

UNECE GRPE Real Driving Emissions IWG

Updated instructions to use the EMROAD Tool within the RDE-IWG

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Outline

- **General information**
- **Objective of the present document**
- **Instructions for the new version**

General information

- **EMROAD is a Microsoft Excel add-in for analysing vehicle emissions data recorded with Portable Emissions Measurement Systems (PEMS). In the frame of the European legislative PEMS programs for heavy-duty vehicles (HDV), non-road mobile machinery (NRMM), and light-duty vehicles (LDV)**
- **EMROAD was developed as a research tool, primarily used to support the development of PEMS data evaluation methods for emissions legislation.**
- **These legislative developments being completed, EMROAD is updated by the JRC on a regular basis to meet the latest applicable methods and requirements are laid down in the EU Regulations for light-duty, heavy-duty vehicles and non-road mobile machinery.**
- **Some golden data files are now provided to benchmark calculations conducted with other software and for the EU regulatory settings and requirements only.**

General information

- Introduction during the 4th Session of the RDE-IWG
- Current (official for EU RDE) version of EMROAD is **6.03 Build 3**
- **[NEW] Working version for RDE IWG: 6.04 Build1 BETA**
- Documentation: Quick start guide, User's Guide, Release Notes
- Mailing list for notifications of new releases

Link to download **6.03 Build 3**:

<https://circabc.europa.eu/w/browse/79a4a9b6-4003-4e02-956d-048dcef1a169>

Link to download **6.04 Build 1 BETA**:

<https://wiki.unece.org/display/trans/RDE+background+material>

Objective of the present document

- **In the EU context: EMROAD is primarily used as a reference tool for calculations according to the EU regulations (that have specific settings for all applications, i.e. RDE-LDV, ISC-HDV and ISM-NRMM)**
- **EMROAD is proposed as a tool to support the work within the RDE-IWG**
- **This presentation provides:**
 - **Instructions to run calculations according to RDE Regional settings and requirements.**
 - **An overview of the RDE GTR reporting template**

Types of calculations from the PEMS files

- Regional settings & requirements (Separate presentation) as a basis for the calculations.
- Regional settings (e.g. speed thresholds, MAW reference curve,...)
- Verification of the trip validity according to the regional requirements (Distance shares, MAW coverage, additional indicators,...)
- Final emissions calculations

Terminology:

"Settings": values required as input

"Requirements": ranges or thresholds that have to be met by the calculated values

Regional Settings & Requirements available in 6.04 BETA1

(All except emissions limits)

Region(s)	Settings/Requirements
China	General version
EU	General version (valid for all vehicle types except N1 and N2 <44W/t)
Japan	General version
South Korea	General version
India	Versions for M and N1 vehicles

Instructions – Regulatory Settings > RDE-LDV

RDE LDV - SIMPLIFIED CALCULATION SETTINGS

RDE Region: EUROPEAN UNION - GENERAL

Data Source: EXF-FILE

Vehicle Type: LIGHT-DUTY VEHICLE - M1-N1 CLASS 1

Fuel Type: DIESEL (B7)

Emissions Limits: LDV EURO 6 - M1 - N1 CLASS 1 - COMP. IGNITION

Exhaust Flow: EXHAUST FLOW METER

Distance: GPS

Vehicle Conditioning: Cold Hot Soak under Extended

Start Altitude: GPS Manual [] [m]

Moving Averaging Window - Reference Quantity & Cycle CO2 Values [g/km]

Reference CO2 Mass [kg]	1.000	[OVC-HEV] Charge Sustaining [g/km]	0.000
Reference Cycle CO2 [g/km]	1.000	Low Speed Phase [g/km]	1.000
Low Speed Phase [g/km]	1.000	High Speed Phase [g/km]	1.000
Medium Speed Phase [g/km]	1.000	Extra High Speed Phase [g/km]	1.000

Regulation Specific Parameters: Euro 6d RDE3 [JRC] GTR REPORT

Ki Corrections: SETTINGS...

INFO
In this simplified interface, only test and vehicle specific parameters may be input - The parameters specific to the RDE evaluation are set as default values. (e.g. Speed binning of windows, CO2 characteristic curve, Trip...)

ADVANCED... APPLY CLOSE

Select from the list the available Region/Vehicle Type:
All the settings and requirements are automatically set.

