QUESTemp°
Heat Stress
Monitors
Models 44 and 46

User Manual
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f. This warranty is VOID if the instrument is opened by anyone other than a factory authorized service center with the one exception where requirements set forth in the manual allow an operator to replace consumables or perform recommended cleaning;

g. This warranty is VOID if the product has been misused, neglected, subjected to accidental or intentional damage, or is not properly installed, maintained, or cleaned according to the requirements of the manual. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

h. New parts or components purchased are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment.

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Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI’s Customer Service department at 1-800-874-2811 (USA) or +001 (651) 490-2811 (International).
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**Introduction**

The QUESTemp° 44 and QUESTemp° 46, offer traditional heat stress monitoring without the aggravation of maintaining a wet bulb. Through collaboration with Professor Dr. Thomas Bernard, from the College of Public Health at the University of South Florida, mathematical models were implemented to create a Waterless Wet Bulb calculation through a combination of dry bulb temperature, globe temperature, relative humidity, and air flow. The Waterless Wet Bulb is used to calculate the Wet Bulb Globe Temperature (WBGT) which is a widely-used method to monitor environmental conditions related to heat stress.

![Figure 1: QUESTemp° 44/46 Heat Stress Monitor](image)

**QUESTemp° Models**

QUESTemp° 44 and QUESTemp° 46 both measure and calculate the dry bulb, wet bulb, globe, WBGT indoors, WBGT outdoors, relative humidity, and Heat Index or Humidex.

With the QUESTemp° 46, you have the capability to measure stay times in order to manage work/rest regimens. Guidance is based on the screening criteria for heat stress as defined in the ACHIH TLV Handbook, U.S. Navy PHEL charts, U.S. Navy/Marine Corp. Ashore Flag system, and EPRI Action Limits.

An additional feature with the QUESTemp° 46 is an optional detachable probe for measuring air velocity to determine appropriate levels of indoor thermal comfort monitoring.
Getting Started

Up and Running Overview

1. Place the QUESTemp° 44/46 Heat Stress Monitor in the work area in a safe location approximately 3.5 feet off the ground.

2. Turn the unit On. If the battery voltage displayed during the power-on sequence is less than or equal to 6.4 volts, replace or recharge the batteries.

3. Be aware that the sensors require 10 minutes to stabilize to a new environment.

4. In the main menu, View will be selected (an indicator arrow denotes the selected menu). Press the I/O Enter key to select.

5. Press the Run/Stop key to begin data logging. Use the arrow keys to set the display to the desired items.

Keypad Operation

The unit operates using a keypad with four keys. The I/O Enter key responds when the key is released while all other keys respond when the key is pressed.

<table>
<thead>
<tr>
<th>Keys</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Enter key</td>
<td>The unit turns on with a single key press. The unit turns off by holding the key down while a countdown of 3-2-1 occurs in the lower right corner of the display. This key is also used to select a mode (such as Setup or View) or enter setup changes. Pressing and releasing the key while viewing temperatures causes the display to view the next available sensor bar (indicated in the upper right corner of the display).</td>
</tr>
<tr>
<td>Up Arrow key</td>
<td>Changes items appearing in the display. Scrolls up.</td>
</tr>
<tr>
<td>Down Arrow key</td>
<td>Changes items appearing in the display. Scrolls down.</td>
</tr>
<tr>
<td>Run/Stop key</td>
<td>From the menu or view modes, pressing this key starts or stops the run mode. Pressing this key will exit the setup, print or reset modes.</td>
</tr>
</tbody>
</table>
### Escaping or moving back one screen

If you are in the setup, print, reset, or calibration screens, you can press **Run/Stop** key to escape or move back one screen.

<table>
<thead>
<tr>
<th>Keys</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escaping or moving back one screen</td>
<td>If you are in the setup, print, reset, or calibration screens, you can press <strong>Run/Stop</strong> key to escape or move back one screen.</td>
</tr>
</tbody>
</table>

---

**Figure 2: Keypad explained and identified**

---

**Turning On/Off and Basic Operation**

To quickly get you started with the QUESTemp° 44/46, the following section explains how to turn on the instrument, run, and stop your session.

1. **Press the I/O Enter key** to turn on. Proceeding the model and revision information displayed on the screen, the main menu will appear.

   ![Indicator arrow](image.png)

   Indicates the selected menu option. Then press I/O enter to select or press up/down arrows

   **Figure 3: Main menu of the QT²44/46**

2. **Press the I/O Enter key** (when view is selected) to access the measurement screens.

   - (The Wet and Dry measurements screen will display. See Figure 6 for an example).

3. To view different measurements, press the **Up** or **Down arrow** key to toggle through the views.
NOTICE
There are five user-selectable languages included in the QUESTemp° 44/46. If you see the fields such as Wet, Dry, WBGTi, and WBGTo, this indicates the measurements are displaying in English.

- To display an alternative language, select Setup from the main menu. Press the Down arrow repeatedly until "English" (or the appropriate language) appears. Then repeatedly press the I/O enter key to toggle through the languages. Once selected, all menus and measurement screens will change to the selected language. To return to the main menu, press the Run/Stop key.

4. To return to the main menu, press and hold the I/O Enter key (3, 2, 1 countdown will appear) and the main menu will display.
   - To select an option on the main menu, press the up or down arrow until an arrow appears directly in front of the appropriate menu selection and then press I/O enter key.

5. To power off, press and hold the I/O enter key from the main menu.

Placing the QUESTemp° 44/46 on the Job Site
The QUESTemp° 44/46 should be placed at a height of 3.5 feet (1.1 m) for standing individuals or 2 feet (.6 m) for seated individuals. Tripod mounting is recommended to get the unit away from anything that might block radiant heat or air flow. A 1/4" x 20 threaded bushing on the bottom of the instrument allows mounting to a standard photographic tripod. DO NOT stand close to the unit during sampling.

Before data logging, allow ten minutes for the sensors readings to stabilize.
Sensors

About the Sensor Bar
The sensor bar, on the QT® 44/46, is calibrated to its specific instrument and is not interchangeable with other QT® 44/46 products. The instrument has a sensor bar label which includes the serial number of the instrument and a sensor bar number. (This is indicated in the diagram below.)

Figure 4: About sensor bar and serial number

Globe Thermometer
The globe thermometer (left position) gives an indication of the radiant heat exposure on an individual due to either direct sunlight or hot objects in the environment. This is accomplished by placing a temperature sensor inside a blackened copper sphere and measuring the temperature rise. The WBGT index is based on the response of a 6-inch diameter globe. The QUESTemp uses a 2-inch diameter globe for a faster response time. The temperature of the 2-inch globe is correlated to match that of a 6-inch globe.

