

Directive 2005/55/EC of the European Parliament and of the Council of 28 September 2005 on the approximation of the laws of the Member States relating to the measures to be taken against the emission of gaseous and particulate pollutants from compression-ignition engines for use in vehicles, and the emission of gaseous pollutants from positive-ignition engines fuelled with natural gas or liquefied petroleum gas for use in vehicles (Text with EEA relevance) (repealed)

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      - HSL2 Heated NO<sub>x</sub> sampling line
      - SL Sampling line for CO and CO<sub>2</sub>
      - BK Background bag (optional; Figure 8 only)
      - BG Sample bag (optional; Figure 8 CO and CO<sub>2</sub> only)...
      - F1 Heated pre-filter (optional)
      - F2 Heated filter
      - P Heated sampling pump
      - HC
      - CO, CO<sub>2</sub>
      - NO
      - C Converter
      - B Cooling bath (optional)
      - T1, T2, T3 Temperature sensor
      - T4 Temperature sensor
      - T5 Temperature sensor
      - G1, G2, G3 Pressure gauge
      - R1, R2 Pressure regulator
      - R3, R4, R5 Pressure regulator
      - FL1, FL2, FL3 Flowmeter
      - FL4 to FL6 Flowmeter (optional)
      - V1 to V5 Selector valve

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- V6, V7 Solenoid valve
- V8 Needle valve
- V9, V10 Needle valve
- V11, V12 Toggle valve (optional)
- 1.3. NMHC analysis (NG fuelled gas engines only)
  - 1.3.1. Gas chromatographic method (GC, Figure 9)
    - Components of Figure 9
      - PC Porapak column
      - MSC Molecular sieve column
      - OV Oven
      - SLP Sample loop
      - P Pump
      - D Dryer
      - HC
      - V1 Sample injection valve
      - V3 Selector valve
      - V2, V4, V5, V6, V7, V8 Needle valve
      - R1, R2, R3 Pressure regulator
      - FC Flow capillary
      - G1, G2, G3 Pressure gauge
      - F1, F2, F3, F4, F5 Filter
      - FL1
    - 1.3.2. Non-methane cutter method (NMC, Figure 10)
      - Components of Figure 10
        - NMC Non-methane cutter
        - HC
        - V1 Selector valve
        - V2, V3 Solenoid valve
        - V4 Needle valve
        - R1 Pressure regulator
        - FL1 Flowmeter
- 2. EXHAUST GAS DILUTION AND DETERMINATION OF THE PARTICULATES
  - 2.1. Introduction
  - 2.2. Partial flow dilution system
    - Isokinetic systems (Figures 11, 12)
    - Flow controlled systems with concentration measurement (Figures 13 to 17)...
    - Flow controlled systems with flow measurement (Figures 18, 19)
    - 2.2.1. Components of Figures 11 to 19
      - EP Exhaust pipe
      - SP Sampling probe (Figures 10, 14, 15, 16, 18, 19)...
      - ISP Isokinetic sampling probe (Figures 11, 12)
      - FD1, FD2 Flow divider (Figure 16)
      - FD3 Flow divider (Figure 17)
      - EGA Exhaust gas analyser (Figures 13, 14, 15, 16, 17)...
      - TT Transfer tube (Figures 11 to 19)
      - DPT Differential pressure transducer (Figures 11, 12, 17)
      - FC1 Flow controller (Figures 11, 12, 17)
      - PCV1, PCV2 Pressure control valve (Figure 16)
      - DC Damping chamber (Figure 17)
      - VN Venturi (Figure 15)
      - FC2 Flow controller (Figures 13, 14, 18, 19, optional)

