DORGEAN
Beijing Dorgean Electronic Technology Co.,Ltd

LI-19

read-out unit

&

datalogger

with µV sensitivity

v 5.1

Introduction

The LI-19 is a low-cost, high-performance sensor readout unit with integrated datalogger.

The sensor sensitivity can be programmed into the LI-19 such that the readout will show calibrated engineering units, rather than millivolts or microvolts.

Use of the datalogger functions and programming the sensor sensitivity, requires a USB interface which is used to connect the LI-19 to a PC.

Specifications

A/D conversion			16 bits
Input range (programmable)	Full scale voltage	Internal counts	Internal resolution
	+/- 200 mV	20,000	10µV
	+/- 100 mV	10,000	10µV
	+/- 50 mV	5,000	10µV
	+/- 25 mV	25,000	1µV
	+/- 12.5 mV	12,500	1µV
	+/- 6.25 mV	6,250	1µV

Basic accuracy after factory calibration	0.1%
Temperature sensitivity	< 0.5% over the full temperature range
Offset drift	< 3 µV over the full temperature range
Operation temperature range	-10 .. +40 °C
Storage temperature range	-20 .. +60 °C
Relative humidity	< 95% RH non-condensing
Input circuit	> 2 MΩ // 680 nF
Input low-pass filter	5 Hz
Input connectors	2 x 4mm banana plug
Display	LCD 4 digits with sign
Decimal dot position (programmable)	8888 or 888.8 or 88.88 or 8.888
Display update	At least 1 per second
Computer interface	USB 1.1 / 2.0 low speed
Supply current	< 2 mA
Batteries	2 AA (penlight) alkaline
Battery life (alkaline)	> 600 hours (25 days) continuous use
Data logger memory	3518 samples
Data logger storage interval	2 .. 65535 seconds
Logged information	Min, max and average over log interval
Software compatibility	Windows 2000, Windows XP, Windows Vista

Operation

The LI-19 accepts two AA size (penlight) batteries. Use alkaline types for best results. New, good quality batteries should give up to 50 days of continuous operation.

Remove the bottom cover of the enclosure to access the battery compartment. Extract the battery holder from the compartment, and install two fresh batteries. Notice the polarization. Replace the bottom cover and connect the sensor. The LI-19 is now ready for use. Switch the LI-19 on with the push-button switch on the top.
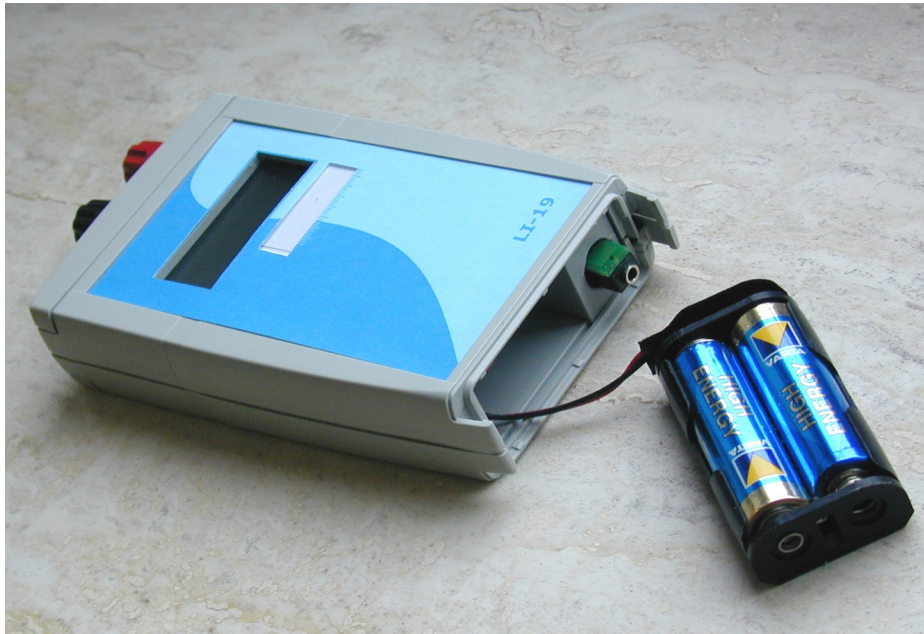
To prevent that the LI-19 is switched off while logging, the on/off switched is mounted so that the button has to be pressed quite deep to switch the LI-19 on or off. You can feel it and hear it when the switch toggles. Press the small black button far enough with your nail or a pencil until you feel and hear it switch.

