Environmental monitoring solutions

# *HSManager*

## User Guide

**Release 15 September 2022**

Cod. SWUM_01507_en

# Sommario

# 1. Introduction

*HSManager* manages the data obtained from *Heat Shield* for the risk assessment of the thermal stress in work environments through the calculation of *WBGT.*

A video tutorial on using the program is available at this address.

## 1.1. Changes introduced with version 1.5

With version 1.5, several changes have been introduced to make the program compatible with the new version of HeatShield devices that allow you to add a subject during configuration:

- Terminology: the definition of the WBGT indexes has been revised to make them more compliant with the legislation
- WBGT subjects: the management of the characteristics of WBGT subjects has been revised and rationalized
- Verification of the limits of the WBGT subjects: the WBGT indexes of the subjects are now calculated both on the average and maximum values of the WBGT, in addition, the new WBGTrefD index has been inserted which represents the difference between the WBGTeff of the subject and its WBGTref limit value
- Visualization of the data of the WBGT subjects: the WBGT of the subjects are now also calculated for each instant of time of the data produced by the instrument and therefore can be displayed, like the other quantities, in the tabular, graphical and statistical display of the individual surveys.
- The program supports the new version of HeatShield devices which allows you to define a WBGT subject at the instrument configuration level.

# 2. System requirements

Personal computer

- Processor at 600 MHz operating frequency or higher. 1 GHz recommended;
- Display: SVGA res. 1024x768 or higher;
- Operating system (*):
    - Microsoft Windows 7/8/10
- Microsoft .NET Framework V.3.5 (**);

(*) Operating systems must be updated with the latest update released by Microsoft and available through Windows Update; for operating systems not listed is not guaranteed correct and complete operation of programs.
(**) Microsoft. NET Framework 3.5 setup is included in LSI Lastem product USB storage issued after March 2011; if necessary, it is automatically installed during the installation process otherwise you can download the installer for Microsoft. NET Framework 3.5 directly from the Microsoft Download Center at http://www.microsoft.com/downloads/en/default.aspx entering ".NET" in the search field.
On Windows 8 you can enable. NET Framework 3.5 manually from the Control Panel . In the Control Panel you can use Add Programs and Features , then Enable or disable Windows features

and then select the check box  Microsoft. NET Framework 3.5.1. . This option requires an Internet connection.

# 3. Reference standard

*ISO 7243:2017 Thermal stress assessment based on WBGT index (wet bulb and globe thermometer temperature)* is the reference standard for the WBGT calculation.
Calculated values are checked also based on the limits proposed by *ACGIH American Conference of Government Industrial Hygienists.*

**Table 1 ISO7243: WBGT reference values**

| Metabolic rate (class) (see Table E.1 for description) | Metabolic rate W | WBGT reference limit for persons acclimatized to heat °C | WBGT reference limit for persons unacclimatized to heat °C |
|---|---|---|---|
| **Class 0 Resting metabolic rate** | < 125 | 33 | 32 |
| **Class 1 Low metabolic rate** | 125 - 235 | 30 | 29 |
| **Class 2 Moderate metabolic rate** | 235 - 360 | 28 | 26 |
| **Class 3 High metabolic rate** | 360 - 465 | 26 | 23 |
| **Class 4 Very high metabolic rate** | > 465 | 25 | 20 |

**Table 2 Screening critera for TLV and Action Limit (ACGIH 2006)**

| Allocation of Work | WBGT reference value (°C) | | | |
|---|---|---|---|---|
| | TLV | | | |
| | Light | Moderate | Heavy | Very Heavy |
| 75% - 100% | 31 | 28 | - | - |
| 50% - 75% | 31 | 29 | 27.5 | - |
| 25%– 50% | 32 | 30 | 29 | 28 |
| 0 – 25% | 32.5 | 31.5 | 30.5 | 30 |
| | Action Limit | | | |
| | Light | Moderate | Heavy | Very Heavy |
| 75% - 100% | 28 | 25 | - | - |
| 50% - 75% | 28.5 | 26 | 24 | - |
| 25%– 50% | 29.5 | 27 | 25.5 | 24.5 |
| 0 – 25% | 30 | 29 | 28 | 27 |

Reference. American Conference of Government Industrial Hygienists (ACGIH 2006)

Additionally, the program calculates the following indexes:

- HI (Heat Index):l *National Oceanic and Atmospheric Administration (NOAA) - 1990 National Weather Service (NWS) Technical Attachment (SR 90-23)*.
- Hx (Canadian Humidex): *Canadian Weather Service* (http://climate.weather.gc.ca/climate_normals/normals_documentation_e.html)

The reference standard for the calculations of PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indexes is the ***UNI EN ISO 7730*** "*Ergonomics of the thermal environments - Analytical Determination and interpretation of thermal comfort using calculations of PMV and PPD indexes and local thermal comfort criteria*".

# 3.1. Change of terminology

With the release of version 1.5 of the software, the names of some indexes relating to the WBGT were changed to maintain greater adherence to the reference legislation.

Basic Indexes

| Abbreviations used previously | BASE | SAT1 | SAT2 |
|---|---|---|---|
| WBGT_I (WBGT_I1 WBGT_I2) | WBGT | WBGT_1 | WBGT_2 |
| WBGT_O (WBGT_O1 WBGT_O2) | WBGTsl | WBGTsl_1 | WBGTsl_2 |

Subject-specific indexes

| Index | BASE | SAT1 | SAT2 |
|---|---|---|---|
| Reference WBGT | WBGTref | WBGTref_1 | WBGTref_2 |
| Effective WBGT | WBGTeff | WBGTeff_1 | WBGTeff_2 |
| Difference WBGT (eff-ref) | WBGTrefD | WBGTrefD_1 | WBGTrefD_2 |

Descriptionsi

| Index | IT | EN |
|---|---|---|
| WBGT | WBGT senza carico radiante | WBGT without solar load |
| WBGTsl | WBGT con carico radiante | WBGT with solar load |
| WBGTeff | WBGT effettivo | Effective WBGT |
| WBGTref | WBGT di riferimento | Reference WBGT |
| WBGTrefD | WBGT effettivo – WBGT di riferimento | Effective WBGT - Reference WBGT |

The program update also automatically updates the current database to adapt it to the new index names.

# 4. Instrument Configurations

The current program version supports four Heat Shield configurations:

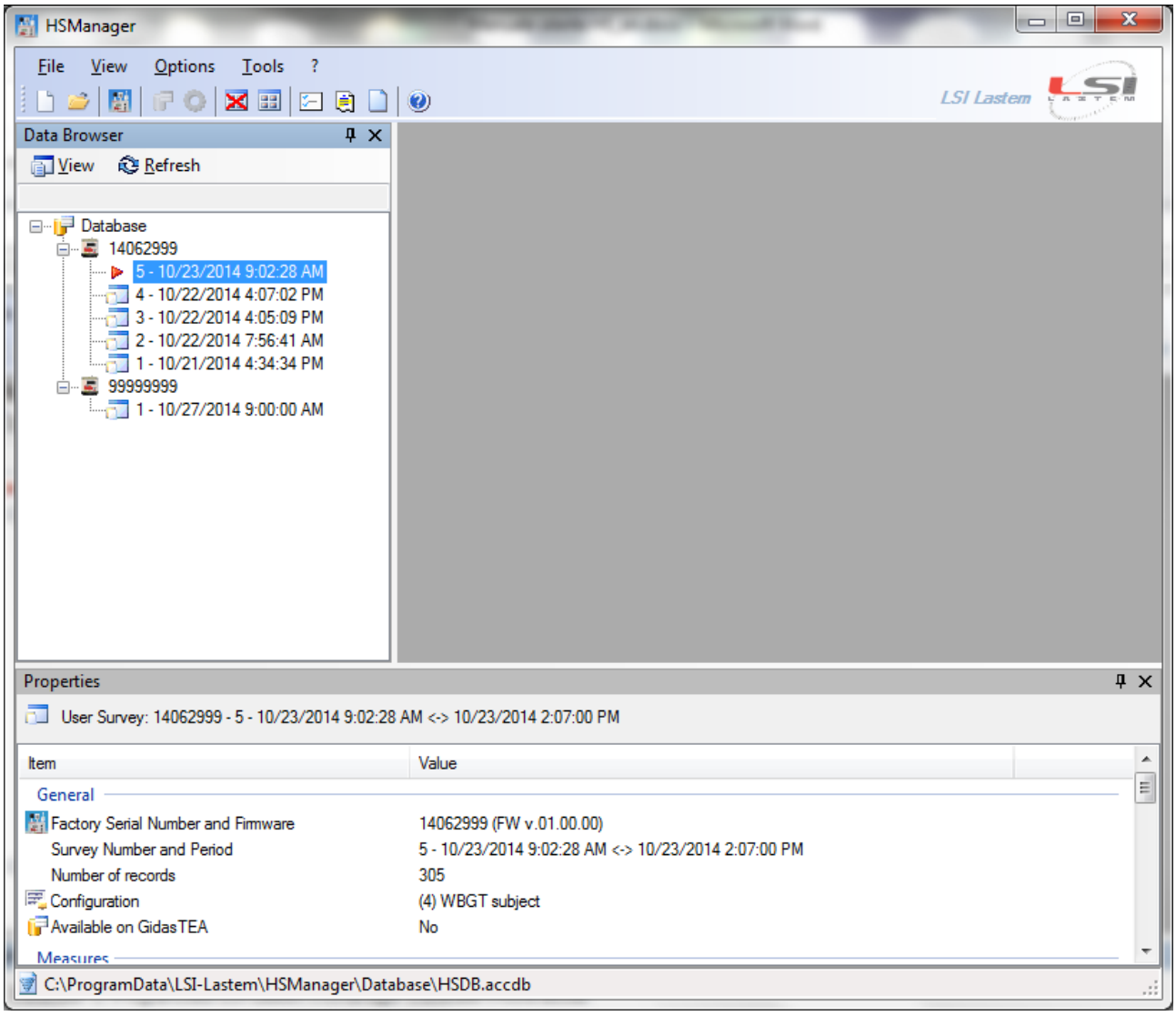
- *One environment*: measurements performed by MASTER unit.
- *Two environments*: measurements performed by MASTER unit and by SATELLITE unit.
- *Three environments*: measurements performed by MASTER unit and by two SATELLITE units
- *Three levels*: measurements performed by MASTER unit by two SATELLITE units on the same vertical axis (*ankles, abdomen, head)*.
- *PMV PPD*: measurements performed by MASTER unit to compute PMV and PPD indexes (configuration supported from software version 1.3.0 and instrument firmware 1.3.0)

Any survey carried out by HS Manager is associated to a configuration in the instrument. The program allows surveys associated to an instrument to be viewed ordering them by date or grouping them by configuration (§ 5.4).

# 5. Using the program

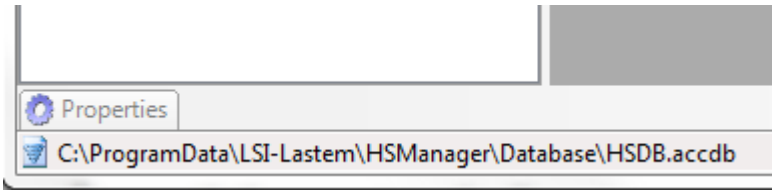
## 5.1. User interface

If the program is connected to a valid database at startup, *Data Browser* and *Properties* windows are displayed.



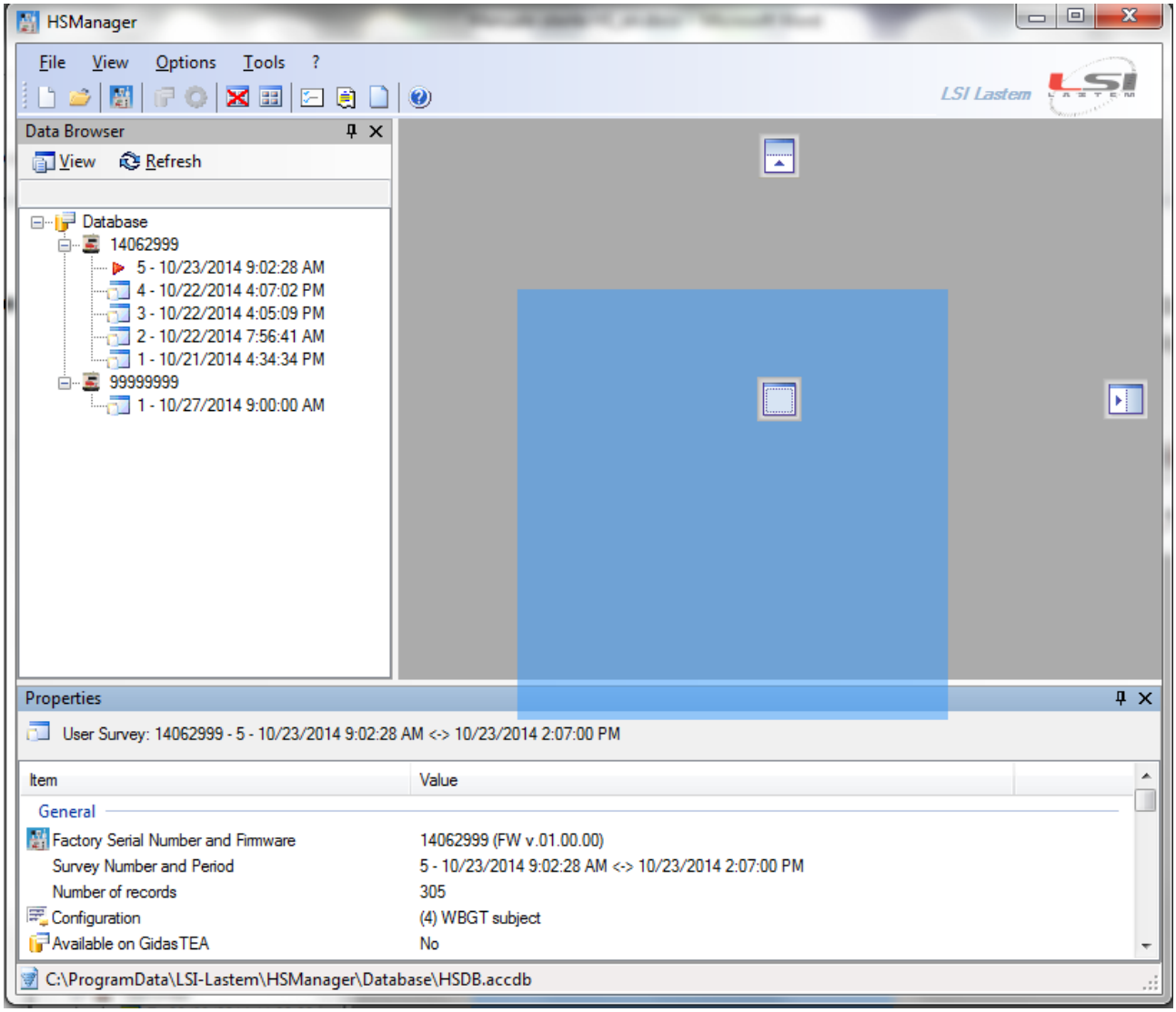

The aspect of the window could be different, as their position can be changed:

- If the icon is displayed on the "Data Browser" line, the window is always visible; if on the line there is the icon this means that the window is automatically hidden when it is not selected, showing only a label at the bottom of the main window (in the example the *Properties* window). Click on this label to restore the window.

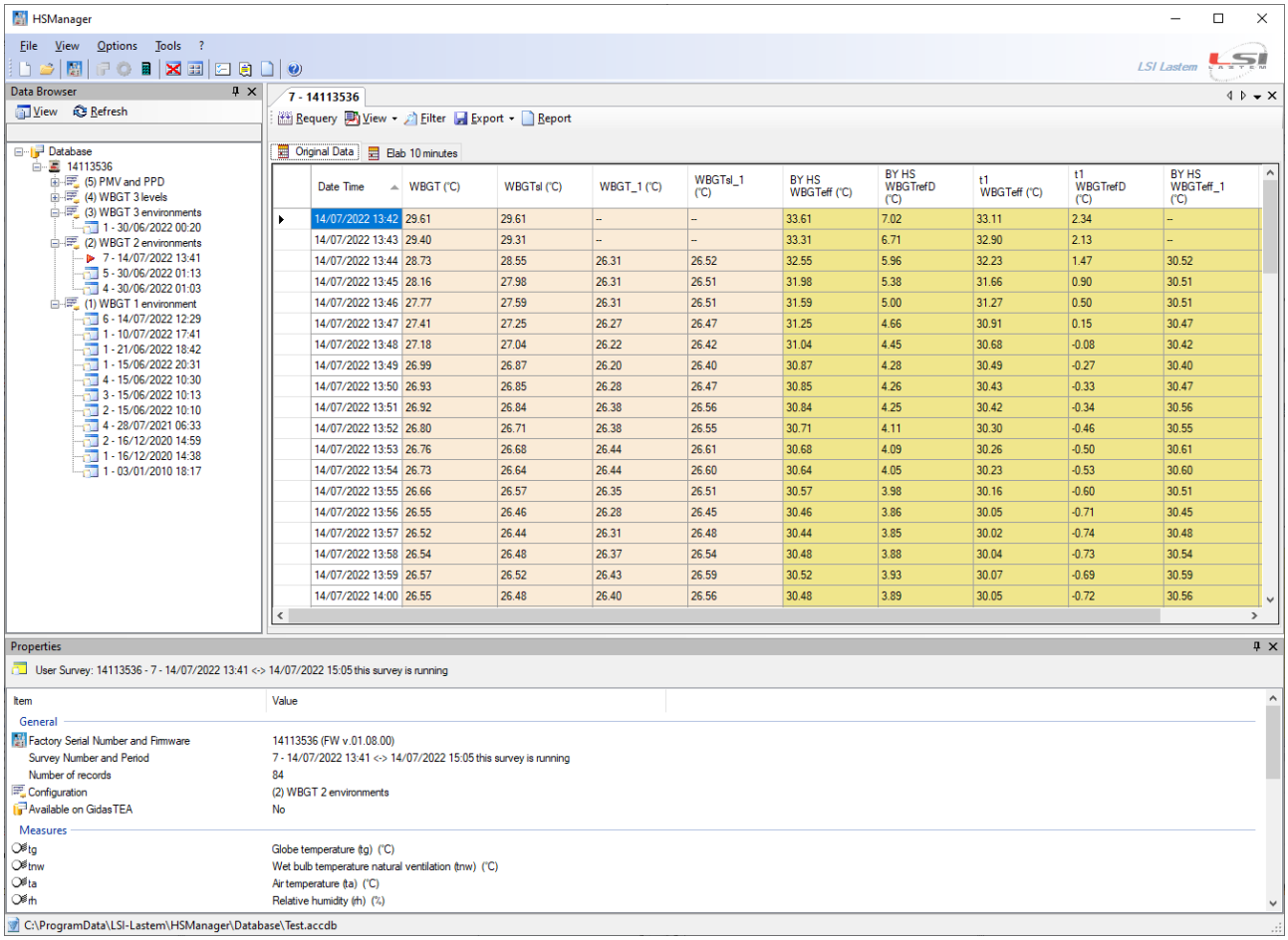



Click on the icon to change its aspect.

