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## ***COPERT 4 v7.0***

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# 1 Methodology

## 1.1 Updated Mileage Degradation Parameters

The mileage degradation parameters of the COPERT 4 methodology (Figure 1) have been updated for post-Euro 3 gasoline passenger cars and light duty vehicles (and Euro 1 & 2 vehicles in case of an enhanced I&M scheme) on the basis of the results of the ARTEMIS project. These are now consistent with the Guidebook 2009 Tier 3 proposed degradation scheme. For light duty vehicles, the parameters of the 1,4-2,0l capacity class are used, in the absence of more specific data.

$MC = A^M \times M^{\text{MEAN}} + B^M$	Capacity Class [l]	Average Mileage [km]	$A^M$	$B^M$	Value at $\geq 160000$ km
				(Value at 0 km)	
<b>Correction for <math>V &lt; 19</math> km/h (<math>MC_{\text{URBAN}}</math>)</b>					
CO - $MC_{\text{URBAN}}$	$\leq 1.4$	32,407	7.129E-06	0.769	1.91
	$> 1.4$	16,993	2.670E-06	0.955	1.38
NO <sub>x</sub> - $MC_{\text{URBAN}}$	$\leq 1.4$	31,313	0	1	1
	$> 1.4$	16,993	3.986E-06	0.932	1.57
HC - $MC_{\text{URBAN}}$	$\leq 1.4$	31,972	3.419E-06	0.891	1.44
	$> 1.4$	17,913	0	1	1
<b>Correction for <math>V &gt; 63</math> km/h (<math>MC_{\text{ROAD}}</math>)</b>					
CO - $MC_{\text{ROAD}}$	$\leq 1.4$	30,123	1.502E-06	0.955	1.20
	$> 1.4$	26,150	0	1	1
NO <sub>x</sub> - $MC_{\text{ROAD}}$	ALL	26,150	0	1	1
HC - $MC_{\text{ROAD}}$	ALL	28,042	0	1	1

**Figure 1:** COPERT 4 Mileage Degradation Parameters

## 1.2 New Hot Emission Factors for Motorcycles

The experimental data from the ARTEMIS project, reviewed and extended with new experimental information submitted by ACEM and EMPA, have been used for the development of new of CO, NO<sub>x</sub>, and VOC emission factors and fuel consumption factors for Motorcycles. The new function is expressed by Eq. 1 along with the parameters of Table 1 (Annex I).

Hot Emission Factors for CO, NO <sub>x</sub> , VOC, FC	$EF[g/km] = a_5v^5 + a_4v^4 + a_3v^3 + a_2v^2 + a_1v + a_0$	Eq. 1
where:	$a_x$ : Parameters from Table 1 (Annex I) $v$ : Vehicle speed	

### ***1.3 CH<sub>4</sub> cold emission factors for Euro 5/6 gasoline passenger cars and LD vehicles***

The Euro 4 gasoline passenger car CH<sub>4</sub> cold emission factors are now used for Euro 5 and Euro 6 technologies as well. They have been also transferred to the corresponding technologies gasoline light duty vehicles. These values were zero in the previous version of the software. The decision to introduce this change was because the emission standard of total hydrocarbons is not differentiated between the Euro 4 to Euro 6 gasoline vehicles. Also, as CH<sub>4</sub> is not an independently regulated pollutant (rather it is regulated through its contribution to total HC), there is no reason why it should be consistently different between light duty vehicles and passenger cars. It is therefore expected that the error in introducing the passenger car cold CH<sub>4</sub> emission factor to LD vehicles is several times lower than assuming zero LDV cold emission factor.

### ***1.4 Updated CO, NO<sub>x</sub>, VOC and CH<sub>4</sub> Hot Emission Factors for Euro 3 to 6 LPG Passenger Cars***

CO, NO<sub>x</sub>, VOC, and CH<sub>4</sub> hot emission factors for Euro 3 to 6 LPG passenger cars are now based on Euro 3 to 6 gasoline 1,4-2,0l ones. In the previous version of COPERT, their emission factors were calculated with a reduction factor over Euro 1.

The decision to do so is because emissions of these vehicle technologies are regulated mostly by the three way catalyst. Therefore the fuel used (LPG or Gasoline) is not expected to have a big effect on the emission level. Since the experimental basis for gasoline vehicles is much larger than LPG, it was decided to use these emission factors for LPG vehicles as well.

