

**Progress Report of the
VIAQ (Vehicle Interior Air Quality)
Informal Working Group**

Munich, November 6-7th 2019

Chair: Andrey KOZLOV, Russian Federation

Co-Chair: Jongsoon LIM, The Republic of Korea

Secretary: Mark POLSTER, Ford

During 173rd WP.29 session in Geneva (14-17 November 2017) Proposal for a new Mutual Resolution (M.R.3) for of the 1958 and the 1998 Agreements concerning Vehicle Interior Air Quality (VIAQ) was adopted (ECE/TRANS/WP.29/2017/136). Final text of Mutual Resolution M.R.3 was published at UNECE site on 1 of November 2018 as the document **ECE/TRANS/WP.29/1143**

United Nations



Economic and Social Council

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Mutual Resolution No. 3 (M.R.3) of the 1958 and the 1998 Agreements

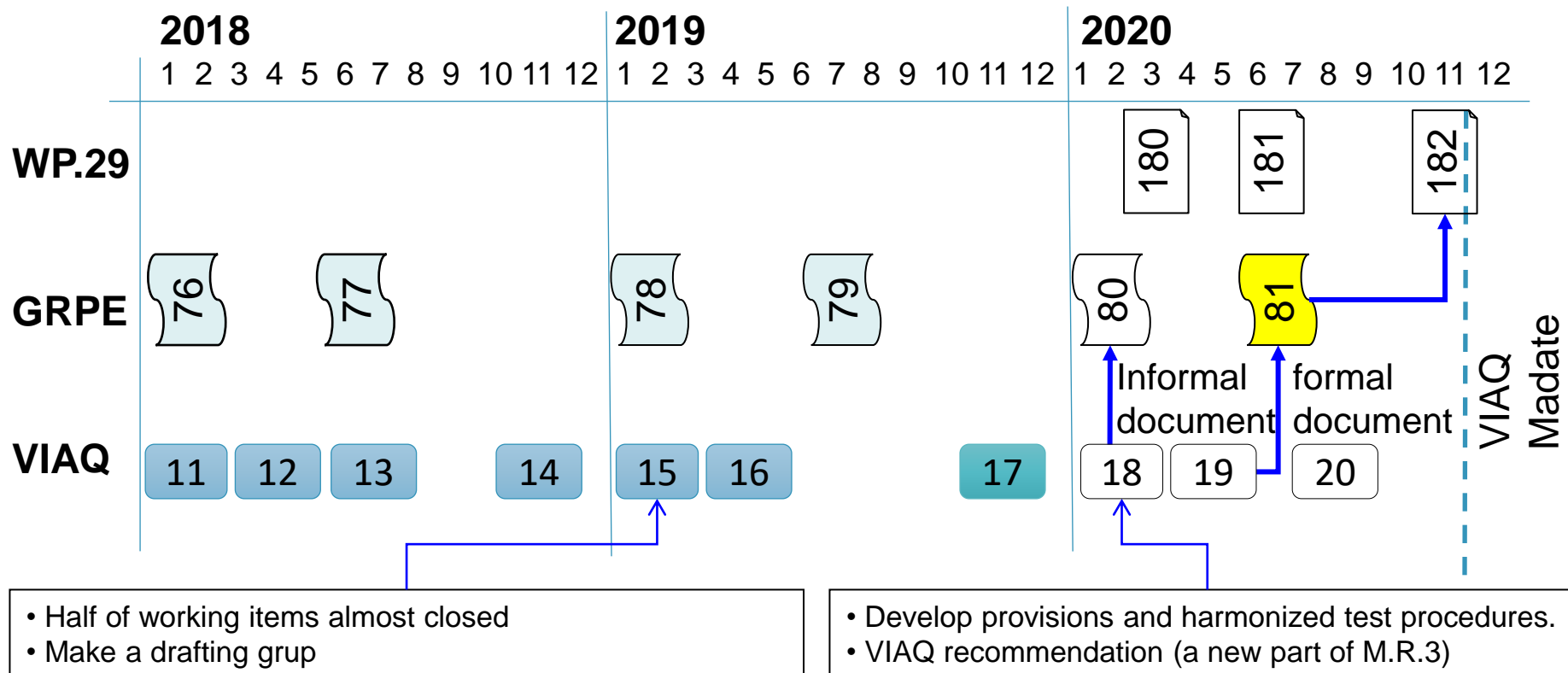
Concerning Vehicle Interior Air Quality (VIAQ)

The text reproduced below was adopted on 14 November 2017 by the World Forum for Harmonization of Vehicle Regulations (WP.29) regarding the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions (1958 Agreement) and on 15 November 2017 by the Executive Committee AC.3 of the Agreement Concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles (1998 Agreement) (ECE/TRANS/WP.29/1118, paras. 99-100 and 101). It is based on document ECE/TRANS/WP.29/2017/136.

