

**TC125**  
**TC150**  
**TC400**  
**TC650**  
**TEMPERATURE CALIBRATORS**  
**USER'S MANUAL**

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SCSMANP004  
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**Thank you**

for purchasing a Tek Know temperature calibrators.

The Tek Know products are manufactured by Scan-Sense AS in accordance with our high quality standards in design, choice of components and workmanship in order to achieve maximum customer satisfaction and to fulfil our vision to be our customers "First Choice".

**The TC125, 150, 400 and 650 are designed and manufactured by :**

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## Contents

1.1	Certification	5
1.2	Warranty	6
1.3	Notice	6
1.4	Safety	7
<b>2.</b>	<b>INTRODUCTION</b>	<b>9</b>
<b>3.</b>	<b>CALIBRATORS TC650 &amp; TC400</b>	<b>11</b>
<b>3.1</b>	<b>PREPARATION</b>	<b>11</b>
3.1.1	Preparing the Heating calibrators for use.	11
3.1.2	Power Requirements TC400 & TC650	13
3.1.3	Fuses	12
<b>3.2</b>	<b>GETTING STARTED</b>	<b>13</b>
3.2.1	Power On	13
3.2.2	Celsius – Fahrenheit Setting	14
3.2.3	Default setting	14
<b>3.3</b>	<b>HOW TO EXECUTE CALIBRATIONS</b>	<b>15</b>
3.3.1	Calibration Procedure	15
3.3.2	Calibration at High Temperatures	16
3.3.3	Precaution	16
3.3.4	Test of thermostats	17
<b>3.4</b>	<b>CALIBRATION HINTS</b>	<b>18</b>
3.4.1	Time Constants	18
3.4.2	High Accuracy	19
3.4.3	Heat loss to the Surroundings	20
3.4.4	Cleaning of block and Insert	20
<b>4.0</b>	<b>CALIBRATORS TC125 &amp; TC150</b>	<b>21</b>
<b>4.1</b>	<b>PREPARATION</b>	<b>21</b>
4.1.1	Preparing the TC125 & TC150 for use	21
4.1.2	Power Requirements	21
4.1.3	Fuses	22
<b>4.2</b>	<b>GETTING STARTED</b>	<b>22</b>
4.2.1	Power on	22
4.2.2	Celsius – Fahrenheit setting	23
4.2.3	Default setting TC125 & TC150	24

<b>4.3</b>	<b>HOW TO EXECUTE CALIBRATIONS</b>	<b>25</b>
4.3.1	Calibration Procedure TC125 & TC150	25
4.3.2	Calibration at Low Temperatures	26
4.3.3.	Precaution	27
4.3.4	Test of Thermostats	27
<b>4.4</b>	<b>CALIBRATION HINTS</b>	<b>28</b>
4.4.1	Time constants	28
4.4.2	High Accuracy	29
4.4.3	Heat loss to the Surroundings	29
4.4.4	Cleaning of Block and Insert	30
4.4.5	Method of calibration	30
<b>5.</b>	<b>RS 232 INTERFACE</b>	<b>31</b>
<b>6.</b>	<b>TECHNICAL SPECIFICATIONS</b>	<b>32</b>
<b>6.1</b>	<b>TC125 &amp; TC150</b>	<b>32</b>
<b>6.2</b>	<b>TC650 &amp; TC400</b>	<b>33</b>

## 1.1 Certification

Scan-Sense AS certifies that this product meets its published specifications at the time of shipment from the factory. Scan-Sense AS further certifies that its calibration measurements are traceable to Norwegian Accreditation Standards and to the calibration facilities of other International Standards Organisation members (FSO).

Scan-Sense AS declares that the following products :

**TC125, TC150, TC400 and TC650**

confirm to the following standards :



EN 500081-1 : 1992

EN 500082-1 : 1992

EN 61010 : 1993

EN 60742-1

IEC 801-2

DS 5104

## **1.2 Warranty**

These Tek Know products are warranted against defects in material and workman-ship for a period of one year from date of shipment. During the warranty period, Scan-Sense will, at its option, either repair or replace products that prove to be defective.

