

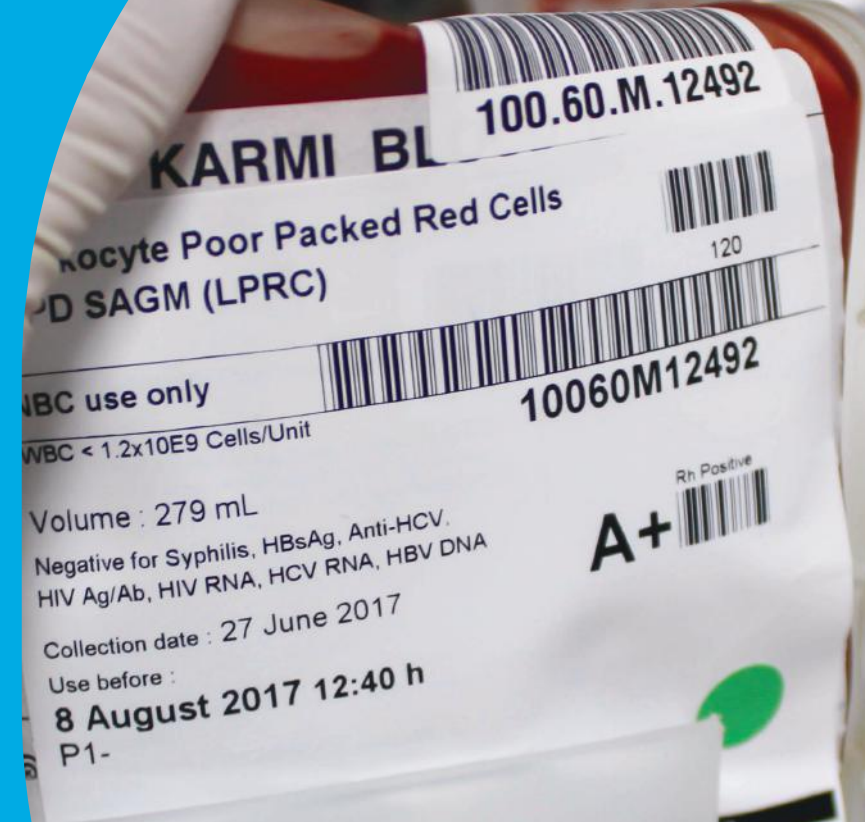
TEKON

CASE STUDY

# TEMPERATURE MONITORING IN BLOOD BANK

## EQUIPMENT FOR STORAGE OF BLOOD AND DERIVATIVES

Temperature monitoring solution in blood  
bank storage equipment.





## OBJECTIVE

Measure and monitor, in real time, temperature of refrigeration and freezing processes resulting from the treatment and conservation of blood components and derivatives, intended for application in humans.

Register and monitor the occurrences and periods of the door openings of the freezing and refrigeration equipment.

## SOLUTION



### TRANSMITTER

The application nature, in addition to the use of 50 DUOS DI + TEMP transmitters and 15 DUOS Hygro-temp transmitters, implied the development of a customized product, capable of registering cryogenic temperatures that occur in the process of preservation of blood-derived components. This custom production process resulted in the planning and development of 70 transmitters for the acquisition of temperatures with PT100 temperature probes.



### REPEATER

The entire communication layer of the application has been strengthened with the integration of 12 DUOS Repeaters, to strengthen the quality of wireless communications and ensure reliable and flawless communication.

