PC-Temperature measurement system for DALLAS 1820

HYGROSENS

Characteristic features

‣ **Up to 16 temperature measurement points**

‣ **Measuring range –55..125°C**

‣ **Three wire, parallel connection of sensors**

‣ **More than 60 meter lead length**

‣ **0.06°C resolution, accuracy grade 0.5°C (20°C)**

‣ **Automatic configuration, calibration function**

‣ **Inclusive of simple Windows™ software**

Typical areas of application

‣ **Monitoring of cold storage or stock rooms, in food industry, quality assurance**

‣ **Temperature measurement in buildings, air conditioning, heating control, solar plants**

‣ **Dallas connection adapter for customer specific software on Windows or Linux platform**

WINDOWS™-Software

‣ **Display of current temperature values**

‣ **Tabular representation of measured values**

‣ **Storing of data on hard disk**

‣ **Graphics Software as accessories**

Description

The product offers an efficient measurement and indication system for a maximum of 16 temperature channels. DALLAS sensors of type 1820 are used as temperature sensors and these are connected in parallel with a three wire lead. The minimum possible bus length is 60 m. By using suitable cables, it is possible to achieve larger lead lengths up to a few hundred meters.

The integrating member between PC and sensor network is a micro controller module which is inserted at the serial port (COM1-4) and makes the DALLAS-Touch-Bus ready through a six pole RJ12 plug connector. Suitable connection cable or measurement sensor can be easily made or can be readily procured from us.

The micro controller controls the dallas touch bus, manages the serial numbers and picks up the temperatures of all connected sensors in a cyclic manner. The currently measured values are sent as ASCII string to the connected PC through the serial interface (RS232). The display and graphical representation of measured values (option) appears on the PC. An easy to use Windows software for display of measured values and data representation is included in the scope of supply.

More such modules can be operated with a PC, provided more free COM-ports are available at our disposal.

Technical Data

Temperature Measurement	
Number of channels	1 to 16 (Auto configuration)
Temperature measurement range	-55 .. 125°C
Typical accuracy at 20°C	± 0.5°C (As DALLAS data sheet)
Module	
Operating temperature Micro controller circuit	-10..60°C
Operating voltage DC	9 V-15 V DC (mains plug)
Operating current	25 mA approx.
Interface	RS 232, 4800 Baud, 8 Data bits, No parity, One Stop bit
Circuit board Dimensions	80 mm x 40 mm x 23 mm
EMV-compatibility	89/336/EWG
Noise emission:	EN 61000-6-3:2001
Noise withstanding:	EN 61000-6-2:2001
Accessories	See Key to Ordering numbers

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WINDOWS-Software RECORDER

With the help of this program the measured values can be received through the interfaces and displayed on the PC. The displayed data is compatible with any desired spread sheet program, with which it is possible to further process the measured values for statistical evaluation and interpretation.

Installation: The program should be first installed under Windows 98, Windows NT or Windows 2000 system. Place the attached diskette in your drive and run the program "setup.exe" either by selecting "Run" from the START menu or through the windows explorer. Then follow the instructions of the installation program. The set-up program creates a new program group "HYGROSENS INSTRUMENTS" in the folder "programs". After successful installation, the software can be accessed and executed through the START menu.

First time operation : Connect the temperature logger to a free serial port on the PC. After first time run of the software, in the menu option "settings" , select device type as "16Ch. Thermometer Templog 4800Bd" and also the serial interface used (for example, COM1) under "connections". The remaining settings (Data rate, Parity, Start and Stop bit) are automatically selected and need not be changed. In case the connection hangs, refer to data communication in the terminal window. Then select "Close" the current settings will be stored.

Please note that still micro controller adapter has to be configured as per the connected sensors (refer below), before displaying the measurement values.

In case, you are not able to make any data communication between PC and the measuring device or the measuring adapter, then first please check the power supply and also cable connection to the PC.

Data recording: First activate all the measurement channels that are to be recorded. In 'Text 1' and 'Text 2', you can enter a description, which has to appear as heading on the top of data file. The selected separator appears between the individual data elements. Enter the recording interval in seconds in the Field "Every". The data is recorded in the file which is entered as path in the 'Start' button. The recording begins with the 'Start' button.

EXCEL™: If you want to use EXCEL for evaluation, then operate the control button EXCEL before start of recording, so that suitable decimal separation characters and field separators are inserted. The created file is compatible with CSV-Format. In order to display the measured data, you can use graphic tools, for example, the diagram-assistant in EXCEL™. However, other software can also be used to evaluate the measured data.