Waterless Wetbulb Sensor and Relative Humidity Sensor
The relative humidity sensor (middle position) is used to calculate the Waterless Wetbulb from a combination of dry bulb temperature, humidity and wind speed measurements. The Waterless Wetbulb is used to calculate an estimated WBGT value.
Dry Bulb Thermometer

The dry bulb thermometer (right position) measures the ambient air temperature. This measurement is used in the outdoor WBGT calculation when a high solar radiant heat load may be present. The series of white plates surrounding the sensor shield it from radiant heat.

Remote, Sensors 2 and 3

The top sensor bar (sensor 1) may be removed from the instrument and used through a remote cable. Shelter the instrument and remote the sensor bar if the measured environment is expecting heavy rain or if temperatures are above 60°C.

The sensor 2 and sensor 3 jacks on the side of the instrument allow simultaneous monitoring of up to three sensor arrays using connecting cables.

Cable lengths of up to two hundred feet (61 meters) may be used without a decrease in accuracy provided the environment does not contain strong electromagnetic fields.
The data from these arrays may be viewed separately or combined into a weighted average WBGT reading per ISO 7243. Change the displayed sensor bar by pressing and releasing the enter key. The upper right corner of the display shows the current sensor bar. 1 refers to the top sensor bar, 2 and 3 are labeled on the side of the unit, W indicates the weighted average which only appears if a WBGT is displayed and all three of the sensor bars are attached.

**Tri-sensor Weighted Average**

Per the recommendations outlined in ISO 7243:1989, when the temperature in the space surrounding a worker is not uniform, it is necessary to determine the WBGT index at three heights corresponding to the worker's ankles, abdomen and head and perform a weighted average on those values. It is computed using the formula:

\[
\text{WBGT}_{w} = \frac{\text{WBGT}_{\text{head}} + (2 \times \text{WBGT}_{\text{abdomen}}) + \text{WBGT}_{\text{ankles}}}{4}
\]

The QUESTemp° 44/46 always assigns the top sensor bar the double weighting. This calculation is shown if a WBGT display has been selected and if three sensor sets are connected.

**Measurements**

The QUESTemp° 44/46 data logging area heat stress monitor directly senses three parameters: dry bulb temperature (DB), globe temperature (G), and relative humidity (RH).

It computes the wet bulb (WB), the Wet Bulb Globe Temperature (WBGT), stay times for four possible indices, and the Heat Index (HI) or the Canadian Humidex. Using inputs on the side of the instrument, two additional sensor arrays can monitor up to three locations simultaneously.

On the QUESTemp° 46 model, you can measure air flow, in meters per second, by plugging an optional hot wire anemometer sensor into a side jack on the unit.

Determine thermal comfort indices, Predicted Mean Vote (PMV) and Predicted Percent Dissatisfied (PPD), using Detection Management Software (DMS).

**Waterless Wetbulb**

The Waterless Wetbulb is an estimated measurement using the % of Relative Humidity, Dry Bulb Temperature, and Globe Bulb Temperature to determine the psychrometric wetbulb. The psychrometric wetbulb value is adjusted based on air flow to provide the waterless wetbulb estimate.
Computing Waterless Wetbulb and Wind Speed

When computing the waterless wetbulb, you can increase accuracy by setting the air flow to the current environments wind speed. The recommended air flow setting for an indoor environment is 0.3 m/s unless otherwise determined with an air-probe measurement (available only on the QTº46 model). The recommended setting for outdoor environment is 2.0 m/s.

**NOTICE**

To convert wind speed from miles/hour to meters/sec use the following formula:

\[
\text{Miles/hour} \times 0.447 = \text{meters/sec.}
\]

(Example: If the average wind speed is 5 mph, then enter 5*.447 = 2.2 meters/sec.)

If you are using the QUESTempº46 with the Air Probe attached, you would not set the air flow setting. (It will automatically calculate with the current reading.)

See “Setup for Waterless Wetbulb Measurement” for details on setting the air flow.

**WetBulb Globe Temperature**

The WBGT is a weighted average of the three temperature sensors using the following formulas:

- WBGT (indoor) = 0.7WB + 0.3G (denoted as “WBGTi” on the display)
- WBGT (outdoor) = 0.7WB + 0.2G + 0.1DB (denoted as “WBGTo” on the display)

The resulting WBGT values can then be compared to indices of work-rest regimens (stay times) based upon workloads.

**Stay Times/Rest Times (QTº46 only)**

Stay times represent how long a worker should be able to safely work under heat stress conditions. Select one of four indices for displaying and printing from the unit: ACGIH Stay Times, NAVY PHEL’s, U.S. Navy/Marine Corp. Ashore Flag Conditions, or EPRI Action Limits. Refer to Appendix B for more information on the indices.

**Heat Index/Humidex**

The Heat Index is determined using the dry bulb temperature and relative humidity. Based upon charts available from the U.S. National Weather Service, Heat Index represents how an average person feels relative to climate conditions. For a given temperature, the higher the humidity, the higher the heat index.
The Heat Index is defined over a temperature range of 70°F–120°F (21°C–49°C) and a relative humidity range of 30%–99%. Outside of this range, the instrument will show dashes in the display for the Heat Index.

The Humidex, used primarily in Canada, works on the same concept as the Heat Index. The values are slightly different. The Humidex is defined over a temperature range of 70°F–109°F (21°C–43°C) and a relative humidity range of 20%–99%. Outside of this range, the instrument will show dashes in the display for the Humidex.

**Air Flow**

The QUESTemp° 46 measures air flow if the TSI® Quest™ Air Probe accessory is used. The Air Probe uses an omni-directional anemometer sensor that measures air flow between 0 and 20 meters per second in 0.1m/s increments. See “Air flow Functionality” for more details.

**Thermal Comfort**

Thermal comfort readings for indoor environments are a benefit of Detection Management Software (DMS) and are not displayed or printed from the instrument directly. Readings are derived from the dry bulb, relative humidity, mean radiant temperature, air flow, and user entered parameters of clothing, metabolic rate and external work.

Thermal comfort indices, Predicted Mean Vote (PMV) and Predicted Percent Dissatisfied (PPD), help predict the thermal satisfaction level of a person with their indoor environment. The PMV is a rating scale of +3 to -3 where +3 is much too warm, -3 is much too cool, and 0 is thermally neutral. The PPD reflects what percent of people in a given location would be dissatisfied with their thermal surroundings.

