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ROLLING RESISTANCE EXPLANATION
NEXT TRY TO EXPLAIN GTR REQUIREMENTS

BMW | 07.09.2017

BMW GROUP

THE NEXT 100 YEARS

ROLLING RESISTANCE HANDLING WITHIN THE WLTP
SOME GTR TEXT

If the interpolation method is applied to rolling resistance, for the purpose of the calculation in 3.2.3.2. in Annex 7, the actual rolling resistance values for the tyres fitted to the test vehicles L and H shall be used as input for the calculation procedure. For an individual vehicle within an interpolation family, the RRC class value for the tyres fitted shall be used.

Annex4, § 4.2.2.1.

RR to be different

The road load interpolation shall only be applied on those road load-relevant characteristics that were identified to be different between test vehicle L_R and H_R. For other road load-relevant characteristic(s), the value of vehicle H_R shall apply.

Annex4, § 4.2.1.3.1.

L and H are actual RR

individual is RR-class

Annex 7, § 3.2.3.2.2.4.

input to calculation

Annex 7, § 3.2.3.2.2.2.

$$f_{0,ind} = f_{0,H} - \Delta f_0 \times \frac{(TM_H \times RR_H - TM_{ind} \times RR_{ind})}{(TM_H \times RR_H - TM_L \times RR_L)}$$

3.2.3.2.2. Rolling resistance of an individual vehicle

The actual rolling resistance values for the selected tyres on test vehicle L, RR_L, and test vehicle H, RR_H, shall be used as input for the interpolation method. See paragraph 4.2.2.1. of Annex 4.

If the tyres on the front and rear axles of vehicle L or H have different rolling resistance values, the weighted mean of the rolling resistances shall be calculated using the following equation:

$$RR_x = RR_{x,FA} \times mp_{x,FA} + RR_{x,RA} \times (1 - mp_{x,FA})$$

where:

$RR_{x,FA}$ is the rolling resistance of the front axle tyres, kg/tonne;

$RR_{x,RA}$ is the rolling resistance of the rear axle tyres, kg/tonne;

$mp_{x,FA}$ is the proportion of the vehicle mass in running order on the front axle;

x represents vehicle L, H or an individual vehicle.

For the tyres fitted to an individual vehicle, the value of the rolling resistance RR_{ind} shall be set to the class value of the applicable tyre rolling resistance class, according to Table A4/2 of Annex 4.
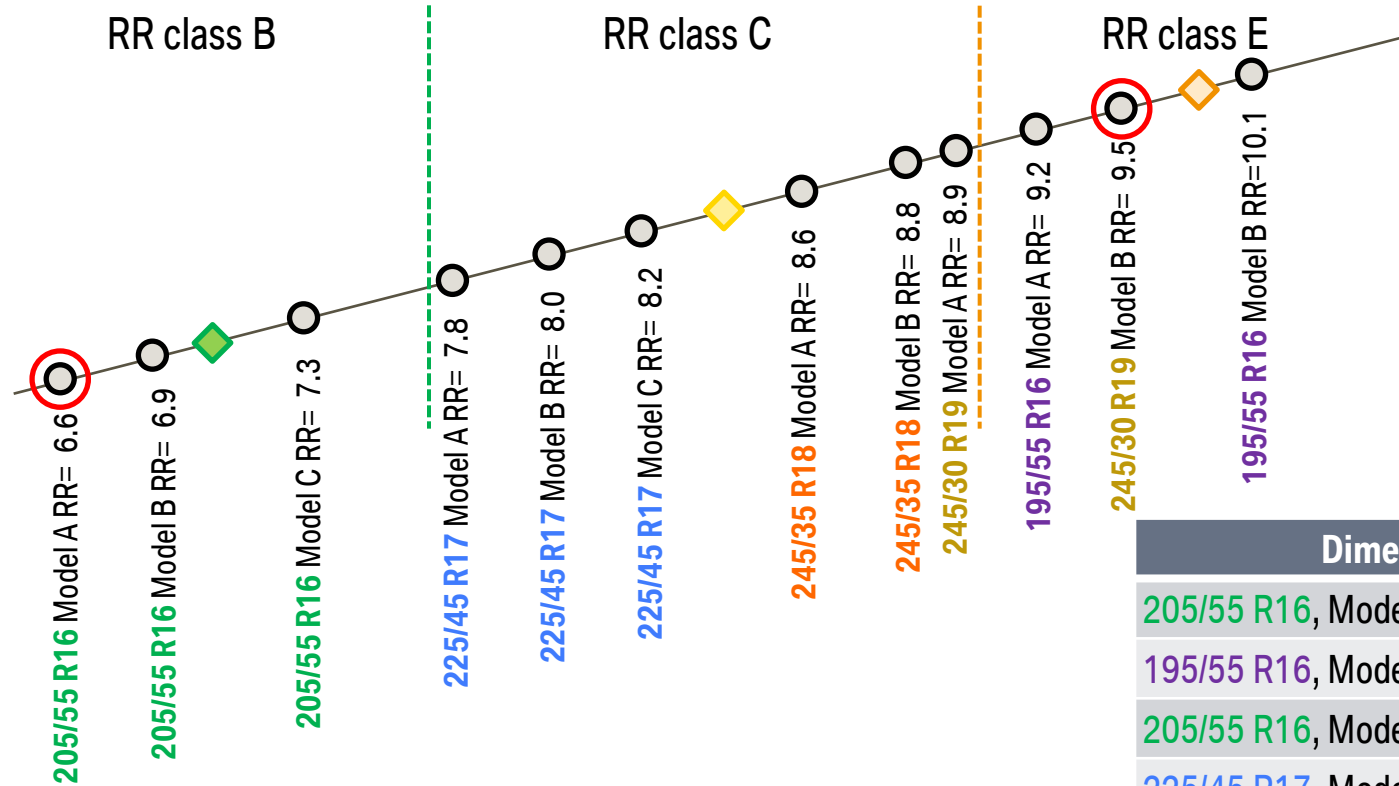
If the tyres have different rolling resistance class values on the front and the rear axle, the weighted mean shall be used, calculated with the equation in this paragraph.