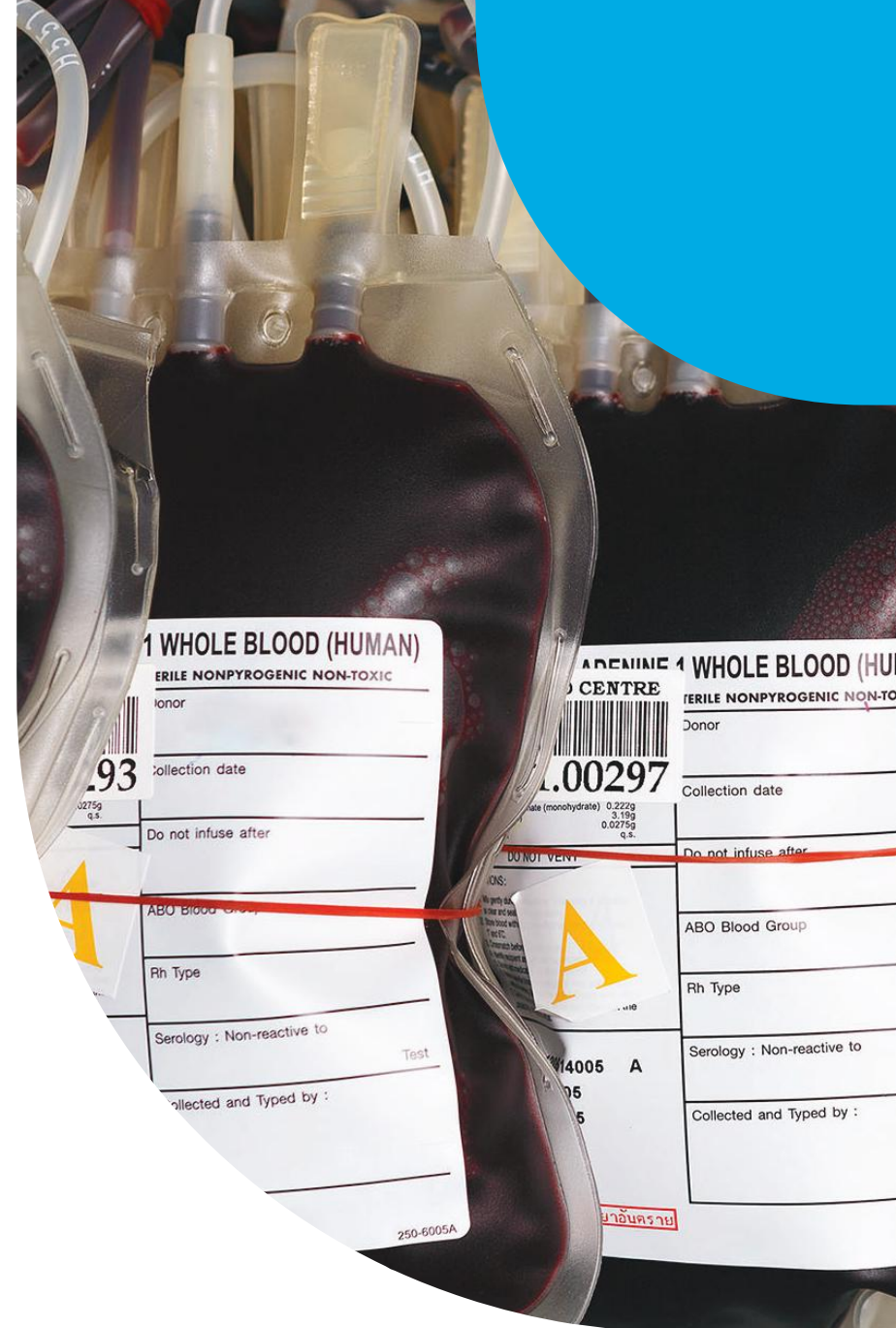
### GATEWAY

The solution consisted of 7 DUOS IoT Gateway that aggregate all the transmitters of the application, in order to use their communication properties through the Modbus TCP / IP protocol, to send the data to the data visualization tool.



### SOFTWARE

All the system information is gathered in a software tool, developed by our business partner Lasma, which ensures the visualization, analysis and alerts on the collected data