The formulas used by DMS to derive the PMV and PPD come from the international standard ISO 7730 “Moderate thermal environments - Determination of the PMV and PPD indices and specification of the conditions for thermal comfort”.
Operating QUESTemp° 44/46

Use the Up Arrow and Down Arrow keys to move the marker in the display in front of the desired mode. Pressing the I/O Enter key will select the mode.

View

Displays the measured data but does not log it. If more than one set of sensors is plugged into the unit, they can be displayed by pressing and releasing the I/O ENTER key. The displayed sensor set is shown in the upper right corner.

<table>
<thead>
<tr>
<th>WET</th>
<th>65.5°F</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRY</td>
<td>74.0°F</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6: Viewing measured data

NOTICE

To return to the menu, hold down the I/O ENTER key while a 3, 2, 1 countdown is shown in the lower right corner of the display. Then the menu screen will appear (see Figure 3 for an example).

Setup

Allows changing temperature units, language, time, date, logging rate, selecting between Heat Index and Humidex, turning air flow on or off, and setting stay time parameters.

To Setup parameters do one of the following:

1. From the main menu, select Setup by pressing the I/O Enter key.
2. Use the Arrow keys to select an item (listed below).
   - **Temperature**: Celsius, Fahrenheit.
   - **Language**: English, Spanish, French, Italian, German.
   - **Time**: 24 hour clock only.
   - **Date**: Day-month-year format.
   - **Log Rate**: 1, 2, 5, 10, 15, 30, 60 minutes.
   - **Heat Index** (United States), **Humidex** (Canada)
   - **Flow**: On (QT°46 only), Off with fixed rate. (0.3 m/s is the recommended value for indoor applications and 2.0 m/s for outdoor applications)
   - **Index**: None, ACGIH, Navy, Marine, EPRI and select either: WBGTi (indoor), WBGTo (outdoor) for Index setting.
**Index Settings** | **Explanation**
---|---
**TLV and action limit** | These index settings only apply to the ACGIH Index. EPRI Navy, and Marine will ignore this setting.

**Clothing Correction** | Parameters are set from 0 – 9.9°C. This is a clothing correction for the WBGT in degrees Celsius and is applied to the selected WBGT when the work duration is calculated. (It will not affect the WBGT as displayed by the unit.) This value should typically be set to 0.0 for the Navy. (The field is noted as “Clo Corr”.)

3. Press the **I/O Enter** key to change a parameter. Time and date require using the **Up/Down Arrows** and **I/O Enter** keys to modify each number.

**NOTICE**
At any time, you can move back one level, by pressing the **Run/Stop** key.

4. Exit Setup by pressing the **Run/Stop** key.

**Setup for Waterless Wetbulb Measurement (air flow rate)**
For the Waterless Wetbulb sensor calculation, an air flow rate (or wind speed) of 0.3 m/s is recommended and is the default setting of the instrument.

**NOTICE**
Only QT²46 supports the optional air-probe accessory.

If an air probe is not selected, the average wind speed of the environment should be configured. This value is then entered into the Flow screen under the setup menu.

**Flow**
- Off
- 00.3 m/s

**Air flow rate**
The selected value will be underlined. Press the **Up/Down** arrow key to change. Press **I/O Enter** key to select a value position.

**Figure 7:** Setting the air flow for Waterless Wetbulb sensor

**To Setup Air Flow Rate**
1. In the setup menu, select **Flow** by pressing the **Up/Down Arrow** key to select.
2. Press **I/O Enter** key and press **Up/Down Arrow** key to change the values. The **I/O Enter** key is pressed to toggle through the changeable fields and to return to the first column.
Print
Allows printing to a parallel or serial printer or to a computer. The QUESTemp° 44/46 will recognize the cable plugged in and configure itself for serial or parallel. If no cable is plugged in, it will default to serial. Press I/O Enter key to begin printing. Press Run/Stop key to return to the menu.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you want to stop the printing, press I/O enter key until you return to the main menu. When the printer has stopped printing, remove the cable from the printer to the instrument.</td>
</tr>
</tbody>
</table>

Reset
Resetting enables you to clear the logged data from memory. Press the I/O Enter key to enter the Reset mode. Clear the memory by holding down the I/O Enter key while the display counts down from three.

Run
The run mode begins a session in memory and logs the data.
1. Begin a session by pressing the Run/Stop key from the view mode (or measurement view). An asterisk in the lower right corner indicates the run mode.
   - To toggle through the views, press the up or down arrow.

<table>
<thead>
<tr>
<th>WBGTi</th>
<th>66.7° F</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBGTo</td>
<td>68.6° F</td>
<td>*</td>
</tr>
</tbody>
</table>

   Figure 8: Run mode indicator

2. End the session by pressing the Run/Stop key again. (The session will stop recording when the asterisk is no longer displayed.)

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the logging memory is full or if there are no sensors plugged into the unit, attempting to enter the Run mode will result in an error message. If the memory capacity is exceeded, the asterisk in the lower right corner of the display will turn into an “F” and the memory remaining screen will show “0.0”.</td>
</tr>
</tbody>
</table>

WBGTi 66.7° F 1
WBGTo 68.6° F * Run indicator
Displayed Items

For the QUESTemp° 44/46, the number in the upper right corner indicates which sensor bar’s data is displayed.

- “1” indicates the sensor bar placed on (or attached to) the top of the instrument. Sensors 2 and 3 are labeled on the side of the unit as “Sensor 2”, and “Sensor 3”.
- “W” indicates the weighted average which only appears if a WBGT is displayed and all three sensor bars are attached. An asterisk in the lower right corner indicates that the unit is in the run mode and is logging data.

The following measurements can be accessed on the display:

| Screen 1: WET (Wet bulb) | WET 80.5° F ▶ 1 
| DRY (Dry bulb) | DRY 92.2° F ✴  

Figure 9: Wet and Dry screen

| Screen 2: GLOBE | GLOBE 92.4° F ▶ 1 
| | ✴  

Figure 10: Globe screen

| Screen 3: WBGTi (Indoors) | WBGTi 84.1° F ▶ 1 
| WBGTto (Outdoors) | WBGTto 107.5° F ✴  

Figure 11: WBGTi & WBGTto screen

| Screen 4: RH (Relative Humidity) | RH 66.2 % ▶ 1 
| H.I. or HU (Heat Index or Humidex) | H.I. 84.3° F ✴  

Figure 12: RH and H.I/HU screen

| Screen 5: Air Flow (QT°46 only) | FLOW 0.3m/s ▶ 1 
| (If turned ON via setup) |  

Figure 13: Air Flow screen on QT°46

| Screen 6: Stay times (QT°46 only) | L M H VH ▶ 1 
| 60 45 30 15 | ✴  

Figure 14: Stay times (ACGIH)
Screen 7: Time (24 hour format)  
Date (day, month, year)

Figure 15: Time & Date screen

Screen 8: BAT (Battery voltage)  
MEM (Logging memory available in days)

Figure 16: Battery & Memory screen

NOTICE
A series of dashes appear in the display if one of the following occur:
▪ The Heat Index or Humidex is outside of its allowable range.
▪ The temperature is outside of its allowable range.
▪ A temperature sensor has failed.
▪ Stay times temperatures are outside of their defined range.

