



Kraftfahrt-Bundesamt

DE-24932 Flensburg

Bestätigung

Confirmation

Benachrichtigung über die Erteilung einer Bestätigung
für eine selbständige technische Einheit (Motorenfamilie)
gemäß der Richtlinie 2005/55/EG, zuletzt geändert durch die Richtlinie
2006/51/EG

Communication concerning the type-approval
of a separate technical unit engine family
with regard to Directive 2005/55/EC as last amended by Directive
2006/51/EC

Nummer der Bestätigung: **2005/55*2008/74G*0376*00**
confirmation No.:

Abschnitt I - Section I

- 0. Allgemeines - General
- 0.1. Fabrikmarke der selbständigen technischen Einheit -
Make of separate technical unit:
Weichai Power Co., Ltd.
- 0.2. Herstellerseitige Bezeichnung für die selbständige technischen Einheit -
Manufacturer's designation of separate technical unit:
WP13E50
- 0.3. Herstellerseitige Typenkodierung mit der die selbständige technische Einheit
gekennzeichnet ist - Manufacturer's type coding as marked on the separate
technical unit:
WP13.550E50
WP13.530E50
WP13.500E50
WP13.480E50
- 04. Fahrzeugklasse - Category of vehicle:
entfällt - not applicable
- 0.5. Motorklasse - Category of engine:
Diesel - diesel
- 0.6. Name und Anschrift des Herstellers - Name and address of manufacturer:
Weichai Power Co., Ltd.
CN-26100 Weifang



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- 0.7. Gegebenenfalls Name und Anschrift des Beauftragten des Herstellers -
Name and address of manufacturer's authorized representative (if any):
entfällt - not applicable

Abschnitt II - Section II

1. Gegebenenfalls Kurzbeschreibung -
Brief description (where appropriate):
siehe Anlage - see Appendix
2. Für die Durchführung der Prüfungen zuständiger Technischer Dienst -
Technical department responsible for carrying out the tests:
TÜV SÜD Auto Service GmbH
DE-80686 München
3. Datum des Prüfberichts - Date of test report:
12.06.2014
4. Nummer des Prüfberichts - Number of test report:
14-00431-CP-GBM-00
5. Gegebenenfalls Grund bzw. Gründe für die Erweiterung der Typgenehmigung -
Ground(s) for extending type-approval (where appropriate):
entfällt - not applicable
6. (Gegebenenfalls) Anmerkungen - Remarks (if any):
siehe Anlage I - See Appendix I



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7. Ort - Place: **DE-24932 Flensburg**
8. Datum - Date: **25.07.2014**
9. Unterschrift: **Im Auftrag**
Signature:

(Matthias Kratz)



10. Das Inhaltsverzeichnis der bei der zuständigen Behörde hinterlegten Typgenehmigungsunterlagen, die auf Antrag erhältlich sind, liegt bei -
A list of documents making up the type-approval file lodged with the administrative department that has granted type-approval, which may be obtained on request, is attached.
- 1 .Anlage zum EG-Typgenehmigungsbogen
Appendix to the EEC type-approval certificate
 - 2 . OBD-Spezifische Information
OBD Related Information
 3. Inhaltsverzeichnis zu den Beschreibungsunterlagen
Index to the information package
 4. Beschreibungsunterlagen
Information package



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Anlage 1 Appendix 1

zur EG Bestätigung Nr.:2005/55*2008/74G*0376*00
betreffend die Typgenehmigung für eine technische Einheit
to confirmation No.:2005/55*2008/74G*0376*00
concerning the type approval of a separate technical unit

1. Kurzbeschreibung - Brief description
- 1.1. Anzugebende Einzelheiten im Zusammenhang mit der Typgenehmigung eines Fahrzeugs mit eingebautem Motor -
Particulars to be completed in relation to the type-approval of a vehicle with an engine installed:
entfällt - not applicable
- 1.2. Wenn der in 1.1 genannte Motor eine Typgenehmigung als selbständige technische Einheit erhalten hat - If the engine referred to in 1.1 has been type-approval as a separate technical unit:
entfällt - not applicable
- 1.3. Anzugebende Einzelheiten im Zusammenhang mit der Typgenehmigung für **eine Motorenfamilie** als selbständige technische Einheit beim Einbau des Motors in ein Fahrzeug einzuhaltende Vorschriften -
Particulars to be completed in relation to the type-approval of an **engine family** as a separate technical unit (conditions to be respected in the installation of the engine on a vehicle):
 - 1.3.1. Höchster und/oder niedrigster Ansaugunterdruck -
Maximum and/or minimum intake depression:
3,5 kPa
 - 1.3.2. Maximal zulässiger Abgasgegendruck - Maximum allowable back pressure:
20,0 kPa
 - 1.3.3. Volumen der Auspuffanlage - Exhaust system volume:
170 dm³
 - 1.3.4. Leistungsaufnahme der vom Motor angetriebenen Hilfseinrichtungen -
Power absorbed by auxiliaries needed for operating the engine:

1.3.4.1. Leerlauf Idle 0,0 kW	Niedrige Drehzahl Low speed 0,5 kW	Hohe Drehzahl High speed 1,9 kW	
Drehzahl A Speed A 0,7 kW	Drehzahl B Speed B 1,0 kW	Drehzahl C Speed C 1,5 kW	Bezugsdrehzahl Reference speed 2,0 kW



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1.3.5. (Gegebenenfalls) Nutzungsbeschränkungen - Restrictions of use (if any):
keine - none

1.4. Emissionswerte des Stamm-Motors - Emission levels of the parent engine:

1.4.1. ESC-Prüfung - ESC test:
Verschlechterungsfaktor (DF) - Deterioration factor (DF):

ESC-Prüfung - ESC test:					
	DF	CO	THC	NO _x	PT
		1,1	1,05	1,05	1,1
	Emissionen- Emissions	CO (g/kWh)	THC (g/kWh)	NO _x (g/kWh)	PT (g/kWh)
	Gemessen- Measured	0,24	0,012	1,55	0,010
	Mit DF berechnet- Calculated with DF:	0,26	0,013	1,63	0,011

1.4.2. ELR-Prüfung - ELR-test :
Rauchwert - Smoke value 0,17 m⁻¹

1.4.3. ETC-Prüfung - ETC-test:
Verschlechterungsfaktor (DF) - Deterioration factor (DF):

ETC -Prüfung - ETC test:						
	DF	CO	NMHC	CH ₄	NO _x	PT
		1,1	1,05	--	1,05	0,022
	Emissionen- Emissions	CO (g/kWh)	NMHC (g/kWh)	THC (g/kWh)	NO _x (g/kWh)	PT (g/kWh)
	mit Regenerierung gemessen- Measured with regeneration	--	--	--	--	--
	Ohne Regenerierung gemessen - Measured without regeneration	--	--	--	--	--
	gemessen/gewichtet- Measured/weighted	0,55	0,020	--	1,38	0,022
	Mit DF berechnet- Calculated with DF:	0,61	0,021	--	1,45	0,024

*) siehe Anlage - see enclosure



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Anlage 2 Appendix 2

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OBD-SPEZIFISCHE INFORMATIONEN OBD RELATED INFORMATION

Laut Anlage 5 zu Anhang II dieser Richtlinie werden die Informationen in dieser Anlage durch den Fahrzeughersteller bereitgestellt, damit die Herstellung von OBD-kompatiblen Ersatzteilen sowie Diagnose- und Prüfgeräten ermöglicht wird. Der Fahrzeughersteller braucht derartige Informationen nicht bereitzustellen, wenn daran Rechte des geistigen Eigentums bestehen oder wenn sie spezifisches Know-how entweder des Herstellers oder des (der) OEM-Zulieferer(s) (Erstausrüster) darstellen.

As noted in Appendix 5 of Annex II to this Directive, the information in this appendix is provided by the vehicle manufacturer for the purposes of enabling the manufacture of OBD-compatible replacement or service parts and diagnostic tools and test equipment. Such information need not be supplied by the vehicle manufacturer if it is covered by intellectual property rights or constitutes specific know-how of the manufacturer or the OEM supplier(s).

Auf Anfrage wird diese Anlage allen interessierten Herstellern von Bauteilen, Diagnose- oder Prüfgeräten zu gleichen Bedingungen zur Verfügung gestellt.

Upon request, this appendix will be made available to any interested component, diagnostic tools or test equipment manufacturer, on a non-discriminatory basis.

Gemäß den Vorschriften in Anhang II Anlage 5 Nummer 1.3.3 sind gemäß dieser Nummer dieselben Angaben erforderlich wie die in jener Anlage vorgesehenen.

In compliance with the provisions of section 1.3.3 of Appendix 5 to Annex II, the information required by this section shall be identical to that provided in that Appendix.

1. Eine Beschreibung des Typs und der Zahl der Vorkonditionierungszyklen für die ursprüngliche Typgenehmigung des Fahrzeugs.

A description of the type and number of the pre-conditioning cycles used for the original type approval of the vehicle.

2. Eine Beschreibung des Typs des OBD-Testzyklus der ursprünglichen Typgenehmigung des Fahrzeugs für das von dem OBD-System überwachte Bauteil

A description of the type of the OBD demonstration cycle used for the original type approval of the vehicle for the component monitored by the OBD system.



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3. Umfassende Unterlagen, in denen alle Bauteile beschrieben sind, die im Rahmen der Strategie zur Meldung von Funktionsstörungen und der Aktivierung der Fehlfunktionsanzeige überwacht werden (feste Anzahl von Fahrzyklen oder statistische Methode), einschließlich eines Verzeichnisses einschlägiger sekundär ermittelter Parameter für jedes Bauteil, das durch das OBD-System überwacht wird. Eine Liste aller vom OBD-System verwendeten Ausgabecodes und -formate (jeweils mit Erläuterung) für einzelne emissionsrelevante Bauteile des Antriebsstrangs und für einzelne nicht emissionsrelevante Bauteile, wenn die Überwachung des Bauteils die Aktivierung der Fehlfunktionsanzeige bestimmt.

A comprehensive document describing all sensed components with the strategy for fault detection and MI activation (fixed number of driving cycles or statistical method), including a list of relevant secondary sensed parameters for each component monitored by the OBD system. A list of all OBD output codes and format used (with an explanation of each) associated with individual emission related powertrain components and individual non-emission related components, where monitoring of the component is used to determine MI activation.



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Anlage 3
Enclosure 3

Zur Nummer der Bestätigung Nr.: 2005/55*2008/74G*0376*00
To EC confirmation No.:

Inhaltsverzeichnis zu den Beschreibungsunterlagen

Index to the information package

Ausgabedatum: **25.07.2014**
Date of issue

letztes Änderungsdatum:
last date of amendment:

1. Nebenbestimmungen und Rechtsbehelfsbelehrung
Collateral clauses and instruction on right to appeal

2. Beschreibungsbogen Nr.:
Information document No.
P13-RZ-1405001

Datum:
Date
15.05.2014

letztes Änderungsdatum: --
last date of amendment:

3. Prüfbericht (e) Nr.:
Test report (s) No.:
14-00431-CP-GBM-00

Datum:
Date
12.06.2014



Kraftfahrt-Bundesamt

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Number of the approval:

- Anlage -

Nebenbestimmungen und Rechtsbehelfsbelehrung

Nebenbestimmungen

Die Einzelerzeugnisse der reihenweisen Fertigung müssen mit den Genehmigungsunterlagen genau übereinstimmen. Änderungen an den Einzelerzeugnissen sind nur mit ausdrücklicher Zustimmung des Kraftfahrt-Bundesamtes gestattet.

Änderungen der Firmenbezeichnung, der Anschrift und der Fertigungsstätten sowie eines bei der Erteilung der Genehmigung benannten Zustellungsbevollmächtigten oder bevollmächtigten Vertreters sind dem Kraftfahrt-Bundesamt unverzüglich mitzuteilen.

Verstöße gegen diese Bestimmungen können zum Widerruf der Genehmigung führen und können überdies strafrechtlich verfolgt werden.

Die Genehmigung erlischt, wenn sie zurückgegeben oder entzogen wird oder der genehmigte Typ den Rechtsvorschriften nicht mehr entspricht. Der Widerruf kann ausgesprochen werden, wenn die für die Erteilung und den Bestand der Genehmigung geforderten Voraussetzungen nicht mehr bestehen, wenn der Genehmigungsinhaber gegen die mit der Genehmigung verbundenen Pflichten - auch soweit sie sich aus den zu dieser Genehmigung zugeordneten besonderen Auflagen ergeben - verstößt oder wenn sich herausstellt, dass der genehmigte Typ den Erfordernissen der Verkehrssicherheit oder des Umweltschutzes nicht entspricht.

Das Kraftfahrt-Bundesamt kann jederzeit die ordnungsgemäße Ausübung der durch diese Genehmigung verliehenen Befugnisse, insbesondere die genehmigungsgerechte Fertigung sowie die Maßnahmen zur Übereinstimmung der Produktion, nachprüfen. Es kann zu diesem Zweck Proben entnehmen oder entnehmen lassen. Dem Kraftfahrt-Bundesamt und/oder seinen Beauftragten ist ungehinderter Zutritt zu Produktions- und Lagerstätten zu gewähren.

Die mit der Erteilung dieser Genehmigung verliehenen Befugnisse sind nicht übertragbar. Schutzrechte Dritter werden durch diese Genehmigung nicht berührt.

Rechtsbehelfsbelehrung

Gegen diese Genehmigung kann innerhalb eines Monats nach Bekanntgabe Widerspruch erhoben werden. Der Widerspruch ist beim **Kraftfahrt-Bundesamt, Fördestraße 16, DE-24944 Flensburg**, schriftlich oder zur Niederschrift einzulegen.



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Confirmation No.:

- Attachment -

Collateral clauses and instruction on right to appeal

Collateral clauses

The individual production of serial fabrication must be in exact accordance with the approval documents. Changes in the individual production are only allowed with express consent of the Kraftfahrt-Bundesamt.

Changes in the name of the company, the address and the manufacturing plant as well as one of the parties given the authority to delivery or authorised representative named when the approval was granted is to be immediately disclosed to the Kraftfahrt-Bundesamt. Breach of this regulation can lead to recall of the approval and moreover can be legally prosecuted.

The approval expires if it is returned or withdrawn or if the type approved no longer complies with the legal requirements. The revocation can be made if the demanded requirements for issuance and the continuance of the approval no longer exist, if the holder of the approval violates the duties involved in the approval, also to the extent that they result from the assigned conditions to this approval, or if it is determined that the approved type does not comply with the requirements of traffic safety or environmental protection.

The Kraftfahrt-Bundesamt may check the proper exercise of the conferred authority taken from this approval at any time. In particular this means the compliant production as well as the measures for conformity of production. For this purpose samples can be taken or have taken. The employees or the representatives of the Kraftfahrt-Bundesamt may get unhindered access to the production and storage facilities.

The conferred authority contained with issuance of this approval is not transferable. Trade mark rights of third parties are not affected with this approval.

Instruction on right to appeal

This approval can be appealed within one month after notification. The appeal is to be filed in writing or as a transcript at the **Kraftfahrt-Bundesamt, Fördestraße 16, DE-24944 Flensburg.**

Techn.Bericht Nr. / *Techn. Report No.:* 14-00431-CP-GBM-00
Hersteller / *Manufacturer:* Weichai Power Co.,Ltd.
Typ / *Type:* WP13E50

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TECHNISCHER BERICHT TECHNICAL REPORT

Nr. / No.: 14-00431-CP-GBM-00

gemäß Richtlinie des Rates über /
with regard to Council Directive relating to

**Maßnahmen gegen die Emission gasförmiger Schadstoffe und luftverunreinigender
Partikel aus Selbstzündungsmotoren zum Antrieb von Fahrzeugen und die Emission
gasförmiger Schadstoffe aus mit Erdgas oder Flüssiggas betriebenen
Fremdzündungsmotoren zum Antrieb von Fahrzeugen /**
*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*

2005/55/EG / EC

vom / of **28.09.2005**

einschließlich der Änderungen durch *including all amendments until*

2008/74/EG / EC

vom / of **18.07.2008**

Bisher erteilte Genehmigungen / <i>Approvals granted up to now</i>		
	Genehmigungsnummer / <i>Number of approval</i>	Datum / <i>Date</i>
EWG / <i>EEC</i>	---	---

Techn.Bericht Nr. / *Techn. Report No.:* 14-00431-CP-GBM-00
Hersteller / *Manufacturer:* Weichai Power Co.,Ltd.
Typ / *Type:* WP13E50

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I. Allgemeine Angaben / General

- 0.1. Fabrikmarke / *Make:* Weichai Power Co.,Ltd.
- 0.2. Typ und allg. Handelsbezeichnung / *Type and gen. Commercialdescription:* WP13E50
- 0.3. Merkmale zur Typerkennung und ihre Anbringungsstelle, sofern am Fahrzeug vorhanden / *Means and location of identification of type, if marked on the vehicle:*
entfällt /*n.a.*
- 0.4. Fahrzeugklasse / *Category of vehicle:* entfällt /*n.a.*
- 0.5. Motorklasse / *Category of engine:* Diesel
- 0.6. Name und Anschrift des Herstellers / *Name and address of manufacturer:* Weichai Power Co.,Ltd.
No. 197A, Fushou East Street,
Weifang, Shandong
China
- (0.12.) Beschreibungsbogen Nr. / *Information Document No.:* P13-RZ-1405001
- Ausgabedatum / *date of issue:* 15.05.2014
Änderung vom / *Modification of:* -

Techn.Bericht Nr. / *Techn. Report No.:* 14-00431-CP-GBM-00
Hersteller / Manufacturer: Weichai Power Co.,Ltd.
Typ / Type: WP13E50

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II. Prüfprotokoll / Test report

1. **Prüfobjekt / Test object**

1.1. Technische Daten / *Technical dates:* siehe Beschreibungsbogen
see Information Document

1.2. Angaben zum Prüfobjekt /
Informations about the test object:

- Marke / *Make:* Weichai Power Co.,Ltd.

- Typ / *Type:* WP13E50

- geprüfte Ausführung /
tested version:

A:	WP13.550E50	Stammotor / parent engine
B:	WP13.530E50	
C:	WP13.500E50	
D:	WP13.480E50	

- Motornummer / *Engine number:* A: 3113J000267

- Schadstoffminderungs-System /
Emission reduction system: SCR- System

- Kalibriernummer der Software des
Motorsteuergerätes /
*Engine Control Unit (ECU) software
calibration number* siehe Beschreibungsbogen, Anlage 2; 2.1.1. /
see information document attachment 2; 2.1.1.

- Name und Anschrift des Herstellers /
Name and adress of manufacturers: Weichai Power Co.,Ltd.
No. 197A, Fushou East Street,
Weifang, Shandong
China

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2. Prüfbedingungen / *Test conditions*

2.1.	Drücke bei Nenndrehzahl / <i>Pressures at rated speed</i>	Ausf. / vers.:	
	- Ansaugunterdruck / <i>Intake depression (kPa):</i>	A-D:	3,5
	- Abgasgegendruck / <i>Exhaust back pressure (kPa):</i>	A-D:	20,0
	- Ladeluftdruck / <i>charge pressure:</i>		
	vor Ladeluftkühler / <i>in front of intercooler (kPa):</i>	A:	136,4
	- nach Ladeluftkühler / <i>behind intercooler (kPa):</i>	A:	138,0
2.2.	Prüfdrehzahlen / <i>Test speeds</i>		
	ESC-, ELR-Prüfung / <i>for ESC, ELR test</i>		
	- Leerlauf / <i>Idle speed (min⁻¹):</i>	A-D:	600
	- Drehzahl A / <i>speed A (min⁻¹):</i>	A-D:	1300
	- Drehzahl B / <i>speed B (min⁻¹):</i>	A-D:	1600
	- Drehzahl C / <i>speed C (min⁻¹):</i>	A-D:	1900
	ETC-Zyklus / <i>ETC cycle</i>		
	- Bezugsdrehzahl / <i>Reference speed (min⁻¹):</i>	A-D:	2140
2.3.	Trübungsmeßgerät / <i>Opacimeter</i>	ELR Prüfung / <i>ELR test</i>	
	- Marke / <i>Make:</i>	AVL	
	- Typ / <i>Type:</i>	439	

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3. Ergebnisse der Prüfungen / *Test results*

3.1. Prüfung nach 2005/55/EWG /
Test according to 2005/55/EEC

3.2. Die Prüfmittel und Prüfbedingungen entsprechen den Anforderungen der Richtlinie 2005/55/EG, Anh.III - V. / *The test equipment and the test conditions are in accordance with annex III - V of the directive 2005/55/EC.*

3.3. Emissionswerte / *Emission test results*

3.3.1.1. ESC-Zyklus / *ESC-cycle*

Ausführung A (Stamm-Motor) / *version A (parent engine)*

	Messwerte / <i>measured values</i> [g/kWh]	Verschlechter- ungsfaktor ¹⁾ / <i>deterioration</i> <i>facxtor</i> ¹⁾	Ergebnisse / <i>results</i> [g/kWh]	Grenzwerte ²⁾ / <i>limits</i> ²⁾ [g/kWh]
CO	0,24	1,1	0,26	1,5
HC	0,012	1,05	0,013	0,46
NO _x	1,55	1,05	1,63	2,0
Partikel / <i>particulate</i>	0,010	1,1	0,011	0,02
mittlere Ammoniak Konzentration im Abgas / <i>average ammonia concentration in exhaust</i>			4,2 ppm	25 ppm ³⁾

¹⁾ gemäß Anhang II, Abschnitt 3.6, 2005/55/EG i.d.F. 2005/78/EG /
according Annex II, section 3.6, 2005/55/EC last amended by 2005/78/EC

²⁾ gemäß Anhang I, Abschnitt 6.2.1, Tabelle 1, Zeile B2, 2005/55/EG /
according Annex I, section 6.2.1, table 1, line B2, 2005/55/EC

³⁾ gemäß Anhang I, Abschnitt 6.5.1.7, 2008/74/EG /
according Annex I, section 6.5.1.7, 2008/74/EC

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3.3.2.1. ETC-Zyklus / *ETC-cycle*

Ausführung A (Stamm-Motor) / *version A (parent engine)*

	Messwerte / <i>measured values</i> [g/kWh]	Verschlechter- ungsfaktor ¹⁾ / <i>deterioration</i> <i>factor</i> ¹⁾	Ergebnisse / <i>results</i> [g/kWh]	Grenzwerte ⁴⁾ / <i>limits</i> ⁴⁾ [g/kWh]
CO	0,55	1,1	0,61	4,0
NMHC ⁵⁾	0,020	1,05	0,021	0,55
CH ₄	n.a.	-	n.a.	1,1
NO _x	1,38	1,05	1,45	2,0
Partikel / <i>particulate</i>	0,022	1,1	0,024	0,03
mittlere Ammoniak Konzentration im Abgas / <i>average ammonia concentration in exhaust</i>			4,7 ppm	25 ppm ³⁾

¹⁾ gemäß Anhang II, Abschnitt 3.6, 2005/55/EG i.d.F. 2005/78/EG /
according Annex II, section 3.6, 2005/55/EC last amended by 2005/78/EC

³⁾ gemäß Anhang I, Abschnitt 6.5.1.7, 2008/74/EG /
according Annex I, section 6.5.1.7, 2008/74/EC

⁴⁾ gemäß Anhang I, Abschnitt 6.2.1, Tabelle 2, Zeile B2, 2005/55/EG
according Annex I, section 6.2.1, table 2, line B2, 2005/55/EC

⁵⁾ dargestellt als THC nach 6.2.2.1, 2005/55/EG
displayed as THC according 6.2.2.1, 2005/55/EC

3.3.3.1. ELR-Zyklus / *ELR-cycle*

Ausführung A (Stamm-Motor) / *version A (parent engine)*

	Ergebnis / <i>result</i> m ⁻¹	Grenzwert / <i>limit</i> m ⁻¹ ¹⁾
Rauch / <i>smoke</i>	0,17	0,5

¹⁾ gemäß Anhang I, Abschnitt 6.2.1, Tabelle 1, Zeile B2, 2005/55/EG
according Annex I, section 6.2.1, table 1, line B2, 2005/55/EC

Techn.Bericht Nr. / *Techn. Report No.:* 14-00431-CP-GBM-00
Hersteller / *Manufacturer:* Weichai Power Co.,Ltd.
Typ / *Type:* WP13E50

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3.4. Prüfergebnisse für die Abgastrübung / *smoke opacity test result*

3.4.1. Bei gleich bleibenden Drehzahlen / *at steady speeds*

3.4.1.1 Ausführung A (Stamm-Motor) / *version A (parent engine)*

	Drehzahl ²⁾ / <i>Engine speed</i> ²⁾ min ⁻¹	Nennwert des Luftdurchsatzes ²⁾ / <i>Nominal flow</i> ²⁾ l/s	Grenzwerte der Absorption ²⁾ / <i>Limit absorption</i> <i>values</i> ²⁾ m ⁻¹	gemessene Ab- sorptionswerte ²⁾ / <i>Measured ab-</i> <i>sorption values</i> ²⁾ m ⁻¹
1	1000	104,5	1,462	0,006
2	1220	127,5	1,328	0,003
3	1440	150,5	1,226	0,005
4	1660	173,5	1,145	0,008
5	1880	196,5	1,079	0,015
6	2100	219,5	1,065	0,037

¹⁾ gemäß Anhang II, Anlage 1, 8.4., 2005/55/EG i.d.F. 2008/74/EG /
according Annex II, Appendix 1, 8.4., 2005/55/EC last amended by 2008/74/EC

²⁾ gemäß Anhang VI, Anlage 1, 1.7.1., 2005/55/EG i.d.F. 2008/74/EG/
according Annex VI, Appendix 1, 1.7.1., 2005/55/EC last amended by 2008/74/EC

3.4.2. Prüfung bei freier Beschleunigung / *free acceleration tests*

gemessener Absorptionswert ³⁾ /
measured absorption value ³⁾: A: 0,32 m⁻¹

zul. Meßwert bei Motoren mit Abgasturboaufladung /
permissible test result in case of engines with exhaust-gas turbo charging:
A: 1,57 m⁻¹

Korrigierter Absorptionswert ³⁾ /
corrected absorption value ³⁾: A: 0,82 m⁻¹

³⁾ gemäß Anhang VI, Anlage 1, 1.7.2., 2005/55/EG i.d.F. 2008/74/EG/
according Annex VI, Appendix 1, 1.7.2., 2005/55/EC last amended by 2008/74/EC

Normale Leerlaufdrehzahl /
normal engine low idle speed: A: 600 min⁻¹

Höchst-drehzahl des Motors /
maximal engine speed: A: 2310 min⁻¹

Nennleistung / *Net power:* A: 400 kW / 2100 min⁻¹

Marke und Typ des Trübungsmessgeräts /
Make and type of opazimeter: siehe 2.3. / *see 2.3.*

Hauptmerkmale des Motors /
Principal characteristics of engine type: siehe 1.2. / *see 1.2.*

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**4. Ort und Datum der Prüfung /
Place and date of testing:**

A: Weifang, China, 19.05.2014

5. OBD

Bezeichnung der OBD-Familie /
Code of OBD-family :

WPOBD2.0

Nummer der Test – Dokumentation /
Number of test documentation :

12-00007-FE-GBM-00 und/and OBD2-RZ-WP7/WP12

6. Bemerkungen / *remarks:*

Die Dokumentation nach 6.1.7.1. a) (2005/55/EG) ist dem Beschreibungsbogen beigelegt (siehe Anlage). Die erweiterte Dokumentation gem. 6.1.7.1. b) (2005/55/EG) hat vorgelegen. / *Documents acc. to 6.1.7.1. a) (2005/55/EG) are attached to the information document (see enclosure). Additional documents acc. to 6.1.7.1. b) (2005/55/EG) were submitted to technical service.*

Die Überprüfung der NOx Kontrollpunkte führte zu keiner Beanstandung. / *The examination of NOx control points was not objectionable.*

Das geprüfte On Board Diagnosesystem entspricht den Anforderungen der OBD 2 mit NOx-Monitoring. / *The tested on board diagnostic system complies with the requirements of OBD 2 with NOx monitoring.*

Die Ausführungen B bis D lassen konstruktionsbedingt ähnliche Abgas-Emissionseigenschaften wie A erwarten. Gemäß Anhang II, Anlage 2 gelten die Abgaswerte des Stammmotors mit dem entsprechenden Abgasreinigungssystem. / *It is be expected that versions B to D depending on the construction-presumably show similar exhaust emission characteristics as A so that according to annex II enclosure 2 the exhaust emission results of the parent engine with the corresponding anti pollution device are therefore valid.*

III. Anlagen / Attachments

1. Beschreibungsbogen / *information document*

2. OBD Testprotokoll und OBD Beschreibung Nr. /
OBD testprotocol and OBD information No.:

12-00007-FE-GBM-00 und/and
OBD2-RZ-WP7/WP12

Ausstellungsdatum / *Date of issue:*
mit Änderung vom / *with amendment from:*

24.07.2012 / 01.09.2011

-

Techn.Bericht Nr. / *Techn. Report No.:* 14-00431-CP-GBM-00
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IV. Schlussbescheinigung / Certification

Der unter Nr. (0.12.) angegebene Beschreibungsbogen und der darin beschriebene Fahrzeugtyp entsprechen der Richtlinie 2005/55/EG zuletzt geändert durch 2008/74/EG mit den Grenzwerten in **Zeile B2** der Tabellen 1 und 2, 6.2.1. /

*The description as mentioned in no. (0.12.) and the vehicle type described therein are in compliance with the directive 2005/55/EC last amended by 2008/74/EG with the limits in **line B2** of the tables 1 and 2 of 6.2.1.*

Der Motortyp entspricht den Anforderungen der Richtlinie 2005/78/EG i.d.F. 2008/74/EG, **Anhang V, Buchstabe G.** /

*The engine type fulfils the requirements of the Directive 2005/78/EC last amended by 2008/74/EC, **Annex V, Character G.***

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Approval authority	Country	Registration-number	Actual scope list
Kraftfahrt-Bundesamt (KBA)	Germany	KBA-P 00100-10	www.kba.de
Vehicle Certification Agency (VCA)	United Kingdom	VCA-TS-006	http://ec.europa.eu/enterprise/sectors/automotive/approval-authorities-technical-services/technical-services/index_en.htm
Approval Authority of the Netherlands (RDW)	The Netherlands	RDW-99050009 01	
National Standards Authority of Ireland (NSAI)	Ireland	Technical Service Number: 49	
Vehicle Safety Certification Center (VSCC)	Taiwan	DE04-06-1	http://www.vsc.org.tw/English/Default.aspx



München, 12.06.2014

M. Böhm
Expert

Techn.Bericht Nr. / *Techn. Report No.*: 12-00007-FE-GBM-00
Hersteller / *Manufacturer*: Weichai Power Co.,Ltd.
Typ / *Type*: WPOBD2.0

Anlage / Attachment
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OBD-II TESTPROTOKOLL /

OBD-II Testprotocol

Nr. / No.: 12-00007-FE-GBM-00

gemäß Richtlinie /
according to directive

2005/55/EG / EC

vom / of **28.09.2005**

in der Fassung /
amended by

2008/74/EG / EC

vom / of **18.07.2008**

1. Angaben zum OBD-System / *Information to the OBD system*

Hersteller /
Manufacturer:

Weichai Power Co.,Ltd.

Datum der Prüfung /
Date of test:

04.-08.06.2011

Umfang der Prüfung /
Scope of test:

OBD Stufe II / *OBD stage II*, mit / *with* NO_x-Control

OBD-Familie /
OBD family:

WPOBD2.0

OBD-Beschreibung /
OBD description:

OBD2-RZ-WP7/WP12

Fahrzeug-Typ /
Vehicle type:

entfällt / *not applicable*

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Hersteller / *Manufacturer*: Weichai Power Co.,Ltd.
Typ / *Type*: WPOBD2.0

Anlage / Attachment
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1.2 Prüfergebnisse / *Test results*

Die Maßnahmen zur Aktivierung, Anzeige und Abschaltung der Fehlfunktions-Anzeige (MI) und zur Speicherung und Löschung der Fehler-Codes (P-Codes) entsprechen den Anforderungen des

Anhang IV, Abschnitt 3.6, 3.7, 3.8 und 3.9

Die Maßnahmen zur Aktivierung, Anzeige und Abschaltung der Reagenz-Füllstandsanzeige inklusive spezifischer Warn-Modus entsprechen den Anforderungen des

Anhang I, Abschnitt 3.3.3 und 6.5.4
Anhang IV, Abschnitt 3.3

Eine unzulässige, vorübergehende Abschaltung des OBD -Systems findet unter Berücksichtigung des

Anhang IV, Abschnitt 3.5.

nicht statt.

