

*Simpson*

**DB-1100**

**DB-1200**

**DB-1300**

**DB-1400**

**DB-1500**

**TEMPERATURE CALIBRATORS  
INSTRUCTION MANUAL**



## **About this Manual**

To the best of our knowledge and at the time written, the information contained in this document is technically correct and the procedures accurate and adequate to operate this instrument in compliance with its original advertised specifications.

## **Notes and Safety Information**

This Operator's Manual contains warning headings which alert the user to check for hazardous conditions. These appear throughout this manual where applicable, and are defined below. To ensure the safety of operating performance of this instrument, these instructions must be adhered to.



Warning, refer to accompanying documents.



Caution, risk of electric shock.

## **Technical Assistance**

SIMPSON ELECTRIC COMPANY offers assistance Monday through Friday 7:30 am to 5:00 pm Central Time by contacting Technical Support or Customer Service at (847) 697-2260.

Internet: <http://www.simpsonelectric.com>

## **Warranty and Returns**

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory or other article of equipment which shall within one (1) year after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service centers, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sales of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service centers, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

A dry-block calibrator is constructed in such a manner that it is impossible to operate without generating dangerous hot areas. It is very important that the operator is aware of the potential dangers.

There are no operational switches or buttons inside the calibrator that are needed during operation. Opening the calibrator during operation is very dangerous due to high temperatures and high voltages. The calibrator is only to be opened by qualified service personnel. When opening the calibrator, consult the service manual for instructions.

After the calibrator has been operated, it may be very warm. Do not turn off the calibrator if it is above 400°C (752°F). The correct procedure is to set the set point to 50°C (122°F) and turn it off when it is well below 400°C (752°F).

If the calibrator switches itself down during operation, this can be due to the internal safety trip switch. In these cases, contact your dealer because a new fuse will have to be installed.

Failure to ground the temperature calibrator properly can result in personal injury. Use a three-prong grounded AC power outlet. Place the temperature calibrator on an even surface and make sure that the air inlet for the fan is not blocked. Connect the power cable to the temperature calibrator and press the Line switch on the bottom panel to turn it on. The calibrator must not be covered. The calibrator must be used in an environment with free space of 1.64 feet above and 0.33 feet free space on either side and with satisfactory ventilation or temperature control.

# Contents

<b>1</b>	<b>PRODUCT DESCRIPTION</b>	<b>5</b>
1.1	General Description	5
<b>2</b>	<b>CALIBRATORS DB-1300, DB-1400 &amp; DB-1500</b>	<b>6</b>
2.1	PREPARATION	6
2.1.1	Preparing the heating calibrators for use.	6
2.1.2	Power requirements for DB-1300, DB-1400 & DB-1500	6
2.1.3	Fuses	6
2.2	GETTING STARTED	7
2.2.1	Power On	7
2.2.2	Celsius – Fahrenheit setting	7
2.2.3	Default setting	7
2.3	MAKING CALIBRATIONS	8
2.3.1	Calibration procedure	8
2.3.2	Calibration at high temperatures	8
2.3.3	Precaution	9
2.3.4	Test of thermostats	9
2.4	CALIBRATION HINTS	9
2.4.1	Time constants	9
2.4.2	High accuracy	10
2.4.3	Heat losses to the surroundings	10
2.4.4	Cleaning of block and insert	10
<b>3</b>	<b>CALIBRATORS DB-1100 &amp; DB-1200</b>	<b>11</b>
3.1	PREPARATION	11
3.1.1	Preparing the DB-1100 & DB-1200 for use	11
3.1.2	Power requirements	11
3.1.3	Fuses	11
3.2	GETTING STARTED	12
3.2.1	Power on	12
3.2.2	Celsius – Fahrenheit setting	12
3.2.3	Default setting DB-1100 & DB-1200	12
3.3	MAKING CALIBRATIONS	13
3.3.1	Calibration Procedure DB-1100 & DB-1200	13
3.3.2	Calibration at low temperatures	13
3.3.3	Precaution	14
3.3.4	Test of thermostats	14
3.4	CALIBRATION HINTS	14
3.4.1	Time constants	14
3.4.2	High accuracy	15
3.4.3	Heat loss to the surroundings	15
3.4.4	Cleaning of block and insert	15
3.4.5	Method of calibration	15
<b>4</b>	<b>RS-232 INTERFACE</b>	<b>16</b>
<b>5</b>	<b>TECHNICAL SPECIFICATIONS</b>	<b>17</b>
5.1	DB-1100 & DB-1200	17
5.2	DB-1300, DB-1400 & DB-1500	18