- Drag the title bar to move the windows in other positions. During the dragging operation, the new possible positions are shown.




Data are shown in the main window:




# 5.2. Menu

**File**

- *New Database*: creates a new database where data generated by the instrument can be saved.
- *Open Database*: opens an existing database.
- *Page Setup*: sets page orientation in chart print.
- *Default Printer*: selects the default printer for chart print;
- *Exit*: closes the program.

**View**

- *Database Browser:* opens the Browser window.
- *Properties Window:* opens the Properties window.
- *Close All Data Viewers:* closes all windows for data viewing.
- *Arrange All Data Viewers:* tiles all windows for data viewing .
- *Browser Refresh:* updates the Browser content based on the data in the database.
- *Reset Default Layout:* resets the default position and the dimension of the windows.

**Options**

- *Program Settings*: general settings of the program.
- *Report:* settings for reports creation.
- *Text File date and Number Format*: settings used to format data and numeric values during data export towards text files.

**Tools**

- *Communications:* communication module.
- *Instrument Backup:* stores data in a compressed binary file.
- *Instrument Restore:* restores data stored in a compressed binary file.
- *Calculator:* starts the index calculator.
- *Database Compression:* performs database compression.
- *Export to GidasTEA Database:* exports data towards *Gidas* database using *GidasTEA* program (§ 7.7).

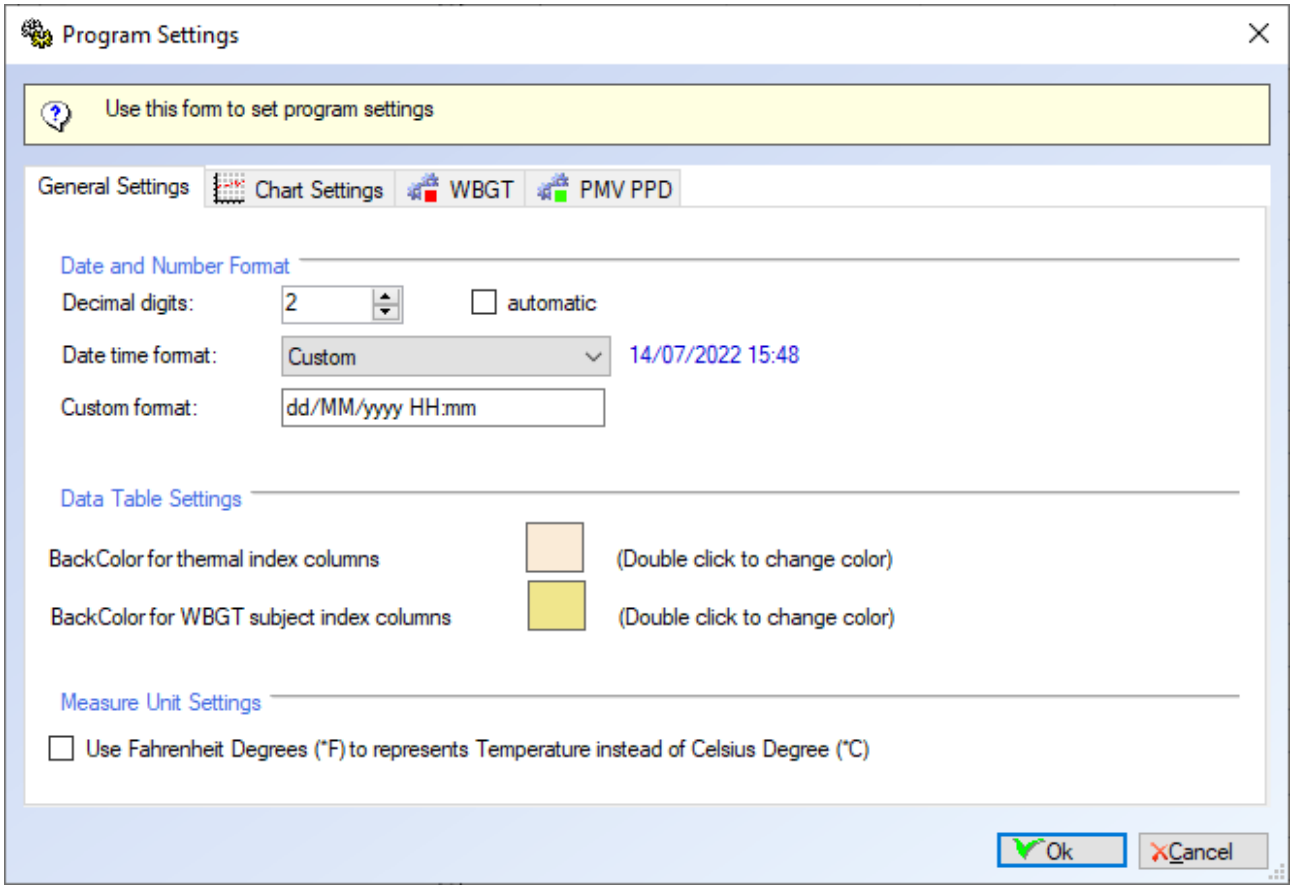
**?**

- *Contents:* shows the program's user manual.
- *Check For Updates:* sends query to check for updates to LSI LASTEM site.
- *About:* information about the program.
- *About HS Database:* shows info about the connected database.

Some of these commands are available also on the key bar below the main window menu.

# 5.3. General configuration options

Select *Options* → *Program Settings*:




Select *General Settings* for:

- Numbers & date format;
- Background color of microclimatic and WBGT subjects index columns in data tables;
- temperature measurement unit (Celsius/Fahrenheit degrees);

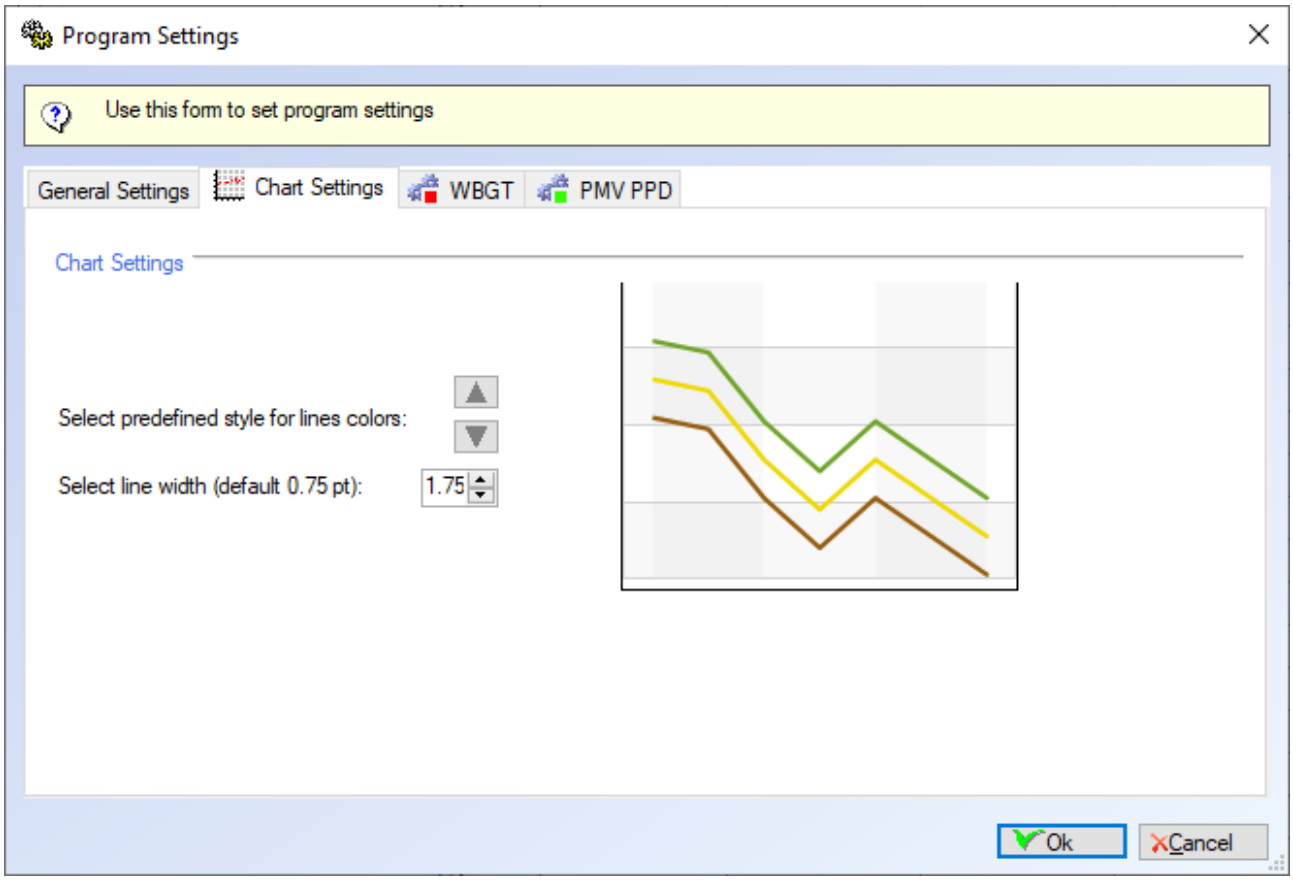
The available formats for the date are:

- *Local:* uses local settings;
- ISO 8601: uses ISO 8601 format (yyyy-mm-ddT hh:mm:ss);
- *Year/Month/Day*;
- *Month/Day/Year*;
- *Day/Month/Year*;
- *Custom:* allows date/time format to be customized through the use of the following symbols:
  - *y:* for years (use *yyyy* to display four-digit years);
  - *M:* for months (use *MM* to display two-digit months);
- *d:* for days (use *dd* to display two-digit days);
- *H:* for the time (use *HH* to display two-digit hours);
- *m:* for minutes (use *mm* to display two-digit minutes);
- *s:* for seconds (use *ss* to display two-digit seconds).

The separator symbol for the time is always the one used locally by the computer except for ISO 8601 format that uses the symbol ':'.

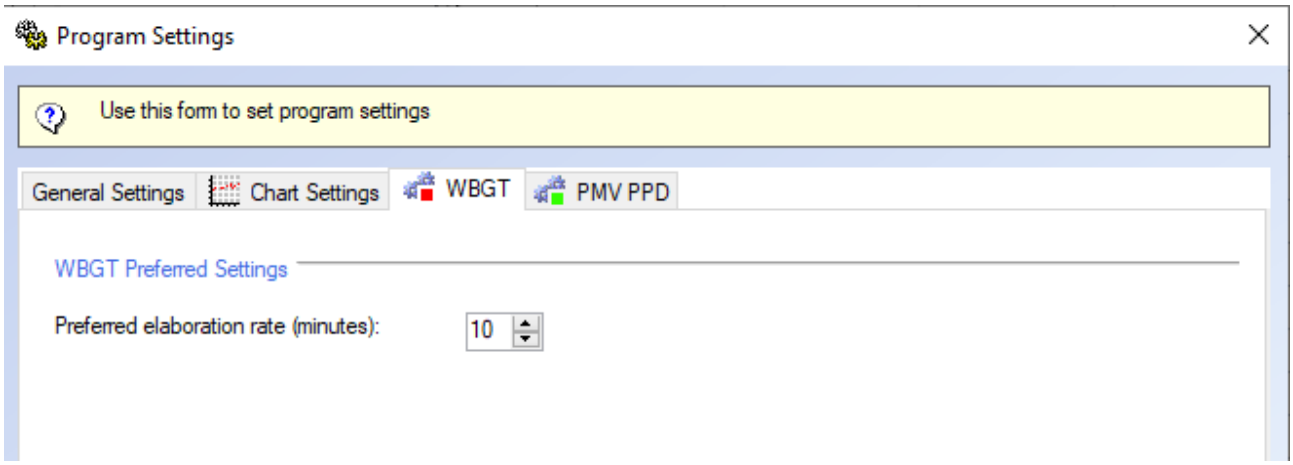
Changes of settings are immediately applied when closing the window.

Some elements of the charts can be set in the *Chart Settings* tab:



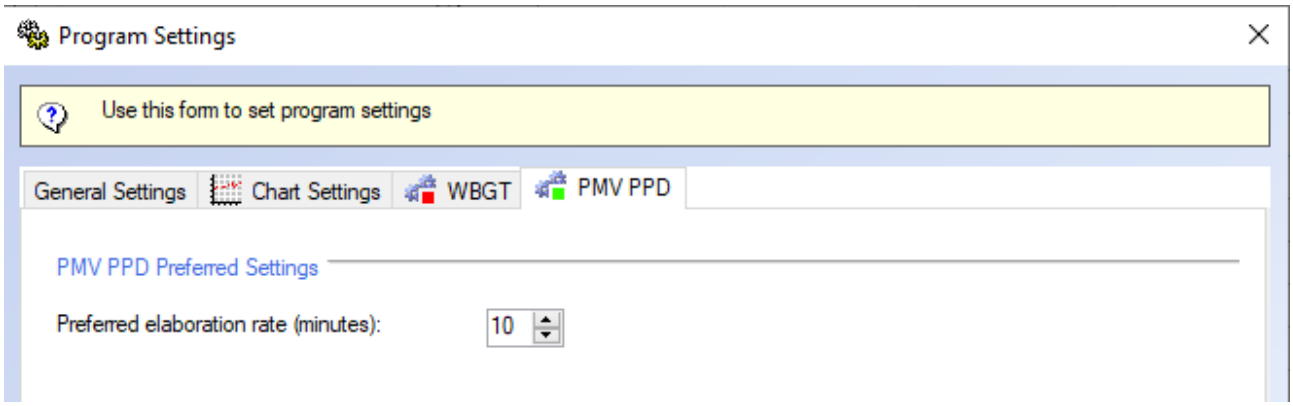

- predefined style for chart elements;
- line width;

The WBGT tab can be used to set:




- predefined re-elaboration rate for data extraction (recommended value *60 minutes*);

The PMV PPD tab can be used to set:

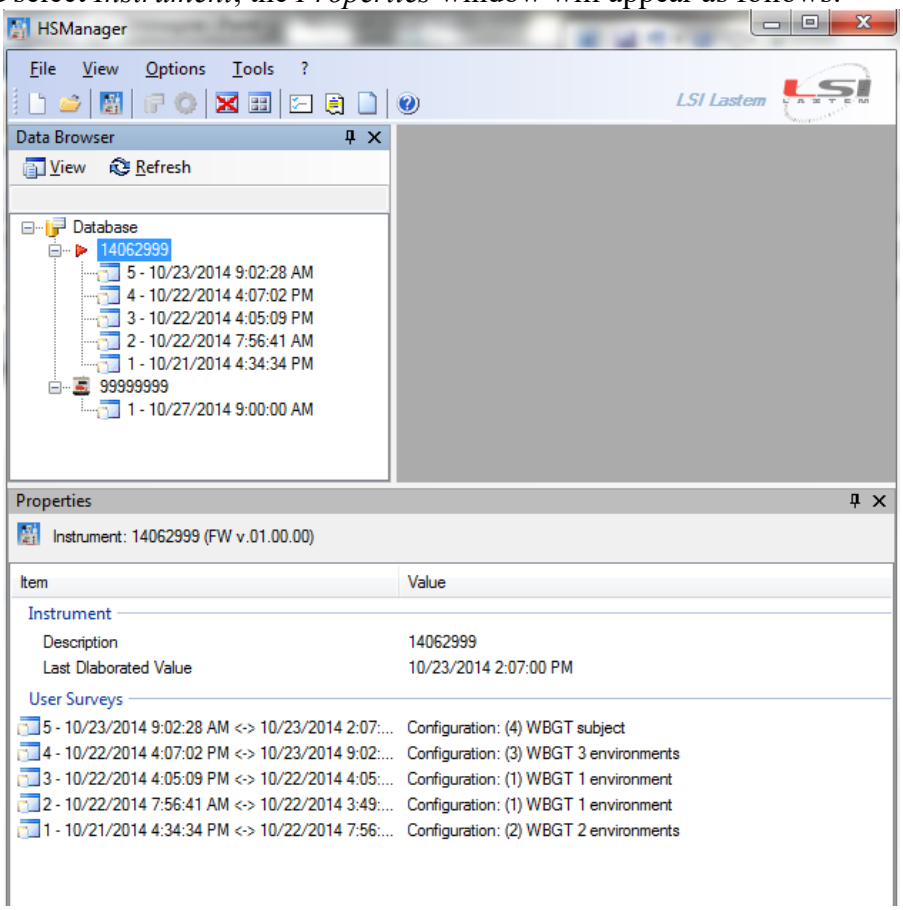



- predefined re-elaboration rate for data extraction (recommended value *60 minutes*);

## 5.4. Data Browser and Properties window

*Data Browser* displays the content of the database showing the list of devices and surveys.

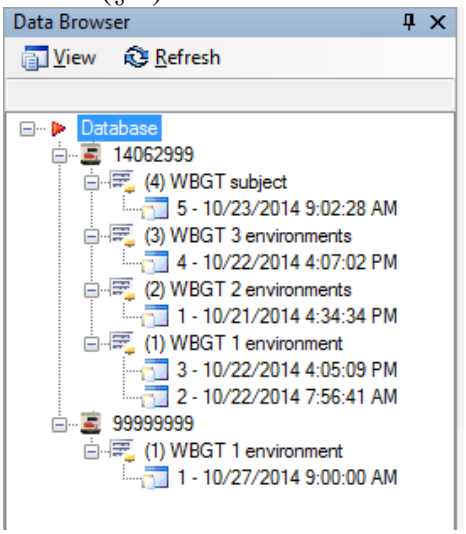
By selecting database device or survey, the *Properties* window will display its characteristics; for instance, if you select *Instrument*, the *Properties* window will appear as follows:




Two buttons are located below *Data Browser*:

- *View*: changes the predefined display of the elements in the database;
- *Refresh*: updates the elements contained in the browser downloading them from the database.

The identification elements of the instruments con be showed in ascending or descending order using the *View* button; this can be used also to group the surveys of each instrument on the basis of the configuration used to produce them (§ 4):




### 5.4.1. Actions available for the elements of the Data Browser

Some elements of the browser have a contextual menu that allows to act directly on the selected element. The contextual menu can be viewed by clicking with the right key of your mouse on the selected element.