Software

Use of the sofware requires a PC with Windows (Vista or newer) operating system and a USB interface. The software has built-in functionality for:

- programming the sensor sensitivity

- data logging functions

For each of these functions, an interface cable is required. This cable is used to connect a LI-19 to the USB bus on a PC. If your LI-19 comes bundled with a sensor, it may be that your supplier already programmed the sensor sensitivity into the LI-19, and that this function is disabled in the software. In that case, the optional interface cable and the software give you access to the data logging functions only.

Main window

After installation, the software can be started from the Start menu. The main window allows you to open a previously stored file with logged data.


LI-19 window
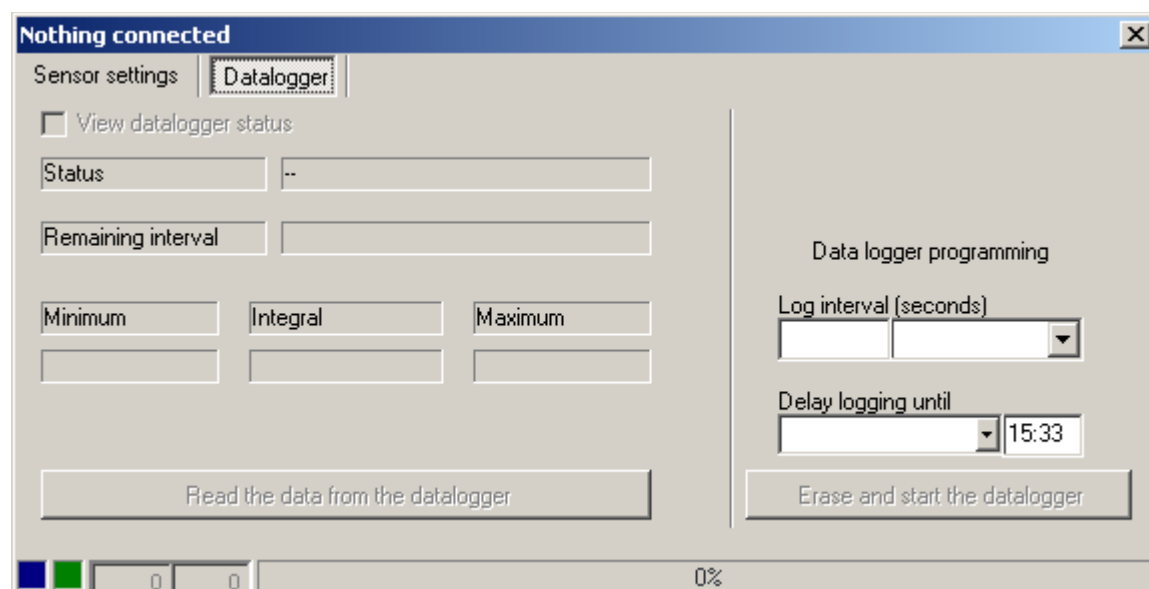
All other functions related to the LI-19 are available in special windows, that will open once you connect an LI-19 to the PC. You can connect more than one LI-19 to your PC, and for each of the devices a separate window will open. These windows may be on top of each other, move them around on your screen to reveal the ones that are covered.

Note that the buttons for 'Sensor settings' may not be available on your version of the software.

The PC will automatically detect the LI-19. If the PC does not detect the LI-19, then check if the LI-19 is switched on, and check the batteries.