Stay Time
The screen(s) displaying stay time data appear different for each of the possible indices.

If ACGIH is selected, the recommended working minutes per hour are shown for each of the workload categories Light (L), Moderate (M), Heavy (H), and Very Heavy (VH). (See Figure 13 above.)

If the Navy PHELS are selected, the recommended working hours are shown based on a maximum of eight hours. Three screens are used to display the PHELS two at time.

NOTICE
“8:01” following one of the PHELS indicates greater than eight hours.

Figure 17: Navy Stay time screen
If **Flag** is selected, the Flag Conditions for U.S. Navy/Marines Corp. Ashore warning system screen will appear. There are five flag systems, no flag, yellow, green, red, and black, which provide heat exposure guidelines for acclimated individuals. (For more information, refer to the “U.S. Navy/ Marine Corp. Ashore Flag System”.)

![HEAT CATEGORY 1 YELLO W FLAG](image)

**Figure 18: Flag Conditions for U.S. Navy/Marine Corp. Ashore**

If **EPRI** is selected, the recommended working hours are shown based on a maximum of four hours. Working hours for Light (L), Moderate (M), and Heavy (H) workload categories are displayed below.

**NOTICE**

“4:01” indicates greater than four hours.

![Light, Medium, and Heavy maximum hours displayed](image)

**Figure 19: EPRI Stay time screen**

### Data Logging

Data from each sensor is recorded at the interval set by the logging rate. Every time **Run/Stop** is pressed, a session is either started or ended in memory. Each session contains a header with time, date, and summary information.

**Memory Table**: Gives the number of logging DAYS.

<table>
<thead>
<tr>
<th>Log Rate</th>
<th>1 min</th>
<th>2 min</th>
<th>5 min</th>
<th>10 min</th>
<th>15 min</th>
<th>30 min</th>
<th>60 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 sensor</td>
<td>11.2</td>
<td>22.5</td>
<td>56.2</td>
<td>112.4</td>
<td>168.6</td>
<td>337.3</td>
<td>674.5</td>
</tr>
<tr>
<td>2 sensors</td>
<td>5.6</td>
<td>11.2</td>
<td>28.1</td>
<td>56.2</td>
<td>84.3</td>
<td>168.6</td>
<td>337.3</td>
</tr>
<tr>
<td>3 sensors</td>
<td>3.7</td>
<td>7.5</td>
<td>18.7</td>
<td>37.5</td>
<td>56.2</td>
<td>112.4</td>
<td>224.8</td>
</tr>
</tbody>
</table>

**Table 1: Data logging (or memory table) table example**
Electronic Sensor Check

A verification module, Quest model 053-923, may be used to check the operation of the QUESTemp’s wet bulb, dry bulb, and globe. The purpose is to verify that the electronic components are within a specific range with known values and a known source. The temperature tolerances should be within ±0.5°C.

Example of Verification module

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the sensors are outside of the tolerances, this indicates the sensor alignment should be serviced off-site for calibration.</td>
</tr>
</tbody>
</table>

Performing an Electronic Sensor Check

1. Ensure the instrument is reading in Celsius prior to your electronic sensor check.
   - To change the temperature setting, select Setup from the main menu. Then, either Fahrenheit or Celsius will appear on the screen. When selected, press I/O enter key to switch between settings. For more information, refer to Operating.

2. Remove the top sensor bar, place to the side, and plug in the verification module into the center pins of the sensor housing.

3. Verify the measurement readings on the screen are within ±0.5°C tolerance to the readings printed on the verification module label. Example below:
   - Wet Bulb (WB) – 11.1°C
   - Dry Bulb (DB) - 45.3°C
   - Globe (G) – 69.2°C

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity (RH) is not valid on this instrument.</td>
</tr>
</tbody>
</table>

4. Once completed, remove verification module and place sensor bar back on the instrument. (Tighten down the two bolts.) Change the Celsius reading back to Fahrenheit. (Refer to step 1 a-b.)
Sensor Alignment

For highly accurate measurement readings, you should align your QUESTemp° 44/46 prior to data logging. For the RH sensor, it is recommended to align with a High concentration level using the 75% sensor salt, NaCl (sodium chloride), or a Low concentration level using the, the 33% sensor salt, MgCl (magnesium chloride). (See ColePalmer.com to order sensor alignment salts.)

RH Sensor Alignment

1. To open, navigate to the main menu and select View by pressing I/O Enter key (see A). A measurement screen will appear (see B).

2. Press and hold I/O Enter key and then press Down Arrow key from the View menu. The Alignment screen will appear.

3. Press Up/Down Arrow key to select either High or Low. Then press I/O Enter key.

4. Remove (or slide) the Sunshield (white globe) from the RH sensor and place it to the side. (See Figure 22.)

5. Place a latex finger cot (user supplied) over the humidity sensor in order for the sensor to stabilize quicker about 15 minutes (or up to 60 minutes without).

**NOTICE**

Latex finger cots can be found at various hardware stores or online such as ColePalmer.com.
6. **Place** the **Salt container**, with the salt alignment cap removed, over the **RH sensor** (middle sensor). Allow level to **stabilize** for at least **15 minutes**. (Refer to Figure 23.)

About sensor alignment: if readings are within ±0.5%, a change in sensor alignment is not required. Skip to step 7 to return to main menu.

**NOTICE**

For a High alignment, use the 75% sensor alignment salt (NaCL) and for a Low alignment, use the 33% alignment salt (MgCl).

**Figure 23: RH alignment with Low % example**

Adjust % to 33% (using up/down arrow keys) and press **Enter** (after level has stabilized) to store sensor alignment level.
7. In either the High/Low RH alignment screen, adjust the level to the percentage displayed on the salt container by using the **Up/Down Arrow** keys. Press **I/O Enter** key to save. (The instrument will state either “Successful” or “Failure” if it passed/did not pass. For “Failure” repeat the steps above.)

