TEST PROCEDURE

Overall Test Procedure
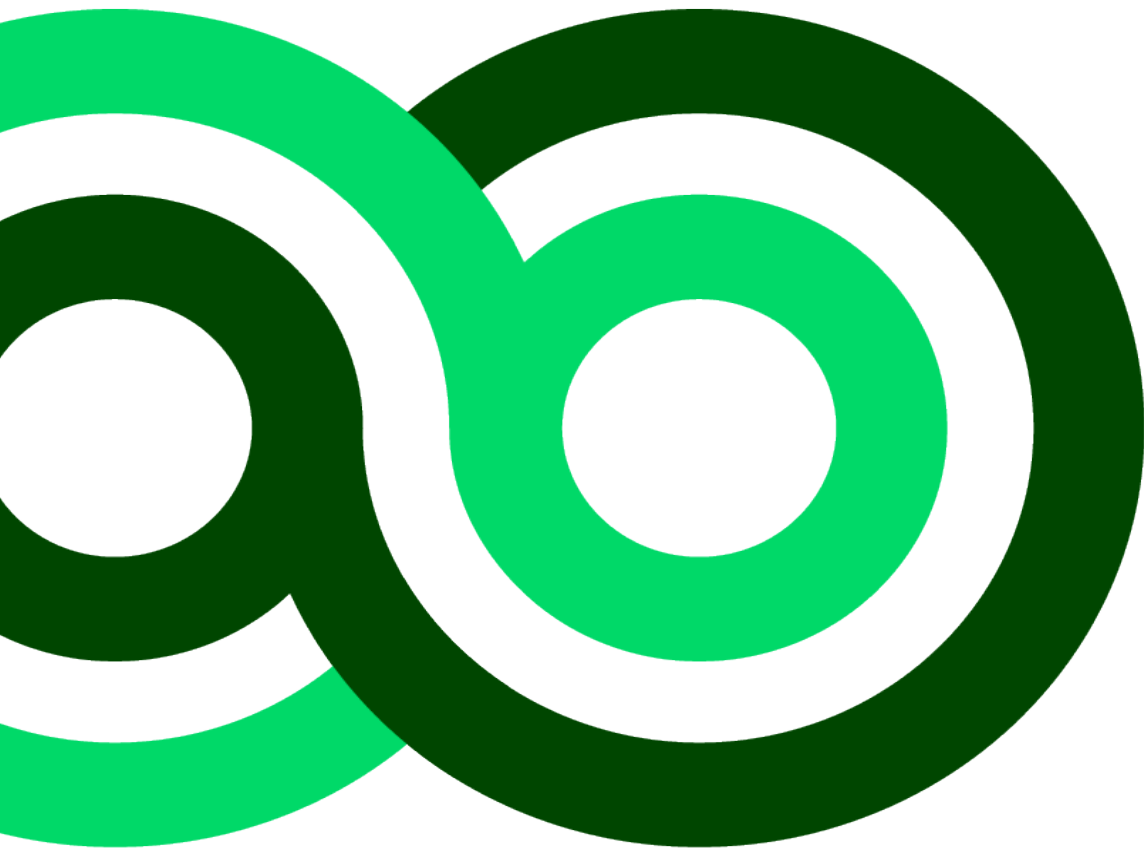
Version 3.0.0 February 2022

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Green NCAP test procedure: stage 1

Specifications test vehicle

vehicle selection: current model year, Euro 6d , according to GNT_Green_NCAP_VSSTR

for definitions, acronyms and symbols please see GNT_Definitions_Accronyms_Symbols

wheel alignment with wheel alignment protocol;

This can be either performed by the laboratory or a specialized workshop. It has to be ensured, that the correct values and tolerances are applicable. A protocol (usually handed out by the workshop or given by the measurement device) has to prove the correctness of the wheel alignment adjustments.

vehicle data collection according to GNT_Parameter_Input_List_Template

driving resistance from vehicle´s CoC documents according to GNT_Driving_Resistance

weighing on laboratory scale according to GNT_Overall_Test_Procedure

Calculation of test masses: The calculation of test masses will automatically be conducted in GNT_Parameter_Input_List_Template by following these formulas:

Laboratory tests:

If deviation between (**mass on laboratory scale**) and **(actual mass – 75 Kg)** is less than ± 3%

$$TM = TM \text{ from CoC (point 47.1.1)}$$

Where:

mass on laboratory scale = *mass on laboratory scale, 100 % fuel, without driver*

actual mass = *point 13.2 of vehicle´s CoC*

If deviation between (**mass on laboratory scale**) and **(actual mass – 75 Kg)** is more than ± 3%

$$TM = UM + OM + 100kg + 0,15 (LM – (UM + OM))$$

Where:

mass on laboratory scale = *mass on laboratory scale, 100 % fuel, without driver*

actual mass = *point 13.2 of vehicle´s CoC*

UM + OM = *actual mass – 75 kg*

LM = *gross vehicle weight: point 16.1 of vehicle´s CoC*

PEMS+ regular cold:

