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Performance Monitoring of a Ground Source Heat Pump System with a Horizontal GHE in Los Humeros, Puebla, México

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ABSTRACT

Ground Source Heat Pumps (GSHP) provide a new and clean way to condition buildings, it is one of the most efficient systems for heating and cooling buildings. The GSHP systems use ground heat exchangers (GHEs) to transfer heat to/from the ground to efficiently provide clean-purpose renewable energy. Currently, its use has increased worldwide, because they make use of renewable energy stored in the ground, using geothermal energy. This paper presents the assessment of the general performances of one GSHP system installed in a kindergarten building "Tierra y Libertad" at Los Humeros, Puebla, México being the first project demonstrative installed in México to heating the building. The system consists of a vertical heat pump unit (water-to-air) with a horizontal heat exchanger system type slinky into three trenches. Basic parameters of its operation were monitored by a data acquisition system, for example, the temperatures of air on the user and buried-pipes side, the electrical power and current consumption of the pump. Based on the building data, this work focuses on the system installation process and the analysis of some parameters to determine the coefficient of performance (COP) average. The results were obtained from a short data storage period from July 2008 to April 2009. The experimental results indicate that the average heat-pump COP is distributed between 3.4 to 3.8.

1. INTRODUCTION

The use of GSHP systems has grown exponentially around the world during the last decades. Nowadays, the GSHP is used in 54 countries - 59 % of the world's total energy use, with 600,000 TJ/year (heating mode), and the leaders are China, USA, Sweden, Germany, and Finland - 84 % of the total use, Lund and Toth (2020). The GSHP offers important benefits, as a cheaper system than direct electric heating systems and oil boilers, they have lower consumption of electricity and need less maintenance than combustion-based heating systems, by last the CO2 emissions are lower than other systems such as burning oil, gas, or biomass (Rivas et. al 2020).

The heat pump is equipment which used natural heat reservoirs (atmosphere, the soil, surface or underground water) but also heat carriers of human origin (such as urban waste-water pipelines, industrial waste-water or exhaust gases), delivers heat at an appropriate temperature level for a wide range of applications (Michopoulos et. al, 2013). GSHP has been considered as the best technology available for the air conditioning of residential or commercial spaces (Lund and Boyd, 2016).

Qiao et. al (2020) analyzed the energy efficiency ratio (EER), water temperature, energy consumption, COP, and the thermodynamic of different climatic zones of Southwestern and Northwestern China with opportunities for the application of GSHP technologies, using a national standard, "Evaluation Standard for Application of Renewable Energy in Building" (GB/T 50801-2013) for the monitoring of the parameters (Mohurd, 2013). The average cooling COPs of soil-source heat pump (SSHP), groundwater heat pump (GWHP), and surface water heat pump (SWHP) units were 4.9, 4.7, and 4.2, respectively. For the case of heating, the average COPs were 4.3, 4.2, and 4.2, respectively. In both cases, heating, and cooling with the SSHP unit being the highest.

The experimental systems are especially useful to know the operation of the complete system, such as the case of Du et. al (2015) who realize an experiment on the data monitoring applied in the school building GSHP system in Tangshan, China. The aim was focused on the parameters acquisition and operation analysis of the heat pump using MODBUS protocol and GPRS communicating with several users. The average COPs were 2.85 and 2.70 in summer and winter, respectively, and heat (cold) unbalance underground existed after a whole year of operation.

Michopoulos et. al (2013) report the performance of heat pump systems installed in a public building complex of a 2420 m^2 area, Northern Greece over an eight-year operation period. The system consists of a vertical ground heat exchanger with 21 boreholes in 80 m depth and 11 water-to-water heat pump units. The Seasonal Energy Efficiency Ratio was found to be between 4.1 - 5.9 and 3.6 - 4.5 in cooling mode and 5.0 - 6.2 and 4.5 - 5.5 in heating mode, respectively.

Another example of performance evaluation of a GSHP (heating and cooling) was in an office building at the Polytechnic University of Valencia, Spain reported in Montagud et. al (2012). GLHEPRO was used to design the system, and the simulations were analyzed and compared with experimental data. The authors proposed GSHP energy performance measurements over five years of operation and chose the mean well exchanger return water temperature (BHE) to represent soil temperature. The results showed that the energy performance was maintained without a noticeable impact on the thermal response of the soil.

The study presented by Bakirci (2010) evaluate the performance of a vertical GSHP system (water-water) for cold climatic conditions in Erzurum, Turkey. Using a DAQ system, the experimental study stores data from October to May of 2008 and 2009. The experimental results indicate that the average heat-pump COP is approximately 3.0 in the coldest months of the heating season.

To develop new capabilities and assimilate the technology of GSHP systems, the Instituto Nacional de Electricidad y Energías Limpias (INEEL) developed the first demonstrative project using this technology applied in Mexico. Two systems were installed in two buildings, in a kindergarten, and a health clinic in Los Humeros village, Puebla. The aim to install the heat pumps was to provide heating for the two buildings. This article reports the kindergarten's "Tierra y Libertad" performance. The system consists of a horizontal ground heat exchanger slinky type, and a water-to-air heat pump unit. The basic parameters of its operation were monitoring using a data acquisition system from July 2008 to April 2009. Based on these recordings, the average COP of the system is estimated.

2. DESCRIPTION OF GSHP PROJECT BACKGROUND

2.1 Description of site and the building

The Los Humeros village is located near the Chignautla municipality, northeast of Puebla state on its border with the Veracruz state, approximately 30 km northwest of Perote city, Veracruz state, see Figure 1. The village is located right in the center of the productive area occupied by the Geothermal Field of Los Humeros, operated by the Federal Electricity Commission (CFE) in the geographical coordinates 19°40'43" North latitude and 97°27' 20.35" West longitude, at an average altitude of 2,810 meters above sea level. Figure 2 shows a picture of Google Maps with one of the proposed sites, the kindergarten called "Tierra y Libertad" marked in the yellow square, (Rivas et al. 2018). The kindergarten "Tierra y Libertad" of 73 m2 (Figure 3) was the designated site for the first installation and testing of the ground source heat pump system in Mexico.

The ground around the kindergarten is flat, from the surface and up to 1 meter deep is composed of pyroclastic (pumice) material with particle sizes of sand, gravel, or clay. The area proposed for the heat exchanger is located a few meters west of the slope that defines the kindergarten near the geological fault of Los Humeros-Maztaloya. The wooded area in Figure 3 indicates part of the fault.

Figure 1: Location of Los Humeros, Puebla, México (Onofre et al 2018).

Figure 2: Google Maps view of the kindergarten "Tierra y Libertad".

Figure 3: Kindergarten front view (left) and area available for the GHE (right). (Modified of Onofre et al. 2018).

The building is oriented from north to south, with an access door to the west and windows on the east and west sides. The earthenware of cement, about 14 cms thick with red waterproofing. The walls are 18 cms thick of block and concrete. It has two smithy windows of 1.65 x 1.30 m (width x height). The building is occupied from Monday to Friday (working days a week) with a schedule of 9 to 13 hours regularly occupying about 30 students (3-6 years old) and the teacher.

2.2 Geographical and climatic conditions of target area

2.2.1 Geographical conditions

Near to the village is the Geothermal Field Los Humeros, CFE, both sites are in a volcanic type of zone knowledge as the "Caldera de Los Humeros" of quaternary age, in the Mexican Neovolcanic Axis, limits with the Sierra Madre Oriental to the north and northeast. Based on Carrasco et al. (2015) and CFE (2007) the soil is constituted with geological materials predominantly by sandy deposits of volcanic origin (pumitic tuffs) and sedimentary (alluvial) little consolidated, including thinner limonitic strata, and gravel of medium-high compactness. The high porosity and permeability, as well as the low compactness of the most superficial materials, makes them present humidity percentages higher than 45% in the first 10 m below the ground level. CFE (2007) mention the existence of recent spills of andesitic and basaltic lava.

Cedillo F. (2000) indicates that the shallower aquifer body is hosted within the boiler subsoil at a depth of about 270 m, according to the water table detected by the PGH-4 geo-hydrological well (CFE, 1990), which is isolated from the regional aquifer associated with the Libres-Oriental basin. Now there are no data from surface bodies or other aquifer horizons hosted in the shallowest levels (CFE, 1990).