### ***1.5 Updated NH<sub>3</sub> Hot and Cold Emission Factors for Conventional to Euro 6 LPG Passenger Cars***

NH<sub>3</sub> hot and cold emission factors for conventional to Euro 6 LPG passenger cars are now based on ECE 15/04 to Euro 6 gasoline 1,4-2,0l ones. These values were zero in the earlier version of the software. The reason to adopt the gasoline emission factors is the same to point 1.4 before, i.e. that the fuel use (LPG or gasoline) is not considered to affect the emission performance of these vehicles.

### ***1.6 Updated PM (exhaust) hot emission factors for Conventional to Euro 6 LPG Passenger Cars***

PM (exhaust) hot emission factors for conventional to Euro 6 LPG passenger cars are now based on ECE 15/04 to Euro 6 gasoline 1,4-2,0l ones. The reason was the same to point 1.4. In previous version of COPERT the PM emission factor of these vehicles were zero.

### ***1.7 Mean cumulative fleet mileage values for LPG Passenger Cars***

Default values for the cumulative mean fleet mileage of LPG Passenger Cars Euro 1 to 6 are introduced, based on the Gasoline Passenger Cars 1,4-2,0l values. This assumes that the actual usage of LPG cars does not differ to gasoline ones.

### ***1.8 Renamed description of PC Euro 5 and 6 technologies***

The description of Euro 5 and Euro 6 technologies of Passenger Cars is now renamed:

- From "PC Euro 5 (post 2005)" to "PC Euro 5 - EC 715/2007"
- From "PC Euro 6" to "PC Euro 6 - EC 715/2007"

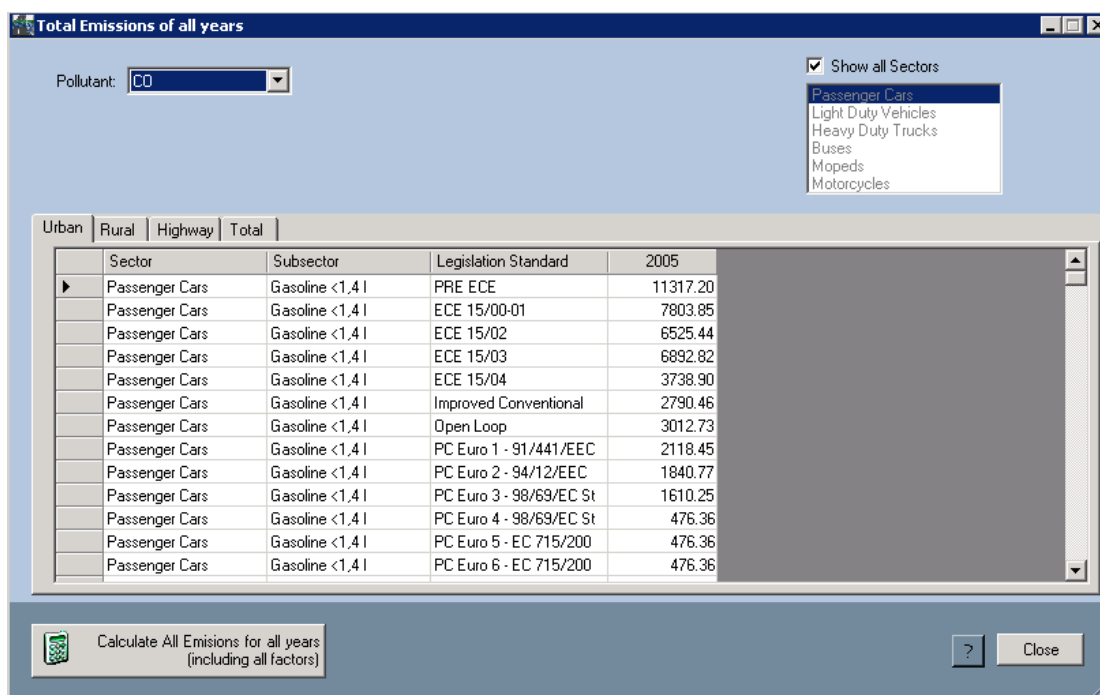
The reason is that an EC regulation is now already in place for these two technologies.