8. To return to the main menu, press **Run/Stop** key.

9. Verify the RH sensor is ±0.5% of the specific percentage. If not repeat the steps above.

10. Remove the alignment salt and finger cot. Replace the Sunshield over the RH sensor when completed with the sensor alignment.

**Printing**

The recorded data can be sent to a computer through the serial RS232 port or to a parallel printer. Serial transmission requires cable #054-715. Parallel transmission requires cable #056-875. With the cable plugged in, select **PRINT** from the menu and press the **I/O Enter** key to enter the PRINT mode. Begin printing by pressing the **I/O Enter** key. Press the key again to abort printing.

**Serial**

TSI® Detection Management Software (DMS) is recommended for downloading, storing, and graphing your data. Communications programs such as Windows® HyperTerminal® program may also be used to capture the printout into a file. The baud rate is fixed at 9600.
Parallel

Data can be sent directly to parallel printers that accept direct ASCII test input without special drivers. Make sure the printer is powered on and is online, ready to accept data, prior to printing.
**Air Flow Functionality**

(Available using TSI® Incorporated's Air Probe on QUESTemp® 46 model only.)

Air flow is measured in meters per second over a range of 0 to 20 m/s in 0.1 m/s increments. The sensor should be placed or held perpendicular in the air stream. Unlike many anemometers, the omni-directional sensor does not require rotating to find the maximum reading. Be careful not to block the air flow with your body during measurements. The sensor's measuring tip is fragile; be cautious if measuring in ducts.
The Air Probe may be either hand-held or mounted behind the QUESTemp° 46 using the mounting bracket hooked to the sensor bar beneath the center bulb sensor. (See Figure 27 below.)

A green lamp indicator in the Air Probe indicates that it is turned on and the battery is good. If the green indicator turns off while the switch is in the On position, replace or recharge the battery.

![Diagram of Air Probe and bracket setup]

**Figure 27: Air flow configuration**

**Operating Sequence**

1. Turn **Flow On** in the setup menu of the QUESTemp° 46.
2. Plug the Air Probe into the port labeled **Flow** on the side of the QUESTemp° 46.
3. Turn on the Air Probe **ON** and make sure the green lamp is lit.
   - In the View or Run modes, air flow is displayed on the fifth screen.
Data Logging Air Flow

To data log air flow in the QUESTemp° 46, the following two conditions must be met.

1. First, turn Flow On in the setup menu.

2. Second, make sure that a temperature sensor bar is connected to the Sensor 1 location (top) of the QUESTemp°46. Flow prints out with the Sensor 1 data therefore air flow data will only be reported if a sensor bar is plugged in. Air flow is recorded during the run mode at the interval the QUESTemp° 46 is setup for.

Batteries for Air Probe

The Air Probe uses a single NiMH Black & Decker® VersaPak™ Gold battery. Typical operating time of the battery is between 6 and 8 hours.

To change the battery, push in and twist, counterclockwise, the cap on the bottom of the Air Probe. Pull out the battery. Insert a fully charged battery and replace the cap.

To recharge the batteries, set the battery into the VersaPack™ charger. The supplied charger accepts one or two batteries. A full charge takes 9 hours. An indicator light shows that the battery is properly charging and it will remain on as long as the battery is in the charger. Continuous charging is not a safety concern.

Operational Check

A verification module, TSI® Model 053-923, may be used to check the operation of the QUESTemp. Remove the top sensor bar and plug the verification module into the top of the unit. With the QUESTemp set to read in degrees Celsius, verify that the displayed readings match those printed on the module within ±0.5°C.

If the readings are not within the ±0.5°C tolerance, then have the unit serviced and calibrated.

Power Options

There are three options for powering the QUESTemp° 46: a 9-volt alkaline battery, a NiMH (Nickel Metal Hydride) rechargeable 6-cell battery pack, and an AC adapter. A door on the back of the unit allows the user access to the 9-volt battery. The rechargeable battery pack is located inside of the unit. If the rechargeable battery pack ever needs to be replaced, it can be accessed by removing the screws from the bottom panel of the unit.
The two-position switch located in the battery compartment must be set by the user if the power supply method is changed. The up position is for the 9-volt battery. The down position allows for either the AC adapter or the rechargeable batteries. The AC adapter will trickle charge the rechargeable batteries if they are in place or it will simply allow for line power operation of the unit.

9-Volt Alkaline Battery Replacement

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recharge batteries only in a non-hazardous environment.</td>
</tr>
</tbody>
</table>

The 9-volt battery should be replaced or the NiMH battery pack should be recharged when the voltage drops below 6.4 volts. The battery voltage is displayed when the instrument is turned on. While turned on, the battery voltage can be displayed at any time by pressing the up or down arrow keys to move through the display until the battery voltage screen appears. If, while operating, the battery voltage drops below 6.4 volts, the display will automatically switch to the display showing the battery voltage along with a low battery message. After a low battery occurs, the unit will continue to operate for approximately 8 hours. When the battery voltage falls to 6.2 volts or below, the unit will automatically turn off.

Replace only with an approved 9-volt alkaline battery.

Approved 9-Volt Batteries

- **Eveready**: .............Energizer® 522, EN22, 6LR61
- **Duracell®**: .............MN1604
- **Panasonic®**: ..........6LR61, 6AM6X
- **Rayovac®**: .............A1604
- **UltraLife®**: ...........U9V

---

*Eveready, Energizer and Rayovac are registered trademarks of Energizer Brands, LLC. Duracell is a registered trademark of Duracell U.S. Operations, Inc. Panasonic is a registered trademark of Panasonic Holdings Corporation. UltraLife is a registered trademark of Ultralife Corporation.*
NiMH Battery Pack

**WARNING**

Recharge batteries only in a non-hazardous environment.

The NiMH rechargeable battery pack is charged in the instrument using TSI® Incorporated’s AC 120 VAC to 9 VDC adapter (part #015-910) or 220 VAC to 9 VDC adapter (part #015-680). A discharged battery pack requires an “overnight” charge of 16 hours (for the 120V adapter). Leaving the AC adapter plugged in for extended lengths of time or when operating the instrument will not harm the rechargeable batteries.

![NiMH Battery](image)

*NIMH Battery*
To install: Slide into case and plug in connector as shown.

**Figure 29: NiMH rechargeable battery**
Contact/Service Information

This section gives directions for contacting TSI® Incorporated for technical information and directions for returning the QUESTemp° 44/46 for service.

Technical Support Contacts

If you have any difficulty setting or operating the instrument, or if you have technical or application questions about this system, contact TSI® Incorporated's Technical Support.