Connection of Sensors

The Dallas temperature sensors of type 1820 has an internal coding (serial-number) and can be operated along with several other sensors on a three wire bus. The sensors are calibrated by the manufacturer.

For short connection lengths, there are no special requirements in respect of the connecting cable to be used. In case of disturbed surroundings, the cable should be shielded. It is also recommended to connect a ceramic capacitor of 100 nF from pin +5V to pin GND at each sensor.

The lead length with unshielded cables can go up to 60 m. To increase the approach length, an additional Pullup-resistor of 1.5k to 10k-Ohms (from Pin "DALLAS" to pin "+5V") can be added. With this, it is possible to increase the cable length up to 150 m or more, but with slightly lower accuracy of measurement due to the increased temperature rise of the sensors.

Indication LED: During normal operation, the LED on the PC adapter glows in intervals of approximately every 30 seconds. If a fault is detected (for example no connected sensors), the LED glows continuously. A faulty sensor gives a temperature value of 327.68°C (or 7FFF Hex in string format). The LED serves as status signal during configuration (see below).

Plug connector layout

Power supply: The inner core of the 3.5 mm socket-plug carries positive operating voltage of approximately 9 to 15 V DC. The outer conductor is minus.

Sensor- plug connector: The Western plug connector 6P6 (RJ12) on the logger side is as shown below (view of the cable i.e. the contact surfaces of the plug):

1	Ground	
2	Ground	
3	Dallas Data	
4	Dallas Data	
5	> +5V	
6	> +5V	
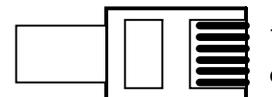
Automatic sensor search

The system should be configured once before first time operation. For this, first all sensors are connected and operating voltage is applied.

- After pressing the 'Configuration' key on the board shortly for 3 times (in each case, approximately pressing for 1 second and then pausing for one second), the program goes into Auto-search mode. The LED consecutively blinks 3 times in a cyclic manner for short duration.

- If now the 'Configuration' key is operated for at least 5 seconds, the sensors connected on the bus are searched and the new configuration is stored in the controller´s memory. The process can as often be repeated as desired. After the sensors are searched and identified, the current temperature values appear on the screen.

- To exit from the Auto search mode, the operating voltage must be switched off for a short while. The configuration remains stored.

- During execution of Autosearch-Function, the stored calibration values are also deleted (see below).

Calibration

The sensors are factory calibrated. The accuracy at 23°C is approx. ±0.5° K, which is sufficient for most of the applications.

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For special requirements of high measurement accuracy, further calibration is possible at one or two reference points by the end user.

Before starting calibration, first all sensor must be connected and searched.

For the first equalisation point, initially all connected sensors must be simultaneously heated to 23.00°C This must be done in a temperature bath, because the accuracy and stability of reference value considerably influences the result. For accepting the reference value, proceed as follows:

- After pressing the configuration key on the board once for a short while (approx. 1 second) from the initial condition, the program goes into calibration mode for the reference temperature of 23.00°C. The LED cyclically blinks once for a short while.
- If the service key is operated in the calibration mode for at least 5 seconds, the measured temperatures of the sensors are set to 23.00°C (Offset correction). The individual correction value for all sensors are stored in the micro controller.
- To leave calibration, the operating voltage must be switched off and on after a short while. The software is again in the measurement mode and the LED is off.

If calibration is also to be done at a second reference point, then all the sensors must be simultaneously heated to 60.00°C.

- After pressing the configuration key on the board twice for a short while (approx. 1 second) from the initial condition, the program goes into calibration mode for the second reference temperature of 60.00°C. The LED cyclically blinks twice.
- If the service key is pressed in the second calibration mode for at least 5 seconds, the measured temperatures of the sensors are set to 60.00°C (change of gain). The individual correction value for each sensor is stored automatically in the micro controller.
- To leave calibration, the operating voltage must be switched off and on after a short while. The software is again in the measurement mode and the LED is off.

Format of Data transfer

The interface works at a data rate of 4800 Bd, 8 data-bits, no parity and one stop bit.