The product must be returned to a service facility designated by Scan-Sense for warranty service or repair. The foregoing warranty will not apply to defects resulting from improper or inadequate maintenance by buyer, buyer supplied software or interfacing, unauthorised modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Scan-Sense shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

## **1.3 Notice**

All rights reserved. Reproduction of any part of this manual in any form what so-ever without Scan-Senses expressed written permission is forbidden.

All efforts have been made to ensure the accuracy of this manual. However, should any errors be detected, Scan-Sense would greatly appreciate being informed of them.

The above notwithstanding, Scan-Sense can assume no responsibility for any errors in this manual or of their consequences.

## 1.4 Safety



The warning sign denotes a hazard. Such warning labels are fitted to several places on the calibrators. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning sign until the indicated conditions are fully understood and met. If you are in doubt please contact your nearest Tek Know dealer.

A dry block calibrator is constructed in such a manner that it is impossible to operate it without generating hot areas that can be of danger. It is very important the operator in charge of the calibrator is aware of the potential dangers and that he relays this information to any other future user.

There are no operational switches or buttons inside the calibrator that is 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.

After the calibrator has been operated it may be very hot. Do not turn off the calibrator if the temperature is above 400°C. The correct procedure is to set the setpoint to 50°C. and allow it to cool below 100°C.

If the calibrator switches itself down during operation, this can be due to the internal safety trip switch. In these cases please 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 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 0.5 m. above and 0.1 m, open space on either side and with satisfactory ventilation or temperature control.



## 2. INTRODUCTION

The TC calibrators user manuals are intended to be used with the Tek Know portable calibrators TC125, TC150, TC400 and TC650. The TC Calibrators are constructed with a dry temperature variable well, with a special designed temperature controller. A digital controller with a dedicated CPU gives the TC calibrators flexible controllability. 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 TC400 & TC650 has a resolution of 0.1°C, however the PID controller works with a resolution of 0.01°C. Effectively this means that a better stability than 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 stable state and longer stabilisation 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 accessories such as cable and inserts.

The communication port RS-232 comes as a standard feature, for use with a computer in the calibration process. Tek Know provides optional calibration software for temperature. The TC calibrators together with the SC200 calibration software and SM300 Signal master will give you an automatic calibration system.

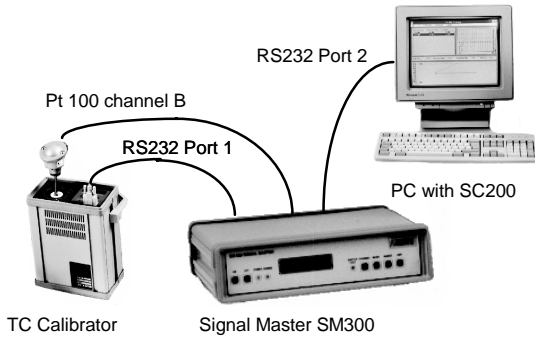


Figure 2-1, 'Automatic calibration with internal reference'

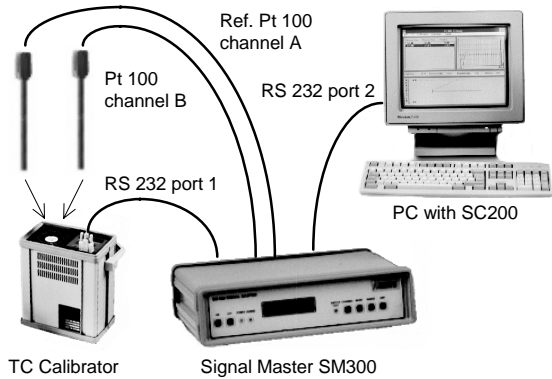


Figure2-2, 'Automatic calibration with external reference'

## **3. CALIBRATORS TC400 & TC650**

### **3.1 PREPARATION**

#### **3.1.1 Preparing the heating calibrators for use.**

**Table 3-1. Items included with the TC400/650 temperature calibrators:**

- Temperature calibrator: TC400 or 650
- Carrying case
- Power cord
- Test cable for thermostats
- Tool for changing inserts
- Insertion tube with 6.5 mm hole.
- Insertion tube with 10.5 mm hole.
- Calibration certificate
- User`s manual

#### **3.1.2 Power requirements for TC400 & TC650**

The TC400 & TC650 temperature calibrators are portable instruments that require no physical installation other than connection to a grounded AC power source. Do not connect AC power until you have verified that the line voltage is correct and that the proper fuse is installed. Otherwise damage to the equipment may occur.

