliminating the need to use error inducing compensating cable.

The Spec-Cal® Eclipse II is supplied with a set of 6 high capacity NiMH batteries, which will power the instrument for up to ten hours. Alternatively, you can use disposable AA cells or power directly from the mains supply using the battery charger/eliminator. A low battery indicator will tell you when your Spec-Cal® Eclipse II needs to be charged, giving reasonable advance warning of instrument power down. To save power, an automatic function is available to power down your instrument if a key has not been pressed for approximately 10 minutes. An isolated 24 Volt integral supply is provided for loop power

## **Multi-Functional Combined with High Performance**

The Spec-Cal® Eclipse II uses an innovative circuit design, providing precision RTD emulation whether used with DC, AC or pulsed waveform excitation currents. This is unlike most other RTD simulators/process calibrators available on the market, which are limited to simulating RTDs for instruments with restricted DC or low frequency AC excitation currents.

RTD simulators generate a voltage, the value of which is a function of the excitation current of the instrument under test and the resistance to be simulated. However, excessive variations in the value or rate of change of excitation current can cause the simulation to become unstable and/or inaccurate. This problem is eliminated in the Spec-Cal® Eclipse II by the use of our unique resistance emulation circuitry, which uses an array of real, switchable resistors to provide the required resistance value. The Spec-Cal® Eclipse II is, in effect, an intelligent resistance emulator.

## **Cold Junction Compensation**

Haven Automation invented thermocouple simulation techniques for use in portable calibrators over 40 years ago and the competition is still trying hard to catch up. Our remote cold junction sampling idea was so unique we took out a patent - no need to search around for the correct thermocouple cable to carry out your calibration, no chance of introducing massive errors by using compensation cable (a common mistake) - just copper conductors and no errors.

Electrical Signals				
Function	Range	Display Resolution	Internal Resolution	Accuracy
Measure	-100 to 100 mV	1 $\mu$ V	0.19 $\mu$ V	0.007 % Reading + 5 $\mu$ V
	-55 to 55 mA	1 $\mu$ A	0.19 $\mu$ A	0.007 % Reading + 5 $\mu$ A
	-30 to 30 V	1 mV	0.06 mV	0.007 % Reading + 3 mV
	0 to 400 $\Omega$ (lexc = 1 mA)	10 m $\Omega$	1 m $\Omega$	0.007 % Reading + 20 m $\Omega$
	400 to 4000 $\Omega$ (lexc = 0.1 mA)	100 m $\Omega$	10 m $\Omega$	0.007 % Reading + 200 m $\Omega$
Generate	-25 to 100 mV	1 $\mu$ V	0.19 $\mu$ V	0.007 % Reading + 5 $\mu$ V
	0 to 22 mA	1 $\mu$ A	0.04 $\mu$ A	0.007 % Reading + 5 $\mu$ A
	-2.5 to 10 V	1 mV	0.02 mV	0.007 % Reading + 3 mV
	18 to 400 $\Omega$ 1	10 m $\Omega$	1 m $\Omega$	0.007 % Reading + 20 m $\Omega$
	400 to 4000 $\Omega$ 2	100 m $\Omega$	10 m $\Omega$	0.007 % Reading + 200 m $\Omega$

1 Excitation current (DC / AC / pulsed) from -10 to +10 mA 2 Excitation current (DC / AC / pulsed) from -1 to +1 mA. All resistance specification is for 4 wire configuration only.



Thermocouple Measurement and Simulation							
Simulation				Measurement			
T/C Type	Range °C	Worst Case Accuracy <sup>3</sup> ± °C	Best Case Accuracy <sup>4</sup> Mid-Range ± °C	T/C Type	Range °C	Worst Case Accuracy <sup>3</sup> ± °C	Best Case Accuracy <sup>4</sup> Mid-Range ± °C
T	-250 to -200	1.1	0.2	T	-270 to -150	1.1	0.2
	-200 to -140	0.3			-150 to 400	0.2	
	-140 to 400	0.2					
E	-250 to -200	0.9	0.2	E	-250 to -200	0.8	0.2
	-200 to 800	0.2			-200 to 800	0.2	
	800 to 1000	0.3			800 to 1000	0.3	
K	-250 to -180	1.7	0.2	K	-250 to -180	1.8	0.2
	-180 to 550	0.3			-180 to 1372	0.4	
	550 to 1372	0.4					
R	-50 to 100	1.4	0.4	R	-50 to 100	1.6	0.4
	100 to 1740	0.7			100 to 1700	0.7	
	1740 to 1767	2.0			1700 to 1767	1.9	
J	-210 to -110	0.3	0.2	J	-210 to -100	0.3	0.2
	-110 to 700	0.2			-100 to 1200	0.2	
	700 to 1200	0.3					
S	-50 to 0	1.3	0.5	S	-50 to 20	1.2	0.5
	0 to 120	0.9			20 to 160	0.9	
	120 to 1740	0.7			160 to 1720	0.7	
	1740 to 1767	1.9			1720 to 1767	2.0	