Die Vorkehrungen gegen Manipulationen des elektronischen Systems entsprechen den Anforderungen des

Anhang I, Abschnitt 6.1.10

Der Mindestinformationsumfang genügt den Forderungen des

Anhang I, Abschnitt 6.5.1.4
Anhang II, Anlage 5, Abschnitt 1
Anhang IV, Abschnitt 4.
Anhang VI, Anlage 2

Die OBD-Funktionsprüfung entspricht den Anforderungen des

Anhang IV, Abschnitt 3.3
Anhang IV, Anlage 1.

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Hersteller / *Manufacturer*: Weichai Power Co.,Ltd.
Typ / *Type*: WPOBD2.0

Anlage / Attachment
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The measures taken to the activation, the indication and the extinguishing of the malfunction indicator (MI) and to the storage and erasing of fault codes (P-codes) correspond with the requirements of

Annex IV, Section 3.6, 3.7, 3.8 and 3.9

the measures taken to the activation, the indication and the extinguishing of the reagent tank level indicator incl. distinct warning mode correspond with the requirements of:

Annex I, Section 3.3.3 and 6.5.4
Annex IV, Section 3.3

An inadmissible, momentary disconnection of the OBD system does not take place under consideration of

Annex IV, Section 3.5.

The provisions for electronic system security fulfil the requirements of the

Annex I, Section 6.1.10

The minimum information request is fulfilled with regard to

Annex I, 6.5.1.4
Annex II, Appendix 5, Section 1
Annex IVI, Section 4
Annex VI, Appendix 2.

The OBD functional check corresponds to

Annex IV, Section 3.3
Annex IV, Appendix 1.

Details zu den durchgeführten Prüfungen sind aus der Tabelle ersichtlich.
Details to the conducted tests are given in the table.

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Typ / *Type*: WPOBD2.0

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OBD-Funktionsprüfung / OBD functional check

Fehlerhafter Betriebszustand / <i>Failure mode</i>	geprüft gemäß Punkt / <i>tested according to point</i>	Anzahl Zyklen / <i>No. cycle</i>	MI *) an / on	Fehler-Code / <i>Fault code</i>
SCR-System / <i>SCR system</i> Füllstandsensor / <i>Tank level indicator</i>	Fehlendes Reagenz / <i>lack of reagent</i>	0 (Zündung an) / (key on)	ja / yes	P203F
SCR-System / <i>SCR system</i> Dosierventil / <i>Dosing valve</i>	Stromkreisunterbrechung / <i>electrical disconnection</i>	3	ja / yes	P2049
SCR-System / <i>SCR system</i> Harnstoffdrucksensor / <i>Reagent pressure sensor</i>	Stromkreisunterbrechung / <i>electrical disconnection</i>	0 (Zündung an) / (key on)	ja / yes	P204D
SCR-System / <i>SCR system</i> Einspritzdüse / <i>Injection nozzle</i>	verstopfte Düse / <i>clogged nozzle</i>	3	ja / yes	P0420
Motor-Einspritzsystem / <i>engine injection system</i> Pumpenelement Zyl. 1/ <i>Dosing pump cyl. 1</i>	Stromkreisunterbrechung / <i>electrical disconnection</i>	3	ja / yes	P0201
SCR-System / <i>SCR system</i> Katalysatorpräsenz/ <i>Presence of catalyst</i>	Unterdosierung / <i>Lower dosing</i>	3	ja / yes	P0420

*) **MI** = Malfunction Indicator (Fehlfunktions-Anzeige)

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Typ / *Type*: WPOBD2.0

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1.3 Geprüftes Motorsystem / *Tested engine system*

- 1.3.1 Motortyp / *Engine type*: WP7.210E50
Testmotor Nr. / *Test engine No.*: 1010F000859
- 1.3.2 Motor-Steuergerät /
Engine-electronical control unit: BOSCH
Kennung / *Marking*: WPEDC7
Cal. No. 610800210121
- 1.3.3 SCR-Steuergerät / *SCR control unit*
Kennung / *Marking*: BOSCH
WPOBD2.0

1.4 Geprüftes Fahrzeug / *Tested vehicle*

entfällt / *not applicable*

1.5 Diagnosegerät / *diagnostic tool*:

Hersteller / *Manufacturer*: Weichai Power Co.,Ltd.
Typ / *Type*: WP-VDS100, 24 Volt

2. Bemerkungen / *Remarks*

Das Auslesen der Freeze Frame Daten erfolgte mit dem unter Punkt 1.5 genannten System. Die Freeze Frame Daten entsprechen den Mindestanforderungen des Anhangs IV, Abschnitt 6. /

The Freeze Frame data access was performed by using the system mentioned in point 1.5. The Freeze Frame data complies with the minimum requirements of Annex IV, Section 6.

Das Auslesen des Kilometerstandes war am Motorprüfstand nicht möglich. /
The vehicle mileage read out was not accessible at the engine test bench.

Die Überprüfung des Drehmomentbegrenzers nach Anhang 1, Punkt 6.1.6, 2005/55/EG erfolgte gemäß 80/1269/EWG. /

Checking of torque limiter according to Annex 1, 6.1.6, 2005/55/EC was performed according to 80/1269/EEC.

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Hersteller / *Manufacturer*: Weichai Power Co.,Ltd.
Typ / *Type*: WPOBD2.0

Anlage / Attachment
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3. Anlagen / Enclosures

OBD Beschreibung/
OBD description:
Version, Datum /
Version, date:

OBD2-RZ-WP7/WP12

VERSION 2.0, 01.09.2011

4. Schlussbescheinigung / Certification

Das geprüfte OBD-II-System mit NOx-Control entspricht den Bestimmungen der 2005/55/EG i.d.F. 2008/74/EG.

The tested OBD-II-system with NOx-control is according to the regulations of 2005/55/EC last amended 2008/74/EC.

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PRÜFLABORATORIUM
TEST LABORATORY

TÜV SÜD Automotive GMBH D-85748 Garching



München 24.07.2012

der Sachverständige / *the expert*
M.Böhm

ANNEX II

INFORMATION DOCUMENT

IN ACCORDANCE WITH ANNEX TO COUNCIL DIRECTIVE 70/156/EEC RELATING TO EC TYPE
APPROVAL

and referring to 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
(Directive 2005/55/EC as last amended by Directive 2008/74/EC)

9. On-board diagnostics (OBD stage2,with Nox-control) system

- 9.1. Written description and/or drawings of the MI: [Refer to Page 2](#)
- 9.2. List and purpose of all components monitored by the OBD system: [Refer to Page 3-4](#)
- 9.3. Written description (general OBD working principle) for: [Refer to Page 5-34](#)
 - 9.3.1. ~~Diesel/gas engine~~:
 - 9.3.1.1. Catalyst monitoring: [Refer to Page 5-34](#)
 - 9.3.1.2. deNOx system monitoring: [Refer to Page 5-34](#)
 - 9.3.1.3. Diesel particulate filter monitoring: [N/A](#)
 - 9.3.1.4. Electronic fuelling system monitoring: [Refer to Page 5-34](#)
 - 9.3.1.5. Other components monitored by the OBD system: [Refer to Page 5-34](#)
 - 9.4. Criteria for MI activation (fixed number of driving cycles or statistical method):
[Refer to Page 35](#)
 - 9.5. List of all OBD output codes and formats used (with explanation of each): [Refer to Page 36-49](#)
- 10. TORQUE LIMITER**
 - 10.1. Description of the torque limiter activation: [Refer to Page 50](#)
 - 10.2. Description of the full load curve limitation: [Refer to Page 51](#)

Written Description and Drawings of MIL

The MIL (Malfunction Indicator Light) is an indicator connecting to OBD system, MIL will remind driver of failures on any components relative with emission or OBD system itself. The MIL is implemented according to ISO 2575, 1982, Symbol 4.36. See picture below: (Miscellaneous).



List and Purpose of All Components Monitored by the OBD System

The following chapter is designed to give an overview of the components monitored by the EOBD system. Its components and their functions within the whole system are described shortly.

Fuel System

- High Pressure Pump

The High Pressure Pump is used to provide the high fuel pressure needed for direct diesel injection. The installed pump is a CPN2.2+ -type pump that always delivers maximum fuel quantity. It is fed by a gear Supply Pump with low pressure fuel.

- Rail Pressure Sensor

The Rail Pressure Sensor is used to determine the actual rail pressure. That value is needed for high pressure control, engine protection and injection control. The sensor is mounted to the rail.

- Solenoid Valve Injectors

The Solenoid Valve Injectors are used to inject the desired fuel mass into the combustion chamber. They are mounted to the cylinder head centred above the combustion chamber.

Comprehensive Components

- Boost Pressure Sensor

The Boost Pressure Sensor is used to determine the air pressure after turbo charger. This value is used for calculation the dynamic lamda value for controlling the black smoke.

- Air Pressure Sensor

The Air Pressure Sensor is used to determine the atmospheric air pressure. This value is needed for calculation of EGR set point, injection control. The sensor is located inside the ECU. There it is separated from humidity but coupled to the atmospheric air pressure via a membrane.

- Camshaft Sensor

The Camshaft Sensor is used to determine the ignition top dead centre. It is mounted to the cylinder head next to a toothed wheel at the camshaft.

- Coolant Temperature Sensor

The Coolant Temperature Sensor is used to determine the temperature of the engine coolant. This value is used for EGR control, boost pressure control, injection control and other functions. It is mounted to the thermostat.

- Engine Speed Sensor

The Engine Speed Sensor is used to determine the engine speed. Moreover it is needed for synchronising the

engine together with the Camshaft Speed Sensor. The sensor is installed at the crankcase.

DeNOx System

- SCR Catalyst Downstream Temperature Sensor

SCR catalyst downstream temperature sensor is installed in exhaust pipe after catalyst. It is used to provided dew point detection of NOx sensor, control and correction of urea injection.

- Urea Heating Valve

Urea heating valve is installed in heating pipe of coolant water. It is used to control heating of urea pipe from coolant water.

- NOx Sensor

NOx sensor is installed in exhaust pipe after catalyst. It is used to provided NOx concentration of exhaust.

- Urea Tank Temperature and Level Sensor

Urea tank temperature and level sensor is installed in urea tank. It is used to provided temperature and level of urea tank, According these, system controls urea tank heating and urea adding.

- Urea Box Temperature Sensor

Urea box temperature sensor is installed in urea supply module. It is used to provided temperature of urea supply module, According these, system controls urea supply module heating.

- Urea Pressure Sensor

Urea pressure sensor is installed in supply module. It is used to provided pressure of urea.

- Pump Speed Sensor

Pump speed sensor is installed in supply module. It is used to provided speed of pump.

- Pump Actuator

Pump actuator is installed in supply module. It is used to control injection pressure of urea.

- Urea Dosing Valve

Urea dosing valve is installed in exhaust pipe. It is used to inject urea to exhaust pipe.

Description of OBD test principles and basic monitoring parameters

1.1 Description of error handling for the diesel engine

Fault diagnosis system is responsible for monitoring the engine control-related components and control functions. Diagnosis system monitors electrical connection failures of the system components, signals credibility and components measured value drift fault.

When fault diagnosis system has tested a component failure, the component is placed firstly at "preliminary fault status." If the fault has been existed for a certain time (each component has a time-to-defect), then it is placed at "confirmed defect status ." If the fault disappears at the time-to-defect, then the timer stops timing and reset to zero, if the fault occurs again, the timer re-starts timing (figure 1). Fault recovery process and the fault test process is similar (figure 2).

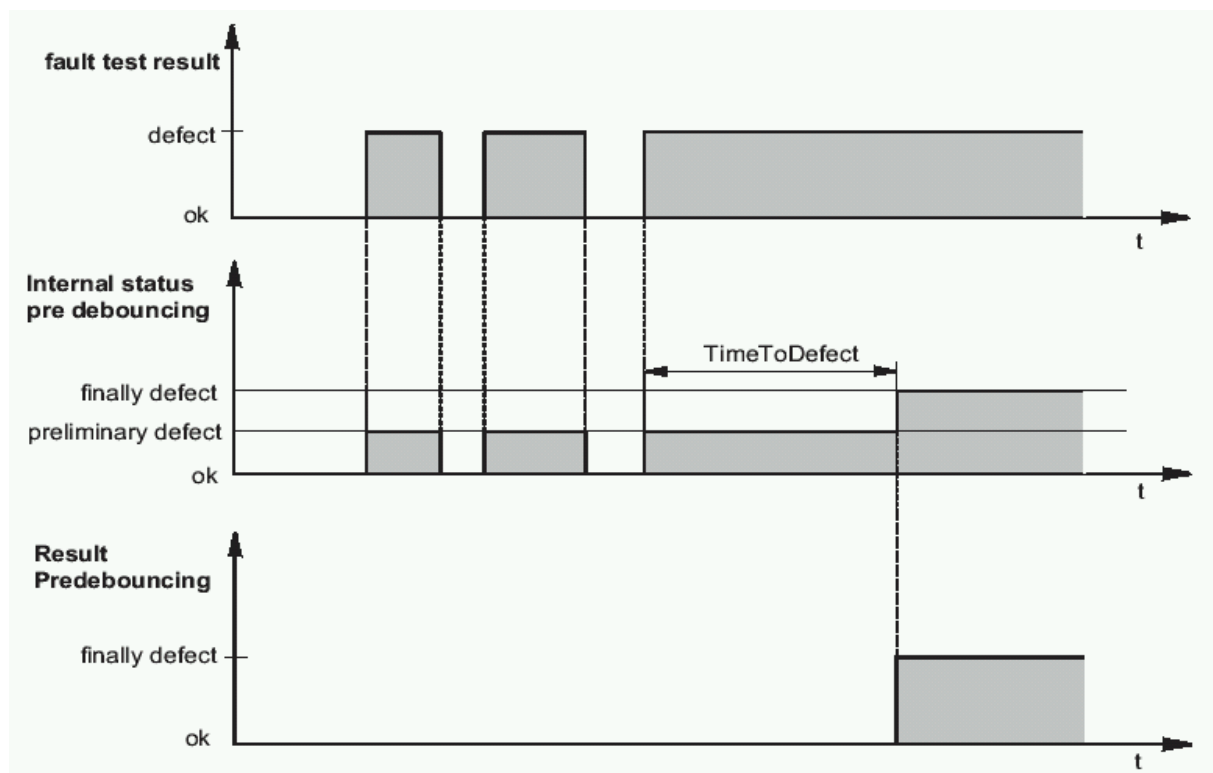


Fig 1 Fault test

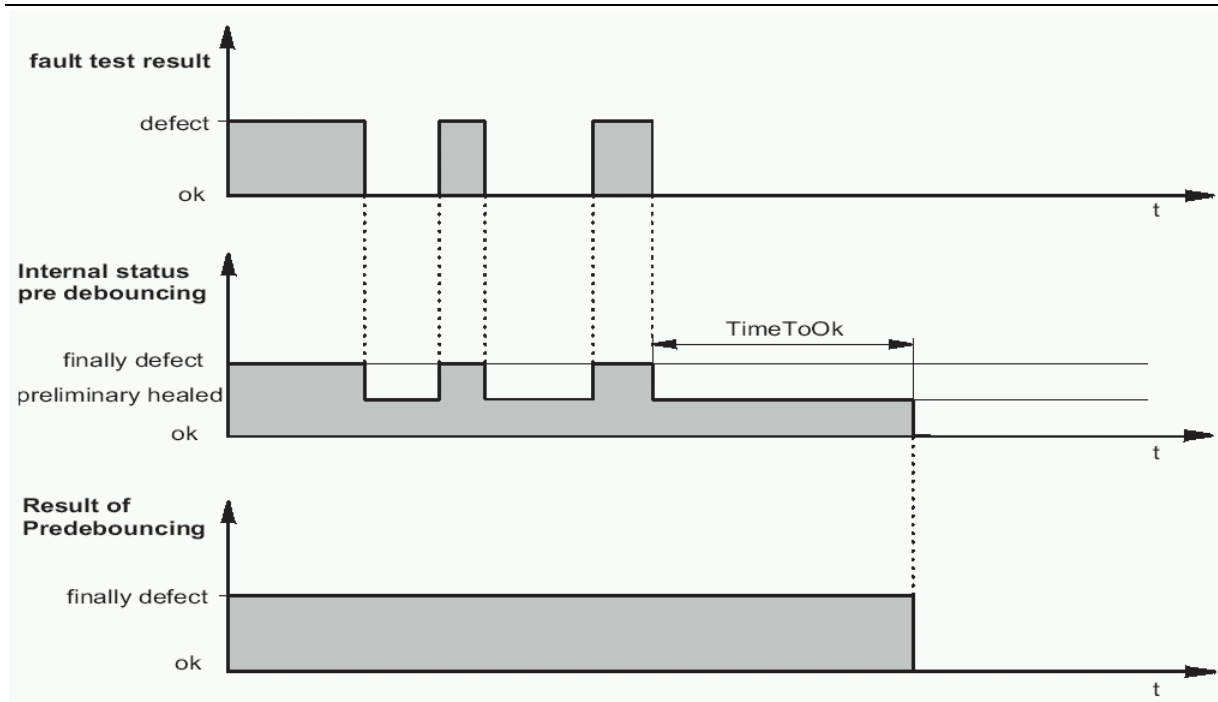


Fig 2 Fault recovery

In order to operate vehicles safely and protect the engine and its components, some measures to deal with the fault at "confirmed defect status" must be taken:

Measures to deal with the faults:

- The use of alternative values for certain variables
- Disable some functions
- Limit the range of variables
- Engine shutdown

Fault handling measures have been playing roles before the faults restore.

For different fault parts and fault type, fault information related to environment variables may be set immediately or after setting driving cycles into the fault memory. General diagnosis device can read out memory failure information and the environment variable information from the fault memory. If the fault stored in the memory disappears at set warm-up cycle, it will be deleted.

Because of limited memory size, memory can store limited fault information. When the fault memory is full, and there are new fault storing request, the lowest priority fault information will be replaced by the new one. If there are a lot of the lowest priority faults, the fault information stored longest will be renewed.

When the emission-related fault is stored into the fault memory, the fault indicator is on immediately to alert the driver. If fault disappears at the set driving cycle, the fault indicator extinguished. When a lot of faults exist simultaneously, then only when all the faults disappear at the set driving cycle, the fault indicator goes out.

1.2 Description of monitoring strategy for NO_x emission monitoring and control system.

OBD regulations requires that, any abnormal running of the engine related to NO_x emission control system should be monitored by the NO_x sensor placed in the exhaust pipe. When NO_x emission is over 3.5g/kWh, the fault indicator is activated. When NO_x emissions limit is over 7.0g/kWh, torque limiter start to work.

In ETC cycle, simulate the faults with emissions of 3.5g/kWh and 7g/kWh respectively by using the deteriorated reactant, calculate separately conversion efficiency limits at the corresponding conditions based on the NO_x concentration measured.

At relatively stable conditions, the current average conversion efficiency limit is calculated according to the NO_x conversion efficiency limits at the corresponding conditions for 3.5g/kWh and 7g/kWh emissions.

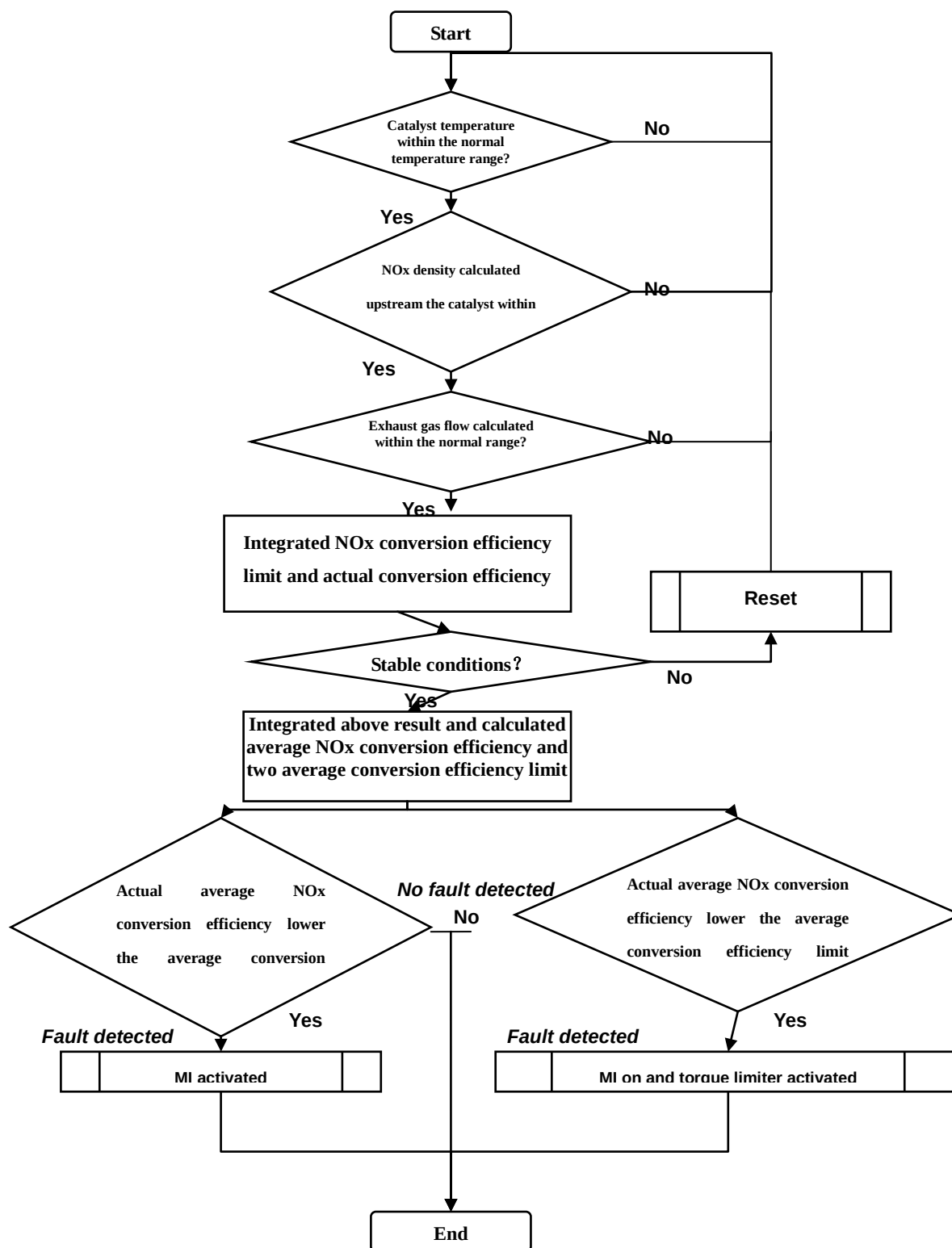
Average conversion efficiency limit = $1 - \frac{\int ((1 \text{ minus conversion efficiency limit}) \text{ NO}_x \text{ mass flow upstream the catalyst})}{\int \text{NO}_x \text{ mass flow upstream the catalyst}}$.

Actual average NO_x conversion efficiency at present is calculated according to the actual conditions and measured NO_x concentration.

Actual average conversion efficiency = $1 - \frac{\int \text{actual NO}_x \text{ mass flow downstream the catalyst measured by the sensor}}{\int \text{NO}_x \text{ mass flow upstream the catalyst}}$.

If the actual average NOx conversion efficiency is lower than the average conversion efficiency limit corresponding to 3.5g/kWh of NOx emissions, the system makes a judgment that the actual NOx emissions exceeding emission limit of 3.5g/kWh, thus multifunction indicator (MI) is activated; If the actual average NOx conversion efficiency is lower the average conversion efficiency limit corresponding to 7g/kWh of NOx emission limit, then the system makes a judgment that the actual NOx emissions exceeding emission limit of 7g/kWh, thus torque limiter starts to work.

Description of monitoring strategy for NOx emission monitoring and control system.



1.3 Diagnosis of fuel control unit

OBD system tests continuously and circularly the electrical connection faults of the fuel control unit drive circuit. Faults includes the short circuit to power supply, short circuit to ground, open circuit and overheating fault.

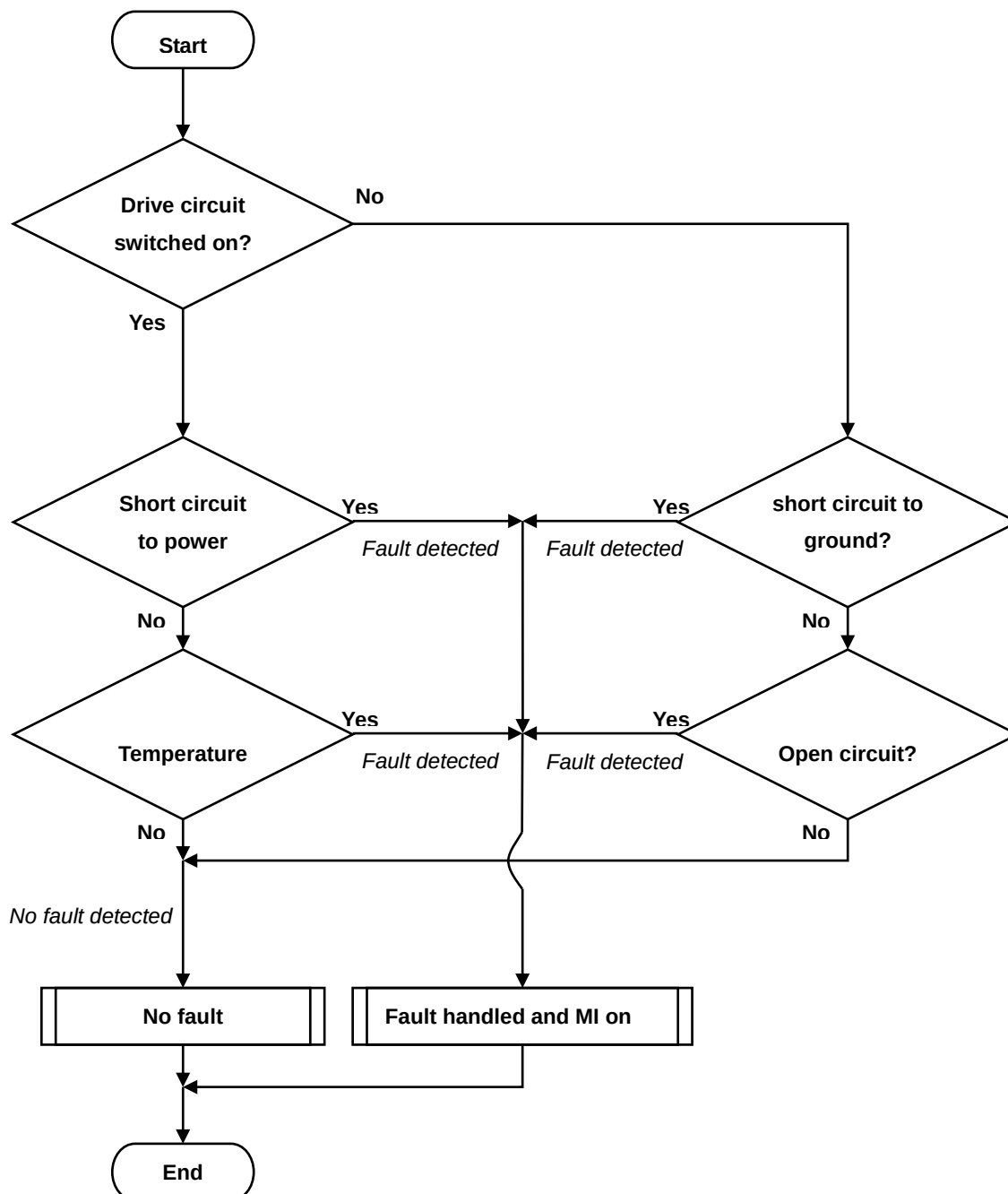
Error test is conducted inside the drive circuit module. Diagnostic functions assess the results of error test and handle the error.

Test the battery short-circuit fault when the drive circuit is switched on: Monitoring the actual output current of the drive circuit, if it exceeds the maximum limit, then short-circuit to battery fault is detected; after that, the error is handled by the system diagnostic function.

Test the ground short-circuit fault when the drive circuit is switched off: Monitoring the actual output current of the drive circuit, if it exceeds the minimum limit, then short-circuit to ground fault is detected; after that, the error is handled by the system diagnostic function.

Test the open circuit fault when the drive circuit is switched off: Monitoring the actual output current of the drive circuit, if it is within the preset range, then open circuit fault is detected; after that, the error is handled by the system diagnostic function.

Test the overheating fault when the drive circuit is switched on: Monitoring the temperature of the drive circuit parts, if it exceeds the temperature limit, then the error within the module of the drive circuit is detected; after that, the error is handled by the system diagnostic function.

Diagnosis flowchart for fuel control unit (drive circuit electrical fault)

1.4 Diagnosis of common rail pressure sensor

OBD system monitors continuously and circularly the output signal of common rail pressure sensor: When the sensor output voltage signal exceeds the upper rated limit, short circuit to power supply or open circuit is detected; When the signal is lower than the lower limit, short circuit to ground fault is detected.

1.5 Diagnosis of pressure limit valve

OBD system monitors the open status of the pressure limit valve, the valve will be opened compulsively when the following conditions occur:

When the rail pressure is higher than the upper limit, but valve has not been opened; or rail pressure sensor goes wrong. In addition, the valve would be opened when it is blocked. If the system detects an open valve, then the fault is of the max. type error; if system detects a pressure lower than the lower limit, the fault is the min error; if the pressure limit valve is not opened when the rail pressure is higher than the upper limit, the fault signal error is detected.

OBD system also monitors the wear of the pressure limit valve. Once the pressure limit valve is opened, the system will activate the timer and counter. Timer is used to cumulate open time of the pressure limit valve, while counter is used for open times of the valves. Once the timer exceeds the upper limit, then the min. type of error is detected. Once the counter exceeds the upper limit, then the max. type of error is detected; If the timer and counter are beyond the upper limits, then the signal type error is detected. The fault can't be self repaired, it can only be removed by the diagnostic device integrated with KWP2000 3B protocol (reset timer and counter).

1.6 Diagnosis of water temperature sensor

OBD system monitors continuously and circularly the output signal of the cooling water temperature sensor: When the sensor output voltage signal exceeds the upper limit, the short circuit to power supply or open circuit fault is detected; When the signal is lower than the lower limit, the short circuit to ground fault is detected.

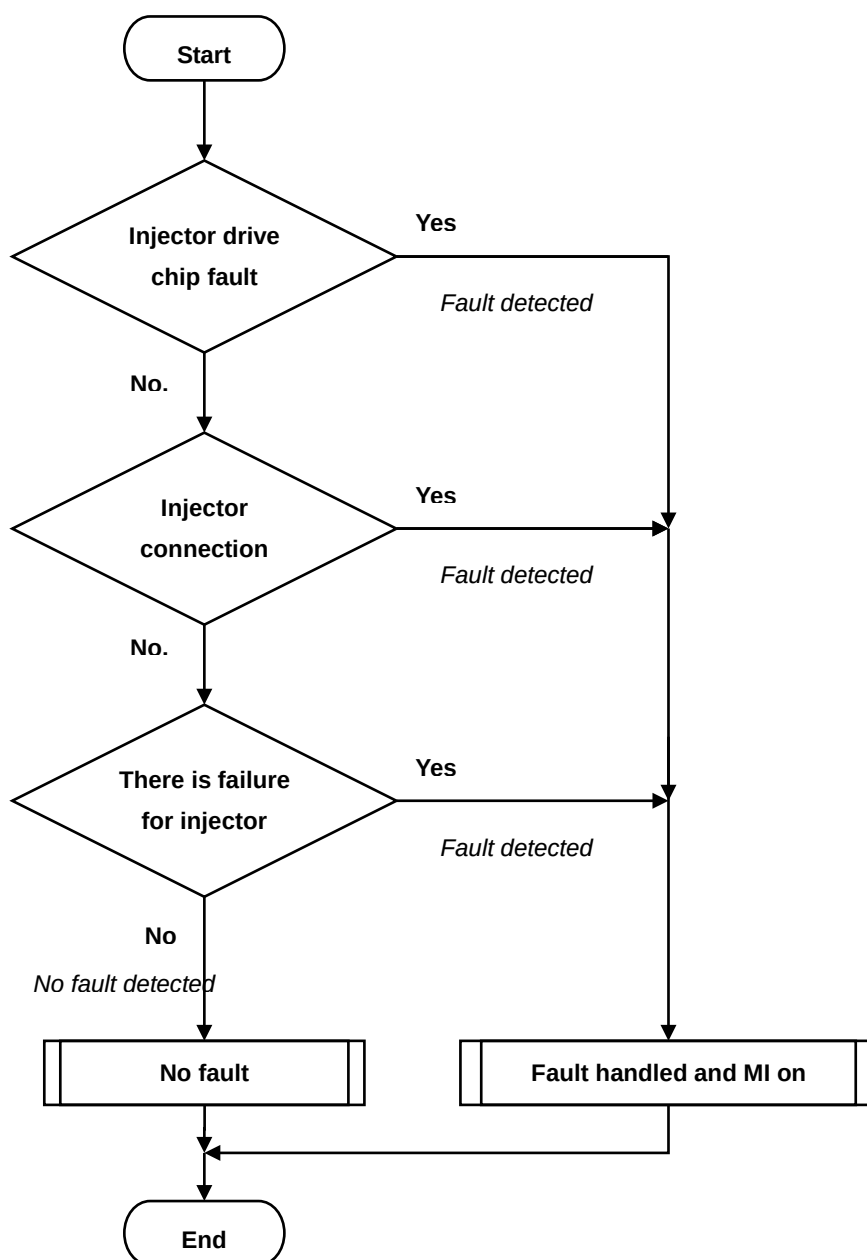
1.7 Diagnosis of injector

Each cylinder injector and the drive circuit is detected once every working cycle. Electronic injector control system controls the voltage on two ends of injector, charge and discharge current solenoid valve with the help of the high and low side transistors.