2.2.2 Climatic conditions

According to García (2004), the town of Los Humeros is located in a region where a semi-arid, temperate BS1kw type climate predominates, with average annual temperatures between 12°C and 18°C, with the temperature of the coldest month between -3°C and 18°C and the hottest month, less than 22°C according to the modification of the Köppen Climate Classification System.

On the other hand, the National Meteorological Service of CONAGUA for the meteorological station No. 21209 Los Humeros-CFE, in the period between 1981-2010 indicates that zone there was an average annual temperature of 11.9°C, with maximum average temperatures of 18.5°C and minimum average of 5.2°C. The hottest months are from March to May with temperatures of 23.5°C, while the coldest months are from November to February with temperatures close to 0°C. The daily maximum and minimum temperature extremes have reached 40°C and -6°C, respectively, (SMN, 2019 and CFE 2015).

2.3 Soil thermophysical properties

To measure the soil thermophysical properties, using a method developed in the Geothermal Management Laboratory of the Instituto Nacional de Electricidad y Energías Limpias (INEEL). García et. al (2017) indicates that with this methodology, the thermal conductivity and diffusivity properties of soils and rock cores can be measured for applications in the numerical simulation of deposits, now, for the ground heat exchangers designs to GSHP systems.

The measured ranges were 0.4 to 5 W/m°C for thermal conductivity, whereas for thermal diffusivity the measured values ranged from 1 x 10-7 m2/s to 1 x 10-6 m2/s, in which good repeatability has been found. The instrumentation used for measurements consists of a laptop computer, a data acquisition device, a constant current source, thermocouples, heaters, and auxiliary devices for laboratory measurement, as well as field measurement, with the main advantage that only alternate current is required for the operation of the devices (García, 2017).

2.4 GHE design

To design the Ground Heat Exchanger (GHE) was necessary to know: the thermal loads of the space to be conditioned, the dimensions of the land available for the installation, the thermophysical properties of the soil, the characteristics of the pipe, and the working fluid to be used, as well as the configuration of the GHE depending on the available budget. For this reason and being the first installation of GSHP in Mexico first, a literature review and analysis was made to know the existing commercial software to calculate and design the GHE, see Figure 4.

As a result of literature review, some software determines only the depth and spacing of boreholes required for a vertical GHE, others can calculate the lengths of vertical and horizontal GHEs, others include the calculation of the amount of pipe required for a GHE in surface waters (pond, lake, river, etc.). Table 1 shows a comparative matrix result from the literature review with the most outstanding characteristics of each software. From the literature review, it is concluded that Ground Loop Design (GLD) software, for us presented the best capacities in the heat exchanger design, additionally, some experts on the topic recommended this software.

Figure 4: Commercial software's for GHE design (Poster presentation of Rivas et. al 2018).

Onofre et. al (2018) presented the thermal load of kindergarten building "Tierra y Libertad", approximately 9 kW for the 73 m^2 building using TRNSYS 17. From GLD library, a generic heat pump of average efficiency of 7 kW capacity was selected. The working fluid is water a flow rate of 0.19 (l/s)/3.5 kW for optimal systems. According to IGSHPA (2011), the stable soil temperature varies between 10 and 23 °C, for this design the average temperature of 17°C. Using GLD 2016 and the module of "average loads per zone" the data of the thermal loads of the building in question and was selected horizontal heat exchanger slinky type (see Figure 5), resulting in a total length of pipe = 700 meters (2200 ft). The type of pipe chosen to assemble the IC is SDR11 ¾" made of High Density Polyethylene (HDPE).

To install the full length of the heat exchanger, a 3-trench configuration was designed due to the space restrictions of the site. The trench requirements per coil were 1 m in width, 2m in depth, 3m distance between trenches, and 32 m in length (see Figure 6).

With the characteristics of the area, building space, and indoor and outdoor design temperatures the peak heating load calculations were 33900 BTUH. The heat pump installed was GeoComfort Enertech Global manufacturer, which provide 100% of the needed heating BTU's would be a 2-ton heat pump (two-stage compressor) see Figure 7.

Table 1: Comparative table of some available software's for GHE design. (modified by Rivas et. al 2018).

Software	Open	Vertical	Horizontal	Slinky	Surface water	Hybrids	Design heat pipe	Financial Analysis	Price (2018) (DLL)/month	Access type
Earth Energy Designer	✘	✔	✘	✘	✘	✘	✘	✘	65	Installation/Web
GchpCalc	✔	✔	✘	✘	✔	✔	✘	✘	38	Installation
GeoAnalyser	✘	✔	✔	✘	✘	-----	✘	✘	38	Web
GeoAnalyst	✔	✔	✔	✔	✔	✘	✔	✔	54	Web
GeoStar	✘	✔	✘	✘	✘	✘	✘	✘	----	Installation
GLHEPRO	✘	✔	✔	✔	✘	✔	✘	✘	68	Installation
GLD	✘	✔	✔	✔	✔	✔	✔	✔	229	Installation
LoopLink	✘	✔	✔	✔	✔	✔	✔	✔	54	Web

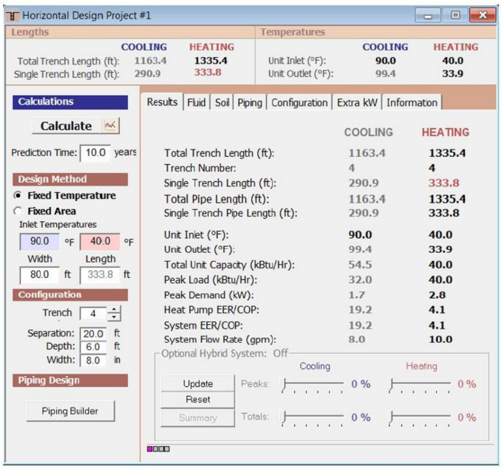


Figure 5: Module to design horizontal heat exchangers (Onofre et. al, 2018)

Figure 6: Horizontal ground loop to kindergarten building (INEEL, 2019)

Figure 7: Heat pump installed (GeoComfort Enertech Global).

3. METHODOLOGY

3.1 Experimental measurement of the system

Process measurement is essential to generate the best possible results about using the resources, machines, performance, profitability, environmental protection, and safety. The process integrates a group of equipment and/or devices to measure, convert, and record variables of a process and then send, evaluate, and control them. Requires effective monitoring systems to analyze process variables, besides the methods or practices to get systems at a low cost of implementation, instrumentation, and maintenance.

A data acquisition system (DAQ) is a system whose function is the control or simply record of one or more variables of a process. All DAQ shares a common aim: to acquire, store, analyze, present information, and control the process. The DAQ stages are shown in Figure 8:

- Stage 1. Signals: The heat pump is provided with a device to read different parts of them, which are: entering water temperature (EWT), leaving water temperature (LWT), entering air temperature (EAT), leaving air temperature (LAT), current consumption (C), voltage consumption (V) (see Figure 9).
- Stage 2. Data acquisition hardware: Used a CR800 device from Campbell Scientific. This system concentrates all signals to store or process the data through a computer (see Figure 10a).
- Stage 3. Communication protocol: The heat pump sends all information using Modbus protocol, for this reason, was programmed the CR800 to read the Modbus.
- Stage 4. Application software: The last stage uses a graphical interface developed to visualize the data or process data. This software integrates the information for processing online or offline data (see Figure 10b).

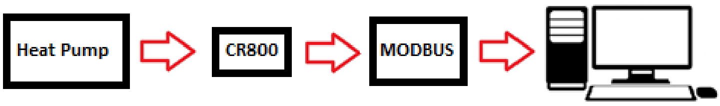


Figure 8: Schematic diagram of DAQ in Los Humeros, Puebla (Modified of Rivas et al. 2018).