● Terms of reference

- ✓ Identify and collect the information and research data on interior air quality and its relevance for vehicles, taking into account the activities being carried out by various governments, and non-governmental organizations.
- ✓ Identify and understand the current regulatory requirements with respect to vehicle interior air quality in different markets.
- ✓ Identify, review and assess existing test procedures suitable for the measurement of harmful substance into the vehicle cabin (including test modes, sample collection methods and analysis methods, etc.)
- ✓ Develop provisions and test procedures in a recommendation by including Part 3 in the Mutual Resolution No. 3.

● Timeline



- **January 2020:** Submit the draft document to GRPE
- **June 2020:** Adoption of the draft document by GRPE
- **November 2020:** Adoption of the draft document by WP.29

➤ **16th VIAQ IWG Meeting**

- Paris, France, May 14-15th 2019
- Two days

➤ **17th VIAQ IWG Meeting**

- Munich, Germany, November 6-7th 2019
- Two days

1. Vehicle Category

2. Test Vehicle age/milage

3. Substances to be Measured*

4. Meteorological Conditions

5. General Test Conditions

6. Test Modes

7. HVAC Modes*

8. Test Procedure*

9. Measurement Methods

10. Sampling Points

11. Sampling Method

12. Test Protocol

* Need clarification of some particular aspects

1. Vehicle Category

Agreed Item



Category 1-1

2. Test Vehicle age/millage

Agreed Item

New cars from series production
Millage
3 000 -15 000 km



3. Substances to be Measured

Russian Standard

Formaldehyde CH₂O
Nitrogen dioxide NO₂
Nitrogen oxide NO
Carbon monoxide CO
Saturated hydrocarbons (C₂H₆...C₇H₁₆)
Methane CH₄

Agreed substances

Carbon monoxide CO
Nitrogen oxide NO
Nitrogen dioxide NO₂



Korea

Carbon monoxide CO
Nitrogen oxide NO
Nitrogen dioxide NO₂

For discussion

(see VIAQ-13-04, VIAQ-14-04 and VIAQ-17-04)

Formaldehyde CH₂O
Particulate matter (PM)

4. Meteorological Conditions

Agreed Item

- ✓ ambient air temperature:
from -7°C to $+30^{\circ}\text{C}$
- ✓ relative humidity:
from 30% to 90%
- ✓ atmospheric pressure
from 85 to 110 kPa



5. General Test Conditions

Agreed Item

1. Test facility for idle test is an open parking zone.
2. Test road for constant speed test is a paved road with the slope up to 6.0%.
3. For the purpose of idle test it is possible to use natural wind (if within the specification) or air blower to provide uniform air flow along the tested vehicle with a velocity of 2 ± 1 m/s.
4. During the tests contamination from outside sources has to be prevented. Therefore background measurements of the analytical substances have to be done before and after the test and in constant speed mode a distances to emission sources has to be not less than 100 m.
5. General inspection should be checked before testing.
6. Windows, doors and ventilation hatches should be closed.
7. HVAC outside flaps have to be closed.