If deviation between (**mass on laboratory scale**) and **(actual mass – 75 Kg)** is less than ± 3%

$$TM_{regular\_cold} = UM + OM + 0,7 (LM - (UM + OM + 75 kg))$$

Where:

mass on laboratory scale = *mass on laboratory scale, 100 % fuel, without driver*

actual mass = *point 13.2 of vehicle´s CoC*

UM + OM = *actual mass – 75 kg*

LM = *gross vehicle weight: point 16.1 of vehicle´s CoC*

If deviation between (**mass on laboratory scale**) and **(actual mass – 75 Kg)** is more than ± 3%

$$TM_{regular\_cold} = \text{mass on laboratory scale} + 0,7 (LM - (\text{mass on laboratory scale} + 75 kg))$$

Where:

mass on laboratory scale = *mass on laboratory scale, 100 % fuel, without driver*

actual mass = *point 13.2 of vehicle´s CoC*

UM + OM = *actual mass – 75 kg*

LM = *gross vehicle weight: point 16.1 of vehicle´s CoC*

PEMS+ heavy warm:

If deviation between (**mass on laboratory scale**) and **(actual mass – 75 Kg)** is less than ± 3%

$$TM_{heavy\_warm} = UM + OM + 0,9 (LM - (UM + OM + 75 kg))$$

Where:

mass on laboratory scale = *mass on laboratory scale, 100 % fuel, without driver*

actual mass = *point 13.2 of vehicle´s CoC*

UM + OM = *actual mass – 75 kg*

LM = *gross vehicle weight: point 16.1 of vehicle´s CoC*

If deviation between (**mass on laboratory scale**) and **(actual mass – 75 Kg)** is more than ± 3%

$$TM_{heavy\_warm} = \text{mass on laboratory scale} + 0,9 (LM - (\text{mass on laboratory scale} + 75 kg))$$

Where:

mass on laboratory scale = *mass on laboratory scale, 100 % fuel, without driver*

actual mass = *point 13.2 of vehicle´s CoC*

UM + OM = *actual mass – 75 kg*

LM = *gross vehicle weight: point 16.1 of vehicle´s CoC*

PEMS+ Eco light warm:

$$TM_{light\_warm} = \text{minimum test mass possible}$$

Minimum mass for execution of the test with driver and test equipment. No additional payload allowed.

tyres summer or if otherwise defined in the CoC according to CoC, min. 50% pattern depth, pressure according to GNT_WLTC+_Test_Procedure

AdBlue quality check according to GNT_AdBlue_Quality_Check; mileage from 1.000km up to 30.000km; PEVs shall be tested with at least 300km

maintenance check according to GNT_WLTC+_Test_Procedure, GNT_Parameter_Input_List_Template, check service history, vehicle memory readout

vehicle OBD memory readout and check; readout OBFCM values and fill in GNT_Parameter_Input_List_Template, installation of accelerator pedal position acquisition device

documentation test vehicle according to GNT_Parameter_Input_List_Template, GNT_Footage_Procedure

vehicle preparation for emissions testing according to GNT_WLTC+_Test_Procedure, GNT_PEMS+_Test_Procedure

Test sequence flexibility:

The test sequence can generally be switched. The influence of such switches regarding the following tests has to be taken into account. It has to be ensured, that a WLTC+ warm cycle is put in front of a WLTC cold test. Same applies for cold start PEMS+ tests, where a Precon of 20 min before the soak is mandatory. This precon can either be the last cycle on the chassis dynamometer or a free trip of at least 20 min.

Warmup for warm start tests:

For a warm up of the engine, the vehicle shall be driven at a speed of 100 km/h until the engine oil temperature has reached 90 °C or for a maximum of 5 minutes, whatever comes first. Therefore, a thermocouple has to be installed to the oil sump. The engine oil temperature at the start of the cycle must be at 90 °C +/- 5 °C. If the installation of a thermocouple isn´t possible, it shall be ensured (e.g. by the vehicle´s gauges), that the vehicle has reached it´s standard operation temperature.

Instructions for tests with Diesel Particulate Filter regeneration occurrence:

If a regeneration is detected during testing, the test should be continued and conducted as normal, not be interrupted, and shall be completed! This rule is valid for any test, both on chassis dyno and on-road. Generally, the results of the test, in which regeneration was detected, will not be included in the rating. The objective of completing tests that retroactively were declared invalid owing to regeneration is to be able to quantify the impact of regeneration on the individual test results as well as on the clean air index scores. Tests in which regeneration occured have to be repeated, in advance it has to be ensured, that the filter is conditioned again.

Vehicle cabin temperature during chassis dynamometer tests: For cabin temperature measurement, a temperature measuring tip has to be installed at the front-seat passenger´s headrest. All measurements shall be recorded.
The **automatic air condition** is operated with A/C switch on, temperature set at 23 °C and fan speed on automatic regulation with airflow on automatic regulation. No readjustments shall be done. Settings shall be proved by photographs.
The **manual air condition** is operated with A/C switch on, temperature ½ (middle position) and fan speed on 1/3 to ¼ with airflow on floor and windscreen. If necessary, the settings for temperature have to be readjusted until 23 °C ± 3 °C are met. This shall only be done during stop phases. All readjustments have to be recorded and proved, e.g. by photographs.