## **2 Software**

### ***2.1 Calculation of all the runs (years) with a single button***

The user can now calculate all the emissions (including all factors) for all years that are stored in the database file. The user can perform this operation under the 'Emissions' > 'Total Emissions of all years' form (Figure 2) using the 'Calculate' button.





**Figure 2:** Calculation of the runs with a single button

## ***2.2 NMVOC Speciation by vehicle type***

A new form is created under 'Emissions > NMVOC Speciation by vehicle type' menu. In this form (Figure 3), NMVOC speciation per vehicle type and substance is provided. The user may select the species to be viewed in the left-hand side top drop-down form and the vehicle type from the right-hand side top drop-down form. The units that emissions are reported change depending on the species viewed. PAHs, POPs, Dioxins and Furans are reported in [g]. All other species are reported in [tn].

## ***2.3 $\beta$ -parameter reduction factor (bc) form***

The option to adjust the cold-start trip distance has been added for user-specified engine technologies. The cold start distance is calculated for first generation (Euro 1) gasoline catalyst vehicles by means of the beta parameter. This distance is decreased for more recent vehicle technologies as the exhaust aftertreatment devices heat up faster. Therefore bc is the fraction of the Euro 1 distance which is required for later vehicle technologies to heat up. This is why bc decreases with improving technology.

The 'Advanced >  $\beta$ -parameter reduction factor (bc)' form (Figure 4) shows the bc values for all gasoline passenger car technologies. A new bc value has to be provided by the user for any new technology introduced (per pollutant), in order for cold-start

emissions to be calculated. If bc value is left zero, then no cold-start will be calculated.

Subsector	Legislation Standard	Emissions (t)
Gasoline <1.4l	PRE ECE	36.57
Gasoline <1.4l	ECE 15/00-01	29.57
Gasoline <1.4l	ECE 15/02	27.13
Gasoline <1.4l	ECE 15/03	27.13
Gasoline <1.4l	ECE 15/04	23
Gasoline <1.4l	Improved Conventional	19.93
Gasoline <1.4l	Open Loop	14.46
Gasoline <1.4l	PC Euro 1 - 91/441/EEC	12.51
Gasoline <1.4l	PC Euro 2 - 94/12/EEC	5.668
Gasoline <1.4l	PC Euro 3 - 98/69/EC Stage2000	2.763
Gasoline <1.4l	PC Euro 4 - 98/69/EC Stage2005	1.632
Gasoline <1.4l	PC Euro 5 - EC 715/2007	1.632
Gasoline <1.4l	PC Euro 6 - EC 715/2007	1.632
Gasoline 1.4 - 2.0l	PRE ECE	37.19
Gasoline 1.4 - 2.0l	ECE 15/00-01	30.18
Gasoline 1.4 - 2.0l	ECE 15/02	27.75
Gasoline 1.4 - 2.0l	ECE 15/03	27.75
Gasoline 1.4 - 2.0l	ECE 15/04	23.61
Gasoline 1.4 - 2.0l	Improved Conventional	18.12
Gasoline 1.4 - 2.0l	Open Loop	6.888
Gasoline 1.4 - 2.0l	PC Euro 1 - 91/441/EEC	12.93
Gasoline 1.4 - 2.0l	PC Euro 2 - 94/12/EEC	5.905
Gasoline 1.4 - 2.0l	PC Euro 3 - 98/69/EC Stage2000	2.895
Gasoline 1.4 - 2.0l	PC Euro 4 - 98/69/EC Stage2005	1.706
Gasoline 1.4 - 2.0l	PC Euro 5 - EC 715/2007	8.464

**Figure 3:** NMVOC Speciation per vehicle type

Legislation Standard	Euro No	Reduction Factor
PC Euro 2 - 94/12/EEC	2	0.72
PC Euro 3 - 98/69/EC Stage2000	3	0.62
PC Euro 4 - 98/69/EC Stage2005	4	0.18
PC Euro 5 - EC 715/2007	5	0.18
PC Euro 6 - EC 715/2007	6	0.18
LD Euro 2 - 96/69/EEC	2	0.72
LD Euro 3 - 98/69/EC Stage2000	3	0.62
LD Euro 4 - 98/69/EC Stage2005	4	0.18
LD Euro 5 - 2008 Standards	5	0.18
LD Euro 6	6	0.18