<table>
<thead>
<tr>
<th>North America and Asia Pacific</th>
<th>Europe, Middle East, and Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Telephone:</strong> 1-800-680-1220 (USA); +1 651-490-2860 (outside USA)</td>
<td><strong>Telephone:</strong> +49 241-52303-0</td>
</tr>
<tr>
<td><strong>Fax:</strong> +1 651-490-3824</td>
<td><strong>E-mail:</strong> <a href="mailto:tsigmbh@tsi.com">tsigmbh@tsi.com</a></td>
</tr>
<tr>
<td><strong>E-mail:</strong> <a href="mailto:technical.services@tsi.com">technical.services@tsi.com</a></td>
<td></td>
</tr>
</tbody>
</table>

Service Contact Information

If your instrument does not operate properly, or if you are returning the instrument for service, visit our website at tsi.com/service for a Service Request form, or contact Customer Service.

<table>
<thead>
<tr>
<th>North America and Asia Pacific</th>
<th>Europe, Middle East, and Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TSI Incorporated</strong></td>
<td><strong>TSI Instruments Ltd.</strong></td>
</tr>
<tr>
<td>1060 Corporate Center Drive</td>
<td>Stirling Road</td>
</tr>
<tr>
<td>Oconomowoc, WI 53006-4828</td>
<td>Cresssex Business Park</td>
</tr>
<tr>
<td><strong>Telephone:</strong> 1-800-680-1220 (USA); +1 651-490-2860 (outside USA)</td>
<td>High Wycombe, Bucks</td>
</tr>
<tr>
<td><strong>E-mail:</strong> <a href="mailto:technical.services@tsi.com">technical.services@tsi.com</a></td>
<td>HP12 3ST</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
</tr>
<tr>
<td></td>
<td><strong>Telephone:</strong> +44 (0) 149 4 459200</td>
</tr>
<tr>
<td></td>
<td><strong>E-mail:</strong> <a href="mailto:tsiuk@tsi.com">tsiuk@tsi.com</a></td>
</tr>
</tbody>
</table>
Returning for Service
Visit our website at tsi.com/service and complete the on-line “Service Request” form or call TSI® at 1-800-680-1220 (USA) or (651) 490-2860, or 001 651 490-2860 (International) for specific return instructions.

Customer Service will need the following information:
▪ The instrument model number
▪ The instrument serial number
▪ A purchase order number (unless under warranty)
▪ A billing address
▪ A shipping address

Use the original packing material to return the instrument to TSI® Incorporated. If you no longer have the original packing material, seal off any ports to prevent debris from entering the instrument and ensure that the display and the connectors on the instrument front and back panels are protected. This instrument is very fragile and must be packed in a manner appropriate for a precision instrument.

Calibration
The QUESTemp® 44/46 heat stress monitor and TSI® field calibrator devices should be examined regularly by the factory. An annual calibration is recommended. (See Service Information above.)
**Appendix A: Specifications**

**Measurements**
- Globe temperature, dry bulb temperature, wet bulb temperature, % relative humidity, WBGTin, WBGTout, WBGT weighted average (if 3 sensor sets), and Heat Index / Humidex.
- Temperatures given in Celsius or Fahrenheit.
- Index (QT°46 only): ACGIH TLV, U.S. Navy PHEL Charts, Flag Conditions for U.S. Navy/Marine Corp. Ashore, and EPRI

**Data Logging**
- Records and prints all measurements at user selected interval of 1, 2, 5, 10, 15, 30, or 60 minutes. 128K bytes of data memory.

**Languages**
- English, French, Spanish, Italian, German

**Housing**
- Designed water resistant to a light rain or mist. If rain is frequent, best practice would be to remote the sensor bar and keep the instrument sheltered.

**Size**
- Height 9.2 in. (23.5 cm); Width 7.2 in. (18.3 mm); Depth 3.0 in. (7.5 mm)
- Dimensions include mounted sensor assembly

**Weight**
- 2.6 lbs. (1.2 kg) with mounted sensor assembly

**Sensor Types**
- Temperature: 1000 ohm platinum RTD
- Humidity: Integrated circuit with capacitive polymer sensor

**Accuracy**
- Dry Bulb and Globe Temperature: ±0.5°C between 0°C and 120°C
- Waterless Wet Bulb Temperature: Expanded measurement uncertainty of 1.1°C (k=2) between 0°C and 80°C
- Relative humidity: ±5% between 20 to 95% (non-condensing)
Operating Temperature Range
- Sensor Assembly: -5°C to +100°C
- Electronics: -5°C to 60°C

Remote Sensor Bars
- 2 x 15 pin D-sub jacks are located on the side of the unit for plugging in 1 or 2 additional sensor bars by using remote cables up to 200 feet (61 m). The top sensor bar can also be remote with a cable.

Power Options
- 9V alkaline, 7.2V NiMH rechargeable pack (charged in the unit), or AC adapter wall power cube (AC adaptor will operate the unit or recharge the NiMH battery pack)

Battery Life
- 9V alkaline: 80 hours
- Rechargeable Nickel Metal Hydride: 160 hours
- (Adding additional sensor bars reduces battery life.)

Charge Time (NiMH Battery Pack)
- 16 hours (charge in the unit)

Air Probe Accessory
- Range: 0–20 meters per second. 0.1 m/s increments
- Sensor: Omni directional heated thermistor
- Accuracy: ±(0.1 m/s + 4%) of measurement value
- Battery Life: 6–8 hours for fully charged NiMH battery
- Charge Time: 9 hours
Appendix B: Heat Exposure Tables

ACGIH
Screening Criteria for Heat Stress Exposure. WBGT values in °C.

**NOTICE**
According to the ACGIH’s guidelines, the temperature values represent a work and rest process which is explained in the standards. Refer to the ACGIH TLVs and BEIs for specific details.