Soak provisions for 23°C soak (roller bench tests and PEMS + tests):

The Soaktime for 23°C cold start tests on the chassis dynamometer and cold start PEMS tests is 6-72 h. The target oil temperature of 23°C ±5°C before test start has to be ensured either by measurement or OBD readout.

Propulsion unit setup	Conventional, GFV, HEV, PHEV					PEV
	reference fuel according to GNT_WLTC+_Test_Procedure					**At no test shall the battery SoC be depleted to a level below 10 % or where power restriction strategies are activated!** **The battery capacity test shall be conducted according to** GNT_Driving_Range_Test_Procedure**; PEMS+ tests can be used for determination of the available battery capacity, the final battery discharge has to be conducted on the chassis dynamometer**
	Diesel and Petrol	**GFV**		**HEV** in addition to the provisions made in GNT_WLTC+_Test_Procedure, the requirements in GNT_Special_Requirements_for_Hybrid_Electric_Vehicles have to be fulfilled	**PHEV** **CD capitals: charge depleting** **CS capitals: charge sustaining** in addition to the provisions made in GNT_WLTC+_Test_Procedure, the requirements in GNT_Special_Requirements_for_Hybrid_Electric_Vehicles have to be fulfilled	
		monovalent	bivalent (fuel tank > 20l)			
	note down BC (board computer) values for fuel consumption of every cycle	**note down BC (board computer) values for fuel consumption of every cycle**	**note down BC (board computer) values for fuel consumption of every cycle**	**note down BC (board computer) values for fuel consumption of every cycle** / **read out OBD battery SOC value before and after each test**	**note down BC (board computer) values for energy consumption of every cycle** / **read out OBD battery SOC value before and after each test**	**note down BC (board computer) values for energy consumption of every cycle** / **read out OBD battery SOC value before and after each test**
Efficiency testing (laboratory)	test cell at 23 °C ± 3 °C	test cell at 23 °C ± 3 °C	test cell at 23 °C ± 3 °C	test cell at 23 °C ± 3 °C	optional 3PHEV Free urban trip (if battery is not depleted) until ICE starts, plus free urban trip for additional 20 km	test cell at 23 °C ± 3 °C
	4WLTC_warm_cd according to GNT_WLTC+_Test_Procedure	4WLTC_warm_cd according to GNT_WLTC+_Test_Procedure — gfv	4WLTC_warm_cd according to GNT_WLTC+_Test_Procedure — gfv	4WLTC_warm_cd according to GNT_WLTC+_Test_Procedure	test cell at 23 °C ± 3 °C	4WLTC_warm_cd according to GNT_WLTC+_Test_Procedure
	maximum 120 s inbetween	maximum 120 s inbetween	maximum 120 s inbetween	maximum 120 s inbetween	4WLTC_warm_cd according to GNT_WLTC+_Test_Procedure	maximum 120 s inbetween
	4cd for 23°C tests according to GNT_WLTC+_Test_Procedure	4cd for 23 °C tests according to GNT_WLTC+_Test_Procedure	4cd for 23 °C tests according to GNT_WLTC+_Test_Procedure	4cd for 23 °C tests according to GNT_WLTC+_Test_Procedure	maximum 120 s inbetween	4cd for 23°C tests, 4WD mode acc. to GNT_WLTC+_Test_Procedure
	warm up	warm up	warm up	warm up, SoC adjustment (60% +/- 10% or to a SoC corresponding to CS mode)	4cd for 23 °C tests according to GNT_WLTC+_Test_Procedure	5WLTC_warm_def according to GNT_WLTC+_Test_Procedure
	5WLTC_warm_def according to GNT_WLTC+_Test_Procedure	5WLTC_warm_def according to GNT_WLTC+_Test_Procedure — gfv	5WLTC_warm_def according to GNT_WLTC+_Test_Procedure — gfv	5WLTC_warm_def according to GNT_WLTC+_Test_Procedure	warmup	**18Battery capacity test** according to GNT_Driving_Range_Test_Procedure **(can also be performed inbetween the tests)**
	41Soaktime 6-72 h, 23 °C ± 3 °C, see provisions	41Soaktime 6-72 h, 23 °C ± 3 °C, see provisions	41Soaktime 6-72 h, 23 °C ± 3 °C, see provisions	41Soaktime 6-72 h, 23 °C ± 3 °C, see provisions	n-times 5WLTC_warm_def_CS until CS acc. to GNT_WLTC+_Test_Procedure	41Soaktime 6-72 h, 23 °C ± 3 °C
	6WLTC_cold_def according to GNT_WLTC+_Test_Procedure	6WLTC_cold_def according to GNT_WLTC+_Test_Procedure — gfv	6WLTC_cold_def according to GNT_WLTC+_Test_Procedure — gfv	6WLTC_cold_def according to GNT_WLTC+_Test_Procedure	warmup	6WLTC_cold_def according to GNT_WLTC+_Test_Procedure
	road load verification	road load verification	road load verification	road load verification	11BAB_warm_def_CS according to GNT_BAB_Motorway_Test_Procedure	