**Figure 4:** β-parameter reduction factor (bc) form

## 2.4 Export in NFR Excel file format

To facilitate reporting of annual emission and activity data to the Convention on Long-range Transboundary Air Pollution (CLRTAP), the calculated results can be exported to the reporting template requested under the Convention. The user has to select the reporting template (this is an excel file) by pressing the **Browse** button and then press **Export File** in the 'File > Import/Export > Export (Excel File)' form (Figure 5). It should be noted that this function is only possible for the latest version of the templates "NFR09" (dated 30.9.2009). All emission and activity data of the road-transport sector (NFR code 1 A 3 b) are automatically filled in the **Annex IV - Table 1** sheet of the template.

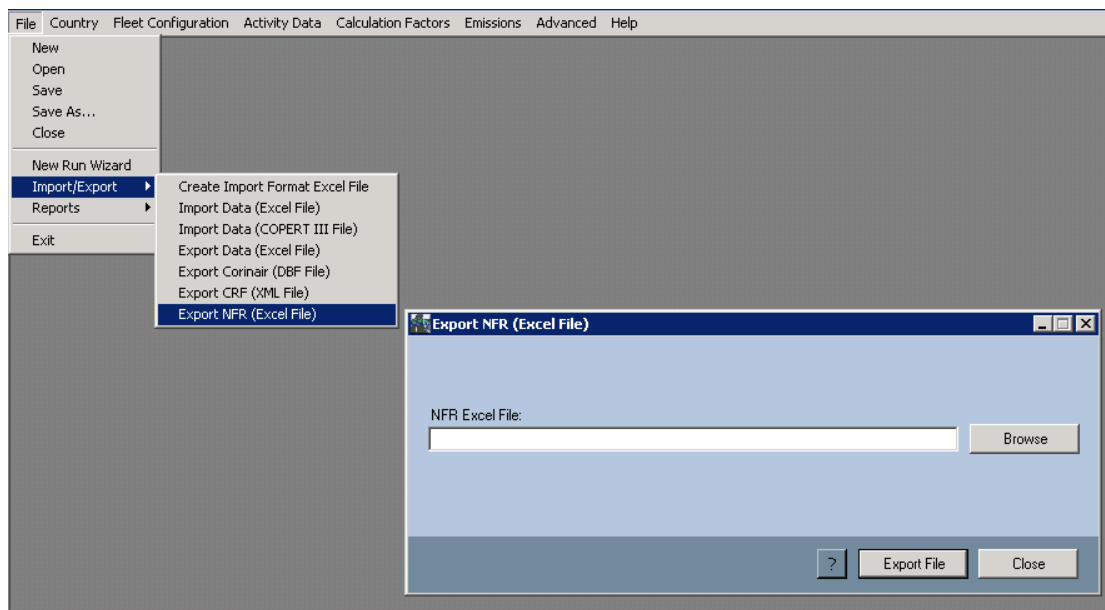


Figure 5: Export NFR Excel file

## 2.5 Non-exhaust Emissions of Heavy Metals in the Export files

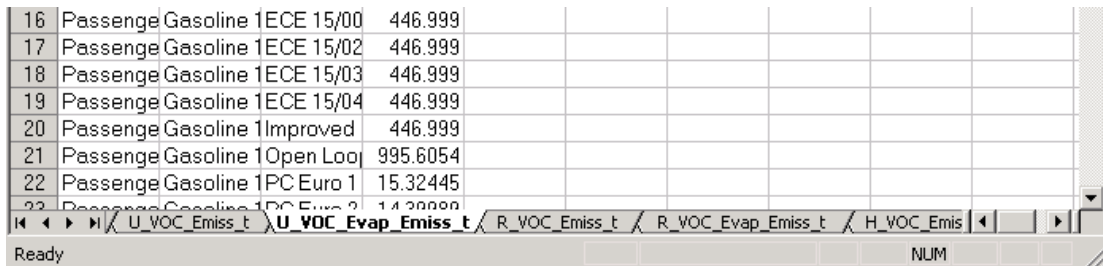
Non-exhaust Emissions of Heavy Metals are now included in the Export Files that are created under the 'File' > 'Import/Export' > 'Export Data (Excel File)' form. As long as the user selects Heavy Metals from the "Results" checkbox area, their non-exhaust Emissions will also be included in the Export file (Figure 6).