Actions available on an Instrument node:

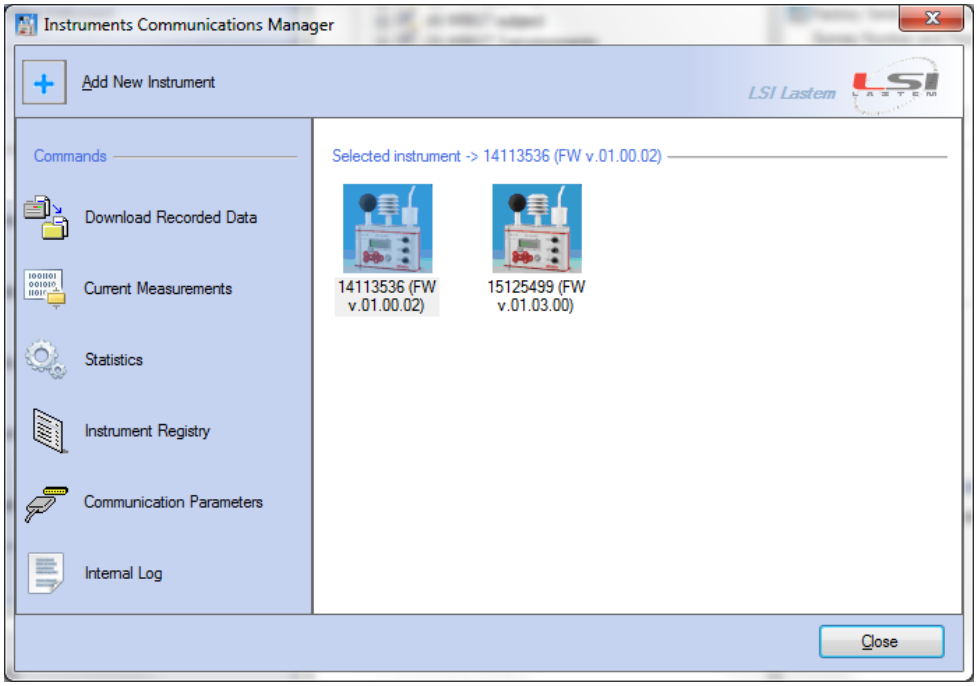
- *Remove Instrument*: removes the selected instrument and its data from the database; if a backup was not previously created, the data will be no more available.

Actions available on a Survey node:

- *Show Data:* shows the survey data (§ 7.3);
- *Remove Survey*: removes the survey data from the database; if a backup was not previously created the data will be no more available.

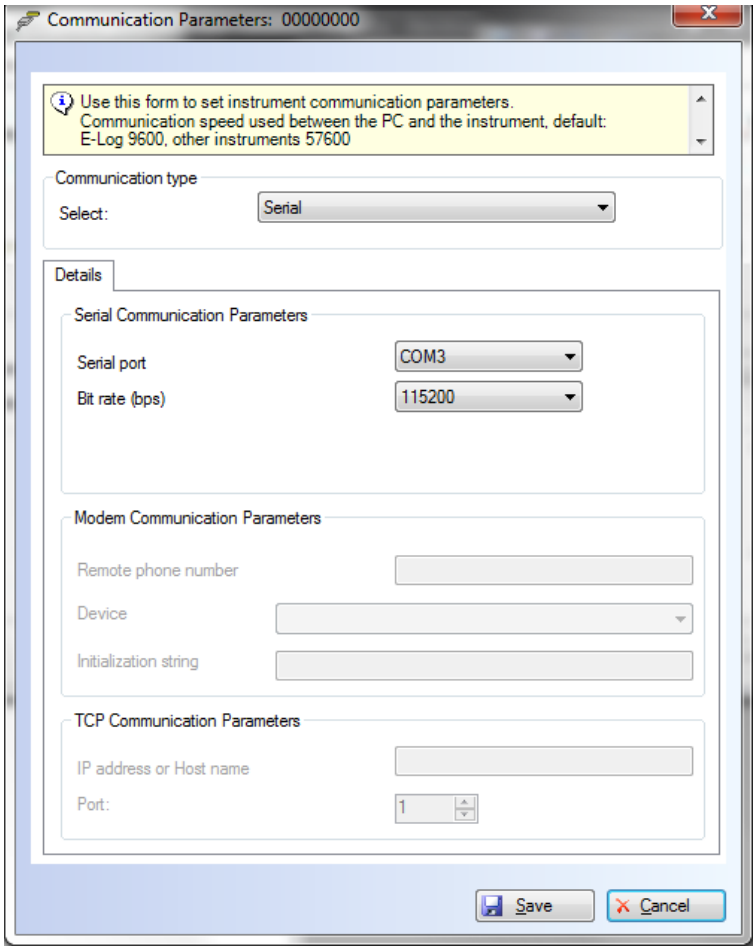
# 6. Communicating with instruments

Select *Tools* → *Communications*. This window shows the list of the available instruments




## 6.1. Adding a new instrument to the program

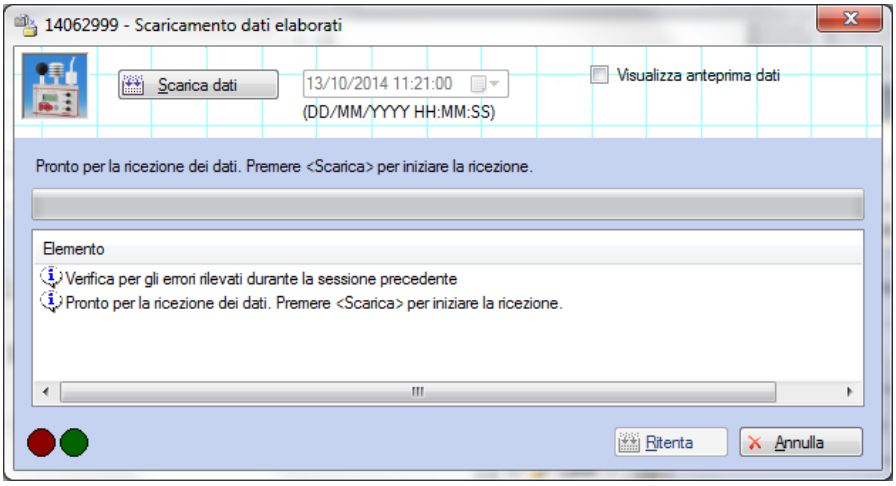
The first operation for managing the data coming from a new instrument consists in adding the instrument to the program. Connect the instrument to your PC and press *Add New Instrument* button to start the guided procedure. The procedure will ask the user to specify the connection parameters:




Usually only the serial port the instrument is connected to needs to be changed.
Once the communication parameters have been set, the program connects to the instrument and adds it to the instrument list.

# 6.2. Downloading processed data

To download processed data connect the instrument to your PC, select it from the list and press *Download Recorded Data* button.

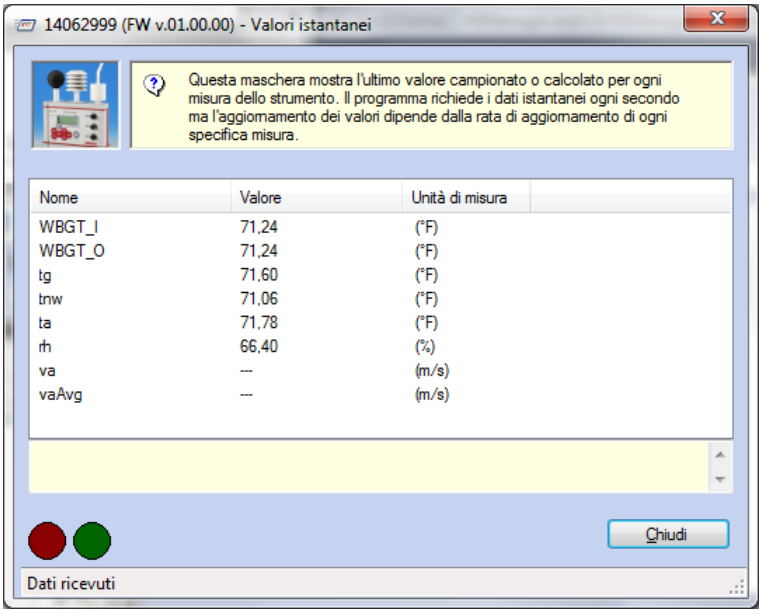



Select *Show Data Preview* to display a data preview, press Download to download data.
Data stored in the instrument will be downloaded to the database connected to the program.

***ATTENTION***
***You cannot change the data query automatically set by the program based on the date of the last downloaded data.***

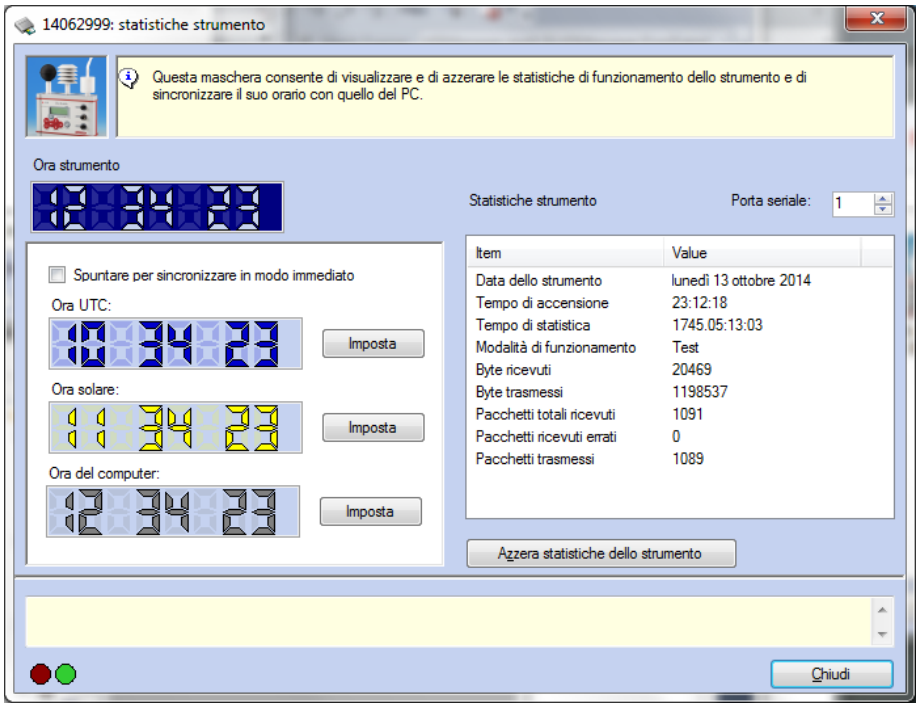
## 6.3. Real time display of measurements

Connect the instrument to your PC, select it from the list and press *Current Measurements* button. This action displays the values of the measurements acquired in that moment by the instrument:




## 6.4. Displaying operating statistics and updating the internal clock

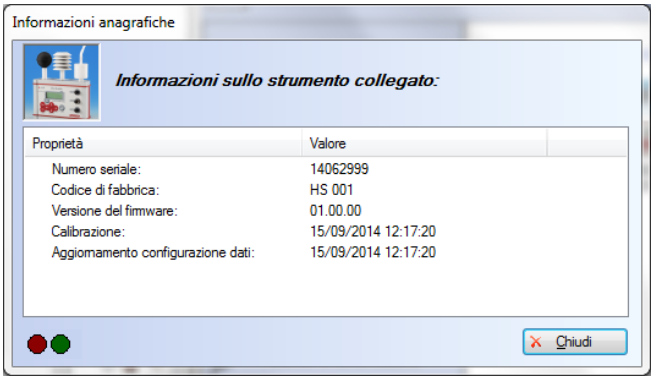
Connect the instrument to your PC, select it from the list and press *Statistics.* This action shows the operating statistics of the instrument:




This window allows you as well to set the internal clock of the instrument.

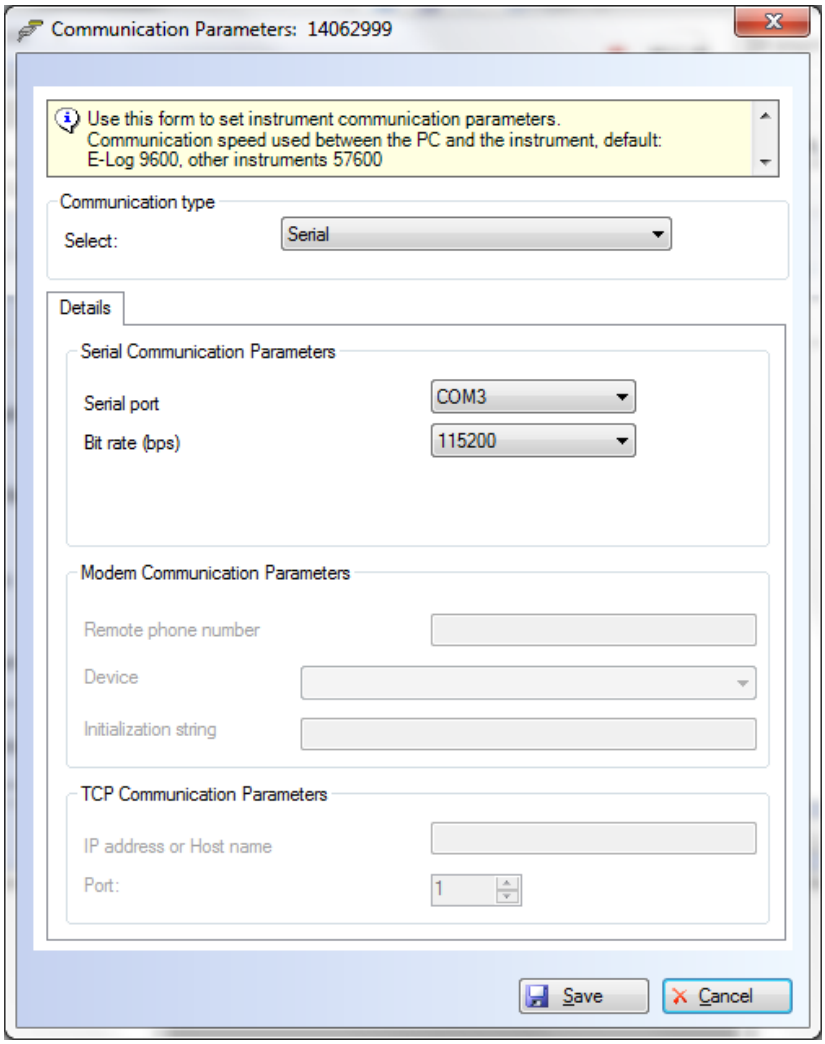
## 6.5. Displaying the registry

Connect the instrument to your PC, select it from the list and press *Instrument Registry.*




## 6.6. Changing communication parameters

Press *Communication Parameters* button to change the communication parameters used by the PC to communicate with the instrument.

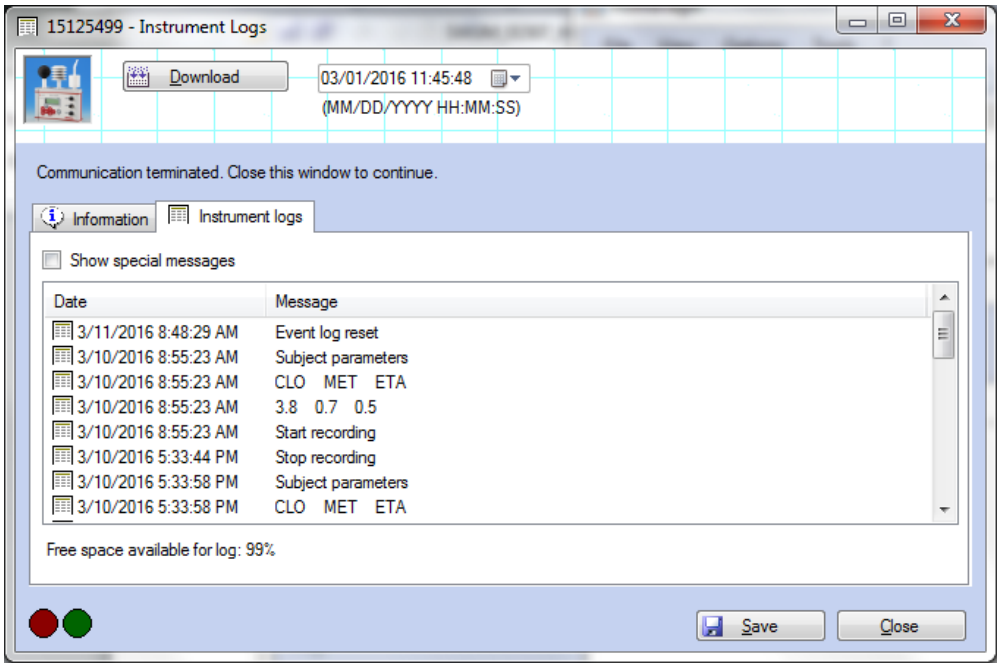



Set parameters and press *Save*

***ATTENTION***
***If communication is performed through a serial port (or through an USB adapter) the communication speed should be the same as the one set in the instrument.***

# 6.7. Displaying internal log

To display internal log connect the instrument to your PC, select it from the list and press *Internal Log* button.


15125499 - Instrument Logs
Download
03/01/2016 11:45:48
(MM/DD/YYYY HH:MM:SS)
Communication terminated. Close this window to continue.
Information
Instrument logs
Show special messages
Date
Message
3/11/2016 8:48:29 AM
Event log reset
3/10/2016 8:55:23 AM
Subject parameters
3/10/2016 8:55:23 AM
CLO MET ETA
3/10/2016 8:55:23 AM
3.8 0.7 0.5
3/10/2016 8:55:23 AM
Start recording
3/10/2016 5:33:44 PM
Stop recording
3/10/2016 5:33:58 PM
Subject parameters
3/10/2016 5:33:58 PM
CLO MET ETA
Free space available for log: 99%
Save
Close

# 7. Data management

## 7.1. Associating a database to the program

A database should be always associated to the program. Two options are available in the *File* menu:

- *New Database*: opens an empty new database.
- *Open Database*: opens an existing database.

