




# ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

<b>Date:</b>	4/19/2023	<b>Start Time:</b>	8:54:09
<b>Test Number:</b>	ONT3_005147	<b>End Time:</b>	10:32:59
<b>Test Vehicle:</b>	3225_GCRXT03.05PV-479		
<b>Test Legislation:</b>	EPA1066		
<b>Test Cycle:</b>	FTP75		
<b>Test Purpose:</b>	Certification		
<b>Test Cell:</b>	iGEM-V-TC1		
<b>Order Number:</b>	3225		
<b>Remark:</b>	TEST #1		

 **QUALITY ASSURANCE**

REDACTED

INSPECTED BY: \_\_\_\_\_

DATE: 4/24/2023

COMMENTS: OK

\_\_\_\_\_

## General Data

Test Number	ONT3_005147		
Test Name	FTP75		
Test Cell	IGEM-V-TC1		
Test Type	FTP75		
Legislation	EPA1066		
Requirements (Bag)	CERTIFICATION		
Requirements (Modal)	CERTIFICATION		
Date	4/19/2023	CH <sub>4</sub> Response Factor	
Test Start	8:54:09	Odometer Position <sup>[mi]</sup>	107610
Start Time Cycle	2023-04-19 09:09-48-(000)	Delay Time Method	
Test End	10:32:59		
Operator	REDACTED	Air Condition	OFF
Driver	REDACTED	Particle Measurement	USUAL
Shiftable	Auto		
Flow Stream	ModalDirty		
Calibrated Ranges	autorange		
Remark	TEST #1		

## Vehicle Data 3225\_GCRXT03.05PV-479

Manufacturer	RAM 1500	Displacement	
Vehicle Model	REDACTED	Engine Family	GCRXT03.05PV
Order Number	3225	Manufacturer	DODGE
Test Group	3225_GCRXT03.05PV-479	Transmission	Automatic
Evaporative Family		Engine Code	

## Dyno Data 3225

Dyno Type	SVOR	Inertia <sup>[lb]</sup>	6000.00
	A <sup>[lbf]</sup>	B <sup>[lbf/mph]</sup>	C <sup>[lbf/mph<sup>2</sup>]</sup>
Street Load	41.990	0.08760	0.036520
Road Load	4.400	0.32000	0.032700

## Fuel Data Diesel-S-000266

Fuel Type	DIESEL	Fuel Temperature <sup>[°C]</sup>	15.00
Fuel Analyze Date		Fuel Density <sup>[kg/l]</sup>	0.8540
Fuel Manufacturer		Net Heat. Val. <sup>[BTU/lb]</sup>	18382
Fuel Tank Number		Carb. Weight Frac.	0.8700
Fuel Charge		HC Ratio	1.7945
Remarks:		OC Ratio	-1.0000

## Weather Limit Data

Temp Min <sup>[deg F]</sup>	68.00	Dew Point Max <sup>[deg F]</sup>	100.00
Temp Max <sup>[deg F]</sup>	86.00	Pressure Min <sup>[mbar]</sup>	800.0
Dew Point Min <sup>[deg F]</sup>	15.01	Pressure Max <sup>[mbar]</sup>	1100.0

## Fan Speed Data RoadSpeed

F1 <sup>[%]</sup>	F2 <sup>[%/mph]</sup>	F3 <sup>[%/mph<sup>2</sup>]</sup>
5	0.745999992	0.0031

Test Data FTP75 Operator REDACTED Speed Table Date: 4/19/2023  
 Test Number ONT3\_005147 Driver REDACTED Shift Table Auto Cold Start

Vehicle	REDACTED	Dyno	Fuel	Test Timing
Vehicle #	REDACTED	Inertia <sup>[B]</sup> 6000.00	Diesel-S-000266	Start Time 8:54:09
Model	RAM 1500	A <sup>[B]</sup> 4.400	Fuel type DIESEL	End Time 10:32:59
Year	2016	B <sup>[B/minor]</sup> 0.32000	Density 0.8540	
Displacement:		C <sup>[B/impH2]</sup> 0.032700	NHV 18382	Soak Time 547.2
Engine Family	GCRXT03.05PV		CWF 0.8700	
Trans	Automatic	Flow Stream ModalDirty		
Odometer <sup>[mi]</sup>	107610	Remark TEST #1		

