California Environmental Protection Agency AIR RESOURCES BOARD	ISUZU MOTORS LTD.	EXECUTIVE ORDER A-020-0250 New On-Road Heavy-Duty Engines

Pursuant to the authority vested in the Air Resources Board by Health and Safety Code Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39516 and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: The engine and emission control systems produced by the manufacturer are certified as described below for use in on-road motor vehicles with a manufacturer's GVWR over 14,000 pounds. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE [1]	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS [2]	ECS & SPECIAL FEATURES [3]	DIAGNOSTIC [6]
2010	ASZXH05.23FB	5.2	Diesel	Diesel	LHDD	DDI, TC, CAC, ECM, EGR, OC, PTOX, SCR-U	EMD

PRIMARY ENGINE'S IDLE EMISSIONS CONTROL [5]	ADDITIONAL IDLE EMISSIONS CONTROL [5]
30g	N/A

ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)
5.2	4HK1TC / 523FB (190)

* =not applicable; **GVWR**=gross vehicle weight rating; **13 CCR xyz**=Title 13, California Code of Regulations, Section xyz; **40 CFR 86.abc**=Title 40, Code of Federal Regulations, Section 86.abc; **L**=liter; **hp**=horsepower; **kw**=kilowatt; **hr**=hour;

[1] **CNG/LNG**=compressed/liquefied natural gas; **LPG**=liquefied petroleum gas; **E85**=85% ethanol fuel; **MF**=multi fuel a.k.a. **BF**=bi fuel; **DF**=dual fuel; **FF**=flexible fuel;

[2] **L/M/H HDD**=light/medium/heavy heavy-duty diesel; **UB**=urban bus; **HDO**=heavy duty Otto;

[3] **ECS**=emission control system; **TWC/OC**=three-way/oxidizing catalyst; **NAC**=NOx adsorption catalyst; **SCR-U / SCR-N**=selective catalytic reduction – urea / – ammonia; **WU (prefix)** =warm-up catalyst; **DPF**=diesel particulate filter; **PTOX**=periodic trap oxidizer; **HO2S/O2S**=heated/oxygen sensor; **HAFS/AFS**=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); **TBI**=throttle body fuel injection; **SFI/MFI**=sequential/multi port fuel injection; **DGI**=direct gasoline injection; **GCARB**=gaseous carburetor; **IDI/DDI**=indirect/direct diesel injection; **TC/SC**=turbo/super charger; **CAC**=charge air cooler; **EGR / EGR-C**=exhaust gas recirculation / cooled EGR; **PAIR/AIR**=pulsed/secondary air injection; **SPL**=smoke puff limiter; **ECM/PCM**=engine/powertrain control module; **EM**=engine modification; **2 (prefix)**=parallel; **(2) (suffix)**=in series;

[5] **ESS**=engine shutdown system (per 13 CCR 1956.8(a)(6)(A)(1); **30g**=30 g/hr NOx (per 13 CCR 1956.8(a)(6)(C); **APS** =internal combustion auxiliary power system; **ALT**=alternative method (per 13 CCR 1956.8(a)(6)(D); **Exempt**=exempted per 13 CCR 1956.8(a)(6)(B) or for CNG/LNG fuel systems; **N/A**=not applicable (e.g., Otto engines and vehicles);

[6] **EMD**=engine manufacturer diagnostic system (13 CCR 1971); **OBD**=on-board diagnostic system (13 CCR 1971.1);

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.8; 2) the EURO and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, for this engine family. "Diesel" CO, EURO and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.8 are in parentheses.).[4]

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.14	0.14	0.20	0.20	*	*	15.5	15.5	0.01	0.01	*	*
FEL	*	*	*	*	*	*	*	*	*	*	*	*
CERT	0.00	0.00	0.17	0.07	*	*	0.03	0.00	0.002	0.002	*	*
NTE	0.21		0.30		*		19.4		0.02		*	

[4] **g/bhp-hr**=grams per brake horsepower-hour; **FTP**=Federal Test Procedure; **EURO**=Euro III European Steady-State Cycle, including **RMCSET**=ram mode cycle supplemental emissions testing; **NTE**=Not-to-Exceed; **STD**=standard or emission test cap; **FEL**=family emission limit; **CERT**=certification level; **NMHC/HC**=non-methane/hydrocarbon; **NOx**=oxides of nitrogen; **CO**=carbon monoxide; **PM**=particulate matter; **HCHO**=formaldehyde; **(Rev.: 2007-02-26)**

BE IT FURTHER RESOLVED: Certification to the FEL(s) listed above, as applicable, is subject to the following terms, limitations and conditions. The FEL(s) is the emission level declared by the manufacturer and serves in lieu of an emission standard for certification purposes in any averaging, banking, or trading (ABT) programs. It will be used for determining compliance of any engine in this family and compliance with such ABT programs.