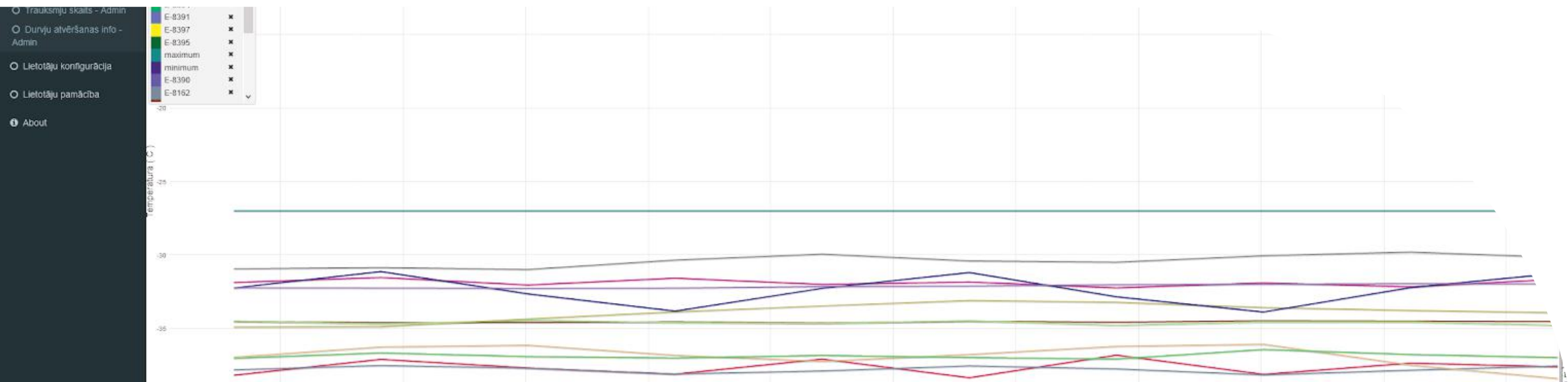
## TECHNICAL DETAILS

Due to the relevance and influence of the type of stored products, the system to be implemented would have to respond to a set of challenges, in order to guarantee the efficiency of monitoring and the preservation of all properties of the assets. The client was going through a phase of infrastructure growth that could involve the displacement of storage equipment, implying the need for a monitoring system with low impact on the mobility of the monitoring points and easily scalable. One of the points that had the greatest weight when choosing Tekon Electronics transmitters, was the requirement of having an accurate measurement system, which offered an accuracy of  $\pm 0,5^{\circ}\text{C}$ , in temperature ranges between  $-85^{\circ}\text{C}$  and  $+ 50^{\circ}\text{C}$ .

The stored assets are spread over two buildings, with several floors, located in two different cities. In total, are involved about 120 refrigeration / freezing equipment for blood and blood products.

The 50 units of the DUOS Di + TEMP transmitter with digital probe were applied to the refrigeration units, which operated in temperature ranges from  $0^{\circ}\text{C}$  to  $35^{\circ}\text{C}$ , in order to monitor the temperatures of the equipment as well as the state of their doors. In this way it was possible to achieve a fast response time and accuracy, in the monitoring of this type of equipment.

All the 70 transmitters developed for this application share some of the properties of the DUOS Di + TEMP, namely the digital input, used to control the state of the equipment





## TECHNICAL DETAILS

doors. One of the development aspects focused on the acquisition of signal from a PT100 probe connected to the equipment. This customized solution was incorporated in storage units with operating temperatures below 0°C, where it would be necessary to guarantee a high measurement accuracy when temperatures of -50°C were reached.

Humidity and temperature levels of the storage rooms were monitored by 15 DUOS Hygrotemp units, powered externally and with the possibility of being powered by batteries, in an emergency case.

Wireless communication networks created in each of the storage locations are reinforced through the 12 DUOS Repeater repeaters. Since the storage units are spread over several floors, the support of the wireless network must be guaranteed by repeaters so that the data transmission reaches 100% efficiency, without registering any failure caused by a connection error.

The entire project was divided into 5 distinct groups, based on the location of the storage equipment, which led to the need to create 5 different wireless networks. For this purpose, 5 DUOS IoT GATEWAY devices were used, to ensure the management of each of the 5 wireless communication networks and send



## TECHNICAL DETAILS

data to a local data logger, configured to send data to the central server and store the data locally. With this set of data management solutions, the risk of loss of information is zero, in case of failure of the local network or server.

Despite the distance between data collection points, the centralization of information streamlines the consultation process by users. The consultation of data can be carried out in the software solution developed for the application, in which, through a browser with an internet connection, users can access the monitoring system, to analyze the registered data and if it is verified, outline corrective actions.

Asset security is strengthened through the implementation of a set of alarms, configured to ensure that users are notified of events with increased relevance for the stability of the monitoring process:

- Temperature;
- Humidity;
- Door opening time;
- Transgression of the limit of door openings;
- Loss of wireless signal;