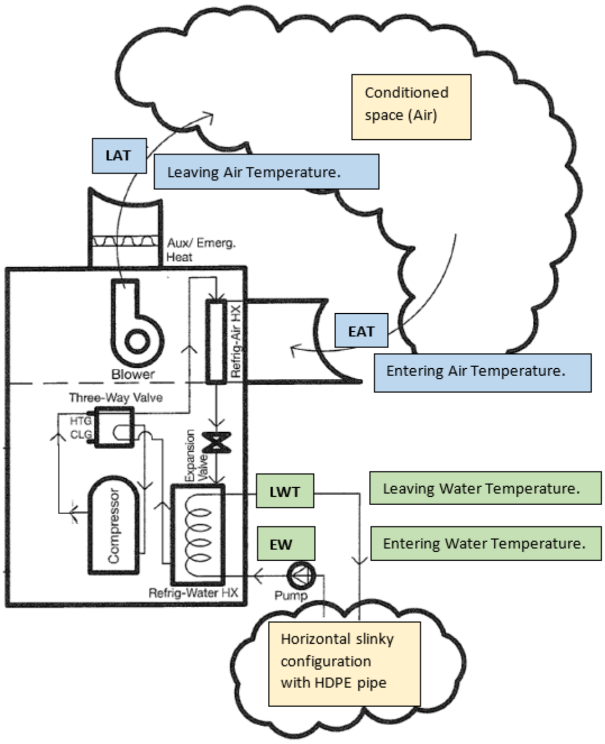
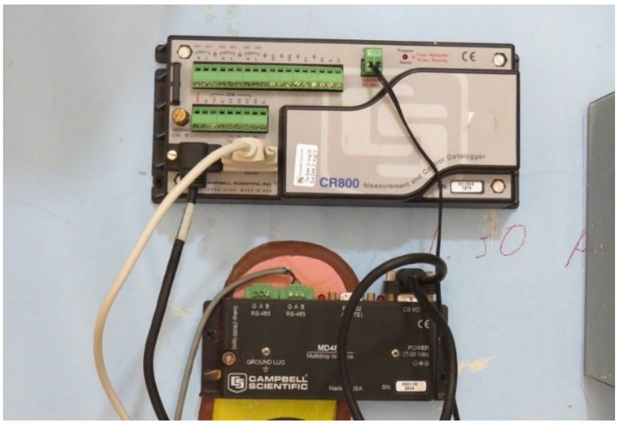
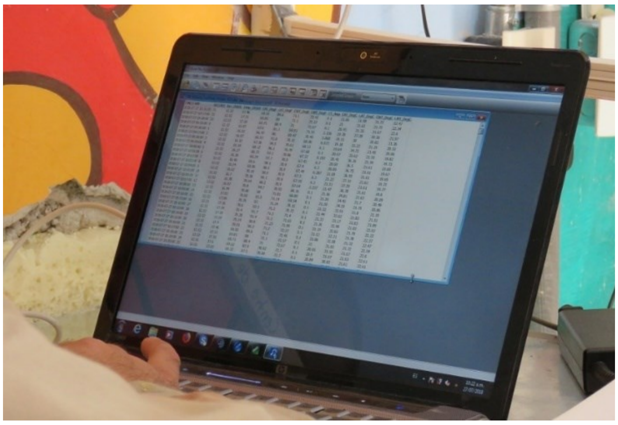


Figure 9: Water to air GSHP (Modified of IGSHPA 2011 manual).



(a)



(b)

Figure 10: DAQ system. a) CR800 device to acquire data. b) Graphical interface to store and analyze data.

4. RESULTS

Heat pump systems are recognized as outstanding heating, cooling, and water heating systems. They provide high levels of comfort, significant reductions in electrical energy use and demand, very low levels of maintenance requirements, and are environmentally attractive (Bakirci, 2010).

The environment gives us an unlimited supply of energy that a heat pump uses, only requires the costs of electricity for operating and running the pump. The heat pumps reduce heating costs and generate heat in an environmentally responsible way. This makes you independent of fossil fuels, contributing to reducing CO2 emissions (Viesmann, 2009).

Healy and Ugursal (1997) says that the parameters that influence the performance and installation cost of the GSHP systems and should be considered in achieving a successful design and efficient operation of the system are: a) size and capacity of GSHP, b) depth, spacing and pipe size of GHE, c) heat transfer fluid, d) flow rate of heat transfer fluid and e) soil type.

This work presents the performance of a GSHP system with horizontal slinky GHE employing the experimental monitoring of the system. The results were obtained in a short period from July to April of 2008 e 2009. Appendix A shows part of the collected data. The sample time programming and storage were each 2 seconds configured due to the change off-and-on stage and vice versa of the GSHP. These changes are very quick so that it was required to verify these changes in current consumption.

4.1. COP calculation

Ground Source Heat Pump efficiency is traditionally measured using a ratio called "coefficient of performance" (COP). The COP of a GSHP is the ratio of the heating or cooling output to the energy input to run the machine. The COP is the most common measure of heat pump efficiency and can be expressed as the ratio of the product heat output of a heat pump to its power energy input (Dincer and Rosen, 2015). A high COP over 1.0 means your heat pump is performing very efficiently, and your heating bills will be low. A heat pump is the only heating and cooling device that has a COP over 1.0 (Brown, 2015).

Air source heat pumps generally have COPs ranging from 2 to 4, indicating that they deliver 2-4 times more thermal energy than they consume in terms of electrical energy. Water and ground source heat pumps normally have COPs of 3-5 (Soltani et al., 2015).

To calculate the coefficient of performance:

$$\text{COP} = \text{Capacity output in BTUH} / \text{power input in BTUH} \quad (1)$$

$$\text{Capacity output (BTUH)} = \text{CFM} \times 1.08 \times \Delta T \quad (2)$$

Where:

ΔT = Temperature difference across air coil (return air – supply air)

CFM = Based on fan setting. ECM motors will be within 5% of listed CFM

And

$$\text{Power input (Watts)} = \text{Volts consumption} * \text{Current consumption} * 0.85 \quad (3)$$

From (3)

$$\text{Power input (BTUH)} = \text{Power input (Watts)} * 3.412 \quad (4)$$

For the installed system, the working values obtained from the database (Appendix A). The energy efficiency of the GSHP unit is preliminarily evaluated calculating the COP using Eq. (1) and the analysis of average data from Appendix A. The COP is primarily distributed from 3.4 to 3.8 throughout the year. This is the first installation of the GSHP systems to climatize a building in México, so the result of the COP evaluation is good. As future works, a more exhaustive analysis of the behavior of the ground temperature profile would be lacking, since the heat exchanger is located in a thermal zone that oscillates between 17 °C on average at the surface and 50 °C at seven meters depth, and this is probably beneficial to the work of the heat pump.

5. CONCLUSIONS

In this article, the data acquisition system to measure the operational parameters and calculate the COP of a vertical GSHP system was presented. This installation is the first demonstrative project in Mexico using the GSHP system for heating buildings. The results presented were applied to a kindergarten called "Tierra y Libertad" this building hosts 30 students between 3 to 6 years old and the teacher with a 72 m2 area. The GSHP system is in operation since 2018 and based on the recordings and results, its operation appears stabilized, as there have been no fluctuations on the temperature profile of the ground heat exchanger. The GSHP was designed to used heat the building because the zone at Los Humeros, Puebla is characterized by a cold climate. The conclusions of the current study are as follows:

- This is the first experience to know all the concepts, designs, selection, and installation of heat-pump therefore the energy-saving effect of a GSHP system largely depends on management and operating mode apart from the design, construction, installation, and operational start-up.
- The DAQ system was installed next to the pump to store the data of some operational parameters. A CR800 device from CS was used. Using MODBUS protocol all the stored information is collected.
- The performance of horizontal GSHP was investigated experimentally and the results indicate that the heat-pump COP is approximately 3.4 to 3.8.
- The selection of a heat-pump system mainly depends on the operating conditions, economic viability, environmental impacts, soil characteristics, soil temperature profiles, etc.
- GSHPs offer the most energy-efficient way to provide heating and cooling in many applications because they can use renewable heat sources.
- The initial costs of the GSHP systems are higher, but they have low operating, maintenance, and life cycle costs and longer life expectancy than most conventional systems.
- It is necessary to establish and improve the operating and management standards and promote the use of GSHP systems in Mexico, which will be of great significance to the promotion of energy-saving.
- As future work, we will continue with the analysis of the information to know more about its operation, maintenance, and performance of the GSHP system with the data collected so far.

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RECOGNITION

Ph.D. Alfonso García Gutiérrez and Ms.C. Daniel González García are recognized for the initial conception of the P13 CeMIEGeo Project.