**Bag Analysis**

PHASE 1	THC <sup>[ppmC]</sup>	CO <sup>[ppm]</sup>	CO <sub>2</sub> <sup>[%]</sup>	NO <sub>x</sub> <sup>[ppm]</sup>	N2O <sup>[ppm]</sup>	CH <sub>4</sub> <sup>[ppm]</sup>	NMHC <sup>[ppm]</sup>	Temp. <sup>[F]</sup>	Volume <sup>[ft<sup>3</sup>]</sup>
Range	100	500	4	30	30			78.62	3214
Zero Read	0.00	0.0	0.0	0.0	0.0			29.03	12.96
Span Read	93.30	464.90	3.721	27.970	27.600			32.64	0.1
Sample	0.64	53.01	0.994	3.534	3.675	0.643		7.020	506.5
Mass.	0.034	5.657	1655.861	0.552	0.225	0.034		3.59	507.6
Mass per Dist.	0.0095	1.5762	464.152	0.1539	0.0626	0.0094		0.8917	2584
PSS Massflow Particles [g/h]	0.2206		PSS Mass per Dist. [g/mile]		0.0087			0	0.0
								1.50	21.8
PHASE 2	THC <sup>[ppmC]</sup>	CO <sup>[ppm]</sup>	CO <sub>2</sub> <sup>[%]</sup>	NO <sub>x</sub> <sup>[ppm]</sup>	N2O <sup>[ppm]</sup>	CH <sub>4</sub> <sup>[ppm]</sup>	NMHC <sup>[ppm]</sup>	Temp. <sup>[F]</sup>	Volume <sup>[ft<sup>3</sup>]</sup>
Range	100	50	1	30	30			79.58	4484
Zero Value	0.00	0.0	0.0	0.0	0.0			29.03	18.52
Span Value	93.30	46.57	0.935	27.970	27.600			31.76	506.6
Sample	0.40	0.35	0.684	0.033	2.412	0.395		7.005	1378.3
Mass.	0.029	0.052	1602.727	0.007	0.206	0.029		3.85	868.8
Mass per Dist.	0.0076	0.0134	416.157	0.0019	0.0535	0.0075		0.8914	2293
PSS Massflow Particles [g/h]	0.1057		PSS Mass per Dist. [g/mile]		0.0068			0	0.0
								1.30	24.4
PHASE 3	THC <sup>[ppmC]</sup>	CO <sup>[ppm]</sup>	CO <sub>2</sub> <sup>[%]</sup>	NO <sub>x</sub> <sup>[ppm]</sup>	N2O <sup>[ppm]</sup>	CH <sub>4</sub> <sup>[ppm]</sup>	NMHC <sup>[ppm]</sup>	Temp. <sup>[F]</sup>	Volume <sup>[ft<sup>3</sup>]</sup>
Range	100	50	1	30	30			80.72	3190
Zero Value	0	0.0	0.0	0.0	0.0			29.03	15.67
Span Value	93.30	46.58	0.935	27.970	27.600			30.82	1921.2
Sample	0	8.17	0.818	0.945	3.009	0.457		7.055	2427.4
Mass.	0.025	0.866	1361.838	0.147	0.183	0.024		3.56	506.3
Mass per Dist.	0.0068	0.2416	379.904	0.0409	0.0509	0.0068		0.8926	1841
PSS Massflow Particles [g/h]	0.2216		PSS Mass per Dist. [g/mile]		0.0087			0	0.0
								1.30	26.8