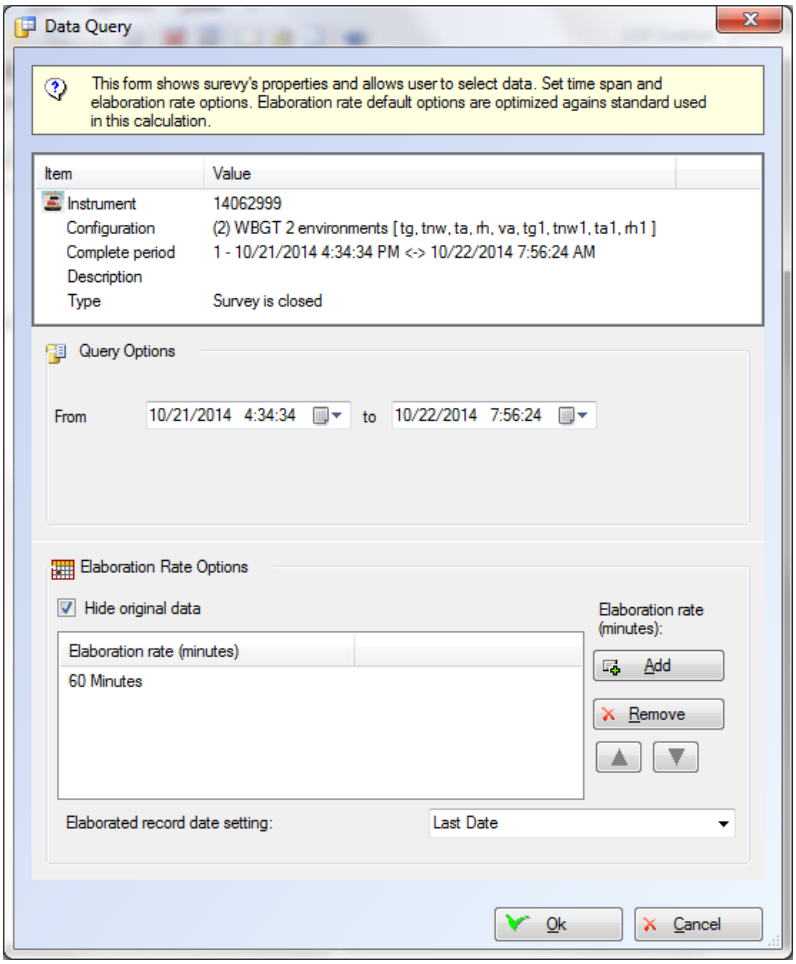
By default the program opens the database on first boot.

`C:\ProgramData\LSI-Lastem\HSManager\Database\HSDB.accdb`

***ATTENTION***
***During the normal use of the program the database DOESN'T need to be saved. The program always displays the data stored in the current database.***

## 7.2. Extracting data

Select a survey in the *Data Browser* and select the option *Show Data* in its contextual menu. The following window shows the settings for data extraction:




The upper part of the window shows the data of the selected instrument.

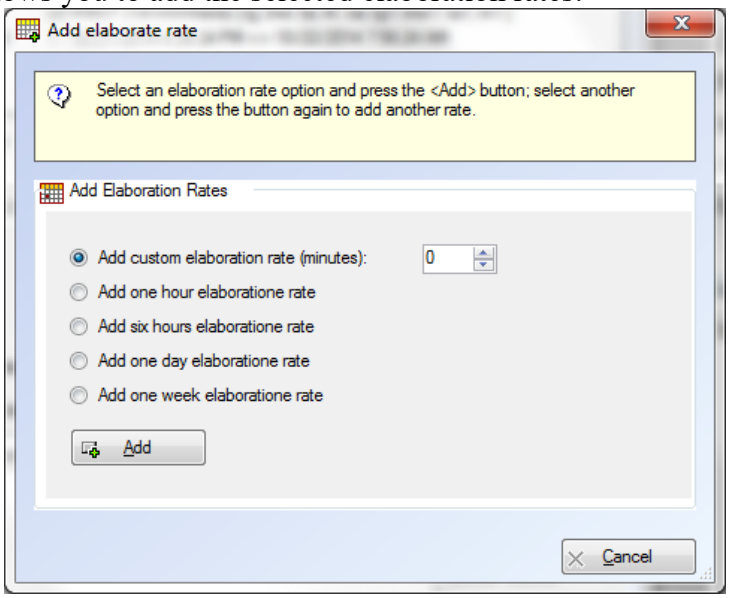
Query Options:

- *From ... to* : select a time interval for data extraction .
- Elaboration Rate Options
- *Hide original data*: select this option if you don't want the original data to be recorded every minute by the instrument to be displayed (default value *selected*);
- *Elaboration Rate List*: contains the list of the elaboration rates expressed in minutes that will be used to elaborate the original data produced by the instrument; use <*Add*> and/or <*Remove*> buttons to add/remove rates; use  buttons to put rates in ascending/descending order (default value set to *60 minutes*);
- *Elaborated record date settings*: this option is used to label date/time of each line of single time intervals values, (defined by the selected elaboration rate), with the start date/time (Start date) or the last date/time (Last date) of the interval. E.g.: data relating the average values acquired in the interval between 02:00 pm and 03:00 pm of 6th June 2014, if set as Start date, are labeled 14.00/07/06/2014; if set as Last date, they will be labeled 15:00/07/06/2014.

***ATTENTION***

***Data elaboration performs the average of variables, ambient measurements and indexes measured by the instrument. So, since the instrument elaborates and logs data every minute, if you choose for instance to process data on a time basis, the extracted values will derive from the time average of the data measured every minute. The indexes measured by the instrument as well are processed statistically and NOT recalculated by the ambient data average.***

The <*Add*> button allows you to add the selected elaboration rates:



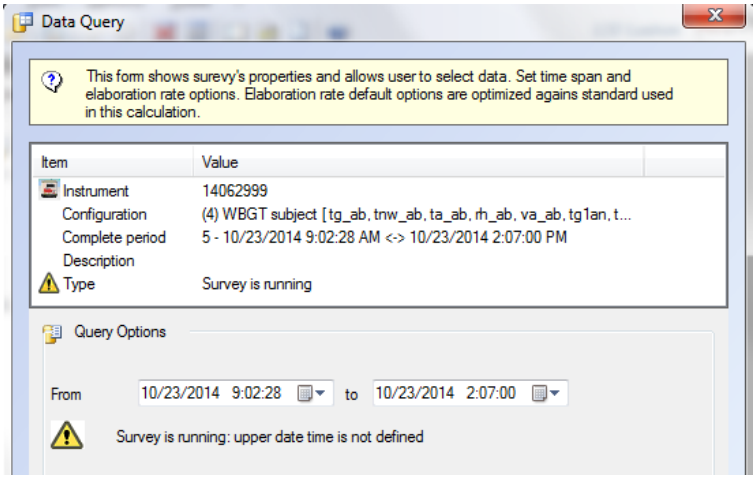

Predefined options for data extraction can be set in the program configuration options (§ 5.3).

## 7.2.1. Running Surveys

If you download data while a survey is in progress, the program reports it in several ways:

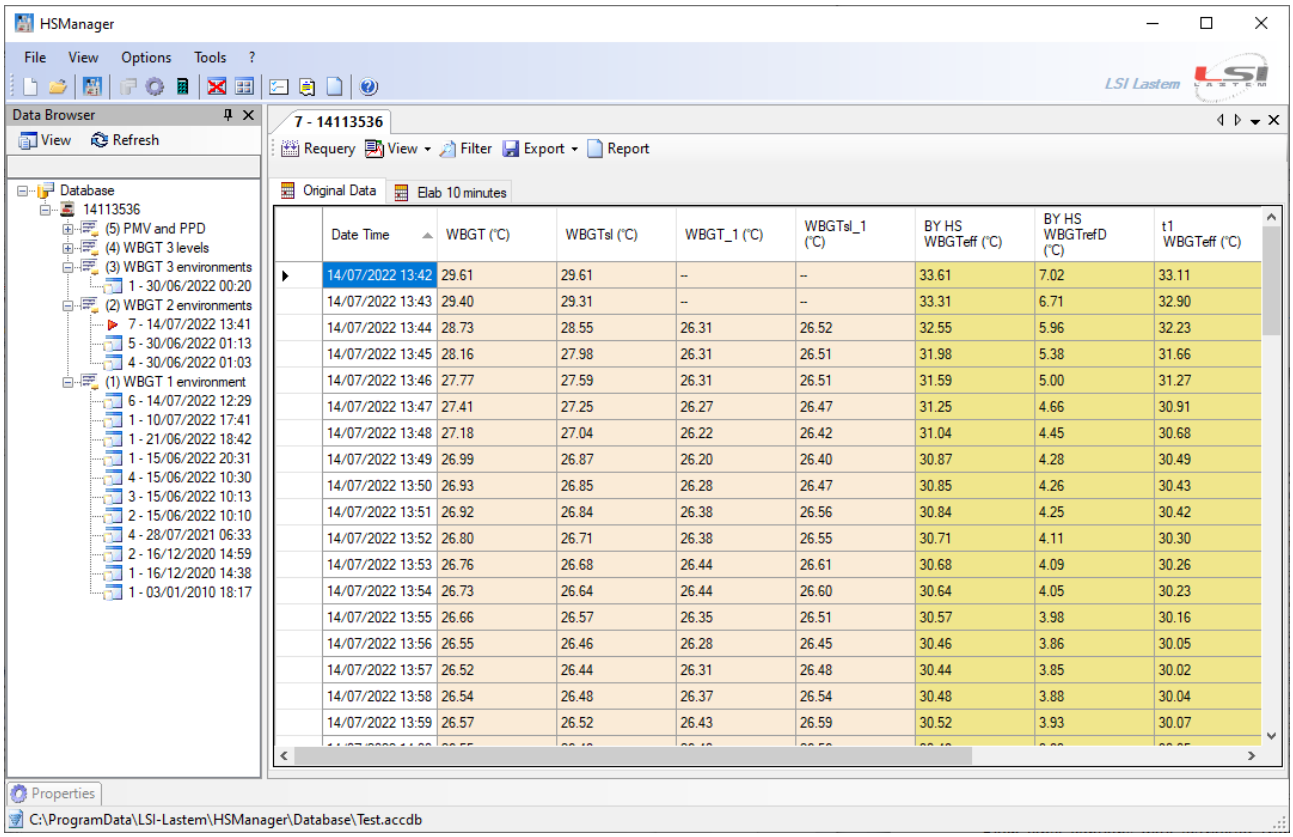
- The *Data Browser* indicates the running survey with a different icon ;
- The *Properties* window indicates the date of the last downloaded data as last date ;

- The *Data Query* window shows that the survey is in progress and assigns the date of the last downloaded data as last date.

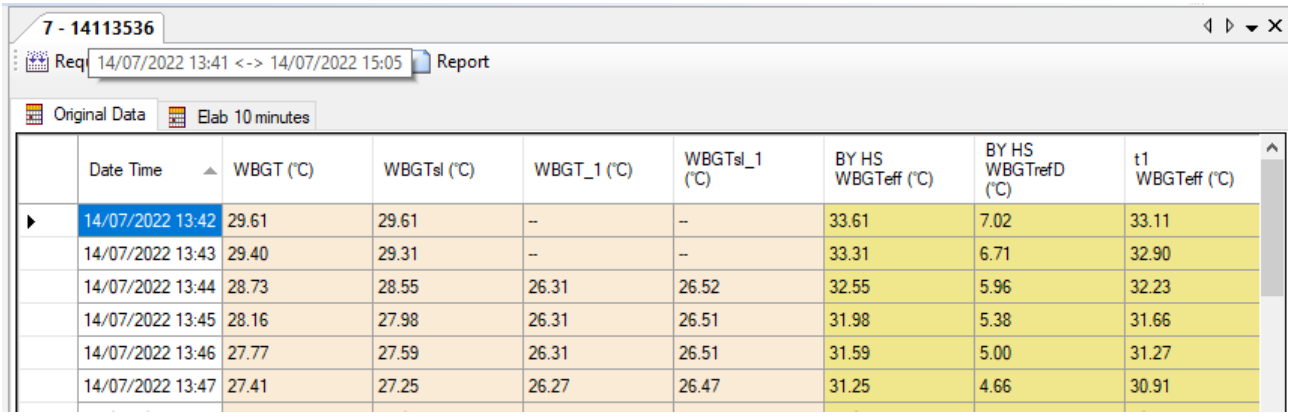



# 7.3. Data display

Select the survey in the *Data Browser*, select *Show Data* option with the contextual menu. Set data extraction (§ 7.2). Data are downloaded from the database and showed in the display window.




Each label contains data extracted from the data base with their elaboration rate. In the example above, the original data and the data elaborated every hour have been requested. The window title displays the number of the survey and the instrument identification number; pointing the mouse on the window title shows the time details of the survey.




| Date Time | WBGT (°C) | WBGTsl (°C) | WBGT_1 (°C) | WBGTsl_1 (°C) | BY HS WBGTeff (°C) | BY HS WBGTrefD (°C) | t1 WBGTeff (°C) |
|---|---|---|---|---|---|---|---|
| 14/07/2022 13:42 | 29.61 | 29.61 | -- | -- | 33.61 | 7.02 | 33.11 |
| 14/07/2022 13:43 | 29.40 | 29.31 | -- | -- | 33.31 | 6.71 | 32.90 |
| 14/07/2022 13:44 | 28.73 | 28.55 | 26.31 | 26.52 | 32.55 | 5.96 | 32.23 |
| 14/07/2022 13:45 | 28.16 | 27.98 | 26.31 | 26.51 | 31.98 | 5.38 | 31.66 |
| 14/07/2022 13:46 | 27.77 | 27.59 | 26.31 | 26.51 | 31.59 | 5.00 | 31.27 |
| 14/07/2022 13:47 | 27.41 | 27.25 | 26.27 | 26.47 | 31.25 | 4.66 | 30.91 |

With the release of version 1.5 of the program, if Subjects have been associated with the survey, the program also calculates and displays the WBGTeff and WBGTrefD indexes of each subject present. This data is added to each view (table, statistics, graph).

The available options can be selected using the buttons below the window title:

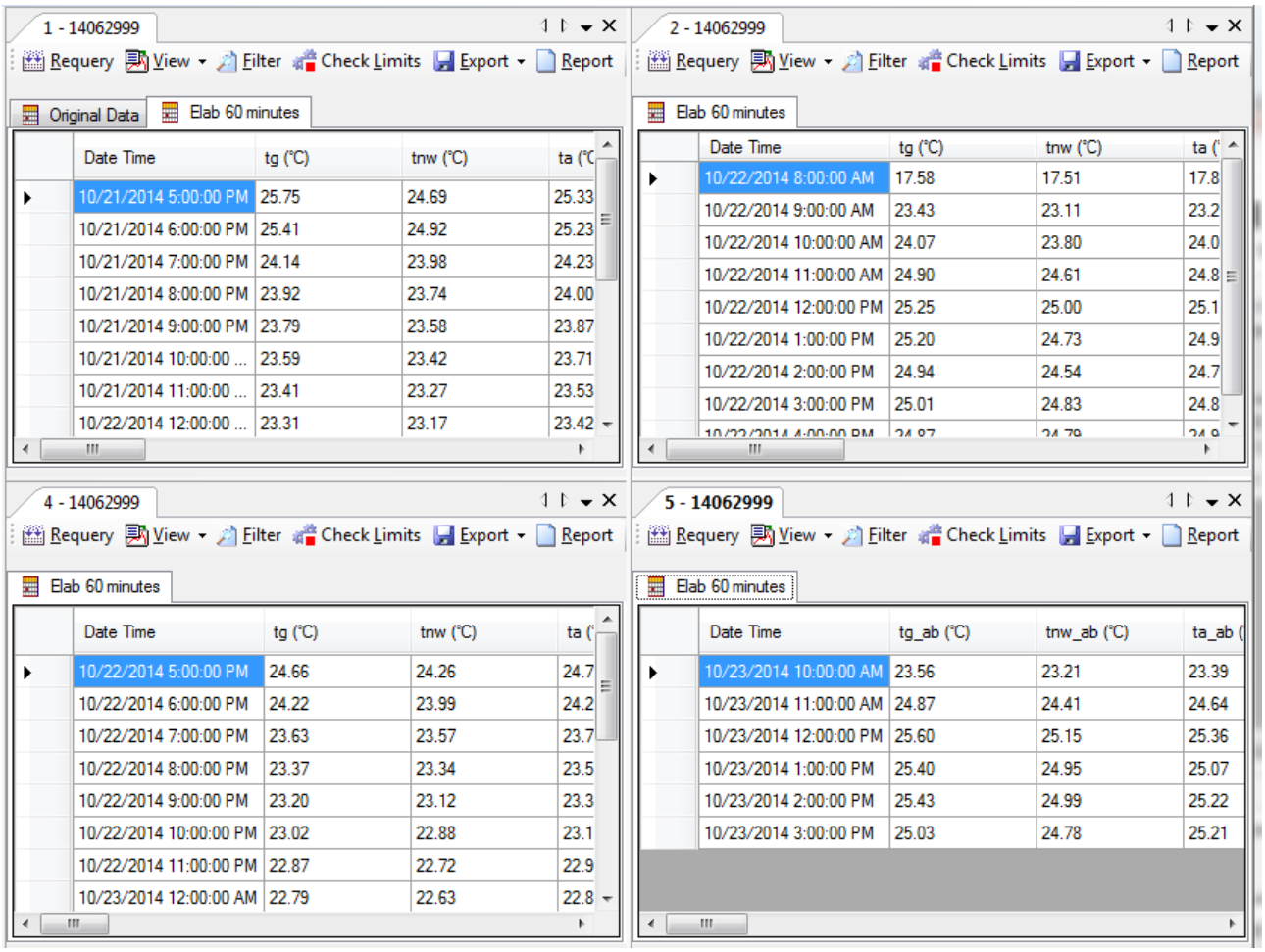
- *Requery*: changes the data extraction options and downloads them from the data base.
- *View*: changes the data display mode; the available modes are *Summary, Data Table, Chart, Statistics*.
- *Filter*: selects the quantities to be displayed (§ 7.3.4).
- *Export*: exports data (§ 7.3.5).
- *Report*: creates a report (§ 8).

To close the current window use the × button placed on the left of the title bar or menu. To close all data viewers, use *View* → *Close All Data Viewers* menu.

Similarly to each data viewer in the main window of the program, also the data viewers of several devices can be dragged and anchored in different positions.

### 7.3.1. Automatic arrangement of data viewers

Selecting *View* → *Arrange All Data Viewers* menu (or button on the button bar) the program automatically sets all data viewers in a two column format, allowing them to be displayed simultaneously.

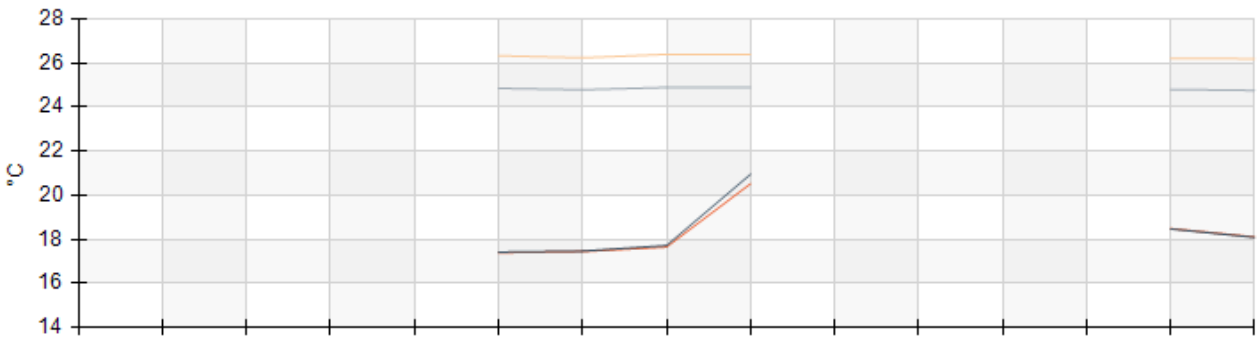



## 7.3.2. Formatting data

You can change numbers and date/time format using the *Options* → *Program Settings* menu, selecting the *General Settings* tab *(§ 5.3)*.
The same menu allows you to set different options for charts, background colors of the microclimatic index columns and the temperature measurement unit.

