

From: [Air.Pollution Control](#)
To: [APC Permitting](#)
Subject: FW: 1304 Southgate Place Kingsport Tennessee 37660 (SCREENING PERMIT)
Date: Friday, February 16, 2024 12:20:19 PM
Attachments: [davis.const@sharp-sbstn.com_02162024_123004PM.pdf](#)

Created 82-0639

From: Tyler Davis <tylerd@vdctn.com>
Sent: Friday, February 16, 2024 11:28 AM
To: Air.Pollution Control <Air.Pollution.Control@tn.gov>
Subject: [EXTERNAL] 1304 Southgate Place Kingsport Tennessee 37660 (SCREENING PERMIT)

***** This is an EXTERNAL email. Please exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email - STS-Security. *****

Dear Technical Secretary,

Please allow me to introduce myself. My name is Tyler Davis and my brother and I own Vic Davis Construction Inc. We are currently trying to get a permit to screen shale material to meet a spec for a job on the above property located at 1304 Southgate Place Kingsport Tennessee 37660. The site is located in Sullivan county. This is our first time filling out the permits and applicable paperwork. If you would please take a look at what we have attached and please let us know at your earliest convenience if we have it filled out correctly or if we need to send any additional information I would greatly appreciate it. This job is getting ready to start and really need to screen material.

Thanks,
Tyler Davis
Vic Davis Construction Inc.
Owner
423-817-7338



DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor, Nashville, TN 37243
Telephone: (615) 532-0554, Email: Air.Pollution.Control@TN.gov

APC 100

**NON-TITLE V PERMIT APPLICATION
FACILITY IDENTIFICATION**

Type or print and submit. Attach appropriate source description forms.					
SITE INFORMATION					
1. Organization's legal name and SOS control number [as registered with the TN Secretary of State (SOS)] <i>Vic Davis Construction INC , 18329</i>					
2. Site name (if different from legal name) <i>Southgate</i>					
3. Is a construction permit application fee being submitted? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (see instructions for appropriate fee to submit)					
4. Site address (St./Rd./Hwy.) <i>Entrance Adjacent to One Fellowship Point</i>				County name <i>Sullivan</i>	
City <i>Kingsport</i>		Zip code <i>37660</i>		5. NAICS or SIC code <i>238910</i>	
6. Site location (in lat. /long.)		Latitude <i>36.5078739</i>		Longitude <i>-082.5527288</i>	
CONTACT INFORMATION (RESPONSIBLE PERSON)					
7. Responsible person/Authorized contact <i>Tyler Davis</i>				Phone number with area code <i>423-817-7338</i>	
Mailing address (St./Rd./Hwy.) <i>1300 Jan Way</i>				Fax number with area code <i>423-246-1627</i>	
City <i>Kingsport</i>		State <i>TN</i>	Zip code <i>37660</i>	Email address <i>tylerd@vdc-tn.com</i>	
CONTACT INFORMATION (TECHNICAL)					
8. Principal technical contact <i>Tyler Davis</i>				Phone number with area code <i>423-817-7338</i>	
Mailing address (St./Rd./Hwy.) <i>1300 Jan Way</i>				Fax number with area code <i>423-246-1627</i>	
City <i>Kingsport</i>		State <i>TN</i>	Zip code <i>37660</i>	Email address <i>tylerd@vdc-tn.com</i>	
CONTACT INFORMATION (BILLING)					
9. Billing contact <i>Tory Davis</i>				Phone number with area code <i>423-817-7333</i>	
Mailing address (St./Rd./Hwy.) <i>1300 Jan Way</i>				Fax number with area code <i>423-246-1627</i>	
City <i>Kingsport</i>		State <i>TN</i>	Zip code <i>37660</i>	Email address <i>toryd@vdc-tn.com</i>	

AIR CONTAMINANT SOURCE(S) INFORMATION

- 10. Description of air contaminant source(s) and Unique Source ID(s).** List, identify, and briefly describe process emission sources, fuel burning installations, and incinerators that are contained in this application and include a Unique Source ID for each source. The Unique Source ID is a name/number/letter, which uniquely identifies the air contaminant source(s), like Boiler #1, Paint Line #1, Engine #1, etc. (see instructions for more details)

McCloskey 12230 Screener - engine #1
 Barford 36x80 Stacker - engine #1
 Barford 36x80 Stacker - engine #1

- 11. Is the air contaminant source(s) in a nonattainment area? If "Yes", then minor source BACT must be addressed.** Yes ☒ No ☐ Partial County = P (on website)

12. Normal operation:	Hours/Day 10	Days/Week 5	Weeks/Year	Days/Year
13. Percent annual throughput	Dec. - Feb.	March - May 15,000 hrs	June - August	Sept. - Nov.

TYPE OF PERMIT REQUESTED (check appropriate box)

14. Operating permit <input type="checkbox"/>	Date construction started Last permit number(s)	Date completed Emission Source Reference Number(s)	Date of ownership change (if applicable) Emission Source Reference Number(s)
Construction permit <input checked="" type="checkbox"/>	Last permit number(s)	Emission Source Reference Number(s)	

If you chose Construction permit above, then choose either New Construction, Modification, or Location Transfer

New Construction <input checked="" type="checkbox"/>	Starting date 3/1/24 if possible	Completion date 5/31/24
Modification <input type="checkbox"/>	Date modification started or will start	Date completed or will complete
Location Transfer <input type="checkbox"/>	Transfer date	Address of last location

15. Describe changes that have been made to this equipment or operation(s) since the last construction or operating permit application:

N/A

1st time Application for this site.

16. Comments

this is a first time request for permit for this site. We will only be screening material only. No crushing.

SIGNATURE

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

17. Signature (application must be signed before it will be processed)

Date

2/15/24

Signer's name (type or print)

Title

Phone number with area code

Tyler Davis

owner

423 - 817 - 7338



DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor, Nashville, TN 37243
Telephone: (615) 532-0554, Email: Air.Pollution.Control@TN.gov

APC 109

**NON-TITLE V PERMIT APPLICATION
ROCK CRUSHING SOURCE DESCRIPTION**

Type or print. Submit for each rock crushing operation. Submit with the APC 100.

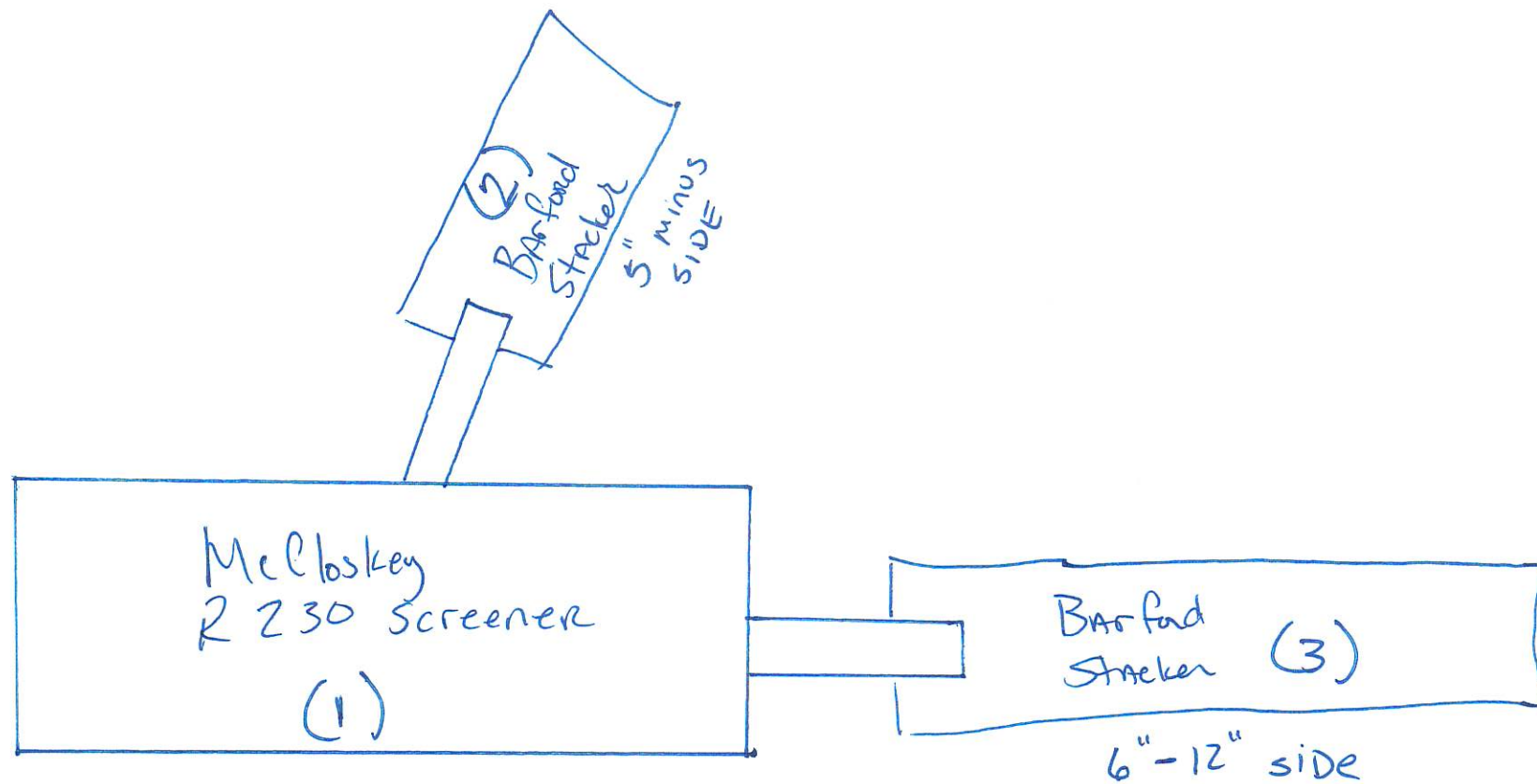
GENERAL IDENTIFICATION AND DESCRIPTION

1. Organization's legal name and SOS control number [as registered with the TN Secretary of State (SOS)]
Vic Davis Construction Inc , 18329
2. Emission Source Reference Number
NEW SOURCE NONE TO DATE
3. Is this air contaminant source subject to an NSPS or NESHAP rule? Yes ☐ No ☒
If Yes, list rule citation, including Part, Subpart, and applicable Sections:

EQUIPMENT INFORMATION

The applicant must submit an equipment list and flow diagram. The applicant may use the table below to list the equipment or attach a separate sheet of paper for the equipment list. The equipment list must include each crusher, screen, conveyor, bin, pugmill, feeder, agricultural lime, etc. The flow diagram must show each piece of equipment labeled with a reference number.