EUROPEAN UNION - GENERAL

CHINA - GENERAL

EUROPEAN UNION - GENERAL

INDIA - M TYPE

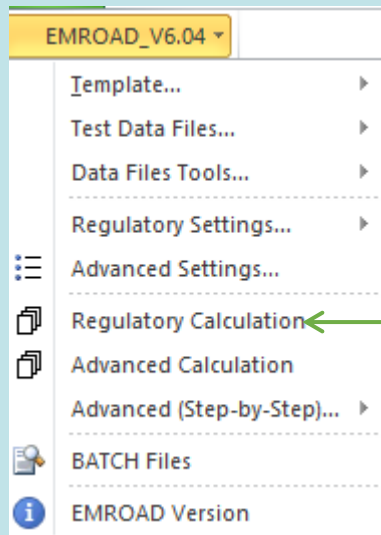
INDIA - N TYPE

JAPAN - GENERAL

SOUTH KOREA - GENERAL

Available regions/categories in BETA1 version

Instructions – Regulatory Calculation



Use the Regulatory Calculation option

RDE GTR Report Section 1 – Moderate/extended Conditions & Emissions Calculation

EU-GENERAL				
EMISSIONS COMPLIANCE [GTR TERMINOLOGY]	[REGIONAL TERMINOLOGY]	UNIT	[MIN or SET]	[MAX]
CO Limit	CO Limit	mg/km		
NOx Limit	NOx Limit	mg/km	80	
PN Limit	PN Limit	#/km		
CO Measurement uncertainty factor	CO Measurement uncertainty factor	-		
NOx Measurement uncertainty factor	NOx Measurement uncertainty factor	-	1.43	
PN Measurement uncertainty factor	PN Measurement uncertainty factor	-	1.50	
Total Emissions Regulated [0=No, 1=Yes]	Total Emissions Regulated [0=No, 1=Yes]	-	1	
Low Speed Emissions Regulated [0=No, 1=Yes]	Urban Emissions Regulated [0=No, 1=Yes]	-	1	
Medium Speed Emissions Regulated [0=No, 1=Yes]	Rural Emissions Regulated [0=No, 1=Yes]	-	0	
High Speed Emissions Regulated [0=No, 1=Yes]	Motorway Emissions Regulated [0=No, 1=Yes]	-	0	
Emissions correction method [0=None, 3=RDE3, 4=RDE4]	Emissions correction method [0=None, 3=RDE3, 4=RDE4]	-	4	
[CO2 based correction] - RF_L1	[CO2 based correction] - RF_L1	-	1.30	1.30
[CO2 based correction] - RF_L2	[CO2 based correction] - RF_L2	-	1.50	1.50
Moderate altitude Max	Moderate altitude Max	m		700
Extended altitude Max	Extended altitude Max	m		1300
Moderate temperature Min	Moderate temperature Min	°C	-2	
Moderate temperature Max	Moderate temperature Max	°C		30
Extended temperature Min	Extended temperature Min	°C	-7	
Extended temperature Max	Extended temperature Max	°C		35
Correction Factor for Extended conditions	Correction Factor for Extended conditions	-	1.60	
Correction Factor for Enhanced-Extended conditions	Correction Factor for Enhanced-Extended conditions	-		
r_K - Total	r_K - Total	-		0.92
r_K - Low Speed	r_K - Urban	-		1.11
r_K - Medium Speed	r_K - Rural	-		NA
r_K - High Speed	r_K - Motorway	-		NA
RF - Total	RF - Total	-		1.00
RF - Low Speed	RF - Urban	-		1.00
RF - Medium Speed	RF - Rural	-		
RF - High Speed	RF - Motorway	-		
CO RDE emissions - Total	CO RDE emissions - Total	mg/km		20.94
NOx RDE emissions - Total	NOx RDE emissions - Total	mg/km		483.42
PN RDE emissions - Total	PN RDE emissions - Total	#/km		NULL
CO RDE emissions - Low Speed	CO RDE emissions - Urban	mg/km		47.82
NOx RDE emissions - Low Speed	NOx RDE emissions - Urban	mg/km		260.37
PN RDE emissions - Low Speed	PN RDE emissions - Urban	#/km		NULL
CO RDE emissions - Medium Speed	CO RDE emissions - Rural	mg/km		
NOx RDE emissions - Medium Speed	NOx RDE emissions - Rural	mg/km		
PN RDE emissions - Medium Speed	PN RDE emissions - Rural	#/km		
CO RDE emissions - High Speed	CO RDE emissions - Motorway	mg/km		

Calculation settings according to the region (Example: EU).