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APPENDX A - DATA OF GSHP

1	TIMESTAMP	RECORD	attery. Adquisit	Temp_ambiente	EWT	LWT	EAT	LAT	EWT	LWT	EAT	LAT	Current L1
2			Volts	°C	°F	°F	°F	°F	°C	°C	°C	°C	Amp
272	26/07/2018 16:30	269	12.52	22.42	73.2	70	78.38	106.7	22.89	21.11	25.77	41.49	6.9
273	26/07/2018 16:31	270	12.52	22.42	73.2	70	78.4	106.7	22.89	21.11	25.78	41.5	6.9
274	26/07/2018 16:31	271	12.52	22.42	73.2	70	78.4	106.8	22.89	21.11	25.78	41.56	6.9
275	26/07/2018 16:31	272	12.52	22.42	73.18	70	78.4	106.8	22.88	21.11	25.78	41.56	6.9
276	26/07/2018 16:31	273	12.52	22.42	73.1	70	78.4	106.8	22.83	21.11	25.78	41.56	6.9
277	26/07/2018 16:31	274	12.52	22.44	73.1	70	78.4	106.8	22.83	21.11	25.78	41.56	6.9
278	26/07/2018 16:31	275	12.52	22.45	73.1	70	78.4	106.8	22.83	21.11	25.78	41.56	6.9
279	26/07/2018 16:31	276	12.52	22.45	73.1	70	78.4	106.8	22.83	21.11	25.78	41.56	6.98
280	26/07/2018 16:31	277	12.51	22.45	73.1	70	78.44	106.9	22.83	21.11	25.8	41.59	7
281	26/07/2018 16:31	278	12.52	22.45	73.02	70	78.52	106.9	22.79	21.11	25.84	41.62	7
282	26/07/2018 16:31	279	12.52	22.45	73	70	78.6	107	22.78	21.11	25.89	41.67	7
283	26/07/2018 16:31	280	12.52	22.45	73	70	78.6	107	22.78	21.11	25.89	41.67	7
284	26/07/2018 16:31	281	12.52	22.45	73	70	78.6	107	22.78	21.11	25.89	41.67	7
285	26/07/2018 16:32	282	12.52	22.45	73	70	78.6	107	22.78	21.11	25.89	41.67	7
286	26/07/2018 16:32	283	12.52	22.45	73	70	78.66	107.1	22.78	21.11	25.92	41.7	7
287	26/07/2018 16:32	284	12.52	22.45	73	70	78.7	107.1	22.78	21.11	25.94	41.72	7
288	26/07/2018 16:32	285	12.52	22.45	72.92	70	78.7	107.1	22.73	21.11	25.94	41.72	7
289	26/07/2018 16:32	286	12.52	22.45	72.9	69.94	78.7	107.1	22.72	21.08	25.94	41.73	7
290	26/07/2018 16:32	287	12.52	22.46	72.9	69.9	78.7	107.2	22.72	21.06	25.94	41.77	7
291	26/07/2018 16:32	288	12.52	22.47	72.84	69.9	78.7	107.2	22.69	21.06	25.94	41.78	7
292	26/07/2018 16:32	289	12.52	22.47	72.8	69.9	78.7	107.2	22.67	21.06	25.94	41.78	7
293	26/07/2018 16:32	290	12.52	22.47	72.8	69.9	78.7	107.2	22.67	21.06	25.94	41.78	7
294	26/07/2018 16:32	291	12.52	22.47	72.8	69.9	78.8	107.2	22.67	21.06	26	41.78	7
295	26/07/2018 16:32	292	12.52	22.47	72.8	69.84	78.8	107.2	22.67	21.02	26	41.8	7
296	26/07/2018 16:32	293	12.52	22.47	72.76	69.8	78.8	107.3	22.64	21	26	41.83	7
297	26/07/2018 16:33	294	12.52	22.47	72.7	69.8	78.9	107.3	22.61	21	26.06	41.83	7
298	26/07/2018 16:33	295	12.52	22.47	72.7	69.8	78.9	107.3	22.61	21	26.06	41.83	7
299	26/07/2018 16:33	296	12.52	22.47	72.7	69.8	78.9	107.4	22.61	21	26.06	41.87	7
300	26/07/2018 16:33	297	12.52	22.47	72.7	69.8	78.98	107.4	22.61	21	26.1	41.89	7
301	26/07/2018 16:33	298	12.52	22.5	72.7	69.8	79	107.4	22.61	21	26.11	41.89	7
302	26/07/2018 16:33	299	12.52	22.5	72.7	69.8	79	107.4	22.61	21	26.11	41.89	7
303	26/07/2018 16:39	0	12.52	22.63	72.02	68.61	80.3	112.2	22.23	20.34	26.82	44.55	9.8
304	26/07/2018 16:40	1	12.52	22.66	72	68.57	80.6	112.6	22.22	20.32	27.01	44.77	9.8
305	26/07/2018 16:41	2	12.52	22.68	72	68.5	80.8	112.8	22.22	20.28	27.11	44.89	9.8
306	26/07/2018 16:42	3	12.52	22.71	72	68.5	81	113.1	22.22	20.28	27.21	45.04	9.8
307	26/07/2018 16:43	4	12.52	22.74	72	68.5	81.2	113.3	22.22	20.28	27.34	45.17	9.8
308	26/07/2018 16:44	5	12.52	22.78	71.95	68.55	81.4	113.5	22.19	20.31	27.44	45.29	9.89
309	26/07/2018 16:45	6	12.52	22.81	71.9	68.6	81.8	113.8	22.17	20.33	27.66	45.43	9.9
310	26/07/2018 16:46	7	12.52	22.85	71.9	68.6	82.2	114	22.17	20.33	27.88	45.58	9.9
311	26/07/2018 16:47	8	12.52	22.89	71.8	68.6	82.3	114.3	22.11	20.33	27.94	45.7	9.9
312	26/07/2018 16:48	9	12.52	22.94	71.7	68.6	82.5	114.5	22.06	20.33	28.03	45.82	9.9
313	26/07/2018 16:49	10	12.52	22.98	71.67	68.5	82.3	114.5	22.04	20.28	27.95	45.83	9.9
314	26/07/2018 16:50	11	12.52	23.03	71.59	68.46	82.4	114.6	22	20.26	27.99	45.9	9.9
315	26/07/2018 16:51	12	12.52	23.07	71.46	68.4	82.5	114.7	21.92	20.22	28.04	45.96	9.9
316	26/07/2018 16:52	13	12.52	23.11	71.38	68.38	82.7	114.9	21.88	20.21	28.16	46.06	9.9
317	26/07/2018 16:53	14	12.52	23.12	71.29	68.3	82.9	114.9	21.83	20.17	28.28	46.06	9.9
318	26/07/2018 16:54	15	12.52	23.13	71.2	68.24	83.1	115	21.78	20.14	28.38	46.11	9.9
319	26/07/2018 16:55	16	12.52	23.13	71.1	68.17	83	115	21.72	20.1	28.35	46.11	9.82
320	26/07/2018 16:56	17	12.52	23.12	71.08	68.28	83.1	113.6	21.71	20.16	28.4	45.34	7.398
321	26/07/2018 16:57	18	12.52	23.12	71	68.63	82.9	111.6	21.66	20.35	28.29	44.24	7.3
322	26/07/2018 16:58	19	12.52	23.12	70.9	68.78	82.5	111	21.61	20.44	28.08	43.88	7.248
323	26/07/2018 16:59	20	12.52	23.12	70.89	68.9	82.3	110.8	21.61	20.5	27.96	43.75	7.2
324	26/07/2018 17:00	21	12.52	23.1	70.8	68.9	82.2	110.6	21.56	20.5	27.91	43.67	7.2
325	26/07/2018 17:01	22	12.52	23.1	70.8	68.9	82.2	110.6	21.56	20.5	27.88	43.67	6.957
326	26/07/2018 17:02	23	12.51	23.11	70.8	69.04	82.4	107.9	21.56	20.58	27.98	42.15	0.207
327	27/07/2018 09:55	0	12.52	15.97	69.01	71.55	67.6	81.1	20.56	21.97	19.78	27.28	2.536
328	27/07/2018 09:56	1	12.52	16.02	69.47	70.45	66.47	86	20.82	21.36	19.15	30	5.868
329	27/07/2018 09:57	2	12.52	16.07	70.15	68.96	66.53	91.8	21.19	20.53	19.18	33.23	6.073
330	27/07/2018 09:58	3	12.52	16.12	70.61	68.11	67.36	94.5	21.45	20.06	19.64	34.72	6.1
331	27/07/2018 09:59	4	12.52	16.19	70.79	67.68	68.12	96.1	21.55	19.82	20.07	35.62	6.1
332	27/07/2018 10:00	5	12.52	16.27	70.86	67.52	68.73	97.1	21.59	19.73	20.41	36.16	6.193
333	27/07/2018 10:01	6	12.52	16.36	70.9	67.43	69.24	97.7	21.61	19.69	20.69	36.5	6.2
334	27/07/2018 10:02	7	12.52	16.45	70.9	67.4	69.6	98.1	21.61	19.67	20.89	36.75	6.2
335	27/07/2018 10:03	8	12.52	16.54	70.9	67.44	69.96	98.5	21.61	19.69	21.09	36.95	6.287
336	27/07/2018 10:04	9	12.52	16.62	70.9	67.5	70.19	98.9	21.61	19.72	21.22	37.15	6.3
337	27/07/2018 10:05	10	12.52	16.7	70.9	67.59	70.36	99.1	21.61	19.77	21.31	37.29	6.3
338	27/07/2018 10:06	11	12.52	16.78	70.9	67.64	70.64	98.2	21.61	19.8	21.47	36.78	2.237
339	27/07/2018 10:07	12	12.52	16.87	70.93	68.16	70.8	94.7	21.63	20.09	21.56	34.81	0.1
340	27/07/2018 10:08	13	12.52	16.94	71.05	68.89	70.86	94	21.7	20.49	21.59	34.45	0.1