# 1 PRODUCT DESCRIPTION

## 1.1 General Description

The DB Calibrators instruction manuals are intended to be used with the Simpson portable calibrators DB-1100, DB-1200, DB-1300, DB-1400 and DB-1500. The DB Calibrators are constructed with a dry temperature variable well, with a newly designed temperature controller. A digital controller with a dedicated CPU gives the DB calibrators flexible control. Digital control provides for adaptive control of the temperature, which saves the operator time and assures high accuracy and easy setting of temperatures. The local LCD displays both the set temperature and reference temperature simultaneously.

The display of the DB-1300, DB-1400 and DB-1500 has a resolution of  $0.1^{\circ}\text{C}$ , however the PID controller works with a resolution of  $0.01^{\circ}\text{C}$ . Effectively this means that a better stability than that stated in the specifications may be obtained. In order to obtain this, the calibration conditions must be ideal. First and foremost, the ambient temperature must be kept in a stable state, and longer stabilization time for the calibrator must be allowed. This is to compensate for the temperature influence on the electronics. They come in a dedicated instrument case with assessors such as cable and inserts.

The communication port RS-232 comes as a standard feature for use with a computer in the calibration process. Simpson provides optional calibration software for temperature. The DB calibrators, together with the CS-1000 calibration software and DB-1600 Signal Conditioner, will give you an automatic calibration system.

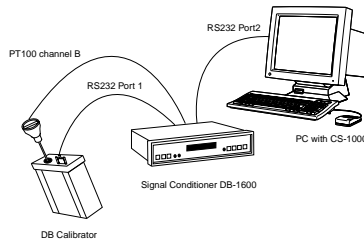


Figure 1-1: Automatic calibration with internal reference

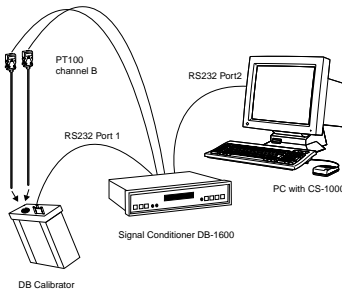


Figure 1-2: Automatic calibration with external reference

# 2 CALIBRATORS DB-1300, DB-1400 & DB-1500

---

## 2.1 PREPARATION

---

### 2.1.1 Preparing the heating calibrators for use.

Table 2-1: Items included with the DB-1300, DB-1400 & DB-1500 temperature calibrators:

- Temperature calibrator: DB-1300, DB-1400 or DB-1500
- Carrying case
- Power cord
- Test cable for thermostats
- Tool for changing inserts
- Insertion tube with 1/4" (probe outer diameter)\*
- Insertion tube with 3/8" (probe outer diameter)
- NIST calibration certificate
- Instruction manual

\* Included with DB-1400 only

### 2.1.2 Power requirements for DB-1300, DB-1400 & DB-1500

The DB-1300, DB-1500 & DB-1500 temperature calibrators are portable instruments that require no physical installation other than connection to a power source. Do not connect AC power until you have verified that the line voltage is correct and that the proper fuse is installed. Damage to the equipment may otherwise result.

Table 2-2: Power requirements for heating calibrators

	110 volt	230 volt
Input Voltage	100 to 130 V	198 to 250 V
Frequency	50 to 60 Hz	50 to 60 Hz
Power	1600 W	1600 W



Failure to ground the temperature calibrator properly can result in personal injury. Use a three-prong grounded AC power outlet. Place the temperature calibrator on an even surface and make sure that the air inlet for the fan is not blocked. Connect the power cable to the temperature calibrator and press the Line switch on the bottom panel to turn it on. The calibrator must not be covered. The calibrator must be used in an environment with free space of two feet above and one-half foot free space on either side and with satisfactory ventilation or temperature control.