## 7.3.3. Incorrect or unrecorded data

Incorrect or unrecorded data are stored in the database using the value -999999. In conformity with the instrument, the user interface displays the missing data with characters --.
Missing data are not shown in the chart:

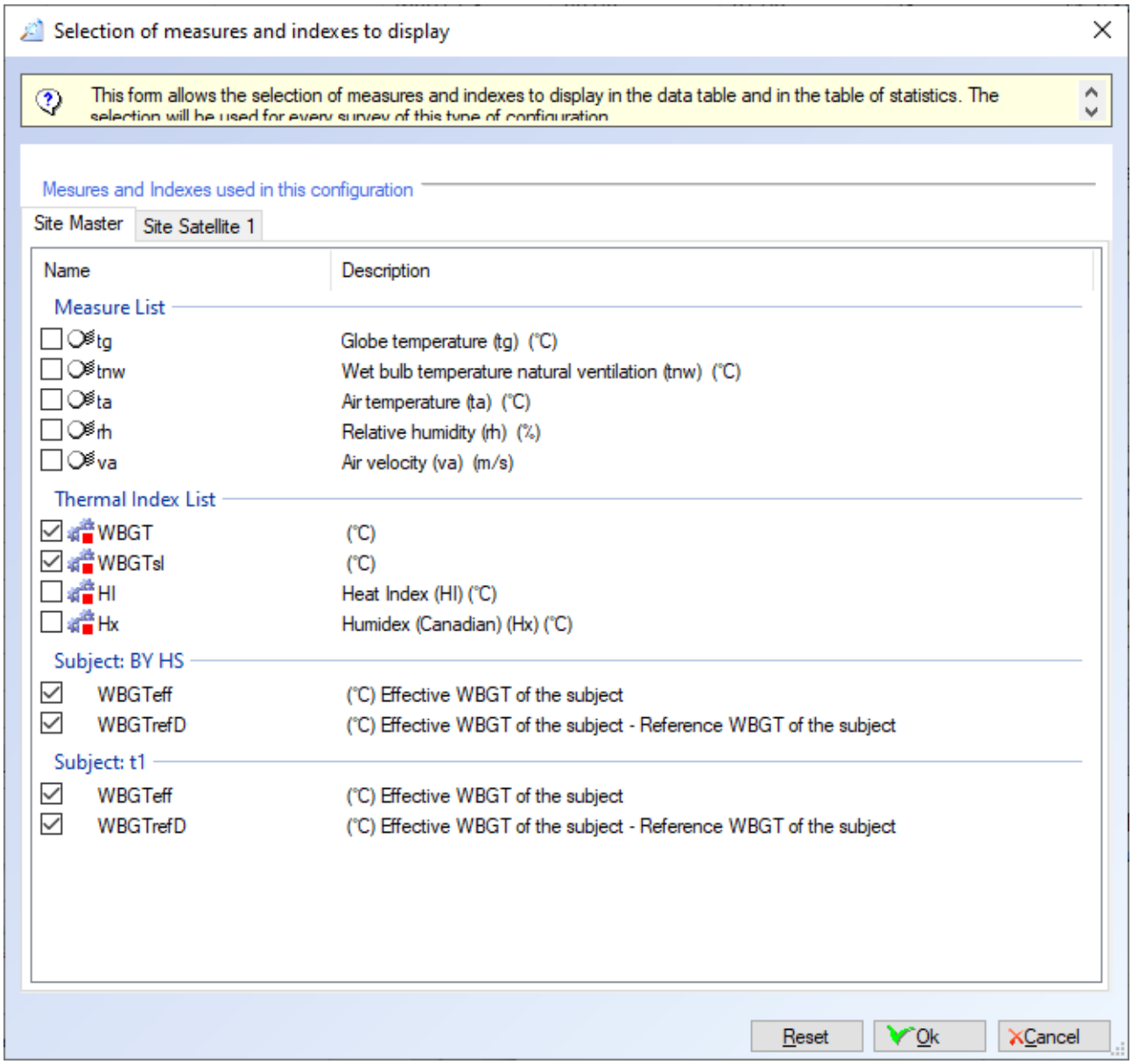


This situation could happen when the user selects the pause function of the survey (available from instrument firmware 1.2.0).

Exporting data towards texts files and Excel XML Worksheet files (§ 7.3.5) shows anyway the numeric value -999999.

## 7.3.4. Filtered quantities

The *Filter* button allows you to select the quantities to be displayed:




The window with the quantities associated to the configuration used in the Instrument for the current survey, the example above shows the configuration for two environments (*Site Master* and *Site Satellite 1*).
If Subjects have been entered for the evaluation of the WBGT, the two index
es WBGTeff and WBGTrefD of each subject present in each environment will also be displayed. In the data display columns, the indexes of the subjects will be indicated by the text: SUBJECT NAME / INDEX NAME.

***ATTENTION***
***Filter settings are common to all the configurations of the same type and are immediately applied to all open data viewers.***

## 7.3.5. Exporting data

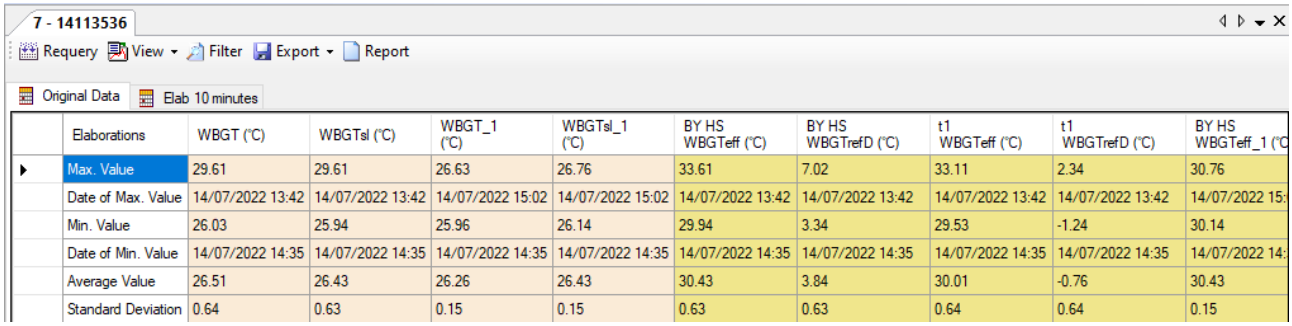
Pressing the *Export* button exports data in two formats:

- *Text File*: exports only the data of the current table to a text file; select *Options* → *Export to text file* menu to set data format.
- *Excel xml Spreadsheet:* exports the data of all tables to a file compatible with XML Spreadsheet Excel format. This file format is supported by Excel versions XP, 2003 and above and by OpenOffice 2.4 version.

***ATTENTION***
***Data export always exports all quantities independently from any applied display filter (§ 7.3.4).***

## 7.3.6. Table of statistics

Selecting *View* → *Statistics* displays the table of statistics:

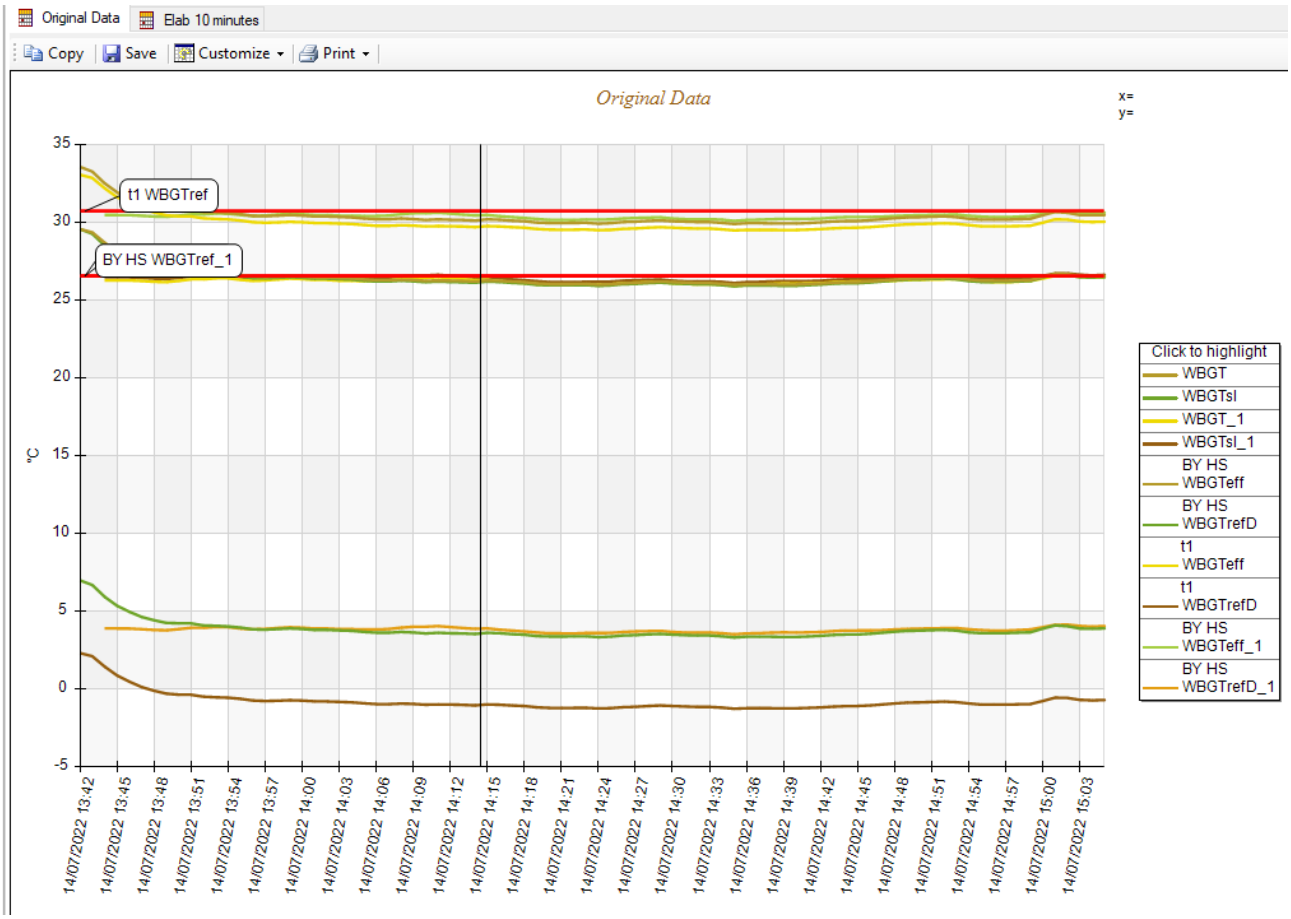



| Elaborations | WBGT (°C) | WBGTsl (°C) | WBGT_1 (°C) | WBGTsl_1 (°C) | BY HS WBGTeff (°C) | BY HS WBGTrefD (°C) | t1 WBGTeff (°C) | t1 WBGTrefD (°C) | BY HS WBGTeff_1 (°C |
|---|---|---|---|---|---|---|---|---|---|
| Max. Value | 29.61 | 29.61 | 26.63 | 26.76 | 33.61 | 7.02 | 33.11 | 2.34 | 30.76 |
| Date of Max. Value | 14/07/2022 13:42 | 14/07/2022 13:42 | 14/07/2022 15:02 | 14/07/2022 15:02 | 14/07/2022 13:42 | 14/07/2022 13:42 | 14/07/2022 13:42 | 14/07/2022 13:42 | 14/07/2022 15: |
| Min. Value | 26.03 | 25.94 | 25.96 | 26.14 | 29.94 | 3.34 | 29.53 | -1.24 | 30.14 |
| Date of Min. Value | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14:35 | 14/07/2022 14: |
| Average Value | 26.51 | 26.43 | 26.26 | 26.43 | 30.43 | 3.84 | 30.01 | -0.76 | 30.43 |
| Standard Deviation | 0.64 | 0.63 | 0.15 | 0.15 | 0.63 | 0.63 | 0.64 | 0.64 | 0.15 |

Statistics refer to the data set in the table. These data can be row values (original values) obtained from the instrument, or processed values, as in the example above (elaboration rate: 10 minutes). So, in this example, values *Max.*, *Min.* and *Average* of the various quantities are obtained from the data processed every 10 minutes.
In order to obtain statistics of the original data every minute you need to select the option "*Hide original data*" to extract them (§ 7.2) and select *View* on the *Original Data* tab.

## 7.3.7. Data display with charts

*View* → *Chart* allows you to switch from tabular display to chart display. The default for the chart is to display only microclimatic indexes. To displays also the measures select the button *Customize --> Show Measures*.




The chart contains a series of buttons:

- *Copy*: copies the chart in the clipboard (JPEG).
- *Save*: allows you to save the chart as image by selecting the format among Windows Bitmap, JPEG, PNG, GIF.
- *Print*: selects printer and chart print.
- *Customize:* shows/hides the legend, shows/hides the cursor coordinates, shows/hides measures selected in the filter.

If there are WBGT subjects and one or both of the associated indexes have been selected in the filter window, the program automatically displays the calculated WBGTref limit value with a red line.

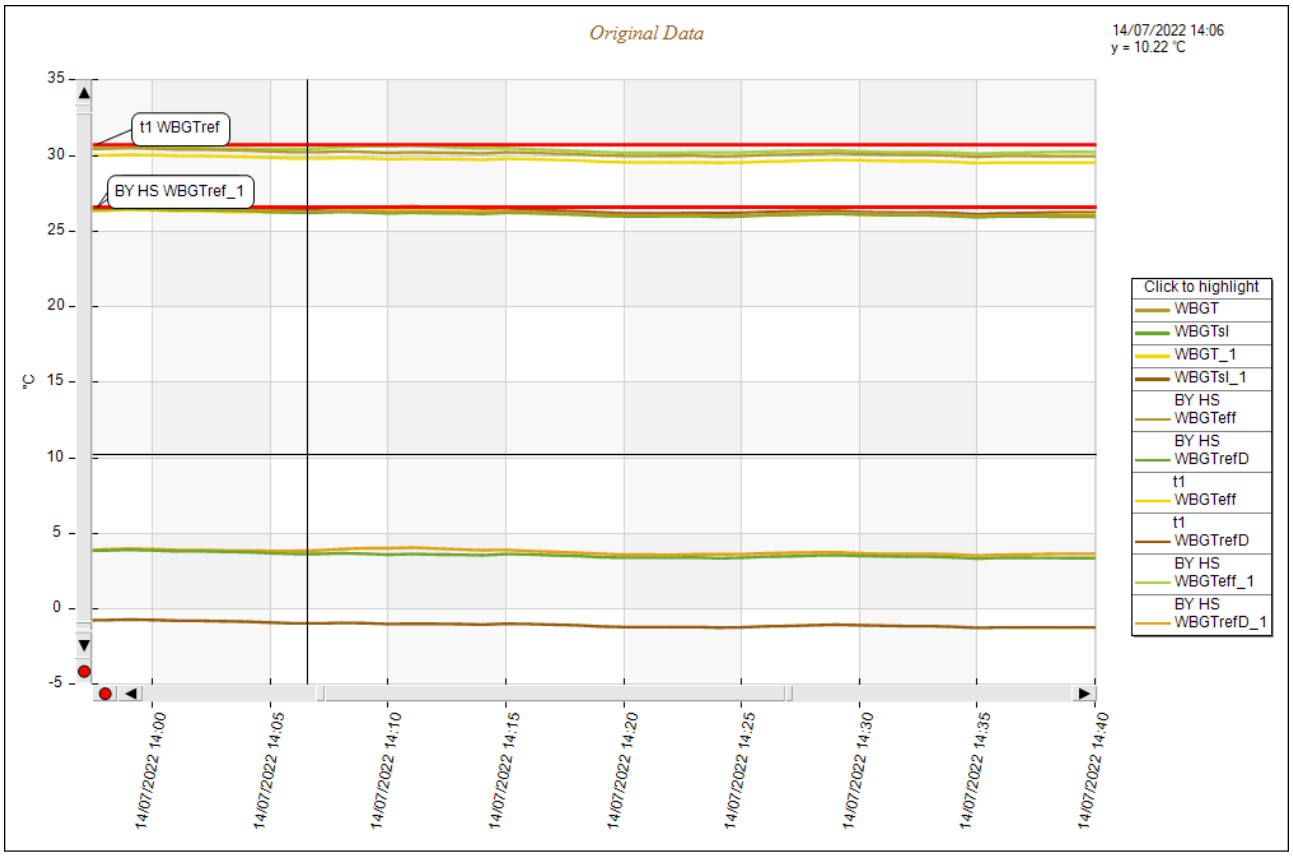
Use the general menu of *File* program to set the page layout and the default printer.
Select *Options* → *Program Settings* menu to change the chart settings (§ 5.3).

#### 7.3.7.1. Zoom functions

The chart has a zoom function available on both axes. To enable the zoom feature:

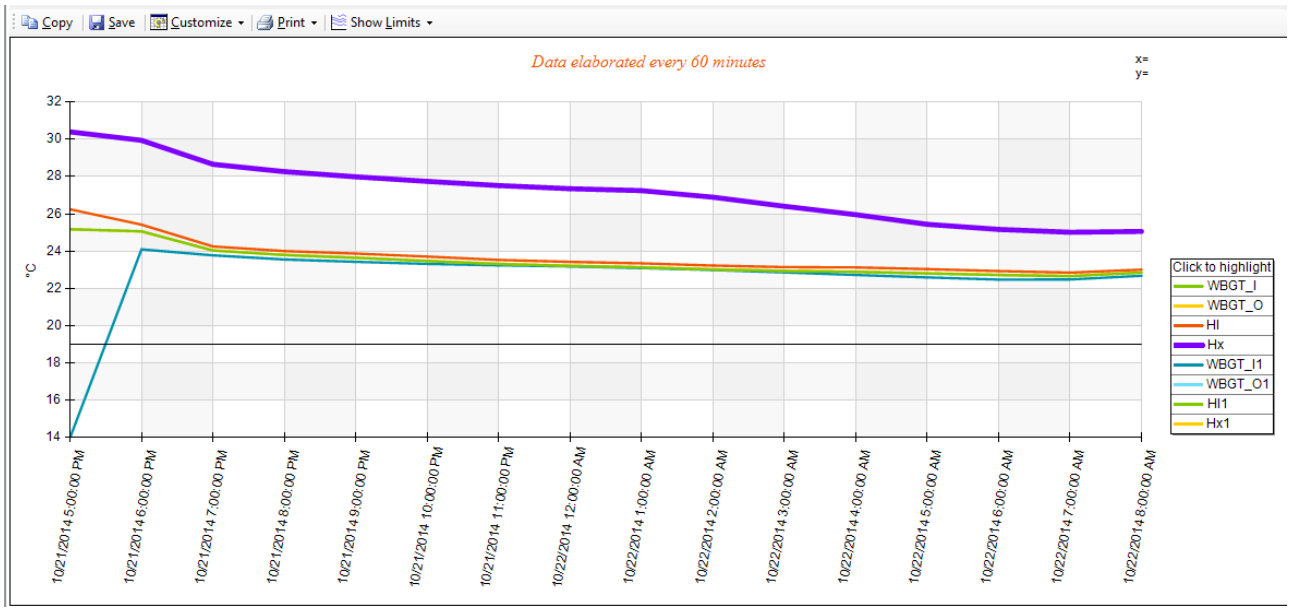
- Select the area to be enlarged with the left key of your mouse.
- Zooming can be again performed on the previously enlarged area.