**Table 3-2. Power requirements for heating calibrators**

	<b>100 Volt</b>	<b>110 Volt</b>	<b>230 Volt</b>
Input Voltage	90 to 110 V	100 to 130 V	198 to 250 V
Frequency	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz
Power consumption:	1600 W	1600 W	1600 W

Failure to ground the temperature calibrator properly can result in personal injury. Use a 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 0.5 m. above and 0.1 m, open space on either side and with satisfactory ventilation or temperature control.



### 3.1.3 Fuses

The fuses used in the TC400 and TC650, 100 & 110Volt versions are ø 6,3 x 32 mm ceramic 15 amp (slow).

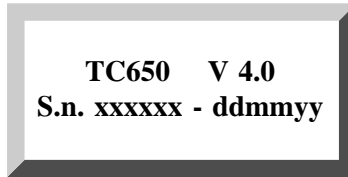
The fuses used in the TC400 and TC650 -230 Volt versions are ø 5 x 20 mm glass 10 amp (slow).

The fuses are placed next to the mains switch.

## 3.2 GETTING STARTED

### 3.2.1 Power On

When the TC650 or TC400 is switched on the LCD display on the front panel will show:

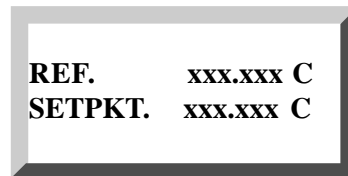


**TC650 V 4.0**  
**S.n. xxxxxx - ddmmyy**

x denotes the serial no. of the calibrator and ddmmyy is the date of last calibration of the calibrator.

V 4.0 indicates the software version no. of the calibrator.

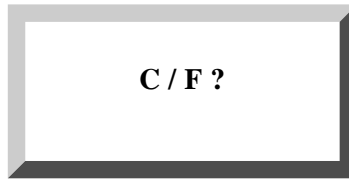
After 10 sec. the display will show:



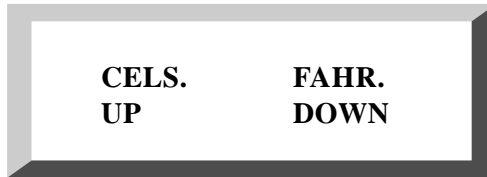
**REF.           xxx.xxx C**  
**SETPKT.       xxx.xxx C**

### 3.2.2. Celsius – Fahrenheit setting

To change the temperature notation press simultaneously the temperature setting buttons  $\epsilon$  and  $\hat{\epsilon}$  while switching on the power to the calibrator. The display will show :



After 2 sec. the display will show :



Press the temperature setting button  $\epsilon$  for displaying the temperature in Celsius. Press the temperature setting button  $\hat{\epsilon}$  for displaying the temperature in Fahrenheit.

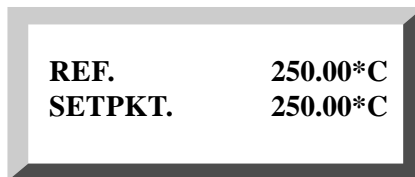
### 3.2.3 Default setting

The default setpoint setting for the TC650 & TC400 is 30°C.

