WARRIOR 1400X

Genehmigungsunterlagen

Caterpillar C4.4 Stage IIIA
Constant Speed, 98kW @ 1800

Ausgabedatum:	**10-02-2017**
Sprache:	**Deutsch (de)**
Revisions-Nr.:	**3.3**

DER TEILEKATALOG BEFINDET SICH AUF EINEM USB-STICK AUF DEM INNEREN DECKBLATT

POWERSCREEN.
A TEREX BRAND

Inhaltsverzeichnis

3 Technische Daten

3.1 Allgemeines

(1) Gewicht der Anlage

Anlage .....Warrior 1400X

Typ.....Mobile Siebanlage

Gesamtgewicht (Bandaufgeber).....27.600 kg

Gesamtgewicht (Plattenförderer).....29.800 kg

*Das „Gesamtgewicht“ bezieht sich auf die Standardkonfiguration der Anlage. Optionales Zubehör hat erheblichen Einfluss auf das Gesamtgewicht der Anlage.

3.2 Technische Daten der Anlagenkomponenten

(1) Aufgabeeinheit (A)

(a) Warrior Aufgabetrichter (Standard & Plattenaufgeber)

Öffnungsgröße.....4,7 m x 2,6 m (Standard)

Aufgabehöhe .....2,85 m (hintere Tür abgesenkt)

Standardrahmen/-trichter.....3,38 m

Rahmenanhebung/Standardtrichter ....3,68 m

(b) Aufgabeband (kein Plattenaufgeber)

Bandbreite .....1300 mm

Typ.....4-fach

(2) Sammelband (B)

Bandbreite .....1200 mm

(3) Siebeinheit (C)

Warrior 1400 Siebkasten

Breite .....1,25 m

Länge.....3,6 m

Gewicht.....3400 kg

Siebwinkel .....13°-19°

(4) Seitenbänder (D & E)

Bandbreite .....900 mm

(5) Endband (F)

Bandbreite .....1200 mm

Haldenhöhe .....3,9 m

Rahmenanhebung .....4,2 m

Neigungswinkel:
Arbeitswinkel .....Bis 25°

(6) Antriebseinheit (G)

(a) Motor

Tier 3/Stufe 3A Caterpillar C4.4 ATAAC

Tier 3 Constant Speed Caterpillar C4.4

Tier 4 Final Caterpillar C4.4

Siehe mitgeliefertes Motorbetriebshandbuch.

(7) Rahmen (H)

(a) Warrior 1400 Raupenfahrwerk

Abtriebsdrehmoment .....14.141-25.345 Nm

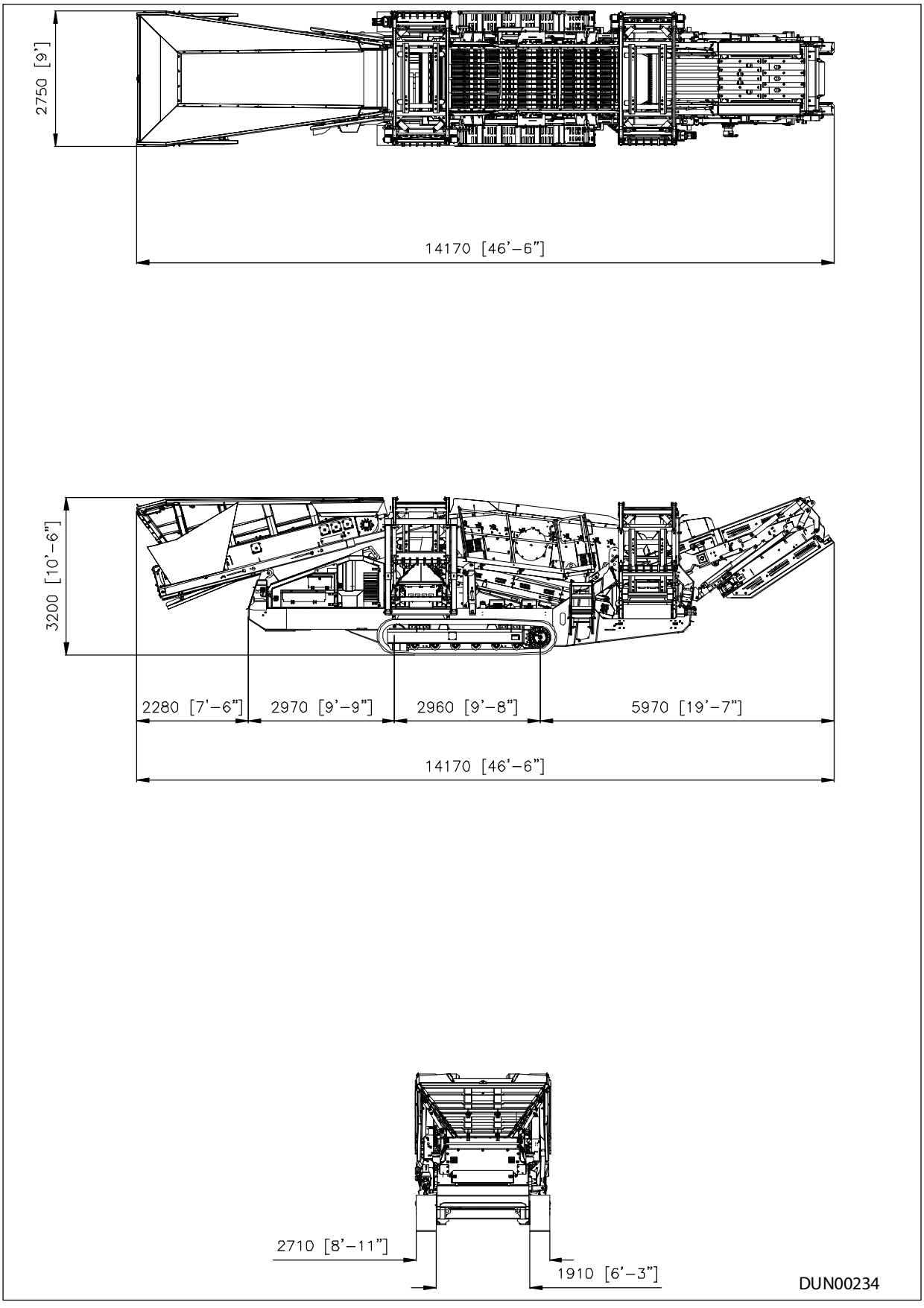
Steigfähigkeit.....25° (niedrige Geschwindigkeit)

Getriebeübersetzung 1:154

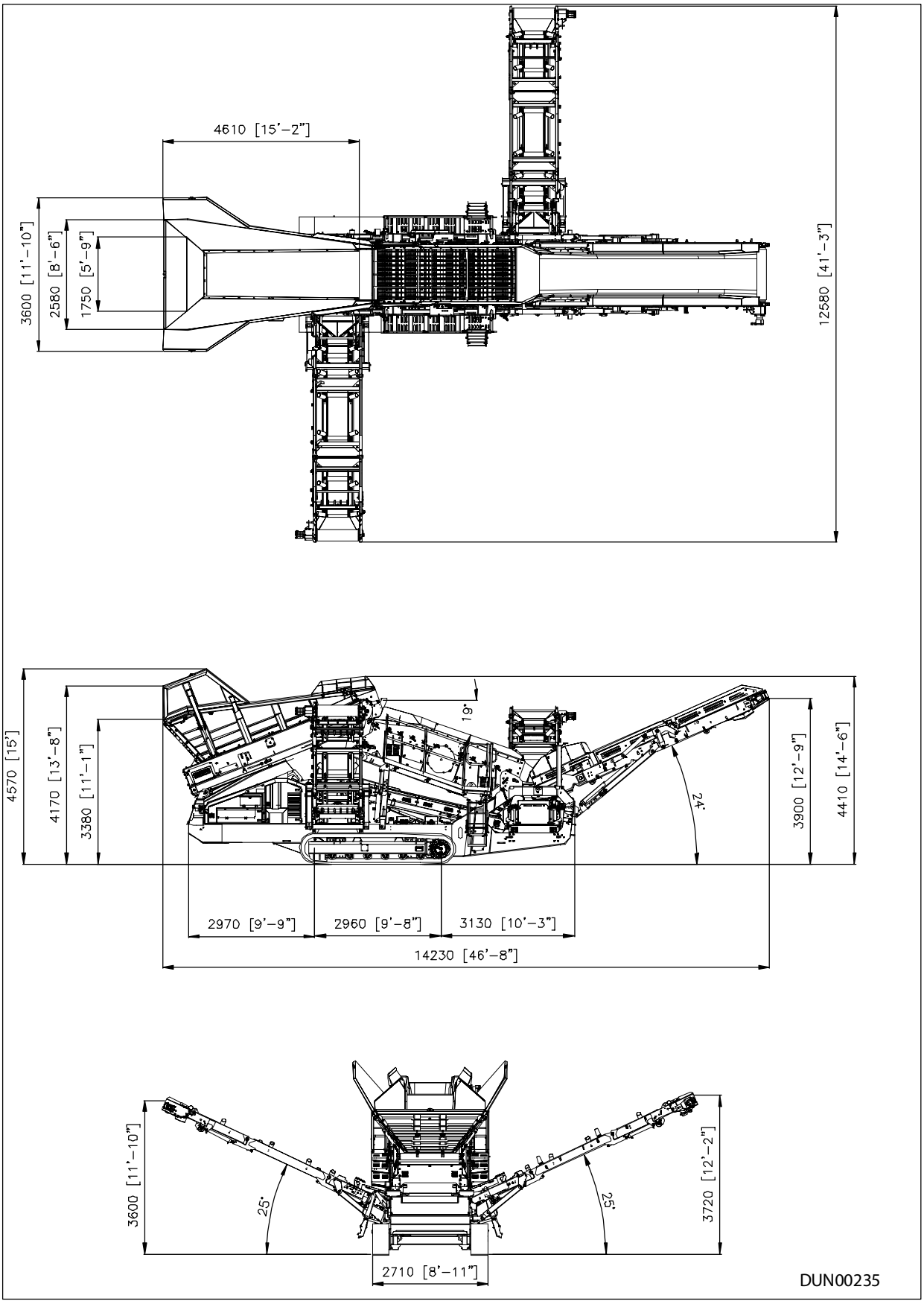
Hydraulikmotor 50 cm3/U

Ungef. Geschwindigkeit.....0,9-2,0 km/h

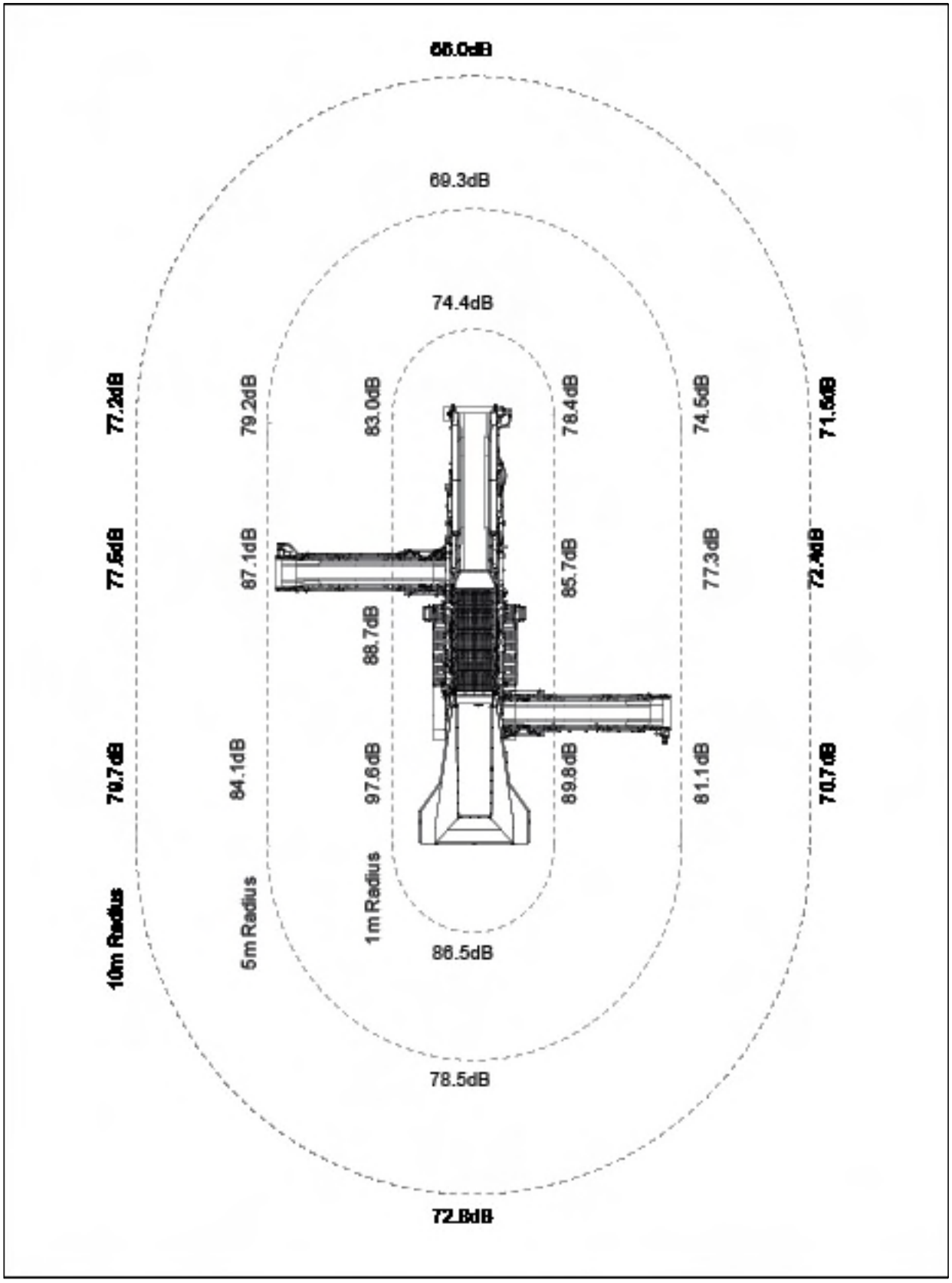
(4) Warrior 1400X für Dreifach-Fraktionierung – Transportstellung



(5) Warrior 1400X für Dreifach-Fraktionierung – Arbeitsstellung



3.4 Lärmpegel in dB(A)



THE UNITED KINGDOM VEHICLE APPROVAL AUTHORITY

COMMUNICATION CONCERNING THE EXTENSION [1] OF AN ENGINE TYPE OR FAMILY OF ENGINE TYPES WITH REGARD TO THE EMISSION OF POLLUTANTS PURSUANT TO DIRECTIVE 97/68/EC, AS LAST AMENDED BY DIRECTIVE 2010/26/EU.

EC type-approval No: e11*97/68IB*2010/26*1574*02

Reason(s) for extension: To cover:
1) New parent rating 4522/1500
2) Removal of parent rating 3854/1500 and child ratings 3854/1800, 3856/1500 and 3856/1800.

SECTION I

0. General

0.1. Make (name of undertaking): Perkins, also branded as Caterpillar

0.2. Manufacturer's designation of the parent-/and (if applicable) of the family engine(s) type(s) [1]:

Parent: 4522/1500

Family members: 4522/1500, 4522/1800, 4520/1800, 4520/1500

0.3. Manufacturer's type coding as marked on the engine(s):

Location: See manufacturers documentation

Method of affixing: Self Adhesive label

0.4. Specification of machinery to be propelled by the engine[2]: See manufacturers documentation

0.5. Name and address of manufacturer:

Perkins Engines Company Limited
Eastfield
Peterborough
PE1 5FQ
United Kingdom

Name and address of manufacturer's authorized representative (if any): Not applicable

0.6. Location, coding and method of affixing of the engine identification number: See manufacturer's documentation

0.7. Location and method of affixing of the EC approval mark: See manufacturer's documentation

0.8. Address(es) of assembly plant(s):

Perkins Engines Company Limited
Eastfield
Peterborough
PE1 5NA
United Kingdom

Perkins Motores do Brasil Ltda
Rua João Chede, 2489
CEP: 81.170-220
Curitiba / Paraná
Brazil

Perkins Power Systems Technology (Wuxi) Co. Limited
No. 8 South Xinchang Road
Wuxi Jiangsu 214142
Republic of China

(1) Delete as appropriate.

(2) As defined in Annex I, section 1 of this Directive (e.g.: 'A')

SECTION II

1. Restriction of use (if any):

1.1. Particular conditions to be respected in the installation of the engine(s) on the machinery

1.1.1. Maximum allowable intake depression: 3.0 kPa

1.1.2. Maximum allowable back pressure: 6 kPa

2. Technical service responsible for carrying out the tests [3] Vehicle Certification Agency

3. Date of test report: As before (15 December 2010) and 14 July 2015

4. Number of test report: As before (ESL226771) and CSR332616

5. The undersigned hereby certifies the accuracy of the manufacturer's description in the attached information document of the engine(s) described above and that the attached test results are applicable to the type. The sample(s) has (have) been selected by the approval authority and submitted by the manufacturer as the (parent) engine type(s) [1].

Type-approval is GRANTED [1]

Place: BRISTOL

Date: 02 FEBRUARY 2016

Signature: 

D LAWLOR
Head of Technical Standards & Legislation

Attachments: Information package.

Test results (see Appendix 1)

Correlation study relevant to sampling systems used which are different from the reference systems [2] (if applicable)

(1) Delete as appropriate.
(2) Specified in Annex I section 4.2.

(3) Fill in n.a. where the tests are carried out by the approval authority itself.

APPENDIX 1

test results for compression ignition engines test results

1. INFORMATION CONCERNING THE CONDUCT OF THE NRSC TEST [1]:

1.1. Reference fuel used for test

1.1.1. Cetane number: 52.6

1.1.2. Sulphur content: 0.0107 % (m/m)

1.1.3. Density: 0.8403 g/cm^3 at 15°C

1.2. Lubricant

1.2.1. Make(s): Shell Rimula X

1.2.2. Type(s): 15W-40

(state percentage of oil in mixture if lubricant and fuel are mixed)

1.3. Engine driven equipment (if applicable)

1.3.1. Enumeration and identifying details: Not applicable

1.3.2. Power absorbed at indicated engine speeds (as specified by the manufacturer): Not applicable

	Power PAE (kW) absorbed at various engine speeds [1], taking into account Appendix 3 of this Annex	
Equipment	Intermediate (if applicable)	Rated
Total:		

1.4. Engine performance

1.4.1. Engine speeds:

Idle: 900 rpm

Intermediate: 1500 rpm

Rated: 1500 rpm

1.4.2. Engine power [1]

Condition	Power setting (kW) at various engine speeds	
	Intermediate (if applicable)	Rated
Maximum power measured on test (P_M) (kW) (a)	Not applicable	94.5
Total power absorbed by engine driven equipment as per section 1.3.2 of this Appendix, or section 3.1 of Annex III (PAE) (kW) (b)	-	-
Net engine power as specified in section 2.4 of Annex I (kW) (c)	Not applicable	94.5
c = a + b		

1.5. Emission levels

1.5.1. Dynamometer setting (kW)

Percent Load	Dynamometer setting (kW) at various engine speeds	
	Intermediate (if applicable)	Rated
10 (if applicable)	-	9.4
25 (if applicable)	-	23.6
50	-	47.2
75	-	70.8
100	-	94.4

1.5.2. Emission results on the NRSC test :

Without deterioration factor	With deterioration factor
CO: 0.91 g/kWh	CO: 1.18 g/kWh
HC: Not applicable	HC: Not applicable
NOx: Not applicable	NOx: Not applicable
NMHC+NOx: 3.16 g/kWh	NMHC+NOx: 3.16 g/kWh
Particulates: 0.134 g/kWh	Particulates: 0.140 g/kWh

1.5.3. Sampling system used for the NRSC test:

1.5.3.1. Gaseous emissions [2]: 2

1.5.3.2. Particulates: 11,14

1.5.3.2.1. Method [3]: multiple filter

2. INFORMATION CONCERNING THE CONDUCT OF THE NRTC TEST [3]:

2.1. Emission results on the NRTC test: Not applicable

CO: . ……..g/kWh

NMHC: ……..g/kWh

NOx: . ……g/kWh

Particulates: . ……..g/kWh

NMHC + NOx : ……g/kWh

2.2. Sampling system used for the NRTC test: Not applicable

Gaseous emissions:

Particulates:

Method: single/multiple filter

(1) For the case of several parent engines to be indicated for each of them.

(2) Indicate figure numbers defined in Annex VI section 1.

(3) Delete as appropriate.

APPENDIX 2

test results for spark ignition engines - Not applicable

1. INFORMATION CONCERNING THE CONDUCT OF THE TEST(S)(1):

1.1. Octane number

1.1.1. Octane number:

1.1.2. State percentage of oil in mixture when lubricant and petrol are mixed as in the case of two-stroke engines

1.1.3. Density of petrol for four-stroke engines and petrol/oil mixture for two-stroke engines

1.2. LUBRICANT

1.2.1. Make(s)

1.2.2. Type(s)

1.3. ENGINE DRIVEN EQUIPMENT (IF APPLICABLE)

1.3.1. Enumeration and identifying details

1.3.2. Power absorbed at indicated engine speed (as specified by the manufacturer)

Equipment	Power P_{AE} (kW) absorbed at various engine speeds (2), taking into account Appendix 3 of this Annex	
	Intermediate (if applicable)	Rated
Total		

1.4. Engine performance

1.4.1. Engine speeds:

Idle: min^{-1}

Intermediate: min^{-1}

Rated: min^{-1}

1.4.2. Engine power [3]

Condition	Power setting (kW) at various engine speeds	
	Intermediate (if applicable)	Rated
Maximum power measured on test (P_M) (kW) (a)		
Total power absorbed by engine driven equipment as per section 1.3.2 of this Appendix, or section 2.8 of Annex III (P_{AE})(kW) (b)		
Net engine power as specified in section 2.4 of Annex I (kW) (c)		
c = a + b		

1.5. Emission levels

1.5.1. Dynamometer setting (kW)

Percent Load	Dynamometer setting (kW) at various engine speeds	
	Intermediate (if applicable)	Rated
10 (if applicable)		
25 (if applicable)		
50		
75		
100		

1.5.2. Emission results on the test cycle:

CO: g/kWh

HC: g/kWh

NO_x: g/kWh

(1) In case of several parent engines, to be indicated for each of them.

(2) Must not be greater than 10 % of the power measured during the test.

(3) Uncorrected power measured in accordance with the provisions of section 2.4 of Annex I.

APPENDIX 3

equipment and auxiliaries to be installed for the test to determine engine power

Number	Equipment and auxiliaries	Fitted for emission test
1	Inlet system	
	Inlet manifold	Yes, standard production equipment
	Crankcase emission control system	Yes, standard production equipment
	Control devices for dual induction inlet manifold system	Yes, standard production equipment
	Air flow meter	Yes, standard production equipment
	Air inlet duct work	Yes (a)
	Air filter	Yes (a)
	Inlet silencer	Yes (a)
	Speed-limiting device	Yes (a)
2	Induction-heating device of inlet manifold	Yes, standard production equipment. If possible to be set in the most favourable condition
3	Exhaust system	
	Exhaust purifier	Test bed equipment
	Exhaust manifold	Yes, standard production equipment
	Connecting pipes	Test bed equipment
	Silencer	Test bed equipment
	Tail pipe	Test bed equipment
	Exhaust brake	No (c)
	Pressure charging device	Yes, standard production equipment
4	Fuel supply pump	Yes, standard production equipment (d)
5	Carburation equipment	
	Carburettor	No
	Electronic control system, air flow meter, etc.	No
	Equipment for gas engines Pressure reducer	No
	Evaporator	No
	Mixer	No
6	Fuel injection equipment (petrol and diesel)	
	Prefilter	Yes, standard production or test bed equipment
	Filter	Yes, standard production or test bed equipment
	Pump	Yes, standard production equipment
	High-pressure pipe	Yes, standard production equipment
	Injector	Yes, standard production equipment
	Air inlet valve	Yes, standard production equipment (e)
	Electronic control system, air flow meter, etc.	Yes, standard production equipment
	Governor/control system	Yes, standard production equipment
	Automatic full-load stop for the control rack depending on atmospheric conditions	Yes, standard production equipment
7	Liquid-cooling equipment	
	Radiator	No
	Fan	No
	Fan cowl	No
	Water pump	Yes, standard production equipment (f)
	Thermostat	Yes, standard production equipment

8	Air cooling Cowl Fan or Blower Temperature-regulating device	 No (h) No (h) No
9	Electrical equipment Generator Spark distribution system Coil or coils Wiring Spark plugs Electronic control system including knock sensor/spark retard system	 Yes, standard production equipment (i) No No Yes, standard production equipment No Yes, standard production equipment
10	Pressure charging equipment Compressor driven either directly by the engine and/or by the exhaust gases Charge air cooler Coolant pump or fan (engine-driven) Coolant flow control device	 Yes, standard production equipment Yes, standard production or test bed equipment (j) (k) No (h) Yes, standard production equipment
11	Auxiliary test-bed fan	Yes, if necessary
12	Anti-pollution device	Yes, standard production equipment (l)
13	Starting equipment	Test bed equipment
14	Lubricating oil pump	Yes, standard production equipment

(a) The complete inlet system shall be fitted as provided for the intended application: where there is a risk of an appreciable effect on the engine power; in the case of naturally aspirated spark ignition engines; when the manufacturer requests that this should be done. In other cases, an equivalent system may be used and a check should be made to ascertain that the intake pressure does not differ by more than 100 Pa from the upper limit specified by the manufacturer for a clean air filter.

(b) The complete exhaust system shall be fitted as provided for the intended application: where there is a risk of an appreciable effect on the engine power; in the case of naturally aspirated spark ignition engines; when the manufacturer requests that this should be done. In other cases, an equivalent system may be installed provided the pressure measured does not differ by more than 1000 Pa from the upper limit specified by the manufacturer.

(c) If an exhaust brake is incorporated in the engine, the throttle valve shall be fixed in the fully open position.

(d) The fuel feed pressure may be adjusted, if necessary, to reproduce the pressure existing in the particular engine application (particularly when a “fuel return” system is used)

(e) The air intake valve is the control valve for the pneumatic governor of the injection pump. The governor or the fuel injection equipment may contain other devices which may affect the amount of injected fuel.

(f) The cooling-liquid circulation shall be operated by the engine water pump only. Cooling of the liquid may be produced by an external circuit, such that the pressure loss of this circuit and the pressure at the pump inlet remain substantially the same as those of the engine cooling system.

(g) The thermostat may be fixed in the fully open position.

(h) When the cooling fan or blower is fitted for the test, the power absorbed shall be added to the results, except for cooling fans of air cooled engines directly fitted on the crankshaft. The fan or blower power shall be determined at the speeds used for the test either by calculation from standard characteristics or by practical tests

(i) Minimum power of the generator: the electrical power of the generator shall be limited to that necessary for operation of accessories which are indispensable for engine operation. If the connection of a battery is necessary, a fully charged battery in good condition shall be used.

(j) Charge air-cooled engines shall be tested with charge air cooling, whether liquid- or air-cooled, but if the manufacturer prefers, a test bench system may replace the air cooler. In either case, the measurement of power at each speed shall be made with the maximum pressure drop and the minimum temperature drop of the engine air across the charge air cooler on the test bench system as specified by the manufacturer.

(k) These may include, for example, exhaust-gas recirculation (EGR)-system, catalytic converter, thermal reactor, secondary air-supply system and fuel evaporation protecting system.

(l) The power for electrical or other starting systems shall be provided from the test bed.

THE UNITED KINGDOM VEHICLE APPROVAL AUTHORITY

APPROVAL NUMBER: e11*97/68IB*2010/26*1574*02

INFORMATION PACKAGE CONTENTS

INDEX REVISION NUMBER: 02 (Two)

Total number of sheets: 10 (Ten)

Reasons for Revision: See approval certificate

Revision date
&
Office stamp

An executive agency of the Department for Transport
April 2013 Revision 3

02-Feb-16
UK Approval Authority

APPLICATION FOR APPROVAL OF:

(Directive 97/68/EC as amended by Directive 2010/26/EC)

Engine Type		Perkins 1104D-E44TA also branded as Caterpillar C4.4
Engine Code		As Information Document
Directive No.		97/68/EC as last amended by 2010/26/EC
Issue No. of Submission		3
Job No.		ESR348968
Reason for Extension or Revision		New Parent rating: 4522/1500 Removal of the following ratings: 3854/1500, 3854/1800 3856/1500 and 3856/1800
Extension History	Issue 1	Original Submission Job ESL226771
	Issue 2	Addition of child ratings: 4522/1500, 4522/1800 4520/1800 and 4520/1500 Correction to App 1&3, 1.13 Minimum cross sectional area of inlet and outlet ports. Updated glow plug supplier from BERU to Hidria. Update Peterborough facility address

Contents

Information Document relating to type-approval and referring to measures against the emissions of gaseous and particulate pollutants from internal combustion engines to be installed in non-road

(Directive 97/68/EC as amended by Directive 2010/26/EC)

Parent engine/engine type: Perkins 1104D-E44TA also branded as Caterpillar C4.4

0 General

0.1 Make (name of undertaking): as last amended by 2010/26/EC

0.2 Type and commercial description of the parent-and (if applicable) of the family engine(s):

4522/1500	4522/1800	4520/1800	4520/1500				

0.3 Manufacturer's type coding as marked on the engine: As item 0.2

0.4 Specification of machinery to be propelled by the engine
As defined in Annex 1 1.A of the Directive

0.5 Name and address of manufacturer: PERKINS ENGINES COMPANY Ltd.,
EASTFIELD, PETERBOROUGH,
PE1 5FQ.

Name and address of manufacturer's authorised representative:

N/A

0.6 Location, coding and method of affixing the engine identification number:

The engine type coding is specified on a plastic self adhesive label in a position on left hand side of cylinder block, on the top cover or a position where it will be visible with the engine installed. The serial number is on an aluminium plate, riveted to a located on the left hand side of the cylinder block, when viewed from the rear of the engine.

7 Location and method of affixing of the EC approval mark

Plastic self adhesive label in a position on the left hand side of the cylinder block, top cover or where it will be visible with the engine installed.

8 Address(es) of assembly plants: PERKINS ENGINES COMPANY Ltd.,
EASTFIELD, PETERBOROUGH, PE1 5FQ

Perkins Motores do Brasil Ltda
Rua João Chede, 2489
CEP: 81.170-220,
Curitiba / Paraná
Brasil

Perkins Power Systems Technology (Wuxi) Co. Ltd.
No. 8 South Xinchang Road, Wuxi
Jiangsu 214142, P.R. China.

Attachments

1.1 Essential characteristics of the parent engine(s)

1.2. Essential characteristics of engine family

1.3 Essential characteristics of engine types within family

2 Characteristics of engine-related parts of the mobile machinery (if applicable)

3 Photographs of the parent engine

4 List further attachments if any.

Appendix 1

Essential Characteristics of the Parent Engine

			Appendix 1
1	**DESCRIPTION OF ENGINE**		
1.1	Manufacturer		Perkins. Also branded as Caterpillar
1.2	Manufacturer's engine code		4522/1500
1.3	Cycle: four stroke/two stroke		4 Stroke Compression Ignition
1.4	Bore:	mm	105
1.5	Stroke:	mm	127
1.6	Number and layout of cylinders		4 in line
1.7	Engine capacity	cm^3	4400
1.8	Rated speed	rev/min	1500
1.9	Maximum torque speed	rev/min	1500
1.10	Volumetric compression ratio (2)	± 1 Ratio	16.9:1 +/-0.4
1.11	Combustion system description		Open Bowl
1.12	Drawing of combustion chamber and piston crown		4475253
1.13	Minimum cross sectional area of inlet and outlet ports	inlet mm^2	1093.385
		exhaust mm^2	922.186
1.14	**Cooling system**		
1.14.1	*Liquid*		
1.14.1.1	Nature of liquid		50:50 mixture - Ethylene glycol to water
1.14.1.2	Circulating pump(s)	yes/no	Yes
1.14.1.3.	~~Characteristics~~ or make~~(s)~~ and type~~(s)~~ (if applicable)		Concentric , Single integrated gear driven centrifugal pump
1.14.1.4.	Drive ratio(s) (if applicable)		2:1
1.14.2	*Air*		N/A
1.15.	**Temperature permitted by the manufacturer**		
1.15.1.	Liquid cooling: maximum temperature at outlet	K	381K + 4K
1.15.2.	Air cooling: reference point		N/A
1.15.3.	Maximum charge air outlet temperature of the inlet of the intercooler (if applicable)	K	328 K
1.15.4.	Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust	K	948 K
1.15.5.	Lubricant temperature	min K	373
		max K	398
1.16.	Pressure charger	yes/no	Yes
1.16.1.	Make		Honeywell
1.16.2.	Type		4643034
1.16.3	Description of system (e.g. max charge pressure, waste-gate, if applicable		Non-Wastegated Turbocharger
1.16.4	Intercooler	yes/no	yes
1.17.	Intake system: Maximum allowable intake depression at rated engine speed and at 100% load	kPa	3.0
1.18.	Exhaust system: Maximum allowable exhaust backpressure at rated engine speed and at 100% load	kPa	6.0
2	**ADDITIONAL ANTI-POLLUTION DEVICES** (if any and not covered by another heading)		
	Description and/or diagram(s)		N/A
3	**FUEL FEED**		
3.1	**Feed pump**		
	Pressure (2) or characteristic diagram	kPa	750 kPa
3.2.	**Injection system**		
3.2.1	*Pump*		
3.2.1.1.	Make(s)		Bosch
3.2.1.2.	Type(s)		3752647
3.2.1.3.	Delivery		
	rated	mm^3/stroke	131.3
		rev/min	1500
	maximum torque	mm^3/stroke	131.3
		rev/min	1500
	Mention the method used: On engine/on pump bench		on engine
3.2.1.4	Injection advance		
3.2.1.4.1.	Injection advance curve (2)		Electronic
3.2.1.4.2.	Timing (2)		Electronic
3.2.2.	*Injection piping*		
3.2.2.1	Length	mm	434 (pump-to-rail), 303 (rail-to-injector)
3.2.2.2.	Internal diameter	mm	3
3.2.3.	*Injectors(s)*		
3.2.3.1.	Make(s)		Bosch
3.2.3.2.	Type(s)		4493315
3.2.3.3.	Opening pressure (2) or characteristic diagram	kPa	20000
3.2.4.	*Governor*		
3.2.4.1.	Make(s)		Caterpillar
3.2.4.2.	Type(s)		Electronic
3.2.4.3.	Speed at which cut-off starts under full load (2)	rev/min	1500
3.2.4.4.	Maximum no-load speed (2)	rev/min	1890+5
3.2.4.5.	Idling speed (2)	rev/min	900+5
3.3	**Cold start system**		
3.3.1.	Make(s)		Hidria
3.3.2	Type(s)		Glowplug
3.3.3.	Description		Optional glowplugs for ambient temperature down top -25°C (fitted by Perkins as customer option), ether for temperatures below -25°C (dealer fitted onto machine)
4	**VALVE TIMING**		
4.1	Maximum lift and angle of opening and closing in relation to dead centres or equivalent data:		
	Maximum lift: Inlet	mm	9.1
	Maximum lift: Exhaust	mm	8.69
	Inlet valve opening	deg BTDC	19
	Inlet valve closing	deg ABDC	42
	Exhaust valve opening	deg BBDC	54
	Exhaust valve closing	deg ATDC	27
4.2	Reference and/or setting range		N/A

Essential Characteristics of the Engine Family

1 Common parameters (1)

1.1	Combustion cycle		4 Stroke Compression Ignition
1.2	Cooling medium		*50:50 mixture - Ethylene glycol* to water
1.3	Method of air aspiration		Pressure charge
1.4	Combustion chamber type/design		Open Bowl
1.5	Valve and porting - configuration, size and number		four valves/cylinder
	Inlet	mm dia	35
	Exhaust	mm dia	33
	Minimum cross-sectional area of inlet and outlet ports		
	Inlet	mm^2	1093.385
	Exhaust	mm^2	922.186
1.6	Fuel system		Common Rail
1.7	Engine management systems		Timing and fueling of electronically controlled fuel injectors which are regulated by an on-board ECU A4:E2
	Proof of identity pursuant to drawing numbers(s)		
1.7.1	-charge cooling system(2)		Air-to-Air
1.7.2	-exhaust gas re-calculation(2)		no
1.7.3	-Water injection/emulsion(2)		no
1.7.4	-air injection(2)		no
1.8	Exhaust after-treatment(2)		no
	Proof of identical (or lowest for the parent engine) ratio: system capacity/fuel delivery per stroke, pursuant to diagram number(s)		

Essential Characteristics of the Engine Family

2 ENGINE FAMILY LISTING
2.1 Name of Engine Family Perkins 1104D-E44TA also branded as Caterpillar C4.4
2.2 Specific of engines within family:

		Parent									
Engine type		4522/1500	4522/1800	4520/1800	4520/1500						
No of cylinders		4 in line	4 in line	4 in line	4 in line						
Rated speed	rev/min	1500	1800	1800	1500						
Fuel delivery per stroke	(mm^3)	131.3	128.4	107.6	111.6						
Rated Net Power (Prime)	kW	94.6	108.1	88.3	77.1						
Rated Net Power (110%)	kW	106.5	122.7	99.2	85.7						
Maximum Torque speed	rev/min	1500	1800	1800	1500						
Fuel delivery per stroke	(mm^3)	131.3	128.4	107.6	111.6						
Maximum Torque (Prime)	Nm	602.1	573.3	468.9	491.4						
Maximum Torque (110%)	Nm	669	637	521	546						
Low idle speed	rev/min	900+5	900+5	900+5	900+5						
Cylinder displacement	% of parent	100	100	100	100						

Engine type											
No of cylinders											
Rated speed	rev/min										
Fuel delivery per stroke	(mm^3)										
Rated Net Power (Prime)	kW										
Rated Net Power (110%)	kW										
Maximum Torque speed	rev/min										
Fuel delivery per stroke	(mm^3)										
Maximum Torque (Prime)	Nm										
Maximum Torque (110%)	Nm										
Low idle speed	rev/min										
Cylinder displacement	% of parent										

Appendix 3

Essential Characteristics of Engine Types Within the Family

			Appendix 3	Appendix 3	Appendix 3
1	**DESCRIPTION OF ENGINE**				
1.1	Manufacturer		Perkins. Also branded as Caterpillar	Perkins. Also branded as Caterpillar	Perkins. Also branded as Caterpillar
1.2	Manufacturer's engine code		4522/1800	4520/1800	4520/1500
1.3	Cycle: four stroke/two stroke		4 Stroke Compression Ignition	4 Stroke Compression Ignition	4 Stroke Compression Ignition
1.4	Bore:	mm	105	105	105
1.5	Stroke:	mm	127	127	127
1.6	Number and layout of cylinders		4 in line	4 in line	4 in line
1.7	Engine capacity	cm^3	4400	4.399	4.399
1.8	Rated speed	rev/min	1800	1800	1500
1.9	Maximum torque speed	rev/min	1800	1800	1500
1.10	Volumetric compression ratio (2)	± 1 Ratio	16.9:1 +/-0.4	16.9:1 +/-0.4	16.9:1 +/-0.4
1.11	Combustion system description		Open Bowl	Open Bowl	Open Bowl
1.12	Drawing of combustion chamber and piston crown		4475253	4209222	4209222
1.13	Minimum cross sectional area of inlet and outlet ports	inlet mm^2	1093.385	1093.385	1093.385
		exhaust mm^2	922.186	922.186	922.186
1.14	**Cooling system**				
1.14.1	*Liquid*				
1.14.1.1	Nature of liquid		50:50 mixture - Ethylene glycol to water	50:50 mixture - Ethylene glycol to water	50:50 mixture - Ethylene glycol to water
1.14.1.2	Circulating pump(s)	yes/no	yes	yes	yes
1.14.1.3.	~~Characteristics~~ or make~~(s)~~ and type~~(s)~~ (if applicable)		Concentric , Single integrated gear driven centrifugal pump	Concentric , Single integrated gear driven centrifugal pump	Concentric , Single integrated gear driven centrifugal pump
1.14.1.4.	Drive ratio(s) (if applicable)		2:1	2:1	2:1
1.14.2	*Air*		N/A	N/A	N/A
1.15.	**Temperature permitted by the manufacturer**				
1.15.1.	Liquid cooling: maximum temperature at outlet	K	381K + 4K	381K + 4K	381K + 4K
1.15.2.	Air cooling: reference point		N/A	N/A	N/A
1.15.3.	Maximum charge air outlet temperature of the inlet of the intercooler (if applicable)	K	328 K	328 K	328 K
1.15.4.	Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold(s)	K	932 K	903.6 K	898.2 K
1.15.5.	Lubricant temperature	min K	373	373	373
		max K	398	398	398
1.16.	Pressure charger	yes/no	yes	yes	yes
1.16.1.	Make		Honeywell	Honeywell	Honeywell
1.16.2.	Type		4643034	4643034	4643034
1.16.3	Description of system (e.g. max charge pressure, waste-gate, if applicable		Non-Wastegated Turbocharger	Non-Wastegated Turbocharger	Non-Wastegated Turbocharger
1.16.4	Intercooler	yes/no	yes	yes	yes
1.17.	Intake system: Maximum allowable intake depression at rated engine speed and at 100% load	kPa	3.0	3.0	3.0
1.18.	Exhaust system: Maximum allowable exhaust backpressure at rated engine speed and at 100% load	kPa	15.0	15.0	6.0

Appendix 3

Essential Characteristics of Engine Types Within the Family

2	**ADDITIONAL ANTI-POLLUTION DEVICES** (if any and not covered by another heading)				
	Description and/or diagram(s)		N/A	N/A	N/A
			4522/1800	4520/1800	4520/1500
3	**FUEL FEED**				
3.1	**Feed pump**				
	Pressure[2] or characteristic diagram	kPa	750 kPa	750 kPa	750 kPa
3.2.	**Injection system**				
3.2.1	*Pump*				
3.2.1.1.	Make(s)		Bosch	Bosch	Bosch
3.2.1.2.	Type(s)		3752647	3752647	3752647
3.2.1.3.	Delivery				
	rated	mm^3/stroke	128.4	107.6	111.6
		rev/min	1800	1800	1500
	maximum torque	mm^3/stroke	128.4	107.6	111.6
		rev/min	1800	1800	1500
	Mention the method used: On engine/on pump bench		on engine	on engine	on engine
3.2.1.4	Injection advance				
3.2.1.4.1.	Injection advance curve [2]		Electronic	Electronic	Electronic
3.2.1.4.2.	Timing [2]		Electronic	Electronic	Electronic
3.2.2.	*Injection piping*				
3.2.2.1	Length	mm	434 (pump-to-rail) 303 (rail-to-injector)	434 (pump-to-rail) 303 (rail-to-injector)	434 (pump-to-rail) 303 (rail-to-injector)
3.2.2.2.	Internal diameter	mm	3	3	3
3.2.3.	*Injectors(s)*				
3.2.3.1.	Make(s)		Bosch	Bosch	Bosch
3.2.3.2.	Type(s)		4493315	4493315	4493315
3.2.3.3.	Opening pressure[2] or characteristic diagram	kPa	20000	20000	20000
3.2.4.	*Governor*				
3.2.4.1.	Make(s)		Caterpillar	Caterpillar	Caterpillar
3.2.4.2.	Type(s)		Electronic	Electronic	Electronic
3.2.4.3.	Speed at which cut-off starts under full load [2]	rev/min	1800	1800	1500
3.2.4.4.	Maximum no-load speed [2]	rev/min	1890+5	1890+5	1890+5
3.2.4.5.	Idling speed [2]	rev/min	900+5	900+5	900+5
3.3	**Cold start system**				
3.3.1.	Make(s)		Hidria	Hidria	Hidria
3.3.2	Type(s)		Glowplug	Glowplug	Glowplug
3.3.3.	Description		Optional glowplugs for ambient temperature down top -25°C (fitted by Perkins as customer option), ether for temperatures below -25°C (dealer fitted onto machine)	Optional glowplugs for ambient temperature down top -25°C (fitted by Perkins as customer option), ether for temperatures below -25°C (dealer fitted onto machine)	Optional glowplugs for ambient temperature down top -25°C (fitted by Perkins as customer option), ether for temperatures below -25°C (dealer fitted onto machine)

Appendix 3

Essential Characteristics of Engine Types Within the Family

			4522/1800	4520/1800	4520/1500
4	**VALVE TIMING**				
4.1	Maximum lift and angle of opening and closing in relation to dead centres or equivalent data:				
	Maximum lift: Inlet	mm	10.2	10.2	10.2
	Maximum lift: Exhaust	mm	9.3	9.3	9.3
	Inlet valve opening	deg BTDC	16	16	16
	Inlet valve closing	deg ABDC	45	45	45
	Exhaust valve opening	deg BBDC	72	72	72
	Exhaust valve closing	deg ATDC	104	104	104
4.2	Reference and/or setting range		Reference	Reference	Reference
5.3	Variable valve timing system (if applicable and where: intake and/or exhaust		N/A	N/A	N/A
5.3.1	Type: continuous or on/off		N/A	N/A	N/A
5.3.2.	Cam phase shift angle		N/A	N/A	N/A
6	**PORTING CONFIGURATION**				
6.1	Position, size and number		four valves per cylinder	four valves per cylinder	four valves per cylinder
	Inlet	mm^2	35	35	35
	Exhaust	mm^2	33	33	33
7	**IGNITION SYSTEM**				
7.4	Ignition timing		Electronic	Electronic	Electronic
7.4.1.	Static advance with respect to TDC		Electronic	Electronic	Electronic
7.4.2.	Advance curve if applicable		Electronic	Electronic	Electronic

Perkins 1104D-E44TA also branded as Caterpillar C4.4