After zooming, the scroll bars will appear on both axes; button is used to go one level up in X or Y axis in the performed zoom:




### 7.3.7.2. Highlighting the lines

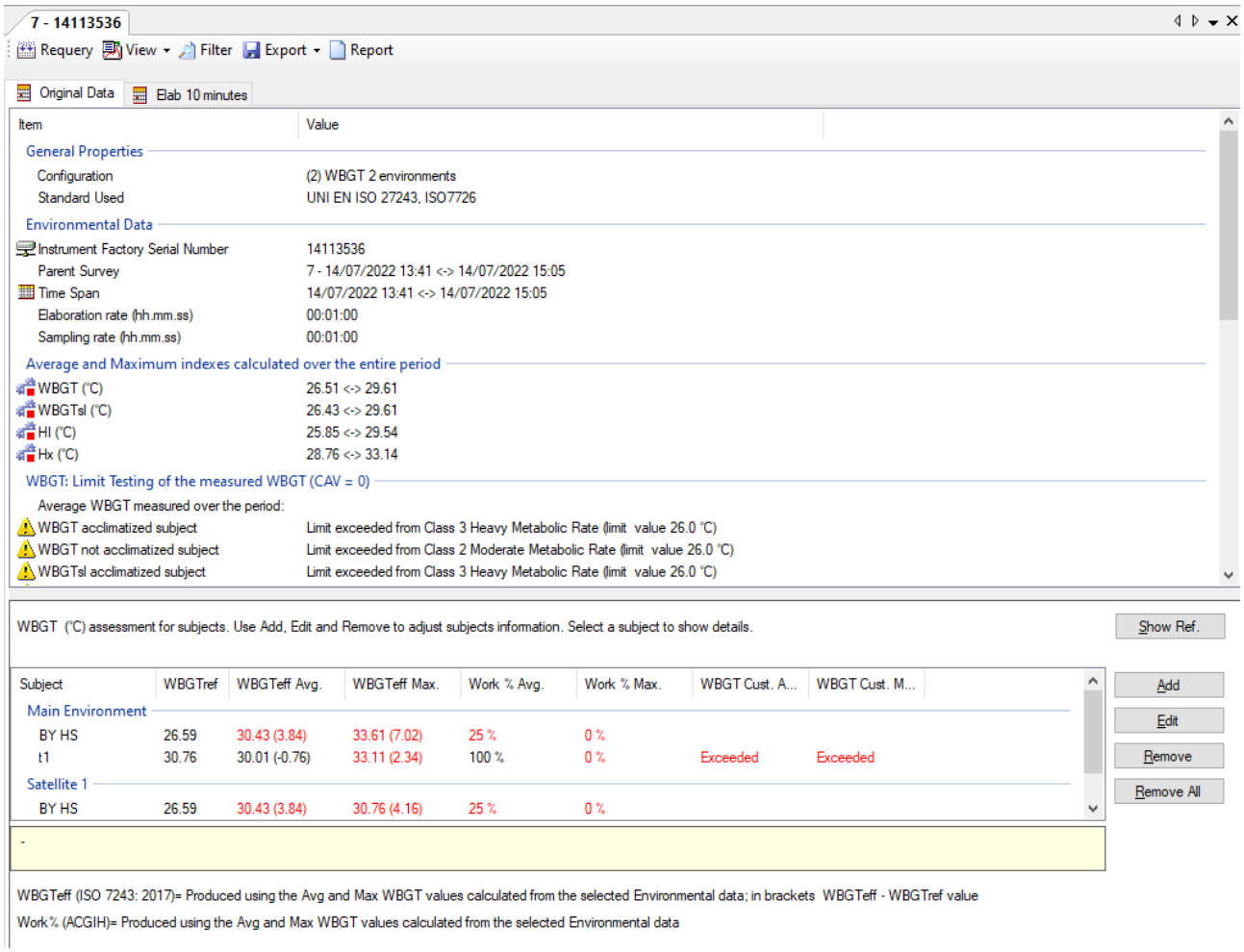
Select an element in the legend to highlight the corresponding line in the chart; this function is very useful when there are multiple lines:




The width of the highlighted line will be double as compared with the other lines in the chart; the option cannot be applied to the cumulative data shown as bars.

## 7.3.8. Summary

*View -> Summary* to view the tab below:




The upper part of this window shows a series of summary information of the extracted data, the values of the calculated indexes and the verification of the general limits defined in the ISO 7243: 2017 standard without taking into account the subjects possibly associated with the survey; from version 1.5 the limits are evaluated both on the average WBGT and on the maximum WBGT.

WBGT values are estimated either for acclimatized subjects and for non-acclimatized ones. For each index, the class of metabolic activity is indicated representing the exceeding limit for the calculated value.

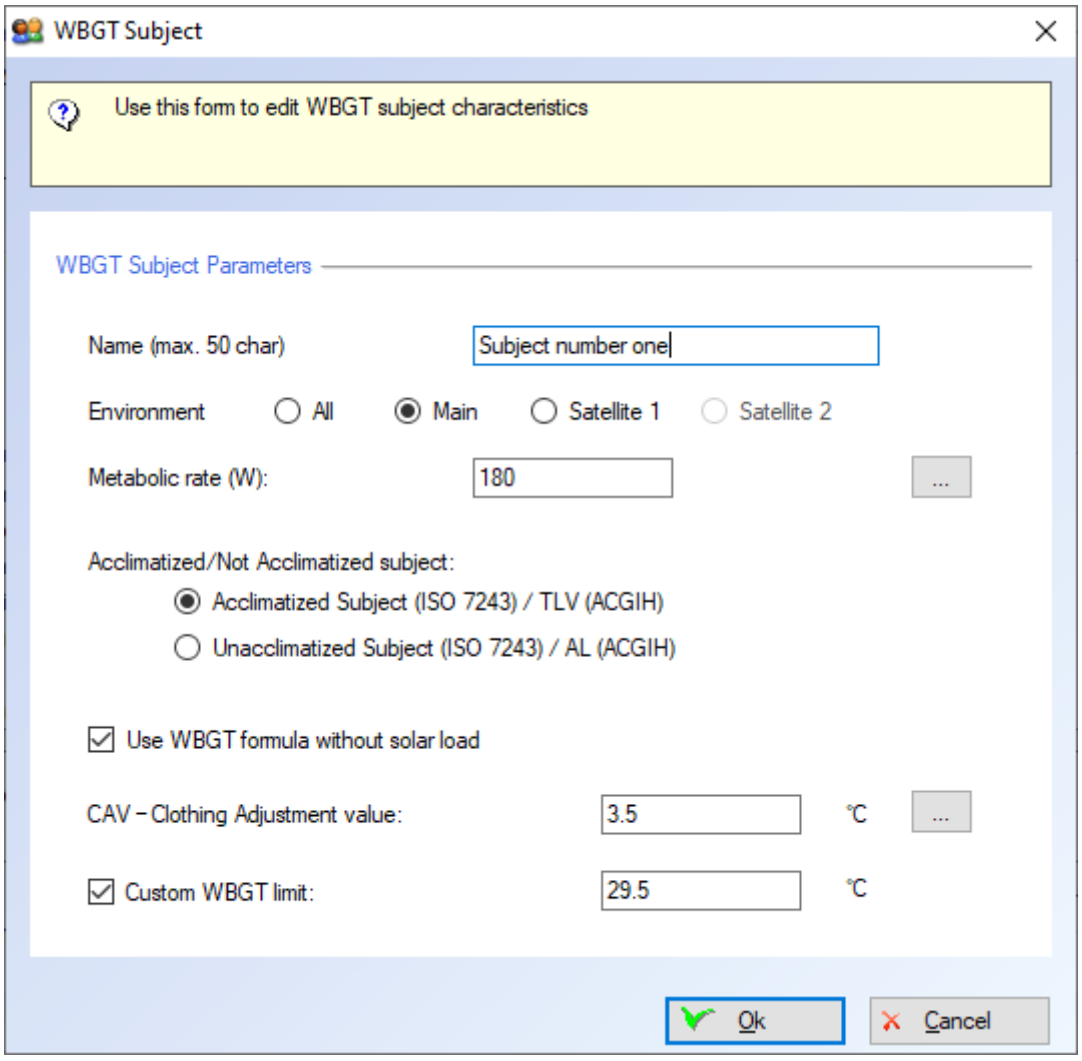
The lower part of the window contains a list of the subjects associated to the survey and their evaluation.

The table displays for each Subject:

- WBGTref: reference limit value
- WBGTeff: actual value of the subject calculated both on the average value and on the maximum value of the corresponding WBGT; the value of the WBGTrefD index is shown in brackets, i.e. the difference between WBGTeff and WBGTref. The values are shown in red when they exceed the limits.
- Work%: percentage of working time possible as reported by *American Conference of Government Industrial Hygienists*.
- The Status of the WBGT Custom Limit, if defined.

Selecting a subject, the lower part of the window displays the characteristics of the selected subject.

Subjects are associated to the single surveys and can be added, changed or removed using the dedicated buttons. Below, the window where you can add/change a subject:




It should be noted that:

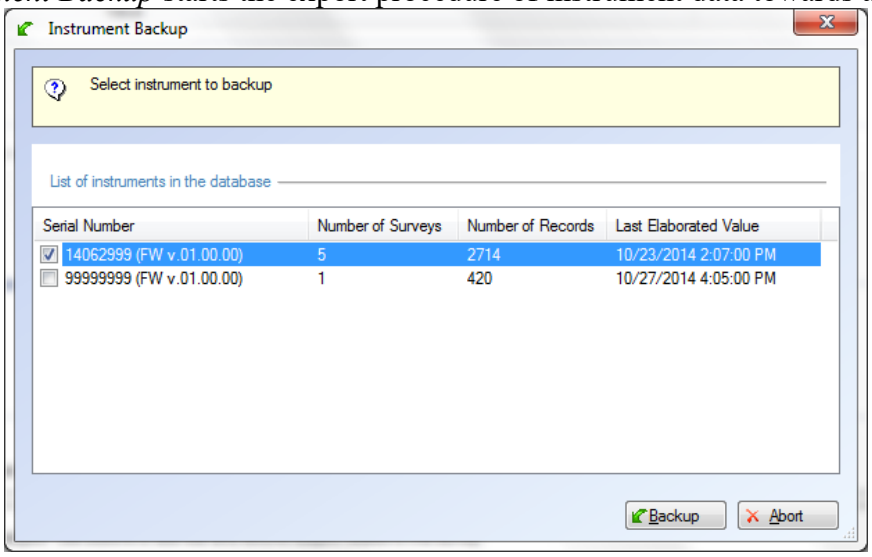
- *Nome:* the subject automatically inserted in the configuration of the instrument's survey is called “BY HS”.
- *Environment*: this field is enabled only for those configurations that use satellite data and allows the position of the subject under consideration to be specified.
- *Metabolic rate (W)*: is the metabolic rate in watts (W) of the subject, used in the calculation of the $WBGT_{ref}$.
- *Acclimatized/Not Acclimatized Subject*: select Subject condition
- *Use WBGT formula without solar load:* if not selected, the calculations will be performed using the WBGTsl index (WBGT with solar load)
- *CAV – Clothing Adjustment Value:* allows you to specify a value to be added to the measured WBGT.
- *Custom WBGT limit*: allows you to enter a custom additional limit value.

Each time a subject is added / removed / modified, the program recalculates the values displayed in the Table / Statistics / Graph window.
The WBGT subject inserted in the instrument is automatically associated with the survey and is called “BY HS” and it cannot be removed or modified.

***WARNING***
***This function is not available for the PMV PPD configuration***

# 7.4. Backup and data recovery of an instrument

*Tools* → *Instrument Backup* starts the export procedure of instrument data towards an archive file.




Select the instrument and press the *Backup* button.
The procedure creates a file named *[Serial Number]_Backup.zip* containing the data of all the surveys of the selected instrument.

*Tools* → *Instrument Restore* starts the guided procedure for re-importing data.

# 7.5. Database Compression

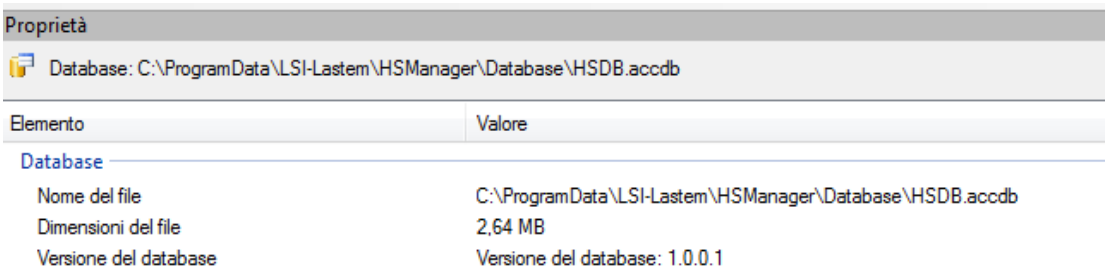
*Tools* → *Database Compression* starts the database compression procedure. This procedure is needed to reclaim disk space when many data from a database have been erased, since the sole erasure operation DOES NOT reduce the file dimension in the database.

The compression makes use of the *Microsoft Office 12.0 Access Database Engine Object Library* installed by the program; in the event of particular computer configurations, the database compression could not be performed.

# 7.6. Backup of database

The program doesn't provide for a backup of the whole database. You can instead back up the data of a single instrument (§ 7.4).
To back up your database:

- Select the *Database* node in the *Browser* and display the database file path in the *Property* tab.




- Close the program and back up the database file.

# 7.7. Exporting data to GidasTEA

*HSManager* allows you to export the data measured by *HeatShield* instruments to *Gidas* database used by *GidasTEA* program. For this reason *HSManager* and *GidasTEA* need to be installed in the same computer, while *Gidas* database doesn't, since it can be shared on the network.

*GidasTEA* is the LSI LASTEM program for the calculation of the most common and known thermal indexes regulated by International law (ISO).

The *Moderate Thermal Environments* module allows the following calculations:

- Moderate base (to, DR, PPD, PMV indexes);
- Moderate ceiling radiant asymmetry (PDwc, PDcc indexes);
- Moderate wall radiant asymmetry (PDcw, PDww indexes);
- Moderate thermal dissatisfaction (PDv, PDf indexes).

The Severe hot thermal environments allows the calculation of:

- PHS Predicted Heat Strain Model (UNI EN ISO 7933);
- WBGT index (UNI EN 12515 - ISO 7243)
- WBGT index at ankles, abdomen, head (UNI EN 12515 - ISO 7243)

The *Cold Thermal Environemnts* module allows the following calculations:

- Cold stress base (indexes IREQ, IclReq, Dlim, TWC);
- Cold stress recovery time (Drec);

*HeatShield* instrument (if equipped with an anemometer) supports the calculation of all indexes calculated by GidasTEA except for the following indexes: *Moderate ceiling radiant asymmetry (PDwc, PDcc indexes), Moderate wall radiant asymmetry (PDcw, PDww indexes), Moderate thermal dissatisfaction (PDv, PDf indexes)* that require the special discomfort probes.

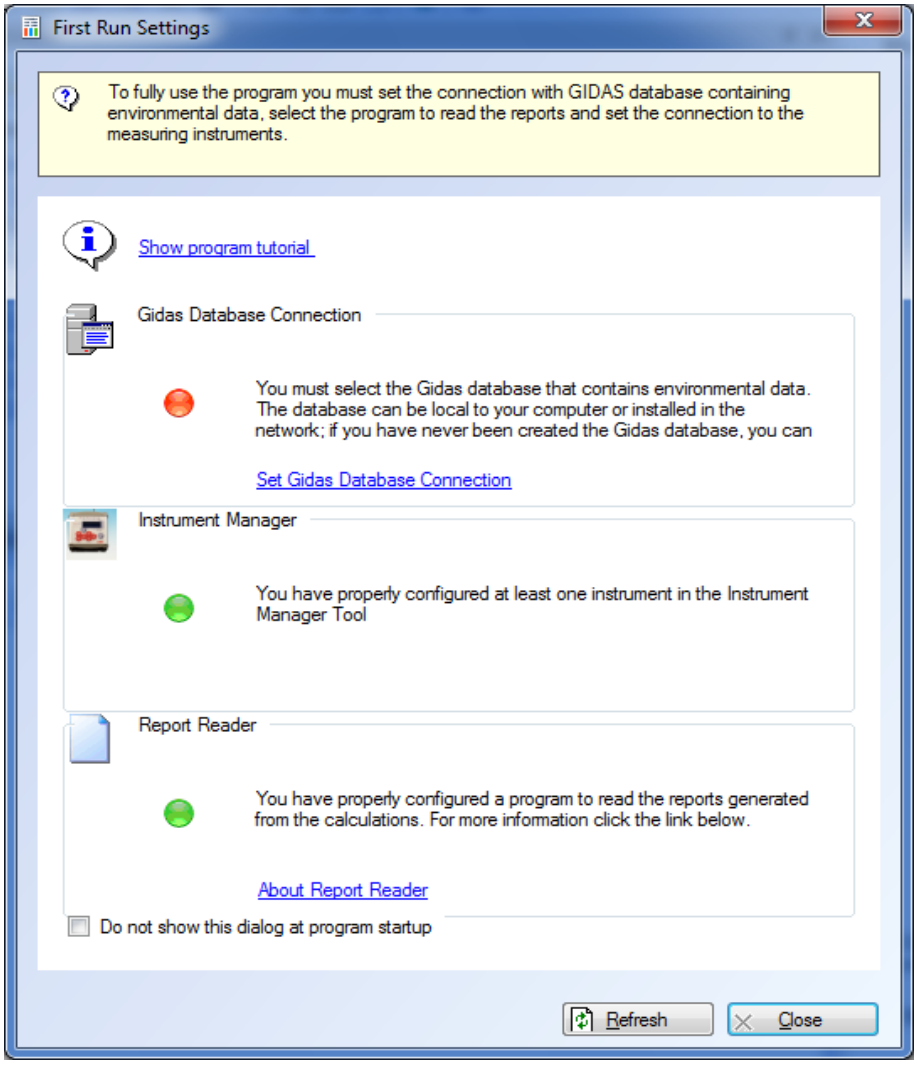
## 7.7.1. GidasTEA configuration for use with HeatShield

Before starting the process of exporting data to *GidasTEA* install the program on the same computer where you installed *HSManager* and start it.