Emissions and efficiency

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
	warm up	warm up	warm up	warm up, SoC adjustment (60% +/- 10% or to a SoC corresponding to CS mode)	**WLTC_warm_CS** (only precon)	road load verification
	11BAB_warm_def according to GNT_BAB_Motorway_Test_Procedure	**11BAB_warm_def** according to GNT_BAB_Motorway_Test_Procedure *gfv*	**11BAB_warm_def** according to GNT_BAB_Motorway_Test_Procedure *gfv*	**11BAB_warm_def** according to GNT_BAB_Motorway_Test_Procedure	41Soaktime 6-72 h, 23 °C ± 3 °C	warm up
			warm up		**6WLTC_cold_def_CS** according to GNT_WLTC+_Test_Procedure	**11BAB_warm_def** according to GNT_BAB_Motorway_Test_Procedure
			WLTC_warm_precon according to GNT_WLTC+_Test_Procedure *petrol*		charge to SOC 100% according to GNT_Driving_Range_Test_Procedur	
			41Soaktime 6-72 h, 23 °C ± 3 °C		41Soaktime 6-72 h, 23 °C ± 3 °C	
			14WLTC_cold_def according to GNT_WLTC+_Test_Procedure *petrol*		**7WLTC_cold_def_CD** according to GNT_WLTC+_Test_Procedure	
			warm up		incl. n-times **WLTC+** according to GNT_WLTC+ _Test_Procedure until CS	
			15BAB_warm_def according to GNT_BAB_Motorway_Test_Procedure *petrol*		road load verification	
					charge to SOC 100% according to GNT_Driving_Range_Test_Procedure	

PEMS testing

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
	for MAW method use CO_2 values in vehicle´s CoC document					
	PEMS preparation and pictures	PEMS preparation and pictures	PEMS preparation and pictures	PEMS preparation and pictures	PEMS preparation and pictures	PEMS preparation and pictures
	20Preconditioning 20 min (can also be preceded cycle)	20Preconditioning 20 min (can also be preceded cycle) *gfv*	20Preconditioning 20 min (can also be preceded cycle) *gfv*	20Preconditioning 20 min (can also be preceded cycle)	20Preconditioning 20 min (can also be preceded cycle); charge to SOC 100%	battery charging to SOC 100%
				SoC adjustment (60% +/- 10% or to a SoC corresponding to CS mode)	41Soaktime 6-72h at 23 °C ± 3 °C	
	41Soaktime 6-72 h at 23 °C ± 3 °C	41Soaktime 6-72 h at 23 °C ± 3 °C	41Soaktime 6-72 h at 23 °C ± 3 °C	41Soaktime 6-72 h at 23 °C ± 3 °C	**32PEMS+ cold CD** according to GNT_PEMS+_Test_Procedure	41Soaktime 6-72 h at 23 °C ± 3 °C
	21PEMS+ cold according to GNT_PEMS+_Test_Procedure	**21PEMS+ cold** according to GNT_PEMS+_Test_Procedure *gfv*	**21PEMS+ cold** according to GNT_PEMS+_Test_Procedure *gfv*	**21PEMS+ cold** according to GNT_PEMS+_Test_Procedure	20Preconditioning 20 min (can also be preceded cycle); ensure CS mode via OBD readout	**21PEMS+ cold** according to GNT_PEMS+_Test_Procedure
					41Soaktime 6-72h at 23 °C ± 3 °C	
					21PEMS+ cold CS according to GNT_PEMS+_Test_Procedure	
	PEMS disassembly	PEMS disassembly	PEMS disassembly	PEMS disassembly	PEMS disassembly	PEMS disassembly

Test Analysis, Rating

Fill in rating sheet (GNT_Rating_Sheet_Master, GNT_Rating_Sheet_PHEV) with preliminary test results to see if stage 2 evaluation is necessary
vehicle OBD memory readout and check
Test analysis according to GNT_Test_performance_limits
Results template GNT_Template_Test_Results
Report table GNT_Template_Test_Results
Rating GNT_Rating_Sheet_Master and GNT_Rating_Sheet_PHEV
Upload Output test data on Sharepoint

Green NCAP test procedure: stage 2

Specifications test vehicle

vehicle selection: current model year, homologation Euro 6c, Euro 6d-Temp, Euro 6d-Temp-EVAP or Euro 6d
(Euro 6 with characters AP), according to GNT_Green_NCAP_VSSTR

for definitions, acronyms and symbols please see GNT_Definitions_Accronyms_Symbols

vehicle data collection according to GNT_Parameter_Input_List_Template

wheel alignment with wheel alignment protocol;
This can be either performed by the laboratory or a specialized workshop. It has to be ensured, that the correct values and tolerances are applicable. A protocol (usually handed out by the workshop or given by the measurement device) has to prove the correctness of the wheel alignment adjustments.

driving resistance from vehicle´s CoC documents according to GNT_Driving_Resistance

weighing on laboratory scale according to GNT_Overall_Test_Procedure

Calculation of test masses: The calculation of test masses will automatically be conducted in GNT_Parameter_Input_List_Template by following these formulas:

Laboratory tests:

If deviation between (**mass on laboratory scale**) and (**actual mass – 75 Kg**) is less than ± 3%

$$TM = TM \text{ from CoC (point 47.1.1)}$$

Where:

mass on laboratory scale = mass on laboratory scale, 100 % fuel, without driver

actual mass = point 13.2 of vehicle´s CoC

If deviation between (**mass on laboratory scale**) and (**actual mass – 75 Kg**) is more than ± 3%

$$TM = UM + OM + 100kg + 0{,}15\ (LM - (UM + OM))$$

Where:

mass on laboratory scale = mass on laboratory scale, 100 % fuel, without driver

actual mass = point 13.2 of vehicle´s CoC

UM + OM = actual mass – 75 kg

LM = gross vehicle weight: point 16.1 of vehicle´s CoC

PEMS+ regular cold:

If deviation between (**mass on laboratory scale**) and (**actual mass – 75 Kg**) is less than ± 3%

$$TM_{regular\_cold} = UM + OM + 0{,}7\ (LM - (UM + OM + 75\ kg))$$

Where:

mass on laboratory scale = mass on laboratory scale, 100 % fuel, without driver

actual mass = point 13.2 of vehicle´s CoC

UM + OM = actual mass – 75 kg

LM = gross vehicle weight: point 16.1 of vehicle´s CoC

If deviation between (**mass on laboratory scale**) and (**actual mass – 75 Kg**) is more than ± 3%

$$TM_{regular\_cold} = \text{mass on laboratory scale} + 0{,}7\ (LM - (\text{mass on laboratory scale} + 75\ kg))$$

Where:

mass on laboratory scale = mass on laboratory scale, 100 % fuel, without driver

actual mass = point 13.2 of vehicle´s CoC

UM + OM = actual mass – 75 kg

LM = gross vehicle weight: point 16.1 of vehicle´s CoC

PEMS+ heavy warm:

If deviation between (**mass on laboratory scale**) and (**actual mass – 75 Kg**) is less than ± 3%

$$TM_{heavy\_warm} = UM + OM + 0{,}9\ (LM - (UM + OM + 75\ kg))$$

Where:

mass on laboratory scale = mass on laboratory scale, 100 % fuel, without driver

actual mass = point 13.2 of vehicle´s CoC

UM + OM = actual mass – 75 kg

LM = gross vehicle weight: point 16.1 of vehicle´s CoC

If deviation between (**mass on laboratory scale**) and (**actual mass – 75 Kg**) is more than ± 3%

$$TM_{heavy\_warm} = \text{mass on laboratory scale} + 0{,}9\ (LM - (\text{mass on laboratory scale} + 75\ kg))$$

Where:

mass on laboratory scale = mass on laboratory scale, 100 % fuel, without driver

actual mass = point 13.2 of vehicle´s CoC

UM + OM = actual mass – 75 kg

LM = gross vehicle weight: point 16.1 of vehicle´s CoC

PEMS+ Eco light warm:

$$TM_{light\_warm} = \text{minimum test mass possible}$$

Minimum mass for execution of the test with driver and test equipment. No additional payload allowed.

tyres summer or if otherwise defined in the CoC according to CoC, min. 50% pattern depth, pressure according to GNT_WLTC+_Test_Procedure

AdBlue quality check according to GNT_AdBlue_Quality_Check

maintenance check according to GNT_WLTC+_Test_Procedure, GNT_Parameter_Input_List_Template, check service history, vehicle memory readout

mileage from 1.000km up to 30.000km; PEVs shall be tested with at least 300km

installation of accelerator pedal position acquisition device

vehicle OBD memory readout and check

readout OBFCM values and fill in GNT_Parameter_Input_List_Template

documentation test vehicle according to GNT_Parameter_Input_List_Template, GNT_Footage_procedure

vehicle preparation for emissions testing according to GNT_WLTC+_Test_Procedure, GNT_PEMS+_Test_Procedure

Test sequence flexibility:

The test sequence can generally be switched. The influence of such switches regarding the following tests has to be taken into account. It has to be ensured, that a WLTC+ warm cycle is put in front of a WLTC+ cold test. Same applies for cold start PEMS tests, where a Precon of 20 min before the soak is mandatory. This precon can either be the last cycle on the chassis dynamometer or a free trip of at least 20 min.

Warmup for warm start tests:

For a warm up of the engine, the vehicle shall be driven at a speed of 100 km/h until the engine oil temperature has reached 90 °C or for a maximum of 5 minutes, whatever comes first. Therefore, a thermocouple has to be installed to the oil sump. The engine oil temperature at the start of the cycle must be at 90 °C +/- 5 °C. If the installation of a thermocouple isn´t possible, it shall be ensured (e.g. by the vehicle´s gauges), that the vehicle has reached it´s standard operation temperature.

Instructions for tests with Diesel Particulate Filter regeneration occurrence:

If a regeneration is detected during testing, the test should be continued and conducted as normal, not be interrupted, and shall be completed! This rule is valid for any test, both on chassis dyno and on-road. Generally, the results of the test, in which regeneration was detected, will not be included in the rating. The objective of completing tests that retroactively were declared invalid owing to regeneration is to be able to quantify the impact of regeneration on the individual test results as well as on the clean air index scores.

According to "GNT_Overall_Test_Procedure", two valid PEMS+ cold tests are to be conducted: "PEMS+ cold" AND "PEMS+ cold rep". A test with regeneration occurring is generally not considered valid. If one of the PEMS+ cold tests is a test with regeneration occurring and therefore invalid, a third PEMS+ cold test shall be conducted. If at the third PEMS+ cold test regeneration is also occurring, the results of the first PEMS+ with regeneration shall be included in the rating – this means that the rating will include the results of one test without regeneration and one test with regeneration, which in this case is declared valid. If at all three tests regeneration occurs, the rating shall consist of the results of the first two tests with regeneration occurrence, which in this case are both declared valid.

Vehicle cabin temperature during chassis dynamometer tests:

For cabin temperature measurement, a temperature measuring tip has to be installed at the front-seat passenger´s headrest. All measurements shall be recorded.
The **automatic air condition** is operated with A/C switch on, temperature set at 23 °C and fan speed on automatic regulation with airflow on automatic regulation. No readjustments shall be done. Settings shall be proved by photographs.
The **manual air condition** is operated with A/C switch on, temperature ½ (middle position) and fan speed on 1/3 to ¼ with airflow on floor and windscreen. If necessary, the settings for temperature have to be readjusted until 23 °C ± 3 °C are met. This shall only be done during stop phases. All readjustments have to be recorded and proved, e.g. by photographs.

Soak provisions for 23°C soak (roller bench tests and PEMS+ tests):

The Soaktime for 23°C cold start tests on the chassis dynamometer and cold start PEMS+ tests is 6-72 h. The target oil temperature of 23°C ±5°C before test start has to be ensured either by measurement or OBD readout.

Propulsion unit setup	Conventional, GFV, HEV, PHEV					PEV
	reference fuel according to GNT_WLTC+_Test_Procedure					At no test shall the battery SoC be depleted to a level below 10 % or where power restriction strategies are activated! The battery capacity test shall be conducted according to GNT_Driving_Range_Test_Procedure; PEMS+ tests can be used for determination of the available battery capacity, the final battery discharge has to be conducted on the chassis dynamometer
	Diesel and Petrol	GFV		HEV in addition to the provisions made in GNT_WLTC+_Test_Procedure the requirements in GNT_Special_Requirements_for_Hybrid_Electric have to be fulfilled	PHEV CD capitals: charge depleting CS capitals: charge sustaining in addition to the provisions made in GNT_WLTC+_Test_Procedure, the requirements in GNT_Special_Requirements_for_Hybrid_Electric_Vehicles have to be fulfilled	
		monovalent	bivalent (fuel tank > 20l)			
	note down BC (board computer) values for fuel consumption of every cycle	note down BC (board computer) values for fuel consumption of every cycle	note down BC (board computer) values for fuel consumption of every cycle	note down BC (board computer) values for fuel consumption of every cycle	note down BC (board computer) values for energy consumption of every cycle	note down BC (board computer) values for energy consumption of every cycle
				read out OBD battery SOC value before and after each test	read out OBD battery SOC value before and after each test	read out OBD battery SOC value before and after each test

Laboratory testing

...ss testing

for MAW method use CO2 values in vehicle´s CoC document					
PEMS preparation and pictures	PEMS preparation and pictures		PEMS preparation and pictures		PEMS preparation and pictures	PEMS preparation and pictures
23Warm up (5 min free urban trip and 80 °C coolant temperature)	23Warm up (5 min free urban trip and 80 °C coolant temperature)	gfv	23Warm up (5 min free urban trip and 80 °C coolant temperature)	gfv	23Warm up (5 min free urban trip and 80 °C coolant temperature), SoC adjustment	41Soak at 23 °C ± 3 °C, until HVB SOC 100%
27Idling 15 min	27Idling 15 min	gfv	27Idling 15 min	gfv	27Idling 15 min	33PEMS_eco_cold CD according to GNT_Emission_Robustness_Test_Procedure
24PEMS_heavy_warm according to GNT_Emission_Robustness_Test_Procedure	24PEMS_heavy_warm according to GNT_Emission_Robustness_Test_Procedure	gfv	24PEMS_heavy_warm according to GNT_Emission_Robustness_Test_Procedure	gfv	24PEMS_heavy_warm according to GNT_Emission_Robustness_Test_Procedure	41Soak at 23 °C ± 3 °C, until HVB SOC 100%
						35PEMS_heavy_cold CD according to GNT_Emission_Robustness_Test_Procedure

	Column 1		Column 2		Column 3		Column 4	Column 5	Column 6
PEMS testing and robustness	36Warm up (5 min free urban trip and 80 °C coolant temperature)		36Warm up (5 min free urban trip and 80 °C coolant temperature)	gfv	36Warm up (5 min free urban trip and 80 °C coolant temperature)	gfv	36Warm up (5 min free urban trip and 80 °C coolant temperature), SoC adjustment	Ensure CS mode (break-off criterion shall be fulfiled, checked by OBD SOC readout)	
								36Warm up (5 min free trip and 80 °C coolant temperature), SoC adjustment	
	28Congestion Simulation according to GNT_Emission_Robustness_Test_Procedure		**28Congestion Simulation** with idling according to GNT_Emission_Robustness_Test_Procedure	gfv	**28Congestion Simulation** with idling according to GNT_Emission_Robustness_Test_Procedure	gfv	**28Congestion Simulation** with idling according to GNT_Emission_Robustness_Test_Procedure	**28Congestion Simulation_CS** with idling according to GNT_Emission_Robustness_Test_Procedure	
	36Warm up (5 min free urban trip and 80 °C coolant temperature)		36Warm up (5 min free urban trip and 80 °C coolant temperature)	gfv	36Warm up (5 min free urban trip and 80 °C coolant temperature)	gfv	36Warm up (5 min free urban trip and 80 °C coolant temperature)		
	30PEMS_eco_warm according to GNT_Emission_Robustness_Test_Procedure		**30PEMS_eco_warm** according to GNT_Emission_Robustness_Test_Procedure	gfv	**30PEMS_eco_warm** according to GNT_Emission_Robustness_Test_Procedure	gfv	**30PEMS_eco_warm** according to GNT_Emission_Robustness_Test_Procedure		
					20Preconditioning ~20 min at motorway speeds	petrol			
					41Soaktime 6-72 h at 23 °C ± 3 °C				
					34PEMS+ cold according to GNT_PEMS+_Test_Procedure	petrol			
Maximum Engine Load Curve Mapping	The maximum engine load curve shall be determined with the support of the manufacturer (taking manufacturer´s data is allowed). If there´s no such support it is not necessary to determine the maximum engine load curve in a separate test		The maximum engine load curve shall be determined with the support of the manufacturer (taking manufacturer´s data is allowed). If there´s no such support it is not necessary to determine the maximum engine load curve in a separate test		The maximum engine load curve shall be determined with the support of the manufacturer (taking manufacturer´s data is allowed). If there´s no such support it is not necessary to determine the maximum engine load curve in a separate test		The maximum engine load curve shall be determined with the support of the manufacturer (taking manufacturer´s data is allowed). If there´s no such support it is not necessary to determine the maximum engine load curve in a separate test	The maximum engine load curve shall be determined with the support of the manufacturer (taking manufacturer´s data is allowed). If there´s no such support it is not necessary to determine the maximum engine load curve in a separate test	The maximum engine load curve shall be determined with the support of the manufacturer (taking manufacturer´s data is allowed). If there´s no such support it is not necessary to determine the maximum engine load curve in a separate test
Emissions and efficiency testing (laboratory)	**38WLTC_warm_cd_CAT** according to GNT_WLTC+_Test_Procedure		**38WLTC_warm_cd_CAT** according to GNT_WLTC+_Test_Procedure	gfv	**38WLTC_warm_cd_CAT** according to GNT_WLTC+_Test_Procedure	gfv	**38WLTC_warm_cd_CAT** according to GNT_WLTC+_Test_Procedure	**38WLTC_warm_cd_CAT** according to GNT_WLTC+_Test_Procedure	**38WLTC_warm_cd_CAT** according to GNT_WLTC+_Test_Procedure
	38cd for WLTC+ cold def CAT according to GNT_WLTC+_CAT_Test_Procedure		**38cd for WLTC+ cold def CAT** according to GNT_WLTC+_CAT_Test_Procedure	gfv	**38cd for WLTC+ cold def CAT** according to GNT_WLTC+_Test_Procedure	gfv	**38cd for WLTC+ cold def CAT** according to GNT_WLTC+_Test_Procedure	**38cd for WLTC+ cold def CAT** according to GNT_WLTC+_CAT_Test_Procedure	**38cd for WLTC+ cold def CAT** according to GNT_WLTC+_Test_Procedure
	39WLTC_warm_def_rep precon at 23°C ±3°C acc. to GNT_WLTC+_Test_Procedure		**39WLTC_warm_def_rep** precon at 23°C ±3°C acc. to GNT_WLTC+_Test_Procedure	gfv	**39WLTC_warm_def_rep** precon at 23°C ±3°C acc. to GNT_WLTC+_Test_Procedure		**39WLTC_warm_def_rep** precon at 23°C ±3°C acc. to GNT_WLTC+_Test_Procedure	**39WLTC_warm_def_rep** precon at 23°C ±3°C acc. to GNT_WLTC+_Test_Procedure	**39WLTC_warm_def_rep** precon at 23°C ±3°C acc. to GNT_WLTC+_Test_Procedure
	optional REESS charging		optional REESS charging		optional REESS charging			Ensure CS mode (break-off criterion shall be fulfiled)	
	41Soaktime minimum 12h, -7 °C ± 3 °C		41Soaktime minimum 12h, -7 °C ± 3 °C		41Soaktime minimum 12h, -7 °C ± 3 °C		41Soaktime minimum 12h, -7 °C ± 3 °C	41Soaktime minimum 12h, -7 °C ± 3 °C	41Soaktime minimum 12h, -7 °C ± 3 °C
	40WLTC_cold_def_CAT according to GNT_WLTC+_CAT_Test_Procedure		**40WLTC_cold_def_CAT** according to GNT_WLTC+_CAT_Test_Procedure	gfv	**40WLTC_cold_def_CAT** according to GNT_WLTC+_CAT_Test_Procedure	gfv	**40WLTC_cold_def_CAT** according to GNT_WLTC+_CAT_Test_Procedure	**40WLTC_cold_def_CAT_CS** according to GNT_WLTC+_CAT_Test_Procedure	**40WLTC_cold_def_CAT** according to GNT_WLTC+_CAT_Test_Procedure

Test Analysis, Rating

vehicle OBD memory readout and check
Test analysis according to GNT_Test_performance_limits
Results template GNT_Template_Test_Results
Report table GNT_Template_Test_Results
Rating GNT_Rating_Sheet_Master and GNT_Rating_Sheet_PHEV
Upload Output test data on Sharepoint

Procedure for AdBlue Quality Check

In order to avoid implausible measurement results due to poor quality or manipulated AdBlue, a quality check of the AdBlue (AUS 32, according to ISO 22241) in the vehicle should be carried out as part of the GNCAP procedure. This document proposes a corresponding procedure and defines the corrective measures to be taken if the quality criteria are not met. This procedure could be integrated in the vehicle maintenance check or during the documentation of the test vehicle.

1. General AdBlue check procedure
1.1 Prepare a sample of the vehicles AdBlue according to point 2 of this document
1.2 Quick check the AdBlue according to point 3.1 of this document
    - If the urea content is within the specified limits, proceed with the WLTC+ precon and WLTC+ cold test
    - If the urea content is out of limits, rinse and refill the AdBlue tank according to point 4 of this document and send the AdBlue sample for analysis according to point 3.2 of this document.
1.3 Check the emission levels after the the WLTC+ precon and WLTC+ cold test

    - If the values for NOx, NH3 and N2O are within reasonable limits, proceed with the tests according to the standard test procedure
    - If the values for NOx, NH3 and N2O are above reasonable limits (high and inconsistent peaks showing evidence of abnormal reactant):
        o **Option 1:** proceed with the tests according to the standard test procedure, analyse the sample according to point 2.2 of this document, and add the results to the vehicle data sheet.
        o **Option 2:** rinse and refill the AdBlue tank according to point 4 of this document and send the AdBlue sample for analysis according to point 3.2 of this document. Repeat the WLTC+ precon and WLTC+ cold test and proceed with the standard measurement protocol

2. AdBlue sampling
2.1 Sampling bottles

The used sampling bottles must fulfil the specifications of ISO 22241-2

    - Wide neck bottles shall be used. Suited materials for these bottles are high-density polyethylene (HPDE), high-density polypropylene (HDPP) polyvinylidene fluoride (PVDF) and perfluoroalkoxy alkane (PFA).
    - Prior to the first use with AdBlue, the bottles shall be cleaned and finally rinsed with deionized water

2.2 AdBlue sample
    - Fill the sampling bottle to 1/3 with AdBlue from the vehicles AdBlue tank to rinse the container. To avoid contamination, do not fill the AdBlue back to the tank. The liquid used for rinsing must then be disposed in accordance with the disposal regulations.
    - Fill the sampling bottle completely (500ml) with AdBlue from the vehicles AdBlue tank.
    - During the filling of the sample, maximum care shall be taken that neither dust nor liquid pollutants get into the bottle.
    - Label the bottle accordingly (vehicle ID, VIN, time and date)

2.3 AdBlue sample storage
    - The sample shall be stored until two months after the publication of the measurement data/rating of the vehicle.
    - According to 22241-2, it is recommended to conduct the analysis within three weeks in order to take into account possible changes in the ammonia content.

3. AdBlue quality check
3.1 Quick check with refractometer
   - AdBlue has to be at lab ambient temperature (15-25°C)
   - Urea content must be between 30 and 35%
   - The value read with the refractometer must be recorded
3.2 AdBlue lab analysis
   - AdBlue lab analysis shall be performed according to 22241-2
   - According to 22241-2, it is recommended to conduct the analysis within three weeks in order to take into account possible changes in the ammonia content.

4. Rinsing/refilling of the vehicle AdBlue tank
4.1 Rinsing
   - If not already done, prepare a sample of the vehicles AdBlue according to 1.2 of this document
   - Empty the vehicles AdBlue tank as much as possible (by removing and emptying or pumping it empty)
   - Fill up one litre of new AdBlue from the lab storage to dilute residuals and empty the tank again
   - Quick check new AdBlue from the lab storage according to point 3.1 of this document
   - Fill the vehicles AdBlue tank completely with new AdBlue from the lab storage
4.2 AdBlue from lab
   - If possible, the AdBlue should already be analysed
   - If the AdBlue is not analysed, take a sample according to point 1.2 of this document
   - The date of the first opening of the AdBlue container must be protocolled
   - AdBlue should be stored at temperatures between -5 °C and + 25 °C
   - AdBlue should not be older than 36 months