### 2.1.3 Fuses

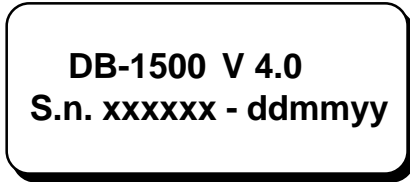
The fuses used in the DB-1300, DB-1400 & DB-1500, 110 volt versions are  $\varnothing$  6.3 x 32 mm ceramic, 15 amp (slow). The fuses used in the DB-1300, DB-1400 & DB-1500 -230 volt versions are  $\varnothing$  5 x 20 mm glass, 10 amp (slow). The fuses are placed next to the main switch.

## 2.2 GETTING STARTED

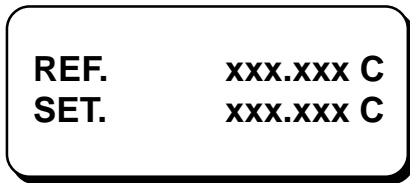
---

### 2.2.1 Power On

When the DB-1300, DB-1400 or DB-1500 is switched on, the LCD display on the front panel will show:



x denotes the serial number of the calibrator and ddmmyy is the date of last calibration of the calibrator. V 4.0 indicates the software version number of the calibrator. After 10 seconds the display will show:



### 2.2.2 Celsius – Fahrenheit setting

To change the temperature notation, simultaneously press the temperature setting buttons **↑** and **↓** while switching on the power to the calibrator.

The display will show:



After two seconds the display will show:



Press the temperature setting button **↑** to display the temperature in Celsius.  
Press the temperature setting button **↓** to display the temperature in Fahrenheit.

### 2.2.3 Default setting

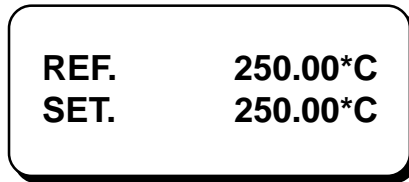
The default set point setting for the DB-1300, DB-1400 and DB-1500 is 50°C.

## 2.3 MAKING CALIBRATIONS

---

### 2.3.1 Calibration procedure

1. Move the adjustable handle to one side and turn on the calibrator.
2. Select an insertion tube that best fits the sensor to be tested.
3. Place the insertion tube in the thermo well and put the sensor to be tested in the insertion tube. Insure that there is a good contact between sensor and insertion tube.
4. The sensor to be tested must be placed as close as possible to the bottom of the thermo well in order to obtain the best possible calibration result.
5. The calibration temperature set point is selected by means of the arrow keys **↑** and **↓** on the front panel of the calibrator. It is indicated on the second line on the display SET.
6. The temperature in the thermo well is indicated in the first line of the display REF.
7. The reference temperature will stabilize to the SET. When the reference temperature has been within  $\pm 0.2^{\circ}\text{C}$  ( $0.36^{\circ}\text{F}$ ) of the set point for three minutes an \* is visible after the last digit of the REF temperature. After seven minutes a second \* appears behind the SET. temperature, the calibrator is now stable to within  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ).



The temperature control within the DB Calibrators uses a specially designed PID controller. Refer to chapter 2.4 for general requirements to obtain the specified accuracy.

### 2.3.2 Calibration at high temperatures

The DB-1300 can generate temperatures up to  $400^{\circ}\text{C}$  ( $750^{\circ}\text{F}$ ). The DB-1400 can generate temperatures up to  $600^{\circ}\text{C}$  ( $1110^{\circ}\text{F}$ ). The DB-1500 can generate temperatures up to  $650^{\circ}\text{C}$  ( $1200^{\circ}\text{F}$ ). When using the calibrators at these high temperatures, drafts may affect the stability of the calibrator. In order not to expose the electronics to high temperatures over a longer period of time, we do not recommend using the calibrator for more than 30 minutes at a time in the  $600\text{-}650^{\circ}\text{C}$  ( $1110\text{-}1200^{\circ}\text{F}$ ) range.



### 2.3.3 Precaution



Note: RTDs and thermocouples will react quickly to temperature changes. Filled bulbs will react more slowly. Even if the calibrator has stabilized, the sensor to be tested may not yet have arrived at the indicated temperature. When testing filled bulbs or similar, allow ample time for temperature stabilization. Some sensors are placed in long protection or extension tubes and can not always be totally immersed in the thermo well.