Verification of requirements according to the region

RDE GTR Report Section 2 – Trip Composition

TRIP CHARACTERISTICS [GTR TERMINOLOGY]	[REGIONAL TERMINOLOGY]		[MIN or SET]	[MAX]	
[Settings] Low Speed Driving - Maximum Speed	[Settings] Urban Driving - Maximum Speed	km/h		60	
[Settings] Medium Speed Driving - Maximum Speed	[Settings] Rural Driving - Maximum Speed	km/h	60	90	
[Settings] High Speed Driving - Reference Speed 1	[Settings] Motorway Driving - Reference Speed 1	km/h	145		
[Settings] High Speed Driving - Reference Speed 2	[Settings] Motorway Driving - Reference Speed 2	km/h	100		
[Settings] Maximum duration for single stop events	[Settings] Maximum duration for single stop events	s		300	
Total trip distance	Total trip distance	km			79
Total trip duration	Total trip duration	min.	90	120	93
Low Speed Driving distance	Urban Driving distance	km	16.00		32.65
Medium Speed Driving distance	Rural Driving distance	km	16.00		25.08
High Speed Driving distance	Motorway Driving distance	km	16.00		21.46
Low Speed Driving distance share	Urban Driving distance share	%	23.00	43.00	41.23
Medium Speed Driving distance share	Rural Driving distance share	%	23.00	43.00	31.67
High Speed Driving distance share	Motorway Driving distance share	%	23.00	43.00	27.10
Low Speed Driving average speed	Urban Driving average speed	km/h	15.00	40.00	31.59
Medium Speed Driving average speed	Rural Driving average speed	km/h			76.78
High Speed Driving average speed	Motorway Driving average speed	km/h			114.81
Total trip average speed	Total trip average speed	km/h			51.19
High Speed Driving above Reference Speed 1	Motorway Driving above 145km/h	% HSD		3.00	0.00
High Speed Driving above Reference Speed 2	Motorway Driving above 100 km/h	min.	5.00		10.00
Low Speed Driving maximum speed	Urban Driving maximum speed	km/h			60.00
Medium Speed Driving maximum speed	Rural Driving maximum speed	km/h			90.00
High Speed Driving maximum speed	Motorway Driving maximum speed	km/h			129.10
Total trip maximum speed	Total trip maximum speed	km/h			129.10
Low Speed Driving operation verification 1	Urban Driving operation verification 1	Y1/NO			
Start and end points elevation absolute difference	Start and end points elevation absolute difference	m		100	41
Low Speed Driving Cumulative positive altitude gain	Urban Driving Cumulative positive altitude gain	m/100km		1200.00	673.22
Medium Speed Driving Cumulative positive altitude gain	Rural Driving Cumulative positive altitude gain	m/100km			615.21
High Speed Driving Cumulative positive altitude gain	Motorway Driving Cumulative positive altitude gain	m/100km			535.51
Total trip Cumulative positive altitude gain	Total trip Cumulative positive altitude gain	m/100km		1200.00	617.89
Stop Time share	Stop Time share	%	6.00	30.00	15.72
Number of stops exceeding maximum duration	Number of stops exceeding maximum duration	-		0	0
Cold start duration	Cold start duration	min.			5.00
Initial idling duration	Initial idling duration	s			11
Cold start average speed	Cold start average speed	km/h			20.46
Cold start maximum speed	Cold start maximum speed	km/h			54.50
Cold start stop time	Cold start stop time	s			26
Data under moderate conditions	Data under moderate conditions	%			0.00
Data under extended conditions	Data under extended conditions	%			0.00
Data under Enhanced-Extended conditions	Data under Enhanced-Extended conditions	%			100.00

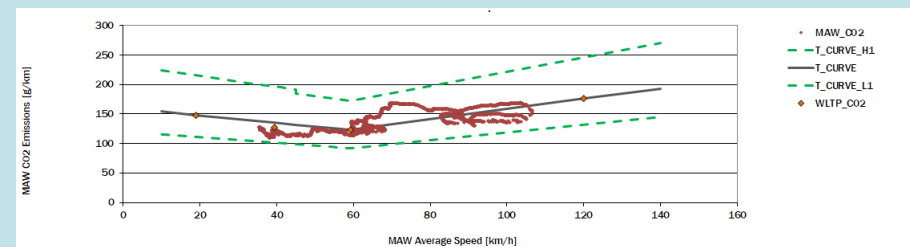
Calculation settings according to the region (Example: EU).