4. Equipment type (Note 1)	Flow diagram reference number (Note 2)	Size (Note 3)	Operating rate (Tons/Hr.)		Date of manufacture
			Design	Actual	
<i>McCloskey R230</i>	<i>1</i>	<i>20'x6'</i>	<i>250</i>	<i>100</i>	<i>2019</i>
<i>Barford 36x80 stacker</i>	<i>2</i>	<i>36"</i>	<i>250</i>	<i>100</i>	<i>2022</i>
<i>Barford 36x80 stacker</i>	<i>3</i>	<i>36"</i>	<i>250</i>	<i>100</i>	<i>2022</i>



EMISSION INFORMATION

5. Air contaminants. Emission estimates for each air contaminant emitted from this point should be based on stack sampling results or engineering calculations. Calculations should be attached on a separate sheet. (see instructions for more details)

Particulate Matter emission data:	Flow diagram ref. no. (Note 5)	Average Emissions (Lbs./Hr.)	Maximum Emissions (Lbs./Hr.)	Average Emissions (Tons/Yr)	Potential Emissions (Tons/Yr)	Emissions Estimation method (Note 6)	Control devices (Note 6)	Control efficiency (%)
Primary crushing								
Secondary crushing								
Tertiary crushing								
Agricultural lime								
Open storage								
Enclosed storage								
Conveying & Transferring								
Loading out								
Traffic dust								
Other (specify) <i>SCREENER</i>								
(2) Other (specify) <i>stackers</i>								
Totals								

Note 1: Equipment type: The applicant must list each crusher, screen, conveyor, bin, pugmill, feeder, agricultural lime, etc.

Note 2: Flow diagram reference number: The applicant must attach a flow diagram. The flow diagram must show each piece of equipment, including each crusher, screen, conveyor, bin, pugmill, feeder, agricultural lime, etc. Each piece of equipment must be labeled with a reference number.

Note 3: Size: For crushers, size is the design operating rate (in ton/hr.). For screens, size is the dimensions of the top deck of the screen. For conveyors, size is the width of the conveyor. For bins, size is the design capacity in tons.

Note 4: Explain in comments, if necessary.

Note 5: As identified on the flow diagram required in item #3

Note 6: Refer to the instructions for the estimation method and control device codes.

6. Control device. Description of proposed monitoring, recordkeeping, and reporting to assure compliance with emission limits. Include operating parameters of control device (flow rate, temperature, pressure drop, etc.).

N/A for this application.

ROAD INFORMATION

7. Roads:	Paved (Miles of road)	Unpaved (Miles of road)	Watered (Miles & frequency)	Other control (specify)
Plant yard		1000'	hourly 800 gal	broom if needed
Access roads	1000'	N/A	hourly 800 gal	broom if needed

STOCKPILE INFORMATION

8. Stockpiles:	Estimated annual tons	Turnover rate (Tons/Month)	Wetted as piled	No. of sides enclosed	Other dust control	Loading method (e.g. loader, conveyor) Load in Load out	
Coarse: Over 1"	15,000						
Fine: 1" to 1/4"							
1/4" and less							
MFG. Sand							
Other (specify)							


9. Comments

We are screening shale. will have a 5" screen deck on machine only. we will have orig 2 products, 5" minus & 5"-12". Stockpiles will be wetted as needed.

SIGNATURE

If this form is being submitted at the same time as an APC 100 form, then a signature is not required on this form. Date this form regardless of whether a signature is provided. If this form is NOT being submitted at the same time as an APC 100 form, then a signature is required.

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

10. Signature 		Date 2/15/24
Signer's name (type or print) Tyler Davis	Title Owner	Phone number with area code 423-817-7338

TMI Emissions Data
 Survey
 (https://www.caterpillarsurveys.com/se.ashx?
 s=4F5AA3C87FC94347)

Engine Emissions Data

For Emissions / Certification feedback and questions, please submit a ticket via our ERC Request Portal (<https://ercrequestspilotprogram.atlassian.net/servicedesk/customer/portal/2>)

Serial Number(Engine)	88106656
Sales Model	C7.1
Regulatory Build Date	05-APR-2019
As Shipped Data	
Engine Arrangement Number	4427801
Regulatory Status	CAT_NR_EPA/CARB_MLIT_R120_R96_China Exp_EU Exp
Regulatory Status	CAT_Korea
Labeled Model Year	2019
EPA Family Code	KPKXL07.0BN1
EPA Emissions Level	EPA TIER 4f
Japan Emissions Level	STEP 4 FINAL
Korea Type Approval	C7.1+4036/2200//15EN*PE*03
UN R120 Type Approval	R120-011033
UN R96 Type Approval	R96-043601Q
Advertised Power	225.3HP/2200RPM/T4036
Liters	7.01

Disclaimer: The information provided has been compiled from third party sources and is accurate to the best of Caterpillar's knowledge. However, Caterpillar cannot guarantee the accuracy, completeness, or validity of the information and is not liable for any errors or omissions contained therein. All information provided should be independently verified and confirmed, including by examining the emissions label located on the engine.

Caterpillar Confidential: Green
 Content Owner: Commercial Processes Division
 Web Master(s): PSG Web Based Systems Support (http://tmiwebclassic.cat.com/tmi/tmihome/PSGIS_support.htm)
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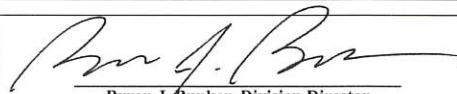


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2019 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: Perkins Engines Co Ltd
(U.S. Manufacturer or Importer)
Certificate Number: KPKXL07.0BN1-019

Effective Date:
12/13/2018
Expiration Date:
12/31/2019


Byron J. Bunker, Division Director
Compliance Division

Issue Date:
12/13/2018
Revision Date:
N/A

Model Year: 2019
Manufacturer Type: Original Engine Manufacturer
Engine Family: KPKXL07.0BN1

Mobile/Stationary Indicator: Both
Emissions Power Category: $130 \leq kW \leq 560$
Fuel Type: Diesel, Non-Standard Fuel
After Treatment Devices: CTOX-DPF-Passive, Diesel Oxidation Catalyst, Ammonia Slip Catalyst, Selective Catalytic Reduction
Non-after Treatment Devices: Electronic/Electric EGR, Electronic Control, Engine Design Modification, Electronic/Electric EGR - Cooled
FELs: PM 0.01 g/kW-hr

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Parts 60 and 1039, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Parts 60 and 1039 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Parts 60 and 1039 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Parts 60 and 1039.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Parts 60 and 1039. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Parts 60 and 1039.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

This certificate of conformity is conditional upon compliance of said manufacturer with the averaging, banking and trading provisions of 40 CFR Part 1039, Subpart H. Failure to comply with these provisions may render this certificate void *ab initio*.

The actual engine power may lie outside the limits of the Emissions Power Category shown above. See the certificate application for details.

Pursuant to the authority vested in California Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-14-012;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2019	KPKXL07.0BN1	7.01	Diesel	8000
SPECIAL FEATURES & EMISSION CONTROL SYSTEMS			TYPICAL EQUIPMENT APPLICATION	
Electronic Direct Injection, Turbocharger, Charge Air Cooler, Engine Control Module, Diesel Oxidation Catalyst, Periodic Trap Oxidizer, Exhaust Gas Recirculation, Selective Catalytic Reduction-Urea, Ammonia Oxidation Catalyst			Crane, Loaders, Tractor, Dozer, Pump, Compressor, Generator Set	

The engine models and codes are attached.

The following are the exhaust certification standards (STD) and certification levels (CERT) for non-methane hydrocarbon (NMHC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			NMHC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW ≤ 560	Tier 4 Final	OPTIONAL STD	0.19	0.40	N/A	3.5	0.02	N/A	N/A	N/A
		FEL	N/A	N/A	N/A	N/A	0.01	N/A	N/A	N/A
		CERT	0.01	0.27	--	1.3	0.002	--	--	--

BE IT FURTHER RESOLVED: That the family emission limit(s) (FEL) is an emission level declared by the manufacturer for use in any averaging, banking and trading program and in lieu of an emission standard for certification. It serves as the applicable emission standard for determining compliance of any engine within this engine family under 13 CCR Sections 2423 and 2427.

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has complied with the more stringent set of standards from the various power categories in conformance with Section 1039.230 (e) of the "California Exhaust Emission Standards and Test Procedures for New 2011 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-D" adopted October 20, 2005 and last amended October 25, 2012.

BE IT FURTHER RESOLVED: That the manufacturer has elected to include engine models in this engine family which are identified for "emergency equipment use only". These "emergency equipment use only" engines are exempt from requirements imposed pursuant to California law and the regulations adopted pursuant thereto for motor vehicle pollution control devices per California Vehicle Code Section 27156.2. The manufacturer must clearly label these engines for "emergency equipment use only" on the engines' emission control label.



PERKINS ENGINES COMPANY LTD.

EXECUTIVE ORDER U-R-022-0220
New Off-Road
Compression-Ignition Engines
Page 2 of 2

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 26 day of December 2018.