### 3.3 HOW TO EXECUTE CALIBRATIONS

#### 3.3.1 Calibration procedure for TC400 and TC650

1. Move the adjustable handle to one side and turn on the main switch.
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.  
Note: The insention tube and the well must be clean.
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  $\leftarrow$  and  $\rightarrow$  on the front panel of the calibrator. It is indicated on the second line on the display SETPK.
6. The temperature in the thermo well is indicated in the first line of the display REF.
7. The reference temperature will stabilise to the SETPKT. When the reference temperature has been within  $\pm 0.2^{\circ}\text{C}$  of the setpoint for 3 min. a \* is visible after the last digit of the REF. temperature. After 7 min. a second \* appears behind the SETPKT temperature, the calibrator is now stable to within  $\pm 0.1^{\circ}\text{C}$ .



<b>REF.</b>	<b>250.00*C</b>
<b>SETPKT.</b>	<b>250.00*C</b>

The temperature control within the TC400 and TC650 uses a specially designed PID controller. Refer to chapter 3.4 for general requirements to obtain the specified accuracy.

### 3.3.2 Calibration at high temperatures

The TC650 can generate temperatures up to 650 °C. The TC400 can generate temperatures up to 400 °C. 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 to use the calibrator for more than 30 min. a time in the range 600-650 °C. If the calibrator is left at high temperature for approximately 45 minutes, the setpoint will automatically be set to 50°C.

### 3.3.3 Precaution

Please pay attention to the fact that RTD's and thermocouples will react quickly to temperature changes. Filled bulbs will react more slowly, even if the TC650 & TC400 have stabilised, 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 stabilisation. 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. The part of the sensor which is not immersed in the calibrator.

Never store the TC650 & TC400 in the carrying case before the temperature in the thermo well is below 50°C.



### **3.3.4 Test of thermostats**

The TC650 & TC400 have a built-in test functions for thermostats. Connect the alligator clips to the on-off function of the thermostat to the calibrator. The test light on the front of the calibrator will indicate when the on-off function of the thermostat is activated. Please pay attention to the fact that thermostats react slowly to temperature changes.

### 3.4 CALIBRATION HINTS

#### 3.4.1 Time constants

The TC650 & TC400'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 3-1.

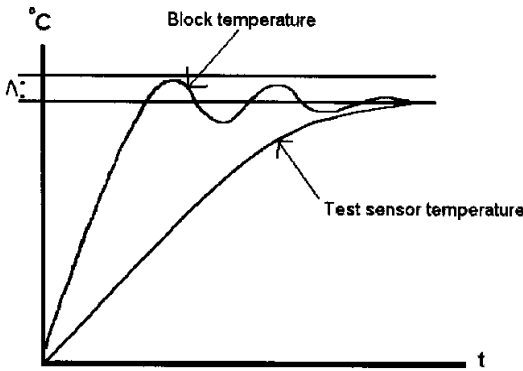


Figure 3-1 'Temperature Response'

A certain overshoot will take place when approaching the Set point. This speeds up stabilisation time for calibrations. This however only applies to the reference temperature, as the sensor tested has a larger mass and reacts more slowly to temperature changes, see fig. 3-1.

Consequently always make sure that before performing a calibration, that the indicator for stable temperature in the calibrator (a \* is shown in the display after the SETPKT. temperature) is present and also take into consideration the mass of the sensor being tested. When the TC650 & TC400 calibrators are used with the SC200 software in semi-automatic mode the PC will inform when the sensor being tested has obtained its stabilisation.

### 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.

For setpoint temperatures above 400 °C it is important that the insert block and sensor is clean and free from dust and oxidisation products.

Always approach the setpoint value from a lower temperature.

The TC400 and TC650 are calibrated dry using a Ø 6mm Industrial Standard Reference Pt-100 sensor placed in the bottom of a 6,5mm drilled insert.

Undrilled insertion tubes optional are available for custom drilling. In these cases Scan-Sense can not guaranty for the calibrators specifications.

To facilitate such calibration Scan-Sense can supply insertion tubes with 2 or more holes according to specifications.

### 3.4.3 Heat losses to the surroundings

When calibrating or 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. 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.