Verification of requirements according to the region

RDE GTR Report Section 3 – Overall Trip Dynamics [MAW]

OVERALL TRIP BYNAMICS [MAW]	[REGIONAL TERMINOLOGY]		[MIN or SET]	[MAX]
[Settings Vehicle Specific] - Reference CO2 mass	[Settings Vehicle Specific] - Reference CO2 mass	kg		
[Settings] - Reference Driving Cycle	[Settings] - Reference Driving Cycle	-	1.70	
[Settings Vehicle Specific] - P1 CO2 emissions	[Settings Vehicle Specific] - P1 CO2 emissions	g/km		
[Settings Vehicle Specific] - P2 CO2 emissions	[Settings Vehicle Specific] - P2 CO2 emissions	g/km	148.58	
[Settings Vehicle Specific] - P3 CO2 emissions	[Settings Vehicle Specific] - P3 CO2 emissions	g/km	123.01	
[Settings] - P1 CO2 emissions - Multiplicative correction fi	[Settings] - P1 CO2 emissions - Multiplicative correction fi	-	176.05	
[Settings] - P2 CO2 emissions - Multiplicative correction fi	[Settings] - P2 CO2 emissions - Multiplicative correction fi	-	1.00	
[Settings] - P3 CO2 emissions - Multiplicative correction fi	[Settings] - P3 CO2 emissions - Multiplicative correction fi	-	1.00	
[Settings] - P1 Average Speed	[Settings] - P1 Average Speed	km/h	1.00	
[Settings] - P2 Average Speed	[Settings] - P2 Average Speed	km/h	59.30	
[Settings] - P3 Average Speed	[Settings] - P3 Average Speed	km/h	120.00	
[Settings] - MAW Low Speed Driving - Average Speed	[Settings] - MAW Urban Driving - Average Speed	km/h	0.00	45.00
[Settings] - MAW Medium Speed Driving - Average Speed	[Settings] - MAW Rural Driving - Average Speed	km/h	45.00	80.00
[Settings] - MAW High Speed Driving - Average Speed	[Settings] - MAW Motorway Driving - Average Speed	km/h	80.00	200.00
[Settings] - Upper tolerance Low Speed Driving	[Settings] - Upper tolerance Urban Driving	%	45	
[Settings] - Upper tolerance Medium Speed Driving	[Settings] - Upper tolerance Rural Driving	%	45	
[Settings] - Upper tolerance High Speed Driving	[Settings] - Upper tolerance Motorway Driving	%	40	
[Settings] - Upper secondary tolerance	[Settings] - Upper secondary tolerance	%	40	
[Settings] - Lower tolerance Low Speed Driving	[Settings] - Lower tolerance Urban Driving	%	100	
[Settings] - Lower tolerance Medium Speed Driving	[Settings] - Lower tolerance Rural Driving	%	25	
[Settings] - Lower tolerance High Speed Driving	[Settings] - Lower tolerance Motorway Driving	%	25	
[Settings] - Lower secondary tolerance	[Settings] - Lower secondary tolerance	%	25	
Upper-primary urban tolerance percentage points increase	Upper-primary urban tolerance percentage points increase	%		0
Total number of windows	Total number of windows	-		4525
Number of windows within the (primary) tolerances	Number of windows within the (primary) tolerances	-		4525
Number of windows outside the (primary) tolerances	Number of windows outside the (primary) tolerances	-		0
Number of Low Speed Driving windows	Number of Urban Driving windows	-		1233
Number of Medium Speed Driving windows	Number of Rural Driving windows	-		2447
Number of High Speed Driving windows	Number of Motorway Driving windows	-		845
Number of Low Speed Driving windows within (primary) tolerances	Number of Urban Driving windows within (primary) tolerances	-		1233
Number of Medium Speed Driving windows within (primary) tolerances	Number of Rural Driving windows within (primary) tolerances	-		2447
Number of High Speed Driving windows within (primary) tolerances	Number of Motorway Driving windows within (primary) tolerances	-		845
Share of normal Low Speed Driving windows	Share of normal Urban Driving windows	%	50.00	100.00
Share of normal Medium Speed Driving windows	Share of normal Rural Driving windows	%	50.00	100.00
Share of normal High Speed Driving windows	Share of normal Motorway Driving windows	%	50.00	100.00
Share of Low Speed Driving windows	Share of Urban Driving windows	%		27.25
Share of Medium Speed Driving windows	Share of Rural Driving windows	%		54.08
Share of High Speed Driving windows	Share of Motorway Driving windows	%		18.67