1	TIMESTAMP	RECORD	attery. Adquisit	Temp_ambiente	EWT	LWT	EAT	LAT	EWT	LWT	EAT	LAT	Current L1
2			Volts	°C	°F	°F	°F	°F	°C	°C	°C	°C	Amp
121	26/07/2018 16:18	118	12.51	22.1	69.2	69.7	70	73.36	20.67	20.94	21.11	22.98	0.1
122	26/07/2018 16:18	119	12.51	22.11	69.2	69.7	70.1	73.3	20.67	20.94	21.17	22.94	1.28
123	26/07/2018 16:18	120	12.52	22.1	69.2	69.7	70.14	73.3	20.67	20.94	21.19	22.94	5.04
124	26/07/2018 16:18	121	12.52	22.08	69.2	69.7	70.26	73.34	20.67	20.94	21.26	22.97	4.8
125	26/07/2018 16:18	122	12.52	22.11	69.2	69.7	70.36	73.72	20.67	20.94	21.31	23.18	5.02
126	26/07/2018 16:18	123	12.52	22.1	69.22	69.56	70.46	74.5	20.68	20.87	21.37	23.61	5.48
127	26/07/2018 16:18	124	12.51	22.11	69.3	69.48	70.58	75.64	20.72	20.82	21.43	24.24	5.82
128	26/07/2018 16:18	125	12.52	22.1	69.36	69.36	70.68	77	20.76	20.76	21.49	25	6.02
129	26/07/2018 16:19	126	12.52	22.1	69.46	69.24	70.76	78.62	20.81	20.69	21.53	25.9	6.24
130	26/07/2018 16:19	127	12.52	22.1	69.5	69.16	70.88	80.3	20.83	20.64	21.6	26.82	6.3
131	26/07/2018 16:19	128	12.51	22.1	69.5	69.06	70.92	81.9	20.83	20.59	21.62	27.7	6.3
132	26/07/2018 16:19	129	12.52	22.1	69.6	68.94	71.02	83.3	20.89	20.52	21.68	28.52	6.32
133	26/07/2018 16:19	130	12.52	22.11	69.62	68.84	71.1	84.7	20.9	20.47	21.72	29.28	6.4
134	26/07/2018 16:19	131	12.52	22.11	69.7	68.72	71.2	85.9	20.94	20.4	21.78	29.97	6.4
135	26/07/2018 16:19	132	12.52	22.11	69.74	68.62	71.26	87.1	20.97	20.34	21.81	30.59	6.4
136	26/07/2018 16:19	133	12.52	22.11	69.8	68.54	71.38	88.2	21	20.3	21.88	31.22	6.4
137	26/07/2018 16:19	134	12.52	22.11	69.9	68.4	71.48	89.2	21.06	20.22	21.93	31.78	6.4
138	26/07/2018 16:19	135	12.52	22.11	69.98	68.36	71.62	90.1	21.1	20.2	22.01	32.29	6.48
139	26/07/2018 16:19	136	12.51	22.11	70.1	68.3	71.72	91	21.17	20.17	22.07	32.78	6.5
140	26/07/2018 16:19	137	12.51	22.11	70.18	68.26	71.82	91.8	21.21	20.14	22.12	33.21	6.5
141	26/07/2018 16:20	138	12.51	22.11	70.3	68.2	71.98	92.5	21.28	20.11	22.21	33.63	6.5
142	26/07/2018 16:20	139	12.52	22.11	70.4	68.2	72.08	93.2	21.33	20.11	22.27	34	6.5
143	26/07/2018 16:20	140	12.52	22.11	70.5	68.16	72.22	93.9	21.39	20.09	22.34	34.37	6.5
144	26/07/2018 16:20	141	12.51	22.11	70.6	68.1	72.36	94.4	21.44	20.06	22.42	34.69	6.5
145	26/07/2018 16:20	142	12.52	22.11	70.7	68.1	72.5	95	21.5	20.06	22.5	35	6.5
146	26/07/2018 16:20	143	12.52	22.11	70.8	68.1	72.62	95.5	21.56	20.06	22.57	35.28	6.5
147	26/07/2018 16:20	144	12.52	22.11	70.9	68.1	72.76	96	21.61	20.06	22.64	35.53	6.5
148	26/07/2018 16:20	145	12.52	22.11	71	68.1	72.9	96.4	21.67	20.06	22.72	35.77	6.5
149	26/07/2018 16:20	146	12.52	22.11	71.06	68.1	73.02	96.8	21.7	20.06	22.79	35.98	6.5
150	26/07/2018 16:20	147	12.51	22.11	71.16	68.1	73.12	97.1	21.76	20.06	22.84	36.19	6.6
151	26/07/2018 16:20	148	12.52	22.11	71.24	68.1	73.28	97.5	21.8	20.06	22.93	36.39	6.6
152	26/07/2018 16:20	149	12.51	22.11	71.3	68.1	73.36	97.8	21.83	20.06	22.98	36.56	6.6
153	26/07/2018 16:21	150	12.52	22.11	71.4	68.18	73.46	98.1	21.89	20.1	23.03	36.72	6.6
154	26/07/2018 16:21	151	12.52	22.11	71.44	68.2	73.56	98.4	21.91	20.11	23.09	36.87	6.6
155	26/07/2018 16:21	152	12.52	22.14	71.5	68.2	73.62	98.6	21.94	20.11	23.12	37.02	6.6
156	26/07/2018 16:21	153	12.51	22.12	71.58	68.2	73.74	98.9	21.99	20.11	23.19	37.19	6.6
157	26/07/2018 16:21	154	12.52	22.14	71.6	68.2	73.84	99.2	22	20.11	23.24	37.31	6.6
158	26/07/2018 16:21	155	12.52	22.14	71.7	68.2	73.94	99.4	22.06	20.11	23.3	37.44	6.6
159	26/07/2018 16:21	156	12.52	22.14	71.7	68.22	74.06	99.7	22.06	20.12	23.37	37.59	6.6
160	26/07/2018 16:21	157	12.52	22.14	71.78	68.3	74.12	99.9	22.1	20.17	23.4	37.7	6.6
161	26/07/2018 16:21	158	12.52	22.14	71.8	68.3	74.2	100	22.11	20.17	23.44	37.8	6.6
162	26/07/2018 16:21	159	12.51	22.14	71.82	68.3	74.28	100.2	22.12	20.17	23.49	37.9	6.6
163	26/07/2018 16:21	160	12.52	22.14	71.9	68.3	74.38	100.4	22.17	20.17	23.54	38	6.6
164	26/07/2018 16:21	161	12.51	22.16	71.92	68.3	74.4	100.6	22.18	20.17	23.56	38.09	6.62
165	26/07/2018 16:22	162	12.51	22.17	72	68.34	74.46	100.7	22.22	20.19	23.59	38.17	6.7
166	26/07/2018 16:22	163	12.51	22.17	72	68.4	74.5	100.8	22.22	20.22	23.61	38.24	6.7
167	26/07/2018 16:22	164	12.52	22.17	72	68.4	74.58	100.9	22.22	20.22	23.66	38.3	6.7
168	26/07/2018 16:22	165	12.51	22.17	72.04	68.4	74.64	101.1	22.24	20.22	23.69	38.38	6.7
169	26/07/2018 16:22	166	12.51	22.17	72.1	68.4	74.7	101.2	22.28	20.22	23.72	38.44	6.7
170	26/07/2018 16:22	167	12.51	22.17	72.1	68.4	74.78	101.3	22.28	20.22	23.77	38.51	6.7
171	26/07/2018 16:22	168	12.52	22.17	72.1	68.4	74.8	101.5	22.28	20.22	23.78	38.6	6.7
172	26/07/2018 16:22	169	12.52	22.17	72.12	68.44	74.9	101.5	22.29	20.24	23.83	38.63	6.7
173	26/07/2018 16:22	170	12.52	22.17	72.2	68.5	74.9	101.7	22.33	20.28	23.83	38.72	6.7
174	26/07/2018 16:22	171	12.52	22.17	72.2	68.5	74.9	101.8	22.33	20.28	23.83	38.76	6.7
175	26/07/2018 16:22	172	12.52	22.19	72.2	68.5	74.92	101.9	22.33	20.28	23.84	38.83	6.7
176	26/07/2018 16:22	173	12.52	22.19	72.2	68.5	75	101.9	22.33	20.28	23.89	38.84	6.7
177	26/07/2018 16:23	174	12.52	22.19	72.2	68.5	75	102.1	22.33	20.28	23.89	38.93	6.7
178	26/07/2018 16:23	175	12.51	22.19	72.28	68.54	75.1	102.1	22.38	20.3	23.94	38.96	6.7
179	26/07/2018 16:23	176	12.52	22.19	72.3	68.6	75.1	102.3	22.39	20.33	23.94	39.03	6.7
180	26/07/2018 16:23	177	12.52	22.19	72.3	68.6	75.2	102.3	22.39	20.33	24	39.06	6.7
181	26/07/2018 16:23	178	12.52	22.19	72.3	68.6	75.22	102.5	22.39	20.33	24.01	39.14	6.7
182	26/07/2018 16:23	179	12.51	22.22	72.3	68.6	75.3	102.5	22.39	20.33	24.06	39.17	6.7
183	26/07/2018 16:23	180	12.52	22.22	72.3	68.6	75.36	102.6	22.39	20.33	24.09	39.21	6.7
184	26/07/2018 16:23	181	12.52	22.22	72.4	68.6	75.48	102.7	22.44	20.33	24.16	39.28	6.7
185	26/07/2018 16:23	182	12.52	22.22	72.4	68.7	75.54	102.7	22.44	20.39	24.19	39.28	6.7
186	26/07/2018 16:23	183	12.52	22.22	72.4	68.7	75.6	102.8	22.44	20.39	24.22	39.36	6.7
187	26/07/2018 16:23	184	12.52	22.22	72.4	68.7	75.7	102.9	22.44	20.39	24.28	39.39	6.7
188	26/07/2018 16:23	185	12.52	22.22	72.4	68.7	75.8	103	22.44	20.39	24.33	39.43	6.7
189	26/07/2018 16:24	186	12.52	22.22	72.44	68.7	75.8	103.1	22.47	20.39	24.33	39.5	6.7