When starting *GidasTEA* for the first time it might be necessary to perform the following:

- Select *Gidas* database connection containing the environmental data: the program can use both local and network databases. If a *Gidas* database has not been created before it is required to create a new *Gidas* database in the local computer. If *Gidas* database has been created during the GIDAS installation procedure, this operation will not be needed.
- Select Instrument Manager to add your instrument into instruments manager. (**Don't select any Instrument** if GIDAS TEA imports data from HS Manager. In that case, data download from Heat Shield instrument to HS Manager is made by HS Manager only. Read § 7.7 to export data from HS Manager to GIDAS TEA programs)
- Set Report Reader to select the program to create data report.

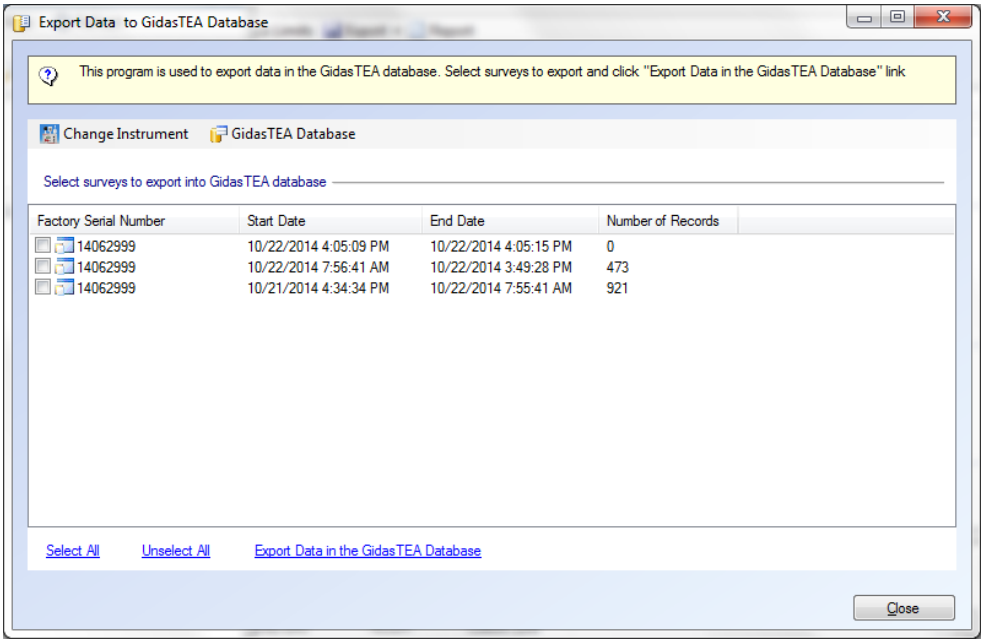
**Warning**:
the window below appears if configuration was not completed or if the user has not selected the option "Do not show this dialog at program startup". If you wish to use *GidasTEA* with the data coming from *HeatShield* instrument, check box " Do not show this dialog at program startup " to avoid this window every time you start *GidasTEA*.




**Warning:**
In order to use *GidasTEA* with the data downloaded in *HS Manager* you must install the *GidasTEA* license to use for the *HeatShield* instrument. **License must be installed before proceeding with the export of data.**
To install the license start *GidasTEA* and select menu *Tools -> License Manager.*

## 7.7.2. Export data to *Gidas TEA*

To export data to *GidasTEA* select *Tools* → *Export to GidasTEA Database* menu to start the export procedure.

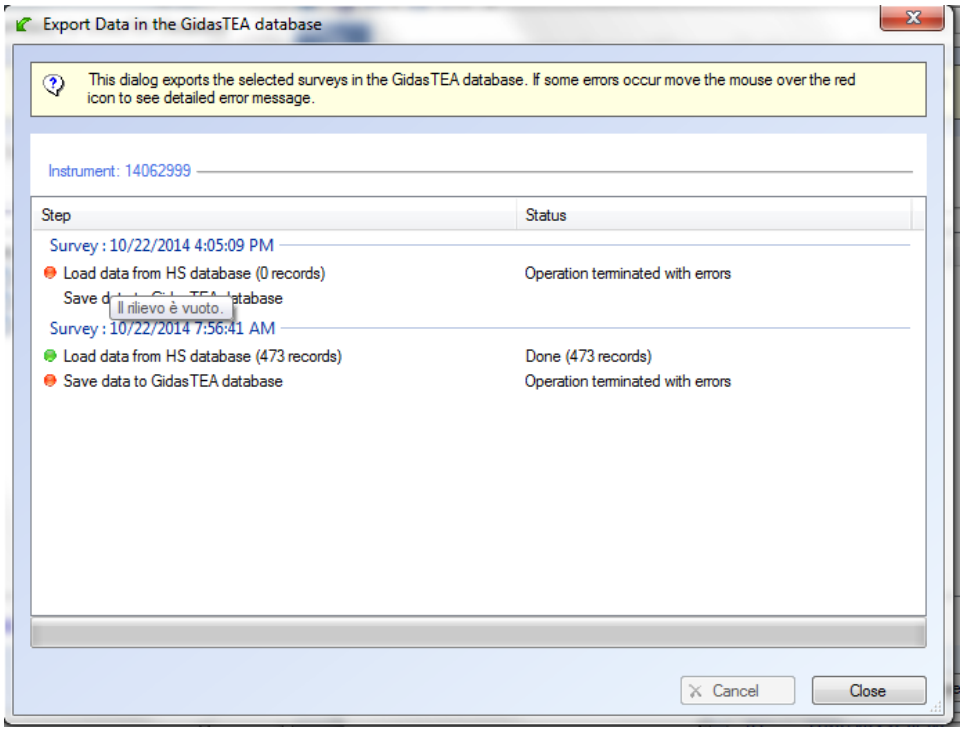



Select the Surveys to be exported and select *Export Data to Gidas TEA Database* link.
*Change Instrument* button allows you to select the instrument where to choose the surveys to be exported in the event *HSManager* database is managing several instruments; *GidasTEA Database* shows the information of *Gidas* database used by *GidasTEA* program.

Note:

- Only closed surveys can be exported; surveys in progress are not displayed in the list.
- Surveys already exported are no more shown in the list.

In the event an error occurs during the export procedure, an error message is displayed by placing your mouse cursor over the red icon:


Export Data in the GidasTEA database
This dialog exports the selected surveys in the GidasTEA database. If some errors occur move the mouse over the red icon to see detailed error message.
Instrument: 14062999
Step
Status
Survey : 10/22/2014 4:05:09 PM
Load data from HS database (0 records)
Operation terminated with errors
Il rilievo è vuoto.
Survey : 10/22/2014 7:56:41 AM
Load data from HS database (473 records)
Done (473 records)
Save data to GidasTEA database
Operation terminated with errors
Cancel
Close

.

# 8. Reports

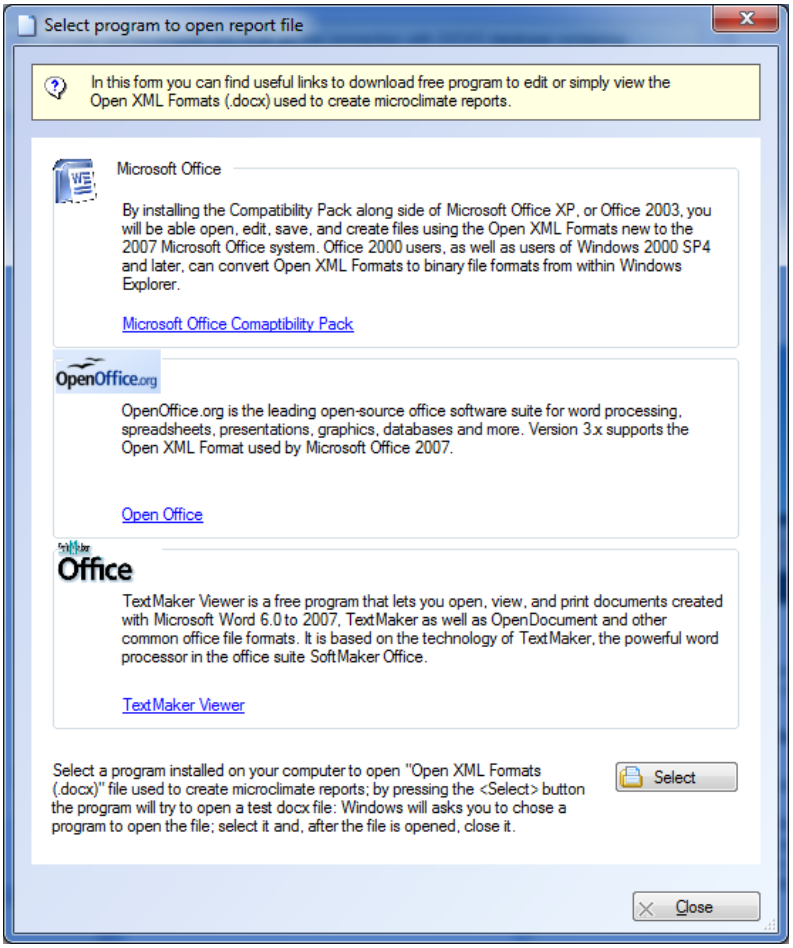
*HS Manager* generates (*Report* key) measurement reports of the extracted data. The report is generated based on the predefined model for the type of configuration of the data examined. Documents are generated as *Office Open XML* files *(docx*). *Docx* format is supported in native mode by Microsoft Word in 2007 version; it is an open format documented by ECMA-376 Standard.

Predefined templates can be configured based on specific requirements (§ 8.1).

## 8.1. Configuration and management of report templates

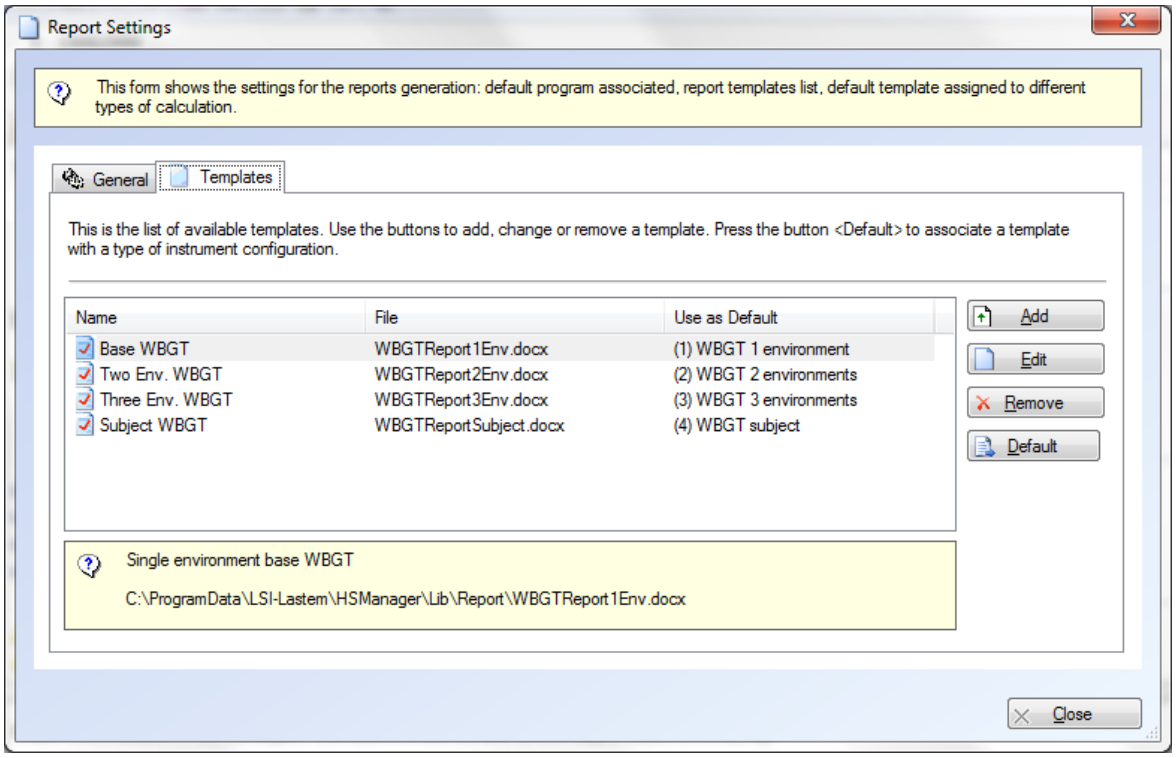
*Options* → *Report* opens a report configuration window. The predefined program associated to *Office Open XML (docx*) file format is displayed in the *General* tab.

If no program is associated, press the *Select* button ***and*** select the program:




Select one of the solutions (or install a program for the management of *docx* files. Press *Select* to associate a program already installed in your computer to *docx* files.

*Templates* Displays the list of the available report templates:




The icon specifies the program fixed templates; they cannot be changed.
Each template can be associated to a configuration, that will be used in automatic mode based on the selected configuration.
Select un element in the list and press:

- *<Remove>* removes definitively the template;
- *<Edit>* opens a *docx* file associated to the template to change it; if you select this option about one of the installed templates, the program generates a copy of the template;
- *<Add>* adds a new template that will be generated starting from the one selected.
- *<Default>* selects the default template used for a given configuration.

## 8.2. Editing a template

***WARNING:***
***version 1.5 has changed the management of calculations for WBGT subjects, consequently some keys are no longer usable by the program. The default templates are updated together with the program but, if you have created custom reports that include the table of subjects, you need to change the keys following the examples of the predefined templates. Obsolete keys are indicated in italics.***

A template is a *docx* document containing markers (keys) which correspond to elements produced by the program.

In Windows 7 and above custom templates are saved in the directory:

```
C:\ProgramData\LSI-Lastem\HSManager\UserTemplate
```

In Windows XP:

```
C:\Documents and Settings\All Users\Dati Applicazioni\LSI-
Lastem\HSManager\UserTemplate
```

The user can change one of the existing templates or create a new one pressing *Add*.
The change of a template is made with an editor supporting *docx* format.
The keys for identifying the elements are enclosed in curly brackets:

| Key | Meaning |
|---|---|
| General | |
| {SOFTWARE} | Name and version of the software used for calculation |
| {REPORTDATE} | Date of report generation |
| {CONFIG} | Description of configuration used for data storage |
| {SERIALNUMBER} | Serial number of instrument used |
| {SURVEY} | Data origin survey |
| {TIMESPAN} | Reference period of data used |
| {ERATE} | Elaboration Rate |
| {SRATE} | Sampling Rate |
| Index Table Title and Position | |
| {INDEXTIT} | Title of paragraph containing index table of principal environment |
| {TABINDEX} | Marker for index table of principal environment |
| {INDEXTIT1} | Title of paragraph containing index table of satellite 1 environment |
| {TABINDEX1} | Marker for index table of satellite 1 environment |
| {INDEXTIT2} | Title of paragraph containing index table of satellite 2 environment |
| {TABINDEX2} | Marker for index table of satellite 2 environment |
| Secondary Index Table Title and Position | |
| {INDEXSECTIT} | Title of paragraph containing secondary index table of principal environment |
| {TABSECINDEX} | Marker for secondary index table of principal environment |
| {INDEXSECTIT1} | Title of paragraph containing secondary index table of satellite 1 environment |
| {TABSECINDEX1} | Marker for secondary index table of satellite 1 environment |
| {INDEXSECTIT2} | Title of paragraph containing secondary index table of satellite 2 environment |
| {TABSECINDEX2} | Marker for secondary index table of satellite 2 environment |
| WBGT Limit Table Title and Position | |
| {WBGTLIMTIT} | Title of paragraph containing the table for the assessment of WBGT limits of principal environment |
| {TABWBGTLIM} | Marker of the table for the assessment of WBGT limits of principal environment |
| {WBGTLIMTIT1} | Title of paragraph containing the table for the assessment of WBGT limits of satellite 1 environment |
| {TABWBGTLIM1} | Marker of the table for the assessment of WBGT limits of satellite 1 environment |
| {WBGTLIMTIT2} | Title of paragraph containing the table for the assessment of WBGT limits of satellite 2 environment |
| {TABWBGTLIM2} | Marker of the table for the assessment of WBGT limits of satellite 2 environment |
| Subject Table Title and Position | |
| {SUBJECTTIT} | Title of paragraph containing the assessment of subjects in the principal environment |
| {TABSUBJECTLIST} | List table of subjects in the principal environment |
| {TABSUBJECTRES} | Table of results for principal environment subjects |
| {SUBJECTTIT1} | Title of paragraph containing the assessment of subjects in satellite 1 environment |
| {TABSUBJECTLIST1} | List table of subjects in satellite 1 environment |
| {TABSUBJECTRES1} | Table of results for subjects in satellite 1 environment |

| | |
|---|---|
| {SUBJECTTIT2} | Title of paragraph containing the assessment of subjects in satellite 2 environment |
| {TABSUBJECTLIST2} | List table of subjects in satellite 2 environment |
| {TABSUBJECTRES2} | Table of results for subjects in satellite 2 environment |
| Keys in single Tables | |
| {ITEM} | Represents the index name in index tables and the type of verified WBGT in WBGT verification table |
| {VALUE} | Represents the index value in index tables and the textual description of respected/exceeded limit in WBGT verification table |
| {SUBJECT} | Represents the subject name in subject tables |
| {SUBJECTDESC} | Represents the textual description of a subject in subject tables |
| {WBGTREF} (**) | Represents the value of the reference WBGT of the subject |
| {WBGTEFFMED} (**) | Represents the effective value of the WBGT of the subject calculated using the corresponding mean WBGT |
| {WBGTEFFMAX} (**) | Represents the effective value of the WBGT of the subject calculated using the corresponding maximum WBGT |
| {WORKMED} (**) | Represents the percentage of work allowed according to the American Conference of Government Industrial Hygienists calculated using the corresponding mean WBGT |
| {WORKMAX} (**) | Represents the percentage of work allowed according to the American Conference of Government Industrial Hygienists calculated using the corresponding maximum WBGT |
| {CUSTMED} (**) | Represents the indication of respected/exceeded of the WBGT Custom limit associated to the subject calculated using the corresponding mean WBGT |
| {CUSTMAX} (**) | Represents the indication of respected/exceeded of the WBGT Custom limit associated to the subject calculated using the corresponding maximum WBGT |
| *{WBGTS}(*)* | *Represents the real WBGT value of a subject* |
| *{EN27243}(*)* | *Represents the indication of limits respected/exceeded contained in ISO 7243:2017* |
| *{ACGIH}(*)* | *Represents the percentage of work allowed according to the American Conference of Government Industrial Hygienists* |
| *{SCUSTOM}(*)* | *Represents the indication of respected/exceeded additional limit associated to the subject* |
| Keys used only with PMV PPD configuration | |
| {CLO} | Clothing (clo) |
| {ETA} | Mechanical Performance (%) |
| {MET} | Activity (met) |
| Chart | |
| {CHART} | Key for indicating the chart position |

*(**) new keys to be used for the indexes of the single subjects*
*(*) obsolete keys that are no longer supported to represent individual subject indexes*

### 8.2.1. Entering index and WBGT limit tables

Enter the text below in the document template to enter the index table:

*{INDEXTIT}*
{TABINDEX}

| {ITEM} | {VALUE} |
|---|---|

If the environment corresponds to the position of the first satellite, replace
{INDEXTIT} key with {INDEXTIT1}
{TABINDEX} with {TABINDEX1};
If the environment corresponds to the position of the second satellite use {INDEXTIT2} and {TABINDEX2}.
{ITEM} and {VALUE} keys are always the same for all the environments and represent the index name and the value it has acquired.