Once the LI-19 is detected, the caption of the window will show the serial number of the LI-19 that was connected.
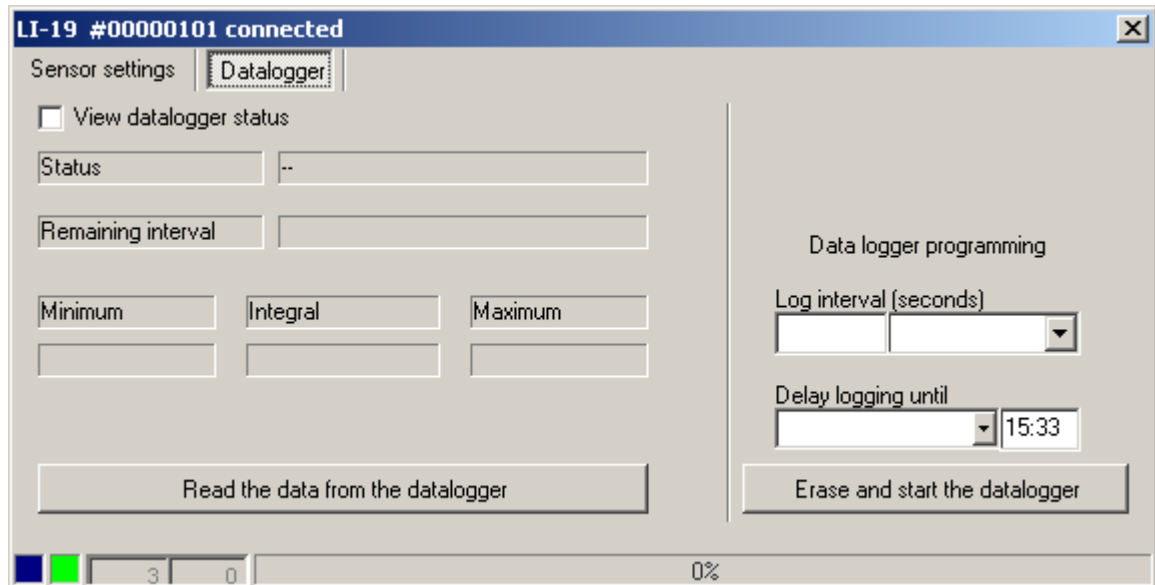
Programming the sensor sensitivity

The software is used to program the sensor sensitivity into the LI-19. If the LI-19 came bundled with a sensor, your supplier may already have programmed the sensitivity of this sensor into the LI-19. If that is the case, the software you received may not have this option.
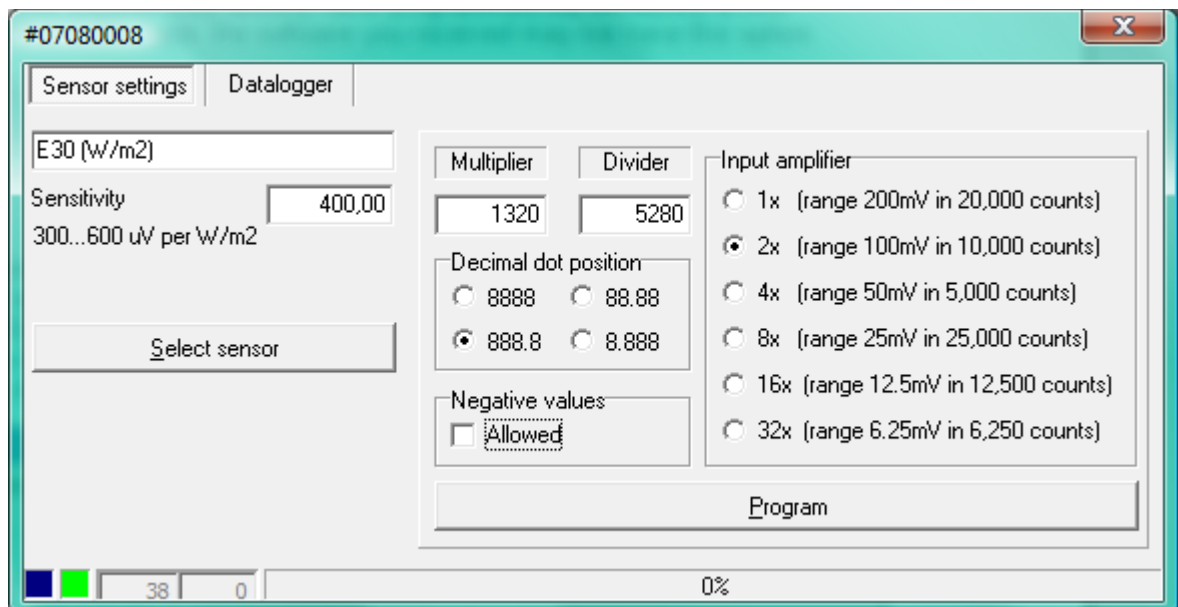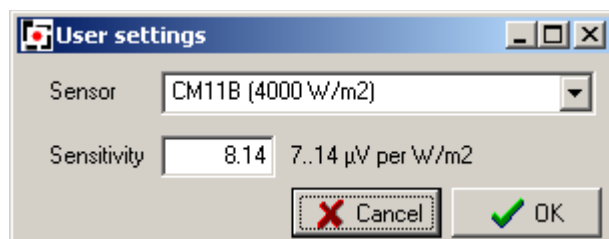