A handwritten signature in cursive script, reading 'Annette Hebert'.

Annette Hebert, Chief
Emissions Compliance, Automotive Regulations and Science Division

U-R-022-0220
Attachment Pg 1 of 8

Engine Model Summary Template

12/14/2018

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesel only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	Cert Test 1	3924/2200	275@2200	144	104	927@1400	186	86	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	2	3960/2200	269@2200	140	101	918@1400	184	85	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	3	3926/2200	250@2200	128	93	895@1400	179	82	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	4	4038/2200	250@2200	128	93	895@1400	179	82	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	5	3962/2200	248@2200	127	92	908@1300	182	78	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

U-R-022-0220

Attachment pg 2 of 8

Engine Model Summary Template

12-14-2018

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	6	3976/1800	239@1800	140	83	766@1400	153	70	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	7	3928/2200	225@2200	115	83	805@1400	160	74	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	8	4036/2200	225@2200	115	83	805@1400	160	74	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	9	3966/2200	215@2200	109	79	735@1400	140	64	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	10	3930/2200	202@2200	103	75	725@1400	138	64	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

Attachment pg 3 of 8

Engine Model Summary Template

12-14-2018

U-R-022-0220

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	11	4034/2200	202@2200	103	75	725@1400	138	64	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	12	3978/1800	204@1800	121	72	642@1400	124	57	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	13	3932/2200	202@2200	105	75	642@1400	124	57	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	14	4052/1800	188@1800	111	65	642@1400	124	57	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	15	4054/2000	176@2000	99	62	637@1400	122	56	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

Attachment pg 4 of 8

Engine Model Summary Template

12-14-2018

U-R-022-0220

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	16	3934/2200	174@2200	92	64	621@1400	118	55	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	17	4028/2200	174@2200	92	64	621@1400	118	55	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	18	4032/2200	173@2200	92	64	642@1400	124	57	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	19	4064/1800	164@1800	97	57	586@1400	115	52	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	20	3990/1800	164@1800	97	57	547@1400	110	49	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

Attachment pg 5 of 8
U-R-022-0220

Engine Model Summary Template

12-14-2013

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Devices Per SAE J1930
KPKXL07.0BN1	21	3936/2200	156@2200	81	59	557@1400	112	50	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	22	4050/2200	156@2200	81	59	557@1400	112	50	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	23	4060/1800	153@1800	90	53	532@1400	106	48	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	24	4354/2200	273@2200	143	103	927@1400	186	86	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	25	4356/2200	250@2200	128	93	895@1400	179	82	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

Attachment pg 6 of 8

Engine Model Summary Template

12-14-2018

U-R-022-0220

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lb/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lb/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	26	4358/2200	225@2200	115	83	805@1400	160	74	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	27	4360/2200	202@2200	103	75	725@1400	138	64	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	Cert Test 28	4346/2200	302@2200	156	113	946@1400	187	86	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	28	4346/2200	302@2200	156	113	946@1400	187	86	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	29	4348/2200	302@2200	156	113	940@1400	179	82	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

Attachment Pg 7 of 8

U-R-022-0220

12-14-2018

Engine Model Summary Template

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesel only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	Cert Test 30	4350/1800	321@1800	197	117	935@1800	197	117	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	30	4350/1800	321@1800	195	115	935@1800	195	115	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	31	4352/1800	247@1800	140	83	720@1800	140	83	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	32	4460/2200	227@2200	115	83	805@1400	162	75	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	33	4530/2200	178@2200	92	67	642@1400	123	57	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

Attachment pg 8 of 8
U-R-022-0220

12-14-2018

Engine Model Summary Template

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
KPKXL07.0BN1	34 AK942 (Emergency)	4530/2200	178@2200	92	67	642@1400	123	57	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR
KPKXL07.0BN1	35	62641800	163@1800	96	57	795@1400	113	52	DDI TAA ECM DOC CTOX PTOX EGR SCR AMOX EPR

TAA = TC + CAC

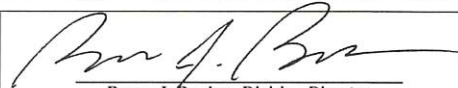


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2021 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: Perkins Engines Co Ltd
(U.S. Manufacturer or Importer)
Certificate Number: MPKXL02.2IR1-039

Effective Date:
09/30/2020
Expiration Date:
12/31/2021


Byron J. Bunker, Division Director
Compliance Division

Issue Date:
09/30/2020
Revision Date:
N/A

Model Year: 2021
Manufacturer Type: Original Engine Manufacturer
Engine Family: MPKXL02.2IR1

Mobile/Stationary Indicator: Both
Emissions Power Category: $37 \leq kW < 56$
Fuel Type: Diesel
After Treatment Devices: Diesel Oxidation Catalyst, PTOX-DPF-Active
Non-after Treatment Devices: Electronic/Electric EGR

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Parts 60 and 1039, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Parts 60 and 1039 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Parts 60 and 1039 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Parts 60 and 1039.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Parts 60 and 1039. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Parts 60 and 1039.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

 CALIFORNIA AIR RESOURCES BOARD	PERKINS ENGINES COMPANY LTD.	EXECUTIVE ORDER U-R-022-0276 New Off-Road Compression-Ignition Engines
--	-------------------------------------	---

Pursuant to the authority vested in California Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-19-095;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2021	MPKXL02.2IR1	2.22	Diesel	8000
SPECIAL FEATURES & EMISSION CONTROL SYSTEMS			TYPICAL EQUIPMENT APPLICATION	
Electronic Direct Injection, Turbocharger, Charge Air Cooler, Engine Control Module, Diesel Oxidation Catalyst, Periodic Trap Oxidizer, Exhaust gas Recirculation			Welder, Mini-Excavator	

The engine models and codes are attached.

The following are the exhaust certification standards (STD) and certification levels (CERT) for non-methane hydrocarbon (NMHC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			NMHC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
37 ≤ kW < 56	Tier 4 Final	STD	N/A	N/A	4.7	5.0	0.03	N/A	N/A	N/A
		CERT	--	--	3.5	1.3	0.003	--	--	--

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed on this 16th day of October 2020.



Allen Lyons, Chief
Emissions Certification and Compliance Division

Engine Model Summary Template

Attachment page 1 of 1
EO#: U-R-022-0276
Date: 09/29/2020

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
MPKXL02.2IR1	5076/2800 Parent	404J-E22TA C2.2	74@2800	47.2	29.1	270@1600	58.7	20.7	DDI,TAA,ECM,DOC,PTOX, EGR
MPKXL02.2IR1	6182/2800	404J-E22TA C2.2	60@2800	39.3	24.3	235@1600	49.9	17.6	DDI,TAA,ECM,DOC,PTOX, EGR
MPKXL02.2IR1	6184/2800	404J-E22TA C2.2	67@2800	42.7	26.3	252@1600	53.6	18.9	DDI,TAA,ECM,DOC,PTOX, EGR

TAA = TC + CAC

EU TYPE-APPROVAL CERTIFICATE

Communication concerning the:

- EU type-approval,
- ~~extension of EU type approval,~~
- ~~refusal of EU type approval,~~
- ~~withdrawal of EU type approval,~~

of an ~~engine type~~/engine family ⁽¹⁾ with regard to gaseous and particulate pollutant emission pursuant to Regulation (EU) 2016/1628, as last amended by (Commission Delegated) ⁽¹⁾ Regulation (EU) 2018/989 ⁽¹⁾⁽²⁾ (of the European Parliament and of the Council) ⁽¹⁾

EU Type Approval No: e24*2016/1628*2018/989EV4/D*0315*00

Reason for extension/refusal/withdrawal ⁽¹⁾:

- N/A

SECTION I

- | | |
|---|--|
| 1.1. Make (trade name(s) of manufacturer): | <i>Perkins Engines Co Ltd,
Caterpillar</i> |
| 1.2. Commercial name(s) (if applicable): | <i>404J-E22TA (Perkins)
C2.2 (Caterpillar)</i> |
| 1.3. Company name and address of manufacturer: | <i>Perkins Engines Co Ltd
Frank Perkins Way
Peterborough PE1 5FQ
United Kingdom</i> |
| 1.4. Name and address of manufacturer's authorised representative (if any): | <i>Caterpillar Energy Solutions GmbH
Attn: General Manager Research and
Development
Carl-Benz-Strasse 1
68167 Mannheim
Germany</i> |
| 1.5. Name(s) and address(es) of assembly/manufacture plant(s): | <i>Perkins Engines Co Ltd
Frank Perkins Way
Peterborough PE1 5FQ
United Kingdom</i> |
| 1.6. Engine type designation /engine family designation/FF ⁽¹⁾ : | <i>NRE4V2.22HPA</i> |
| 1.7. Category and sub-category of the engine type /engine family ⁽¹⁾⁽⁴⁾ : | <i>NRE-v-4</i> |
| 1.8. Emissions durability period category: | <i>Not Applicable/Cat 1/Cat 2/Cat 3 ⁽¹⁾</i> |
| 1.9. Emissions stage: | <i>V/ SPE</i> |
| 1.10. Engine for snow throwers ⁽⁵⁾ : | <i>Yes/No ⁽¹⁾</i> |

EU Type Approval No: e24*2016/1628*2018/989EV4/D*0315*00

SECTION II

1. Technical service responsible for carrying out the tests: *TÜV SÜD Auto Service GmbH,
Westendstraße 199,
D-80686 München,
Germany.*
2. Date(s) of test report(s): *06.09.2019*
3. Number(s) of test report(s): *19-00885-CP-GBM-00*

SECTION III

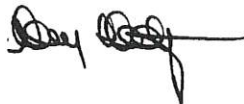
The undersigned hereby certifies the accuracy of the manufacturer's description in the attached information document of the ~~engine type~~/engine family ⁽¹⁾ described above, for which one or more representative samples, selected by the approval authority, have been submitted as prototypes and that the attached test results apply to the ~~engine type~~/engine family ⁽¹⁾.