1	TIMESTAMP	RECORD	attery. Adquisit	Temp_ambiente	EWT	LWT	EAT	LAT	EWT	LWT	EAT	LAT	Current L1
2			Volts	°C	°F	°F	°F	°F	°C	°C	°C	°C	Amp
98787	11/12/2018 02:04	98172	12.52	12.91	60.04	66.61	63.78	77.41	15.58	19.23	17.66	25.23	0.1
98788	11/12/2018 02:06	98173	12.52	12.89	60.04	66.48	63.68	76.7	15.58	19.16	17.6	24.83	0.1
98789	11/12/2018 02:08	98174	12.52	12.86	60.06	66.38	63.53	76.06	15.59	19.1	17.52	24.48	0.1
98790	11/12/2018 02:10	98175	12.52	12.83	60.05	66.24	63.43	75.46	15.58	19.02	17.46	24.14	0.1
98791	11/12/2018 02:12	98176	12.52	12.81	60.07	65.94	63.1	75.7	15.59	18.85	17.28	24.28	2.535
98792	11/12/2018 02:14	98177	12.52	12.78	60.09	63.38	63.25	86.3	15.61	17.43	17.36	30.15	5.793
98793	11/12/2018 02:16	98178	12.52	12.77	60.08	62.06	64.85	90.5	15.60	16.7	18.25	32.48	5.918
98794	11/12/2018 02:18	98179	12.52	12.77	60.1	61.61	66.07	92	15.61	16.45	18.93	33.33	6
98795	11/12/2018 02:20	98180	12.52	12.79	60.09	61.43	66.73	92.7	15.61	16.35	19.29	33.73	6
98796	11/12/2018 02:22	98181	12.52	12.81	60.11	61.4	67.24	93.2	15.62	16.33	19.58	34.01	6.037
98797	11/12/2018 02:24	98182	12.52	12.83	60.07	61.39	67.47	93.6	15.59	16.33	19.7	34.2	5.47
98798	11/12/2018 02:26	98183	12.52	12.86	60.04	61.91	67.57	89.5	15.58	16.62	19.76	31.96	0.103
98799	11/12/2018 02:28	98184	12.52	12.88	60.04	63.27	67.13	88	15.58	17.37	19.52	31.1	0.1
98800	11/12/2018 02:30	98185	12.52	12.88	60.04	64.37	66.49	86.9	15.58	17.98	19.16	30.51	0.1
98801	11/12/2018 02:32	98186	12.52	12.88	60.05	65.23	65.91	85.8	15.58	18.46	18.84	29.91	0.1
98802	11/12/2018 02:34	98187	12.52	12.88	60.06	65.81	65.46	84.8	15.59	18.78	18.59	29.31	0.1
98803	11/12/2018 02:36	98188	12.52	12.86	60.05	66.21	65.07	83.7	15.58	19	18.37	28.73	0.1
98804	11/12/2018 02:38	98189	12.52	12.85	60.06	66.45	64.75	82.7	15.59	19.14	18.2	28.17	0.1
98805	11/12/2018 02:40	98190	12.52	12.82	60.05	66.55	64.49	81.7	15.58	19.2	18.05	27.63	0.1
98806	11/12/2018 02:42	98191	12.52	12.81	60.08	66.6	64.25	80.8	15.60	19.22	17.92	27.1	0.1
98807	11/12/2018 02:44	98192	12.52	12.77	60.06	66.56	64.04	79.88	15.59	19.2	17.8	26.6	0.1
98808	11/12/2018 02:46	98193	12.52	12.75	60.04	66.5	63.84	79.03	15.58	19.17	17.69	26.13	0.1
98809	11/12/2018 02:48	98194	12.52	12.72	60.05	66.41	63.68	78.21	15.58	19.12	17.6	25.68	0.1
98810	11/12/2018 02:50	98195	12.52	12.68	60.05	66.29	63.51	77.44	15.58	19.05	17.51	25.25	0.1
98811	11/12/2018 02:52	98196	12.52	12.65	60.03	66.18	63.38	76.69	15.57	18.99	17.43	24.83	0.1
98812	11/12/2018 02:54	98197	12.52	12.62	60.05	66.06	63.23	76.02	15.58	18.92	17.35	24.45	0.1
98813	11/12/2018 02:56	98198	12.52	12.59	60.08	64.69	62.65	80.6	15.60	18.16	17.03	26.98	5.353
98814	11/12/2018 02:58	98199	12.52	12.56	60.07	62.32	63.93	88.7	15.59	16.84	17.74	31.52	5.86
98815	11/12/2018 03:00	98200	12.52	12.56	60.08	61.52	65.27	91.1	15.60	16.4	18.49	32.83	5.965
98816	11/12/2018 03:02	98201	12.52	12.56	60.09	61.21	66.17	92.1	15.61	16.23	18.98	33.39	6
98817	11/12/2018 03:04	98202	12.52	12.58	60.09	61.1	66.78	92.7	15.61	16.17	19.32	33.71	6.03
98818	11/12/2018 03:06	98203	12.52	12.58	60.08	61.07	67.15	93.1	15.60	16.15	19.53	33.96	6.1
98819	11/12/2018 03:08	98204	12.52	12.61	60.08	60.98	67.46	93.4	15.60	16.1	19.7	34.1	5.47
98820	11/12/2018 03:10	98205	12.52	12.63	60.05	61.44	67.38	89.3	15.58	16.35	19.65	31.83	0.103