Wizard

You can use the built-in wizard to determine optimal settings for the LI-19, depending on the type of sensor that you have, and its calibration factor.

Depending on the sensor sensitivity, the Wizard will select the optimal input stage amplification for the LI-19, and store appropriate settings for the input amplifier. The position of the decimal dot in the display is also set. After the wizard is used, the LI-19 only has to be programmed to make it suitable for use with the specified sensor.

Use the 'Select sensor' button to access the wizard. The Wizard accommodates many different sensors.

Use the wizard to select the sensor model that is to be used, and then enter the sensitivity of the sensor. The LI-19 is then ready to be programmed with the new settings. To do that, click the 'Program' button.

Once programmed this way, the LI-19 shows the sensitivity for a few seconds on the display when switched on, before it starts showing actual measurements. This way you can check the sensitivity setting before use.

Please note that the LI-19 only shows the sensitivity when programmed using the PC software at least once – so it may not yet do this when you receive the unit.

Manually

Your version of the software may not have manual selection of the input amplifier enabled. If it is enabled, and if you want to manually enter the sensor settings, the required LI-19 setup is determined in the following steps:

1. Go to the 'Sensor settings' page. The full range output voltage of the sensor should be less than or equal to the full scale input voltage of the LI-19. The full range output voltage is used to select the maximum input stage amplification factor of the LI-19 in the software. In the box that says 'Input amplifier' you can select the amplification that corresponds to the required full scale input.
2. Next to the amplification factor, you can read how many internal counts each input range will give you. The number that the LI-19 should display at the full scale input value is entered into the multiplier input field. The number of internal counts that corresponds to that full scale input, is entered into the divider field.

3. The decimal dot position for the display is selected.

4. Tick the 'Allowed' checkbox for negative values if the sensor can measure values less than zero. If you do not tick this box, the LI-19 will clip all negative values to zero.

5. The LI-19 is ready to be programmed with the new settings. To do that, click the 'Program' button.

Some examples:

We have a sensor with a calibration factor of 1.238 mV/W/m². We want to measure in a test-room where the light intensity is 100 W/m² max.

Step 1: Set the input amplifier to give the required range. Select the 'Sensor settings' page.

The full scale output of the sensor is:

1.238 mV/W/m^2 x 100 W/m^2 = 123.8 mV

This should fit the selected range, so an amplification of 1x (input range 200 mV) is the right choice. From the table you can see that this range gives you 20000 counts.

Step 2: Determine the display reading. Enter the figure that the LI-19 should display at full scale in the multiplier field. You can use all 4 available digits, keeping in mind that we can add a decimal point later. So in this case we can enter 1000 for the multiplier.