1. The ~~engine type~~/engine family ⁽¹⁾ meets/~~does not meet~~ ⁽¹⁾ the requirements laid down in Regulation (EU) 2016/1628.
2. The approval is: *granted/extended/refused/withdrawn* ⁽¹⁾
3. The approval is granted in accordance with Article 35 of Regulation (EU) 2016/1628 and the validity of the approval is thus limited to dd/mm/yyyy ⁽³⁾ *N/A*
4. Restrictions to validity ⁽³⁾⁽⁶⁾: *N/A*
5. Exemptions applied ⁽³⁾⁽⁶⁾: *N/A*

Place: *Dublin.*

Date: *6th November, 2019*

Name and signature
(or visual representation of an
'advanced electronic signature'
according to Regulation (EU) No 910/2014, including data for verification):




Attachments:

Information package

Test report(s)

Where applicable, the name(s) and specimen(s) of the signature(s) of the person(s) authorised to sign statement of conformity and a statement of their position in the company Where applicable, a completed specimen of a statement of conformity

NB:

If this model is used for EU type-approval of an engine as an exemption for new technologies or new concepts, pursuant to Article 35(4) of Regulation (EU) 2016/1628, the heading of the certificate shall read 'PROVISIONAL EU TYPE-APPROVAL CERTIFICATE VALID ONLY ON THE TERRITORY OF ... ⁽⁷⁾'.

Addendum

PART A — CHARACTERISTICS OF THE ~~ENGINE TYPE~~/ENGINE FAMILY ⁽¹⁾

2. Common design parameters of the ~~engine type~~/engine family ⁽¹⁾
- 2.1. Combustion Cycle: *four stroke cycle/two stroke cycle/rotary
other: (describe) ⁽¹⁾*
- 2.2. Ignition Type: *Compression ignition/spark ignition ⁽¹⁾*
- 2.3.1. Position of the cylinders in the block: *V/in-line/radial/other(specify) ⁽¹⁾*
- 2.6 Main Cooling medium: *Air/Water/Oil ⁽¹⁾*
- 2.7. Method of air aspiration: *naturally aspirated/pressure charged/
pressure charged with charge cooler ⁽¹⁾*
- 2.8.1. Fuel Type(s): *Diesel (non-road gas-oil)/Ethanol for
dedicated compression ignition engines
(ED95)/Petrol (E10)/Ethanol(E85)/
(Natural gas/Biomethane)/Liquid
Petroleum Gas (LPG) ⁽¹⁾*
- 2.8.1.1. Sub Fuel type (Natural gas/Biomethane only): *Universal fuel—high calorific fuel (H-
gas) and low calorific fuel (L-gas)/
Restricted fuel—high calorific fuel (H
gas)/Restricted fuel—low calorific fuel
(L-gas)/Fuel specific (LNG);*
- 2.8.2. Fuelling arrangement: *Liquid-fuel only/Gaseous-fuel only/Dual-
fuel type 1A/Dual-fuel type 1B/Dual-fuel
type 2A/Dual-fuel type 2B/Dual-fuel
type 3B ⁽¹⁾*
- 2.8.3. List of additional fuels compatible with use by the engine declared by the manufacturer in accordance with point 1 of Annex I to Delegated Regulation (EU) 2017/654 (provide reference to recognised standard or specification): *B20 biofuel per ASTM D7467
or EN16709:2015*
- 2.8.4. Lubricant added to fuel: *Yes/No ⁽¹⁾*
- 2.8.5. Fuel supply type: *Pump (high-pressure) line and injector/in
line pump or distributor pump/Unit
injector/Common rail/Carburettor/port
injector/direct injector/Mixing unit/
other(specify) ⁽¹⁾*
- 2.9. Engine management systems: *mechanical/electronic control strategy ⁽¹⁾*

EU Type Approval No: e24*2016/1628*2018/989EV4/D*0315*00

2.10.	Miscellaneous devices:	Yes /No ⁽¹⁾
2.10.1.	Exhaust gas recirculation (EGR):	Yes/ No ⁽¹⁾
2.10.2.	Water injection:	Yes /No ⁽¹⁾
2.10.3.	Air injection:	Yes /No ⁽¹⁾
2.10.4.	Others (specify):	No
2.11.	Exhaust after-treatment system:	Yes/ No ⁽¹⁾
2.11.1.	Oxidation catalyst:	Yes/ No ⁽¹⁾
2.11.2.	DeNOx system with selective reduction of NOx (addition of reducing agent):	Yes /No ⁽¹⁾
2.11.3.	Other DeNOx systems:	Yes /No ⁽¹⁾
2.11.4.	Three-way catalyst combining oxidation and NOx reduction:	Yes /No ⁽¹⁾
2.11.5.	Particulate after-treatment system with passive regeneration:	Yes /No ⁽¹⁾
2.11.6.	Particulate after-treatment system with active regeneration:	Yes/ No ⁽¹⁾
2.11.7.	Other particulate after-treatment systems:	Yes /No ⁽¹⁾
2.11.8.	Other after-treatment devices (specify):	No
2.11.9.	Other devices or features that have a strong influence on emissions (specify):	No

EU Type Approval No: e24*2016/1628*2018/989EV4/D*0315*00

3. Essential characteristics of the engine type(s)

Item Number	Item Description	Parent Engine /Engine type	Engine types within the family (if applicable)	
3.1.1.	Engine Type Designation:	5076/2800	6184/2800	6184/2800
3.1.2.	Engine type designation shown on engine mark: Yes/No ⁽¹⁾	Yes	Yes	Yes
3.1.3.	Location of the manufacturer's statutory marking:	<i>The serial number is engraved onto an aluminium plate which may be located on either the right or left hand side of the cylinder block, it is held in place by 2 rivets. The serial number is electronically issued in sequence at the beginning of the engine assembly process.</i>		
3.2.1.	Declared rated speed (rpm):	2800	2800	2800
3.2.1.2.	Declared rated net Power (kW):	55	50	45
3.2.2.	Maximum power speed (rpm):	2800	2800	2800
3.2.2.2.	Maximum net power (kW):	55	50	45
3.2.3.	Declared maximum torque speed (rpm):	1600	1600	1600
3.2.3.2.	Declared maximum torque (Nm):	270	252	235
3.6.3.	Number of Cylinders:	4	4	4
3.6.4.	Engine total swept volume (cm ³):	2216	2216	2216
3.8.5.	Device for recycling crankcase gases: Yes/No ⁽¹⁾	Yes	Yes	Yes
3.11.3.12.	Consumable reagent: Yes/No ⁽¹⁾	No	No	No
3.11.3.12.1.	Type and concentration of reagent needed for catalytic action:	N/A	N/A	N/A
3.11.3.13.	NOx sensor(s): Yes/No ⁽¹⁾	No	No	No
3.11.3.14.	Oxygen sensor: Yes/No ⁽¹⁾	No	No	No
3.11.4.7.	Fuel borne catalyst (FBC): Yes/No ⁽¹⁾	No	No	No

EU Type Approval No: e24*2016/1628*2018/989EV4/D*0315*00

Particular conditions to be respected in the installation of the engine on non-road mobile machinery:

Item Number	Item Description	Parent Engine / Engine type	Engine types within the family (if applicable)	
3.8.1.1.	Maximum allowable intake depression at 100 % engine speed and at 100 % load (kPa) with clean air cleaner:	5	5	5
3.8.3.2.	Maximum charge air cooler outlet temperature at 100 % speed and 100 % load (deg. C):	50	50	50
3.8.3.3.	Maximum allowable pressure drop across charge cooler at 100 % engine speed and at 100 % load (kPa) (if applicable):	10kpa	10kpa	10kpa
3.9.3.	Maximum permissible exhaust gas backpressure at 100 % engine speed and at 100 % load (kPa):	16.25	14.1	14.1
3.9.3.1	Location of measurement:	<i>Engine Back Pressure Valve Out</i>		
3.11.1.2.	Maximum temperature drop from exhaust system or turbine outlet to first exhaust after-treatment system (deg. C) if stated:	<i>Per A&I guide</i>	<i>Per A&I guide</i>	<i>Per A&I guide</i>
3.11.1.2.1.	Test conditions for measurement:	<i>Per A&I guide</i>	<i>Per A&I guide</i>	<i>Per A&I guide</i>

PART B — TEST RESULTS

3.8. Manufacturer intends to use ECU torque signal for in-service monitoring: *Yes/No⁽¹⁾*

3.8.1. Dynamometer torque greater than or equal to $0,93 \times$ ECU torque: *Yes/No⁽¹⁾*

3.8.2. ECU torque correction factor in case that dynamometer torque less than $0,93 \times$ ECU torque: *N/A*

11.1. Cycle emissions results

Emissions	CO (g/kWh)	HC (g/kWh)	NOx (g/kWh)	HC+NOx (g/kWh)	PM (g/kWh)	PN #/kWh	Test Cycle ⁽⁸⁾
NRSC final result with DF.	0,009	0,007	3,15	3,16	0,0004	0,3	CI
NRTC Final test result with DF	0,063	0,016	3,28	3,3	0,0006	0,3	NRTC

(*) Optionally, as an alternative, any combination of values satisfying the equation $(HC + NOx) \times CO^{0,784} \leq 8,57$ as well as the following conditions: $CO \leq 20,6$ g/kWh and $(HC + NOx) \leq 2,7$ g/kWh

11.2. CO₂ result: *NRSC: 752,71 g/kWh*
NRTC: 796,43 g/kWh

EU Type Approval No: e24*2016/1628*2018/989EV4/D*0315*00

11.3. In service monitoring reference values ⁽⁹⁾

11.3.1. Reference work (kWh): *N/A*

11.3.2. Reference CO₂ mass (g): *N/A*

Explanatory notes to Annex IV:

(Footnote markers, footnotes and explanatory notes not to be stated on the EU type-approval certificate)

- ⁽¹⁾ Strike out the unused options, or only show the used option(s).
- ⁽²⁾ Indicate only the latest amendment in case of an amendment of one or more Articles of Regulation (EU) 2016/1628, according to the amendment applied for the EU type-approval.
- ⁽³⁾ Delete this entry when not applicable.
- ⁽⁴⁾ Indicate the applicable option for the category and sub-category in accordance with entry 1.7 of the information document set out in Part A of Appendix 3 to Annex I.
- ⁽⁵⁾ Indicate whether the approval is for a NRS (< 19 kW) engine family consisting exclusively of engine types for snow throwers.
- ⁽⁶⁾ Applicable only for EU type-approval of an engine type or an engine family as an exemption for new technologies or new concepts, pursuant to Article 35 of Regulation (EU) 2016/1628.
- ⁽⁷⁾ Indicate the Member State.
- ⁽⁸⁾ Indicate the test cycle in accordance with the fifth column of the Tables set out in Annex IV to Regulation (EU) 2016/1628.
- ⁽⁹⁾ Only applicable to engines of sub-categories NRE-v-5 and NRE-v-6 tested on NRTC.