98821	11/12/2018 03:12	98206	12.52	12.63	60.04	62.81	66.93	87.8	15.58	17.11	19.41	30.99	0.1
98822	11/12/2018 03:14	98207	12.52	12.65	60.05	63.89	66.33	86.7	15.58	17.72	19.07	30.41	0.1
98823	11/12/2018 03:16	98208	12.52	12.64	60.07	64.71	65.74	85.7	15.59	18.17	18.75	29.83	0.1
98824	11/12/2018 03:18	98209	12.52	12.63	60.06	65.32	65.23	84.7	15.59	18.51	18.46	29.25	0.1
98825	11/12/2018 03:20	98210	12.52	12.63	60.04	65.71	64.83	83.6	15.58	18.73	18.24	28.67	0.1
98826	11/12/2018 03:22	98211	12.52	12.61	60.06	65.95	64.49	82.6	15.59	18.86	18.05	28.11	0.1
98827	11/12/2018 03:24	98212	12.52	12.58	60.06	66.07	64.21	81.6	15.59	18.93	17.9	27.55	0.1
98828	11/12/2018 03:26	98213	12.52	12.56	60.06	66.1	63.95	80.7	15.59	18.94	17.75	27.03	0.1
98829	11/12/2018 03:28	98214	12.52	12.53	60.03	66.1	63.74	79.74	15.57	18.94	17.63	26.53	0.1
98830	11/12/2018 03:30	98215	12.52	12.5	60.06	66.03	63.55	78.88	15.59	18.91	17.53	26.05	0.1
98831	11/12/2018 03:32	98216	12.52	12.47	60.03	65.95	63.37	78.06	15.57	18.86	17.43	25.59	0.1
98832	11/12/2018 03:34	98217	12.52	12.44	60.04	65.88	63.2	77.3	15.58	18.82	17.33	25.17	0.1
98833	11/12/2018 03:36	98218	12.52	12.4	60.04	65.73	63.05	76.55	15.58	18.74	17.25	24.75	0.1
98834	11/12/2018 03:38	98219	12.52	12.38	60.07	64.41	62.39	80.8	15.59	18	16.89	27.11	5.35
98835	11/12/2018 03:40	98220	12.52	12.35	60.09	62.04	63.7	88.5	15.61	16.69	17.61	31.38	5.853
98836	11/12/2018 03:42	98221	12.52	12.35	60.09	61.24	65.1	90.9	15.61	16.24	18.39	32.71	5.957
98837	11/12/2018 03:44	98222	12.52	12.35	60.09	60.93	66.02	91.8	15.61	16.07	18.9	33.24	6
98838	11/12/2018 03:46	98223	12.52	12.37	60.1	60.8	66.49	92.4	15.61	16	19.16	33.57	6
98839	11/12/2018 03:48	98224	12.52	12.39	60.08	60.8	66.87	92.8	15.60	16	19.37	33.8	6.05
98840	11/12/2018 03:50	98225	12.52	12.41	60.08	60.72	67.25	93.2	15.60	15.95	19.58	33.99	6.1
98841	11/12/2018 03:52	98226	12.52	12.43	60.06	60.65	67.42	91.6	15.59	15.92	19.68	33.11	2.472
98842	11/12/2018 03:54	98227	12.52	12.44	60.04	61.76	67.09	88.1	15.58	16.53	19.49	31.19	0.1
98843	11/12/2018 03:56	98228	12.52	12.46	60.06	63.01	66.51	87.1	15.59	17.23	19.17	30.63	0.1
98844	11/12/2018 03:58	98229	12.52	12.46	60.06	63.98	65.88	86.1	15.59	17.77	18.82	30.06	0.1
98845	11/12/2018 04:00	98230	12.52	12.46	60.05	64.71	65.33	85.1	15.58	18.17	18.52	29.48	0.1
98846	11/12/2018 04:02	98231	12.52	12.44	60.06	65.2	64.88	84	15.59	18.44	18.27	28.9	0.1
98847	11/12/2018 04:04	98232	12.52	12.44	60.05	65.52	64.49	83	15.58	18.62	18.05	28.33	0.1
98848	11/12/2018 04:06	98233	12.52	12.41	60.04	65.69	64.18	82	15.58	18.72	17.88	27.76	0.1
98849	11/12/2018 04:08	98234	12.52	12.39	60.04	65.78	63.89	81	15.58	18.77	17.72	27.22	0.1
98850	11/12/2018 04:10	98235	12.52	12.36	60.04	65.8	63.63	80.1	15.58	18.78	17.57	26.71	0.1
98851	11/12/2018 04:12	98236	12.52	12.34	60.03	65.75	63.43	79.19	15.57	18.75	17.46	26.22	0.1
98852	11/12/2018 04:14	98237	12.52	12.3	60.05	65.7	63.23	78.32	15.58	18.72	17.35	25.74	0.1
98853	11/12/2018 04:16	98238	12.52	12.27	60.03	65.6	63.06	77.53	15.57	18.67	17.26	25.3	0.1
98854	11/12/2018 04:18	98239	12.52	12.23	60.06	65.3	62.63	77.19	15.59	18.5	17.02	25.1	2.532
98855	11/12/2018 04:20	98240	12.52	12.2	60.09	62.75	62.68	85.6	15.61	17.08	17.04	29.79	5.748