Enter the number of counts that correspond with the full scale output of the sensor (here 20000 counts * 123.8mV / 200mV = 12380) in the divider field.

Step 3: Set the decimal dot to 888.8. The display will then read 100.0 at 100 W/m^2 input on the sensor.

Step 4: Select if you want to see negative values or not.

Step 5: Program the settings into the LI-19.

One more example.

We have a sensor with a calibration factor of 4.56 µV/W/m^2. We want to measure in the open field where the maximum expected irradiance is 1100 W/m^2.

Step 1: Set the input amplifier to give the required range. Select the 'Sensor settings' page.

The full scale output of the sensor is:

4.56 µV/W/m^2 x 1100 W/m^2 = 5.016 mV

This should fit the selected range, so select an amplification of 32x, that gives an input range of 6.25 mV. From the table you can see that this range gives you 6250 counts.

Step 2: Determine the display reading. Enter the figure that the LI-19 should display at full scale in the multiplier field. You can use all 4 available digits, keeping in mind that we can add a decimal point later. So in this case we can enter 1100 for the full scale display value in the multiplier field.

Enter the number of counts that correspond with the full scale output of the sensor (here 6250 counts * 5.016mV / 6.25mV = 5016) in the divider field.

Step 3: Set the decimal dot to 8888. The display will then read 1100 at 1100 W/m^2 input on the sensor.

Step 4: Select if you want to see negative values or not.

Step 5: Program the settings into the LI-19.

Data logger

The PC software is used to enter the data logger setup, and to transfer the setup to the LI-19.

When the LI-19 is programmed with a new datalogger setup, the logger memory in the LI-19 is erased, and then the new settings are used to start a new logging sequence. The logging

only stops when the logger memory is full, when the batteries are depleted, or when the LI-19 is switched off. The PC software can be used to check the logging activities of the LI-19, and the LI-19 also shows some display characters to indicate what it is doing.

Log interval

The log interval is entered in seconds. The pull-down box can be used to preset the correct number of seconds for some popular log intervals. Note that the pull-down is only used for selecting a preset, the number on the left is the log interval that will be transferred to, and used by, the data logger in the LI-19.

Initial delay

When logging starts, an optional delay is used to postpone the start of the first logging interval until a specified date and time. This date and time at which the first interval will start, can be entered in the PC software. When the logger is busy counting down the delay for the first logging interval, the LCD on the LI-19 shows an 'l' that flashes at a slow (1 second on, one second off) rate.

Logging

Once the initial delay has elapsed (the initial delay can be 0) the first logging interval is started. The LI-19 is now actually logging, and the 'l' on the LCD flashes rapidly (½ second on, ½ second off)

Logged values

During a logging interval, the LI-19 accumulates minimum input value, maximum input value, and average input value. Once the logging interval has elapsed, the values are stored in the logger memory and the next interval is started. Each time the LI-19 stores a new set of values in the logger memory, it flashes the 'm' sign on the display. Logging only stops when the logger memory is full, when the batteries are depleted, or when the LI-19 is switched off.

Read status

You can view the logger status while the logger is active. Reading the status will not interfere with the logging process.

The status will show what the logger is doing, how much time remains in the current interval (if the logger is logging) and what the measured values are. The logger measures an integral over the logging interval. The PC software uses the integral and the interval period to calculate an average value over the logging interval.