Index to the Information Package

Date of issue:	<i>6th November, 2019.</i>
Date of latest amendment:	<i>N/A</i>
Reason for extension/revision:	<i>N/A</i>
1. Additional conditions, and advisory notes on legal alternatives.	
2. Test report(s)	
- numbers(s):	<i>19-00885-CP-GBM-00</i>
- date of issue:	<i>06.09.2019</i>
- date of latest amendment:	<i>N/A</i>
3. Information document	
- number(s):	<i>NRE4V2.22HPA_Regulation EU 2016_1628</i>
- date of issue:	<i>31.07.2019</i>
- date of latest amendment:	<i>N/A</i>
Documentation:	<i>34 pages</i>

Appendix: Additional conditions, and advisory notes on legal alternatives

A: Additional conditions:

1. The attached technical report, with any of its attachments, forms part of this Type Approval certificate.
2. Each type from series production shall be to the measurements specified in the attached drawings, and shall be manufactured only from the materials specified in the Approval documents.
3. Changes in the type are permitted only with the explicit permission of NSAI. Breaches of this requirement will lead to a withdrawal of the Type Approval, and in addition may be subject to criminal prosecution.
4. At regular intervals, any tests or associated checks prescribed by the applicable legislation to verify continued conformity with the approved type shall be carried out. The manufacturer shall demonstrate compliance with this by submitting to NSAI evidence of adequate arrangements and documented control plans for each type approved.
5. Any set of samples or test pieces showing evidence of non-conformity shall give rise to further sampling and testing and all steps shall be taken to restore conformity of production.
6. This Type Approval will expire when it is surrendered by the holder, or withdrawn by NSAI, or when the approved type no longer conforms to legal requirements. The recall of the Type Approval can be issued by NSAI when the conditions required for the issuing or continuation of the Type Approval are no longer current, or when the Approval holder is in breach of the duties attached to the Type Approval, or when it is established that the approved type no longer meets the requirements of traffic safety.
7. Changes in the company name, address or manufacturing site, as well as in any of the sales or other agents specified in the issuing of the approval must immediately be notified to NSAI.
8. The duties imposed by the issuing of this certificate are not transferable. The legal protection of third parties is not affected by this certificate.
9. When the manufacture or sale of the system, component or separate technical unit has not been started within one year of the date of issue of this certificate, then NSAI is to be informed. This requirement also applies when the manufacture or sale has been halted for more than one year, or when it ought to have been halted for more than one year. The initial commencement of manufacture or sale, or the resumption of manufacture or sale, shall then be notified to NSAI within one month of commencement or resumption.

B: Legal Options:

Any objection to the requirements set out in this certificate shall be made within one month of the date of issue. The objection shall be made, in writing, to NSAI in Dublin.

Techn. Bericht Nr. / Techn. Report no. 19-00885-CP-GBM-00
Hersteller / Manufacturer: Perkins Engines Company Ltd.
Motortyp / type of engine: 5076/2800
Familie / Family: NRE4V2.22HPA

Seite / page 1/16

TECHNISCHER BERICHT TECHNICAL REPORT

Nr. / No.: 19-00885-CP-GBM-00

**Test Durchführung entsprechend der VO (EU) Nr. 2016/1628
Vom 14.09.2016**

**Mit Durchführungsverordnung VO (EU) Nr.
2017/654 (geändert durch EU/2018/989),
2017/655 (geändert durch EU/2018/987),
2017/656 (geändert durch EU/2018/988)**

**Test procedure according Directive (EC) Nr. 2016/1628
Dated 14.09.2016**

**With Commission Delegated Regulation No. (EU)
2017/654 (amended by EU/2018/989),
2017/655 (amended by EU/2018/987),
2017/656 (amended by EU/2018/988)**

über / relating to

Maßnahmen zur Bekämpfung der Emission von gasförmigen Schadstoffen und
Luftverunreinigenden Partikeln aus
Verbrennungsmotoren zum Antrieb für mobile Maschinen und Geräte.
*measures against the emission of gaseous and particulate pollutants from internal
combustion engines to be installed in non road mobile machinery.*

0. **Grund des Nachtrages:** --
Reason for extension: --

Genehmigungsstand / Approval status	
<input checked="" type="checkbox"/>	Erteilung einer Typgenehmigung <i>Granting of a type approval</i>
<input type="checkbox"/>	Nachtrag/Änderung zur Typgenehmigung Nr. <i>Extension/correction to type approval no.</i>

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Motortyp / type of engine: 5076/2800
Familie / Family: NRE4V2.22HPA

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I. Allgemeine Angaben
General data

- 0.1 Handelsmarke des Fahrzeugs:
Make of vehicle:
- 0.2 Fahrzeugtyp:
Type of vehicle: mobile Maschinen und Geräte
non road mobile machinery
- 0.3 Fahrzeugausführung:
Sort of vehicle: entsprechend EG/2016/1628
according directive EU/2016/1628
- 0.4 Testzyklus Typ:
Test cycle: NRSC Test und NRTC Test
nach Anhang XVII EU/2017/654

NRSC Test and NRTC Test
Acc. annex XVII of EU/2017/654
- 0.5 Name und Anschrift des Herstellers:
Name and address of the manufacturer: Perkins Engines Company Ltd.
Frank Perkins Way
Peterborough
PE1 – 5FQ / United Kingdom
- 0.5.1 Name und Anschrift des Vertreters des
Herstellers:
*Name and address of the manufacturer
representative* Caterpillar Energy Solutions GmbH
Attn: General Manager Research and
Development
Carl-Benz-Strasse 1
68167 Mannheim
Germany
- 0.6 Bezugs-Nr. des Beschreibungsbogen:
Information document reference no.: NRE4V2.22HPA_Regulation EU
2016_1628
- Ausstellungsdatum:
Date of issue: 31.07.2019
- Änderungsdatum:
Amendment type: --

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II. Prüfprotokoll Test report

1. Technische Daten des Prüfobjekts *Technical data of test-object*

- | | | |
|---------|---|---|
| 1.1. | Fahrzeugausführung (Code):
<i>Sort of vehicle (code):</i> | --- |
| 1.2. | Angaben über den Motor
<i>Engine data</i> | |
| 1.2.1. | Marke:
<i>Make of engine</i> | Perkins Engines Company Ltd.
(404J-E22TA), also branded as
(Caterpillar C2.2) |
| 1.2.2. | Klasse und Unterklasse des Motors:
<i>Engine category and subcategory:</i> | NRE-v-4 |
| 1.2.3. | Typ / Ausführung:
<i>Type / sort</i> | NRE4V2.22HPA (family) |
| 1.2.4. | Stammmotor:
<i>Parent engine:</i> | 5076/2800 |
| 1.2.5. | Nummer:
<i>Number:</i> | J3400260 |
| 1.2.6. | Maximale Nutzleistung bei Drehzahl:
<i>Maximum net power at speed:</i> | 55 kW/ 2800 min ⁻¹ |
| 1.2.7. | Nennwert der Nutzleistung bei Drehzahl:
<i>Rated net power at speed:</i> | 55 kW/ 2800 min ⁻¹ |
| 1.2.8. | Maximales Drehmoment bei Drehzahl:
<i>Maximum torque at speed:</i> | 270 Nm/ 1600 min ⁻¹ |
| 1.2.9. | Zylinderzahl
<i>Number of cylinders:</i> | 4 |
| 1.2.10. | Gesamthubraum:
<i>Total cylinder displacement:</i> | 2216 cm ³ |
| 1.2.11. | Lage der Zylinder in Block
<i>Position of the cylinder in the block:</i> | in-line |
| 1.2.12. | Arbeitsweise:
<i>Combustion cycle:</i> | four stroke |



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1.2.13.	Art der Zündung: Ignition type:	compression ignition
1.2.14.	Luftansaugverfahren: Method of aspiration:	Turbocharged
1.2.15.	Abgasnachbehandlung Exhaust-after-treatment:	DOC+DPF (sporadische passive /aktive Regeneration) DOC+DPF (infrequent active and passive regeneration)
1.2.16.	AGR: EGR:	Yes
2.1.	Motorabbildungskurve: Engine mapping:	see Attachment of this report
2.2.	Dokumentation zur Ermittlung der Verschlechterungsfaktoren: Deterioration factor determination documentation reference:	see 'Deterioration Factor Determination for Perkins' document
2.3.	Dokumentation zur Ermittlung der Regenerationsfaktoren (periodische Regeneration): Regeneration factor determination documentation reference (infrequent regeneration):	see test results 7.1.4
2.4.	Prüfbericht Test report NO _x -Control Diagnostic: NO _x -Control Diagnostic Particulate-Control Diagnostic: Particulate-Control Diagnostic	see emission control strategy attachments see emission control strategy attachments