The metal tube may conduct heat or cold away from the thermo well and this may affect the calibration. This can be prevented by using insulation material on the part of the sensor that is not immersed in the well. Never store the calibrator in the carrying case before the temperature in the thermo well is below 50°C (122°F).

### 2.3.4 Test of thermostats

The DB-1300, DB-1400 and DB-1500 have a built-in test function for thermostats. By means of the cable, connect the alligator clips to the on/off function of the thermostat with the plug on the calibrator. The test light on the front of the calibrator will indicate when the on/off function of the thermostat is activated. Note that thermostats react slowly to temperature changes.

## 2.4 CALIBRATION HINTS

---

### 2.4.1 Time constants

The DB-1300, DB-1400 & DB-1500's reference sensors are mounted in the heating/cooling block and will react quickly to temperature changes (small time constant). The sensors being tested have a larger time constant due to larger mass and longer distance to the heating/cooling elements. Consequently, the temperature curve for the reference sensor and the sensor being tested will be different. See figure 2-1.

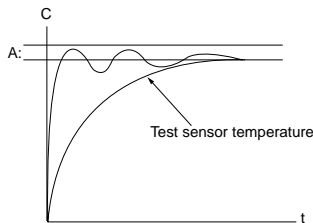


Figure 2-1: Temperature Response

A certain overshoot will take place when approaching the SET POINT. This speeds up stabilization time for calibrations. This only applies to the reference temperature, as the sensor that is being tested has a larger mass and reacts more slowly to temperature changes (see fig.1, the dotted line). Consequently, always make sure that before performing calibration, the indicator for stable temperature in the calibrator is present (a \* is shown in the display after the SET POINT temperature). Also take into consideration the mass of the sensor being tested. When the DB-1300, DB-1400 and DB-1500 calibrators are used with the CS-1000 software in semiautomatic mode, the PC will inform when the sensor being tested has obtained its stabilization.

## 2.4.2 High accuracy

Dry block calibrators' accuracy and performance to a given specification is dependent on the fact that it reproduces the conditions for under which it was calibrated. There are several factors that may have affect on the accuracy of the calibrators. There are variations in the sensor diameter, length, thermo-conductivity, the active element's position in the sensor, cleanness of the sensor and fit in the insert from the one used during the calibrator's calibration. For set point temperatures above 400 °C (750°F), it is important that the insert block and sensor is clean and free from dust and oxidization products.

Always approach the set point value from a lower temperature.

The DB-1300, DB-1400 and DB-1500 are calibrated dry using a .24" Industrial Standard Reference Pt-100 sensor placed in the bottom of a 1/4" insert.

Simpson delivers undrilled insertion tubes to allow customers to drill to their own sensor diameter. In these cases we can not guarantee the calibrators' specifications as we cannot control the customization.

## 2.4.3 Heat losses to the surroundings

When calibrating - testing a long sensor that is partly exposed when mounted in the calibrator, a heat loss to the surroundings will result. This is especially true when the sensor has a large mass that is exposed. This heat loss will affect the accuracy, and may be as much as 0.5°C to 1.0°C (0.9-1.8°F). As a general rule, this error when minimal is the exposed length of the sensor is < 1/4 of the length of the sensor. We recommend that the exposed part of the sensor is insulated. See figure 3-2.

Different insulating materials may be used but is important that they can withstand the operating temperatures and has a good insulation characteristic.

It should be flexible so that it can be tucked around the sensor. Consult Simpson for further information.

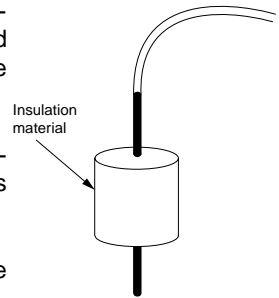


Figure 2-2 'Insulation'

## 2.4.4 Cleaning of block and insert

In order to obtain maximum and repetitive performance of the calibrator it is important to keep the temperature well and insert as clean as possible at all times. Before starting a calibration clean the well, insert and sensor with fin wire wool or a wire brush. Gun bore cleaning tools are suitable for this purpose (not the solvents). Remove the dust from the cleaning process with a dry cloth or compressed air.