1	TIMESTAMP	RECORD	attery. Adquisit	Temp_ambiente	EWT	LWT	EAT	LAT	EWT	LWT	EAT	LAT	Current L1
2			Volts	°C	°F	°F	°F	°F	°C	°C	°C	°C	Amp
199518	30/04/2019 06:50	63825	12.51	13.52	60.1	59.81	60.1	60.67	15.61	15.45	15.61	15.93	0.1
199519	30/04/2019 06:52	63826	12.51	13.52	60.09	59.8	60.09	60.6	15.61	15.44	15.6	15.89	0.1
199520	30/04/2019 06:54	63827	12.51	13.5	60.04	59.8	60.05	60.67	15.58	15.44	15.58	15.93	0.808
199521	30/04/2019 06:56	63828	12.51	13.49	62.89	60.17	60.94	75.64	17.16	15.65	16.08	24.25	5.685
199522	30/04/2019 06:58	63829	12.51	13.49	69.46	64.4	62.67	86.3	20.81	18	17.04	30.16	5.91
199523	30/04/2019 07:00	63830	12.51	13.51	70.78	66.03	64.2	90.1	21.54	18.91	17.89	32.29	6.027
199524	30/04/2019 07:02	63831	12.51	13.55	70.9	66.4	65.31	92.4	21.61	19.11	18.5	33.56	6.1
199525	30/04/2019 07:04	63832	12.51	13.6	71.31	66.81	66.04	93.8	21.84	19.34	18.91	34.35	6.172
199526	30/04/2019 07:06	63833	12.51	13.66	71.91	67.59	66.65	91.7	22.17	19.77	19.25	33.19	1.482
199527	30/04/2019 07:08	63834	12.51	13.72	72.15	68.84	66.8	88.6	22.31	20.47	19.33	31.43	0.1
199528	30/04/2019 07:10	63835	12.51	13.77	72.14	69.8	66.67	87.5	22.30	21	19.26	30.82	0.1
199529	30/04/2019 07:12	63836	12.51	13.81	71.94	70.38	66.4	86.3	22.19	21.32	19.11	30.18	0.1
199530	30/04/2019 07:14	63837	12.51	13.85	71.69	70.7	66.13	85.2	22.05	21.5	18.96	29.55	0.1
199531	30/04/2019 07:16	63838	12.51	13.88	71.44	70.84	65.92	84.1	21.91	21.58	18.84	28.94	0.1
199532	30/04/2019 07:18	63839	12.51	13.91	71.16	70.9	65.73	83	21.75	21.61	18.74	28.34	0.1
199533	30/04/2019 07:20	63840	12.51	13.93	70.88	70.84	65.63	82	21.60	21.58	18.68	27.77	0.1
199534	30/04/2019 07:22	63841	12.51	13.94	70.59	70.8	65.55	81	21.44	21.56	18.64	27.24	0.1
199535	30/04/2019 07:24	63842	12.51	13.96	70.31	70.73	65.46	80.1	21.28	21.52	18.59	26.73	0.1
199536	30/04/2019 07:26	63843	12.51	13.97	70.04	70.61	65.4	79.28	21.13	21.45	18.56	26.27	0.1
199537	30/04/2019 07:28	63844	12.51	13.99	69.78	70.51	65.38	78.49	20.99	21.39	18.54	25.83	0.1
199538	30/04/2019 07:30	63845	12.51	13.99	69.52	70.39	65.3	77.76	20.84	21.33	18.5	25.42	0.1
199539	30/04/2019 07:32	63846	12.51	13.99	69.26	70.3	65.29	77.08	20.70	21.28	18.49	25.04	0.1
199540	30/04/2019 07:34	63847	12.51	14	69.01	70.2	65.2	76.44	20.56	21.22	18.45	24.69	0.1
199541	30/04/2019 07:36	63848	12.51	14.01	68.79	70.09	65.2	75.88	20.44	21.16	18.44	24.38	0.1
199542	30/04/2019 07:38	63849	12.51	14.01	68.56	70	65.14	75.34	20.31	21.11	18.41	24.08	0.1
199543	30/04/2019 07:40	63850	12.51	14.02	68.35	69.92	65.1	74.85	20.20	21.07	18.39	23.81	0.1
199544	30/04/2019 07:42	63851	12.51	14.04	68.14	69.8	65.1	74.4	20.08	21	18.39	23.55	0.1
199545	30/04/2019 07:44	63852	12.51	14.04	67.94	69.7	65.06	73.96	19.97	20.94	18.36	23.31	0.1
199546	30/04/2019 07:46	63853	12.51	14.04	67.76	69.58	65	73.55	19.87	20.88	18.33	23.08	0.1
199547	30/04/2019 07:48	63854	12.51	14.06	67.56	69.5	64.99	73.16	19.76	20.83	18.33	22.87	0.1
199548	30/04/2019 07:50	63855	12.51	14.06	67.39	69.39	64.9	72.81	19.66	20.77	18.28	22.67	0.1
199549	30/04/2019 07:52	63856	12.51	14.07	67.24	69.26	64.9	72.47	19.58	20.7	18.28	22.48	0.1
199550	30/04/2019 07:54	63857	12.51	14.08	67.06	69.18	64.85	72.14	19.48	20.66	18.25	22.3	0.1
199551	30/04/2019 07:56	63858	12.51	14.09	67.55	68.69	64.22	75.35	19.75	20.39	17.9	24.08	3.548
199552	30/04/2019 07:58	63859	12.51	14.1	70.88	67.8	63.37	89.2	21.60	19.89	17.42	31.78	5.957
199553	30/04/2019 08:00	63860	12.51	14.14	71.97	67.82	64.82	93.4	22.21	19.9	18.23	34.13	6.098
199554	30/04/2019 08:02	63861	12.51	14.19	71.78	67.6	66.1	95.2	22.10	19.78	18.95	35.1	6.16
199555	30/04/2019 08:04	63862	12.51	14.26	71.71	67.52	66.95	96.3	22.06	19.73	19.42	35.7	6.25
199556	30/04/2019 08:06	63863	12.51	14.34	71.99	67.78	67.44	96.5	22.21	19.88	19.69	35.81	4.595
199557	30/04/2019 08:08	63864	12.51	14.42	72.16	68.82	67.73	91.6	22.31	20.46	19.85	33.09	0.1
199558	30/04/2019 08:10	63865	12.51	14.5	72.2	70.15	67.85	90.4	22.33	21.19	19.92	32.42	0.1
199559	30/04/2019 08:12	63866	12.51	14.57	72.17	70.99	67.62	89.2	22.32	21.66	19.79	31.77	0.1
199560	30/04/2019 08:14	63867	12.51	14.62	72.01	71.44	67.32	88	22.23	21.91	19.62	31.1	0.1
199561	30/04/2019 08:16	63868	12.51	14.66	71.8	71.66	67.05	86.8	22.11	22.03	19.47	30.44	0.1
199562	30/04/2019 08:18	63869	12.51	14.69	71.59	71.71	66.83	85.8	21.99	22.06	19.35	29.86	0.1
199563	30/04/2019 08:20	63870	12.51	14.73	71.35	71.73	66.67	84.7	21.86	22.07	19.26	29.29	0.1
199564	30/04/2019 08:22	63871	12.51	14.74	71.12	71.7	66.54	83.8	21.73	22.06	19.19	28.75	0.1
199565	30/04/2019 08:24	63872	12.51	14.77	70.89	71.63	66.49	82.8	21.61	22.02	19.16	28.24	0.1
199566	30/04/2019 08:26	63873	12.51	14.78	70.68	71.56	66.4	82	21.49	21.98	19.11	27.77	0.1
199567	30/04/2019 08:28	63874	12.51	14.79	70.44	71.43	66.38	81.2	21.36	21.9	19.1	27.33	0.1
199568	30/04/2019 08:30	63875	12.51	14.8	70.22	71.34	66.3	80.5	21.24	21.86	19.06	26.92	0.1
199569	30/04/2019 08:32	63876	12.51	14.82	70.02	71.24	66.3	79.76	21.12	21.8	19.06	26.53	0.1
199570	30/04/2019 08:34	63877	12.51	14.83	69.8	71.11	66.24	79.11	21.00	21.73	19.02	26.17	0.1
199571	30/04/2019 08:36	63878	12.51	14.84	69.61	71.04	66.2	78.52	20.89	21.69	19	25.84	0.1
199572	30/04/2019 08:38	63879	12.51	14.86	69.42	70.93	66.2	77.95	20.79	21.63	19	25.53	0.1
199573	30/04/2019 08:40	63880	12.51	14.88	69.22	70.82	66.16	77.42	20.68	21.57	18.98	25.23	0.1
199574	30/04/2019 08:42	63881	12.51	14.9	69.04	70.76	66.1	76.89	20.58	21.53	18.94	24.94	0.1
199575	30/04/2019 08:44	63882	12.51	14.93	68.87	70.63	66.03	76.4	20.48	21.46	18.91	24.67	0.1
199576	30/04/2019 08:46	63883	12.51	14.96	68.7	70.53	66	75.96	20.39	21.41	18.89	24.43	0.1
199577	30/04/2019 08:48	63884	12.51	14.99	68.56	70.44	65.96	75.55	20.31	21.36	18.87	24.19	0.1
199578	30/04/2019 08:50	63885	12.51	15.03	68.39	70.32	65.9	75.18	20.22	21.29	18.83	23.99	0.1
199579	30/04/2019 08:52	63886	12.51	15.06	68.26	70.24	65.9	74.83	20.15	21.24	18.83	23.8	0.1
199580	30/04/2019 08:54	63887	12.51	15.11	68.13	70.14	65.84	74.49	20.07	21.19	18.8	23.61	0.1
199581	30/04/2019 08:56	63888	12.51	15.16	68	70.02	65.78	74.21	20.00	21.12	18.77	23.45	0.1
199582	30/04/2019 08:58	63889	12.51	15.21	67.87	69.96	65.7	73.92	19.93	21.09	18.72	23.29	0.1
199583	30/04/2019 09:00	63890	12.51	15.27	67.8	69.83	65.67	73.66	19.89	21.02	18.7	23.14	0.77
199584	30/04/2019 09:02	63891	12.51	15.33	69.66	68.61	64.17	84.7	20.92	20.34	17.87	29.28	5.86
199585	30/04/2019 09:04	63892	12.51	15.42	72	68.27	64.9	93.1	22.22	20.15	18.28	33.96	6.082
199586	30/04/2019 09:06	63893	12.51	15.54	72.12	68.08	66.69	95.7	22.29	20.05	19.27	35.41	6.21