The transfer of useful data takes place in lines. All characters are ASCII coded. All information is sent continuously without separation characters. In a line, only information of one channel is transferred. At the end of the line, the last two ASCII characters are sent for the check sum (8 bit CRC) of the current line. Each line closes with the character 'Carriage return' '<CR>´. Several lines form a data-block. A data-block can have the following contents, for example:

```
@<CR>
I010110E0223C000000B1<CR>
V0108DA7D<CR>
I02011050013C00000021<CR>
V0208C276<CR>
I030110B0093C00000017<CR>
V0308CCF9<CR>
$<CR>
```

The data block has following structure:

- A synchronization pattern for the beginning of a Data block. For synchronization, the sequence ´@ <CR>´ is used.
- The configuration data (´Identifier´) of a channel. The data line begins with the character 'I', followed by the logical channel number, and then followed by configuration data and the Sensor serial number. The line is closed with the check sum and the character <CR>.
- The measurements of a channel. The data line begins with the character ´V´, followed by the logical channel number, followed by useful data. Only numerical measurement values and the check sum (CRC), at the end of the line, are transferred. All other information like number format, number of characters, physical unit, etc. are contained in the configuration data (sensor coding).
- The configuration data and measurement values follow the same scheme for all other channels.
- The continuation character ´$´ <CR>´ is sent at the end of a data-block

Structure of Configuration Dataline

The configuration data line contains all information of the sensor working on the corresponding channel. The line has following structure:

- Character ´I´ at the beginning of the line.
- 8 bits (two ASCII characters) logical channel number. The logical channel number is used to co-relate configuration data with the measured values. The channel number is generated in the device. The first channel has the number 01. A maximum of 16 channels are transferred. The numbers are given continuously.
- 8 bits (two ASCII characters) physical sensor coding. Based on sensor coding, the number format, scale, physical unit and allowable range of values are specified. The sensor coding is 01 for the described device.
- 8 bits (two ASCII characters) Hardware coding (type of the measurement sensor). The Dallas sensors have the code number 10.
- 48 bits (twelve ASCII characters) serial number of the sensor: Here, the serial number of Dallas-sensor is mentioned.
- 8 bits (two ASCII characters) CRC (check sum)
- ´ <CR>´ as line termination

## Structure of Measured value Datalines

The measurement value data line contains the current measurements of the sensor operating on the corresponding channel. All information are represented in binary and is transferred ASCII coded format without separation characters. For the sensor marking 01, the line has following structure:

- Character ´V´ at the beginning of the line
- 8 bits (two ASCII character) logical channel number
- 2 Bytes (4 ASCII characters) measurement data with 0.01°C resolution. The hexadecimal value is to be converted into a decimal number and to be divided by 100. With this, the temperature value is obtained in °C with two decimals.
- 8 bits (two ASCII characters) check sum (CRC)
- ´<CR>´ as line termination

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Accessories (Optional)
Software "PCLOG"
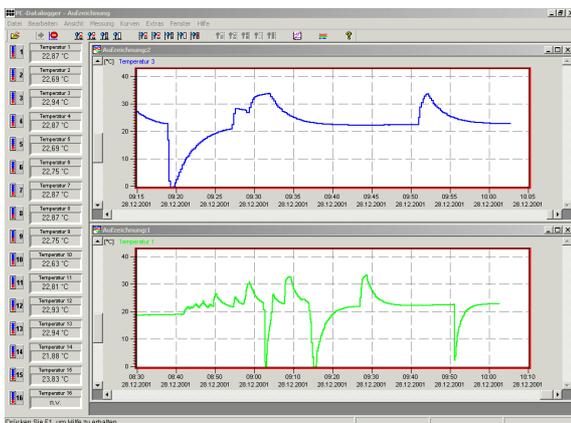
The software screen is in English and German language. Temperature values can displayed in °F or °C. Besides data storing on hard disk, the software offers as most important feature the graphical representation of all measured and recorded channels in the form of a temperature Vs time chart (online scriber function). By means of Drag & Click, the window section can be enlarged and the time or temperature axis can be scaled as desired. Besides the graphic view, the representation is also possible in the form of a table. Cut & paste is used for capturing measured data series into a spreadsheet program (for example EXCEL^{TM}). All tables and graphic representations can be printed out in colors. In addition, simple monitoring and controlling functions are also integrated in the software. Limits can be set for each channel. An acoustic signal (Wave file) is given when the values are exceeded. Control of up to eight external devices is possible by a relay card, to be attached at the parallel port or USB connector.

Software Profilab
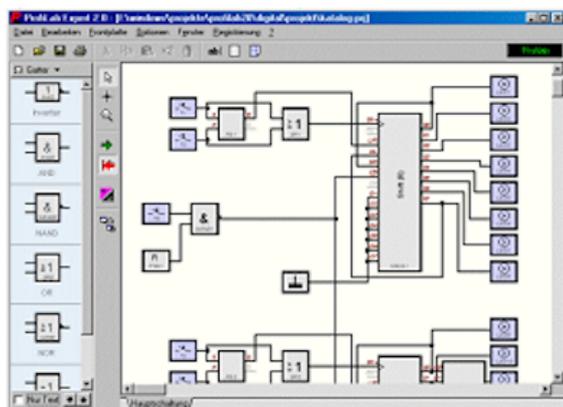
With this software, professional measurement and control projects can be realized in a simple, graphics based development platform. You can simply draw the wiring diagram of the measurement circuit and do the project design. Without any knowledge of programming, the measurement values of up to 16 temperature sensors can be easily used in the measurement circuit.