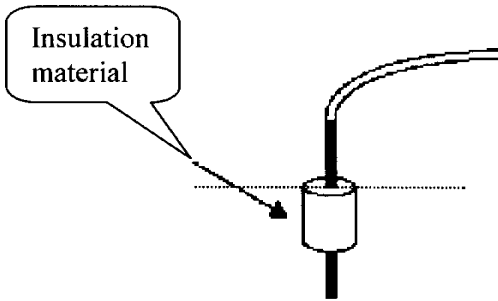


Figure 3-2 'Insulation'

Different insulating materials may be used, but it is important that it 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 Scan-Sense for further information.

### 3.4.4 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 fine 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.

## **4.0 CALIBRATORS TC125 and TC150**

### **4.1 PREPARATION**

#### **4.1.1 Preparing the cooling calibrators for use**

**Table 4 -1. Items included with the TC125 and TC150 Temperature Calibrator**

- Temperature calibrator TC125 or TC150
- Carrying case
- Power cord
- Test cable for thermostats
- Tool for changing inserts
- Silicon oil and syringe
- Insertion tube 3.5 mm hole.
- Insertion tube 6.5 mm hole.
- Calibration certificate
- Users manual

#### **4.1.2 Power requirements for TC125 and TC150**

The TC125 and TC150 temperature calibrators are portable instruments and require no physical installation other than connection to a grounded AC power source.



Do not connect AC power until you have verified that the line voltage is correct and that the proper fuse is installed. Otherwise damage to the equipment may occur.

**Table 1-2. Power requirements for cooling calibrators**

	<b>110 Volt</b>	<b>230 Volt</b>
Input Voltage	90 to 130 V rms	180 to 260 Vrms
Frequency	47 to 65 Hz	47 to 65 Hz
Power consumption	180 W	180 W



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

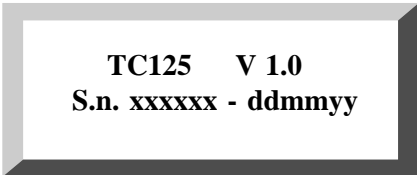
### **4.1.3 Fuses**

The fuse used in TC150 & TC125 is a  
ø 5 x 20 mm 2.0 amp (slow) 230 V.  
The fuse is placed next to the mains switch.

## **4.2 GETTING STARTED**

### **4.2.1 Power on**

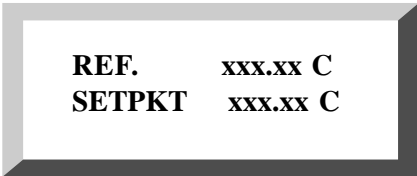
When the TC125 or TC150 is switched on the LCD display on the front panel will show:



**TC125    V 1.0**  
**S.n. xxxxxx - ddmmyy**

x denotes the serial no. of the calibrator and ddmmyy is the date of last calibration of the calibrator. V 1.0 shows the software version no. of the calibrator.

After 10 sec. the display will show:



**REF.        xxx.xx C**  
**SETPKT    xxx.xx C**

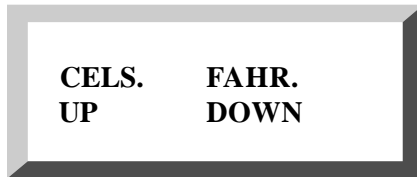
#### **4.2.2        Celsius – Fahrenheit setting**

To change the temperature notation press simultaneously the temperature setting buttons  $\hat{e}$  and  $\hat{c}$  while turning on the power to the calibrator.

The display will show :



After 2 sec. the display will show :



Press the temperature setting button  $\hat{e}$  for displaying the temperature in Celsius.

Press the temperature setting button  $\hat{e}$  for displaying the temperature in Fahrenheit.

### 4.2.3 Default setting TC125 and TC150

The default setpoint for the TC125 and TC150 is 20°C.