**Total Result (weighted)**

Weighted	THC <sup>[g/mile]</sup>	CO <sup>[g/mile]</sup>	CO <sub>2</sub> <sup>[g/mile]</sup>	NO <sub>x</sub> <sup>[g/mile]</sup>	N2O <sup>[g/mile]</sup>	CH <sub>4</sub> <sup>[g/mile]</sup>	NMHC <sup>[g/mile]</sup>	HC+NO <sub>x</sub> <sup>[g/mile]</sup>	Fuel Economy
Mass per Dist.	0.0078	0.4003	416.15	0.0441	0.0547	0.0077	0.05190		mile/gal 24.41
Mass per Dist. (rounded)	0.0078	0.4003	416.2	0.0441	0.0547	0.0077	0.0519		
Mass per Dist. - Particulate PSS	0.0076								

**Test Data:** FTP75  
**Test Number:** ONT3\_005147

**Operator:**  
**Driver:**

**REDACTED**  
**REDACTED**

**Date:** 4/19/2023

**Driver Violations**

	<u>Phase1</u>	<u>Phase2</u>	<u>Phase3</u>
Number of Violations	-	0	0
Duration of Violations	(s) 0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

**Phase 1  
Analyzer Adjust**

	Range Number	Range ppm	Zero Value ppm	Zero Set Value ppm	Zero Offset %	Span Value ppm	Span Set Value ppm	Span Offset %	ReZero Value ppm
CO <sub>2</sub> (%)	2	4	0.00	0.00	0.01	3.72	3.72	-0.03	0.00
CO	2	500	0.02	0.00	0.00	464.90	464.90	0.00	0.03
NO <sub>x</sub>	1	30	0.00	0.00	0.01	27.97	27.97	0.00	0.01
THC (ppmC1)	2	30	0.00	0.00	0.00	28.35	28.35	0.00	0.06
CH <sub>4</sub>	1	30	0.00	0.00	0.00	27.60	27.60	0.00	0.00

**Analyzer Check**

	Range Number	Range ppm	Zero Value ppm	Zero Set Value ppm	Zero Drift %	Span Value ppm	Span Set Value ppm	Span Drift %
CO <sub>2</sub> (%)	2	4	0.00	0.00	0.00	3.72	3.72	-0.02
CO	2	500	0.02	0.00	0.00	464.61	464.90	-0.06
NO <sub>x</sub>	1	30	0.02	0.00	0.05	27.64	27.97	-1.09
THC (ppmC1)	2	30	0.08	0.00	0.05			
CH <sub>4</sub>	1	30	0.00	0.00	0.00	27.47	27.60	-0.42

**Phase 2  
Analyzer Adjust**

	Range Number	Range ppm	Zero Value ppm	Zero Set Value ppm	Zero Offset %	Span Value ppm	Span Set Value ppm	Span Offset %	ReZero Value ppm
CO <sub>2</sub> (%)	1	1	0.00	0.00	0.02	0.94	0.94	-0.02	0.00
CO	1	50	-0.01	0.00	-0.01	46.57	46.56	0.02	0.02
NO <sub>x</sub>	1	30	0.01	0.00	0.03	27.97	27.97	0.00	0.01
THC (ppmC1)	2	100	0.00	0.00	0.00	93.31	93.30	0.01	0.02
CH <sub>4</sub>	1	30	0.00	0.00	0.00	27.60	27.60	0.00	0.00

**Analyzer Check**

	Range Number	Range ppm	Zero Value ppm	Zero Set Value ppm	Zero Drift %	Span Value ppm	Span Set Value ppm	Span Drift %
CO <sub>2</sub> (%)	1	1	0.00	0.00	0.00	0.93	0.94	-0.36
CO	1	50	0.03	0.00	0.02	46.49	46.56	-0.16
NO <sub>x</sub>	1	30	0.02	0.00	0.05	27.91	27.97	-0.21
THC (ppmC1)	2	100	0.02	0.00	0.00			
CH <sub>4</sub>	1	30	0.00	0.00	-0.01	27.56	27.60	-0.13