<table>
<thead>
<tr>
<th>Work and recovery (TLV)</th>
<th>Light</th>
<th>Moderate</th>
<th>Heavy</th>
<th>Very Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>75% to 100%</td>
<td>31.0</td>
<td>28.0</td>
<td>26.0*</td>
<td>23.5*</td>
</tr>
<tr>
<td>50% to 75%</td>
<td>31.0</td>
<td>29.0</td>
<td>27.5</td>
<td>25.5*</td>
</tr>
<tr>
<td>25% to 50%</td>
<td>32.0</td>
<td>30.0</td>
<td>29.0</td>
<td>28.0</td>
</tr>
<tr>
<td>0% to 25%</td>
<td>32.5</td>
<td>31.5</td>
<td>30.5</td>
<td>30.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work and recovery (Action Limit)</th>
<th>Light</th>
<th>Moderate</th>
<th>Heavy</th>
<th>Very Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>75% to 100%</td>
<td>28.0</td>
<td>25.0</td>
<td>22.5*</td>
<td>20.0*</td>
</tr>
<tr>
<td>50% to 75%</td>
<td>28.5</td>
<td>26.0</td>
<td>24.0</td>
<td>22.5*</td>
</tr>
<tr>
<td>25% to 50%</td>
<td>29.5</td>
<td>27.0</td>
<td>25.5</td>
<td>24.5</td>
</tr>
<tr>
<td>0% to 25%</td>
<td>30.0</td>
<td>29.0</td>
<td>28.0</td>
<td>27.0</td>
</tr>
</tbody>
</table>

*Values not specified by ACGIH have been estimated for continuity.
ACGIH Clothing Corrections

The following clothing corrections are in degrees Celsius. When a clothing correction is entered into the setup portion of the QUESTemp° 46, the value is added to the WBGT only for looking up the stay times. The WBGT value displayed by the unit does not reflect corrections.

<table>
<thead>
<tr>
<th>Clothing type</th>
<th>Clothing correction [Addition to WBGT (°C)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work clothes (long sleeve shirt and pants)</td>
<td>0°</td>
</tr>
<tr>
<td>Cloth (woven material) coveralls</td>
<td>0°</td>
</tr>
<tr>
<td>Double-layer woven clothing</td>
<td>3°</td>
</tr>
<tr>
<td>SMS polypropylene coveralls</td>
<td>0.5°</td>
</tr>
<tr>
<td>Polyolefin coveralls</td>
<td>1°</td>
</tr>
<tr>
<td>Limited-use vapor-barrier coveralls</td>
<td>11°</td>
</tr>
</tbody>
</table>

Cited from “American Conference of Governmental Industrial Hygienists - Threshold Limit Values and Biological Exposure Indices for 2008”; Reprinted with permission from ACGIH

United States Navy

Physiological Heat Exposure Limits (PHEL) Time Table
(Without the presence of fuel combustion gases/fuel vapors)

The recommended working hours are shown based on a maximum of eight hours. Naval personnel will follow a category, I – VI, based upon their function.

<table>
<thead>
<tr>
<th>PHEL Curves (Total Exposure Time in Hours: Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBGT(F)</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>80.0</td>
</tr>
<tr>
<td>81.0</td>
</tr>
<tr>
<td>82.0</td>
</tr>
<tr>
<td>83.0</td>
</tr>
<tr>
<td>84.0</td>
</tr>
<tr>
<td>85.0</td>
</tr>
<tr>
<td>86.0</td>
</tr>
<tr>
<td>87.0</td>
</tr>
<tr>
<td>88.0</td>
</tr>
<tr>
<td>89.0</td>
</tr>
<tr>
<td>90.0</td>
</tr>
<tr>
<td>WBGT(F)</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>91.0</td>
</tr>
<tr>
<td>92.0</td>
</tr>
<tr>
<td>93.0</td>
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<tr>
<td>94.0</td>
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<td>95.0</td>
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<td>100.0</td>
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<td>101.0</td>
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<td>102.0</td>
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<td>103.0</td>
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<tr>
<td>104.0</td>
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<tr>
<td>105.0</td>
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<td>106.0</td>
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<td>107.0</td>
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<td>108.0</td>
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<td>109.0</td>
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<td>110.0</td>
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<td>111.0</td>
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<td>112.0</td>
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<td>113.0</td>
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<td>114.0</td>
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<td>115.0</td>
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<tr>
<td>116.0</td>
</tr>
<tr>
<td>117.0</td>
</tr>
<tr>
<td>118.0</td>
</tr>
<tr>
<td>119.0</td>
</tr>
<tr>
<td>120.0</td>
</tr>
</tbody>
</table>
Flag Conditions for U.S. Navy/Marine Corp. Ashore

The following chart details the heat stress monitoring Flag Conditions for U.S. Navy/Marine Corp. Ashore in Degrees Fahrenheit and Celsius.

<table>
<thead>
<tr>
<th>WBGT(F)</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>121.0</td>
<td>0:35</td>
<td>0:30</td>
<td>0:25</td>
<td>0:20</td>
<td>0:15</td>
<td>0:10</td>
</tr>
<tr>
<td>122.0</td>
<td>0:30</td>
<td>0:25</td>
<td>0:20</td>
<td>0:15</td>
<td>0:15</td>
<td>0:10</td>
</tr>
<tr>
<td>123.0</td>
<td>0:30</td>
<td>0:25</td>
<td>0:20</td>
<td>0:15</td>
<td>0:10</td>
<td>0:10</td>
</tr>
<tr>
<td>124.0</td>
<td>0:25</td>
<td>0:25</td>
<td>0:20</td>
<td>0:15</td>
<td>0:10</td>
<td>0:05</td>
</tr>
</tbody>
</table>

Flag Degrees F

<table>
<thead>
<tr>
<th>No Flag</th>
<th>Green</th>
<th>Yellow</th>
<th>Red</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;80.0</td>
<td>80.0–84.9</td>
<td>85.0–87.9</td>
<td>88.0–89.9</td>
<td>&gt;90</td>
</tr>
</tbody>
</table>

Flag Degrees C

<table>
<thead>
<tr>
<th>No Flag</th>
<th>Green</th>
<th>Yellow</th>
<th>Red</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;26.7</td>
<td>26.7–29.4</td>
<td>29.4–31.1</td>
<td>31.1–32.2</td>
<td>&gt;32.2</td>
</tr>
</tbody>
</table>

*Rest means minimal physical activity (sitting or standing) and should be accomplished in the shade if possible.

Electrical Power Research Institute (EPRI)

The recommended working hours are shown based on a maximum of four hours. A time of 4:01 indicates greater than 4 hours.

<table>
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<th>Moderate</th>
<th>Heavy</th>
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</tr>
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<td>1:15</td>
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Appendix C: Accessories

Sensor array with 2-inch globe.................... 057-902
6-foot shielded remote sensor cable .............. 053-924
25-foot shielded remote sensor cable .............. 053-925
100-foot shielded remote sensor cable ........... 053-926
200-foot shielded remote sensor cable .......... 053-927
Serial computer cable ................................ 054-715
Parallel printer cable................................ 056-875
120 VAC to 9 VDC adapter ......................... 015-910
220 VAC to 9 VDC adapter ......................... 015-680
Verification module .................................. 053-923
Tripod ..................................................... 059-045
User’s manual .......................................... 053-664

Air Probe Accessories

NiMH battery............................................. 53-039
Dual 120 volt charger ............................... 53-037
Dual 220 volt charger ............................... 53-038
Appendix D: TSI® Detection Management Software DMS

The focus of this section is to briefly introduce the following DMS topics: downloading data, setting up parameters, and viewing data in charts, graphs, and reports. All data may be stored and saved in the software for record retention and/or for historical analysis. (For further details on DMS, refer to the online Help and select Contents.)