***ATTENTION***
***The table containing {ITEM} and {VALUE} keys must have only UNE line and must be in the same paragraph of the key {TABINDEX} (in Word enter {TABINDEX} text and press SHIFT + ENTER to go in a new line without starting a new paragraph)***

Proceed in the same way to enter the table of the secondary indexes in the configuration and WBGT indexes verification table according to ISO 7243:2017 regulation.

*{WBGTLIMTIT}*
{TABWBGTLIM}

| {ITEM} | {VALUE} |
|---|---|

## 8.2.2. Entering subject tables

(Not used in PMV PPD configuration)

Enter the text below in the document template to enter the table with the list of subjects in the report:

*{SUBJECTTIT}*

Subject List:
{TABSUBJECTLIST}

| Subject | Description |
|---|---|
| {SUBJECT} | {SUBJECTDESC} |

Similarly to what previously described, if the environment corresponds to the position of the first satellite replace
{SUBJECTTIT} key with {SUBJECTTIT1}
{TABSUBJECTLIST} with {TABSUBJECTLIST1};
if the environment corresponds to the position of the second satellite use {SUBJECTTIT2} and {TABSUBJECTLIST2}.
{SUBJECT} and {SUBJECTDESC} keys are always the same for all the environments and represent the index name and a textual description of its characteristics.

Enter the text below in the document template to enter the table with the list of the results for each subject in the report:

{TABSUBJECTRES}

| Subject | WBGTeff | WBGTref | ISO 7243:2017 | ACGIH | Custom |
|---|---|---|---|---|---|
| {SUBJECT} | {WBGTS} | {WBGTREF} | {EN27243} | {ACGHU} | {SCUSTOM} |

**8.3. {TABSUBJECTRES}**

| Subject | WBGTref | WBGTeff avg | WBGTeff max | Work % avg | Work % max | WBGT Cust. avg | WBGT Cust. max |
|---|---|---|---|---|---|---|---|
| {SUBJECT} | {WBGTREF} | {WBGTEFFMED} | {WBGTEFFMAX} | {WORKMED} | {WORKMAX} | {CUSTMED} | {CUSTMAX} |

Similarly to what previously described, if the environment corresponds to the position of the first satellite replace
{TABSUBJECTRES} key with {TABSUBJECTRES1};
If it corresponds to the position of the second satellite use {TABSUBJECTRES2}.

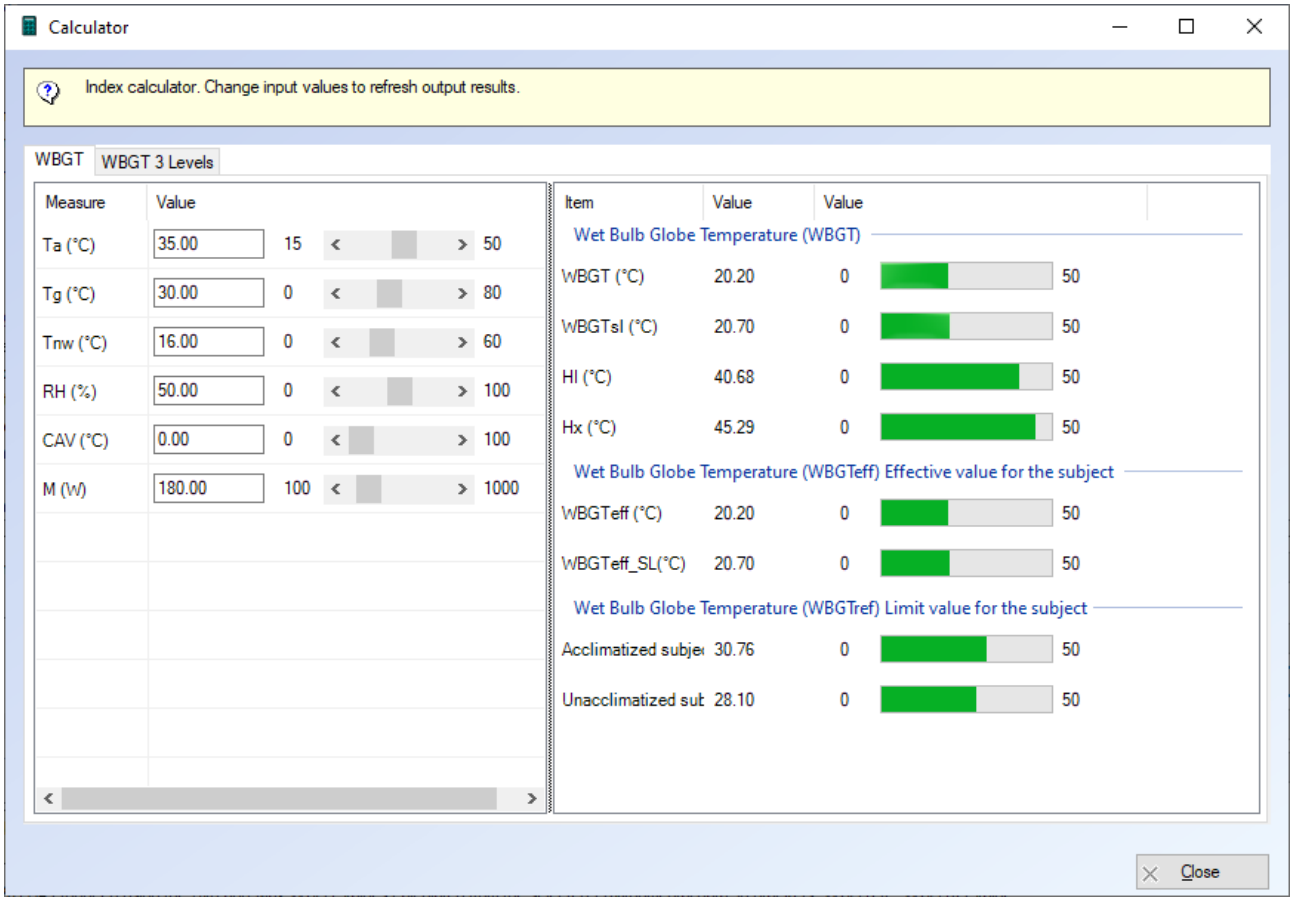
***ATTENTION***
***The tables must have only ONE line and must be in the same paragraph of the key {TABSUBJECTLIST} or {TABSUBJECTRES} (in Word enter the text {..} and press SHIFT + ENTER to go in a new line without starting a new paragraph)***

### 8.3.1. Entering a chart

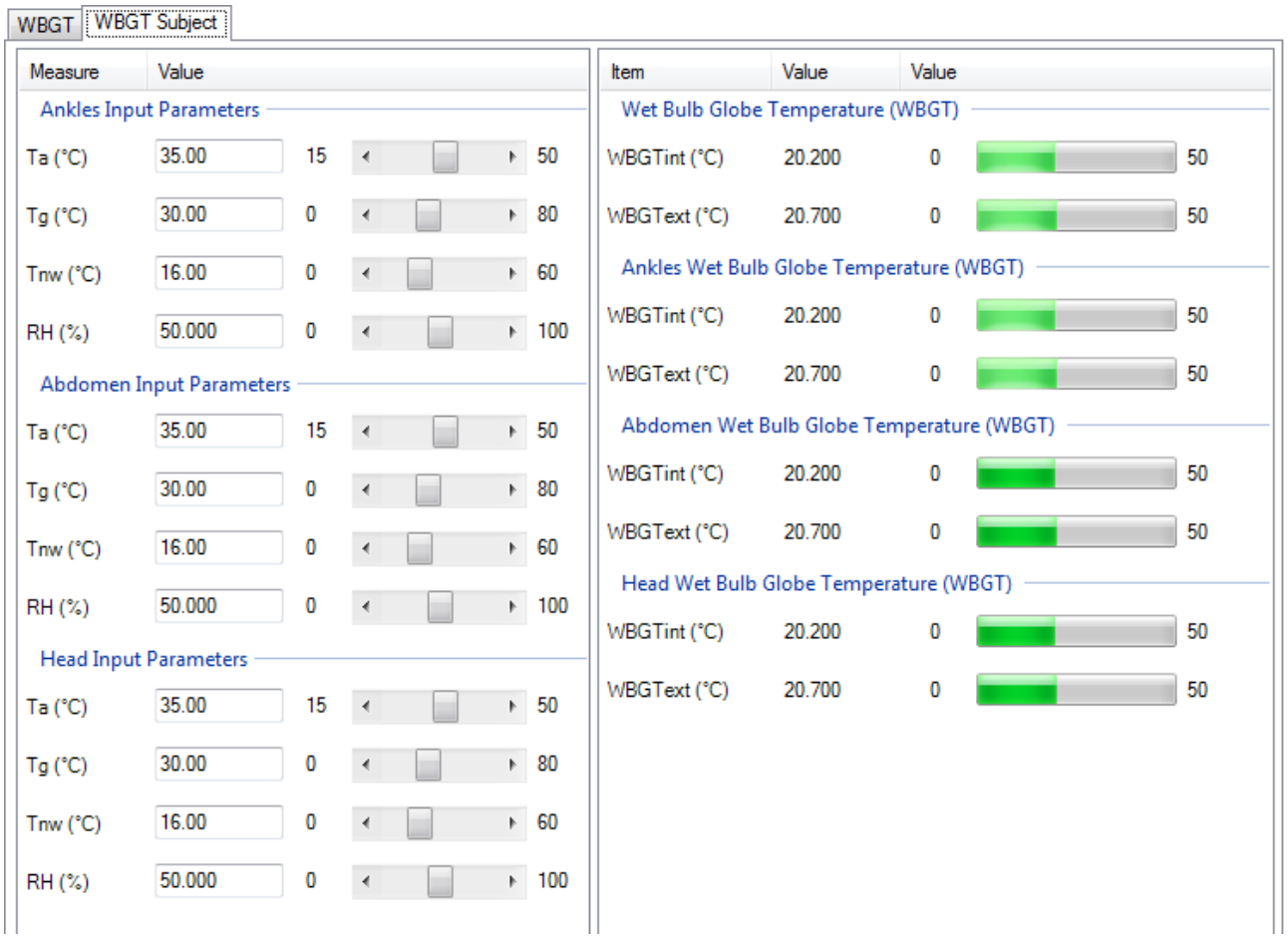
Use the key {CHART} to enter the chart in the report template; the chart will be entered exactly as it appears when the report is generated.

# 9. The Calculator

To shows the Calculator select menu Tools → Calculator or the  button on the toolbar.




The Calculator computes the indexes *WBGT*, *Humidex* and *Heat Index* using values of the requested measures. Furthermore, by entering the values of CAV and M it is possible to evaluate the $WBGT_{eff}$ of the suvject and the limit values $WBGT_{ref}$ calculated following the Annex A of the standard.
The tab *WBGT 3 levels* computes the *WBGT* indexes using measures taken at the ankles, abdomen and head of the subject (although the 2017 version of ISO 7243 no longer contains this calculation).


WBGT
WBGT Subject
Measure
Value
Ankles Input Parameters
Ta (°C) 35.00 15 50
Tg (°C) 30.00 0 80
Tnw (°C) 16.00 0 60
RH (%) 50.000 0 100
Abdomen Input Parameters
Ta (°C) 35.00 15 50
Tg (°C) 30.00 0 80
Tnw (°C) 16.00 0 60
RH (%) 50.000 0 100
Head Input Parameters
Ta (°C) 35.00 15 50
Tg (°C) 30.00 0 80
Tnw (°C) 16.00 0 60
RH (%) 50.000 0 100
Item
Value
Value
Wet Bulb Globe Temperature (WBGT)
WBGTint (°C) 20.200 0 50
WBGText (°C) 20.700 0 50
Ankles Wet Bulb Globe Temperature (WBGT)
WBGTint (°C) 20.200 0 50
WBGText (°C) 20.700 0 50
Abdomen Wet Bulb Globe Temperature (WBGT)
WBGTint (°C) 20.200 0 50
WBGText (°C) 20.700 0 50
Head Wet Bulb Globe Temperature (WBGT)
WBGTint (°C) 20.200 0 50
WBGText (°C) 20.700 0 50

# 10. Program update

Use menu *?* → *Check for updates* to run the program *LSI Update Center* that checks for the availability of the new versions of the LSI LASTEM programs installed in the computer.

The *LSI Update Center* program is one of the components of the *LSI Support Center* program that can be directly installed from LSI LASTEM products CD or from the license files CD or by downloading the installer file from LSI LASTEM FTP site. The *LSI Support Center* also contains the component that manages the licenses of the programs installed in the local computer.

## 10.1.1. Installing the program from FTP site

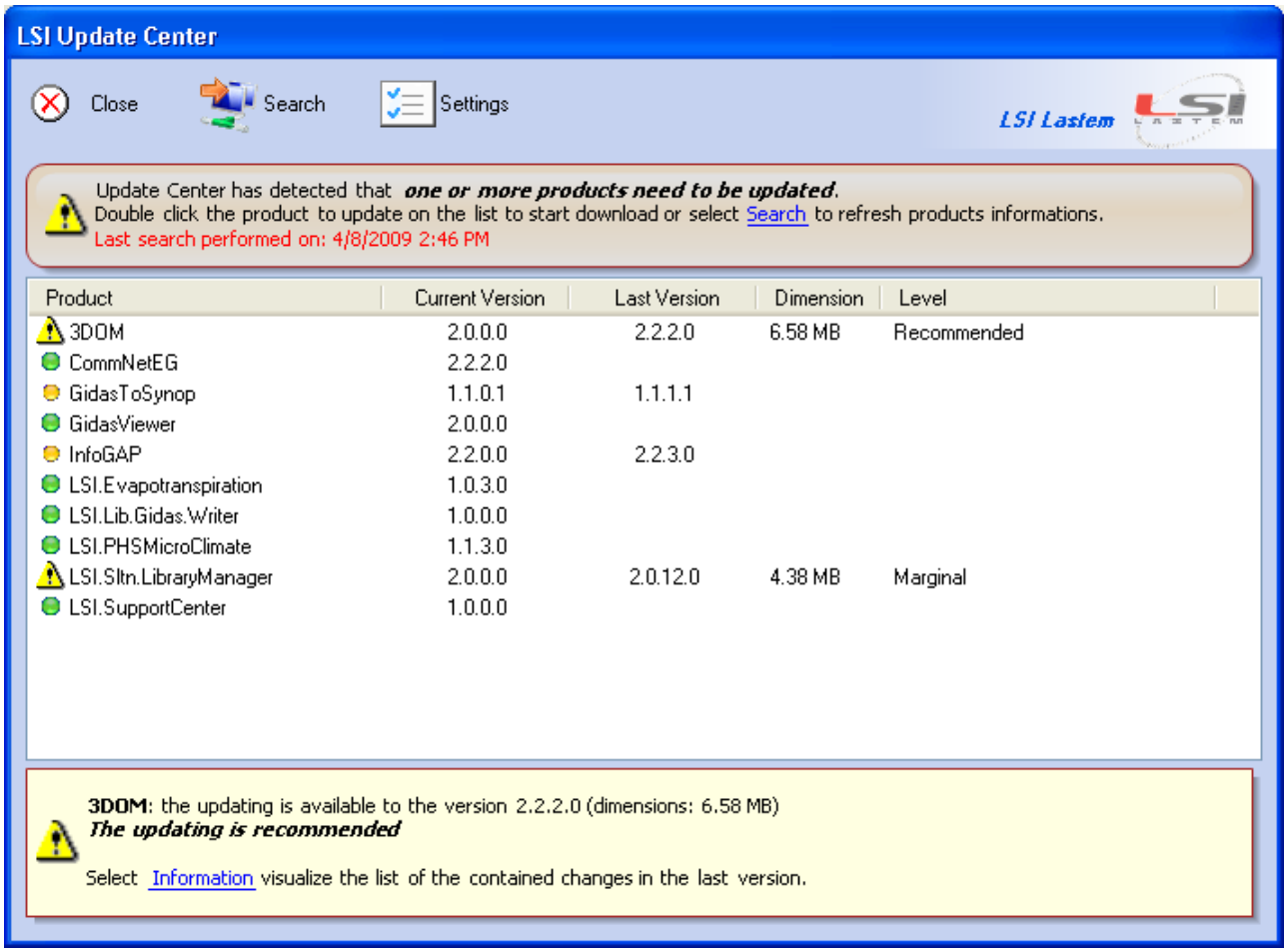
If the program *LSI Update Center* is not installed in the local computer you can download the installation file from the LSI LASTEM FTP site. The installation will automatically starts at the end of download; the program will be started at the end of the installation procedure.

## 10.1.2. Program use

*LSI Update Center* program consists in two templates:

- *LSI Update Center Monitor* program that is automatically started with the operating system and that periodically checks for the available updates for all LSI LASTEM programs installed in the computer;
- *LSI Update Center* program shows the state of the available updates and, if that's the case, downloads the installation files from LSI LASTEM web site and starts the upgrade.

*LSI Update Center* program shows the state of the LSI LASTEM programs installed in the local computer:




For each program the installed run version and the last available version is displayed.
A program can be:

- Updated;
- Not updatable: a new version exists but the product is not updatable;
- Updatable: double click the product to update the list to start download of the installer file.

Selecting *Information* displays a web page containing the list of changes of all the versions of the selected program.

Search for updates is made through the button <*Search*> and connection properties are changed through the button <*Settings*> if a proxy is used and a time interval is used as well by the monitor for the automatic search for updates.

It should be noted that when this program is started by the menu *Start* → *Programs* of Windows or from the contextual menu of the monitor, the program displays the results of the last automatic search operated by the automatic monitor showing the date of the search. Press the <*Search*> button to update the data.