- FM1 Flow measurement device (Figures 11, 12, 18, 19)
- FM2 Flow measurement device (Figure 19)
- PB Pressures blower (Figures 11, 12, 13, 14, 15, 16,...)
- SB Suction blower (Figures 11, 12, 13, 16, 17, 19)...
- DAF Dilution air filter (Figures 11 to 19)
- DT Dilution tunnel (Figures 11 to 19)
- HE Heat exchanger (Figures 16, 17)
- 2.3. Full flow dilution system
  - 2.3.1. Components of Figure 20
    - EP Exhaust pipe
    - PDP Positive displacement pump
    - CFV Critical Flow Venturi
    - HE Heat exchanger (optional, if EFC is used)
    - EFC Electronic flow compensation (optional, if HE is used)
    - DT Dilution tunnel
    - DAF Dilution air filter
    - PSP Particulate sampling probe
- 2.4. Particulate sampling system
  - 2.4.1. Components of Figures 21 and 22
    - PTT Particulate transfer tube (Figures 21, 22)
    - SDT Secondary dilution tunnel (Figure 22)
    - FH Filter holder(s) (Figures 21, 22)
    - P Sampling pump (Figures 21, 22)
    - DP Dilution air pump (Figure 22)
    - FC3 Flow controller (Figures 21, 22)
    - FM3 Flow measurement device (Figures 21, 22)
    - FM4 Flow measurement device (Figure 22)
    - BV Ball valve (optional)
- 3. DETERMINATION OF SMOKE
  - 3.1. Introduction
  - 3.2. Full flow opacimeter
    - 3.2.1. Components of Figure 23
      - EP Exhaust Pipe
      - OPL Optical Path Length
      - LS Light source
      - LD Light detector
      - CL Collimating lens
      - T1 Temperature sensor (optional)
  - 3.3. Partial flow opacimeter
    - 3.3.1. Components of Figure 24
      - EP Exhaust pipe
      - SP Sampling probe
      - TT Transfer tube
      - FM Flow measurement device
      - MC Measuring chamber
      - OPL Optical path length
      - LS Light source
      - LD Light detector
      - CL Collimating lens
      - T1 Temperature sensor
      - P Sampling pump (optional)

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## ANNEX VI

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### Appendix 1

to EC type-approval certificate No ... concerning the type approval of a vehicle/separate technical unit/component

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- 1.4. Emission levels of the engine/parent engine:
  - 1.4.1. ESC test:
  - 1.4.2. ELR test:
  - 1.4.3. ETC test:
- 1.5. ....
- 1.6. Carbon monoxide emissions test results
- 1.7. Smoke opacity test results
  - 1.7.1. ....
  - 1.7.2. Free acceleration tests
    - 1.7.2.1. Engine test in accordance with Section 4.3 of Annex VI...
    - 1.7.2.2. Under free acceleration
      - 1.7.2.2.1. ....
      - 1.7.2.2.2. ....
      - 1.7.2.2.3. ....
    - 1.7.2.3. Vehicle test according to section 3 of Annex VI to...
      - 1.7.2.3.1. ....
      - 1.7.2.3.2. ....
  - 1.7.3. ....
  - 1.7.4. ....
  - 1.7.5. Principal characteristics of engine type
    - 1.7.5.1. ....
    - 1.7.5.2. ....
    - 1.7.5.3. ....
    - 1.7.5.4. ....
    - 1.7.5.5. ....