**Phase 3  
Analyzer Adjust**

	Range Number	Range ppm	Zero Value ppm	Zero Set Value ppm	Zero Offset %	Span Value ppm	Span Set Value ppm	Span Offset %	ReZero Value ppm
CO <sub>2</sub> (%)	1	1	0.00	0.00	0.01	0.94	0.94	-0.02	0.00
CO	1	50	0.02	0.00	0.03	46.58	46.56	0.04	0.06
NO <sub>x</sub>	1	30	0.00	0.00	0.02	27.97	27.97	0.00	0.00
THC (ppmC1)	2			0.00					
CH <sub>4</sub>	1	30	0.00	0.00	0.00	27.60	27.60	0.00	0.00

**Analyzer Check**

	Range Number	Range ppm	Zero Value ppm	Zero Set Value ppm	Zero Drift %	Span Value ppm	Span Set Value ppm	Span Drift %
CO <sub>2</sub> (%)	1	1	0.00	0.00	-0.02	0.93	0.94	-0.28
CO	1	50	0.04	0.00	-0.04	46.52	46.56	-0.11
NO <sub>x</sub>	1	30	0.01	0.00	0.02	27.88	27.97	-0.31
THC (ppmC1)	2	100	0.04	0.00	0.02	93.27	93.51	0.21
CH <sub>4</sub>	1	30	0.00	0.00	0.00	27.57	27.60	-0.10

Operator **REDACTED** Driver **REDACTED** Customer : 3225  
 Test Purpose: Certification Legislation: EPA1066 Requirements (Bag) CERTIFICATION  
 Conditioning: Emission Standards Default  
 Test Intent: TEST #1

VIN **REDACTED**

**DYNO Data**

	Road Load	Street Load
Inertia [lb]	6000.00	
A [N]	19.572	186.781
B [N/km/h]	0.88448	0.24213
C [N/km2/h2]	0.056161	0.062722

	Phase1	Phase2	Phase3	Phase4	Weighted
<b>Distance (m)</b>					
Target	5779.15	6210.96	5779.15		17769.25
Driven	5775.51	6198.12	5768.81		17742.45
<b>Distance Rating (%)</b>	-0.0628	-0.2066	-0.1789		-0.1508
<b>Cycle Energy (MJ)</b>					
Target	4.61	4.17	4.61		8.78
Driven	4.59	4.23	4.60		8.82
<b>Distance per Energy Cycle (m/MJ)</b>					
Target	4.61	4.17	4.61		1365.36
Driven	4.59	4.23	4.60		1357.37
<b>Road Load Work Fraction</b>					
Target	0.4105	0.2735	0.4105		0.3454
Driven	0.4249	0.2680	0.4148		0.3467
<b>Inertial Work (MJ)</b>					
Target	2.72	3.03	2.72		5.75
Driven	2.64	3.09	2.69		5.76
<b>Inertial Work Fraction</b>					
Target	0.5895	0.7265	0.5895		0.6546
Driven	0.5751	0.7320	0.5852		0.6533
<b>Inertial Work Rating (%)</b>	-2.8283	1.9676	-0.9426		0.2098
<b>Absolute Speed Change (m/s)</b>					
Target	204.88	340.91	204.88		545.79
Driven	201.27	345.35	203.59		547.95
<b>Absolute Speed Change Rating (%)</b>	-1.7574	1.3018	-0.6274		0.3952
<b>Energy Rating (%)</b>	-0.3931	1.2040	-0.2174		0.1654
<b>Energy Economy Rating (%)</b>	-0.3316	1.3938	-0.0386		0.5855

Operator **REDACTED** Driver **REDACTED** Customer : 3225  
 Test Purpose: Certification Legislation **EPA1066** Requirements (Reg) **CERTIFICATION**  
 Conditioning: Emission Default