30	Passenger Cars	Gasoline >2,0l	ECE 15/02	0.224292083			
31	Passenger Cars	Gasoline >2,0l	ECE 15/03	0.224292083			
32	Passenger Cars	Gasoline >2,0l	ECE 15/04	0.213285727			
33	Passenger Cars	Gasoline >2,0l	PC Euro 1 - 91/441/EEC	0.222448209			
34	Passenger Cars	Gasoline >2,0l	PC Euro 2 - 94/12/EEC	0.227032214			
35	Passenger Cars	Gasoline >2,0l	PC Euro 3 - 98/69/EC Stage2000	0.215012108			
36	Passenger Cars	Gasoline >2,0l	PC Euro 4 - 98/69/EC Stage2005	0.245537491			

Figure 6: Export of Heavy Metals non-exhaust Emissions

## 2.6 Evaporation Emissions in the Export files

Evaporation Emissions are now included in the Export Files that are created under the 'File' > 'Import/Export' > 'Export Data (Excel File)' form. As long as the user selects the VOC or the NMVOC exhaust emissions, the Evaporation Emissions will also be included in the Export file (Figure 7).

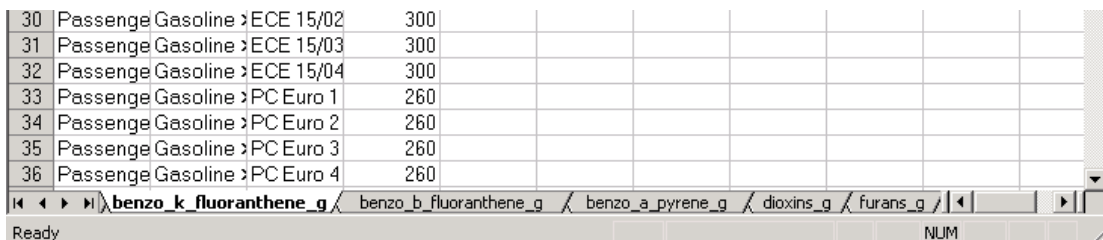


16	Passenge Gasoline	TECE 15/00	446.999						
17	Passenge Gasoline	TECE 15/02	446.999						
18	Passenge Gasoline	TECE 15/03	446.999						
19	Passenge Gasoline	TECE 15/04	446.999						
20	Passenge Gasoline	Improved	446.999						
21	Passenge Gasoline	Open Loop	995.6054						
22	Passenge Gasoline	PC Euro 1	15.32445						
23	Passenge Gasoline	PC Euro 2	14.30000						

Figure 7: Export of Evaporation Emissions

## 2.7 PAHs & POPs, Dioxins and Furans in the Export files

The four protocol PAHs & POPs (indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene, benzo(b) fluoranthene, benzo(a)pyrene), and Dioxins and Furans Emissions are now included in the Export Files that are created under the 'File' > 'Import/Export' > 'Export Data (Excel File)' form. As long as the user selects the "NMVOC\_Spec\_2\_g" option in the Results checkbox area, these Emissions will also be included in the Export file (Figure 8).



30	Passenge Gasoline	ECE 15/02	300						
31	Passenge Gasoline	ECE 15/03	300						
32	Passenge Gasoline	ECE 15/04	300						
33	Passenge Gasoline	PC Euro 1	260						
34	Passenge Gasoline	PC Euro 2	260						
35	Passenge Gasoline	PC Euro 3	260						
36	Passenge Gasoline	PC Euro 4	260						

Figure 8: Export of Basic PAHs & POPs, Dioxins and Furans Emissions

## 2.8 Units included in the Export files

When the user creates an Export file, every worksheet has a unit indicating whether the Emissions are in tones (t) or kilos (kg).

## ***2.9 Updated 'Mean\_Fleet\_Mileage\_km' worksheet in the Export files***

The 'Mean\_Fleet\_Mileage\_km' worksheet of the Excel Export files now includes all vehicles that are selected in the fleet configuration of COPERT. In previous versions of COPERT this worksheet included only the vehicle types for which evaporation emissions and/or mileage degradation factors were calculated. Since mean fleet mileage is now also used for the calculation of N<sub>2</sub>O and NH<sub>3</sub> emissions this list had to be extended in order to cover all vehicle types.