### Appendix 2

#### OBD RELATED INFORMATION

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## ANNEX VII

### EXAMPLE OF CALCULATION PROCEDURE

1. ESC TEST
  - 1.1. Gaseous emissions
    - Calculation of the dry to wet correction factor  $KW_r$  (Annex...
    - Calculation of the wet concentrations:
    - Calculation of the NO<sub>x</sub> humidity correction factor  $KH_D$  (Annex III,...
    - Calculation of the emission mass flow rates (Annex III, Appendix...
    - Calculation of the specific emissions (Annex III, Appendix 1, Section...
    - Calculation of the specific NO<sub>x</sub> emission of the random point...
    - Determination of the emission value from the test cycle (Annex...
    - Comparison of the NO<sub>x</sub> emission values (Annex III, Appendix 1,...
  - 1.2. Particulate emissions
    - Calculation of GEDF (Annex III, Appendix 1, Sections 5.2.3 and...
    - Calculation of the mass flow rate (Annex III, Appendix 1,...
    - Background correction (optional)
    - Calculation of the specific emission (Annex III, Appendix 1, Section...
    - Calculation of the specific weighting factor (Annex III, Appendix 1,...
2. ELR TEST
  - 2.1. General remarks on the Bessel filter
  - 2.2. Calculation of the Bessel algorithm
    - Step 1 Required Bessel filter response time  $t_F$ :
    - Step 2 Estimation of cut-off frequency and calculation of Bessel constants  $E, \dots$
    - Step 3 Application of Bessel filter on step input:
    - Step 4 Filter response time of first iteration cycle:
    - Step 5 Deviation between required and obtained filter response time of first...
    - Step 6 Checking the iteration criteria:
    - Step 7 Final Bessel algorithm:
  - 2.3. Calculation of the smoke values
    - Calculation of the k-value (Annex III, Appendix 1, Section 6.3.1):...
    - Calculation of Bessel averaged smoke (Annex III, Appendix 1, Section...
    - Calculation of the final smoke value (Annex III, Appendix 1,...
    - Cycle validation (Annex III, Appendix 1, Section 3.4)
3. ETC TEST
  - 3.1. Gaseous emissions (diesel engine)
    - Calculation of the diluted exhaust gas flow (Annex III, Appendix...
    - Calculation of the NO<sub>x</sub> correction factor (Annex III, Appendix 2,...
    - Calculation of the background corrected concentrations (Annex III, Appendix 2,...
    - Calculation of the emissions mass flow (Annex III, Appendix 2,...
    - Calculation of the specific emissions (Annex III, Appendix 2, Section...
  - 3.2. Particulate emissions (diesel engine)
    - Calculation of the mass emission (Annex III, Appendix 2, Section...
    - Calculation of the background corrected mass emission (Annex III, Appendix...
    - Calculation of the specific emission (Annex III, Appendix 2, Section...
  - 3.3. Gaseous emissions (CNG engine)

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Calculation of the NO<sub>x</sub>, correction factor (Annex III, Appendix 2,...  
Calculation of the NMHC concentration (Annex III, Appendix 2,  
Section...  
Calculation of the background corrected concentrations (Annex III,  
Appendix 2,...  
For NMHC, the background concentration is the difference between  
HCconcd...  
Calculation of the emissions mass flow (Annex III, Appendix 2,...  
Calculation of the specific emissions (Annex III, Appendix 2, Section...

- 4.  $\lambda$ -SHIFT FACTOR ( $S\lambda$ )
  - 4.1. Calculation of the  $\lambda$ -shift factor ( $S\lambda$ )
  - 4.2. Examples for the calculation of the  $\lambda$ -shift factor  $S\lambda$ 
    - Example **GP25**: CH<sub>4</sub> = 86 %, N<sub>2</sub> = 14 % (by volume)
    - Example **GR**: CH<sub>4</sub> = 87 %, C<sub>2</sub>H<sub>6</sub> = 13 % (by vol)
    - Example **USA**: CH<sub>4</sub> = 89 %, C<sub>2</sub>H<sub>6</sub> = 4,5 %, C<sub>3</sub>H<sub>8</sub> = 2,3 %,...

## ANNEX VIII

### SPECIFIC TECHNICAL REQUIREMENTS RELATING TO ETHANOL-FUELLED DIESEL ENGINES

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IN ANNEX III, APPENDIX 1:

- 4.2. Dry/wet correction
- 4.3. NO<sub>x</sub> correction for humidity and temperature
- 4.4. Calculation of the emission mass flow rates

IN ANNEX III, APPENDIX 2:

- 4.2. ....
- 4.3. Calculation of the emission mass flow
  - 4.3.1 Systems with constant mass flow
    - 4.3.1.1. Determination of the background corrected concentrations
  - 4.3.2. Systems with flow compensation
- 4.4. Calculation of the specific emissions

## ANNEX IX

### TIME-LIMITS FOR THE TRANSPOSITION OF THE REPEALED DIRECTIVES INTO NATIONAL LAWS

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## ANNEX X

### CORRELATION TABLE

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