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DOMUS – Deliverable Report

D5.1 - Components in the
Active Comfort System

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Publishable summary

This deliverable describes a set of components constituting the Active Comfort System, to be at first designed through virtual studies and later realized as physical prototypes or Proof of Concepts for installation into the DOMUS demonstrator vehicle (FIAT 500e).

The functional specifications of the components derive from the outcomes in WP1, in terms of different physical variables influencing the perception of comfort by occupants, to be measured by sensors and or controlled by the components in the system.

Some further guidelines for the conception of the components derive from the outcomes by WP2.

The definition of Active Comfort System to be realized for equipping the DOMUS demonstration car is related to the capability of it to identify the changes in the environmental (outdoor and indoor) and occupants conditions during the usage of the car, to react to such changes properly to provide suitable comfort level in cabin without any intervention by occupants for changing the setting of system or components of it and requiring the minimum amount of energy consumption.

From engineering perspective, the Active Comfort System is thus the integration of components such as sensors and actuators to the electronic and electrical architecture, to be designed and realized as prototype, capable to operate both the Holistic Comfort Model (or an equivalent comfort model for cabin thermal regulation and control) and all the physical parts listed in the following, designed and prototyped by Partners.

Based on existing know-how and competence by Partners in WP5 on how to control the variables affecting the comfort in cabin of Electrical Vehicles (EV), a list of most effective components to control them is identified and described in the report.

Then, following the Deliverables from WP1 and WP2, some further components can be added to the base system, currently defined by the following parts:

1. Cabin Air Conditioning system, includes the new HVAC module (conceived, designed and prototyped in Task 5.1.2, containing the evaporator and the heater core), the high voltage water heater based on PTC elements, the electric compressor, the condenser at the front end of the vehicle and electric water pump to circulate water-glycol mixture through the heater core and PTC. All the parts listed here a part of the new HVAC are carry-over parts already used in the DOMUS demo car.
2. Cabin air diffusion system, includes the new multi-function air outlet on top of the cockpit, the ventilation outlets at the sides of the cockpit, the air outlets at the bottom of cockpit for heating the front floor area (conceived, designed, prototypes and tested in Task 5.1.2)
3. Heating surfaces (by radiation or conduction) installed at the cockpit surfaces, at the interiors panels and at the seats capable to improve locally the comfort perception by occupants (conceived, designed and prototyped in Task 5.1.3)
4. Front seats with integrated heating or ventilation functions for reducing the discomfort by the occupants when start using the car after outdoor soaking in winter or summer conditions (conceived, designed and prototyped in Task 4.1)
5. The heat storage system (conceived, designed, prototyped and tested in Task 5.3, made by heat storage device, electric coolant pump, electric water valve and hoses) capable to store the heat from the warm coolant used in the battery cooling system by PCM technology and releasing it at the restart of the car usage or in cabin precondition (heating) mode (release of heat to the air flow generated by the HVAC)
6. Set of sensors for measurement of most important physical variables influencing the comfort in the cabin (defined and characterized by bench or vehicle tests in Task 5.1.1): I.R. matrix sensor for body temperature measurement, temperature and relative humidity in cabin (close to windscreen for anti-fogging function), air temperature sensors inside the HVAC and evaporator air outlet sensor, air quality sensor (outdoor condition) for preventing the entrance of polluted air into cabin by operating the air intake door in HVAC and the set of sensors installed in the active seats to acquire information about vital signs from occupants

This deliverable describes the most important features of each of the components listed here above and the way of integrating and or controlling them when integrated into the active comfort system for the DOMUS demo car.