VADC TMS

Iekārtu parametru konfigurācija

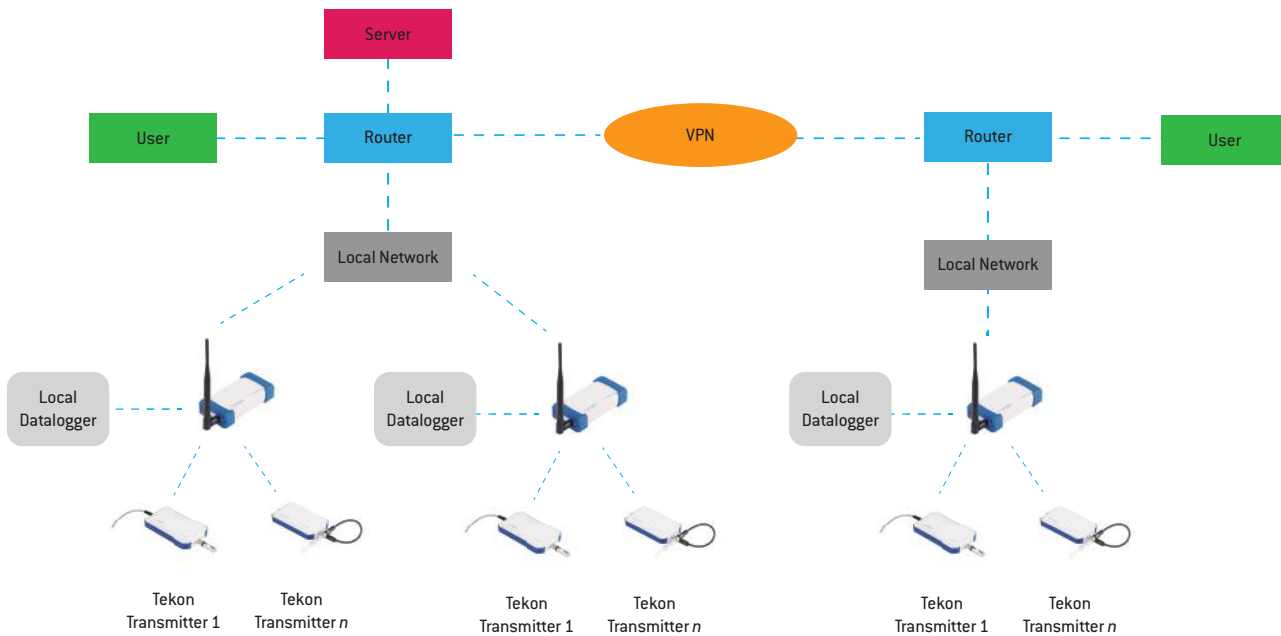
Sensora tips: Temp + DI | Telpas: Rēzekne/VDCLF/Galvenais korpus/467\_Rēzekne/VDCLF/Galvenais ko... | Izvēlēties visas | [Attēlot datus](#)

Meklēt:

| ID | Iekārtas nosaukums | On/Off                              | Temp Min [C] | Temp Max [C] | Max atvērto durvju laiks [min] | Durvju atvēršanas limits [reizes] | Temp Hist [C] | Temp trauksm. ierobež.              | Durvju atv.sk.trauksm. ierobež.     | Durvju atv.ilg.trauksm. ierobež.    | Seriālais num. |
|----|--------------------|-------------------------------------|--------------|--------------|--------------------------------|-----------------------------------|---------------|-------------------------------------|-------------------------------------|-------------------------------------|----------------|
| 1  | E-7059             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200014    |
| 2  | E-8387             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200030    |
| 3  | E-8394             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200015    |
| 4  | E-8391             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200069    |
| 5  | E-8397             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200056    |
| 6  | E-8395             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200028    |
| 7  | E-8389             | <input checked="" type="checkbox"/> | -73          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200035    |
| 8  | E-8398             | <input checked="" type="checkbox"/> | -70          | -27          | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1203200058    |
| 9  | ID-5869            | <input checked="" type="checkbox"/> | 2            | 8            | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1902200042    |
| 10 | ID-5867            | <input checked="" type="checkbox"/> | 2            | 8            | 5                              | 800                               | 0             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | I1902200016    |

## TECHNICAL DETAILS

The implemented monitoring system notifies users via email, with information on which device the alert originated from and why (temperature, humidity, communication failure, sensor error, excessive door opening time, etc.). When the register that originated the alarm is again within the operating parameters, the alarm must be filed by users, associating a cause for the alarm source.



## CONCLUSION

The implementation of the monitoring system was carried out successfully. The technological solutions of Tekon Electronics and other developments added by the partner ZTF Lasma, allowed to outline a joint system, fully operational, which ensured the efficient monitoring of the temperatures and states of the access doors of the storage units and preservation of the blood and blood products.

Through this system, the thermal stability and ideal storage conditions necessary to guarantee the quality of the product were ensured, and that when administered to users or other uses, they can play their important role, always focused on the preservation of human lives.







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## THANK YOU NOTE

Tekon Electronics congratulates ZTF Lasma on completing this important business. For Tekon Electronics, this project represented a technological challenge associated with an opportunity to acquire new knowledge and custom product development in a short period of time.

We appreciate the preference for Tekon Electronics solutions with the certainty that the commercial partnership will provide new projects together.



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