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2.5. *Vorkehrungen gegen Manipulation*
Anti-tampering devices

Motoren mit ECU: see emission control strategy
Engines with ECU: attachments

Motoren mit mech. Entfällt
Emissionsminderungseinrichtung not applicable
Engines with mechanical
Emission control

2.6. *Hersteller verwendet Drehmomentsignal* Ja
ECU zur ISM-Prüfung yes
Manufacturer uses ECU torque signal for
ISM-Testing

Gemessenes Drehmoment auf Ja
dem Prüfstand $\geq 0,93 \times$ Drehmomentsignal der yes
ECU
Dynamometer torque $\geq 0,93 \times$ ECU torque
signal

Drehmomentenkorrekturfaktor Entfällt
ECE torque correction factor not applicable

III. Prüfung / Test

Prüfeinrichtungen und Prüfbedingungen entsprechend Anhang VI der EG VO.
2017/654

Test installations and conditions are in accordance with annex VI of EC directive
no. 2017/654

1. Ort: Perkins Engines Company Ltd.
Location: Frank Perkins Way
Peterborough
PE1 – 5FQ / United Kingdom

2. Datum der Prüfung: 13.05.2019
Date of Test:

3. Prüfungsbericht Nummer: 19-00885-CP-GBM
Test report number:



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4.	Prüfbedingungen Test conditions	
4.1.	Drücke bei Nenndrehzahl Pressures at nominal speed	
4.1.1.	Ansaugunterdruck: Intake vacuum:	5,0 kPa
4.1.2.	Abgasgegendruck: Exhaust gas back pressure:	16,1 kPa
4.1.3.	Ladeluftdruck: Charge-air pressure:	129,1 kPa (After intercooler)
4.2.	Prüfdrehzahlen bei NRSC Test Test speeds with NRSC	
4.2.1.	Leerlauf: Idling speed:	800 min ⁻¹
4.2.2.	Zwischendrehzahl: Intermediate speed:	1600 min ⁻¹
4.2.3.	Nenndrehzahl: Rated speed:	2800 min ⁻¹
4.2.4.	Drehzahl bei Höchstleistung: Speed at max. power:	2800 min ⁻¹
4.3.	Für die Prüfung verwendeter Bezugskraftstoff Reference fuel used for test	
4.3.1.	Cetanzahl / Cetane (ASTM D-613)	52,2
4.3.2.	Schwefelgehalt / Sulphur content	1,0 ppm (mg/kg)
4.3.3.	Dichte / Density	835,8 kg/m ³

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4.4. Schmiermittel / Lubricant

4.4.1. Marke / Make Cat C5-4

4.4.2. Typ / Type 10W-30

5. Motorleistung / Engine performance

5.1. Motordrehzahl / Engine speeds

Leerlauf / idle: 1000±200 min⁻¹

Zwischendrehzahl / Intermediate: 1600 min⁻¹

Nenndrehzahl / Rated: 2800 min⁻¹

5.2. Vom Motor angetriebene Einrichtungen (falls vorhanden) Engine driven equipment (if applicable)

5.2.1. Die Leistung bei den angegebenen Motordrehzahlen, die von Hilfsaggregaten aufgenommen wird, die für die Funktion des Motors unerlässlich sind und für die Prüfungen nicht eingebaut werden können (laut Herstellerangaben) sind aufzuführen:

The power absorbed at indicated engine speeds by necessary auxiliaries for engine operation that cannot be fitted for the test (as specified by the manufacturer) to be stated:

Typ und Kennzeichen des Hilfsaggregats <i>Auxiliary type and identifying details</i>	Leistungsaufnahme des Nebenaggregats (kW) bei angegebener Drehzahl Power absorbed by auxiliary (kW) at indicated engine speed						
	Idle	63%	80%	91%	Inter- med.	Max. Power.	100%
	***	***	***	***	***	***	***
	***	***	***	***	***	***	***
	***	***	***	***	***	***	***
Total (Pf,i) (kW):	***	***	***	***	***	***	***

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- 5.2.2. Die Leistungsaufnahme bei den angegebenen Motordrehzahlen von Hilfsaggregaten, die die mit dem Betrieb der nicht für den Straßenverkehr bestimmten mobilen Maschine bzw. des Geräts in Verbindung stehen, mit dem Motor verbunden sind und für die Prüfungen nicht entfernt werden können (laut Herstellerangaben), sind aufzuführen

The power absorbed at indicated engine speeds by auxiliaries linked with the operation of the non-road mobile machinery that cannot be removed for the test (as specified by the manufacturer) to be stated:

Typ und Kennzeichen des Hilfsaggregats <i>Auxiliary type and identifying details</i>	Leistungsaufnahme des Nebenaggregats (kW) bei angegebener Drehzahl <i>Power absorbed by auxiliary (kW) at indicated engine speed</i>						
	Idle	63%	80%	91%	Inter- med.	Max. Power.	100%
	***	***	***	***	***	***	***
	***	***	***	***	***	***	***
	***	***	***	***	***	***	***
Total ($P_{r,i}$) (kW):	***	***	***	***	***	***	***

- 5.3. Nettomotorleistung
Engine net power:

Bedingung <i>Condition</i>	Nettomotorleistung (kW) bei angegebener Drehzahl <i>Engine net power (kW) at indicated engine speed</i>		
	Zwischendrehzahl <i>/ Intermediate</i>	Nenndrehzahl / <i>Rated</i>	100%
Bei der Prüfung gemessene Hoechstleistung ($P_{m,i}$) (kW) <i>Maximum power measured on test ($P_{m,i}$) (kW)</i>	45,2	55	55
Leistung der Hilfsaggregate insgesamt aus Pkt. 5.2.1 ($P_{f,i}$)	0,0	0,0	0,0
Leistung der Hilfsaggregate insgesamt aus Pkt. 5.2.2 ($P_{r,i}$)	0,0	0,0	0,0
Nettomotorleistung <i>Engine net power</i> $P_i = P_{m,i} - P_{f,i} + P_{r,i}$	45,2	55	55

6. Bedingungen bei der Prüfung
Conditions at test

- 6.1. f_a im Bereich von 0,93 bis 1,07 Ja
 f_a within range 0,93 to 1,07 yes

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6.1.1. Falls fa nicht innerhalb des vorgegebenen Bereich
If f_a not within specified range

Meereshöhe der Prüfeinrichtung (m) <i>Altitude of test facility (m)</i>	Entfällt not applicable
--	----------------------------

Trockener Luftdruck (kPa) <i>Dry atmospheric pressure (kPa)</i>	Entfällt not applicable
--	----------------------------

6.2. Zulässiger Temperaturbereich für die Einlassluft (°C) <i>Applicable intake air temperature range (°C)</i>	20 ... 30
--	-----------

7. Prüfergebnisse
Test results

Prüfergebnisse gemäß 2017/654 Anhang VII, Anlage 1 mit VO (EG) Nr. 2016/1628
Test Results according to 2017/654 EC annex VII, appendix 1, Directive (EC) Nr. 2016/1628

7.1. Ergebnis für **NRSC**-Emissionen
NRSC Emissions results

7.1.1. Angewandter **NRSC** Prüfzyklus
Applied NRSC test cycle

Zyklus / Cycle	C1	C2	D2	E2	E3	F	G2	G3	H
Einzelphasen Prüfzyklus / <i>Discrete mode</i>									
Mehrphasenzyklus (RMC) <i>RMC</i>	x								

7.1.1.1 Mode length:	1800 sec
----------------------	----------

7.1.1.2 Sampling time:	1815 sec
------------------------	----------

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7.1.2 Einstellung des Leistungsprüfstandes (kW) *Dynamometer setting (kW)*

Einstellung des Leistungsprüfstandes (kW) bei angegebener Motordrehzahl nach Anpassung für die Leistungsaufnahme der Hilfsaggregate ¹⁾ <i>Dynamometer setting (kW) at indicated engine speed after adjustment for auxiliary power ¹⁾</i>		
% Teillast % load	Zwischendrehzahl Intermediate	Nenndrehzahl Rated
10	4,5	5,5
25	11,3	13,8
50	22,6	27,5
75	33,9	41,3
100	45,2	55

¹⁾ Die Einstellung des Leistungsprüfstandes wird mithilfe des Verfahrens in Anhang VI Nummer 7.7.1.3 der Delegierten Verordnung (EU) 2017/654 bestimmt. Die Leistungsaufnahme von Hilfsaggregaten wird mithilfe der Gesamtwerte aus Abschnitt 7.1. und 7.2. bestimmt.

The dynamometer setting shall be determined using the procedure set out in point 7.7.1.3 of Annex VI to Delegated Regulation (EU) 2017/654. The auxiliary power in that point shall be determined using the total values set of section 7.1. and 7.2.