Read data

Use the PC software to read the logger memory from the LI-19. You can do this while the LI-19 is logging, reading data will not interfere with the logging process. When the data from the logger memory is collected, it will be presented in a chart.
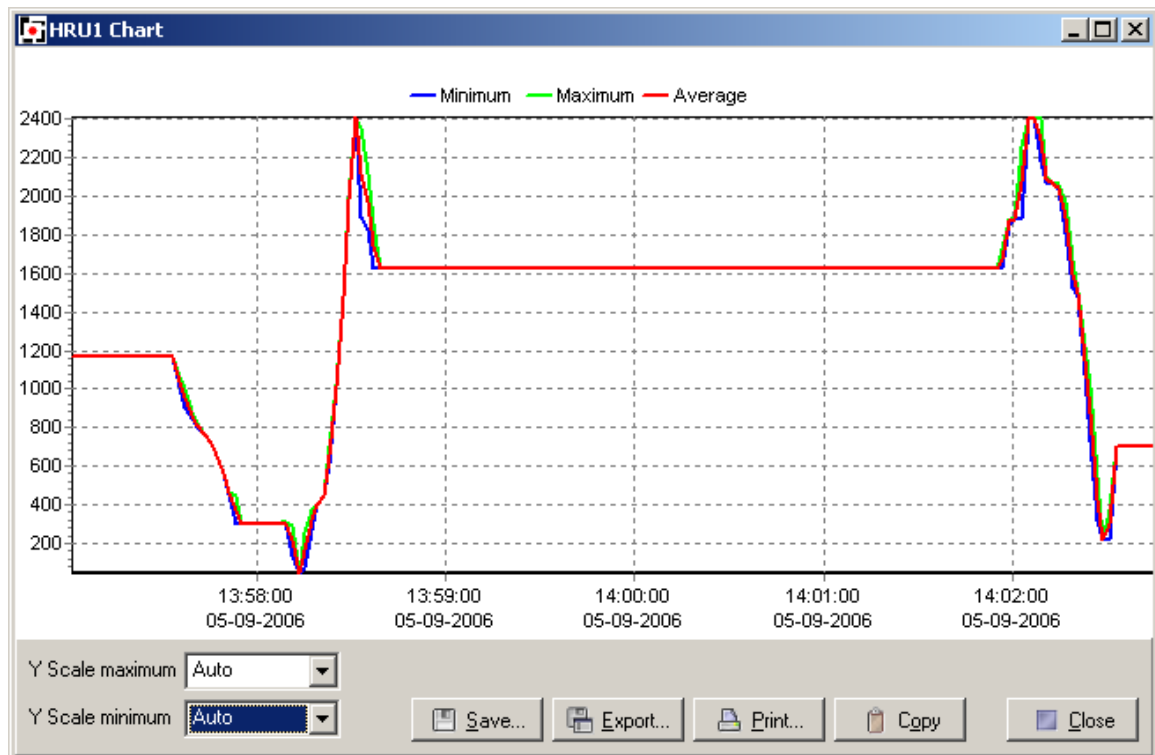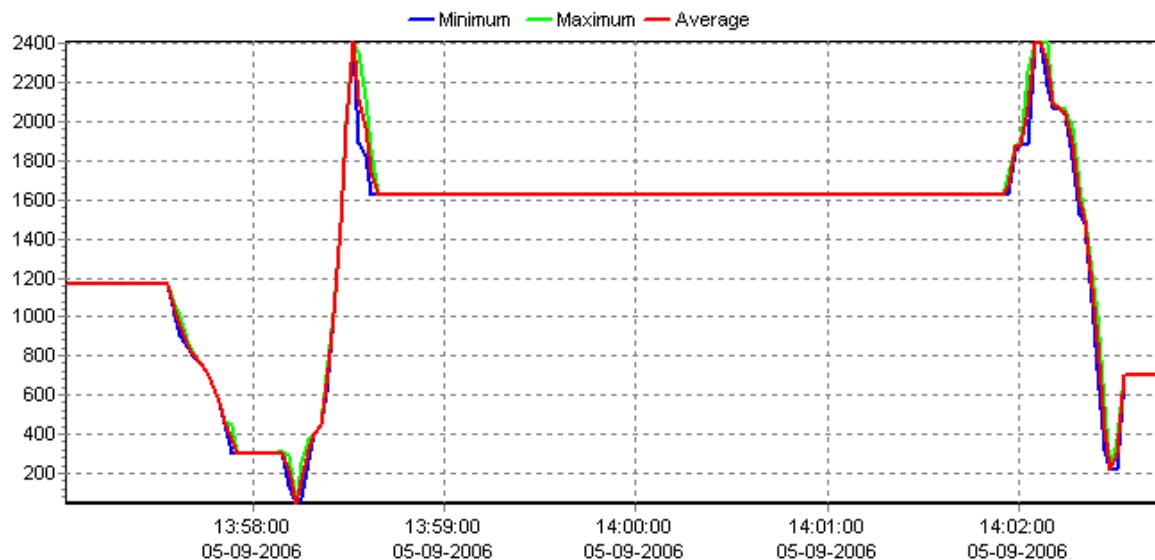