BE IT FURTHER RESOLVED: Except in vehicle applications exempted per 13 CCR 1956.8(a)(6)(B), engines in this engine family certified under 13 CCR 1956.8(a)(6)(C) [30 g/hr NOx] and section 35.B.4 of the incorporated "California Exhaust Emissions Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" adopted Dec. 12, 2002, as last amended Sep. 1, 2006, shall be provided with an approved "Certified Clean Idle" label that shall be affixed to the vehicle into which the engine is installed.

BE IT FURTHER RESOLVED: That the listed engine models have been conditionally certified pending submission of clean idle emission data which complies with 13 CCR 1956.8(a)(6)(C) [30 g/hr NOx] and section 35.B.4 of the incorporated "California Exhaust Emissions Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" adopted Dec. 12, 2002, as last amended Sep. 1, 2006. The required test data shall be submitted within 30 days from date this Executive Order was signed. If the manufacturer fails to provide compliant emission test data within the aforementioned period, this Executive Order is hereby null and void and all engines sold under this Executive Order are hereby deemed as uncertified engines.

BE IT FURTHER RESOLVED: For the listed engine models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels) and 13 CCR 2035 et seq. (emission control warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.
The Bureau of Automotive Repair will be notified by copy of this Executive Order.

Executed at El Monte, California on this 9th day of July 2010.

FOR ANNETTE HEBERT

Annette Hebert, Chief
Mobile Source Operations Division

SUPERSEDED

Engine Model Summary Template

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
~~ASZXH05.23FA~~	~~523FA~~	~~4HK1TC~~	~~210@2500~~	~~143@2500~~	~~79.5@2500~~	~~441@1850 -2500~~	~~135@1850~~	~~55.0@1850~~	~~DFI, EGR, CAC, TC, PCV, OC, PTOX, VAF ,EM, SCR~~
ASZXH05.23FB	523FB	4HK1TC	190@2650	126@2650	74.0@2650	376@1600 -2650	115@1600	40.5@1600	~~DFI, EGR, CAC, TC, PCV, OC, PTOX, VAF ,EM, SCR~~

DDI, TC, CAC, ECM, EGR, OC, PTOX, SCR

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A-020-0250

V1.2EZ -3/07

Family Information Form-Template

Manufacturer:

Engine category:

Cert contact:

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1. Model Year: 2010
2. Carry over: No
   If yes, list the previous family:
3. Process Code: New Submission
   Date EPA Fee Paid: 10/22/2009
4. EPA Standard Engine Family: ASZXH05.23FB
5. Mfr's Family Name: N/A
6. Engine Cycle: Diesel
7. Displacement(s) (CID or Liters) 5.2 Liters
8. Engine Configuration: L-4
   Use the following format:V-8 or I-6
9. Emission Control & Aftertreatment:
   Check all that apply

X Electronic control	Lean NOx
X Engine Modification	X SCR
3WCatalyst	X DOC
Smoke puff limiter	None
Passive DPF	Other
X Active DPF	
X EGR	
NOx adsorber	

If Other Describe: SCR, ECM, EGR, OC, DECX

10. Fuel Type: Diesel
11. Fuel System Type: Electronic Direct Injection DDI
12. Method Of Aspiration: Single Stage Turbo TC, CAC
    Turbocharger Type VGT
    Aftercooling Air to Air
13. Useful Life Period: 10 years / 110,000 miles
14. Deterioration Factor Type
    A. Gaseous Exhaust: Multiplicative
    B. Smoke: NA
15. Intended Service Class LHDD
    If CFF, Select which category: CFF/ULEV
16. Projected Sales : FED [redacted]
    CA [redacted]
    TOTAL [redacted]
17. Estimated Production Period: Start 5/7/10 End 12/31/2010
18. Sales Area: ○ Fed ○ Cal ◉ 50 St