7.1.3. Verschlechterungsfaktor (DF): ermittelt im Dauerlauf
Deterioration Factor (DF): determined by durability test

7.1.4. IRAF:Bestimmung / IRAF determination

<i>Emissionen</i> <i>Emissions</i>	CO (g/kWh)	HC (g/kWh)	NO _x (g/kWh)	HC+NO _x (g/kWh)	PM (g/kWh)	PN (#/kWh) (x 10 ¹²)
Prüfergebnis ohne Regeneration <i>Test result without regeneration</i>	0,0270	0,0086	3,4900	3,4986	0,0002	0,1814
Prüfergebnis mit Regeneration <i>Test result with regeneration</i>	0,0237	0,0539	4,9417	4,9956	0,0075	10,002 1
Zyklen Anzahl zwis. regen.* <i>Cycles between regeneration</i>	117	117	117	117	117	117
Zyklen Anzahl mit regen* <i>Cycles with regeneration</i>	2	2	2	2	2	2
IRAF Korrektur <i>IRAF adjustment (additive)</i>	-0,0001	0,0008	0,0244	0,0252	0,0001	0,1651
Gewichtete Emission <i>Weighted emission</i>	0,0269	0,0093	3,5144	3,5237	0,0004	0,3465
Leistungsklasse des Stamm Motors / <i>Net power (P)</i>	37 kW ≤ P < 56 KW					

* = values are not multiplied with 10¹²

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7.1.5. Die nach Zyklus **NRSC** gewichteten Ergebnisse der Emissionensprüfung
The cycle weighted emissions results NRSC

<i>Emissionen</i> <i>Emissions</i>	CO (g/kWh)	HC (g/kWh)	NO_x (g/kWh)	HC+NO_x (g/kWh)	PM (g/kWh)	PN (#/kWh) (x 10 ¹²)
Prüfergebnis ohne Regeneration <i>Test result without regeneration</i>	0,0057	0,0041	3,1238	3,1279	0,0003	0,0933
DF <i>additiv</i> <i>additiv</i>	1,57	1,5	1,0	-	1,0	1,0
k_{ru}/k_{rd} <i>multiplikativ</i> <i>multiplicative</i>	-	-	-	-	-	-
IRAF Korrektur <i>IRAF adjustment</i>	-0,0001	0,0008	0,0244	0,0252	0,0001	0,1651
Prüfergebnis mit IRAFs ¹⁾ <i>Test result with IRAFs</i>	0,0056	0,0049	3,1482	3,1531	0,0004	0,2584
Prüfergebnisse mit DF und KI <i>Test result with DF and KI</i>	0,009	0,007	3,148	3,155	0,0004	0,3
Grenzwerte Stufe V <i>Limit values Stage V</i>	5,00	-	-	4,70	0,015	1
Leistungsklasse des Stamm Motors / Net power (P)	37 kW ≤ P < 56 kW					

¹⁾ IRAF = Anpassungsfaktor für die sporadische Regeneration
IRAF = infrequent regeneration adjustment factors

7.1.6. Nach Zyklus gewichtetes CO₂ (g/kWh): 752,71
Cycle weighted CO₂ (g/kWh):

7.1.7. Nach Zyklus gewichtetes NH₃ (ppm): ---
Cycle weighted NH₃ (ppm):

7.2. Informationen zur Durchführung der **NRTC**-Prüfung
Informationen concerning the conduct of the NRTC test

7.2.1. Angewendte Vergänglich Prüfzyklus
Applied transient test cycle

NRTC	x
LSI-NRTC	

7.2.2. Verschlechterungsfaktor (DF): calculated/fixed
Deterioration Factor (DF):

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7.2.3. Die nach NRTC Zyklus gewichteten Ergebnisse der Emissionsprüfung
The NRTC cycle weighted emissions results

Emissionen <i>Emissions</i>	CO (g/kWh)	HC (g/kWh)	NO _x (g/kWh)	HC+NO _x (g/kWh)	PM (g/kWh)	PN (#/kWh) (x 10 ¹²)
Ergebnis der Prüfung mit Kaltstart <i>Cold start test result</i>	0,176	0,019	3,685	3,704	0,0006	0,1206
Ergebnis der Prüfung mit Warmstart ohne Regeneration <i>Hot start test result without regeneration</i>	0,025	0,009	3,207	3,216	0,0005	0,1327
Gewichtetes Prüfergebnis <i>Weighted test result</i>	0,0401	0,00988	3,2549	3,26478	0,00051	0,13149
k _{ru} /k _{rd} (DF) additiv <i>k_{ru}/k_{rd} (DF) additive</i>	1,57	1,5	1,0	-	1,0	1,0
k _{ru} /k _{rd} (DF) multiplikativ <i>k_{ru}/k_{rd} (DF) multiplicative</i>	-	-	-	-	-	-
IRAF Korrektur <i>IRAF adjustment</i>	-0,0001	0,0008	0,0244	0,0252	0,0001	0,1651
Prüfergebnis mit IRAFs ^{*)} <i>Test result with IRAFs</i>	0,0400	0,0106	3,2793	3,2899	0,0006	0,2965
Abschließendes Prüfergebnis mit DF und IRAF <i>Final test result incl IRAF and DF</i>	0,063	0,016	3,28	3,30	0,0006	0,3
Grenzwerte Stufe V <i>Limit values Stage V</i>	5,00	-	-	4,70	0,015	1
Leistungsklasse des Stamm Motors <i>Net power (P)</i>	130 kW ≤ P < 560 kW					

^{*)} IRAF = Anpassungsfaktor für die sporadische Regeneration
IRAF = infrequent regeneration adjustment factors

7.2.4. Hot cycle CO₂ (g/kWh): 796,43

7.2.5. Nach Zyklus gewichtetes NH₃ (ppm):
Cycle average NH₃ (ppm):

Cold NRTC	Hot NRTC	Limit
- ppm	- ppm	10 ppm

7.2.6. Zyklusarbeit für Warmstartprüfung (kWh) 6,7889
Cycle work for hot start test (kWh)

7.2.7. CO₂ im Zyklus für Warmstartprüfung (g) 5408,40
Cycle CO₂ for hot start test (g)

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7.3 Für die Prüfung verwendetes Probenamesystem:
Sampling system used for the test:

7.3.1 Gasförmige Emissionen: Rohgas-Probenahme
Gaseous Emissions: *raw gas sampling*

7.3.2 PM: Teilstrom-Probenahme
PM: partial flow sampling

Methode: Einfachfilter
Method: single filter

Partikelanzahl: Teilstrom-Probenahme
Particle number: partial flow sampling

7.4. Endergebnis der Emissionsprüfung
Final emission results

Emissionen <i>Emissions</i>	CO (g/kWh)	HC (g/kWh)	NO _x (g/kWh)	HC+NO _x (g/kWh)	PM (g/kWh)	PN (#/kWh) (x 10 ¹²)	Zyklus Cycle
NRSC abschließendes Prüfergebnis mit DF und KI <i>NRSC final test result with DF and KI</i>	0,009	0,007	3,15	3,16	0,0004	0,3	C1
NRTC abschließendes Prüfergebnis mit DF und KI <i>NRTC final test result with DF and KI</i>	0,063	0,016	3,28	3,30	0,0006	0,3	NRTC
Grenzwerte <i>Limit values</i>	5,00	-	-	4,70	0,015	1	

7.4.1 CO₂ result: 796,43

7.4.2. In service monitoring reference values:

7.4.2.1 Reference work (kWh): n.a

7.4.2.2 Reference CO₂ mass (g): n.a

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Zusätzliche Prüfpunkte für den Kontrollbereich
Additional points for the control area

Emission at control point	Engine speed (rpm)	Torque (Nm)	CO (g/kWh)	HC (g/kWh)	NO _x (g/kWh)	HC+NO _x (g/kWh)	PM (g/kWh)	PN (#/kWh) x 10 ¹²
Point 1	2800	120	0,005	-	-	2,656	0,000	0,0454
Point 2	2800	150	0,004	-	-	1,964	0,000	0,0588
Point 3	2800	200	0,003	-	-	2,135	0,001	0,0479

The engine family does not exceed the applicable emission limit values by a factor of 2 when tested as per annex V.

7.5. Bemerkungen: none
Remarks:

III. **Anlagen**
Enclosures

- Beschreibungsbogen Nr. NRE4V2.22HPA_Regulation EU 2016_1628 einschließlich Anlagen
Description form no. NRE4V2.22HPA_Regulation EU 2016_1628 including Enclosures
- Motorabbildungskurve / *Engine mapping*
- Darstellung der Emissionsminderungsstrategie / *Emission control strategy*
*Below mentioned documents will be sent separately.

1	Stage V Non-Road Emission Control Strategy Description
2	ECM Data Reading Connector
3	ECM Data Reading NCD / PCD
4	ECU Tamper Prevention
5	Perkins Worldwide Inducement Strategy
6	Declaration by manufacturer on compliance with Regulation No. (EU) 2016/1628
7	Emission labeling
8	Perkins Stage V Non-road DF Document
9	Fuel Compliance Statement
10	Operation and Maintenance Manual
11	IRAF summary
12	APPLICATION & INSTALLATION MANUAL
13	Particulate Control Diagnostic (PCD) System Information
14	NO _x Control Diagnostic (NCD) System Information
15	Perkins Tamper Prevention Description
16	Control plan
17	NCD Demonstration

Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 15/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

IV. Statement of conformity:

Die unter Ziffer I.06 angegebene Beschreibungsmappe und der darin beschriebene Typ entsprechen der genannten Prüfgrundlage. Der ungünstigste Fall wurde entsprechend Prozessbeschreibung „Erstellung von Gutachten“ bestimmt.

Der Prüfbericht darf nur vom Auftraggeber und nur in vollem Wortlaut vervielfältigt und weitergegeben werden. Eine auszugsweise Vervielfältigung und Veröffentlichung des Prüfberichtes ist nur nach schriftlicher Genehmigung des Prüflaboratoriums zulässig

The information folder as mentioned under No. I.06 and the type described therein are in compliance with the test specification mentioned above. The worst-case was selected in accordance with document "Preparation of Test Reports".