Overall Status **Passed**

**Phase 1**

Test Record #: **ONT3\_005147**

Vehicle ID: **REDACTED**

	<u>Average</u>	<u>Min</u>	<u>Max</u>	<u>Low Limit</u>	<u>Upper Limit</u>	<u>Status</u>
<b>General</b>						
Cell Temperature (°C)	25.90	25.70	26.10	20.00	30.00	Passed
Barometer (mbar)	983.17	983.10	983.20	800.00	1100.00	Passed
Dew Point Temperature (°C)	8.33	7.90	8.80	-9.44	37.78	Passed
Specific Humidity Test Cell (gr/lb)	49.14	47.69	50.73	38.50	87.50	Passed
Dilution Air Temperature (°C)	21.88	21.75	22.05	15.00	52.00	Passed
Weighted Test Dilution Factor (-)	15.91			7.00	20.00	Passed
Dilution Factor (-)	12.96			7.00	20.00	Passed
Fuel Economy (mpg)	21.81			10.00	50.00	Passed
Zero Offset (%)	-	0.00	0.01	-2.00	2.00	Passed
Span Offset (%)	-	-0.03	0.00	-2.00	2.00	Passed
Zero Check Drift (%)	-	0.00	0.05	-2.00	2.00	Passed
Span Check Drift (%)	-	-1.09	-0.02	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2) (%)	n.a.	-	-	-10.00	10.00	Passed
<b>Ambient Concentrations</b>						
HC (ppm)	3.94			2.00	10.00	Passed
NO <sub>x</sub> (ppm)	0.07			-0.10	10.00	Passed
CO (ppm)	0.63			0.00	15.00	Passed
CO <sub>2</sub> (ppm)	553.97			300.00	650.00	Passed
CH <sub>4</sub> (ppm)	2.46			1.30	10.00	Passed
N <sub>2</sub> O (ppm)				0.20	0.50	Passed
<b>PM Filter Parameters</b>						
Particulate Filter Temperature (°C)	50.43	49.11	51.75	42.00	60.00	Passed
Filter Face Velocity (cm/s)	90.34			0.00	100.00	Passed
Particulate Result Validation (ug)	158.00			1.00	600.00	Passed
<b>Test-Cycle Specific Validations</b>						
Phase Distance (miles)	3.59			3.52	3.66	Passed
Sample Phase Time (s)	507.6			504.4	508.4	Passed
Duration Phase 1 (s)	506.40					NA
Crank Time Phase1 (s)	1.50			0	5	Passed
Crank Time Phase3 (s)	1.30			0	5	Passed
Crank Counts	1			0	1	Passed
Shutdown Time Phase 1				0	5	Passed
Shutdown Time Phase 3				0	5	Passed
Hot Soak Time (s)	547.20			540.00	660.00	Passed
Test Hold Counts	0					Passed
Duration Test Hold (s)	0.00			0	60	Passed

Operator **REDACTED** Driver **REDACTED** Customer :  
 Test Purpose: Certification Legislation: *EPA1066* Requirements (Bag)  
 Conditioning: Emission Default