Applicable Regulations

- ○ Part 89
- ○ Part 1039 } Nonroa
- ○ Part 60 only certified to requirements of Part 1039
- ○ Part 60 only certified to requirements of Part 89 } Stationa only
- ○ Part 60 and Part 1039
- ○ Part 60 and Part 89 } Station Nonroa

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19. Plant Contact:
    Takashi Oodaira Official Manager,Quality Assurance Planning,ISUZU MOTORS LTD.
    Telephone(03)5471-1111
20. Plant Location:
    ISUZU MOTORS LTD.
    8 Tsuchidana,
    Fujisawa-shi,Kanagawa-ken
    252-8501,Japan
21. ABT Information: Check all that apply

In the split family program	NMHC+NOx
PM	X NA
NOx	

22. Family Emission Limits:
    PM
    NOx
    NMHC + NOx
    Units: g/bHp-hr
23. Nonroad Engine Equipment Types:

Crane	Dozer	Generator Set
Loaders	Pump	NA
Tractor	Compressor	Other...

Are: 2.evans

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24. Auxiliary Emission Control Devices:

AECD	Sensed	PARAMETER	Controlled	VMT	TONS/ENGINE	emission control?
Warm Up	Intake air temperature	Injection timing , main	Please			Yes
DPF	Mass air flow sensor	EGR, Intake throttle ,	refer to			Yes
EGR	IIntake manifold	EGR	separate			Yes
Overheat	Fuel temperature sensor	coolant temperature, fuel	AECD			Yes
SCR	Coolant temperature sensor	DEF Injection	Submission			Yes
						Yes
						Yes
						Yes
						Yes
						Yes

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25. Adjustable Parameters:

Parameter	Adjustable Range (or N/a)	Tamper Resistance Method (or N/a)
N/A		

26. OBD

OBD Approval date:

OBD Approval Method:

Examples: letter from EPA , verbal from EPA, E.O. covers it

27. Maintenance Interval

Alternate Maintenance Int.? Yes

If yes, describe DEF refill interval

28. Is this engine family using the Delegated Assembly flexibility described in 85.1713? Yes No

If yes, attach plan in a container field on technical description page

29. Comments:

Note

SUPERSEDED

Test Information Form

Manufacturer: **Isuzu Motors Limited**

Engine category: **On-highway HDDE**

Cert contact: **ISUZU Manufacturing Services**

1. EPA Standard Engine Family: **ASZXH05.23FB**
2. Process Code: **New Submission**
3. Test Data Set: **1**
4. Engine Code: **523FA-1**
5. Engine Model: **4HK1TC**
6. Displacement(s) (cid Or Liters): **5.2 Liters**
7. Engine I.d. Number: **4HK1-767699**
8. Rated HP @ Rated RPM: **210** @ **2500**
9. Torque (ft-lb) @ Engine RPM: **441** @ **1850-2500**
10. WAIVERs:

CO	PM	Smoke	Idle Co
No	No	Yes	NA

11. Cold Start? **No**
12. Certification Fuel: **Diesel (Part 86.1313-2007(b)-Table N07-2)**
13. Special Test Device **No**
14. Test Procedure: **On-Hwy Diesel**

15. Crankcase emissions (CCEs)

- (●) **CCEs routed into the air inlet system**
- ( ) **CCEs routed into the exhaust upstream of aftertreatment**
- ( ) **CCEs measured separately from exhaust emissions.**

If the CCEs are measured separately list them in the tech. description (item 13) and account for them in the test results listed below.

16. Official Test Results Date: **10/24/2009**

	Test 1	Test 2	Test 3	DFs
HC/OMHCE				
NMHC/OMNMHCE	0.00			1.000
HC + NOx				
CARBON MONOXIDE	0.01			3.286
OXIDE OF NITROGEN	0.15			1.133
PARTICULATE	0.002			1.000
FORMALDEHYDE				
ACCELERATION (%opacity)				
LUGGING (Gen) (%opacity)				
PEAK (%opacity)				
IDLE CO %				
CO2	570			

17. Adjustment Factors

	DPF EFL	DPF EFH	DPF UAF	DPF DAF	NOx Adsorber, etc (Strategy) EFL	EFH	UAF	DAF
HC/OMHCE	0.001	0.000	0.000	0.001				
CARBON MONOXIDE	0.006	0.000	0.000	0.006				
OXIDE OF NITROGEN	0.151	0.288	0.003	-0.134				
PARTICULATE	0.002	0.009	0.000	-0.007				