Four injectors are controlled by a "column" module, the injector is controlled by a specialized drive chip. The drive chip monitors the voltage at the both channels of the high and low sides, charge and discharge current. If a deviation occurs compared with expected voltage/current, then the fault is detected and transmitted to the micro-controller.

A mode recognition system is used to determine the fault more accurately (either for a specific cylinder, specific module, or for the chip itself). In this mode recognition system, the energizing time, the voltage, the current and the drive chip of each injector are all taken as a mode, compare this mode with the pre-defined error mode matrix, if more than a certain number of cases conforming with pre-defined error pattern are detected, then the fault corresponding to the error pattern is detected.

Injector diagnosis flowchart:



1.8 Diagnosis of atmospheric pressure sensor

OBD system tests the signal range of output voltage of the atmospheric pressure sensor.

If the output voltage signal of the sensor exceeds the upper limit, it indicates that the sensor short circuit or open circuit to battery; if the sensor output signal is lower the lower limit, then the sensor short circuit to ground.

1.9 Diagnosis of boosting pressure sensor

OBD system tests the signal range of output voltage of the boosting pressure sensor.

If the output voltage signal of the sensor exceeds the upper limit, it indicates that the sensor short circuit or open circuit to battery; if the sensor output signal is lower than the lower limit, then the sensor short circuit to ground.

1.10 Diagnosis of ECU modulus conversion module

OBD system tests the signal of ECU modulus conversion module. When the converter reference voltage is higher than the upper limit calibrated, the largest type of fault is tested. And when the converter reference voltage is lower than the lower limit calibrated, the smallest type of fault is tested. When the converter test pulse voltage exceeds the upper limit calibrated, signal type fault is tested; and when the converter signal is not converted completely at certain time window, unauthentic type of fault is tested.

1.11 Diagnosis of ECU power supply module

OBD tests the voltage signal of ECU power supply module. When the voltage of the power supply module is higher than the upper limit, the largest type of fault is tested. And when the voltage is lower than the lower limit, the smallest type of fault is tested.

1.12 Diagnosis of fuel supply system

When the rail pressure controller operates at the state of closed loop controlling, the OBD system tests the fault of fuel supply system by monitoring the controller deviation, the min. rail pressure and the max. rail pressure.

The controller deviation includes plus deviation and minus deviation.

OBD can test two controller plus deviation faults. For the first deviation test, it makes a comparison between the measured rail pressure deviation and the calculated limit according to the engine speed.

If the actual value is larger than the calculated value, then a fault is tested.

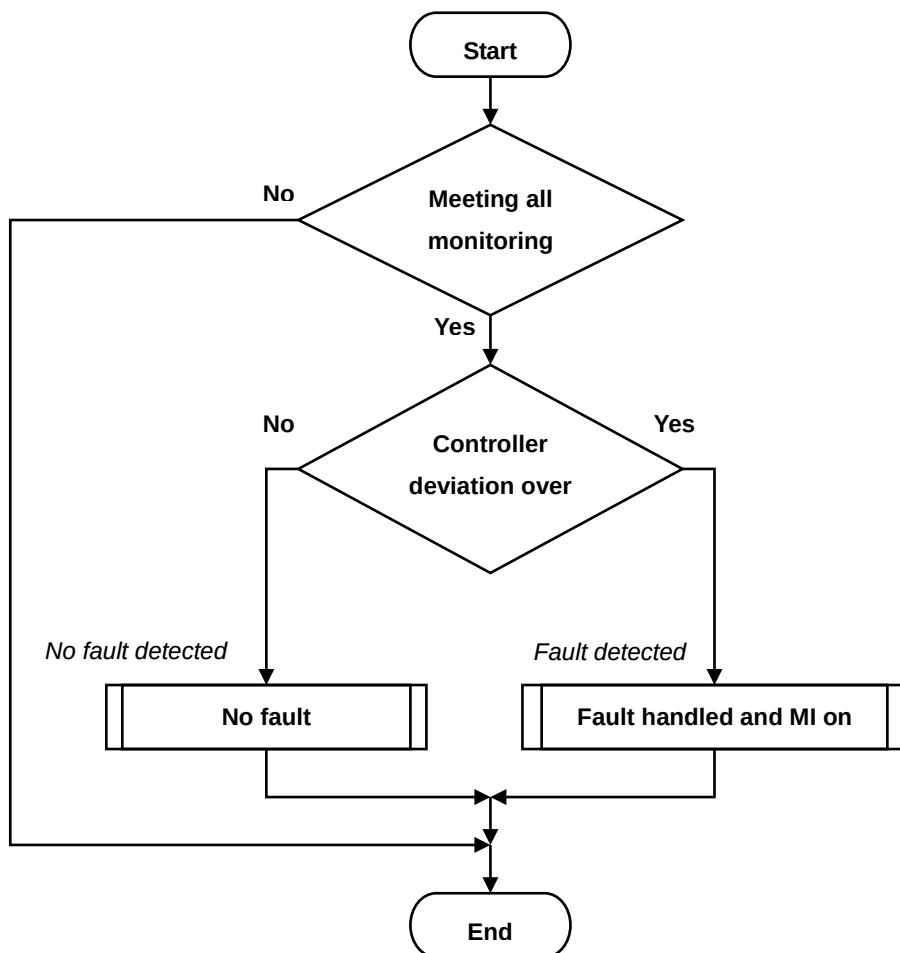
For the second deviation test, two conditions must be met. First of all, the above described first plus

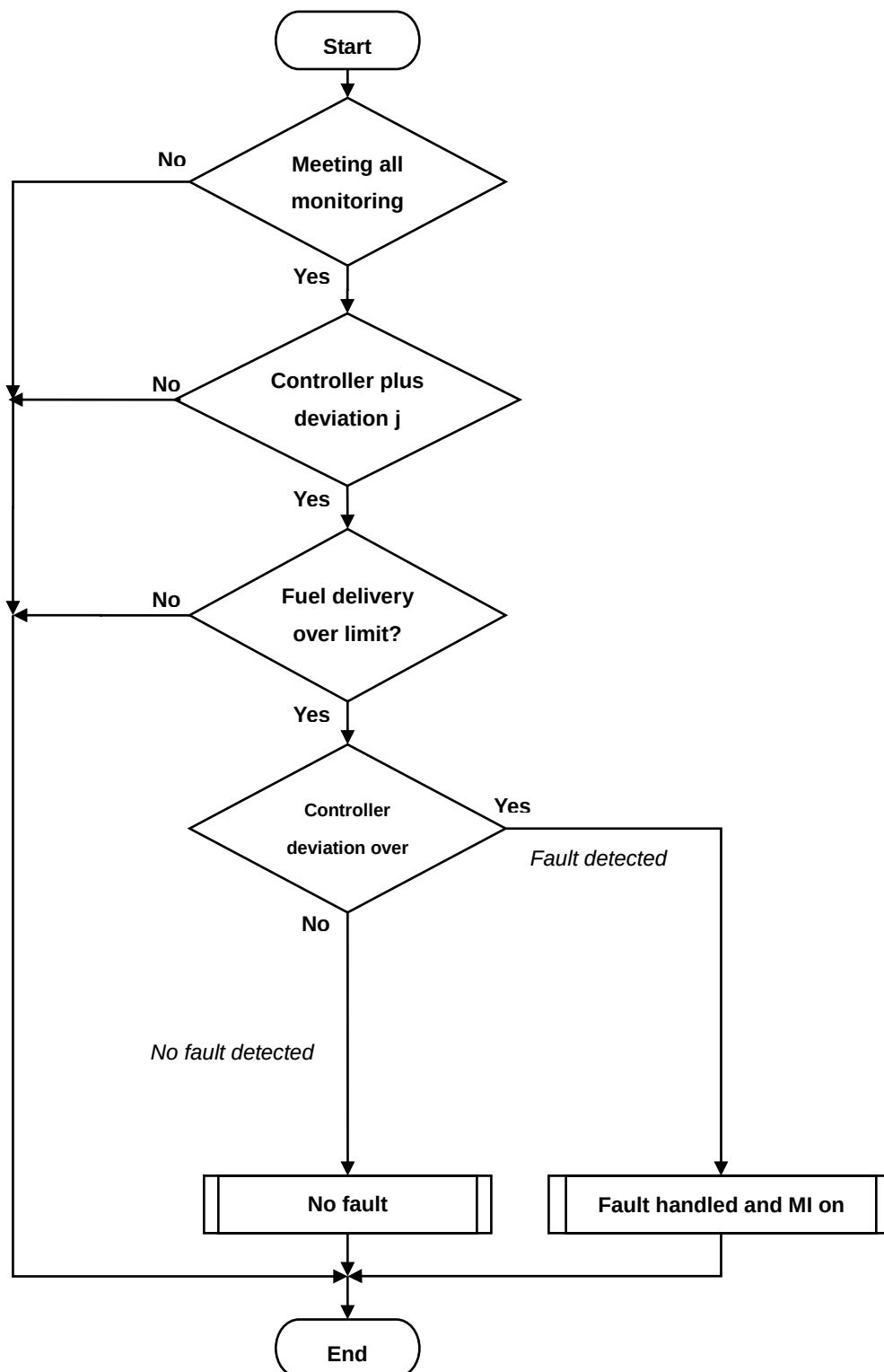
deviation fault must have been tested. Secondly, the fuel supply of fuel control unit must be greater than one of the calibrated limits. When the above two conditions are met, compare the deviation of rail pressure controller and one calibrated limit. If the deviation is larger than the limit, then a fault is tested.

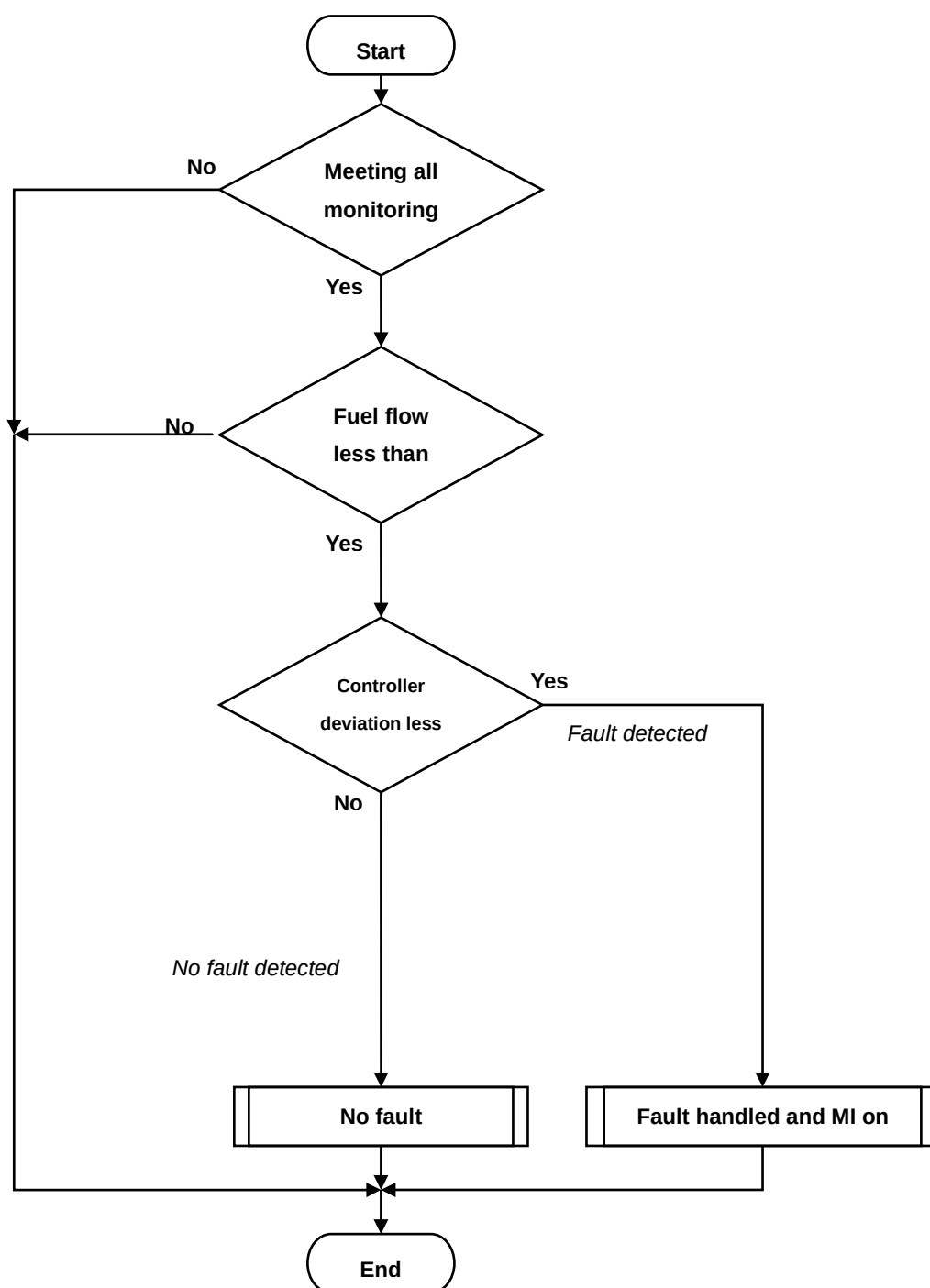
For test of controller minus deviation, the following conditions must be met: the fuel supply of the control unit is lower than a calibrated limit, fuel temperature is higher than a calibrated limit and injection quantity exceeds a calibrated limit. At this time, when the deviation of rail pressure controller is lower than the calculated limit based on the engine speed, then a minus deviation fault is tested.

When the rail pressure is lower than the calculated limit based on the engine speed, the minimum rail pressure fault is tested.

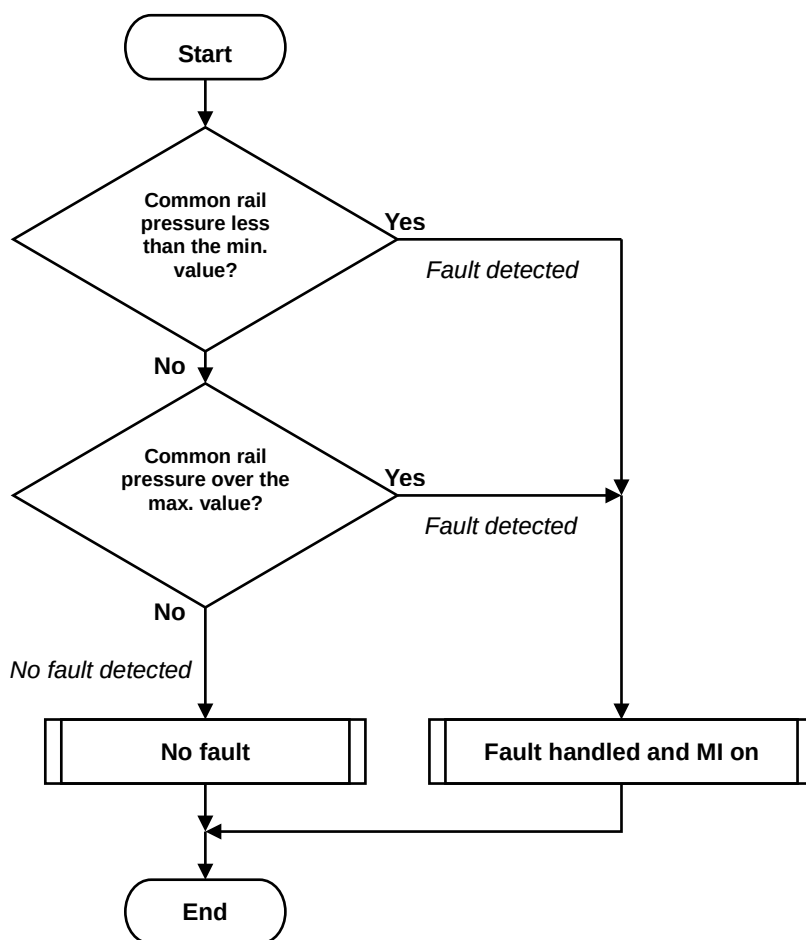
When the rail pressure exceeds the calibrated limit, the maximum rail pressure fault is tested.

Detecting flowchart for common rail pressure controller plus deviation (1):

Detecting flowchart for rail pressure controller plus deviation (2):

Detecting flowchart for common rail pressure controller minus deviation:

Detecting flowchart for rail pressure min/max limit:



1.13 Diagnosis of crankshaft sensor

The OBD system tests the output signal of crankshaft sensor for “no signal” or “unauthentic signal”.

The crankshaft sensor is composed of a signal wheel and a Hall sensor. If the phase sensor signal is effective, but there is no crankshaft sensor signal, then no crankshaft sensor signal fault is tested.

The credibility of the signal is determined by testing the dynamic change of crankshaft signal.

When the dynamic change exceeds the stated engine speed limit, unauthentic signal fault is tested.

The monitoring function is continually performed in engine operation.

1.14 Diagnosis of camshaft sensor

The OBD system tests the output signal of camshaft sensor for “no signal” or “unauthentic signal”.

If the camshaft sensor signal is effective, but there is no camshaft sensor signal is tested, then no camshaft sensor signal fault is tested.

If the camshaft sensor signal and the phase sensor signal failed synchronically, or there is an improper angle deviation between the crankshaft sensor signal and the camshaft sensor signal in engine operation, then unauthentic phase sensor signal is tested.

The monitoring function is continually performed in engine operation.

1.15 Diagnosis of urea tank temperature sensor

This diagnostic function tests the voltage signal range of urea tank temperature sensor.

When the voltage signal of the sensor is higher than the calibrated upper limit, sensor short circuit to power is tested. When the signal is lower than the lower limit, sensor to ground short circuit is tested.

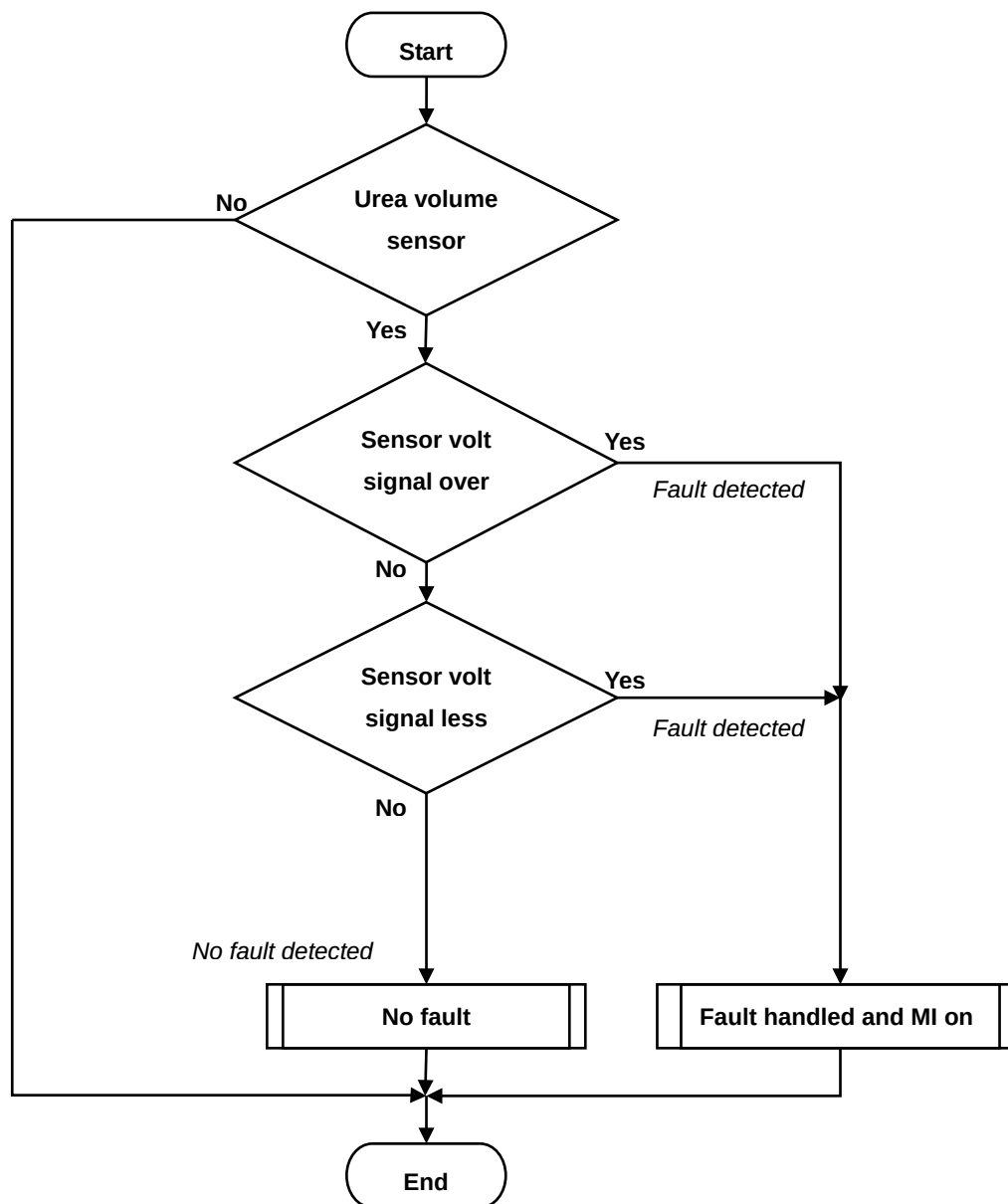
1.16 Urea level sensor and remaining urea test

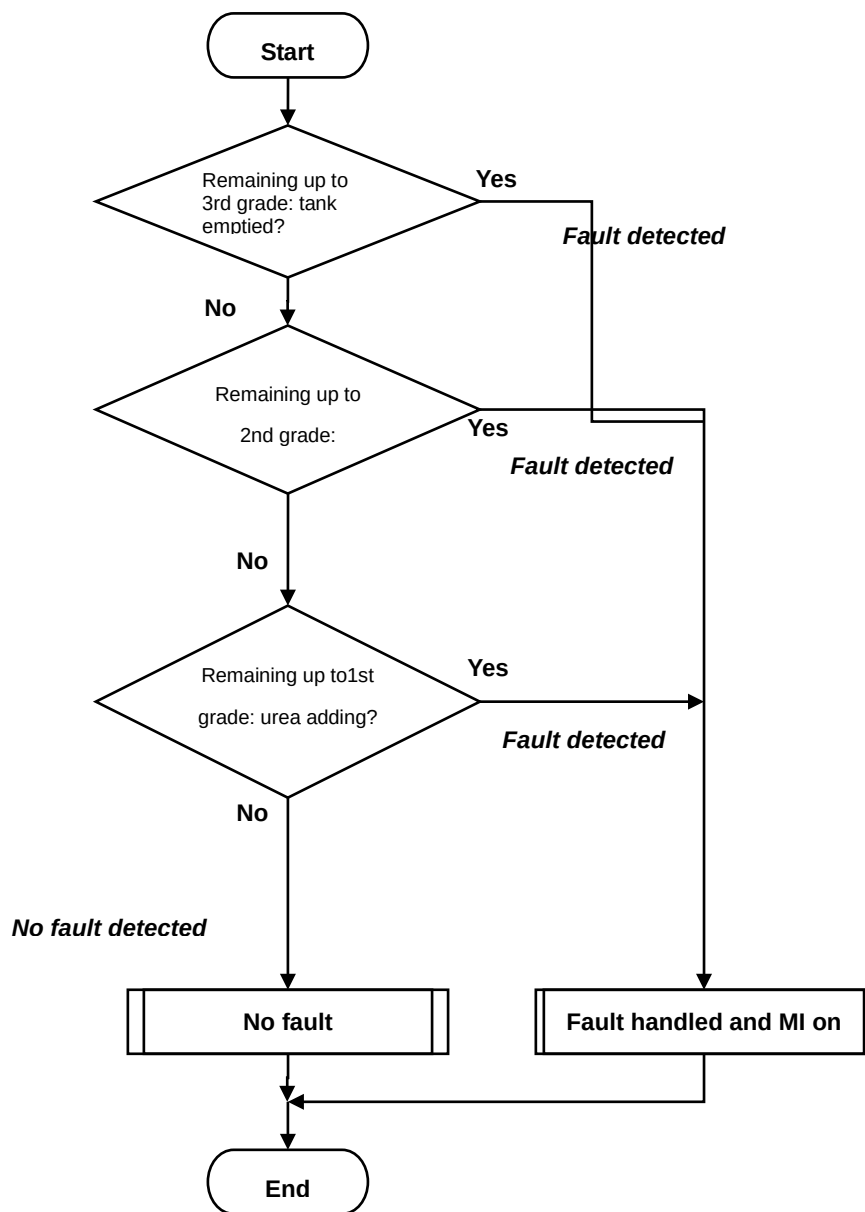
Diagnostic function monitors circularly the range of the output voltage signal of the urea level sensor.

When the sensor output voltage signal exceeds the upper limit, short circuit to power supply is detected; when the signal is lower than the lower limit, short circuit to ground is detected.

According to the OBD regulations, the remaining urea in the urea tank should be tested.

The remaining urea test is divided into 3 level. If remaining urea is lower than the first level, then storage is error, but MI is not activated and urea injecting continuously. If remaining urea is lower than the second level, MI is activated and urea injection is stopped, but the urea is cooled continuously. If the remaining urea is lower than the third level, that is urea tank is empty, then MI is immediately activated, at the same time the urea injection and cooling is stopped.

Diagnosis flowchart for urea level sensor:

Urea volume detecting flowchart:

1.17 Diagnosis for temperature sensor at down stream of catalyst

The diagnosis function performs the range check of voltage signal sent from temperature sensor at down stream of the catalyst circularly.

The short circuit to power supply would be detected when the voltage signals from sensor got above the rated upper limit; the short circuit to ground would be detected when the voltage signals got below the rated lower limit.

1.18 Diagnosis for temperature sensor of urea supply module

The diagnosis function performs the range check of voltage signal sent from temperature sensor of the urea supply module.

The short circuit to power supply would be detected when the voltage signals from sensor got above the rated upper limit; the short circuit to ground would be detected when the voltage signals got below the rated lower limit.

Whereas the urea solution will freeze when the temperature is below -11°C , the system has urea solution heating function. If the urea temperature measured by the urea supply module is less than the rated lower limit or more than the rated upper limit during urea solution heating, the signal is not plausible.

1.19 Diagnosis for sensor power supply control module of after-treatment control unit

The sensor power is supplied by power supply control module. One power supply control module can supply power for four sensors.

The power supply control module chip CY310 has self-diagnosis function. At the time of fault handling, the error report self-diagnosed from power supply control module chip is sent to after-treatment control unit, the final reaction corresponds with related sensor error path.

1.20 Diagnosis for urea pressure pump

In the DeNox system, the urea pump of supply module is used to increase the pressure of urea solution. The pump adopts closed loop mode to control urea pressure in supply module.

The pump speed can be calculated by measuring the operation of pump transmission shaft with three Hall sensors. According to the measured values from three Hall sensors, the faults of the pump

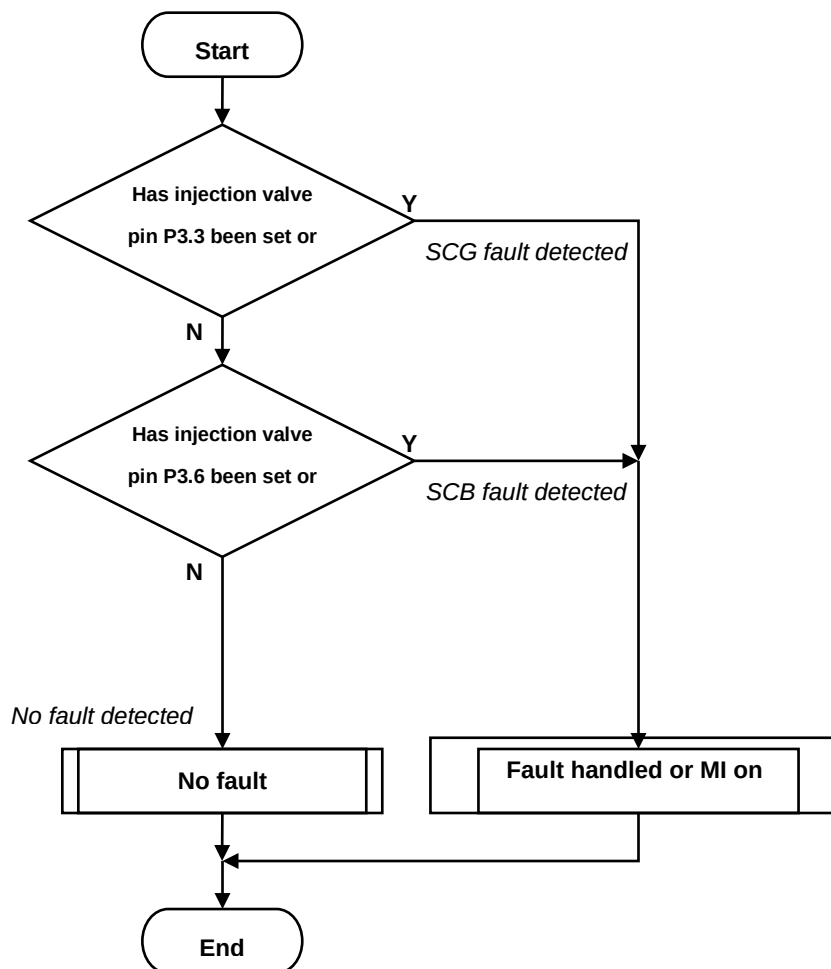
can be detected, such as pump motor blocked, over speed for pump, Hall sensor failure.

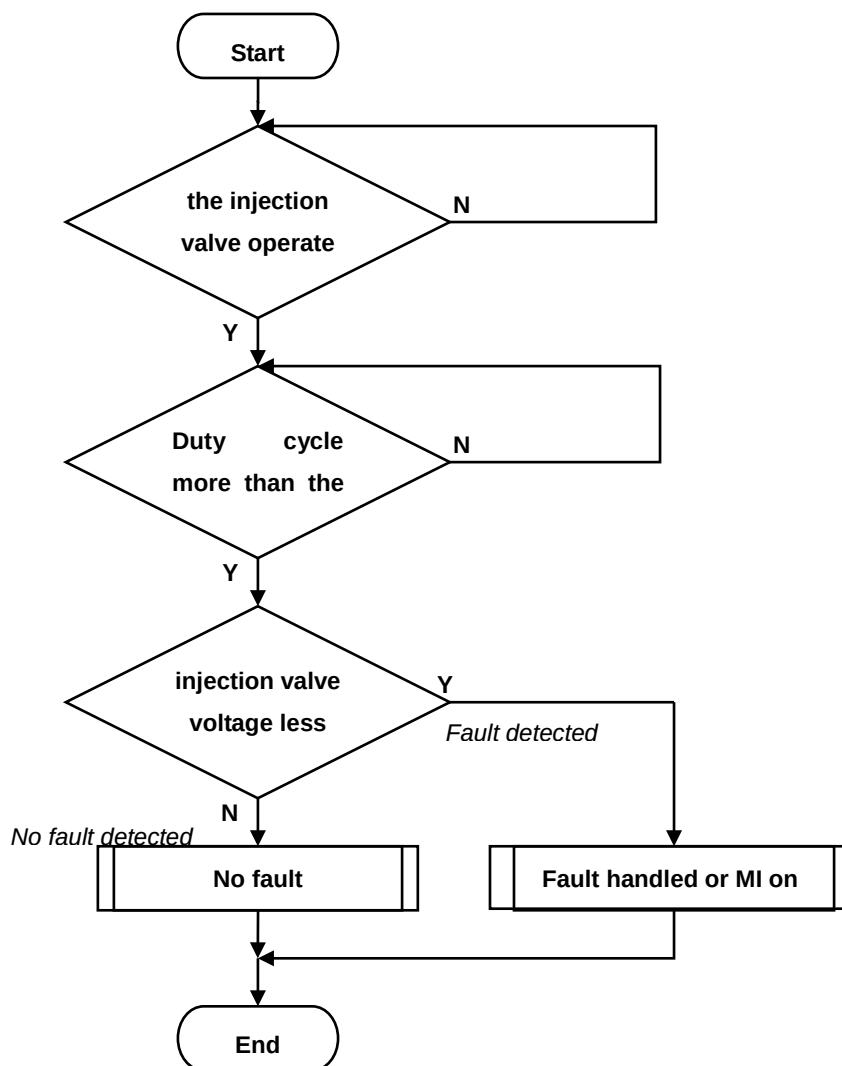
1.21 Diagnosis for urea injection valve

The urea injection valve adopts PWM wave control and is used to control the injection of urea. The faults of urea control valve include short circuit to ground, short circuit to power supply, open circuit, injector blocked.