## 4.3 HOW TO EXECUTE CALIBRATIONS

### 4.3.1 Calibration Procedure TC125 & TC150

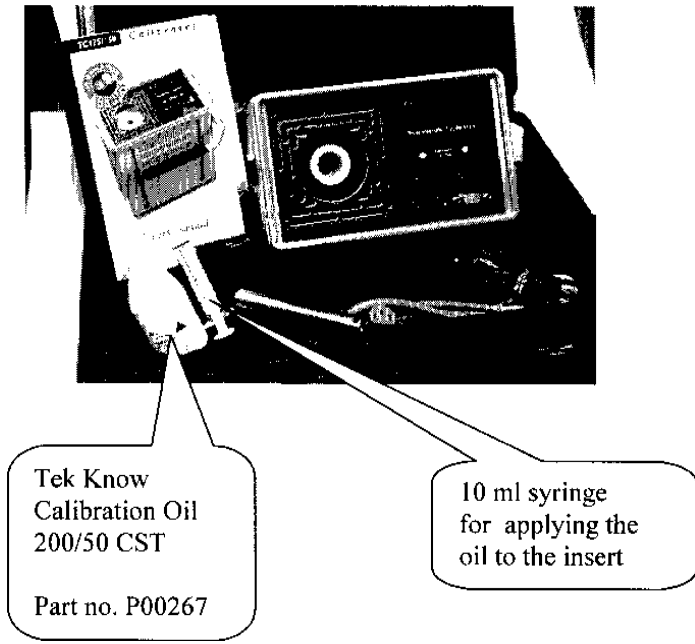
1. Move the adjustable handle to one side and turn on the main switch.
2. Select the insertion tube that best fits the sensor to be tested.
3. Place the insertion tube in the thermo well and place the sensor to be tested in the insertion tube and insure that a close contact between sensor and insertion 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 SETPKT.
6. The temperature in the thermo well is indicated on the first line of the display. REF.
7. The reference temperature will stabilise to the SETPKT. When the reference temperature has been within  $\pm 0.2^{\circ}\text{C}$  of the setpoint for 3 min. a \* is visible after the last digit of the REF. temperature. After 7 min. a second \* appears behind the SETPKT temperature, the calibrator is now stable to within  $\pm 0.1^{\circ}\text{C}$ .

<b>REF.</b>	<b>-15.00 *C</b>
<b>SETPKT.</b>	<b>-15.00 *C</b>

A PID controller is used in the TC125 & TC 150 to control the temperature. Refer to chapter 4.4 for general requirements to obtain the specified accuracy.

### 4.3.2 Calibration at low temperatures

The TC125 and TC150 can generate a temperature down to  $-40^{\circ}\text{C}$  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 TC125 & TC150. This is a silicon based oil with a viscosity of 50 and has a temperature range of  $-25^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ . 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 accessory with all cooling calibrators from Tek Know. Additional oil is available from Scan-Sense in 100ml bottles, order part no. P00267.

### 4.3.3. Precaution

Please pay attention to the fact that RTD's and thermocouples will react quickly to temperature changes. Filled bulbs will react more slowly and even if the TC125 has stabilised, 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 stabilisation. 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 coldness 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 TC125 and TC150 in the carrying case before the temperature in the thermo well is below 50°C.

### 4.3.4 Test of thermostats

The TC125 and TC150 has a built-in test function for thermostats. Connect the alligator clips to the on-off function of the thermostat to the calibrator. The test light on the front of the calibrator will indicate when the on-off function of the thermostat is activated. Please pay attention to the fact that thermostats may react slowly to temperature changes.

## 4.4 CALIBRATION HINTS

### 4.4.1 Time constants

The TC125 and TC150's reference sensor is mounted in the heating-cooling block and will react quickly to temperature changes (small time constant). The sensors being tested has 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. 4-1

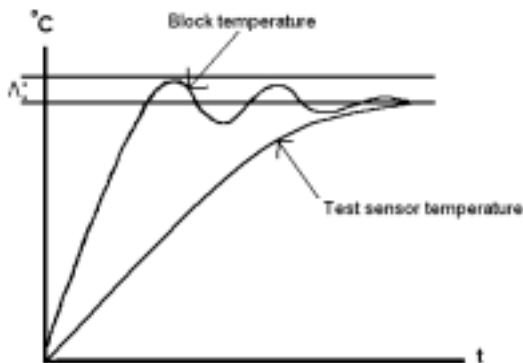


Figure 4-1 ' Temperature Response '

A certain overshoot will take place when approaching the Setpoint typically approximately  $0.3^{\circ}\text{C}$ . This speeds stabilisation 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.