6. Test Modes

Agreed Item



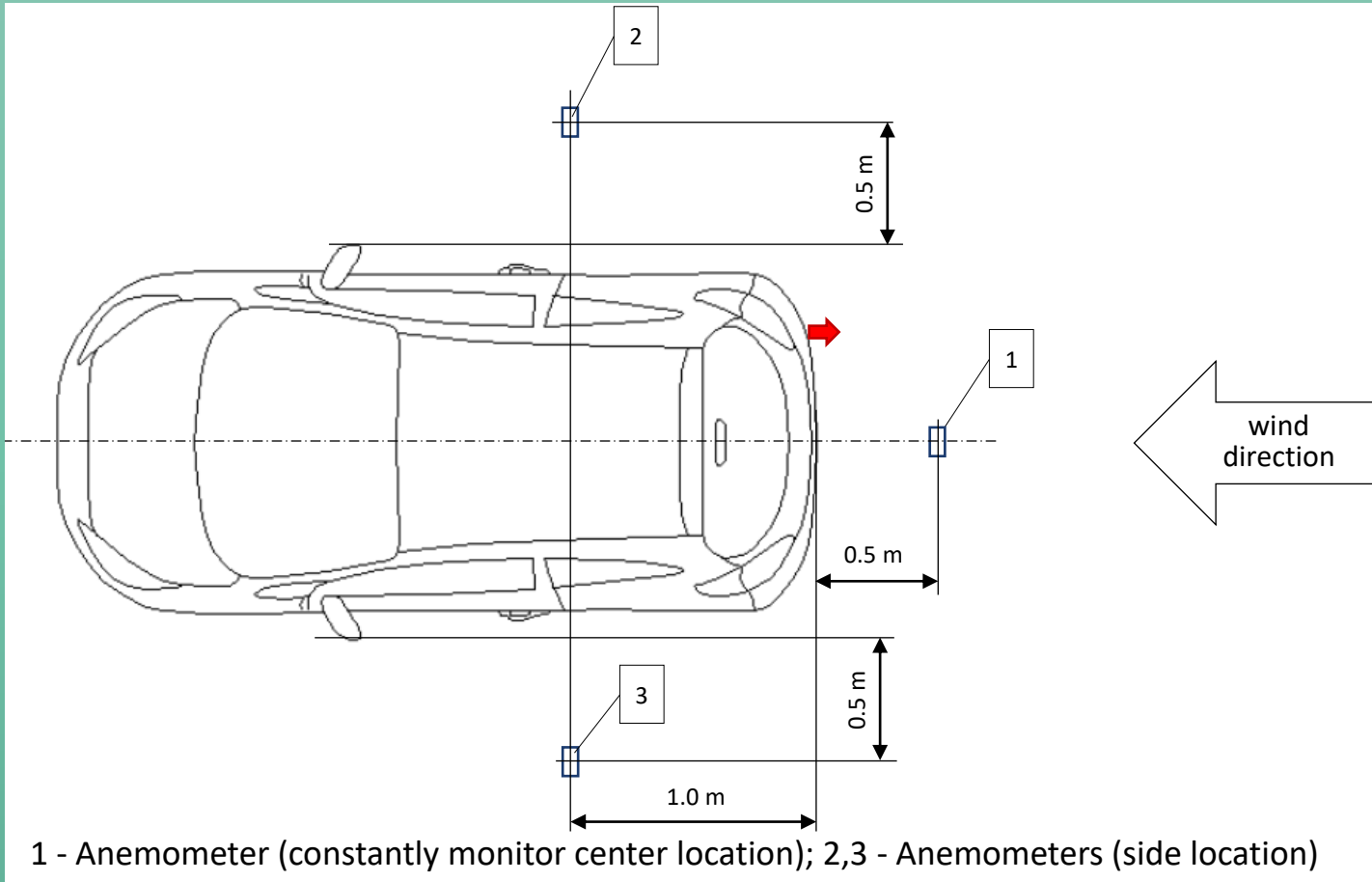
1. Idling Test

2. Constant Speed Test

- Movement at constant speed 50 km/h
- Movement at constant speed 130 km/h

7.HVAC Modes / 8.Test Procedure

Idle test



Test conditions:

- ✓ wind velocity 2.0 ± 1 m/s
- ✓ velocity difference between anemometers 1, 2 and 3 not more than 15%



HVAC mode:

- ✓ recirculation: ON
- ✓ air conditioner: OFF
- ✓ ventilator speed: MAXIMAL
- ✓ outside air flaps: closed
- ✓ temperature setting: manual and coolest level
- ✓ dashboard vent: all open and horizontal
- ✓ rear vents: closed

It is acceptable to use air blower to simulate air movement around tested vehicle