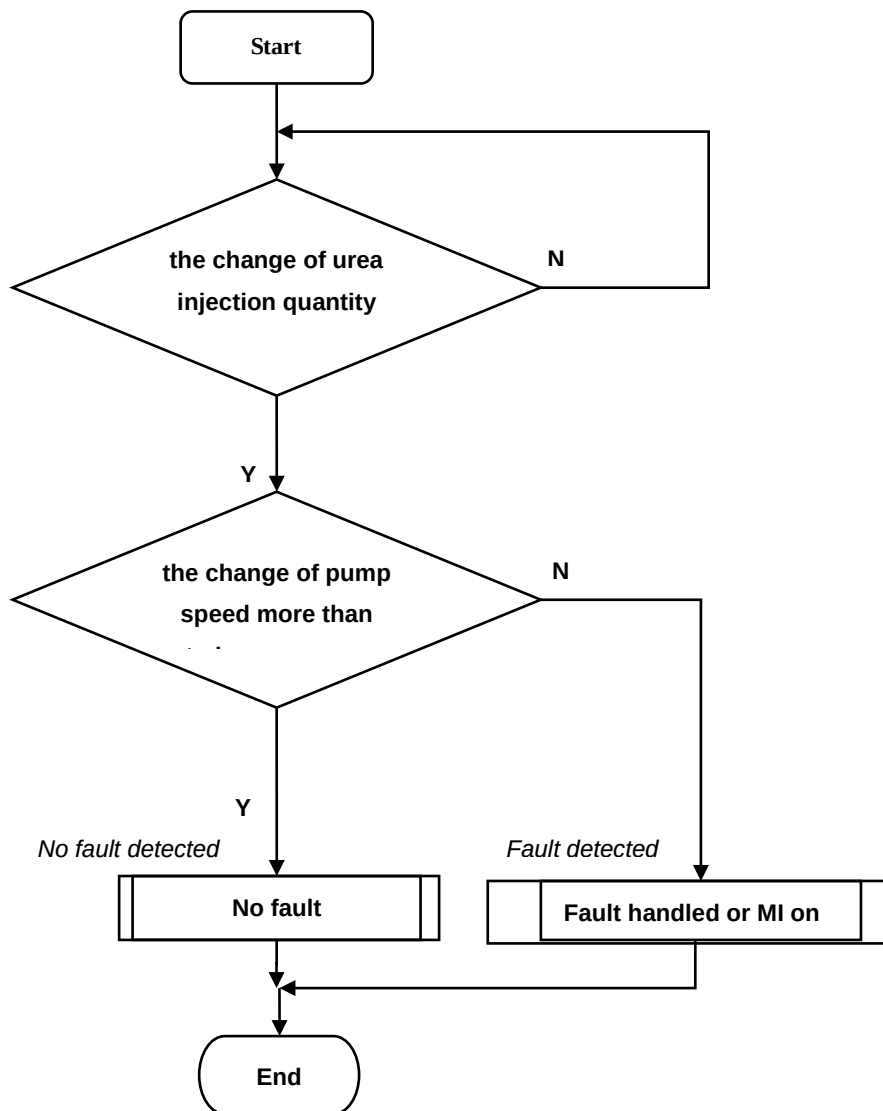
The short circuit to ground and to power supply can be detected by the feedback values of urea injection valve pins. The system inspects the feedback values of pins several times, if the times of relevant feedback value setting is more than rated times, the system reports the related faults. Under the condition of urea valve with its power on, if the PWM wave controlled by injection valve is over the rated value, namely there is a request for injecting urea; but the feedback voltage of the injection valve is less than the working limit, namely there's no action of the injection valve, the open fault then can be detected.

The plausibility of urea injection quantity and pump speed would be confirmed every time in the course of system starting. The system evaluates the pump speed in accordance with urea injection. If the urea injection quantity has a large change, but the pump speed has a small change, then the fault of injector blocked should be detected.

Diagnosis flow chart for urea injection valve (short circuit to ground and to power supply)

Diagnosis flow chart for open circuit

Diagnosis flow chart for injector blocked



1.22 Diagnosis for urea pressure sensor and its plausibility

The diagnosis function performs the range check of voltage signal sent from urea pressure sensor circularly.

The short circuit to power supply would be detected when the voltage signals from sensor got above the rated upper limit; the short circuit to ground would be detected when the voltage signals got below the rated lower limit.

The plausibility of urea pressure sensor should be inspected before urea pressure increased in the course of system starting. The system compares the urea pressure with the atmospheric pressure, if the difference is too large, then the fault can be detected.

1.23 Diagnosis for CAN and CAN communication

The system inspects the short circuit for CAN 1 and 2, CAN system hardware will report related error when short circuit on High Side to Low Side of CAN 1 or 2 occurs.

The system inspects the message AMB and EEC1 for CAN, when the frame is detected for time-out, effective message is overridden and J1939 message range stands in error, the system can report error.

1.24 Diagnosis for urea heater valve

In winter, the system heats urea tank through introducing engine cooling water. The cooling water is controlled with urea tank heater valve. Once the temperature reaches a certain level, the urea tank heater valve will turn off. If the valve blocked, the urea tank temperature would be too high due to the cooling water heating the urea tank continuously.

1.25 Diagnosis for NOx sensor

NOx sensor is in communication with after-treatment control unit through CAN, the communication is as follows: the heating signal transferred from after-treatment control unit to NOx sensor, or NOx value transferred from NOx sensor to after-treatment system.

The system determines the connecting faults of NOx sensor by the messages from CAN. The faults include short circuit, open circuit, unreasonable supply voltage for sensor, NOx signal above the Max. credible value of NOx.

The system determines the NOx heater signal faults by the messages from CAN. The faults

include short circuit and open circuit.

The NOx sensor operates around 800°C. The NOx heater starts heating the NOx sensor after dew-point inspection. The system would inspect the sensor plausibility during NOx sensor heating. If Max. heating time was over the time limit and no temperature signal came from NOx sensor, the system would detect unplausible heating.

Plausibility inspection for NOx sensor:

The inspections for NOx sensor plausibility include peak value inspection and unreasonable signal change-range inspection. In this way, unplausible NOx sensor signal can be detected, as well as avoid using fake NOx sensor.

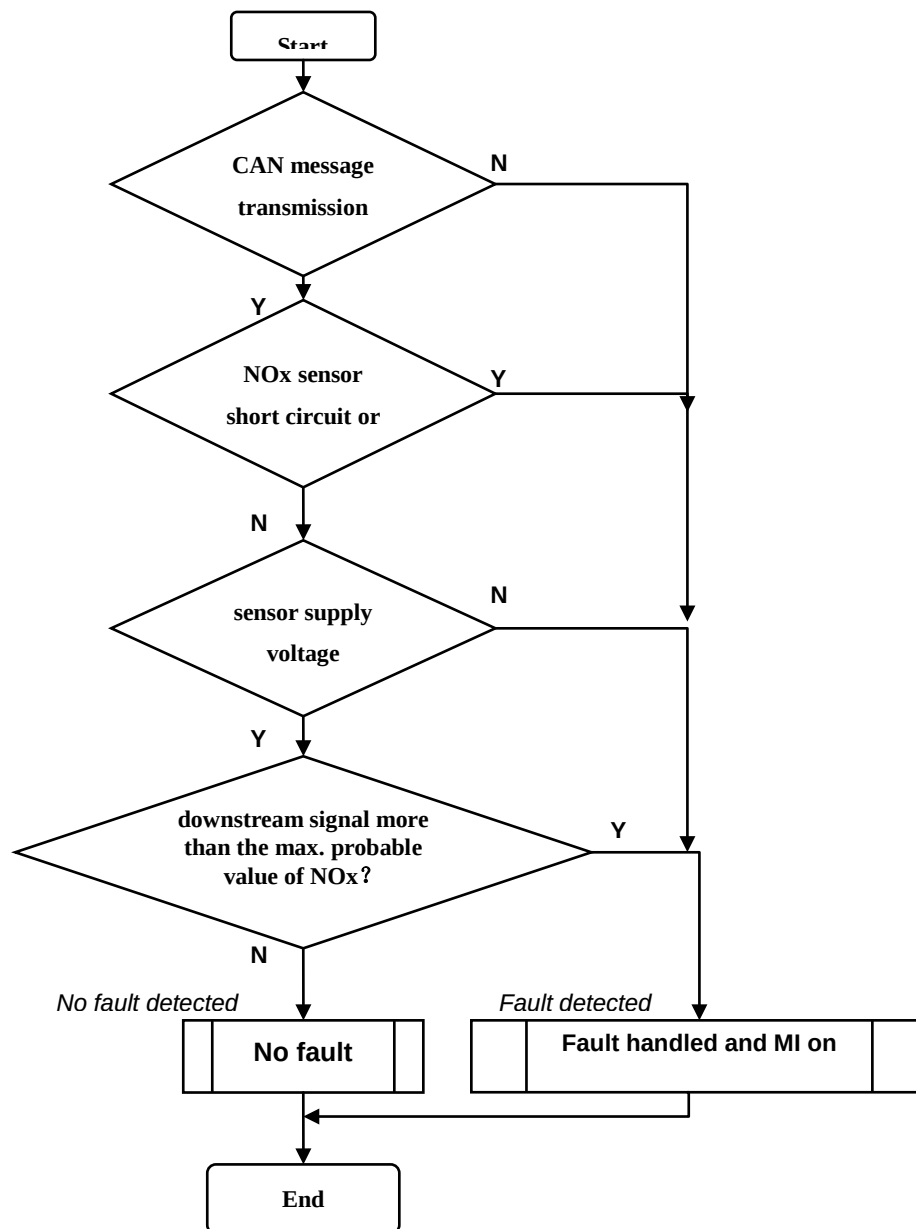
When the NOx flow rises from one steady-state to another before catalyst, NOx density measured by NOx sensor should appear a wave peak after a certain period.

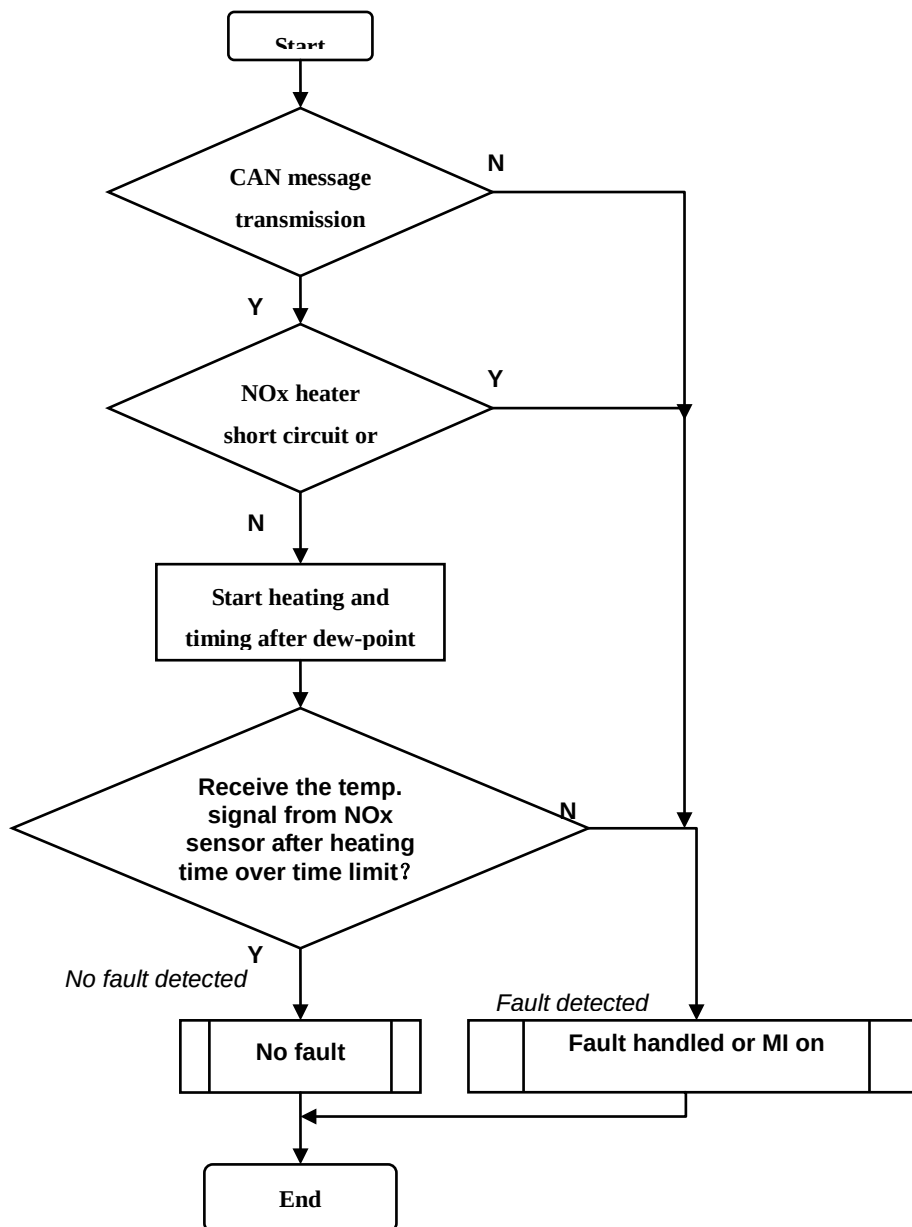
Wave peak inspection:

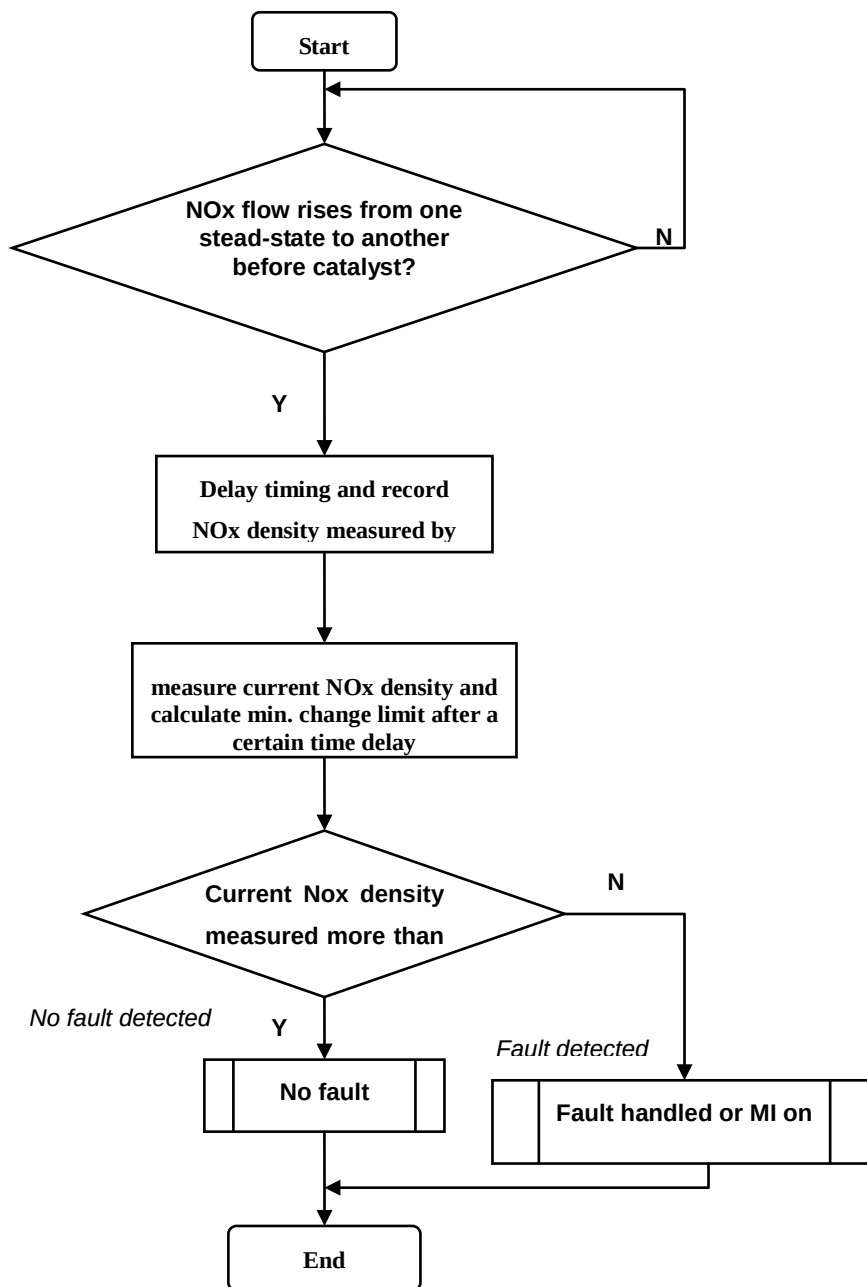
When the NOx flow rises from one steady-state to another before catalyst, the system records the NOx density before changing. A min. change limit can be calculated by recorded NOx density adding a theoretic change-value (calculated from catalyst temperature). After a certain time delay, compare the min. change limit with the current NOx density measured by NOx sensor, when measured density is less than min. change limit, NOx sensor signal peak error can be detected.

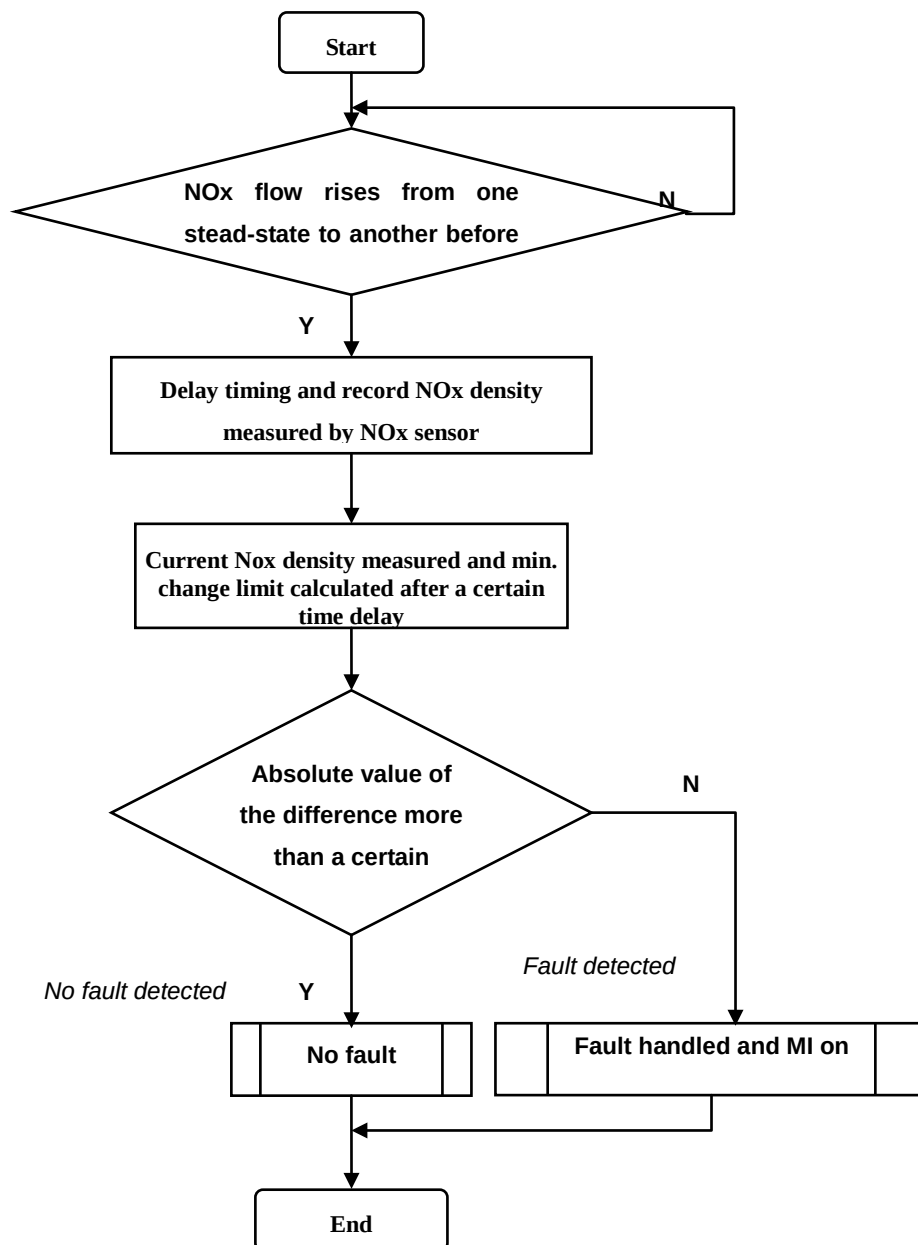
Unreasonable signal change-range inspection:

When the NOx flow rises from one steady-state to another before catalyst, the system records the NOx density before changing. After a certain time delay, compare the current NOx density measured by NOx sensor with the former recorded value, when absolute value of the difference is less than a certain value, the system determines that the signal of NOx sensor is not plausible.

Diagnosis flow chart for connection fault of NOx sensor

Diagnosis flow chart for signal fault of Nox heater

Diagnosis flow chart for peak value fault of Nox sensor

Diagnosis flow chart for unreasonable signal range of NOx sensor

MIL Activation Rules

MIL ON:

- MIL ON Immediately
- MIL ON in 3 DC
- MIL won't on

MIL OFF:

- after 3 continuous DCs

Fault delete:

- after 40 WUCs or for long-term error storage 400 days or 9600 hours (NOx control)

DC: driving cycle

WUC: warm up cycle

Trouble Code List of OBD System

OBD FAULT

DFC	Description	Class	MIL	p-code
DFC_AFSBattErr	Battery voltage error of HFM6 sensor	8	ON	P0100
DFC_AFSDrftAdjPlausMax	DFC for plausibility check	7	ON_3DC	P0101
DFC_AFSDrftAdjPlausNPL	DFC for plausibility check	7	ON_3DC	P0101
DFC_AFSDrftIdlAdjVal	DFC for low idle correction exceeding the maximum drift limit	7	ON_3DC	P0101
DFC_AFSDrftLdAdjVal	DFC for load correction exceeding the maximum drift limit	7	ON_3DC	P0101
DFC_AFSSetDrftMax	Sensitivity drift high error for HFM sensor	7	ON_3DC	P0101
DFC_AFSSetDrftMin	Sensitivity drift error low for HFM sensor	7	ON_3DC	P0101
DFC_AFSSigErr	SCB of hardware signal of HFM6 sensor	8	ON	P0103
DFC_AFSSRCRawMax	SRC high error for raw value in HFM6 sensor	8	ON	P0103
DFC_AFSSRCRawMin	SRC low error for raw value in HFM6 sensor	8	ON	P0102
DFC_AirCtlGovDvtEOMMax	Positive governor deviation above limit for regeneration	7	ON_3DC	P0101
DFC_AirCtlGovDvtEOMMin	negative governor deviation below limit for regeneration	7	ON_3DC	P0101
DFC_AirCtlGovDvtMax	Positive governor deviation above limit	7	ON_3DC	P0402
DFC_AirCtlGovDvtMin	negative governor deviation below limit	7	ON_3DC	P0401
DFC_AirCtlRmpTOut	Error path for too longtime spent in transtion mode Rgn to Nrm	7	ON_3DC	P0100
DFC_ARlySCB_0	Short circuit to battery error at acuator relay	8	ON	P0659
DFC_ARlySCB_1	Short circuit to battery error at acuator relay	8	ON	P2671
DFC_ARlySCB_2	Short circuit to battery error at acuator relay	8	ON	P2686
DFC_ARlySCG_0	Short circuit to ground error at actuator relay	8	ON	P0658
DFC_ARlySCG_1	Short circuit to ground error at actuator relay	8	ON	P2670
DFC_ARlySCG_2	Short circuit to ground error at actuator relay	8	ON	P2685
DFC_BusDiagBusOffNodeA	BusOff error CAN A	8	ON	U0073
DFC_CEngDsTSRCMax	SRC High for Engine coolant temperature(down stream)	8	ON	P0118
DFC_CEngDsTSRCMin	SRC low for Engine coolant temperature(down stream)	8	ON	P0117
DFC_ComAT1OG1TO	Timeout Error of CAN-Receive-Frame AT1O1	7	ON_3DC	U0113
DFC_EnvPSRCMax	SRC High for Environment Pressure	8	ON	P2229
DFC_EnvPSRCMin	SRC low for Environment Pressure	8	ON	P2228
DFC_EnvTSRCMax	SRC High for Environment Temperature	8	ON	P0073
DFC_EnvTSRCMin	SRC low for Environment Temperature	8	ON	P0072
DFC_EpmCaSI1ErrSig	DFC for camshaft signal diagnose - disturbed signal	8	ON	P0341

DFC_EpmCaSI1NoSig	DFC for camshaft signal diagnose - no signal	8	ON	P0340
DFC_EpmCaSI1OfsErr	DFC for camshaft offset angle exceeded	8	ON	P0340
DFC_EpmCrSErrSig	DFC for crankshaft signal diagnose - disturbed signal	8	ON	P0336
DFC_EpmCrSNoSig	DFC for crankshaft signal diagnose - no signal	8	ON	P0335
DFC_InjCrvInjLimChrgBal	Number of injections is limited by charge balance of booster capacity	6	OFF	P100E
DFC_InjCrvInjLimQntBal	Number of injections is limited by quantity balance of high pressure pump	6	OFF	P100F
DFC_InjCrvInjLimSys	Number of injections is limited by system	6	OFF	P1010
DFC_InjCrvNumInjRtmLim	Number of injections is limited by runtime	6	OFF	P1011
DFC_InjVlvPresMin	check of minimum rail pressure	6	OFF	P0087
DFC_IVDiaBnkShCir_0	short circuit	8	ON	P062D
DFC_IVDiaBnkShCir_1	short circuit	8	ON	P062E
DFC_IVDiaChp_0	CY33X is defect	8	ON	P062B
DFC_IVDiaCylNoLd_0	open load	8	ON	P0201
DFC_IVDiaCylNoLd_1	open load	8	ON	P0202
DFC_IVDiaCylNoLd_2	open load	8	ON	P0203
DFC_IVDiaCylNoLd_3	open load	8	ON	P0204
DFC_IVDiaCylNoLd_4	open load	8	ON	P0205
DFC_IVDiaCylNoLd_5	open load	8	ON	P0206
DFC_IVDiaCylPttDet_0	special pattern for special cases	8	ON	P0263
DFC_IVDiaCylPttDet_1	special pattern for special cases	8	ON	P0266
DFC_IVDiaCylPttDet_2	special pattern for special cases	8	ON	P0269
DFC_IVDiaCylPttDet_3	special pattern for special cases	8	ON	P0272
DFC_IVDiaCylPttDet_4	special pattern for special cases	8	ON	P0275
DFC_IVDiaCylPttDet_5	special pattern for special cases	8	ON	P0278
DFC_IVDiaCylShCir_0	general short circuit	8	ON	P0262
DFC_IVDiaCylShCir_1	general short circuit	8	ON	P0265
DFC_IVDiaCylShCir_2	general short circuit	8	ON	P0268
DFC_IVDiaCylShCir_3	general short circuit	8	ON	P0271
DFC_IVDiaCylShCir_4	general short circuit	8	ON	P0274
DFC_IVDiaCylShCir_5	general short circuit	8	ON	P0277
DFC_IVDiaCylShCirHSLS_0	short circuit Low Side to High Side	8	ON	P0261
DFC_IVDiaCylShCirHSLS_1	short circuit Low Side to High Side	8	ON	P0264
DFC_IVDiaCylShCirHSLS_2	short circuit Low Side to High Side	8	ON	P0267
DFC_IVDiaCylShCirHSLS_3	short circuit Low Side to High Side	8	ON	P0270
DFC_IVDiaCylShCirHSLS_4	short circuit Low Side to High Side	8	ON	P0273
DFC_IVDiaCylShCirHSLS_5	short circuit Low Side to High Side	8	ON	P0276
DFC_MeUnIntCtct	Intermittent contact between ECU and MeUn	8	ON	P0251
DFC_MeUnOL	open load of metering unit output	8	ON	P0251
DFC_MeUnOT	over teperature of device driver of metering unit	8	ON	P0252
DFC_MeUnShCirHSBatt	short circuit to battery in the high side of the MeUn	8	ON	P0254

DFC_MeUnShCirHSGnd	short circuit to ground in the high side of the MeUn	8	ON	P0253
DFC_MeUnShCirLSBatt	short circuit to battery of metering unit output	8	ON	P0254
DFC_MeUnShCirLSGnd	short circuit to ground of metering unit output	8	ON	P0253
DFC_MeUnSRCMax	signal range check high error of metering unit AD-channel	8	ON	P0254
DFC_MeUnSRCMin	signal range check low error of metering unit AD-channel	8	ON	P0253
DFC_NoCat2DsBattSt	Power supply monitoring for the Nox sensor	7	ON_3DC	P2200
DFC_NoCat2DsCmpChk	NOx sensor plausibility check with other sensors	7	ON_3DC	P2201
DFC_NoCat2DsFdbkFault	Nox feed back fault detection	7	ON_3DC	P2204
DFC_NoCat2DsLamBinMax	SRC Max error for the binary lambda signal	7	ON_3DC	P2200
DFC_NoCat2DsLamBinMin	SRC Min error for the binary lambda signal	7	ON_3DC	P2200
DFC_NoCat2DsLamLinMax	SRC Max error for the Linear lambda signal	7	ON_3DC	P2200
DFC_NoCat2DsLamLinMin	SRC Min error for the Linear lambda signal	7	ON_3DC	P2200
DFC_NoCat2DsLamPlausMax	Error detection and healing of MAX error of lambda plausibility test	7	ON_3DC	P2200
DFC_NoCat2DsLamPlausMin	Error detection and healing of MIN error of lambda plausibility test	7	ON_3DC	P2200
DFC_NoCat2DsNOxOfsCorrMaxLim	Offset Max error detection based on the NOx Offset value.	7	ON_3DC	P2201
DFC_NoCat2DsNOxOfsCorrMinLim	Offset Min error detection based on the NOx Offset value.	7	ON_3DC	P2201
DFC_NoCat2DsNOxOfsMax	NOx offset max error detection	7	ON_3DC	P2201
DFC_NoCat2DsNOxOfsMin	NOx offset min error detection	7	ON_3DC	P2201
DFC_NoCat2DsNOxPlausMin	Plausibiliti error during Rich to Lean switch over	7	ON_3DC	P2201
DFC_NoCat2DsNOxRdyTO	Monitoring of Nox signal readiness	7	ON_3DC	P2200
DFC_NoCat2DsNOxSRCMax	SRC Max error for the NOx signal	7	ON_3DC	P2201
DFC_NoCat2DsNOxSRCMin	SRC Min error for the NOx signal	7	ON_3DC	P2201
DFC_NoCat2DsOpCir	Open circuit error for the NOx signal	7	ON_3DC	P2200
DFC_NoCat2DsShCir	Short circuit error for the NOx signal	7	ON_3DC	P2200
DFC_PCRGovDvtMax	positive governor deviation above limit	7	ON_3DC	P2263
DFC_PCRGovDvtMin	negative governor deviation below limit	7	ON_3DC	P2263
DFC_PIntkVUsSRCMax	Diagnostic fault check for SRC high in air pressure upstream of intake valve sensor	8	ON	P0238
DFC_PIntkVUsSRCMin	Diagnostic fault check for SRC low in air pressure upstream of intake valve sensor	8	ON	P0237
DFC_PRVOpn	pressure relief valve is open	8	ON	P0089
DFC_PRVRPOutOfRng	Averaged rail pressure is outside the expected tolerance range	8	ON	P1037
DFC_RailMeUn0	maximum positive deviation of rail pressure exceeded	8	ON	P0251
DFC_RailMeUn10	leakage is detected based on fuel quantity balance	8	ON	P0251