The QT° 44/46 instruments are used for measuring occupational heat stress. The following sections explain communicating with the QUESTemp° and DMS, saving and sending configurations, downloading, viewing data, setup, firmware updates, and printing reports.

QUESTemp° 44/46

The QT° 44/46 instruments are used for measuring occupational heat stress. The following sections explain communicating with the QUESTemp° and DMS, saving and sending configurations, downloading, viewing data, setup, firmware updates, and printing reports.

Communication Setup

The communication setup is an important starting point with your instrument and DMS. Once communicating, you have the option to download data, configure instrument parameters and use quick setup features for time and date settings. The following explains the QT° 44/46 communication setup steps.

1. Using a TSI® cable, part number 054-715, plug the cable into the computer and plug the opposite end into the side jack of the QT° 44/46 data port.

Figure 30: Communicating with the QT° 44/46 and DMS
2. From the start page of DMS, select the [Setup] or [Download] buttons and the instrument communication panel will appear.

3. Select Heat Stress and then select the Model Type by clicking on QT°44 or QT°46. (See ❶ and ❷). (You are now ready to setup or download your instrument.)

4. Once selected, see the following sections for downloading or setup parameters to learn more about working with the QT° 44/46.
   - See the subsequent QT°44/QT°46 instrument setup sections to setup or download your instrument.

![Figure 31: QT°44/46 downloading data](image)

**NOTICE**

The first time you communicate with the QUESTemp° and DMS the Found New Hardware wizard will appear. Install and follow the screen prompts.

**Downloading Data with the QT°44/46**

The Instrument Download feature is used to download your files from the QT°44/46 into the software for review and analysis of the data. Once the files are downloaded and if “Go to Data Finder after Download” is checked, DMS will open into the Data Finder window.
NOTICE
The Data Finder window stores all of the downloaded data by instrument, session and study. The information is stored in a bar chart style with measurements/parameters displayed on the top navigational bar.

To download, follow steps below:

1. To download the QT⁰ 44/46 data, ensure your instrument is communicating properly. (See Communication Setup in Appendix D for details.)

2. From the Start page, select the button.

3. Select the Heat Stress Family and select the appropriate QT⁰ 44/46 model from the Instrument window (see 1 and 2).

4. Optional: Click on the “Go to Data Finder after download” checkbox to view your session/study information after the download (see 3).

5. Press the Download button (see 4).

Figure 32: Downloading QT⁰44/46 files

Viewing Data in DMS

The following section outlines viewing your data with the QT⁰ 44/46 models.
Selecting a Session/Study

To view downloaded data from the welcome page, click on the button and the data finder screen will appear. (Or select the Data Finder tab if already opened.)

1. Select a session by either double-clicking on data or click on the session/study and select the button.

**NOTICE**

The example below illustrates a session selected with a run time of 3 minutes. (See ❶).

- **Family: Heat Stress**: QT⁰44/46 data is stored in this family. (See ❷).
- **Session/Study**: The QT⁰44/46 data is organized by the table headings, such as the session/study name (See ❸).
- **Start Time**: To quickly locate your study by most recent start time, click on the Start Time heading and it will sort ascending/descending (See ❹).
- **Parameters & measurements**: The table headings and columns are customizable by a quick click, drag, and drop to a new column location (similar to Microsoft® Excel® spreadsheet program.)

![Figure 33: Selecting a session](image)

Double-click to select/view QT⁰44/46 data in charts and graphs

Charts and Graphs in Panel Layout View (PLV) Page

The measurements and parameters will be displayed in charts and graphs which may be customized for analysis and/or reporting purposes.

**NOTICE**

A button provides a quick link to viewing the panel layout view data in a report format.
1. In the PLV page, it is divided into Work Items (see ❶), Add panel (see ❷), Arrange Panels (see C) and Data Panels (see D).

- **Work items ❶** – select either the session or study (in order to view appropriate measurement/parameter data).

- **Add panel ❷** – double-click on a chart/table type and it will appear as a panel on your screen.

- **Arrange panels ❸** – displays the order of the charts/tables which appear in the panel layout. Also, when a chart/table is selected in the arrange panels palette, the associated data panel is selected. The resize handles are applied and the panel is brought into view. (This is very useful when several panels are displayed.) To delete a panel, right-click on a chart/table and press delete from your keyboard.

- **Data panels ❹** – used to view your measurement and/or parameters from your study. **Note:** Use the menu bar icons and/or configure icon to customize parameters.

- **Toolbar and Configure button ❺** – the toolbar and configure button are used to customize or select different measurement parameters.

![Figure 34: QT°44/46 data in panel layout view](image-url)
2. To change the graph/table data parameters, click on the button. Each graph/table may have different configurable parameters depending on the parameters applicable to the specific panel.

3. To view the data as a report, click the button. (Note: The panels will print in the order in which they are displayed in the panel layout page.)

4. The quick tips below explain how to customize the panels and/or graphs/tables:
   - **To stretch the graph/tables**, click on one the corner’s edge of a chart or table and drag the mouse. (Note that selection handles will appear.) The graph/table will expand or shrink when resizing.
   - **To move the graph**, click, drag and drop to the appropriate panel position.
   - **To change ranges**, when clicking on either the x-axis or y-axis, click and drag the mouse until the appropriate range is selected.

   **NOTICE**

   It will span the numbers up or down depending on how you drag the mouse.

   - **To save a layout**, Right-click outside the tables/graphs area as displayed below. Click **Remember Setting**.

   ![Figure 35: Rearranging panels and saving layout](image-url)
Reports and Printing
To quickly create reports, open your data (in the data finder page) and click the quick report button. A standard template of charts and graphs (or panels) will appear in the report.

- **Viewing reports**: if you are in the data layout page and you have rearranged the charts/tables, the report will print in the sequence in which they appear on the screen.

- **Printing reports**: while in the report view page you have two options outlined below:
  - Click on the icon from the title bar.
  - Click on the icon from the session report title bar.

![Customize the report by inserting on-site testing images](image)

![Quickly switch back to the panel layout view (charts & tables)](image)

**Figure 36: Sample QT°46 report**