3225  
 CERTIFICATION

**Phase 2**

Overall Status **Passed**

	<u>Average</u>	<u>Min</u>	<u>Max</u>	<u>Low Limit</u>	<u>Upper Limit</u>	<u>Status</u>
<b>General</b>						
Cell Temperature (°C)	26.44	26.00	26.70	20.00	30.00	Passed
Barometer (mbar)	983.15	983.10	983.20	800.00	1100.00	Passed
Dew Point Temperature (°C)	8.30	7.90	8.80	-9.44	37.78	Passed
Specific Humidity Test Cell (gr/lb)	49.04	47.76	50.72	38.50	87.50	Passed
Dilution Air Temperature (°C)	21.96	21.75	22.25	15.00	52.00	Passed
Dilution Factor (-)	18.52			7.00	20.00	Passed
Fuel Economy (mpg)	24.45			10.00	50.00	Passed
Zero Offset (%)	-	-0.01	0.03	-2.00	2.00	Passed
Span Offset (%)	-	-0.02	0.02	-2.00	2.00	Passed
Zero Check Drift (%)	-	-0.01	0.05	-2.00	2.00	Passed
Span Check Drift (%)	-	-0.36	-0.13	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2) (%)	n.a.			-10.00	10.00	Passed
<b>Ambient Concentrations</b>						
HC (ppm)	3.94			2.00	10.00	Passed
NO <sub>x</sub> (ppm)	0.06			-0.10	10.00	Passed
CO (ppm)	0.45			0.00	15.00	Passed
CO <sub>2</sub> (ppm)	532.89			300.00	650.00	Passed
CH <sub>4</sub> (ppm)	2.41			1.30	10.00	Passed
N <sub>2</sub> O (ppm)				0.20	0.50	
<b>PM Filter Parameters</b>						
Particulate Filter Temperature (°C)	49.83	47.91	51.75	42.00	60.00	Passed
Filter Face Velocity (cm/s)	90.26			0.00	100.00	Passed
Particulate Result Validation (ug)	159.00			2.00	600.00	Passed
<b>Test-Cycle Specific Validations</b>						
Phase Distance (miles)	3.85			3.78	3.94	Passed
Sample Phase Time (s)	868.8			867.7	871.7	Passed
Duration Phase 2 (s)	869.70					NA
Crank Time Phase1 (s)	1.5000			0	5	Passed
Crank Time Phase3 (s)	1.30			0	5	Passed
Crank Counts	1			0	1	Passed
Shutdown Time Phase 1				0	5	
Shutdown Time Phase 2				0	5	
Hot Soak Time (s)	547.20			540.00	660.00	Passed
Test Hold Counts	0					Passed
Duration Test Hold (s)	0.00			0	60	Passed



Operator  
 Test Purpose:  
 Conditioning:

**REDACTED**  
 Certification

Driver **REDACTED**  
 Legislation *EPA1066*  
 Emission Default

Customer :  
 Requirements (Reg)

3225  
**CERTIFICATION**

		<b>Phase 3</b>					Overall Status
		<b>Average</b>	<b>Min</b>	<b>Max</b>	<b>Low Limit</b>	<b>Upper Limit</b>	<b>Passed</b>
<b>General</b>							
Cell Temperature	(°C)	27.06	26.70	27.50	20.00	30.00	Passed
Barometer	(mbar)	983.07	983.00	983.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	8.40	7.90	8.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	49.38	47.88	51.13	38.50	87.50	Passed
Dilution Air Temperature	(°C)	22.56	22.35	23.25	15.00	52.00	Passed
Dilution Factor	(-)	15.67			7.00	20.00	Passed
Fuel Economy	(mpg)	26.76			10.00	50.00	Passed
Zero Offset	(%)	-	0.00	0.03	-2.00	2.00	Passed
Span Offset	(%)	-	-0.02	0.04	-2.00	2.00	Passed
Zero Check Drift	(%)	-	-0.04	0.02	-2.00	2.00	Passed
Span Check Drift	(%)	-	-0.31	0.21	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
<b>Ambient Concentrations</b>							
HC	(ppm)	3.70			2.00	10.00	Passed
NO <sub>x</sub>	(ppm)	0.05			-0.10	10.00	Passed
CO	(ppm)	0.32			0.00	15.00	Passed
CO <sub>2</sub>	(ppm)	529.16			300.00	650.00	Passed
CH <sub>4</sub>	(ppm)	2.50			1.30	10.00	Passed
N <sub>2</sub> O	(ppm)				0.20	0.50	
<b>PM Filter Parameters</b>							
Particulate Filter Temperature	(°C)	49.62	48.15	51.65	42.00	60.00	Passed
Filter Face Velocity	(cm/s)	84.32			0.00	100.00	Passed
Particulate Result Validation	(ug)	159.00			2.00	600.00	Passed
<b>Test-Cycle Specific Validations</b>							
Phase Distance	(miles)	3.58			3.52	3.66	Passed
Sample Phase Time	(s)	506.3			504.2	508.2	Passed
Duration Phase 3	(s)	506.20					NA
Crank Time Phase1	(s)	1.5000			0	5	Passed
Crank Time Phase3	(s)	1.30			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	547.20			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed