

# THERMO- PHYSIOLOGICAL COMFORT OF CAR SEATS

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**Abstract:** This paper investigates car seat performance from the point of view of thermo-physiological comfort. Thermal resistance  $R_{ct}$  [ $m^2K/W$ ] and water vapour resistance  $R_{et}$  [ $m^2Pa/W$ ] of car seats and car seat covers were evaluated using both thermal manikin STAN (Seat Test Automotive Manikin) and SGHP system (Sweating Guarded Hotplate). The main goal was to analyse how the structure of car seat covers (especially in terms of the combination of the top and middle layer) affects the overall thermo-physiological comfort of the seat (as a complex, including the metal structure and the polyurethane seat). The results showed a significant correlation ( $R=0,99$ ,  $p\text{-value}=0,05$ ) between the transport parameters of the car seat covers and the entire seat's transport properties. On the other hand, a significant difference was shown between the level of  $R_{et}$  values of individual covers according to SGHP (about 45% for three samples of car seat cover), in contrast to the  $R_{et}$  parameters by STAN for individual complex car seats (only 28% for the same three types of car seat covers). The impermeable polyurethane cushion material within the car seat's inner structure probably caused this performance drop.

**Keywords:** car seats, thermo-physiological comfort, thermal manikin, water vapour resistance, thermal resistance

Three car seats were tested. These seats are commonly used in Skoda Octavia car models (see Figure 1), and they are different in car seat covers only; see basic characteristics of car seat covers in Table 1.

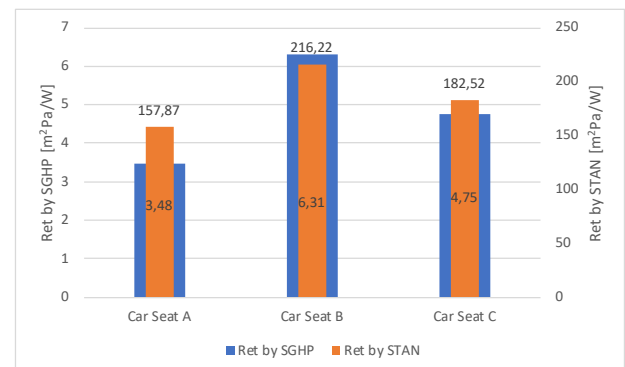
**Table 1** Table type styles

Code	Structure/material	Thickness [mm]	Weight [g/m <sup>2</sup> ]
Car seat A	Top layer		
	warp knit, 100% PES	0,9	215
	Middle layer		
	foam, 100% PUR	7,2	405
Car seat B	Top layer		
	twill fabric, 100% PES	0,9	215
	Middle layer		
	foam, 100% PUR + 3D warp knitted spacer, 100% PES	8,6	540
Car seat C	Top layer		
	twill fabric, 100% PES	1,1	235
	Middle layer		
	foam, 100% PUR + 3D warp knitted spacer, 100% PES	8,6	540

Both thermal resistance  $R_{ct}$  [ $m^2K/W$ ] and water vapour resistance  $R_{et}$  [ $m^2Pa/W$ ] were measured by thermal manikin STAN and SGHP (see Figures 2 and 3). A comparison of results of water vapour resistance  $R_{et}$  for tested car seats A, B and C is shown in Figure 3.



**Figure 1** STAN manikin and SGHP system [1, 2]



**Figure 2** Comparison water vapour resistance  $R_{et}$  measured by both SGHP system and STAN manikin

## REFERENCES

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