## ***2.10 Fuel Balance data included in the Export files***

The data that are displayed under the 'Emissions' > 'Fuel Balance' form are now included in the Export files in the "FB\_Calculated\_t" (Calculated Fuel Consumption) and "FB\_Deviation\_perc" (Deviation between Statistical and Calculated Fuel Consumption) worksheets.

## ***2.11 COPERT version and Date/Time included in the Export files***

The exact version of COPERT 4 that was used to create an Export file is now included in the " \_\_INPUT\_DATA\_\_ " and " \_\_\_\_RESULTS\_\_\_\_ " worksheets. Also the date and time that the output file was created is included in these worksheets.

## ***2.12 Displaying the full path of the active database file***

The user can now view and copy the full path of the opened database file under the 'Country' > 'View All Run Details' form.

# **3 Bugs Fixed**

## ***3.1 Corrected PM non-exhaust calculation***

There was a software bug during the calculation of the PM tyre and brake wear emissions. The result of this bug was that the Urban and Rural PM non-exhaust emissions were equal to the Highway emissions. This is now corrected.

### ***3.2 Corrected Cadmium non-exhaust calculation***

The parameters for the calculation of the Cadmium non-exhaust emissions have been corrected. The problem was that the content of tyre and brake wear in Cadmium was erroneously typed as 520 ppm wt. and 1500 ppm wt. respectively. Now these values are consistent with Guidebook 2009 (4.7 ppm wt. and 22.4 ppm wt. respectively).

### ***3.3 Corrected evaporation factors calculation***

The warm and hot soak emission factors for pre-Euro uncontrolled vehicles equipped with carburetor were zero. This is corrected and now there is a uniform emission factor for all carbureted uncontrolled vehicles regardless of Euro technology.

### ***3.4 Corrected N<sub>2</sub>O, NH<sub>3</sub> and CH<sub>4</sub> Hot and cold emissions calculation***

There was a software bug during the calculation of N<sub>2</sub>O, NH<sub>3</sub> and CH<sub>4</sub> hot and cold emissions. Because of this bug there was a misallocation between the hot and cold emissions of these pollutants. Furthermore the N<sub>2</sub>O cold emissions were stored in place of NH<sub>3</sub> cold emissions and vice versa, This is now corrected.

### ***3.5 Corrected N<sub>2</sub>O Hot emission factor of Urban Buses Standard Euro III***

The correct emission factor (0.006 g/km) is now introduced in COPERT 4 for N<sub>2</sub>O hot emissions of Urban Buses Standard 15 - 18t Euro III vehicles. The previous value was erroneously typed as 0.001 g/km.

### ***3.6 Bug Fixed for the 'Country' > 'View All Run Details' form***

When the user tries to open a database from a previous version of COPERT, the application converts the database according to the latest format. Due to a software bug, after this conversion the user could not view any data in the 'Country' > 'View All Run Details' form. This bug is now fixed.

### ***3.7 Bug Fixed for the 'Beta Calculated' label on the 'Run Details' table***

The 'Beta Calculated' label on the Run Details table is now correctly updated when the user presses the 'OK' button on the 'Country' > 'Country Info' form.

