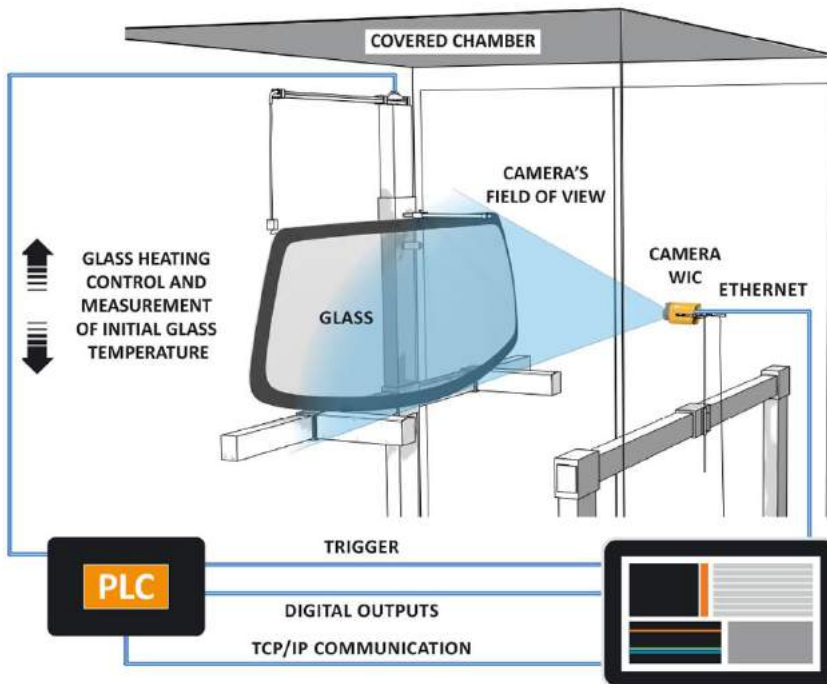


## MONITORING THE CORRECT HEATING OF THE WINDSCREEN

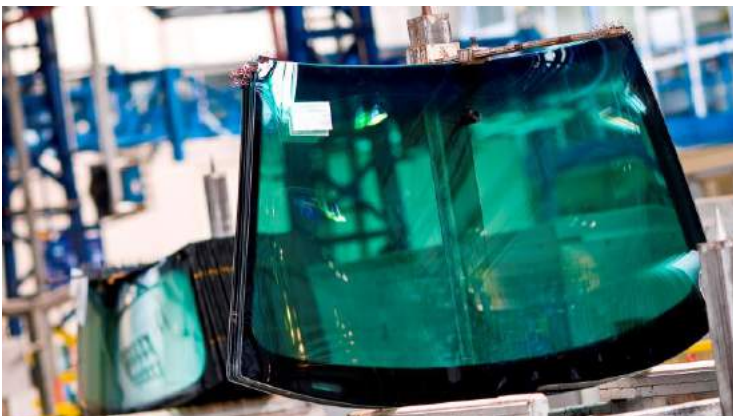


In these times of modern cars, the heating of the rear window or windscreen is almost standard equipment of each new car. Heating is provided by small resistance wires inside each glass. If the wire is defective, a short circuit occurs in the area. The short circuit is not visible to the naked eye because these are very small components on a large glass surface, but they are very well recognisable with a WIC thermal imaging camera because the short circuit produces a large amount of heat. In the current trend of high demands on

reliability and zero error rate of the manufactured parts in the automotive industry, it is necessary to monitor also these very small and for human eye imperceptible defects.

### ① Setting of the Assignment

In the company Xxxxx, a world leader company in flat glass production, **the correct and homogeneous** windscreen heating required to be monitored. These are very small defects on resistance wires inside the glass. They are almost invisible to the eye, but they can be easily detected by the WIC thermal imaging camera. As there is no space for longer glass heating during production, **the glass is heated by +/- 5 °C**, but the initial glass temperature may vary by up to 20 °C during the year due to the ambient temperature. Therefore, the evaluation of **measured temperature in dependence on the initial temperature of the windscreen** was required. There is not only one type of windscreen produced and therefore it is also necessary **automatically to change** the system settings according to the type of the monitored windscreen.



## ➔ Solution of the Assignment

To address the application, the ThermoInspector thermal imaging system was used, which is primarily intended for the applications **monitoring production processes, monitoring temperature stability and homogeneity during processes, input – output temperature monitoring, etc.**, and where up to 4 WIC thermal imaging cameras may be connected simultaneously.

In this particular case, because of the size of the windscreen, a single WIC 640 x 512px thermal imaging camera was used, which is connected to the ThermoInspector control computer via the **Ethernet cable**. The thermal imaging camera was placed on a static holder perpendicular to the monitored windscreen. Because glass is a very reflective material for the thermal imaging camera, the camera needed to be placed in a black, homogeneous chamber, without surrounding heat sources. The system has been configured to the **Fixed Time Measurement mode**, which means that the camera monitors the areas in the image (ROI) for a fixed number of pictures after the trigger signal, in this case it is only one picture. The trigger signal was brought to the ThermoInspector from the control PLC and it is activated when the glass is heated to the desired temperature. If the temperature limit on one of the ROI is not met, an alarm is displayed on the screen that informs the operator and **saves the appropriate record** to the control computer. The system has digital outputs that inform the control PLC of the detected short circuit in the windscreen heating. It also communicates with the PLC via the Ethernet cable **using the TCP/IP protocol**. Before each measurement, the PLC will always send to the ThermoInspector information about the type of the windscreen and its current temperature. According to the information, **without the need for operator intervention, the system itself sets the ROI** and, according to the input temperature, it sets the desired temperature limits and manual pallet temperature range for easier visual monitoring by the operator.

**Optionally adjustable ROI** were used to check the temperature of the windscreen, in which the camera **evaluates the measured data in real time**. Polygons covering the most problematic parts of the windscreen were chosen as the optimal ROI. In these areas, the maximum measured values/temperatures are monitored in real time and compared with the set limits. Visualisation of the entire process for operators was displayed on the **ThermoInspector** touch control computer.