# 3 CALIBRATORS DB-1100 & DB-1200

---

## 3.1 PREPARATION

---

### 3.1.1 Preparing the DB-1100 & DB-1200 for use

Table 3 -1. Items included with the DB-1100/DB-1200 Temperature Calibrator

- Temperature calibrator DB-1100 & DB-1200
- Carrying case
- Power cord
- Test cable for thermostats
- Tool for changing inserts
- Insertion tube 1/8" (probe outer diameter)
- Insertion tube 3/16" (probe outer diameter)
- Oil kit
- NIST calibration certificate
- Instruction manual

### 3.1.2 Power requirements

The DB-1100 and DB-1200 temperature calibrators are portable instruments and require no physical installation other than connection to a power source.

Do not connect AC power until you have verified that the line voltage is correct and that the proper fuse is installed. Damage to the equipment could result.

Table 3-2. Power requirements

	110 volt	230 volt
Input Voltage	90 to 130 V rms	180 to 260 Vrms
Frequency	47 to 65 Hz	47 to 66 Hz
Power	180 W	180 W



Failure to ground the temperature calibrator properly can result in personal injury. Use a three-prong grounded AC power outlet.

### 3.1.3 Fuses

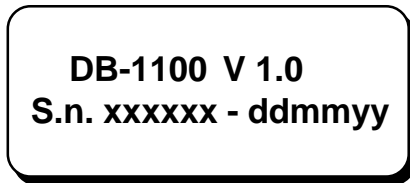
The fuse used in DB-1100 & DB-1200 is a 5 x 20 mm, 2.0 amp (slow) 230 V. The fuse is placed next to the main switch.

## 3.2 GETTING STARTED

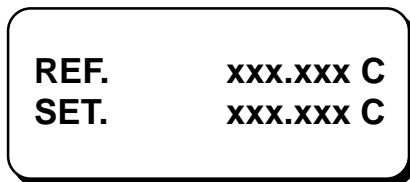
---

### 3.2.1 Power on

When the DB-1100/1200 is switched on the LCD display on the front panel will show:



x denotes the serial number of the calibrator and ddmmyy is the date of last calibration of the calibrator. V 1.0 shows the software version number of the calibrator. After ten seconds the display will show:



### 3.2.2 Celsius – Fahrenheit setting

To change the temperature notation press simultaneously the temperature setting buttons  $\uparrow$  and  $\downarrow$  while turning on the power to the calibrator.



The display will show:



After two seconds the display will show:

Press the temperature setting button  $\uparrow$  for displaying the temperature in Celsius. Press the temperature setting button  $\downarrow$  for displaying the temperature in Fahrenheit.

### 3.2.3 Default setting DB-1100 & DB-1200

The default set point is 0°C for the DB-1100 & DB-1200.

## 3.3 MAKING CALIBRATIONS

---

### 3.3.1 Calibration Procedure DB-1100 & DB-1200

1. Move the adjustable handle to one side and turn on the calibrator.
2. Select the insertion tube that best fits the sensor to be tested.
3. Place the insertion tube in the thermo well and place the sensor to be tested in the insertion tube and insure that a close contact between sensor and insertion tube is obtained.
4. The sensor to be tested must be placed as close as possible to the bottom of the thermo well in order to obtain the best possible calibration result.
5. The calibration temperature set point is selected by means of the arrow keys and on the front panel of the calibrator. It is indicated on the second line on the display SET.
6. The temperature in the thermo well is indicated on the first line of the display. REF.
7. The reference temperature will stabilize to the SET. When the reference temperature has been within  $\pm 0.2^{\circ}\text{C}$  ( $0.36^{\circ}\text{F}$ ) of the set point for three minutes a \* is visible after the last digit of the REF temperature. After seven minutes a second \* appears behind the SET. temperature, the calibrator is now stable to within  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ).

REF.	-15.00°C
SET.	-15.00°C

A PID controller is used in the DB-1100 & DB-1200 to control the temperature. Refer to chapter 3.4 for general requirements to obtain the specified accuracy.

### 3.3.2 Calibration at low temperatures

The DB-1100/DB-1200 can generate a temperature down to  $-40^{\circ}\text{C}$  ( $81^{\circ}\text{F}$ ) below ambient temperature. In order to achieve best thermal coupling to the sensor-undergoing test, a special silicon oil may be used in the hole between the sensor and insert.