DFC_RailMeUn2	maximum negative rail pressure deviation with metering unit on lower limit is exceeded	8	ON	P0251
DFC_RailMeUn22	maximum negative rail pressure deviation with metering unit on lower limit is exceeded (second stage)	8	ON	P0251
DFC_RailMeUn3	minimum rail pressure exceeded	8	ON	P0087
DFC_RailMeUn4	maximum rail pressure exceeded	8	ON	P0088
DFC_RailMeUn42	maximum rail pressure exceeded (second stage)	8	ON	P0088
DFC_RailMeUn7	setpoint of metering unit in overrun mode not plausible	8	ON	P1050
DFC_RailMeUn8	setpoint of metering unit in idle mode not plausible	8	ON	P0251
DFC_RailPGradMon	Rail pressure raw value is intermittent	6	OFF	P0194
DFC_RailPOfsTstMax	rail pressure raw value is above maximum offset	7	ON_3DC	P0191
DFC_RailPOfsTstMin	rail pressure raw value is below minimum offset	7	ON_3DC	P0191
DFC_RailPRV4	maximum rail pressure exceeded	8	ON	P0088
DFC_RailPSRCMax	Sensor voltage above upper limit	8	ON	P0193
DFC_RailPSRCMin	Sensor voltage below lower limit	8	ON	P0192
DFC_SCRChkAdapMax	Longterm adaption factor exceeds threshold	7	ON_3DC	P3051
DFC_SCRChkAdapMin	Longterm adaption factor below threshold	7	ON_3DC	P3052
DFC_SCRChkEta1	DFC for Evaluation of Temperature Range 1	7	ON_3DC	P0420
DFC_SCRChkEta2	DFC for Evaluation of Temperature Range 2	8	ON	P0420
DFC_SCRChkNOxDsPeakErr	DFC for peak plausibility check for NOx sensor downstream of SCR Cat	7	ON_3DC	P2214
DFC_SCRChkNOxDsPlausMax	DFC for plausibility error Max for NOx sensor downstream of SCR Cat	7	ON_3DC	P2214
DFC_SCRChkNOxDsPlausMin	DFC for plausibility error Min for NOx sensor downstream of SCR Cat	7	ON_3DC	P2214
DFC_SCRChkNOxDsStkErr	DFC for Stuck in range error check for NOx sensor downstream of SCR Cat	7	ON_3DC	P2214
DFC_SCRChkTTCL	Monitoring of the time until the dosing release is given	7	ON_3DC	P3042
DFC_SCRMonDetModeBLPlaus	General backflow line plausability error	7	ON_3DC	P3050
DFC_SCRMonDetModePresChk	General pressure check error	7	ON_3DC	P3053
DFC_SCRMonDetModePresStab	Pressure stabilisation error	7	ON_3DC	P3054
DFC_SCRMonMetCtlOvrPresErr	Monitoring of Metering Control Malfuntion Max	7	ON_3DC	P3039
DFC_SCRMonMetCtlUndrPresErr	Monitoring of Metering Control Malfuntion Min	7	ON_3DC	P3056
DFC_SCRMonOvrPresErr	Monitoring of over pressure	7	ON_3DC	P3039
DFC_SCRMonPresBuildUpErr	Monitoring of Pressure Build Up Malfuntion Max	7	ON_3DC	P3040
DFC_SCRMonPresDropChk	General pressure drop check error	7	ON_3DC	P3049
DFC_SCRMonPresRdcErr	Monitoring of Pressure Reduction Malfuntion Max	7	ON_3DC	P3041
DFC_SCRPODMonTnkT	Error Urea tank temperature is overheated	7	ON_3DC	P2043
DFC_SCRPODPlausUCatUsTMax	Error SCR catalyst upstream temperature sensor	7	ON_3DC	P0426

	plausibility max threshold			
DFC_SCRPODPlausUCatUsTMin	Error SCR catalyst upstream temperature sensor plausibility min threshold	7	ON_3DC	P0426
DFC_SCRPODPlausUCatUsTStat	Error SCR catalyst upstream temperature sensor static plausibility	7	ON_3DC	P0426
DFC_SCRPODPlausUDosVlv	Dosing Valve is blocked	7	ON_3DC	P2047
DFC_SCRPODPlausURevVlv	Reverting Valve is Blocked closed	7	ON_3DC	P3014
DFC_SCRPODPUQPErr	Reporting of the error for the PUQP function	7	ON_3DC	P3000
DFC_SCRPODSMHtr	Error supply module heater plausibility	7	ON_3DC	P3057
DFC_SCRPODSMHtrT	Error urea supply module heater temperature sensor dynamic plausibility	7	ON_3DC	P3058
DFC_SCRPODSMHtrTCldStrt	Error urea supply module heater temperature sensor cold start plausibility	7	ON_3DC	P3059
DFC_SCRPODSMT	Error urea supply module temperature sensor dynamic plausibility	7	ON_3DC	P3060
DFC_SCRPODSMTTCldStrt	Error urea supply module temperature sensor cold start plausibility	7	ON_3DC	P3061
DFC_SMHtrTDycFail	Diagnostic Fault Check for Supply Module temperature Duty cycle in failure range	8	ON	P3029
DFC_SMHtrTDycInvl	Diagnostic Fault Check for Supply Module Heater Temperature Duty cycle in invalid range	8	ON	P3029
DFC_SMNoAvl	Temperature measurement module not available	8	ON	P3038
DFC_SMPerPwm	Diagnostic Fault Check period outside valid range	8	ON	P2062
DFC_SMPwm	Diagnostic Fault Check to detect faulty PWM signal	8	ON	P2062
DFC_SMTDycFail	Diagnostic Fault Check for Supply Module temperature Duty cycle in failure range	8	ON	P3029
DFC_SMTDycInvl	Diagnostic Fault Check for Supply Module Temperature Duty cycle in invalid range	8	ON	P3029
DFC_SRCMaxUTnkLvl	DFC for SRC high error of the urea tank level sesnor	8	ON	P203D
DFC_SRCMinUTnkLvl	DFC for SRC low error of the urea tank level sesnor	8	ON	P203C
DFC_SSpMon1	Error Sensor supplies 1	8	ON	P0643
DFC_SSpMon2	Error Sensor supplies 2	8	ON	P0653
DFC_SSpMon3	Error Sensor supplies 3	8	ON	P0699
DFC_TAFSDtyCycHi	SRC high for air temperature sensor	8	ON	P0113
DFC_TAFSDtyCycLo	SRC low for air temperature sensor	8	ON	P0112
DFC_TAFSPerHi	SRC high for period duration of air temperature sensor	8	ON	P0113
DFC_TAFSPerLo	SRC low for period duration of air temperature sensor	8	ON	P0112
DFC_TCACDsSRCMax	SRC High for Charge air cooler downstream Temperature	8	ON	P0098

DFC_TCACDsSRCMin	SRC low for Charge air cooler downstream Temperature	8	ON	P0097
DFC_TCACDsVDPlaus	Diagnostic fault check for charged air cooler downstream temperature sensor	8	ON	P0096
DFC_TIntkVUsSRCMax	Diagnostics Fault Check for signal value above maximum limit	8	ON	P0113
DFC_TIntkVUsSRCMin	Diagnostics Fault Check for "signal value below minimum limit"	8	ON	P0112
DFC_TrChOL	DFC for OL error on the PWM output powerstage	8	ON	P0045
DFC_TrChOvrSpd	Error path for monitoring of Turbocharger overspeed	8	ON	P0049
DFC_TrChOvrTemp	DFC for OT error on the PWM output powerstage	8	ON	P0045
DFC_TrChSCB	DFC for SCB error on the PWM output powerstage	8	ON	P0048
DFC_TrChSCG	DFC for SCG error on the PWM output powerstage	8	ON	P0047
DFC_UCatUsTSRCMax	Diagnostic Fault Check for Signal above maximum limit.	8	ON	P042D
DFC_UCatUsTSRCMin	Diagnostic Fault Check for Signal below minimum limit.	8	ON	P042C
DFC_UDCRdcAgRmn	Status of tank level	9	ON	P203F
DFC_UDosVlvEPHi	Current at the end of injection phase exceeds max threshold	8	ON	P2049
DFC_UDosVlvOvrTemp	Diagnostic error check for overtemperature.	8	ON	P3009
DFC_UDosVlvSCBLS	Diagnostic error check for short circuit to battery error on lowside switch.	8	ON	P2049
DFC_UDosVlvSCBOLHS	Diagnostic error check for short circuit to battery on highside or open load error.	8	ON	P2049
DFC_UDosVlvSCGOLLS	Diagnostic error check for short circuit to ground or open load on the lowside switch.	8	ON	P2048
DFC_UDosVlvSCHS	Diagnostic error check for short circuit error on highside switch.	8	ON	P2047
DFC_UHtrBLLOL	DFC for Open Load error of Urea Backflow Line Heater Actuator powerstage	8	ON	P3021
DFC_UHtrBLSCB	DFC for Short Circuit to Battery of Urea Backflow Line Heater Actuator powerstage	8	ON	P3023
DFC_UHtrBLSCG	DFC for Short Circuit to Ground of Urea Backflow Line Heater Actuator powerstage	8	ON	P3022
DFC_UHtrPLOL	DFC for Open Load error of Urea Pressure Line Heater Actuator powerstage	8	ON	P3024
DFC_UHtrPLSCB	DFC for Short Circuit to Battery of Urea Pressure Line heater Actuator powerstage	8	ON	P3027
DFC_UHtrPLSCG	DFC for Short Circuit to Ground of Urea Pressure Line Heater Actuator powerstage	8	ON	P3026

DFC_UHtrRlyLdSCB	DFC for Short Circuit to Battery of Urea Heater Relay circuit	8	ON	P3077
DFC_UHtrRlyOL	DFC for Open Load error of urea heater relay device	8	ON	P3043
DFC_UHtrRlyOvrTemp	DFC for Over Temperature error of urea heater relay device	8	ON	P3044
DFC_UHtrRlySCB	DFC for Short Circuit to Battery error of urea heater relay device	8	ON	P3045
DFC_UHtrRlySCG	DFC for Short Circuit to Ground error of urea heater relay device	8	ON	P3046
DFC_UHtrSLOL	DFC for Open Load error of Urea Suction Line Heater Actuator powerstage	8	ON	P3028
DFC_UHtrSLSCB	DFC for Short Circuit to Battery of Urea Suction Line Heater Actuator powerstage	8	ON	P3032
DFC_UHtrSLSCG	DFC for Short Circuit to Ground of Urea Suction Line Heater Actuator powerstage	8	ON	P3031
DFC_UHtrSMLdFdBkPlaus	DFC for Open Load to Ground error of Suction Line Urea Heater Relay	8	ON	P3082
DFC_UHtrSMLdOL	DFC for Open Load to Ground error of Urea supply module Heater Relay	8	ON	P3083
DFC_UHtrSMLdSCGOL		8	ON	P3084
DFC_UHtrSMOL	DFC for Open Load error of Urea Supply Module Heater Actuator powerstage	8	ON	P3033
DFC_UHtrSMOvrTemp	DFC for Over Temperature error of Urea Supply Module Heater Actuator powerstage	8	ON	P3085
DFC_UHtrSMSCB	DFC for Short Circuit to Battery of Urea Supply Module Heater Actuator powerstage	8	ON	P3037
DFC_UHtrSMSCG	DFC for Short Circuit to Ground of Urea Supply Module Heater Actuator powerstage	8	ON	P3036
DFC_UHtrTnkOL	DFC for Open Load error of Urea Tank Heater Actuator powerstage	8	ON	P3016
DFC_UHtrTnkOvrTemp	DFC for Over Temperature error of Urea Tank Heater Actuator powerstage	8	ON	P3018
DFC_UHtrTnkSCB	DFC for Short Circuit to Battery of Urea Tank Heater Actuator powerstage	8	ON	P3020
DFC_UHtrTnkSCG	DFC for Short Circuit to Ground of Urea Tank Heater Actuator powerstage	8	ON	P3019
DFC_UPmpMotNDvt	Pump Motor Speed Deviation	8	ON	P3001
DFC_UPmpMotNDvtPerm	Permanent Pump Motor Speed Deviation	8	ON	P3086
DFC_UPmpMotNoAvl	Pump motor not available for actuation	8	ON	P3002
DFC_UPmpMotOL	DFC for OL error on the PWM output powerstage for the actuator	8	ON	P3006
DFC_UPmpMotOvrTemp	DFC for over temperature error on the PWM output powerstage for the actuator	8	ON	P3003

DFC_UPmpMotSCB	DFC for SCB error on the PWM output powerstage for the actuator	8	ON	P3004
DFC_UPmpMotSCG	DFC for SCG error on the PWM output powerstage for the actuator	8	ON	P3005
DFC_UPmpPPlausMax	Check for pressure sensor value above the allowed threshold	7	ON_3DC	P3007
DFC_UPmpPPlausMin	Diagnostic check for pressure sensor value below the allowed threshold	7	ON_3DC	P3007
DFC_UPmpPSRCMax	Diagnostic Fault Check for Signal above maximum limit.	8	ON	P204D
DFC_UPmpPSRCMin	Diagnostic Fault Check for Signal below minimum limit.	8	ON	P204C
DFC_URevVlvHSOL	DFC for Open Load error of urea reverting valve actuator high side powerstage	8	ON	P3047
DFC_URevVlvHSOvrTemp	DFC for Over Temperature of urea reverting valve actuator high side powerstage	8	ON	P3048
DFC_URevVlvHSSCB	DFC for Short Circuit to Battery of urea reverting valve actuator high side powerstage	8	ON	P3049
DFC_URevVlvHSSCG	DFC for Short Circuit to Ground of urea reverting valve actuator high side powerstage	8	ON	P3050
DFC_URevVlvOL	DFC for Open Load error of urea reverting valve actuator powerstage	8	ON	P3010
DFC_URevVlvOvrTemp	DFC for Over Temperature of urea reverting valve actuator powerstage	8	ON	P3011
DFC_URevVlvSCB	DFC for Short Circuit to Battery of urea reverting valve actuator powerstage	8	ON	P3013
DFC_URevVlvSCG	DFC for Short Circuit to Ground of urea reverting valve actuator powerstage	8	ON	P3012
DFC_UTnkTSRCMax	Diagnostic Fault Check for Signal above maximum limit.	8	ON	P205D
DFC_UTnkTSRCMin	Diagnostic Fault Check for Signal below minimum limit.	8	ON	P205C
DFC_UTnkTVDPlausTempMax	Error Tank temperature sensor plausibility max threshold	7	ON_3DC	P205B
DFC_UTnkTVDPlausTempMin	Error Tank temperature sensor plausibility min threshold	7	ON_3DC	P205B

indelibleCode&OBD torque limiter

DFC	Description	Class	Fault code can be deleted or not	Torque Limiter	P-Code
DFC_ComAT10G1T0	Timeout Error of CAN-Receive-Frame AT101	7	YES	after 36 hours	U0113
DFC_NoCat2DsBattSt	Power supply monitoring for the Nox sensor	7	YES	after 36 hours	P2200
DFC_NoCat2DsCmpChk	NOx sensor plausibility check with other sensors	7	YES	after 36 hours	P2201
DFC_NoCat2DsFdbkFault	Nox feed back fault detection	7	YES	after 36 hours	P2204
DFC_NoCat2DsNOxOfsCorrMaxLim	Offset Max error detection based on the NOx Offset value.	7	YES	after 36 hours	P2201
DFC_NoCat2DsNOxOfsCorrMinLim	Offset Min error detection based on the NOx Offset value.	7	YES	after 36 hours	P2201
DFC_NoCat2DsNOxOfsMax	NOx offset max error detection	7	YES	after 36 hours	P2201
DFC_NoCat2DsNOxOfsMin	NOx offset min error detection	7	YES	after 36 hours	P2201
DFC_NoCat2DsNOxPlausMin	Plausibiliti error during Rich to Lean switch over	7	YES	after 36 hours	P2201
DFC_NoCat2DsNOxRdyT0	Monitoring of Nox signal readiness	7	YES	after 36 hours	P2200
DFC_NoCat2DsNOxSRCMax	SRC Max error for the NOx signal	7	YES	after 36 hours	P2201
DFC_NoCat2DsNOxSRCMin	SRC Min error for the NOx signal	7	YES	after 36	P2201

				hours	
DFC_NoCat2DsOpCir	Open circuit error for the NOx signal	7	YES	after 36 hours	P2200
DFC_NoCat2DsShCir	Short circuit error for the NOx signal	7	YES	after 36 hours	P2200
DFC_SCRChkEta1	DFC for Evaluation of Temperature Range 1	7	NO	no torque limiter	P0420
DFC_SCRChkEta2	DFC for Evaluation of Temperature Range 2	8	NO	immediately	P0420
DFC_SCRChkNOxDsPeakErr	DFC for peak plausibility check for NOx sensor down-stream of SCR Cat	7	NO	after 36 hours	P2214
DFC_SCRChkNOxDsPlausMax	DFC for plausibility error Max for NOx sensor down-stream of SCR Cat	7	NO	after 36 hours	P2214
DFC_SCRChkNOxDsPlausMin	DFC for plausibility error Min for NOx sensor down-stream of SCR Cat	7	NO	after 36 hours	P2214
DFC_SCRChkNOxDsStkErr	DFC for Stuck in range error check for NOx sensor downstream of SCR Cat	7	NO	after 36 hours	P2214
DFC_SCRChkTTCL	Monitoring of the time until the dosing release is given	7	YES	after 36 hours	P3042
DFC_SCRMonDetModePresChk	General pressure check error	7	YES	after 36 hours	P3053
DFC_SCRMonDetModePresStab	Pressure stabilisation	7	NO	immediately	P3054

	error				
DFC_SCRMonMetCtlOvrPresErr	Monitoring of Metering Control Malfuntion Max	7	YES	after 36 hours	P3039
DFC_SCRMonMetCtlUndrPresErr	Monitoring of Metering Control Malfuntion Min	7	NO	immediately	P3056
DFC_SCRMonOvrPresErr	Monitoring of over pressure	7	YES	no torque limiter	P3039
DFC_SCRMonPresBuildUpErr	Monitoring of Pressure Build Up Malfuntion Max	7	NO	immediately	P3040
DFC_SCRMonPresDropChk	General pressure drop check error	7	YES	after 36 hours	P3049
DFC_SCRMonPresRdcErr	Monitoring of Pressure Reduction Malfuntion Max	7	YES	no torque limiter	P3041
DFC_SCRPODPlausUCatUsTMax	Error SCR catalyst upstream temperature sensor plausi-bility max threshold	7	NO	after 36 hours	P0426
DFC_SCRPODPlausUCatUsTMin	Error SCR catalyst upstream temperature sensor plausi-bility min threshold	7	NO	after 36 hours	P0426
DFC_SCRPODPlausUCatUsTStat	Error SCR catalyst upstream temperature sensor static plausibility	7	NO	after 36 hours	P0426
DFC_SCRPODPlausUDosVlv	Dosing Valve is blocked	7	NO	immediately	P2047
DFC_SCRPODPlausUTnkLv1Hi	Urea tank sensor indicates too high fill level	7	NO	after 36 hours	P3066
DFC_SCRPODPlausUTnkLv1Lo	Urea tank sensor indicates too low	7	NO	immediately	P3067

	fill level				
DFC_SMHtrTDycFail	Diagnostic Fault Check for Supply Module temperature Duty cycle in failure range	8	NO	after 36 hours	P3029
DFC_SMNoAvl	Temperature measurement module not available	8	NO	immedia tely	P3038
DFC_SMTDycFail	Diagnostic Fault Check for Supply Module temperature Duty cycle in failure range	8	NO	immedia tely	P3029
DFC_SMTDycInvld	Diagnostic Fault Check for Supply Module Temperature Duty cycle in invalid range	8	NO	immedia tely	P3029
DFC_SRCMaxUTnkLvl	DFC for SRC high error of the urea tank level sesnor	8	YES	after 36 hours	P203D
DFC_SRCMinUTnkLvl	DFC for SRC low error of the urea tank level sesnor	8	YES	after 36 hours	P203C
DFC_UCatUsTSRCMax	SRC high for Urea catalyst upstream temperature sensor	8	YES	after 36 hours	P042D
DFC_UCatUsTSRCMin	SRC low for Urea catalyst upstream temperature sensor	8	YES	after 36 hours	P042C
DFC_UDCRdcAgRmn	Status of tank level	9	NO	immedia tely	P203F
DFC_UDosVlvEPHi	Short circuit to ground error in high side powerstage of Urea dosing valve	7	NO	immedia tely	P2049

	actuator				
DFC_UDosVlvOvrTemp	Short circuit to ground error in high side powerstage of Urea dosing valve actuator	7	NO	immediately	P2049
DFC_UDosVlvSCBLS	Short circuit to battery error in powerstage of Urea dosing valve actuator	8	NO	immediately	P2049
DFC_UDosVlvSCBOLHS	Short circuit to battery error in high side powerstage of Urea dosing valve actuator	8	NO	immediately	P2049
DFC_UDosVlvSCGOLLS	Short circuit to ground error in powerstage of Urea dosing valve actuator	8	NO	immediately	P2048
DFC_UDosVlvSCHS	Short circuit error in high side powerstage of Urea dosing valve actuator	8	NO	immediately	P2047
DFC_UPmpMotNDvt	Pump Motor Speed Deviation	8	NO	after 36 hours	P3001
DFC_UPmpMotNDvtPerm	Permanent Pump Motor Speed Deviation	8	NO	after 36 hours	P3086
DFC_UPmpMotNoAv1	Pump motor not available for actuation	8	NO	immediately	P3002
DFC_UPmpMotOL	No load error on powerstage for urea pump motor	8	NO	immediately	P3006
DFC_UPmpMotOvrTemp	Over temperature error on powerstage for urea pump motor	8	NO	immediately	P3003

DFC_UPmpMotSCB	Short circuit to battery error on powerstage for urea pump motor	8	NO	immediately	P3004
DFC_UPmpMotSCG	Short circuit to ground error on powerstage for urea pump motor	8	NO	immediately	P3005
DFC_UPmpPPlausMax	SRC error for Urea Pump Module Pressure Sensor	7	NO	immediately	P3007
DFC_UPmpPPlausMin	SRC error for Urea Pump Module Pressure Sensor	7	NO	immediately	P3007
DFC_UPmpPSRCMax	SRC high for Urea Pump Module Pressure Sensor	8	NO	immediately	P204D
DFC_UPmpPSRCMin	SRC low for Urea Pump Module Pressure Sensor	8	NO	immediately	P204C

Description of the Torque Limiter Activation

Torque limiter is designed according to OBD rule of law. It is activated when NOx emission exceeds OBD threshold.

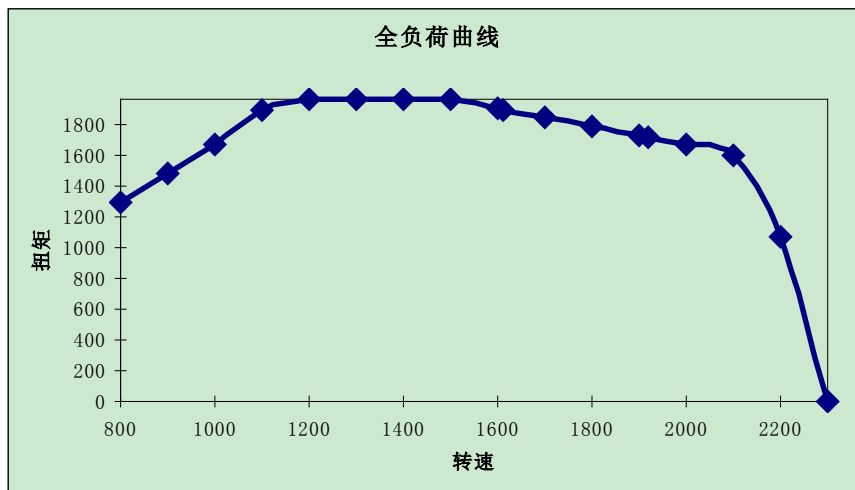
Engine control unit can distinguish failures that result in torque limiter immediate activated or immediately after 36 hours. After treatment unit sends torque limiter request to engine control unit via CAN communication.

Description of the Full Load Curve Limitation

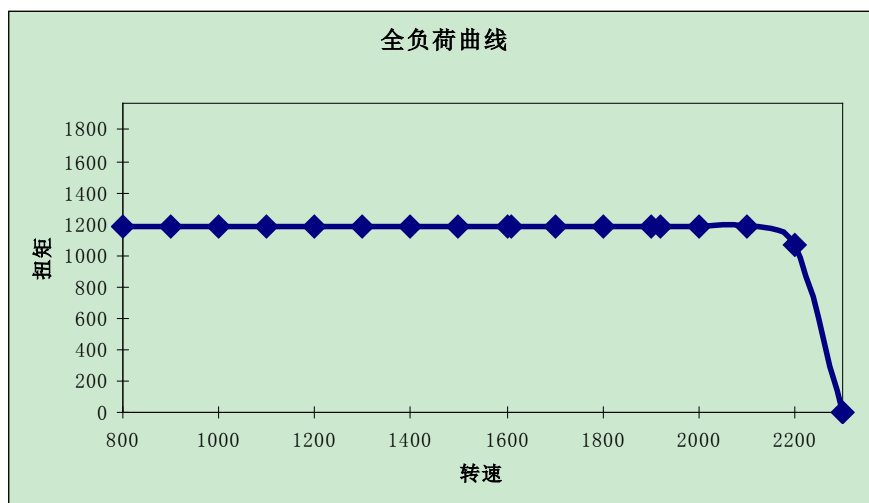
Description of the Full Load Curve Limitation

WP12.460E50

When there is not failure on engine, The maximum torque:2110Nm:

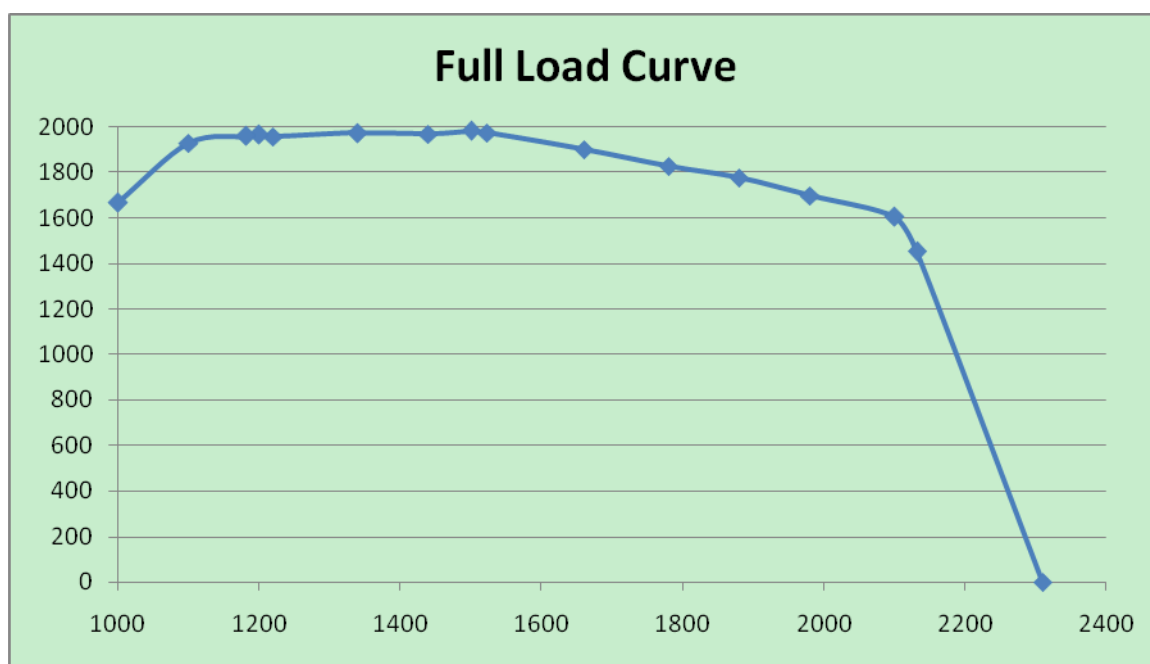


When torque limiter is activated, The maximum torque:60%* maximum torque equal 1266Nm:

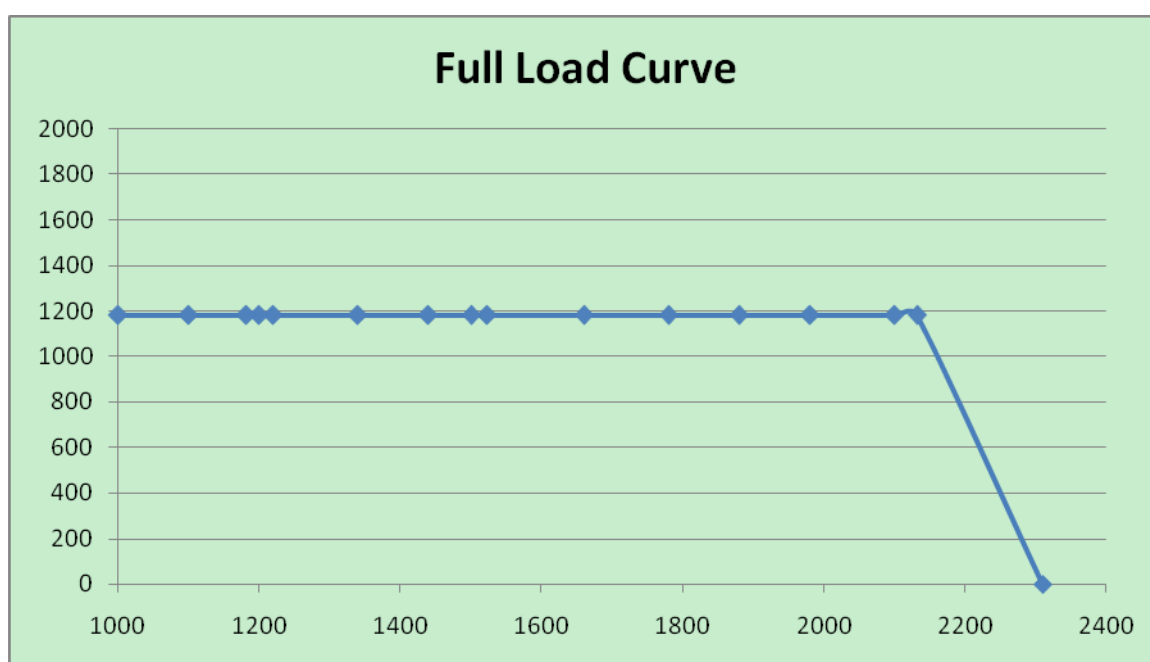


WP12.480E50

When there is not failure on engine, The maximum torque:1970Nm:

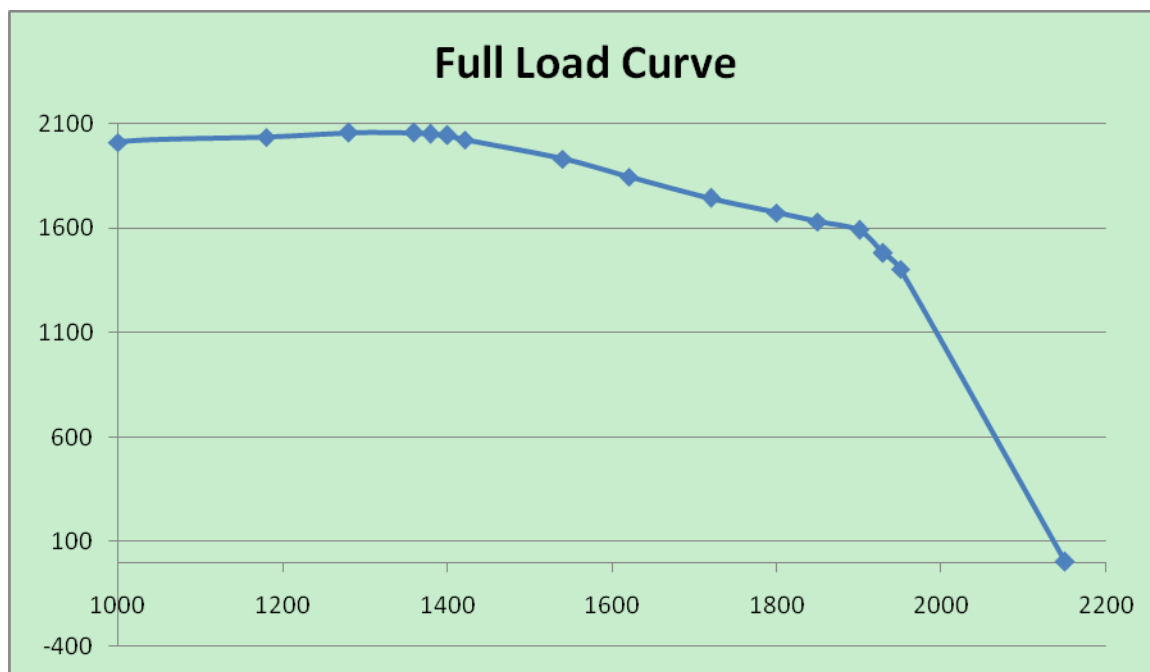


When torque limiter is activated, The maximum torque:60%* maximum torque equal 1182Nm:

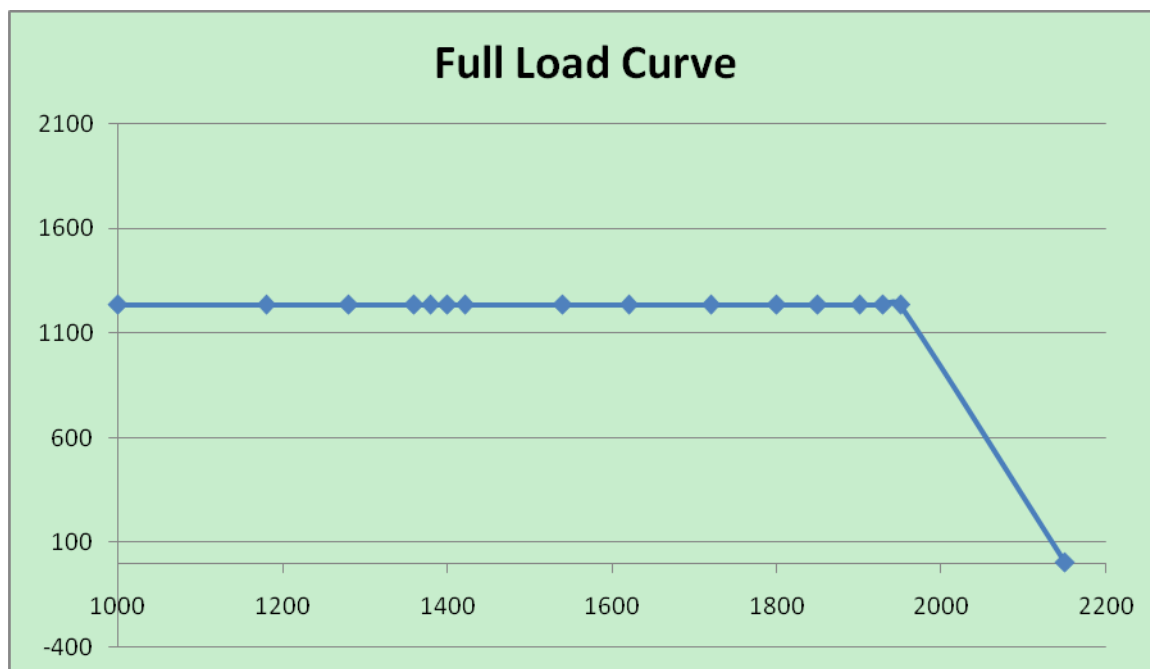


WP12.430E50

When there is not failure on engine, The maximum torque:2060Nm:

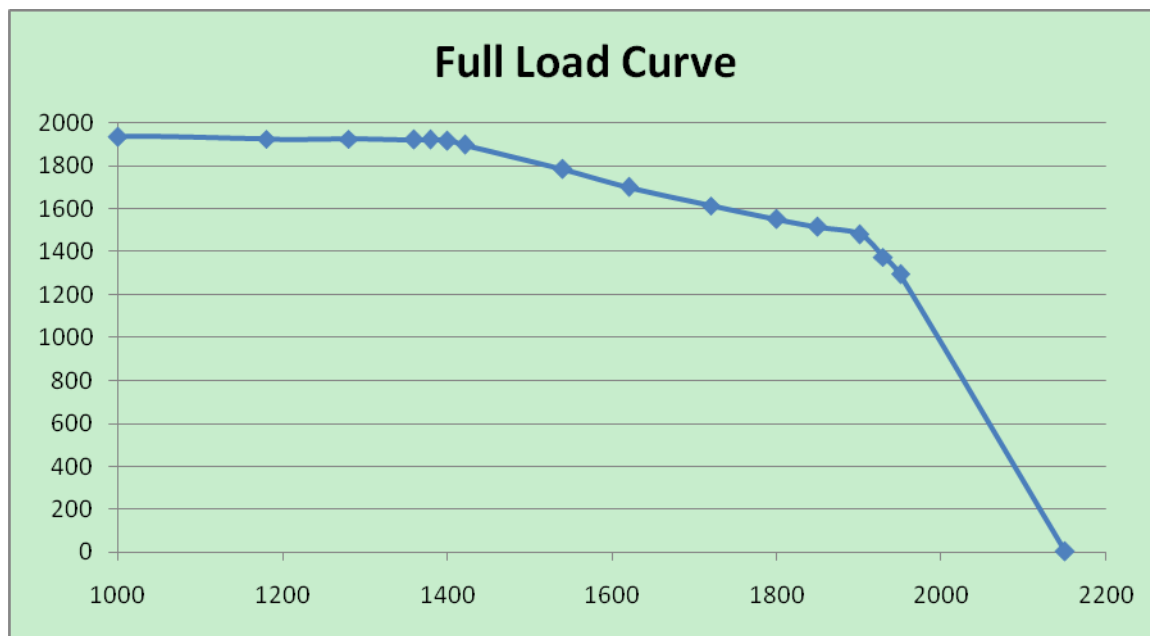


When torque limiter is activated, The maximum torque:60%* maximum torque equal 1236Nm:

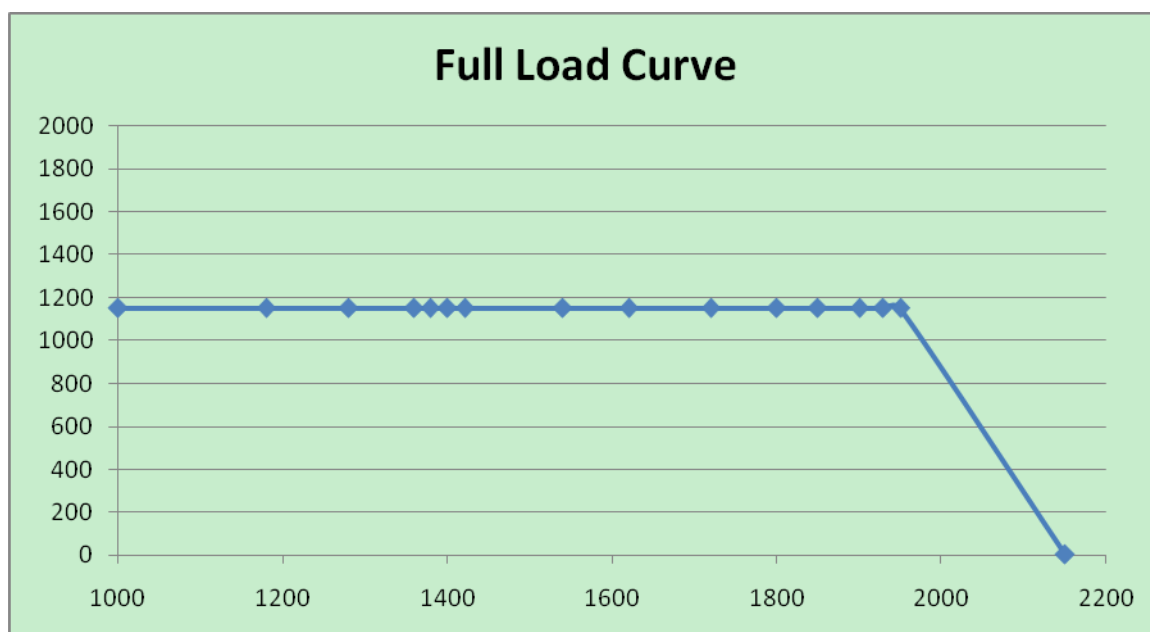


WP12.400E50

When there is not failure on engine, The maximum torque:1920Nm:

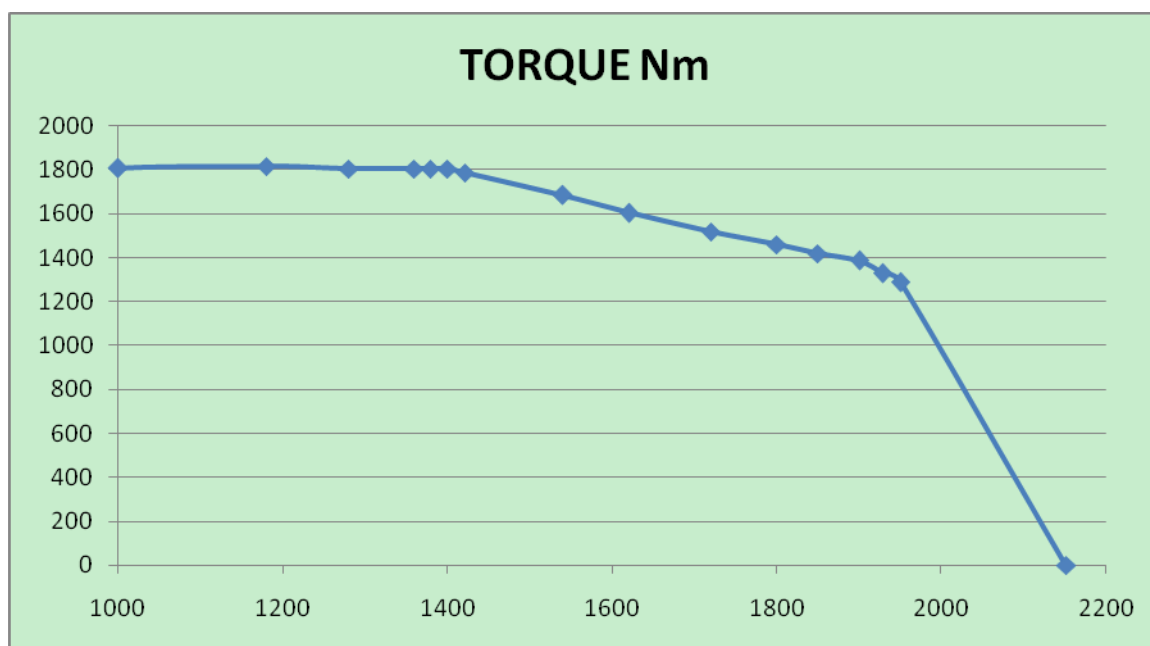


When torque limiter is activated, The maximum torque:60%* maximum torque equal 1152Nm:

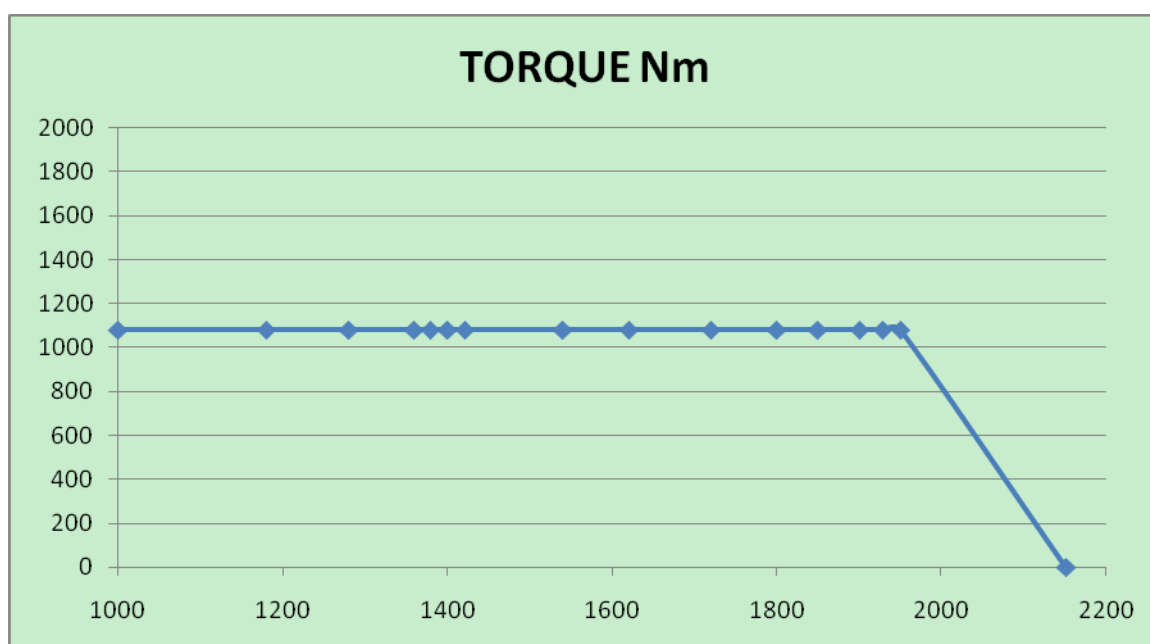


WP12.375E50

When there is not failure on engine, The maximum torque:1800Nm:

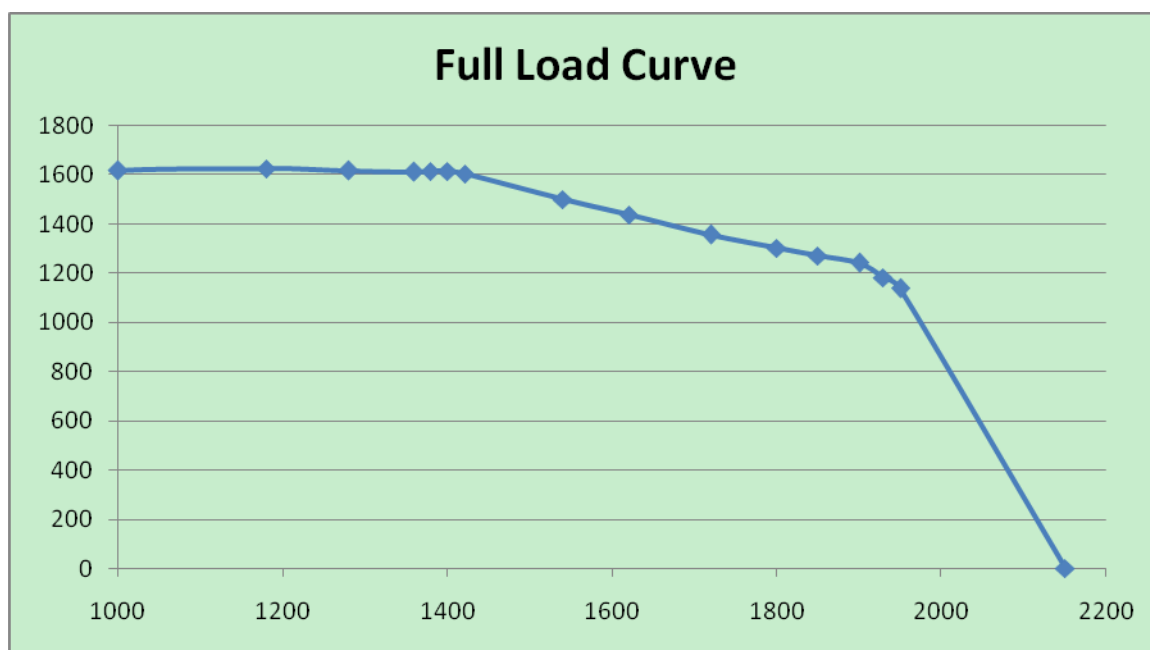


When torque limiter is activated, The maximum torque:60%* maximum torque equal 1080Nm:

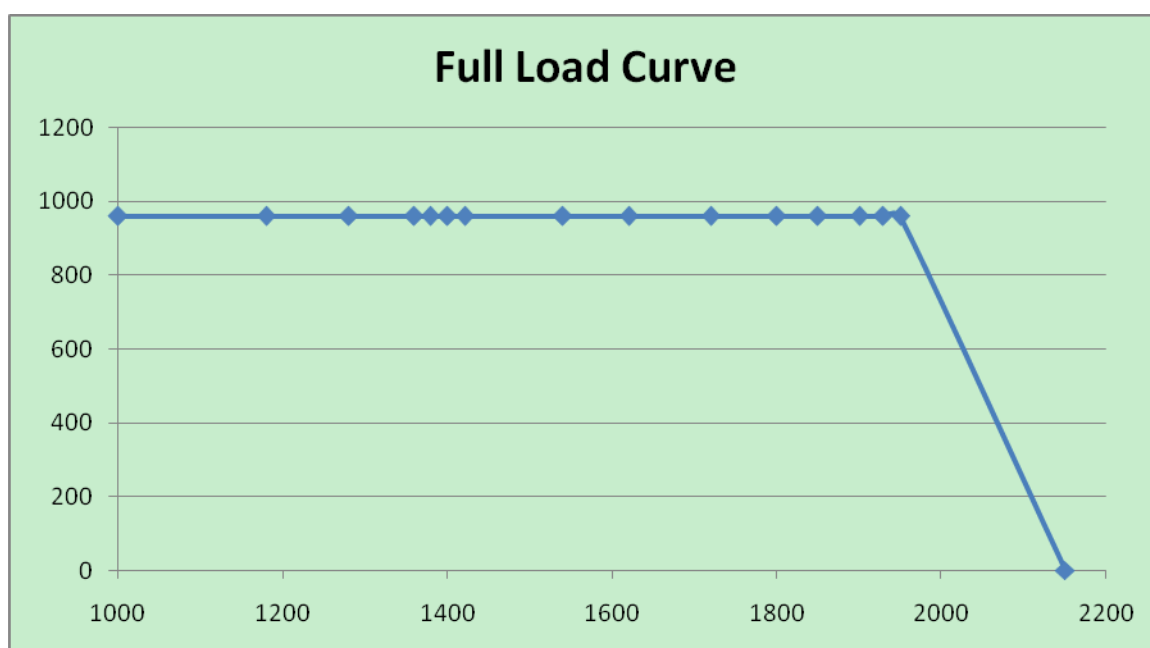


WP12.336E50

When there is not failure on engine, The maximum torque:1600Nm:

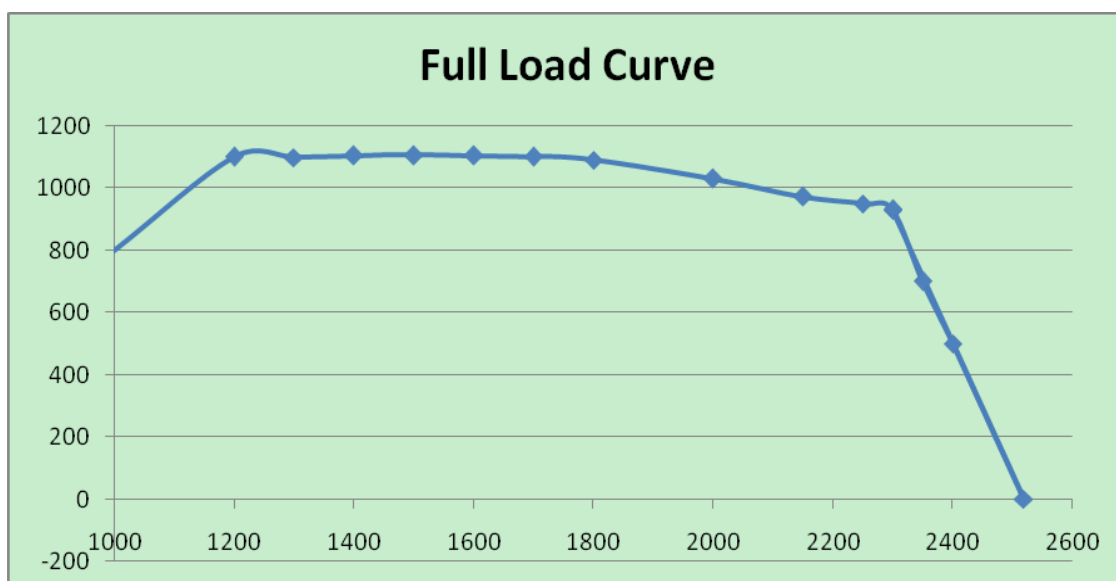


When torque limiter is activated, The maximum torque:60%* maximum torque equal 960Nm:

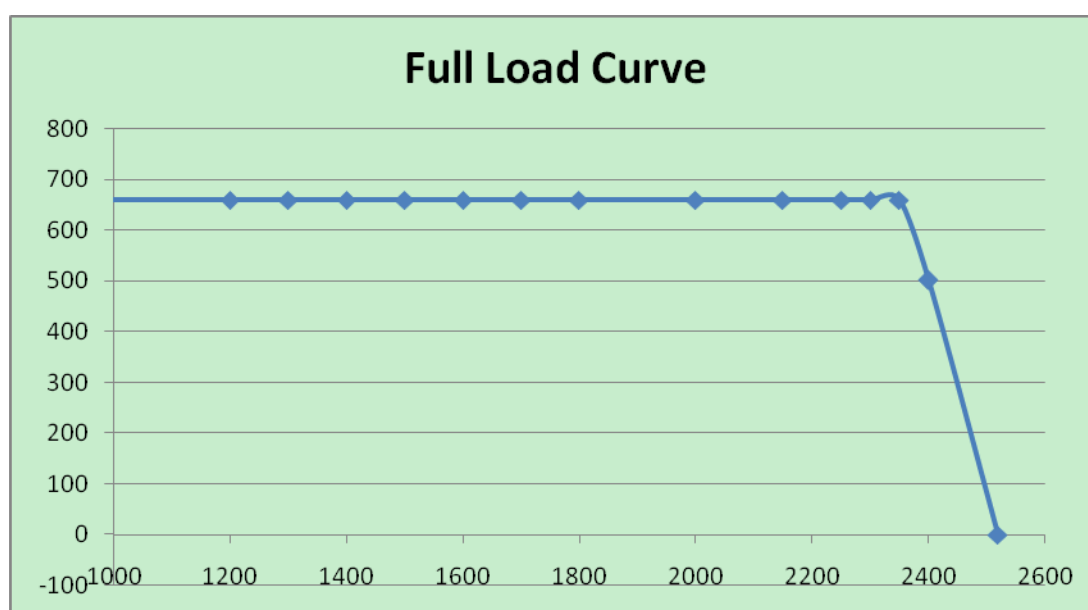


WP7.300E50

When there is not failure on engine, The maximum torque:1100Nm:

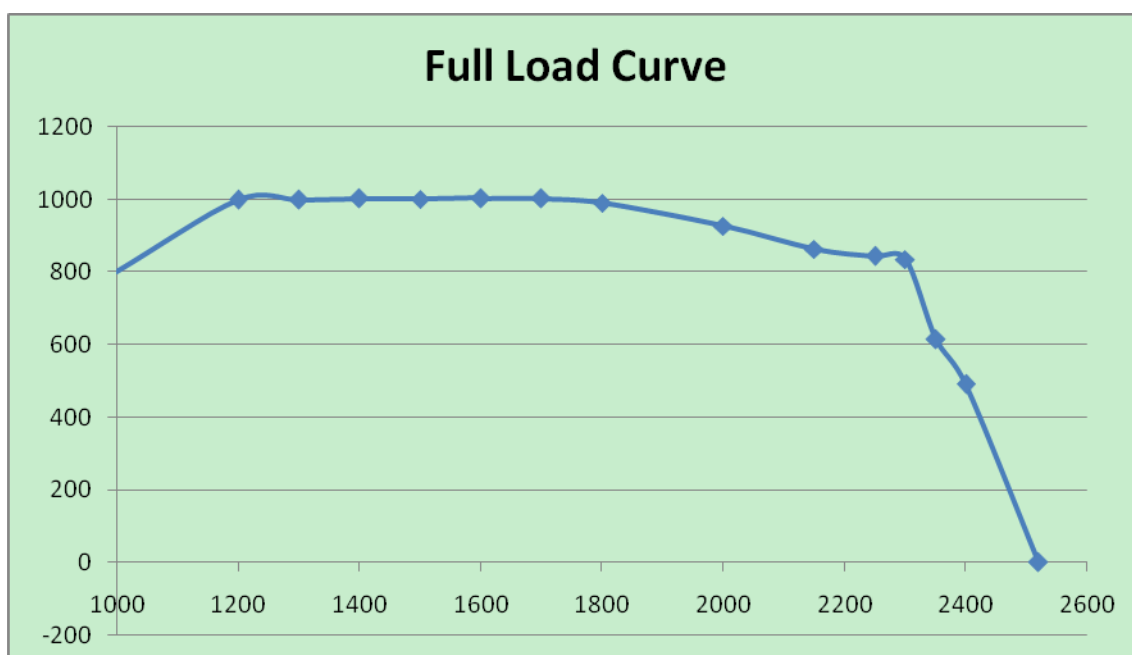


When torque limiter is activated, The maximum torque:60%* maximum torque equal 660Nm:

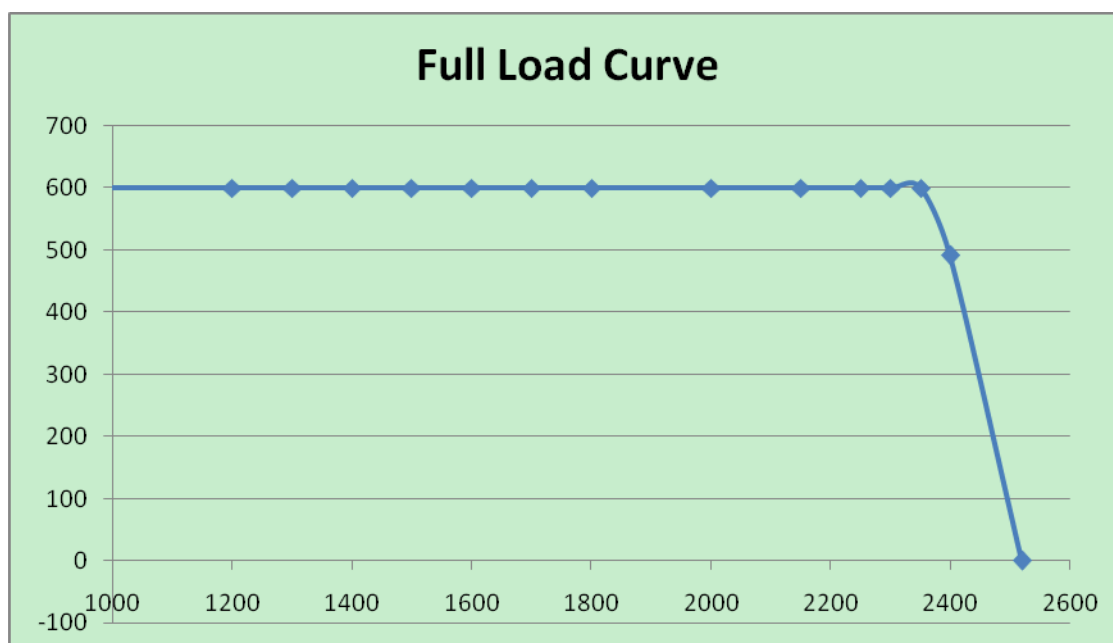


WP7Q270E500

When there is not failure on engine, The maximum torque:1000Nm:

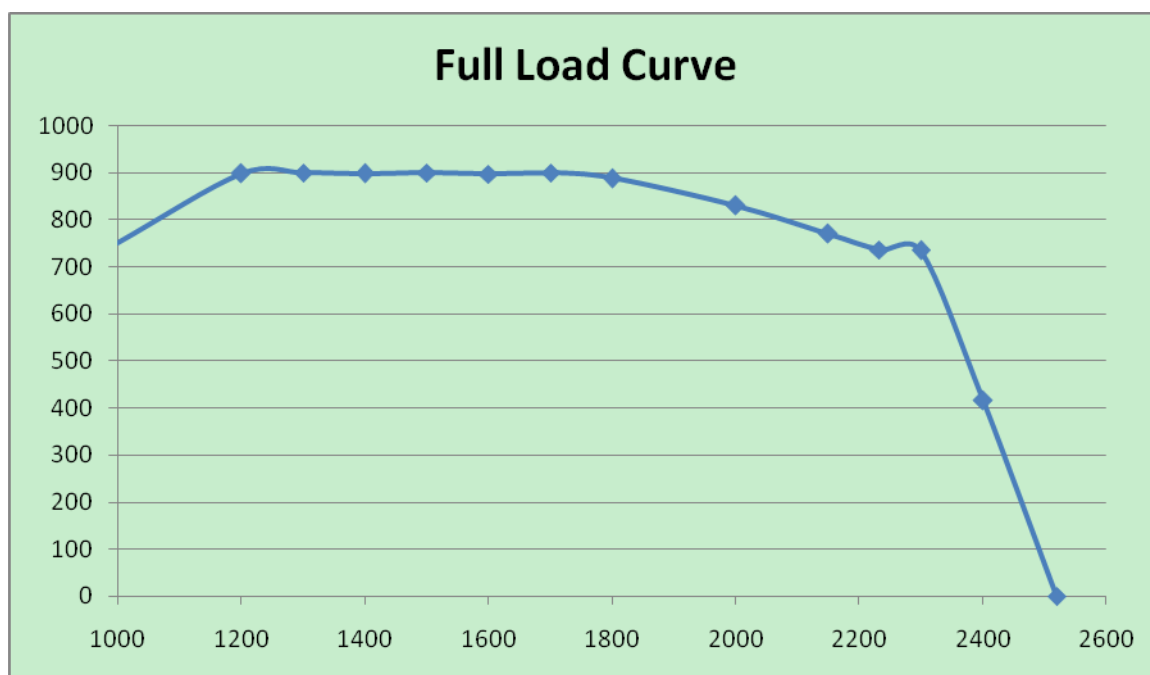


When torque limiter is activated, The maximum torque:60%* maximum torque equal 600Nm:

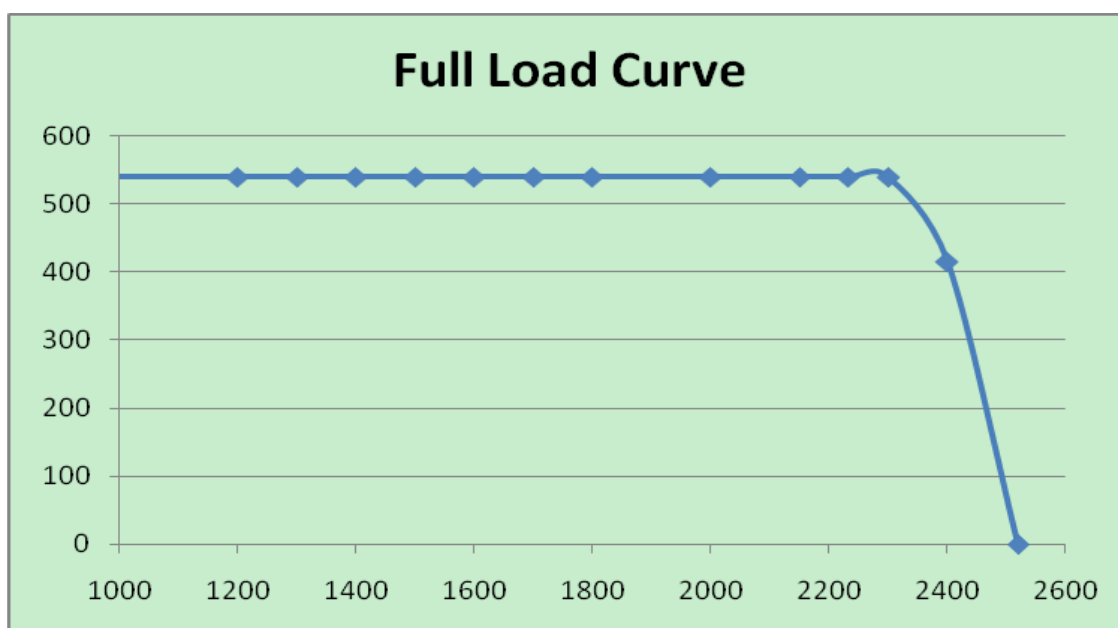


WP7Q240E500

When there is not failure on engine, The maximum torque:900Nm:

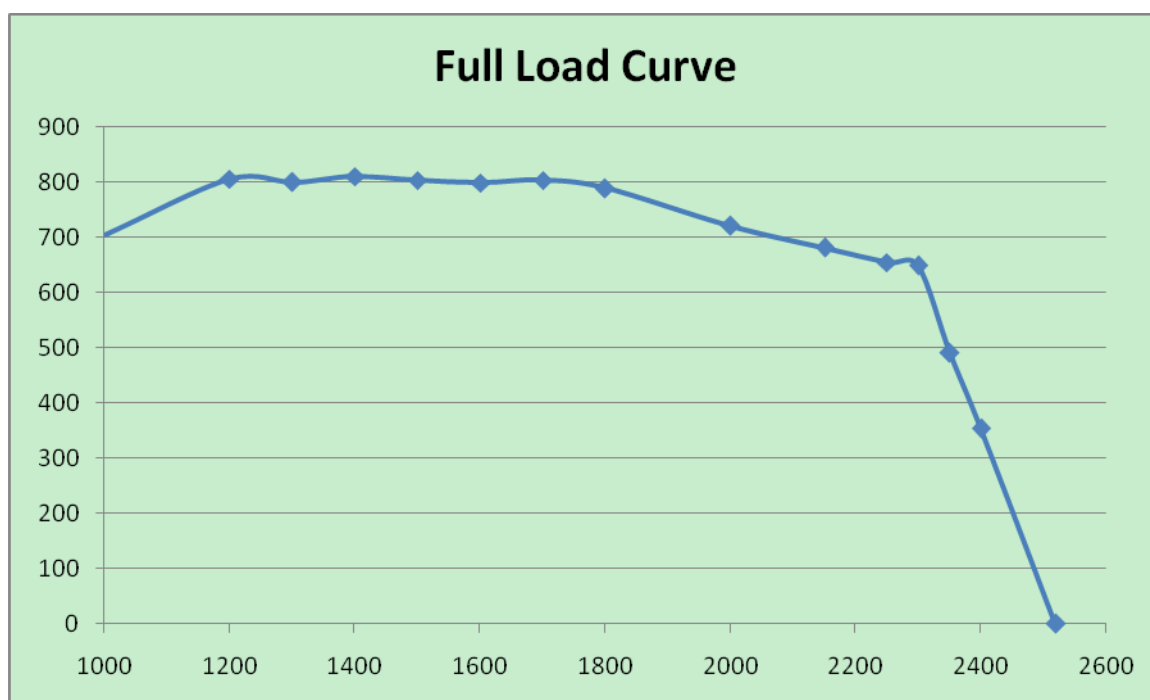


When torque limiter is activated, The maximum torque:60%* maximum torque equal 540Nm:

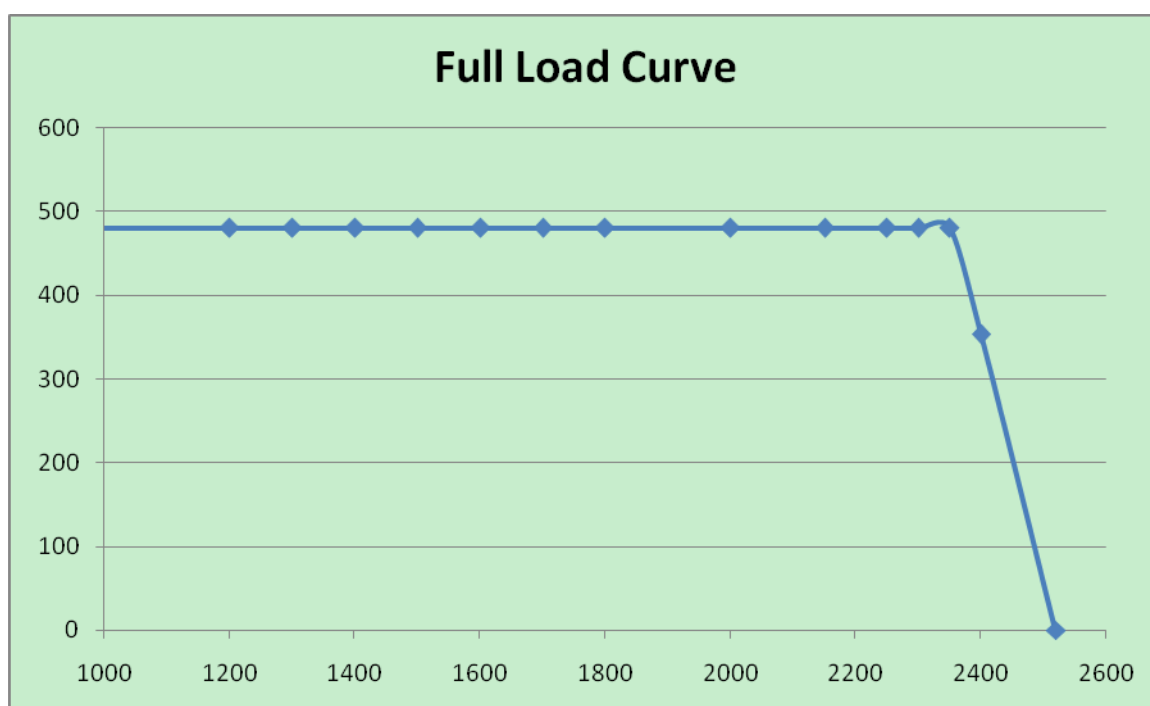


WP7Q210E500

When there is not failure on engine, The maximum torque:800Nm:



When torque limiter is activated, The maximum torque:60%* maximum torque equal 480Nm:



OBD make and type

- make: Bosch
- type: WPOBD2.0

OBD family

- parent engine: WP7.300E50
- engine types: WP7.300E50、WP7Q270E500、WP7Q240E500、WP7Q210E500
WP12.460E50、WP12.480E50、WP12.430E50、WP12.400E50
WP12.375E50、WP12.336E50

ANNEX I

ESSENTIAL CHARACTERISTICS OF THE ENGINE AND INFORMATION
CONCERNING THE CONDUCT OF TEST

Vehicle type/parent engine/engine: WP13E50

A	WP13.550E50	405kW@2100min-1	2300Nm@1200-1500 min-1
B	WP13.530E50	390kW@2100min-1	2220Nm@1200-1500 min-1
C	WP13.500E50	368kW@2100min-1	2100Nm@1200-1500 min-1
D	WP13.480E50	353kW@1900min-1	2110Nm@1100-1400 min-1

0. GENERAL

0.1 Make (name of undertaking): Weichai Power Co., Ltd.0.2 Type and commercial description (mention any variants): WP13E50

0.3 Means and location of identification of type, if marked on the vehicle: n. a.

0.4 Category of vehicle (if applicable): n. a.

0.5 Category of engine: diesel/NG fuelled/LPG fuelled/ethanol fuelled0.6 Name and address of manufacturer: Weichai Power Co., Ltd.
No. 197A, Fushou East Street, Weifang, Shandong, China

0.7 Name and address of manufacturer's representative: n. a.

0.8 Location of statutory plates and inscriptions and method of fixing: See the picture0.9 In the case of components and separate technical units, location and method of affixing of the EC approval mark: On the engine0.10 Address of assembly plant(s): No. 197A, Fushou East Street, Weifang, Shandong, China

Attachments

1. Essential characteristics of the (parent) engine and information concerning the product of test.
2. Essential characteristics of the engine family.
3. Essential characteristics of the engine types within the family.
4. Characteristics of the engine-related vehicle parts (if applicable).
5. Photographs and/ or drawings of the parent engine type and, if applicable, of the engine compartment.
6. List further attachment if any.

Appendix I

 ESSENTIAL CHARACTERISTICS OF THE (PARENT) ENGINE AND INFORMATION CONCERNING THE CONDUCT
 OF TEST ⁽¹⁾
1. DESCRIPTION OF ENGINE

- 1.1. Manufacturer: Weichai Power Co., Ltd.
- 1.2. Manufacturer's engine code: WP13.550E50
- 1.3. Cycle: four stroke / ~~two stroke~~ ⁽²⁾
- 1.4. Number and arrangement of cylinders: 6, In-line, Vertical
- 1.4.1. Bore: 127 mm
- 1.4.2. Stroke: 165 mm
- 1.4.3. Firing order: 1-5-3-6-2-4
- 1.5. Engine capacity: 12.54×10^3 cm³
- 1.6. Volumetric compression ratio ⁽³⁾ : 17:1
- 1.7. Drawing(s) of combustion chamber and piston crown: Refer to the section
- 1.8. Minimum cross-sectional area of inlet and outlet ports: Inlet: 1192mm², Outlet: 1072mm²
- 1.9. Idling speed: 600 ± 50 min⁻¹
- 1.10. Maximum net power: 400 kW at 2100 min⁻¹
- 1.11. Maximum permitted engine speed: 2310 min⁻¹
- 1.12. Maximum net torque: 2300 Nm at 1200~1500 min⁻¹
- 1.13. Combustion system: compression ignition / ~~positive ignition~~ ⁽²⁾
- 1.14. Fuel: Diesel / ~~LPG~~ / ~~NG-H~~ / ~~NG-L~~ / ~~NG-HL~~ ⁽²⁾
- 1.15. Cooling system
- 1.15.1. Liquid
- 1.15.1.1. Nature of liquid: Water
- 1.15.1.2. Circulating pump(s): yes / ~~no~~ ⁽²⁾
- 1.15.1.3. Characteristics or make(s) and type(s) (if applicable): No details
- 1.15.1.4. Drive ratio(s) (if applicable): 1.95
- 1.15.2. Air: N/A
- 1.16. Temperature permitted by the manufacturer
- 1.16.1. Liquid cooling: Maximum temperature at outlet: 356~368 K
- 1.16.2. Air cooling: N/A
- 1.16.3. Maximum temperature of the air at the outlet of the intake intercooler (if applicable) 328 K
- 1.16.4. Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold(s) or turbocharger(s): 873 K
- 1.16.5. Fuel temperature: min. 308 K, max. 314 K
for diesel engines at injection pump inlet, for gas fuelled engines at pressure regulator final stage.
- 1.16.6. Fuel pressure: min.kPa, max.kPa
at pressure regulator final stage, NG fuelled gas engines only. N/A
- 1.16.7. Lubricant temperature: min. 353 K, max. 378 K
- 1.17 Pressure charger: yes / ~~no~~ ⁽²⁾
- 1.17.1. Make: BORGWARNER

1.17.2. Type: B3G

1.17.3. Description of the system (e.g. max. charge pressure, wastegate, if applicable):
176.5kPa, with wastegate downstream intercooler

1.17.4. Intercooler: yes/~~no~~⁽²⁾

1.18. Intake system

Maximum allowable intake depression at rated engine speed and at 100% load: 3.5kPa

1.19. Exhaust system

Maximum allowable exhaust back pressure at rated engine speed and at 100% load: 20 kPa

Exhaust system volume: 170dm³

1.20. Engine Electronic Control Unit (EECU) (all engine types):

1.20.1. Make: BOSCH

1.20.2. Type: WPEDC7

1.20.3. Software calibration number(s): 612750860001

2. MEASURES TAKEN AGAINST AIR POLLUTION

2.1. Device for recycling crankcase gases (description and drawings): Oil separator, see the picture

2.2. Additional anti-pollution devices (if any, and if not covered by another heading)
SCR

2.2.1. Catalytic converter: yes/~~no~~⁽²⁾

2.2.1.1. Make(s): Weichai Power Co., Ltd

2.2.1.2. Type(s): WPSCR-002

2.2.1.3. Number of catalytic converters and elements: 1×2

2.2.1.4. Dimensions, shape and volume of catalytic converter(s): 584×450×568, cube, 149 L

2.2.1.5. Type of catalytic action: Selective Catalytic Reduction

2.2.1.6. Total charge of precious metals: none

2.2.1.7. Relative concentration: none

2.2.1.8. Substrate (structure and material): honeycomb monolith, cordierite

2.2.1.9. Cell density: 300 cpsi

2.2.1.10. Type of casting for the catalytic converter(s): stainless steel

2.2.1.11. Location of the catalytic converter(s) (place and reference distance in the exhaust line): 800mm~2800mm from turbo downstream

2.2.1.12. Normal operating temperature range (K): 473~823K

2.2.1.13. Consumable reagents (where appropriate): UREA

2.2.1.13.1. Type and concentration of reagent needed for catalytic action: alkalescent, 32.5% (w/w water)

2.2.1.13.2. Normal operational temperature range of reagent: 268~343K

2.2.1.13.3. International standard (where appropriate): DIN 70070

2.2.1.13.4. Frequency of reagent refill: continuous/~~maintenance~~

2.2.2. Oxygen sensor: yes/~~no~~⁽²⁾

2.2.2.1. Make(s):

2.2.2.2. Type(s):

2.2.2.3. Location:

2.2.3. Air injection: yes/~~no~~⁽²⁾

2.2.3.1. Type (pulse air, air pump, etc.)

2.2.4. EGR: yes/~~no~~⁽²⁾

2.2.4.1. Characteristics (flow rate etc.)

2.2.5. Particulate trap: ~~yes~~/no⁽²⁾

2.2.5.1. Dimensions, shape and capacity of the particulate trap:

2.2.5.2. Type and design of the particulate trap:

2.2.5.3. Location (reference distance in the exhaust line):

2.2.5.4. Method or system of regeneration, description and/or drawing:

2.2.5.5. Normal operating temperature (K) and pressure (kPa) range:

2.2.5.6. In case of periodic regeneration:

-Number of ETC test cycles between 2 regeneration (n1):

-Number of ETC test cycles during regeneration (n2):

2.2.6. Other system: ~~yes~~/no⁽²⁾

2.2.6.1. Description and operation:

3. FUEL FEED

3.1. Diesel engines

3.1.1. Feed pump

Pressure⁽³⁾ : 260L/h at 350 kPa or characteristic diagram⁽²⁾:.....

3.1.2. Injection system

3.1.2.1. Pump: Common Rail System

3.1.2.1.1. Make(s): BOSCH

3.1.2.1.2. Type(s): WPCPN2

3.1.2.1.3. Delivery: 278mm³⁽³⁾ per stroke at engine speed of: 2100min⁻¹ at full injection, or characteristic diagram⁽²⁾ (3):.....

Mention the method used: On engine/~~on pump bench~~⁽²⁾

If boost control is supplied, state the characteristic fuel delivery and boost pressure versus engine speed.

3.1.2.1.4. Injection advance

3.1.2.1.4.1. Injection advance curve⁽³⁾: Controlled by ECU

3.1.2.1.4.2. Static injection timing⁽³⁾: Controlled by ECU

3.1.2.2. Injection piping

3.1.2.2.1. Length: 297 mm

3.1.2.2.2. Internal diameter: Φ3.6 mm

3.1.2.3. Injector(s)

3.1.2.3.1. Make(s): BOSCH

3.1.2.3.2. Type(s): WPCRIN2

3.1.2.3.3. Opening pressure: 25MPa⁽³⁾

or characteristic diagram⁽²⁾ (3):.....

3.1.2.4. Governor

3.1.2.4.1. Make(s): BOSCH

3.1.2.4.2. Type(s): hardware: WPEDC7, ECU Data set No.: 612750860001

3.1.2.4.3. Speed at which cut-off starts under full load: 2100min⁻¹

3.1.2.4.4. Maximum no-load speed: 2310min⁻¹

3.1.2.4.5. Idling speed: 600±50min⁻¹

3.1.3. Cold start system:

3.1.3.1. Make(s): N.A.

3.1.3.2. Type(s): 612630120003

3.1.3.3. Description: Electric Pre-warm

3.1.3.4. Auxiliary starting aid: N/A

3.2. Gas fuelled engines ⁽⁶⁾ N/A

4. VALVE TIMING

4.1. Maximum lift of valves and angles of opening and closing in relation to dead centres or equivalent data: Maximum lift of intake valves: 10.44mm, Maximum lift of exhaust valves: 11.06mm; Angles of opening and closing: 20° BTDC 34° ABDC 49° BBDC 21° ATDC

4.2. Reference and/or setting ranges ⁽²⁾ :

5. IGNITION SYSTEM—(SPARK IGNITION ENGINES ONLY) N/A

6. ENGINE-DRIVEN EQUIPMENT

The engine must be submitted for testing with the auxiliaries needed for operating the engine (e.g. fan, water pump, etc.), as specified in and under the operating conditions of Directive 80/1269/EEC, annex •, section 5.1.1.

6.1. Auxiliaries to be fitted for the test

If it is impossible or inappropriate to install the auxiliaries on the test bench, the power absorbed by them must be determined and subtracted from the measured engine power over the whole operating area of the test cycle(s).

6.2. Auxiliaries to be removed for the test

Auxiliaries needed only for the operation of the vehicle (e.g. air compressor, air-conditioning system etc.) must be removed for the test. Where the auxiliaries cannot be removed, the power absorbed by them may be determined and added to the measured engine power over the whole operating area of the test cycle(s).

7. ADDITIONAL INFORMATION ON TEST CONDITIONS

7.1. Lubricant used

7.1.1. Make: China Petrochemical Co., Ltd.

7.1.2. Type: 15W/40 CI-4

(State percentage of oil in mixture if lubricant and fuel are mixed): N/A

7.2. Engine-driven equipment (if applicable)

The power absorbed by the auxiliaries needs only be determined,

- if auxiliaries needed for operating the engine, are not fitted to the engine and/or
- if auxiliaries not needed for operating the engine, are fitted to the engine.

7.2.1. Enumeration and identifying details: fan

7.2.2. Power absorbed at various indicated engine speeds:

Equipment	Power absorbed (kW) at various engine speeds						
	Idle	Low Speed	High Speed	Speed A(7)	Speed B(7)	Speed C(7)	Ref. Speed(8)
P(a) Auxiliaries needed for operating the engine (to be subtracted from measured engine power)	0	0.5	1.9	0.7	1	1.5	2

see item 6.1.							
P(b) Auxiliaries not needed for operating the engine (to be added to measured Engine power) see item 6.2.	0	0	0	0	0	0	0

8. ENGINE PERFORMANCE

8.1. Engine speeds ⁽⁹⁾

Low speed (n_{lo}): 1000min⁻¹

High speed (n_{hi}): 2200min⁻¹

for ESC and ELR Cycles

Idle: 600min⁻¹

Speed A: 1300min⁻¹

Speed B: 1600min⁻¹

Speed C: 1900min⁻¹

for ETC cycle

Reference speed: 2140min⁻¹

8.2. Engine power in kW

	Engine speed				
	idle	Speed A(2)	Speed B(2)	Speed C(2)	Ref. Speed(3)
P(m) Power measured on test bed	0	313.1	373.6	397.9	356.4
P(a) Power absorbed by auxiliaries to be fitted for test (item 6.1) - if fitted - if not fitted	0	0.7	1	1.5	2.0
P(b) Power absorbed by auxiliaries to be removed for test (item 6.2) - if fitted - if not fitted	0	0	0	0	0
P(n) Net engine power = P(m) - P(a) + P(b)	0	312.4	372.6	396.4	354.4

8.3. Dynamometer settings (kW)

The dynamometer settings for the ESC and ELR tests and for the reference cycle of the ETC test must be based upon the net engine power P(n) of paragraph 8.2. It is recommended to install the engine on the test bed in the net condition. In this case, P(m) and P(n) are identical. If it is impossible or inappropriate to operate the engine under net conditions, the dynamometer settings must be corrected to net conditions using the above formula.

8.3.1. ESC and ELR Tests

The dynamometer settings must be calculated according to the formula in annex III, appendix 1, section 1.2.

Per cent load	Engine Speed			
	idle	Speed A	Speed B	Speed C
10	0	31.3	37.4	39.8
25	0	78.3	93.4	99.5
50	0	156.6	186.8	199.0
75	0	234.8	280.2	298.4
100	0	313.1	373.6	397.9

8.3.2. ETC Test

If the engine is not tested under net conditions, the correction formula for converting the measured power or measured cycle work, as determined according to annex III, appendix 2, section 2, to net power or net cycle work must be submitted by the engine manufacturer for the whole operating area of the cycle, and approved by the Technical Service.

9. On-board diagnostics (OBD) system

9.1. Written description and/or drawings of the MI: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.2. List and purpose of all components monitored by the OBD system: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.3. Written description (general OBD working principle) for:

9.3.1. Diesel/gas engine:

9.3.1.1. Catalyst monitoring: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.3.1.2. deNOx system monitoring: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.3.1.3. Diesel particulate filter monitoring: [N/A](#)

9.3.1.4. Electronic fuelling system monitoring: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.3.1.5. Other components monitored by the OBD system: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.4. Criteria for MI activation (fixed number of driving cycles or statistical method): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

9.5. List of all OBD output codes and formats used (with explanation of each): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

10. TORQUE LIMITER

10.1. Description of the torque limiter activation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

10.2. Description of the full load curve limitation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

Footnotes:

(1) In the case of non-conventional engines and systems, particulars equivalent to those referred to here must be supplied by the manufacturer.

(2) Strike out what does not apply.

(3) Specify the tolerance.

(6) In the case of systems laid out in a different manner, supply equivalent information (for paragraph 3.2).

(7) ESC test

(8) ETC test only.

(9) Specify the tolerance; to be within ± 3 per cent of the values declared by the manufacturer.

Appendix 2

ESSENTIAL CHARACTERISTICS OF THE ENGINE FAMILY

1. COMMON PARAMETERS

- 1.1. Combustion cycle: 4 stroke
- 1.2. Cooling medium: Water
- 1.3. Number of cylinders ⁽¹⁾: 6
- 1.4. Individual cylinder displacement: 2.083 L
- 1.5. Method of air aspiration: Charge & Inter-cool
- 1.6. Combustion chamber type/design: @ combustion chamber
- 1.7. Valve and porting - configuration, size and number: 4 valves
- 1.8. Fuel system: Common Rail
- 1.9. Ignition system (gas engines): N/A
- 1.10. Miscellaneous features:
- charge cooling system ⁽¹⁾: Turbo charger, Intercooler
 - exhaust gas recirculation ⁽¹⁾: N/A
 - water injection/emulsion ⁽¹⁾: N/A
 - air injection ⁽¹⁾: N/A
- 1.11. Exhaust after-treatment ⁽¹⁾: SCR

Proof of identical (or lowest for the parent engine) ratio:

system capacity / fuel delivery per stroke, pursuant to

diagram number(s):

2. ENGINE FAMILY LISTING

2.1. Name of diesel engine family: WP13

2.1.1. Specification of engines within this family:

				Parent engine
Engine Type	<u>WP13.480E50</u>	<u>WP13.500E50</u>	<u>WP13.530E50</u>	<u>WP13.550E50</u>
No. of cylinders	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
Rated speed (min ⁻¹)	<u>1900</u>	<u>2100</u>	<u>2100</u>	<u>2100</u>
Fuel delivery per stroke (mm ³)	<u>256</u>	<u>249</u>	<u>267</u>	<u>278</u>
Rated net power (kW)	<u>348</u>	<u>363</u>	<u>385</u>	<u>400</u>
Maximum torque speed (min ⁻¹)	<u>1100-1400</u>	<u>1200-1500</u>	<u>1200-1500</u>	<u>1200-1500</u>
Fuel delivery per stroke (mm ³)	<u>287</u>	<u>288</u>	<u>307</u>	<u>318</u>
Maximum torque (Nm)	<u>2110</u>	<u>2100</u>	<u>2220</u>	<u>2300</u>
Low idle speed (min-1)	<u>600</u>	<u>600</u>	<u>600</u>	<u>600</u>
Cylinder displacement (in % of parent engine)	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
ECU Data set No.	<u>612750860013</u>	<u>612750860009</u>	<u>612750860005</u>	<u>612750860001</u>

2.2. Name of gas engine family: N/A

⁽¹⁾ If not applicable, mark "N/A"

Appendix 3.1

ESSENTIAL CHARACTERISTICS OF THE ENGINE TYPE WITHIN THE FAMILY (1)

1. DESCRIPTION OF ENGINE

- 1.1. Manufacturer: Weichai Power Co., Ltd.
- 1.2. Manufacturer's engine code: WP13.530E50
- 1.3. Cycle: four stroke / ~~two stroke~~ (2)
- 1.4. Number and arrangement of cylinders: 6, In-line, Vertical
- 1.4.1. Bore: 127 mm
- 1.4.2. Stroke: 165 mm
- 1.4.3. Firing order: 1-5-3-6-2-4
- 1.5. Engine capacity: 12.54×10^3 cm³
- 1.6. Volumetric compression ratio (3) : 17:1
- 1.7. Drawing(s) of combustion chamber and piston crown: Refer to the section
- 1.8. Minimum cross-sectional area of inlet and outlet ports: Inlet: 1192mm², Outlet: 1072mm²
- 1.9. Idling speed: 600 ± 50 min⁻¹
- 1.10. Maximum net power: 385 kW at 2100 min⁻¹
- 1.11. Maximum permitted engine speed: 2310 min⁻¹
- 1.12. Maximum net torque: 2220 Nm at 1200~1500 min⁻¹
- 1.13. Combustion system: compression ignition / ~~positive ignition~~ (2)
- 1.14. Fuel: Diesel / ~~LPG~~ / ~~NG-H~~ / ~~NG-L~~ / ~~NG-HL~~ (2)
- 1.15. Cooling system
- 1.15.1. Liquid
- 1.15.1.1. Nature of liquid: Water
- 1.15.1.2. Circulating pump(s): yes / ~~no~~ (2)
- 1.15.1.3. Characteristics or make(s) and type(s) (if applicable): No details
- 1.15.1.4. Drive ratio(s) (if applicable): 1.95
- 1.15.2. Air: N/A
- 1.16. Temperature permitted by the manufacturer
- 1.16.1. Liquid cooling: Maximum temperature at outlet: 356~368 K
- 1.16.2. Air cooling: N/A
- 1.16.3. Maximum temperature of the air at the outlet of the intake intercooler (if applicable) 328 K
- 1.16.4. Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold(s) or turbocharger(s): 873 K
- 1.16.5. Fuel temperature: min. 308 K, max. 314 K
for diesel engines at injection pump inlet, for gas fuelled engines at pressure regulator final stage.
- 1.16.6. Fuel pressure: min.kPa, max.kPa
at pressure regulator final stage, NG fuelled gas engines only. N/A
- 1.16.7. Lubricant temperature: min. 353 K, max. 378 K
- 1.17 Pressure charger: yes / ~~no~~ (2)
- 1.17.1. Make: BORGWARNER

1.17.2. Type: B3G

1.17.3. Description of the system (e.g. max. charge pressure, wastegate, if applicable):
173.5kPa, with wastegate downstream intercooler

1.17.4. Intercooler: ~~yes~~/no⁽²⁾

1.18. Intake system

Maximum allowable intake depression at rated engine speed and at 100% load: 3.5kPa

1.19. Exhaust system

Maximum allowable exhaust back pressure at rated engine speed and at 100% load: 20 kPa

Exhaust system volume: 170dm³

1.20. Engine Electronic Control Unit (EECU) (all engine types):

1.20.1. Make: BOSCH

1.20.2. Type: WPEDC7

1.20.3. Software calibration number(s): 612750860005

2. MEASURES TAKEN AGAINST AIR POLLUTION

2.1. Device for recycling crankcase gases (description and drawings): Oil separator, see the picture

2.2. Additional anti-pollution devices (if any, and if not covered by another heading)
SCR

2.2.1. Catalytic converter: ~~yes~~/no⁽²⁾

2.2.1.1. Make(s): Weichai Power Co., Ltd.

2.2.1.2. Type(s): WPSCR-002

2.2.1.3. Number of catalytic converters and elements: 1×2

2.2.1.4. Dimensions, shape and volume of catalytic converter(s): 584×450×568, cube, 149 L

2.2.1.5. Type of catalytic action: Selective Catalytic Reduction

2.2.1.6. Total charge of precious metals: none

2.2.1.7. Relative concentration: none

2.2.1.8. Substrate (structure and material): honeycomb monolith, cordierite

2.2.1.9. Cell density: 300 cpsi

2.2.1.10. Type of casting for the catalytic converter(s): stainless steel

2.2.1.11. Location of the catalytic converter(s) (place and reference distance in the exhaust line): 800mm~2800mm from turbo downstream

2.2.1.12. Normal operating temperature range (K): 473~823K

2.2.1.13. Consumable reagents (where appropriate): UREA

2.2.1.13.1. Type and concentration of reagent needed for catalytic action: alkalescent, 32.5% (w/w water)

2.2.1.13.2. Normal operational temperature range of reagent: 268~343K

2.2.1.13.3. International standard (where appropriate): DIN 70070

2.2.1.13.4. Frequency of reagent refill: continuous/~~maintenance~~

2.2.2. Oxygen sensor: ~~yes~~/no⁽²⁾

2.2.2.1. Make(s):

2.2.2.2. Type(s):

2.2.2.3. Location:

2.2.3. Air injection: ~~yes~~/no⁽²⁾

2.2.3.1. Type (pulse air, air pump, etc.)

2.2.4. EGR: ~~yes~~/no⁽²⁾

2.2.4.1. Characteristics (flow rate etc.)

2.2.5. Particulate trap: ~~yes~~/no⁽²⁾

2.2.5.1. Dimensions, shape and capacity of the particulate trap:

2.2.5.2. Type and design of the particulate trap:

2.2.5.3. Location (reference distance in the exhaust line):

2.2.5.4. Method or system of regeneration, description and/or drawing:

2.2.6. Other system: ~~yes~~/no⁽²⁾

2.2.6.1. Description and operation:

3. FUEL FEED

3.1. Diesel engines

3.1.1. Feed pump

Pressure⁽³⁾ : 260L/h at 350 kPa or characteristic diagram⁽²⁾ :

3.1.2. Injection system

3.1.2.1. Pump: Common Rail System

3.1.2.1.1. Make(s): BOSCH

3.1.2.1.2. Type(s): WPCPN2

3.1.2.1.3. Delivery: 267mm³⁽³⁾ per stroke at engine speed of: 2100min⁻¹ at full injection, or characteristic diagram⁽²⁾ ⁽³⁾ :

Mention the method used: On engine/on pump bench⁽²⁾

If boost control is supplied, state the characteristic fuel delivery and boost pressure versus engine speed.