## 4 Annex I

**Table 1:** Motorcycle emission factors parameters

<i>component</i>	<i>swept volume</i>	<i>COPERT</i>	<i>a5</i>	<i>a4</i>	<i>a3</i>	<i>a2</i>	<i>a1</i>	<i>a0</i>	<i>valid speed range</i>
CO [g/km]	<= 150 cm <sup>3</sup>	2S Conventional	-1.63784E-08	5.16436E-06	-0.000647768	0.043972032	-1.519864293	35.96681299	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	2S Euro 1	-1.08139E-08	3.40947E-06	-0.000427623	0.029026332	-1.003226314	23.73391824	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	2S Euro 2	-8.50216E-09	2.68041E-06	-0.000336232	0.022843589	-0.790520401	18.74761744	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	2S Euro 3	-4.81799E-09	1.51951E-06	-0.0001904	0.01287541	-0.442933844	10.40400667	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Conventional	-1.3734E-08	4.66194E-06	-0.00063577	0.046895339	-1.791984834	42.05768942	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 1	-1.38859E-08	4.26705E-06	-0.000515647	0.034546071	-1.189854047	26.20565227	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 2	-7.28091E-09	2.32699E-06	-0.000303593	0.021260629	-0.727832456	13.02609102	0 - 100 km/h
CO [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 3	-4.01631E-09	1.28288E-06	-0.000167327	0.011718838	-0.401225185	7.182862146	0 - 100 km/h
CO [g/km]	> 750 cm <sup>3</sup>	4S 250-750 AND >750 cc Conventional	-9.98897E-09	4.36715E-06	-0.000740334	0.063037072	-2.679125005	63.97607418	0 - 140 km/h
CO [g/km]	> 750 cm <sup>3</sup>	4S 250-750 AND >750 cc Euro 1	-1.21658E-08	4.83232E-06	-0.000689993	0.045767117	-1.486026893	29.84685154	0 - 140 km/h
CO [g/km]	> 750 cm <sup>3</sup>	4S 250-750 AND >750 cc Euro 2	-2.0224E-10	3.3103E-07	-7.18322E-05	0.007732602	-0.401974451	9.717779879	0 - 140 km/h
CO [g/km]	> 750 cm <sup>3</sup>	4S 250-750 AND >750 cc Euro 3	-1.18851E-10	1.84992E-07	-3.9878E-05	0.004274546	-0.221696192	5.356293862	0 - 140 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	2S Conventional	-1.37489E-08	4.71416E-06	-0.000641816	0.045681373	-1.746870617	35.59948836	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	2S Euro 1	-3.15019E-09	1.10705E-06	-0.000158571	0.012462206	-0.52233883	11.18807162	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	2S Euro 2	-1.57834E-09	5.58485E-07	-8.07668E-05	0.00643151	-0.272817963	5.902514633	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	2S Euro 3	-1.09761E-09	3.83612E-07	-5.44652E-05	0.004227392	-0.175203873	3.72183124	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Conventional	-8.3493E-10	3.31976E-07	-5.3914E-05	0.004657606	-0.216954719	5.155085703	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 1	-7.56017E-10	2.83664E-07	-4.28555E-05	0.003413277	-0.146498811	3.53540292	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 2	-7.00427E-10	2.34974E-07	-3.11554E-05	0.002092681	-0.072104223	1.45462558	0 - 100 km/h
HC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 3	-4.74323E-10	1.59552E-07	-2.11538E-05	0.00141299	-0.048089873	0.939427259	0 - 100 km/h
HC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Conventional	-7.76126E-10	3.62188E-07	-6.48735E-05	0.005791461	-0.280770129	7.660094935	0 - 140 km/h