A calibration oil kit is supplied with the cooling calibrators DB-1100 & DB-1200.

The lubricant is a silicon-based oil with a viscosity of 50 and has a temperature range of  $-25^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  ( $13-300^{\circ}\text{F}$ ). The oil has no hazardous material present and comes in a 100 ml plastic bottle. It is supplied together with a 10ml syringe in a plastic zip bag as a standard delivery with all cooling calibrators from Simpson.

### 3.3.3. Precaution

Please pay attention to the fact that RTDs and thermocouples will react quickly to temperature changes. Filled bulbs will react more slowly and even if the DB-1100 or DB-1200 have stabilized the sensor to be tested may not yet have arrived at the indicated temperature. So when testing filled bulbs or similar please allow ample time for temperature stabilization. Some sensors are placed in long protection or extension tubes and can not always be totally immersed in the thermo well.



The metal tube may direct heat or cold away from the thermo well and this may affect the calibration. Using insulating material on the part of the sensor, which is not immersed in the calibrator, can prevent this. Never store the DB-1100/1200 in the carrying case before the temperature in the thermo well is below 50°C (122°F).

### 3.3.4 Test of thermostats

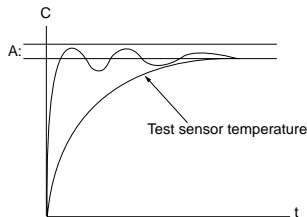
The DB-1100/1200 has a built-in test function for thermostats. By means of the cable, connect the alligator clips to the on-off function of the thermostat with the plug on the calibrator. The test light on the front of the calibrator will indicate when the on-off function of the thermostat is activated. Please note that thermostats may react slowly to temperature changes.

## 3.4 CALIBRATION HINTS

---

### 3.4.1 Time constants

The DB-1100 and DB-1200's reference sensors are mounted in the heating-cooling block and will react quickly to temperature changes (small time constant). The sensors being tested have a larger time constant due to larger mass and longer distance to the heating-cooling elements. Consequently the temperature curve for



the reference sensor and the sensor being tested will be different. See fig. 3-1.

*Figure 3-1 ' Temperature Response'*

A certain overshoot will take place when approaching the SET POINT-typically approximately 0.3°C (0.54°F). This speeds stabilization time for calibrations. This however only applies to the reference temperature, as the sensor being tested has a larger mass and reacts more slowly to temperature changes, see fig. 4-1. Dotted line. Consequently, always make sure that before performing calibration, that the indicator for stable temperatures in the calibrator (a \* is shown in the display after the SET POINT temperature) is present and also take into consideration the mass of the sensor being tested.

When using the DB-1100 & DB-1200 with the CS-1000 software in semiautomatic

mode, the PC will inform when the sensor being tested has obtained stabilization.

### 3.4.2 High accuracy

Dry block calibrators accuracy and performance to a given specification is dependent on the fact that it reproduces the conditions for under which it was calibrated. There are several factors that may have affect on the accuracy of the calibrators. There are variations in the sensor diameter, length, thermo-conductivity, the active element's position in the sensor, cleanness of the sensor and fit in the insert from the one used during the calibrator's calibration.

Simpson delivers undrilled insertion tubes to allow customers to drill to their own sensor diameter. In these cases we can not guaranty for the calibrators specifications as we cannot control the customization.

### 3.4.3 Heat loss to the surroundings

When calibrating - testing a long sensor that is partly exposed when mounted in the calibrator, a heat loss to the surroundings will result. This is especially true when the sensor has a large mass that is exposed. This heat loss will affect the accuracy, and may be as much as 0.5°C to 1.0°C (0.9-1.8°F).

As a general rule, the exposed length of the sensor should be <1/4 of the length of the sensor. We recommend that some of the exposed part of the sensor be insulated. See fig. 3-2.

Different insulating materials may be used but is important that they can withstand the operating temperatures and has a good insulation characteristic. It should be flexible so that it can be tucked around the sensor. Consult Simpson for further information.

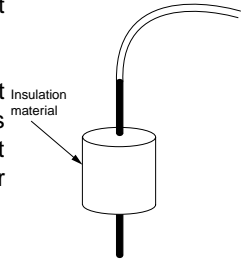


Figure 3-2 ' Insulation

### 3.4.4 Cleaning of block and insert

In order to obtain maximum performance of the calibrator it is important to keep the temperature well and insert as clean as possible. Before starting a calibration clean the well and insert. The insert is cleaned using a dry cloth. Compressed air may be used to clean the well.