3.1.2.1.4. Injection advance

3.1.2.1.4.1. Injection advance curve⁽³⁾ : Controlled by ECU

3.1.2.1.4.2. Static injection timing⁽³⁾ : Controlled by ECU

3.1.2.2. Injection piping

3.1.2.2.1. Length: 297 mm

3.1.2.2.2. Internal diameter: Φ3.6 mm

3.1.2.3. Injector(s)

3.1.2.3.1. Make(s): BOSCH

3.1.2.3.2. Type(s): WPCRIN2

3.1.2.3.3. Opening pressure: 25MPa⁽³⁾

or characteristic diagram⁽²⁾ ⁽³⁾ :

3.1.2.4. Governor

3.1.2.4.1. Make(s): BOSCH

3.1.2.4.2. Type(s): hardware: WPEDC7, ECU Data set No.: 612750860005

3.1.2.4.3. Speed at which cut-off starts under full load: 2100min⁻¹

3.1.2.4.4. Maximum no-load speed: 2310min⁻¹

3.1.2.4.5. Idling speed: 600±50min⁻¹

3.1.3. Cold start system:

3.1.3.1. Make(s): No details

3.1.3.2. Type(s): 612630120003

3.1.3.3. Description: Electric Pre-warm

3.1.3.4. Auxiliary starting aid: N/A

3.2. Gas fuelled engines⁽⁶⁾ N/A

4. VALVE TIMING

4.1. Maximum lift of valves and angles of opening and closing in relation to dead centres or equivalent data: Maximum lift of intake valves: 10.44 mm, Maximum lift of exhaust valves: 11.06mm mm; Angles of opening and closing: IVO20° BTDC IVC34° ABDC EVO49° BBDC EVC21° ATDC

4.2. Reference and/or setting ranges ⁽²⁾ :

6. On-board diagnostic (OBD) system

6.1. Written description and/or drawing of the MI (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.2. List and purpose of all components monitored by the OBD system: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3. Written description (general OBD working principles) for:

6.3.1. Diesel/gas engines (4):

6.3.1.1. Catalyst monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.2. deNOx system monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.3. Diesel particulate filter monitoring (4): [N/A](#)

6.3.1.4. Electronic fuelling system monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.5. Other components monitored by the OBD system (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.4. Criteria for MI activation (fixed number of driving cycles or statistical method): [Refer to the attachment-11](#)

6.5. List of all OBD output codes and formats used (with explanation of each): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

7. TORQUE LIMITER

7.1. Description of the torque limiter activation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

7.2. Description of the full load curve limitation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

Appendix 3.2

ESSENTIAL CHARACTERISTICS OF THE ENGINE TYPE WITHIN THE FAMILY (1)

1. DESCRIPTION OF ENGINE

- 1.1. Manufacturer: Weichai Power Co., Ltd.
- 1.2. Manufacturer's engine code: WP13.500E50
- 1.3. Cycle: four stroke / ~~two stroke~~ (2)
- 1.4. Number and arrangement of cylinders: 6, In-line, Vertical
- 1.4.1. Bore: 127mm
- 1.4.2. Stroke: 165 mm
- 1.4.3. Firing order: 1-5-3-6-2-4
- 1.5. Engine capacity: 12.54×10^3 cm³
- 1.6. Volumetric compression ratio (3) : 17:1
- 1.7. Drawing(s) of combustion chamber and piston crown: Refer to the section
- 1.8. Minimum cross-sectional area of inlet and outlet ports: Inlet: 1192mm², Outlet: 1072mm²
- 1.9. Idling speed: 600 ± 50 min⁻¹
- 1.10. Maximum net power: 363 kW at 2100 min⁻¹
- 1.11. Maximum permitted engine speed: 2310 min⁻¹
- 1.12. Maximum net torque: 2100 Nm at 1200~1500 min⁻¹
- 1.13. Combustion system: compression ignition / ~~positive ignition~~ (2)
- 1.14. Fuel: Diesel / ~~LPG~~ / ~~NG-H~~ / ~~NG-L~~ / ~~NG-HL~~ (2)
- 1.15. Cooling system
- 1.15.1. Liquid
- 1.15.1.1. Nature of liquid: Water
- 1.15.1.2. Circulating pump(s): yes / ~~no~~ (2)
- 1.15.1.3. Characteristics or make(s) and type(s) (if applicable): No details
- 1.15.1.4. Drive ratio(s) (if applicable): 1.95
- 1.15.2. Air: N/A
- 1.16. Temperature permitted by the manufacturer
- 1.16.1. Liquid cooling: Maximum temperature at outlet: 356~368 K
- 1.16.2. Air cooling: N/A
- 1.16.3. Maximum temperature of the air at the outlet of the intake intercooler (if applicable) 323 K
- 1.16.4. Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold(s) or turbocharger(s): 873 K
- 1.16.5. Fuel temperature: min. 308 K, max. 314 K
for diesel engines at injection pump inlet, for gas fuelled engines at pressure regulator final stage.
- 1.16.6. Fuel pressure: min.kPa, max.kPa
at pressure regulator final stage, NG fuelled gas engines only. N/A
- 1.16.7. Lubricant temperature: min. 353 K, max. 378 K
- 1.17 Pressure charger: yes / ~~no~~ (2)
- 1.17.1. Make: BORGWARNER

1.17.2. Type: B3G

1.17.3. Description of the system (e.g. max. charge pressure, wastegate, if applicable):
167.1kPa, with wastegate downstream intercooler

1.17.4. Intercooler: ~~yes~~/no⁽²⁾

1.18. Intake system

Maximum allowable intake depression at rated engine speed and at 100% load: 3.5kPa

1.19. Exhaust system

Maximum allowable exhaust back pressure at rated engine speed and at 100% load: 20kPa

Exhaust system volume: 170dm³

1.20. Engine Electronic Control Unit (EECU) (all engine types):

1.20.1. Make: BOSCH

1.20.2. Type: WPEDC7

1.20.3. Software calibration number(s): 612750860009

2. MEASURES TAKEN AGAINST AIR POLLUTION

2.1. Device for recycling crankcase gases (description and drawings): Oil separator, see the picture

2.2. Additional anti-pollution devices (if any, and if not covered by another heading)
SCR

2.2.1. Catalytic converter: ~~yes~~/no⁽²⁾

2.2.1.1. Make(s): Weichai Power Co., Ltd.

2.2.1.2. Type(s): WPSCR-002

2.2.1.3. Number of catalytic converters and elements: 1×2

2.2.1.4. Dimensions, shape and volume of catalytic converter(s): 584×450×568, cube, 149L

2.2.1.5. Type of catalytic action: Selective Catalytic Reduction

2.2.1.6. Total charge of precious metals: none

2.2.1.7. Relative concentration: none

2.2.1.8. Substrate (structure and material): honeycomb monolith, cordierite

2.2.1.9. Cell density: 300 cpsi

2.2.1.10. Type of casting for the catalytic converter(s): stainless steel

2.2.1.11. Location of the catalytic converter(s) (place and reference distance in the exhaust line): 800mm~2800mm from turbo downstream

2.2.2. Oxygen sensor: ~~yes~~/no⁽²⁾

2.2.2.1. Make(s):

2.2.2.2. Type(s):

2.2.2.3. Location:

2.2.3. Air injection: ~~yes~~/no⁽²⁾

2.2.3.1. Type (pulse air, air pump, etc.)

2.2.4. EGR: ~~yes~~/no⁽²⁾

2.2.4.1. Characteristics (flow rate etc.)

2.2.5. Particulate trap: ~~yes~~/no⁽²⁾

2.2.5.1. Dimensions, shape and capacity of the particulate trap:

2.2.5.2. Type and design of the particulate trap:

2.2.5.3. Location (reference distance in the exhaust line):

2.2.5.4. Method or system of regeneration, description and/or drawing:

2.2.6. Other system: ~~yes~~/no⁽²⁾

2.2.6.1. Description and operation:

3. FUEL FEED

3.1. Diesel engines

3.1.1. Feed pump

Pressure⁽³⁾ : 260L/h at 350 kPa or characteristic diagram⁽²⁾ :

3.1.2. Injection system

3.1.2.1. Pump: Common Rail System3.1.2.1.1. Make(s): BOSCH3.1.2.1.2. Type(s): WPCPN2

3.1.2.1.3. Delivery: 249mm³ ⁽³⁾ per stroke at engine speed of: 2100min⁻¹ at full injection, or characteristic diagram⁽²⁾ ⁽³⁾ :

Mention the method used: On engine/on pump bench ⁽²⁾

If boost control is supplied, state the characteristic fuel delivery and boost pressure versus engine speed.

3.1.2.1.4. Injection advance

3.1.2.1.4.1. Injection advance curve ⁽³⁾ : Controlled by ECU3.1.2.1.4.2. Static injection timing ⁽³⁾ : Controlled by ECU

3.1.2.2. Injection piping

3.1.2.2.1. Length: 297 mm3.1.2.2.2. Internal diameter: Φ3.6 mm

3.1.2.3. Injector(s)

3.1.2.3.1. Make(s): BOSCH3.1.2.3.2. Type(s): WPCRIN23.1.2.3.3. Opening pressure: 25MPa ⁽³⁾

or characteristic diagram ⁽²⁾ ⁽³⁾ :

3.1.2.4. Governor

3.1.2.4.1. Make(s): BOSCH3.1.2.4.2. Type(s): hardware: WPEDC7, ECU Data set No.: 6127508600093.1.2.4.3. Speed at which cut-off starts under full load: 2100min⁻¹3.1.2.4.4. Maximum no-load speed: 2310min⁻¹3.1.2.4.5. Idling speed: 600±50min⁻¹

3.1.3. Cold start system:

3.1.3.1. Make(s): No details

3.1.3.2. Type(s): 6126301200033.1.3.3. Description: Electric Pre-warm3.1.3.4. Auxiliary starting aid: N/A3.2. Gas fuelled engines ⁽⁶⁾ N/A**4. VALVE TIMING**

4.1. Maximum lift of valves and angles of opening and closing in relation to dead centres or equivalent data: Maximum lift of intake valves: 10.44mm, Maximum lift of exhaust valves: 11.06mm; Angles of opening and closing: IVO20° BTDC IVC34° ABDC EVO49° BBDC EVC21° ATDC

4.2. Reference and/or setting ranges ⁽²⁾ :

6. On-board diagnostic (OBD) system

6.1. Written description and/or drawing of the MI (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.2. List and purpose of all components monitored by the OBD system: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3. Written description (general OBD working principles) for:

6.3.1. Diesel/gas engines (4):

6.3.1.1. Catalyst monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.2. deNOx system monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.3. Diesel particulate filter monitoring (4): [N/A](#)

6.3.1.4. Electronic fuelling system monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.5. Other components monitored by the OBD system (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.4. Criteria for MI activation (fixed number of driving cycles or statistical method): [Refer to the attachment-11](#)

6.5. List of all OBD output codes and formats used (with explanation of each): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

7. TORQUE LIMITER

7.1. Description of the torque limiter activation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

7.2. Description of the full load curve limitation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

Appendix 3.3

ESSENTIAL CHARACTERISTICS OF THE ENGINE TYPE WITHIN THE FAMILY (1)

1. DESCRIPTION OF ENGINE

- 1.1. Manufacturer: Weichai Power Co., Ltd.
- 1.2. Manufacturer's engine code: WP13.480E50
- 1.3. Cycle: four stroke / ~~two stroke~~ (2)
- 1.4. Number and arrangement of cylinders: 6, In-line, Vertical
- 1.4.1. Bore: 127 mm
- 1.4.2. Stroke: 165 mm
- 1.4.3. Firing order: 1-5-3-6-2-4
- 1.5. Engine capacity: 11.596×10^3 cm³
- 1.6. Volumetric compression ratio (3): 17:1
- 1.7. Drawing(s) of combustion chamber and piston crown: Refer to the section
- 1.8. Minimum cross-sectional area of inlet and outlet ports: Inlet: 1192mm², Outlet: 1072mm²
- 1.9. Idling speed: 600 ± 50 min⁻¹
- 1.10. Maximum net power: 348 kW at 1900 min⁻¹
- 1.11. Maximum permitted engine speed: 2150 min⁻¹
- 1.12. Maximum net torque: 2110 Nm at 1100~1400 min⁻¹
- 1.13. Combustion system: compression ignition / ~~positive ignition~~ (2)
- 1.14. Fuel: Diesel / ~~LPG~~ / ~~NG-H~~ / ~~NG-L~~ / ~~NG-HL~~ (2)
- 1.15. Cooling system
- 1.15.1. Liquid
- 1.15.1.1. Nature of liquid: Water
- 1.15.1.2. Circulating pump(s): yes / ~~no~~ (2)
- 1.15.1.3. Characteristics or make(s) and type(s) (if applicable): No details
- 1.15.1.4. Drive ratio(s) (if applicable): 1.95
- 1.15.2. Air: N/A
- 1.16. Temperature permitted by the manufacturer
- 1.16.1. Liquid cooling: Maximum temperature at outlet: 356~368 K
- 1.16.2. Air cooling: N/A
- 1.16.3. Maximum temperature of the air at the outlet of the intake intercooler (if applicable) 323 K
- 1.16.4. Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold(s) or turbocharger(s): 873 K
- 1.16.5. Fuel temperature: min. 308 K, max. 314 K
for diesel engines at injection pump inlet, for gas fuelled engines at pressure regulator final stage.
- 1.16.6. Fuel pressure: min.kPa, max.kPa
at pressure regulator final stage, NG fuelled gas engines only. N/A
- 1.16.7. Lubricant temperature: min. 353 K, max. 378 K
- 1.17 Pressure charger: yes / ~~no~~ (2)
- 1.17.1. Make: BORGWARNER

1.17.2. Type: B3G

1.17.3. Description of the system (e.g. max. charge pressure, wastegate, if applicable):
167.1kPa, with wastegate downstream intercooler

1.17.4. Intercooler: ~~yes~~/no⁽²⁾

1.18. Intake system

Maximum allowable intake depression at rated engine speed and at 100% load: 3.5kPa

1.19. Exhaust system

Maximum allowable exhaust back pressure at rated engine speed and at 100% load: 20 kPa

Exhaust system volume: 170dm³

1.20. Engine Electronic Control Unit (EECU) (all engine types):

1.20.1. Make: BOSCH

1.20.2. Type: WPEDC7

1.20.3. Software calibration number(s): 612750860013

2. MEASURES TAKEN AGAINST AIR POLLUTION

2.1. Device for recycling crankcase gases (description and drawings): Oil separator, see the picture

2.2. Additional anti-pollution devices (if any, and if not covered by another heading)
SCR

2.2.1. Catalytic converter: ~~yes~~/no⁽²⁾

2.2.1.1. Make(s): Weichai Power Co., Ltd.

2.2.1.2. Type(s): WPSCR-002

2.2.1.3. Number of catalytic converters and elements: 1x2

2.2.1.4. Dimensions, shape and volume of catalytic converter(s): 584×450×568, cube, 149 L

2.2.1.5. Type of catalytic action: Selective Catalytic Reduction

2.2.1.6. Total charge of precious metals: none

2.2.1.7. Relative concentration: none

2.2.1.8. Substrate (structure and material): honeycomb monolith, cordierite

2.2.1.9. Cell density: 300 cpsi

2.2.1.10. Type of casting for the catalytic converter(s): stainless steel

2.2.1.11. Location of the catalytic converter(s) (place and reference distance in the exhaust line): 800mm~2800mm from turbo downstream

2.2.2. Oxygen sensor: ~~yes~~/no⁽²⁾

2.2.2.1. Make(s):

2.2.2.2. Type(s):

2.2.2.3. Location:

2.2.3. Air injection: ~~yes~~/no⁽²⁾

2.2.3.1. Type (pulse air, air pump, etc.)

2.2.4. EGR: ~~yes~~/no⁽²⁾

2.2.4.1. Characteristics (flow rate etc.)

2.2.5. Particulate trap: ~~yes~~/no⁽²⁾

2.2.5.1. Dimensions, shape and capacity of the particulate trap:

2.2.5.2. Type and design of the particulate trap:

2.2.5.3. Location (reference distance in the exhaust line):

2.2.5.4. Method or system of regeneration, description and/or drawing:

2.2.6. Other system: ~~yes~~/no⁽²⁾

2.2.6.1. Description and operation:

3. FUEL FEED

3.1. Diesel engines

3.1.1. Feed pump

Pressure⁽³⁾ : 260L/h at 350 kPa or characteristic diagram⁽²⁾ :

3.1.2. Injection system

3.1.2.1. Pump: Common Rail System3.1.2.1.1. Make(s): BOSCH3.1.2.1.2. Type(s): WPCPN2

3.1.2.1.3. Delivery: 256mm³ ⁽³⁾ per stroke at engine speed of: 1900min⁻¹ at full injection, or characteristic diagram⁽²⁾ ⁽³⁾ :

Mention the method used: On engine/on pump bench ⁽²⁾

If boost control is supplied, state the characteristic fuel delivery and boost pressure versus engine speed.

3.1.2.1.4. Injection advance

3.1.2.1.4.1. Injection advance curve ⁽³⁾ : Controlled by ECU3.1.2.1.4.2. Static injection timing ⁽³⁾ : Controlled by ECU

3.1.2.2. Injection piping

3.1.2.2.1. Length: 297 mm3.1.2.2.2. Internal diameter: Φ3.6 mm

3.1.2.3. Injector(s)

3.1.2.3.1. Make(s): BOSCH3.1.2.3.2. Type(s): WPCRIN23.1.2.3.3. Opening pressure: 25MPa ⁽³⁾

or characteristic diagram ⁽²⁾ ⁽³⁾ :

3.1.2.4. Governor

3.1.2.4.1. Make(s): BOSCH3.1.2.4.2. Type(s): hardware: WPEDC7, ECU Data set No.: 6127508600133.1.2.4.3. Speed at which cut-off starts under full load: 1900min⁻¹3.1.2.4.4. Maximum no-load speed: 2150min⁻¹3.1.2.4.5. Idling speed: 600±50min⁻¹

3.1.3. Cold start system:

3.1.3.1. Make(s): No details

3.1.3.2. Type(s): 6126301200033.1.3.3. Description: Electric Pre-warm3.1.3.4. Auxiliary starting aid: N/A3.2. Gas fuelled engines ⁽⁶⁾ N/A**4. VALVE TIMING**

4.1. Maximum lift of valves and angles of opening and closing in relation to dead centres or equivalent data: Maximum lift of intake valves: 10.44mm, Maximum lift of exhaust valves: 11.06mm; Angles of opening and closing: IVO20° BTDC IVC34° ABDC EVO49° BBDC EVC21° ATDC

4.2. Reference and/or setting ranges ⁽²⁾ :

6. On-board diagnostic (OBD) system

6.1. Written description and/or drawing of the MI (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.2. List and purpose of all components monitored by the OBD system: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3. Written description (general OBD working principles) for:

6.3.1. Diesel/gas engines (4):

6.3.1.1. Catalyst monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.2. deNOx system monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.3. Diesel particulate filter monitoring (4): [N/A](#)

6.3.1.4. Electronic fuelling system monitoring (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.3.1.5. Other components monitored by the OBD system (4): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

6.4. Criteria for MI activation (fixed number of driving cycles or statistical method): [Refer to the attachment-11](#)

6.5. List of all OBD output codes and formats used (with explanation of each): [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

7. TORQUE LIMITER

7.1. Description of the torque limiter activation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)

7.2. Description of the full load curve limitation: [Refer to OBD2-RZ-WP7-WP5-WP10-WP12-EU5](#)



Appendix 4

CHARACTERISTICS OF THE ENGINE-RELATED VEHICLE PARTS

- 1. Intake system depression at rated engine speed and at 100 per cent load: [<3.5](#) kPa
- 2. Exhaust system back pressure at rated engine speed and at 100 per cent load: [<20](#) kPa
- 3. Volume of exhaust system: [170](#)dm³
- 4. Power absorbed by the auxiliaries needed for operating the engine as specified in and under the operation conditions of Directive 80/1269/EEC, annex I , section 5.1.1

	Engine Speed						
	idle	Low speed	High Speed	Speed (A) (1)	Speed B(1)	Speed C(1)	Ref. Speed (2)
P(a) Auxiliaries needed for operating the engine (to be subtracted from measured engine power) see annex 1, item 6.1.	0	0.5	1.9	0.7	1	1.5	2

- (1) ESC test
- (2) ETC test only.

Appendix 5

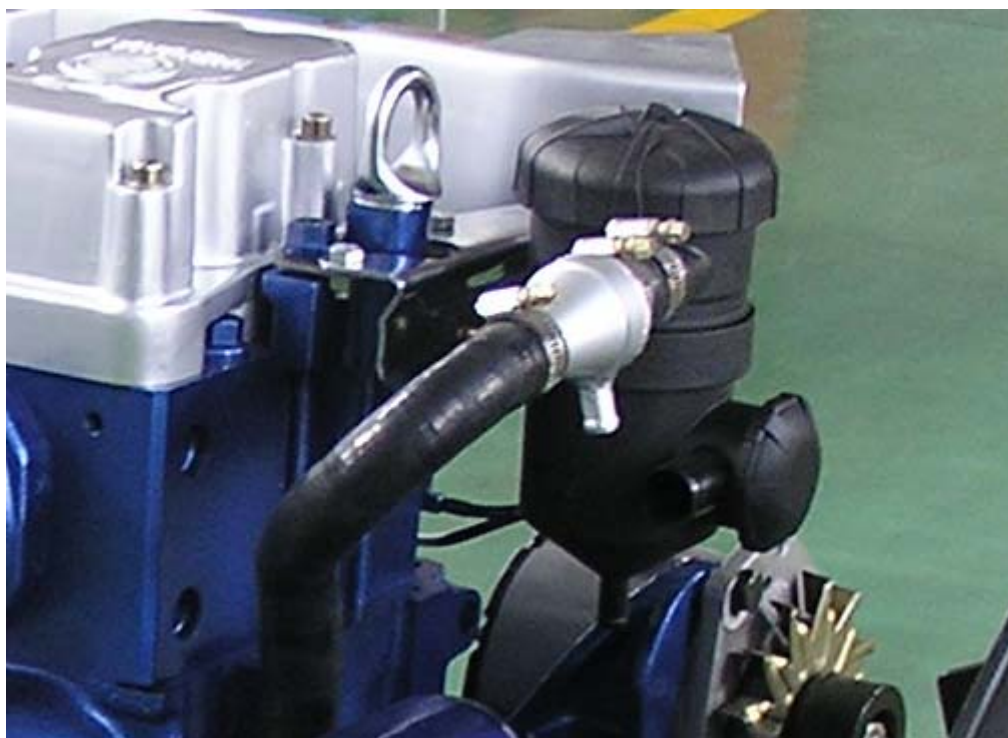
LIST OF ATTACHED DRAWINGS AND PICTURES

1. Picture of Location of Statutory Plates and Inscriptions
2. Picture of Device for Recycling Crankcase Gases
3. Drawing of Combustion Chamber and Piston Crown
4. Drawing of Intake Manifold
5. Drawing of Front And Rear Exhaust Manifold
6. Drawing of Middle Exhaust Manifold
7. Diagram of Intercooler Calculation
8. Emission control equipment

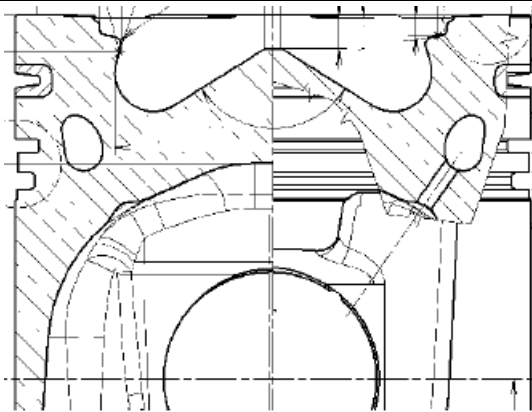


Location

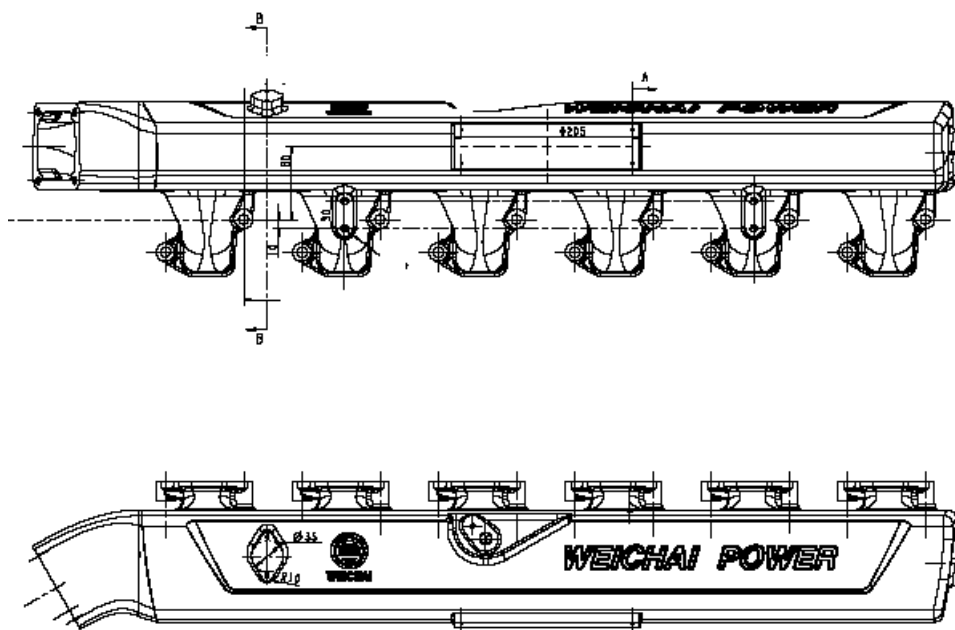
Picture of Location of Statutory Plates and Inscriptions



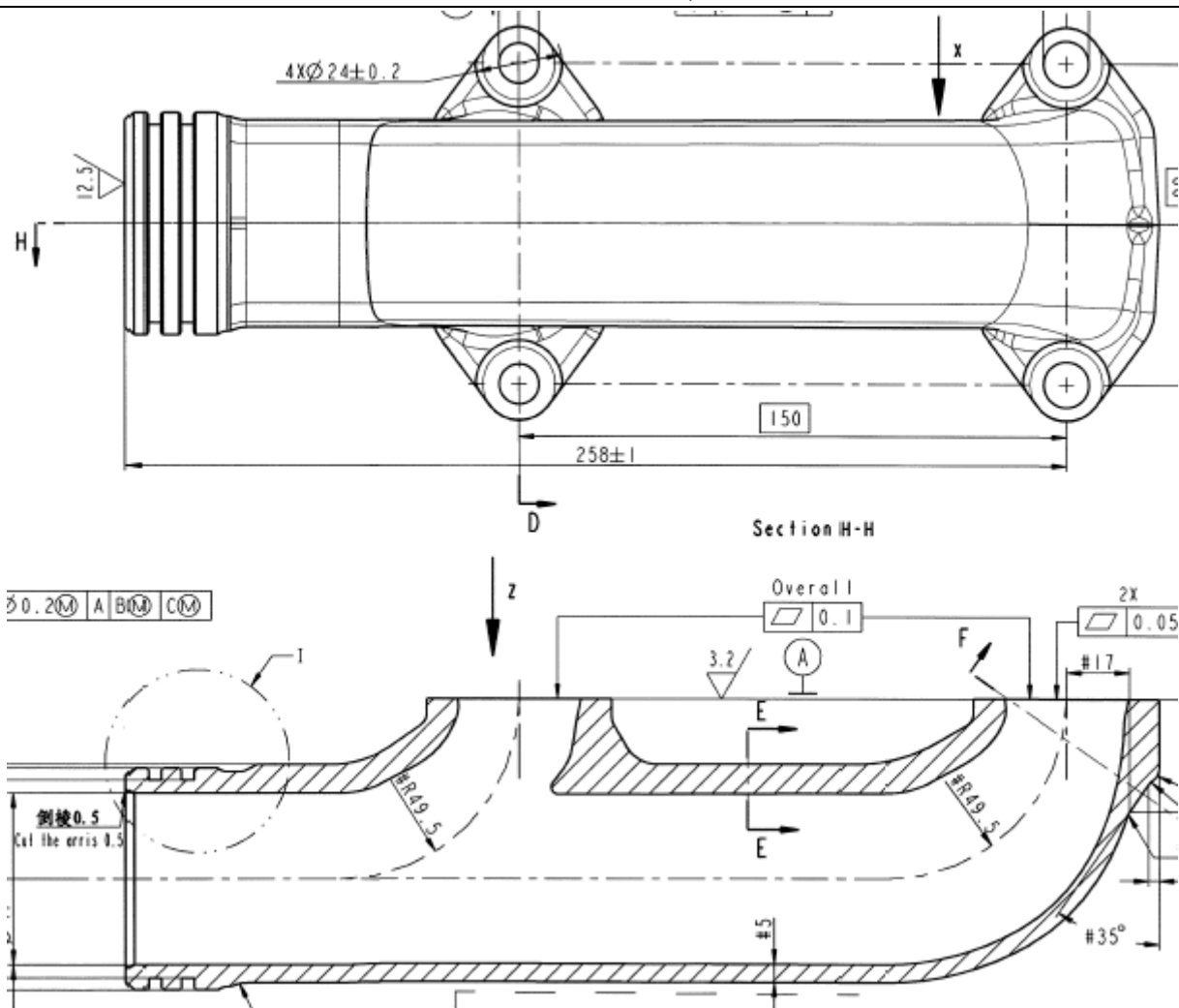
Picture of Device for Recycling Crankcase Gases



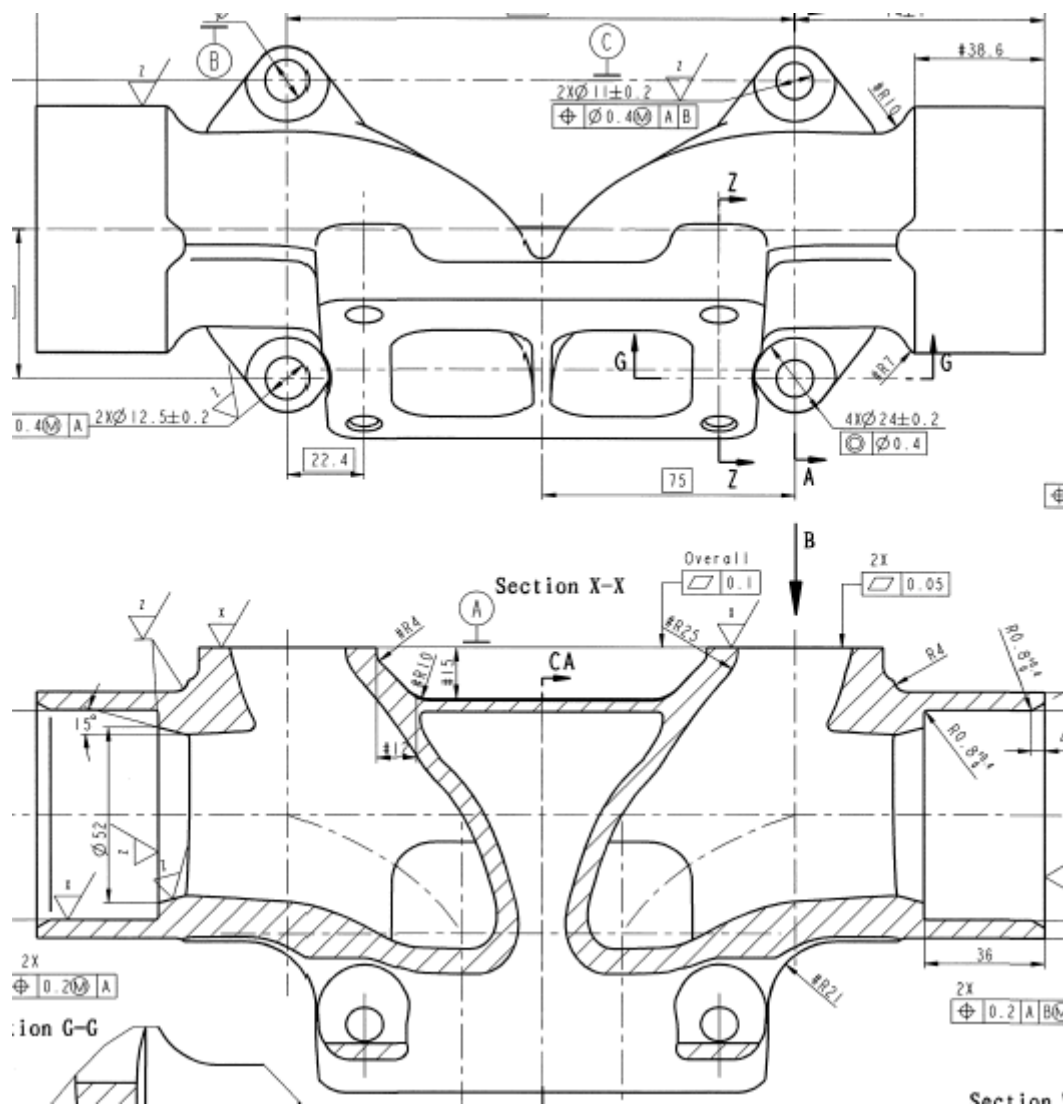
Drawing of Combustion Chamber and Piston Crown



Drawing of Intake Manifold

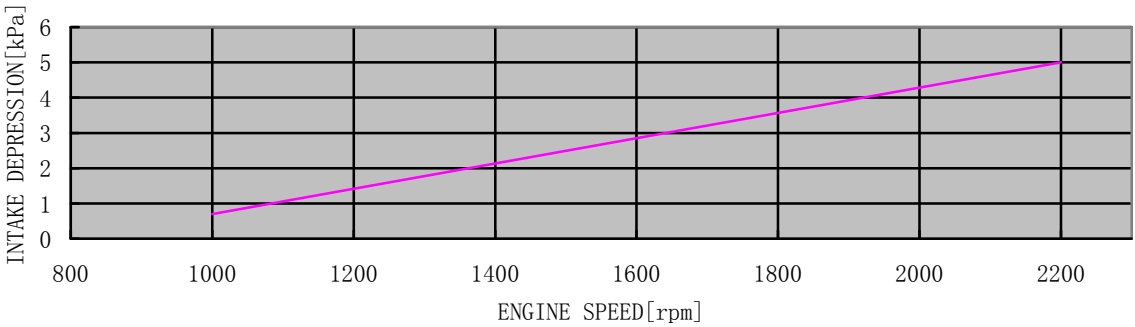


Drawing of Front and Rear Exhaust Manifold



Drawing of Middle Exhaust Manifold

Intake depression between PBC and PAAC



Temperature difference between TBC and TAAC

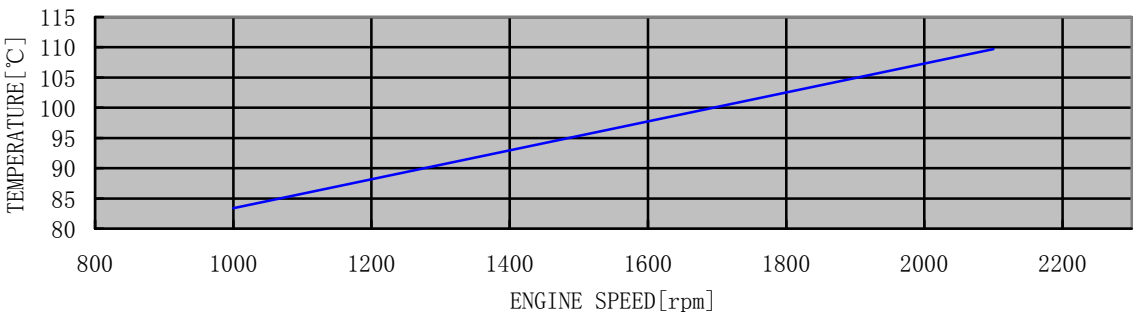


Diagram of Intercooler Calculation

Emission control equipment

The components liable to affect, where appropriate, the emission of gaseous and particulate pollutants from diesel and gas engines shall be so designed, constructed, assembled and installed as to enable the engine, in normal use, to comply with the provisions of this Directive.

1. ECU

Bosch ECU has stable system processing capability. Multi-level system protection and error correction measurement increase the reliability and the safety of the engine. The free communication with the vehicle electronic control unit is realized through CAN and K bus.

2. Injection Pump and Common Rail

Injection pressure up to 1600 bar and a flexible control on fuel quantity and injection on timing, make sure that the engine can meet the standard of low emission and low fuel consumption.

3. Turbocharger

The turbocharger adjusts the intake air mass freely. This can optimize the combustion.

4. Wiring harness and Sensors

ECU uses the wiring harness to communicate with the sensors and actuators from the engine and the vehicle. The high quantity and performance make the electronic control system trustier.

5. Exhaust aftertreatment system

The aftertreatment system is selective catalytic reduction converter. This system can reduce NOx emission to N₂ by NH₃ which acquired from urea.