The Y scale can be manually set, and you can also use the mouse to zoom in on a specific area of the chart. Drag the mouse pointer from the top left corner of the area of interest, to the bottom right corner of the area of interest. When the mouse is released, the chart will zoom in on the selected area.
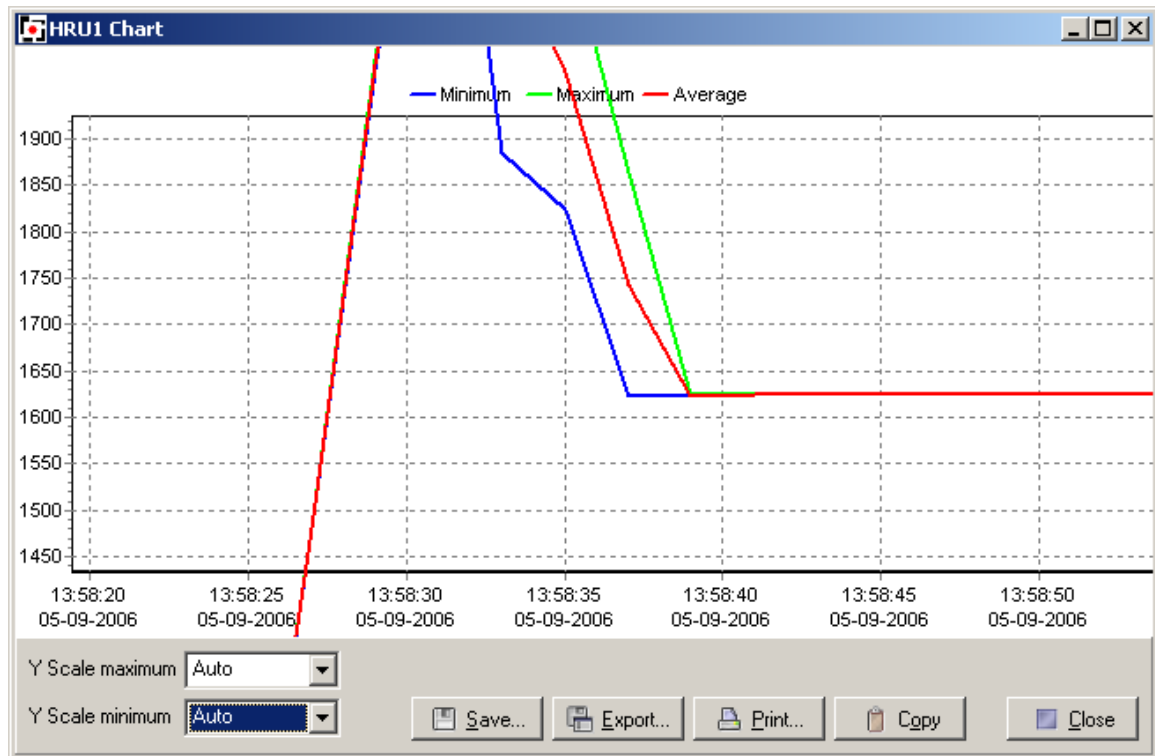
Drag the mouse from bottom right to top left to zoom out again.

Save the data in a logger data file, or export the data in a text format that can be imported in a spreadsheet.
Use the Copy button to place the chart on the clipboard, ready to be pasted into a word document.