Calculation settings according to the region (Example: EU).



Verification of requirements according to the region

RDE GTR Report Section 4 – Excess or Absence of Dynamics

EXCESS/ABSENCE OF TRIP DYNAMICS	[REGIONAL TERMINOLOGY]	[MIN or SET]	[MAX]
[Settings] - RPA Limit curve a1_RPA	[Settings] - RPA Limit curve a1_RPA	-0.001600	
[Settings] - RPA Limit curve b1_RPA	[Settings] - RPA Limit curve b1_RPA	0.175500	
[Settings] - RPA Limit curve a2_RPA	[Settings] - RPA Limit curve a2_RPA	0.000000	
[Settings] - RPA Limit curve b2_RPA	[Settings] - RPA Limit curve b2_RPA	-0.025000	
[Settings] - RPA Limit curve - Intersect speed	[Settings] - RPA Limit curve - Intersect speed	km/h	94.05
[Settings] - Speed*Acc Limit curve a1_SPA	[Settings] - Speed*Acc Limit curve a1_SPA		0.136000
[Settings] - Speed*Acc Limit curve b1_SPA	[Settings] - Speed*Acc Limit curve b1_SPA		14.440000
[Settings] - Speed*Acc Limit curve a2_SPA	[Settings] - Speed*Acc Limit curve a2_SPA		0.074200
[Settings] - Speed*Acc Limit curve b2_SPA	[Settings] - Speed*Acc Limit curve b2_SPA		18.966000
[Settings] - Speed*Acc Limit curve - Intersect speed	[Settings] - Speed*Acc Limit curve - Intersect speed	km/h	74.60
Low Speed Driving RPA	Urban Driving RPA	m/s2	0.18
Medium Speed Driving RPA	Rural Driving RPA	m/s2	0.13
High Speed Driving RPA	Motorway Driving RPA	m/s2	0.09
Low Speed Driving 95th percentile Speed*Acc	Urban Driving 95th percentile Speed*Acc	m2/s3	14.52
Medium Speed Driving 95th percentile Speed*Acc	Rural Driving 95th percentile Speed*Acc	m2/s3	20.91
High Speed Driving 95th percentile Speed*Acc	Motorway Driving 95th percentile Speed*Acc	m2/s3	18.73
Low Speed Driving RPA - Compliant	Urban Driving RPA - Compliant	Y1/N0	1
Medium Speed Driving RPA - Compliant	Rural Driving RPA - Compliant	Y1/N0	1
High Speed Driving RPA - Compliant	Motorway Driving RPA - Compliant	Y1/N0	1
Low Speed Driving 95th percentile Speed*Acc - Compliant	Urban Driving 95th percentile Speed*Acc - Compliant	Y1/N0	1
Medium Speed Driving 95th percentile Speed*Acc - Compliant	Rural Driving 95th percentile Speed*Acc - Compliant	Y1/N0	1
High Speed Driving 95th percentile Speed*Acc - Compliant	Motorway Driving 95th percentile Speed*Acc - Compliant	Y1/N0	1
Number of counts - Low Speed Driving	Number of counts - Urban Driving	-	150
Number of counts - Medium Speed Driving	Number of counts - Rural Driving	-	150
Number of counts - High Speed Driving	Number of counts - Motorway Driving	-	100

Calculation settings according to the region (Example: EU).

Verification of requirements according to the region