HC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 1	-4.12084E-10	1.88204E-07	-3.28182E-05	0.002901124	-0.140097964	3.948915628	0 - 140 km/h
HC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 2	-2.25114E-10	1.01163E-07	-1.68569E-05	0.001437249	-0.065096969	1.745610192	0 - 140 km/h
HC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 3	-1.18027E-10	5.43846E-08	-9.25038E-06	0.000812136	-0.038054122	1.062316562	0 - 140 km/h
HC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Conventional	-7.48337E-10	3.29651E-07	-5.68034E-05	0.005165189	-0.264668407	7.686704779	0 - 140 km/h
HC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 1	-6.34076E-10	2.94396E-07	-5.1452E-05	0.004479723	-0.205331344	4.736752674	0 - 140 km/h
HC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 2	-2.97522E-10	1.46021E-07	-2.59195E-05	0.002236236	-0.096172425	1.968625452	0 - 140 km/h
HC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 3	-1.95518E-10	9.42773E-08	-1.65177E-05	0.001408833	-0.060004887	1.220974127	0 - 140 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	2S Conventional	-3.50147E-10	1.00297E-07	-1.07255E-05	0.000528152	-0.01159148	0.113402908	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	2S Euro 1	-3.0353E-11	7.9618E-09	-8.27945E-07	4.68363E-05	-0.001231948	0.050417764	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	2S Euro 2	-2.25014E-10	6.63853E-08	-7.39832E-06	0.000386426	-0.00901853	0.117084245	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	2S Euro 3	-1.7378E-11	1.09001E-08	-1.87284E-06	0.000130221	-0.003540199	0.049698197	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Conventional	-4.59709E-10	1.36858E-07	-1.54059E-05	0.000823226	-0.016964492	0.348380624	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 1	-7.07461E-10	2.09768E-07	-2.34586E-05	0.001234971	-0.026326074	0.436782997	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 2	-3.89222E-10	1.14094E-07	-1.27528E-05	0.000734034	-0.018969892	0.400982562	0 - 100 km/h
NOx [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 3	-1.95267E-10	6.01372E-08	-6.85958E-06	0.00040795	-0.010901361	0.31913078	0 - 100 km/h
NOx [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Conventional	5.32976E-10	-1.66445E-07	1.91082E-05	-0.000929605	0.020208136	0.085372082	0 - 140 km/h
NOx [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 1	6.4553E-11	-1.73802E-08	1.40619E-06	1.9811E-05	-0.00179344	0.245361768	0 - 140 km/h
NOx [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 2	-9.295E-12	5.28378E-09	-1.0501E-06	0.000138622	-0.006920611	0.186235416	0 - 140 km/h
NOx [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 3	-1.9298E-11	8.17396E-09	-1.29645E-06	0.000118149	-0.004822914	0.106720937	0 - 140 km/h
NOx [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Conventional	1.34846E-10	-5.13301E-08	7.63942E-06	-0.000464325	0.011418533	0.039433997	0 - 140 km/h
NOx [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 1	-3.4881E-11	1.23655E-08	-1.98838E-06	0.00023567	-0.011038414	0.305914396	0 - 140 km/h
NOx [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 2	1.4791E-11	-3.64851E-09	2.87739E-07	9.90898E-05	-0.008524247	0.275362648	0 - 140 km/h
NOx [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 3	2.88E-12	2.55543E-10	-2.08684E-07	7.75314E-05	-0.005274381	0.152658622	0 - 140 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	2S Conventional	-3.44212E-08	1.15213E-05	-0.001543282	0.109463403	-4.08109273	87.94123794	0 - 100 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	2S Euro 1	-3.17267E-08	1.06204E-05	-0.001422801	0.100939862	-3.764219396	81.13748142	0 - 100 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	2S Euro 2	-3.17267E-08	1.06204E-05	-0.001422801	0.100939862	-3.764219396	81.13748142	0 - 100 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	2S Euro 3	-3.17267E-08	1.06204E-05	-0.001422801	0.100939862	-3.764219396	81.13748142	0 - 100 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Conventional	-4.67452E-08	1.50031E-05	-0.00188696	0.120535755	-3.859125331	75.72595005	0 - 100 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 1	-3.84411E-08	1.23379E-05	-0.001551718	0.099115213	-3.173047231	62.25328956	0 - 100 km/h

FC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 2	-3.41596E-08	1.11384E-05	-0.001428217	0.092738812	-3.05183804	59.32683603	0 - 100 km/h
FC [g/km]	<= 150 cm <sup>3</sup>	4S <250 cc Euro 3	-3.41596E-08	1.11384E-05	-0.001428217	0.092738812	-3.05183804	59.32683603	0 - 100 km/h
FC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Conventional	-1.59535E-08	6.94162E-06	-0.001150818	0.095452518	-3.982557364	101.4827516	0 - 140 km/h
FC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 1	-1.22569E-08	5.43061E-06	-0.000926261	0.080626992	-3.517493554	92.48704992	0 - 140 km/h
FC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 2	-1.22488E-08	5.40821E-06	-0.000913842	0.078181255	-3.332072465	85.0481612	0 - 140 km/h
FC [g/km]	250 cm <sup>3</sup> < eng_cap <= 750 cm <sup>3</sup>	4S 250-750 cc Euro 3	-1.22488E-08	5.40821E-06	-0.000913842	0.078181255	-3.332072465	85.0481612	0 - 140 km/h
FC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Conventional	-1.81854E-08	7.98113E-06	-0.001347333	0.113926477	-4.819510935	121.2722828	0 - 140 km/h
FC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 1	-1.77508E-08	7.80495E-06	-0.001326217	0.112927418	-4.871094605	122.9632992	0 - 140 km/h
FC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 2	-1.83335E-08	8.05006E-06	-0.001363115	0.115742777	-4.939331658	121.3318552	0 - 140 km/h
FC [g/km]	> 750 cm <sup>3</sup>	4S >750 cc Euro 3	-1.83335E-08	8.05006E-06	-0.001363115	0.115742777	-4.939331658	121.3318552	0 - 140 km/h