Consequently 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 TC125 & TC150 software in seem automatic mode the PC will inform when the sensor being tested has obtained stabilisation.

## 4.4.2 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.

Undrilled insertion tubes optional are available for custom drilling. In these cases Scan-Sense can not guaranty for the calibrators specifications. To fabricate such calibration Scan-Sense can supply insertion tubes with 2 or more holes according to specifications.

## 4.4.3 Heat loss to the surroundings

When calibrating or 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  $0.5^{\circ}\text{C}$  to  $1.0^{\circ}\text{C}$ .

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. 4-2.

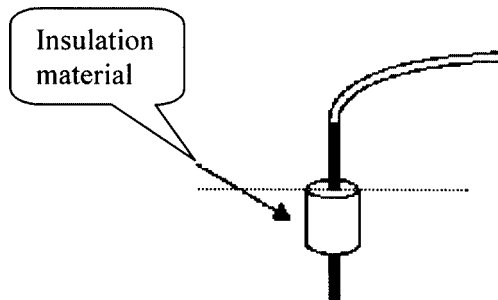


Figure 4-2 'Insulation

Different insulating materials may be used, but it is important that it 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 Scan-Sense for further information.

#### **4.4.4 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.

#### **4.4.5 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 therefore 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.

## RS 232 INTERFACE

The TC Calibrators are supplied with an RS 232 port for connection to a PC as a standard.

To ease the calibration task and save man-hours, Scan-Sense have developed a Windows® based software SC200. By using the SC200 software, automatic calibration can easily be done by the user.

Data can be presented in a calibration report that takes into account the ISO 9000 specifications, procedures, set-up and traceability.

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.

### SETUP:

Baudrate : 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 TC Calibrators communicate with the SC200 PC based calibration software using an eight-byte communications protocol. All parameter settings and control can be set remotely using the SC200 software.

## 6. TECHNICAL SPECIFICATIONS

### 6.1 TC125 & TC150

<b>Modell</b>	<b>TC125</b>	<b>TC150</b>
Temperature range*	-40°C to +125°C	-40°C to +150°C
Calibrated range	-20°C to +125°C	-20°C to +150°C
Resolution	0.01°C	0.01°C
Accuracy	±0.3°C	±0.3°C
Stability	±0.03°C	±0.03°C
Max cooling time	20min	20min
Max heating time	15min	50min
Well depth	110mm	110mm
Well diameter	19mm	19mm
Thermostat test	yes	yes
RS 232	yes	yes
Line voltage	110(90-130 V)	110(90-130 V)
	230(180-260V)	230(180-260V)
Power consumption	180W	180W
Dimensions	225x125x275mm	225x125x275mm
Weight	6,8 kg	6,8 kg
Operational temp. range	0°C to +40°C	0°C to +40°C

\* Min. temp is relative to ambient temp.



## 6.2 TC650 & TC400

<b>Modell</b>	<b>TC400</b>	<b>TC650</b>
Temperature range*	50°C to +400°C	50°C to +650°C
Calibrated range	50°C to +400°C	50°C to +650°C
Resolution	0.1°C	0.1°C
Accuracy	±0.3°C	±0.5°C
Stability	±0.03°C	±0.05°C
Max heating time	12min	18min
Well depth	155mm	155mm
Well diameter	26mm	26mm
Thermostat test	yes	yes
RS 232	yes	yes
Line voltage	110 V AC	110 V AC
	90-110V	90-110V
Line voltage	110 V AC	110 V AC
	110-130V	110-130V
Line voltage	230 V AC	230 V AC
	198-250V	198-250V
Power consumption	1600W	1600W
Dimensions	225x125x275mm	225x125x275mm
Weight	7,3 kg	7,3 kg
Operational temp. range	0°C to +40°C	0°C to +40°C

**Notes:**

**Notes:**

**Notes:**