7.HVAC Modes / 8.Test Procedure

Idle test



1. Insure the wind speed is equal to 2 ± 1 m/s in case of testing at natural air movement.
2. Park the vehicle in a position so the wind direction achieves a linear speed of air perpendicular to the rear of the test vehicle.
3. Locate the sensors to the center point behind the test vehicle to measure wind speed, temperature and humidity.
4. Verify the uniformity of the wind to insure it is constant across the vehicle within the airflow tolerance and perpendicular to the rear of the vehicle.
5. Start the engine and warm-up vehicle by driving for a minimum 15 minutes.
6. After warm-up, park the vehicle by backing into the previous position. Set the vehicle's climate system to air conditioner: OFF; recirculation: ON; outside air flaps: closed; temperature: manual and coolest level; fan: highest level; dashboard vent: all open and horizontal, and rear vents: closed.
7. With the engine off, ventilate vehicle for 5 minutes with all doors and windows open. Then close the doors and windows. During sampling, no people are inside the test vehicle.
8. With the engine off measure the background pollutant concentrations.
9. Open the door, start the engine, confirm the climate system settings, exit and close the door. This operation should take about one minute. Sample air from a location between the front seats, **take at least 5 measurements during 15 minutes.**
10. Take another background measurement according to chapter 8.
11. Vehicle idle test is complete.

7.HVAC Modes / 8.Test Procedure

Constant speed test



1. Speed modes:

- ✓ 50 km/h (city traffic)
- ✓ 130 km/h (highway)

2. HVAC mode:

- ✓ air conditioner: OFF (option is ON)
- ✓ recirculation: ON
- ✓ ventilator speed: MAXIMAL
- ✓ outside air flaps: closed
- ✓ temperature setting: $20 \pm 2^{\circ}\text{C}$
- ✓ dashboard vent: all open and horizontal
- ✓ rear vents: closed

7.HVAC Modes / 8.Test Procedure

Constant speed test



1. Start the engine and warm-up vehicle by driving for a minimum 15 minutes.
2. After warm-up, park the vehicle and set the vehicle's climate system to air conditioner: **OFF**; recirculation: ON; outside air flaps: closed; temperature: $20\pm 2^{\circ}\text{C}$; fan: highest level; dashboard vent: all open and horizontal, and rear seat vents: closed.
3. With the engine off, ventilate vehicle for 5 minutes with all doors and windows open. Then close the doors and windows.
4. With the engine off measure the background pollutant concentrations.
5. Start the engine, confirm the climate system settings. Start driving and accelerate smoothly to a speed of 50 km/h. Measure the vehicle interior pollutant concentration level. Sample air from a location between the front seats, take at least 5 measurements during 15 minutes.
6. Repeat measurement in accordance with item 5 at a speed of **130 km/h**.
7. Take another background measurement according to chapter 4.
8. Stop all measurements, park the vehicle and switch engine off.
9. Vehicle constant speed test is complete.