B	300 to 600	1.7	0.5	B	300 to 750	1.5	0.5
	600 to 1000	1.1			750 to 1020	0.8	
	100 to 1820	0.7			1020 to 1820	0.6	
N	-250 to 220	1.9	0.2	N	-250 to -160	1.9	0.2
	-220 to 150	0.7			-160 to 150	0.5	
	-150 to 1300	0.3			-150 to 1300	0.3	
PR (JIS)	0 to 250	1.9	0.6	PR (JIS)	0 to 250	1.9	0.6
	250 to 1600	0.8			250 to 1600	0.8	
	1600 to 1770	0.7			1600 to 1770	0.7	
U (DIN)	-200 to -120	1.0	0.2	U (DIN)	-200 to -140	1.2	0.2
	-120 to 180	0.4			-140 to 100	0.5	
	180 to 600	0.2			100 to 600	0.3	
L (DIN)	-200 to -120	0.6	0.2	L (DIN)	-200 to -120	0.9	0.2
	-120 to 900	0.3			-120 to 900	0.5	
NI (ANSI)	-18 to 1310	0.2	0.2	NI (ANSI)	-18 to 1310	0.3	0.2

3 Worst case accuracy: calculated at 0 °C manual CJ using worst case electrical accuracy and worst case linearization errors over specified range.

4 Best case, mid-range accuracy: calculated at 0 °C manual CJ using worst case electrical accuracy and worst case linearization errors. Resolution for all ranges: 0.1 °C.



RTD Measurement and Simulation							
Simulation				Measurement			
RTD Type	Range °C	Worst Case Accuracy <sup>5</sup> ± °C	Best Case Accuracy <sup>6</sup> Mid-Range ± °C	RTD Type	Range °C	Worst Case Accuracy <sup>5</sup> ± °C	Best Case Accuracy <sup>6</sup> Mid-Range ± °C
Pt50	-155 to 300	0.15	0.15	Pt50	-155 to 280	0.15	0.16
	300 to 850	0.23			280 to 850	0.26	
Pt100	-200 to 360	0.10	0.10	Pt100	-200 to 310	0.10	0.10
	360 to 850	0.16			310 to 850	0.19	
Pt200	-200 to 10	0.04	0.06	Pt200	-200 to 60	0.05	0.07
	10 to 260	0.07			60 to 260	0.07	
	260 to 850	0.43			260 to 850	0.46	
Pt500	-200 to 60	0.02	0.15	Pt500	-200 to -60	0.03	0.16
	-60 to 300	0.15			-60 to 330	0.16	
	300 to 850	0.23			300 to 850	0.26	
Pt1000	-200 to 10	0.02	0.10	Pt1000	-200 to -150	0.02	0.10
	10 to 260	0.09			-150 to 310	0.10	
	260 to 850	0.16			310 to 850	0.19	
Ni100	-60 to 110	0.05	0.04	Ni100	-60 to 150	0.06	0.04
	110 to 180	0.04			150 to 180	0.07	
Ni20	-80 to 150	0.10	0.03	Ni20	-80 to 120	0.12	0.04
	150 to 260	0.07			120 to 260	0.09	

5 Worst case accuracy: calculated using worst case 4 wire electrical accuracy and worst case linearization errors across the specified range

6 Best case, mid-range accuracy: calculated using worst case 4 wire electrical accuracy and worst case linearization errors.

Resolution for all ranges: 0.01

Spec-Cal® Eclipse II has been designed to maintain its specification over a period of 1 year.

Due to our policy of continual product development we reserve the right to amend this specification without notice



### General Specification

24 V DC Supply	25 mA maximum output
Terminal Type	4 mm binding posts to accept wire or 4 mm plug
Isolation	The MEASURE, GENERATE and 24 V terminals are mutually isolated
Over Voltage Protection	30 V AC and DC
<b>Cold Junction (Internal/External):</b>	
Accuracy	± 0.1 °C at 23 °C (± 0.2 °F at 73 °F), 0.1 degree resolution
Range	-50 to +136 °C (-58 to +276 °F)
Error	Add 0.01 °C per degree difference from 23 °C (0.02 °F from 73 °F)
<b>Environmental</b>	
Temperature	-5 to +50 °C (23 to 122 °F)
Relative Humidity	10 to 80 % non-condensing < 70 % recommended
Storage Temperature	-20 to 60 °C (-4 to 140 °F)
Internal Reference Drift	< 7 ppm per °C from 23 °C (73 °F)
<b>Ramp Specification</b>	
Ramp Units available	V, mV, mV%, mA, mA%, °C, °F
Min Ramp Increment	least significant digit of range
Ramp Step Time	5 sec to 9999.9 sec
Ramp Delay	1 sec to 5 min (before start of cycle)
Modes	auto single cycle; auto continuous cycle; manual
<b>Dimensions</b>	
L x W x H	246 x 105 x 57 mm
Weight	1 kg

### Supplied Complete with:

Carry case, battery charger, standard accessories, and UKAS calibration certificate issued by Haven Automation Ltd.



#### Haven Automation Limited

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