Frequency Factor: **0.022**

Frequency Factor:

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18. Certification Levels (Rounded Test Results)

Units-- g/bHp-hr --Units

		STDs g/BHP-hr	STDs g/kW-hr	FELs
HC/OMHCE				
NMHC/OMNMHCE	0.0 (0.00)	0.14		
NMHC + NOx				
CARBON MONOXIDE	0.0 (0.03)	15.5		
OXIDE OF NITROGEN	0.2 (0.17)	0.20		
PARTICULATE	0.00 (0.002)	0.01		
FORMALDEHYDE				
ACCELERATION (%opacity)				
LUGGING (Gen) (%opacity)				
PEAK (%opacity)				
IDLE CO%				

SUPERSEDED

Supplemental Test Information Form

Manufacturer: **Isuzu Motors Limited**

Engine category: **On-highway HDDE**

1. EPA Engine Family: **ASZXH05.23FB**
2. Process Code: New Submission
3. Test Data Set: 1
4. Engine Code: 523FA-1
5. Engine Model: 4HK1TC
6. Displacement(s) (cid Or Liters): 5.2 Liters
7. Engine I.d. Number: 4HK1-767699
8. Rated HP @ Rated RPM: 210 @ 2500
9. Torque (ft-lb) @ Engine RPM: 441 @ 1850-2500
10. WAIVERs:

CO	PM	Smoke
No	No	Yes

11. Cold Start? No
12. Certification Fuel: Diesel (Part 86.1313-2007(b)-Table N07-2)
13. Special Test Device
14. Test Procedure: Supplemental Euro III AND TLRT

15. Supplemental Euro III Test Information

Test Date:	**10/24/2009**		A Speed:	**1775**	(RPM)	A Speed Max Torque:	**431**	(ft-lbs)	**Mystery Points**		
N_{lo} Speed:	**1428**	(RPM)	B Speed:	**2122**	(RPM)	B Speed Max Torque:	**441**	(ft-lbs)	% Speed	% Load	
N_{hi} Speed:	**2815**	(RPM)	C Speed:	**2468**	(RPM)	C Speed Max Torque:	**441**	(ft-lbs)			

16. Supplemental Euro III Modal Results (g/bhp-hr):

ESC Test Point

	1	2	3	4	5	6	7	8	9	10	11	12	13	Myst 1	Myst 2	Myst 3
HC/OMHCE																
NMHC/OMNMHCE																
HC + NOx																
CO																
NOx																
Formaldehyde																
RPM																
Torque (ft - lbs)																
CO2																

17. Adjustment Factors

	DPF EFL	DPF EFH	DPF UAF	DPF DAF	NOx Adsorber, etc Strategy EFL	EFH	UAF	DAF
HC/OMHCE	0.000	0.000	0.000	0.000				
CARBON MONOXIDE	0.000	0.000	0.000	0.000				
OXIDE OF NITROGEN	0.056	0.108	0.002	-0.050				
PARTICULATE	0.002	0.004	0.000	-0.002				
Frequency Factor	0.0353				Frequency Factor			

18. Weighted Composite Results (g/bhp-hr): **19. Deterioration Factors:** **20. Certification Levels (g/bhp-hr):**

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HC/OMHCE						
NMHC/OMNMHCE	0.00		1.000		**0.0**	(0.00)
HC + NOx						
CO	0.00	**X**	3.286	**=**	**0.0**	(0.00)
NOx	0.06		1.133		**0.1**	(0.07)
Formaldehyde						
PM (Composite only)	0.002		1.000		**0.00**	(0.002)
CO2	532.24	DF Type:	Multiplicative	Same DFs as test page		Limits

21. Transient Load Response Limit Results (g/bhp-hr):

	HC	NOx	PM	Beginning Load (ft-lbs)	Sample Interval Length
Lowest NTE Speed					
15% ESC Speed	**0.00**	**0.02**	**0.01**	**202.39**	**720.00**
25% ESC Speed	**0.00**	**0.02**	**0.00**	**186.60**	**720.00**
50% ESC Speed	**0.00**	**0.01**	**0.00**	**156.07**	**720.00**
75% ESC Speed	**0.00**	**0.01**	**0.00**	**132.32**	**720.00**
100% ESC Speed	**0.00**	**0.01**	**0.00**	**132.32**	**720.00**

SUPERSEDED