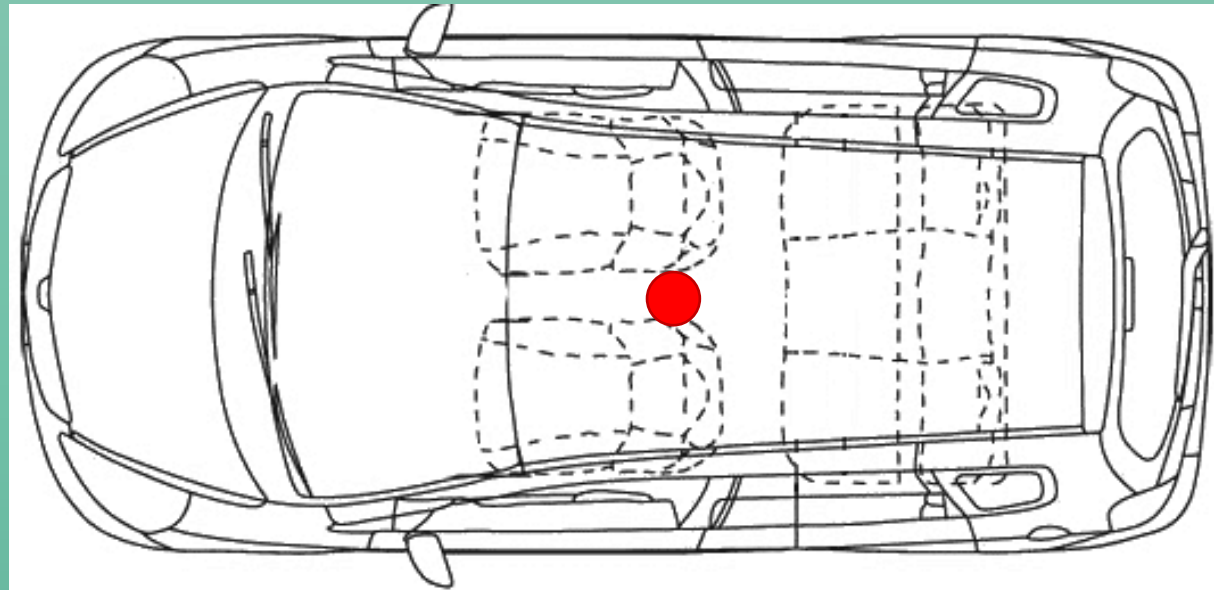


9. Measurement Methods

Substances	Proposed measuring methods	Type of analysis
CH ₂ O	1) High performance liquid chromatography (HPLC) UV detection	1) Off-line analysis at the laboratory after preliminary air sampling to the cartridges
	2) Gas chromatography (GC) with nitrogen phosphorus detection (NPD), or mass spectrometer (MS) and capillary or packed columns	2) Off-line analysis at the laboratory after preliminary air sampling to the cartridges
	3) Photo-electric colorimetric method	3) On-line (express) analysis
NO, NO ₂	1) Chemiluminescence (CLD)	1) On-line (express) analysis or stationary analysis at the laboratory after preliminary air sampling to the sealed bags
	2) High-sensitivity electrochemical detection (ECD)	2) On-line (express) analysis
CO	1) Infrared photoacoustic spectroscopy	1) On-line (express) analysis
	2) Electrochemical detection (ECD)	2) On-line (express) analysis
PM _{2,5} PM ₁₀	1) Light-scattering laser photometer need additional discussion	1) On-line (express) analysis

10. Sampling Points / 11. Sampling Method

Agreed Item



The sampling point is between headrests of front seats
The sampling method is aspiration

12. Test Protocol

The data exchange file shall be constructed as follows. Pollutant concentrations as well as any other relevant parameters shall be reported and exchanged as a csv-formatted data file. Parameter values shall be separated by a comma, ASCII-Code #h2C. The decimal marker of numerical values shall be a point, ASCII-Code #h2E. Lines shall be terminated by carriage return, ASCII-Code #h0D. No thousands separators shall be used.

Headers of the Reporting and Data Exchange File are in the table (for example)

Line #	Parameter	Basic Data Type [A=Alpha or N=Numeric (max length, fractional digits)]	Data Type [Enumeration String, Decimal, Integer]	Total Digits	Fractional Digits	Minimum Value	Maximum Value	Allowed Values for: Enumeration or Description or Units
1	Process Code	N(2)	Integer			0	99	Version of Test Report. 1st dataset is N=0, highest value is the latest correction of existing dataset
14	Factory Name	A(50)	String					Place of Manufacturer
15	Vehicle Identification Number	A(17)	String					17-character vehicle identification number (VIN)
31	Background – Carbon Monoxide	N(4,1)	Decimal	5	1	0.0	9999.9	CAS#: 201230-82-2 [mg/m ³]
32	Background – Nitrogen Monoxide	N(4,1)	Decimal	5	1	0.0	9999.9	CAS#: 10102-43-9 [µg/m ³]
33	Background – Nitrogen Dioxide	N(4,1)	Decimal	5	1	0.0	9999.9	CAS#: 10102-44-0 [µg/m ³]

Items which need additional clarification on 17th meeting

1. Substances to be Measured

- Formaldehyde CH₂O
- Particulate matter (PM_{2.5} and PM₁₀)

2. Constant speed test

- Speed 130 km/h
- Air conditioner: OFF (option is ON)

Developed and edited during 16th meeting two documents:

- ✓ Update of part I of Mutual Resolution No. 3 (VIAQ-16-06)
- ✓ Draft of part III of Mutual Resolution No. 3 (VIAQ-16-08)

**as parts of Revision 2 of Mutual Resolution (M.R.3) on
Vehicle Interior Air Quality**

➤ **18th VIAQ IWG Meeting (TBD)**

- Geneva, Switzerland, January 15th 2020
- Half a day

➤ **19th VIAQ IWG Meeting (TBD)**

- Paris, France, March 2020
- Two days