If the same tyres were fitted to test vehicles L and H, the value of RR_{ind} for the interpolation method shall be set to RR_H.

In the case that the interpolation family is derived from one or more road load

IF INTERPOLATION IS USED FOR RR, THE INDIVIDUAL CAR ALWAYS GETS THE CLASS VALUE

RR class B · **RR class C** · **RR class E**

205/55 R16 Model A RR= 6.6
205/55 R16 Model B RR= 6.9
205/55 R16 Model C RR= 7.3
225/45 R17 Model A RR= 7.8
225/45 R17 Model B RR= 8.0
225/45 R17 Model C RR= 8.2
245/35 R18 Model A RR= 8.6
245/35 R18 Model B RR= 8.8
245/30 R19 Model A RR= 8.9
195/55 R16 Model A RR= 9.2
245/30 R19 Model B RR= 9.5
195/55 R16 Model B RR=10.1

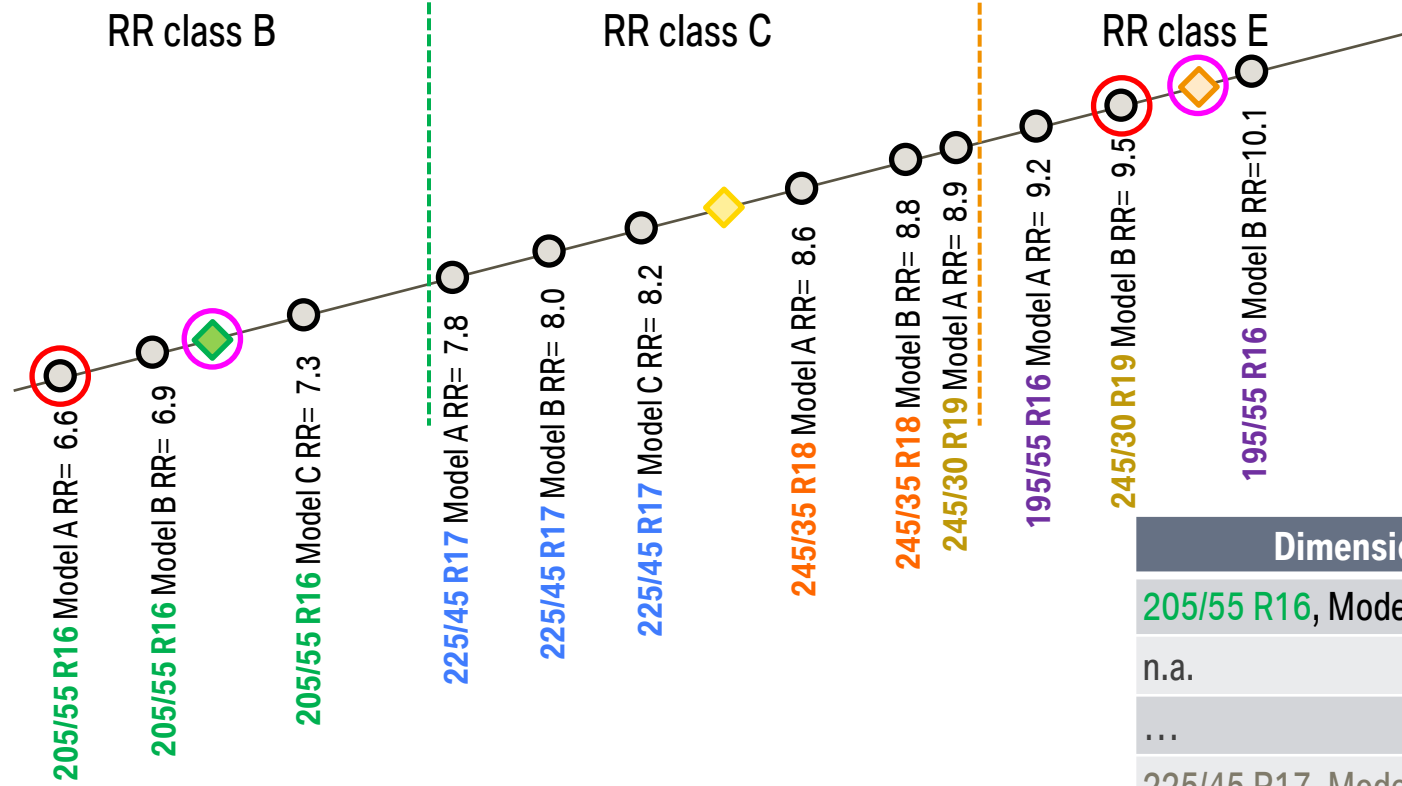|	C1 tyres	
efficiency class	RRC in kg/to	class value (for CO_2)
A	RRC ≤ 6.5	RRC = 5.9
B	6.5 < RRC ≤ 7.7	RRC = 7.1
C	7.7 < RRC ≤ 9.0	RRC = 8.4
E	9.0 < RRC ≤ 10.5	RRC = 9.8
F	10.5 < RRC ≤ 12.0	RRC = 11.3
G	RRC > 12.0	RRC = 12.9

Dimension	Usage	RR [kg/t]
205/55 R16, Model A	Test Vehicle Low ⭕	6.6
195/55 R16, Model A or B	individual consumer car	9.8 (E) ◇
205/55 R16, Model A, B, or C	individual consumer car**	7.1 (A) ◆
225/45 R17, Model A, B or C	individual consumer car	8.4 (C) ◇
245/35 R18, Model A or B	individual consumer car	8.4 (C) ◇
245/30 R19, Model A or B	individual consumer car	9.8 (E) ◇
245/30 R19, Model B	Test Vehicle High* ⭕	9.5

* 19" tyre was selected instead of worse 16" tyre due to cycle energy requirement (mass / aerodynamics). As a consequence, consumer vehicle with RR class E has to extrapolate CO_2.

** Even if by chance the tyre model on the consumer vehicle is "Model A", which was type approved as vehicle Low with RR 6.6, the RR for that car is the RR class value, which is 7.1.

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RR class B   RR class C   RR class E

205/55 R16 Model A RR= 6.6
205/55 R16 Model B RR= 6.9
205/55 R16 Model C RR= 7.3
225/45 R17 Model A RR= 7.8
225/45 R17 Model B RR= 8.0
225/45 R17 Model C RR= 8.2
245/35 R18 Model A RR= 8.6
245/35 R18 Model B RR= 8.8
245/30 R19 Model A RR= 8.9
195/55 R16 Model A RR= 9.2
245/30 R19 Model B RR= 9.5
195/55 R16 Model B RR=10.1

C1 tyres		
efficiency class	RRC in kg/to	class value (for CO_2)
A	RRC ≤ 6.5	RRC = 5.9
B	6.5 < RRC ≤ 7.7	RRC = 7.1
C	7.7 < RRC ≤ 9.0	RRC = 8.4
E	9.0 < RRC ≤ 10.5	RRC = 9.8
F	10.5 < RRC ≤ 12.0	RRC = 11.3
G	RRC > 12.0	RRC = 12.9

Dimension	Usage	RR [kg/t]
205/55 R16, Model A	Road Load Test Vehicle Low	6.6
n.a.	Interpolation Vehicle Low	7.1 (A)
…	…	…
225/45 R17, Model A, B or C	some individual consumer car	8.4 (C)
…	…	…
n.a.	Interpolation Vehicle High	9.8 (E)
245/30 R19, Model B	Road Load Test Vehicle High	9.5

If the Road Load Family is used, test vehicles High und Low of the Interpolation Family already receive a RR class value.

THANK YOU!

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100 YEARS

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