Arithmetic and logical components take care of linking and processing of the measurements. Modules like impulse generators, timers and relay cards etc. provide extensive possibilities for control and regulation. Various instruments, scribers and tables serve as the storage and representation of measured values and you can monitor the measurement system with display and control elements. The system is operated through a self designed front panel, on which you can arrange switches, potentiometers, displays, LED´s, instruments etc. The software also enables compilation of the project into an EXE-file, which can run without Profilab.

Relay Board
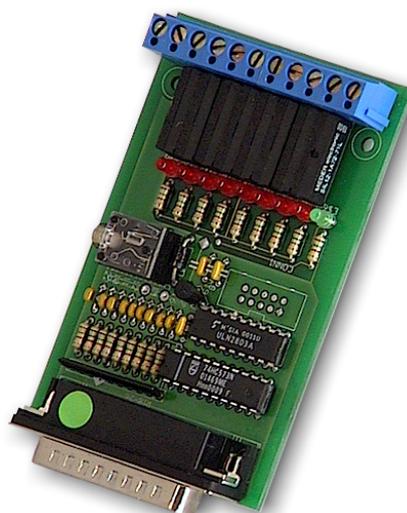
The control information from the software "PCLOG " or "PROFILAB" is transferred over the PC LPT-Port as a binary signal. The relay cards supplied as accessories are needed to connect power devices like heaters, valves, servomotors or alarm buzzers. The switching status is indicated with LED´s. The relay boards are also used for many other applications.

The maximum load switching capability of Model 183084 is 15 W (max. 30 V/0.5A). This model is suitable only for low voltages. An external main power supply 12 V DC is required.

The higher rating version REL-T2 is suitable for switching of mains voltage. The permissible operating current is 230V AC / 10 A. The main power supply 230V/5 VA is integrated on the printed circuit board itself.

For further information, visit our website: www.hygrosens.com

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Index to Ordering Numbers

PC-Adapter	184010
* Measuring instrument LCDisplay, RS 232	HM 207
* Mains Power Supply 9V/500 mA	NG 9V
Software	
WINDOWS-Software PCLOG-TELOG	183030
Windows-Software PROFILAB EXPERT	183044
Driver for LABVIEW	LABVIEW-TELOG
Priceworthy temperature probe inclusive connecting cord	
Temperature Sensor DS 1820, 2m Cable	184037
* Temperature Sensor DS 1820, 5m Cable	DS1820-LC-5M
Temperature Sensor DS 1820, 10m Cable	184052
* Temperature Sensor DS 1820, 15m Cable	DS1820-LC-15M
* Temperature Sensor DS 1820, 20m Cable	DS1820-LC-20M
Temperature probe with Stainless steel protection casing 6 mm x 30	
Temperature Sensor DS 1820, 2m Cable	184067
* Temperature Sensor DS 1820, 5m Cable	DS1820-PUR-5M
Pressure resistant temperature probe with Screw-in threads	
Screw-in sensor, M10, 2m Cable	184082
* Screw-in sensor, M10, 5m Cable	DS 1820-HD-5M
* Screw-in sensor, M10, Special length	DS 1820-HD-SL
* Screw-in sensor, G1/8", 2m Cable	DS1820-G18-2M
* Screw-in sensor, G1/8", 5m Cable	DS1820-G18-5M
* Screw-in sensor, G1/8",Special length	DS1820-G18-SL
Wiring Box	
* Distribution board without. case, 8 Sockets	VERT8-TEMPLOG
Distribution board, 10 Sockets, with case	184112
Relay Board	
8 Relays low voltage	183084
* 8 Relays Mains Voltage	REL-T2
Accessories	
Temperature sensor DS 1820, TO 35	184024
* 4-p. Flat Cable, without plugs, 5m	KAB-4P4-5M
* 4-p.Flat Cable, without plugs, 20m	KAB-4P4-20M
* 4-p.Flat Cable, without plugs, special length	KAB-4P4-SL
* 4-p.Flat Cable, 2 x RJ12-Plug, 5m	KAB-4P4-ST-5M
* RJ12-Plug, 6 pin, 10 pcs.	ST-RJ12-6P6
* Mounting tool for RJ12-Plug	MONZA RJ12

Items marked * are not available at CONRAD-ELECTRONIC. Procure directly from HYGROSENS

There will be more accessories available in future. For further information, visit our website: www.hygrosens.com