### 3.4.5 Method of calibration

During the calibration of the calibrator a silicon oil was used in the insert in order to obtain a good thermal conduction between the insert and the reference thermometer. This silicon oil was used during the entire calibration of the calibrator.

We recommend that silicon oil be used in the insert when using the calibrator in

order to obtain the same conditions as when the calibrator was calibrated.

## **4 RS-232 INTERFACE**

---

The DB Calibrators come with an RS-232 port for connection to a PC as a standard.

To ease the calibration task we have developed a Windows based software CS-1000 to be used with the calibrator when calibrating.

By using the CS-1000 software the calibration procedure is made easy and simple and the data can be presented in a calibration report that takes into account the ISO 9000 specifications, procedures, setup and tractability.

It will also generate a simple database for your sensors and temperature circuits. The software will be of a significant time saving factor for the operator, when at the same time it is almost self instructive in use.

Baud rate : 9600 baud  
no parity  
8 bits  
1 stop bit

9 pin D-SUB female connector,

Tx	pin 2
Rx	pin 3
Gnd	pin 5

The DB Calibrators communicate with the CS-1000 PC based calibration software using an eight-byte communications protocol. All parameter settings and control can be set remotely using the CS-1000 software.



## 5 TECHNICAL SPECIFICATIONS

---

Model	DB-1100	DB-1200
Temperature Range	-40 to +125°C (81°F below ambient to 250°F)	-40 to +150°C (81°F below ambient to 300°F)
Calibrated Range	-20 to +125°C (81°F below ambient to 250°F)	-20 to +150°C (81°F below ambient to 300°F)
Resolution	0.01°C (0.02°F)	
Accuracy	±0.3°C (0.6°F)	
Stability	±0.03°C (0.06°F)	
Max. Cooling Time	20 minutes	
Max. Heating Time	15 minutes	
Well Depth	4.33" (110mm)	
Well Diameter	3/4" (19mm)	
Thermostat Test	Yes	
RS-232	Yes	
Line Voltage	110VAC (90-130VAC)	
Line Voltage	230VAC (180-260VAC)	
Power	180 watt	
Dimensions	W 8.86" (225mm) H 4.92" (125mm) D 10.83" (275mm)	
Weight	15lbs (6.8kg)	
Operating Temperature Range	0 to +40°C (32 to 104°F)	

## 5.1 DB-1100 & DB-1200

## 5.2 DB-1300, DB-1400 & DB-1500

Model	DB-1300	DB-1400	DB-1500
Temperature Range	50 to 400°C (122 to 750°F)	50 to 600°C (122 to 1110°F)	50 to 650°C (122 to 1200°F)
Calibrated Range	50 to 400°C (122 to 750°F)	50 to 600°C (122 to 1110°F)	50 to 650°C (122 to 1200°F)
Resolution	0.01°C (0.02°F)		
Accuracy	±0.3°C (0.6°F)	±0.5°C (0.9°F)	±0.5°C (0.9°F)
Stability	±0.03°C (0.06°F)	±0.05°C (0.09°F)	±0.05°C (0.09°F)
Max. Heating Time	12 Minutes	18 Minutes	18 Minutes
Well Depth	6" (155mm)		
Well Diameter	1" (26mm)		
Thermostat Test	Yes		
RS-232	Yes		
Line Voltage	110VAC (100-130VAC)		
Line Voltage	230VAC (198-250VAC)		
Power	1600 watt		
Dimensions	W 8.86" (225mm) H 4.92" (125mm) D 10.83" (275mm)		
Weight	16lbs (7.3kg)		
Operating Temperature Range	0 to +40°C (32 to 104°F)		

## NOTES

**SIMPSON ELECTRIC COMPANY** 853 Dundee Avenue  
Elgin, IL 60120-3090 (847) 697-2260 FAX (847) 697-2272  
Printed in U.S.A. Part No. 06-116847 Edition 3, 05/01  
Visit us on the web at: [www.simpsonelectric.com](http://www.simpsonelectric.com)