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TÜV SÜD Auto Service GmbH is designated as Technical Service by:

Genehmigungsbehörde/ Approval authority	Land/Country	Registriernummer/ Registration-number
Kraftfahrt-Bundesamt (KBA)	Deutschland/ Germany	KBA-P 00100-10
Vehicle Certification Agency (VCA)	Vereintes Königreich/ United Kingdom	VCA-TS-006
Approval Authority of the Netherlands (RDW)	Niederlande/ The Netherlands	RDWT-082-xx
National Standards Authority of Ireland (NSAI)	Irland/ Ireland	Technical Service Number: 49
Vehicle Safety Certification Center (VSCC)	Taiwan/ Taiwan	DE04-06-2
Société Nationale de Certification et d'Homologation s.à r.l.	Luxemburg Luxembourg	B27180



B. Sc. Ramazan Köse

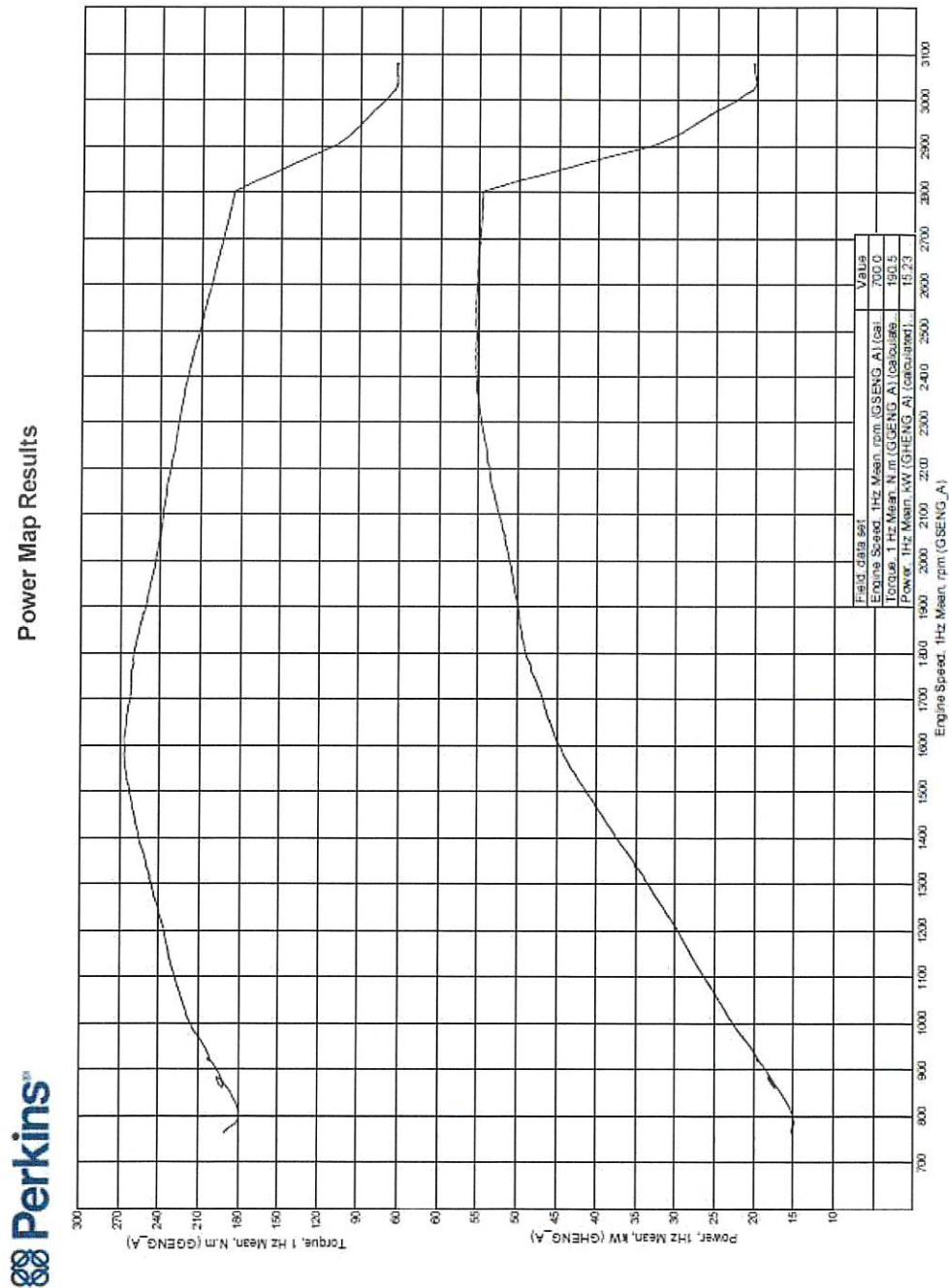
Munich, 06.09.2019

Techn. Bericht Nr. / Techn. Report no. 19-00885-CP-GBM-00
Hersteller / Manufacturer: Perkins Engines Company Ltd.
Motortyp / type of engine: 5076/2800
Familie / Family: NRE4V2.22HPA

Seite / page 16/16

Anlage/Attachment

Power and Torque Curves



Application for approval of:

Engine Family	NRE4V2.22HPA
Engine Code	As information document
Directive No.	(EU) 2016/1628
Issue no. of Submission	1
Reason for Extension or Revision	New Submission
Extension History	N/A

Appendix 3

Information document

PART A

1 GENERAL INFORMATION

1.1.	Make (trade name(s) of manufacturer):	Perkins Engines Co Ltd, also branded as Caterpillar
1.2.	Commercial name(s) (if applicable):	404J-E22TA (Perkins) C2.2 (Caterpillar)
1.3.	Company name and address of manufacturer:	Perkins Engines Co Ltd Frank Perkins Way Peterborough PE1 5FQ United Kingdom
1.4.	Name and address of manufacturer's authorised representative (if any):	Caterpillar Energy Solutions GmbH Attn: General Manager Research and Development Carl-Benz-Strasse 1 68167 Mannheim Germany
1.5.	Name(s) and address(es) of assembly/manufacture plant(s):	Perkins Engines Co Ltd Frank Perkins Way Peterborough PE1 5FQ United Kingdom
1.6.	Engine type designation/engine family designation/ET:	NRE4V2.22HPA
1.7.	Category and sub-category of the engine type/engine family:	NRE-v-4
1.8.	Emissions durability period category:	Not Applicable
1.9.	Emissions stage:	V
1.10.	In case of NRS <19 kW only, engine family consisting exclusively of engine types for snow throwers: Yes/No	NO
1.11.	Reference power is:	rated net power
1.12.	Primary NRSC test cycle:	C1
1.12.1.	In case of variable speed IWP category only, Additional propulsion test cycle:	Not applied
1.12.2.	In case of IWP category only, additional auxiliary NRSC test cycle:	Not applied
1.13.	Transient test cycle:	NRTC
1.14.	Restrictions on use (if applicable):	N/A

PART B**2 COMMON DESIGN PARAMETERS OF ENGINE FAMILY (1)**

2.1.	NRE4V2.22HPA	four stroke cycle
2.2.	Ignition Type:	Compression ignition
2.3.	Configuration of the cylinders	
2.3.1.	Position of the cylinders in the block:	in-line
2.3.2.	Bore centre to centre dimension (mm):	94mm
2.4.	Combustion chamber type/design	
2.4.1.	Open chamber/divided chamber/other(specify)	Open chamber
2.4.2.	Valve and porting configuration:	cross-flow, 1 inlet, 1 exhaust
2.4.3.	Number of valves per cylinder:	2
2.5.	Range of swept volume per cylinder (cm3):	0.55
2.6.	Main Cooling medium:	Water
2.7.	Method of air aspiration:	pressure charged with charge cooler
2.8.	Fuel	
2.8.1.	Fuel Type:	Diesel (non-road gas-oil)
2.8.1.1.	Sub Fuel type (Natural gas/Biomethane only):	
2.8.2.	Fuelling arrangement:	Liquid-fuel only
2.8.3.	list of additional fuels, fuel mixtures or emulsions suitable for use by the engine, as declared by the manufacturer in accordance with point 1.2.3 of Annex I to Delegated Regulation (EU) 2017/654 (provide reference to recognised standard or specification):	B20 biofuel per ASTM D7467 or EN16709:2015
2.8.4.	Lubricant added to fuel:	NO
2.8.4.1.	Specification:	N/A
2.8.4.2.	Ratio of fuel to oil:	N/A
2.8.5.	Fuel supply type:	Common rail
2.9.	Engine management systems:	electronic control strategy (2)
2.10.	Miscellaneous devices: (if yes provide a schematic diagram of the location and order of the devices)	NO
2.10.1.	Exhaust gas recirculation (EGR): Yes/No (if yes, complete section 3.10.1 and provide a schematic diagram of the location and order of the devices)	YES
2.10.2.	Water injection: (if yes, complete section 3.10.2 and provide a schematic diagram of the location and order of the devices)	NO
2.10.3.	Air injection: (if yes, complete section 3.10.3 and provide a schematic diagram of the location and order of the devices)	NO

2.10.4.	Others Others: Yes/No (if yes, complete section 3.10.4 and provide a schematic diagram of the location and order of the devices)	NO
2.11.	Exhaust after-treatment system: (if yes provide a schematic diagram of the location and order of the devices)	YES
2.11.1.	Oxidation catalyst: (if yes, complete section 3.11.2)	YES
2.11.2.	DeNOx system with selective reduction of NOx (addition of reducing agent): (if yes, complete section 3.11.3)	NO
2.11.3.	Other DeNOx systems: (if yes, complete section 3.11.3)	NO
2.11.4.	Three-way catalyst combining oxidation and NOx reduction: (if yes, complete section 3.11.3)	NO
2.11.5.	Particulate after-treatment system with passive regeneration: (if yes, complete section 3.11.4)	NO
2.11.5.1.	Wall-flow/non-wall-flow	Wall-flow
2.11.6.	Particulate after-treatment system with active regeneration: (if yes, complete section 3.11.4)	YES
2.11.6.1.	Wall-flow/non-wall-flow	Wall-flow
2.11.7.	Other particulate after-treatment systems: (if yes, complete section 3.11.4)	NO
2.11.8.	Other after-treatment devices (specify): (if yes, complete section 3.11.5)	No
2.11.9.	Other devices or features that have a strong influence on emissions: Yes/No (if yes, complete section 3.11.7);	N/A

PART C

3. ESSENTIAL CHARACTERISTICS OF THE ENGINE TYPE(S)

Item Number	NRE4V2.22HPA	Parent engine/engine type	Engine types within the engine family	
			Type 2	Type 3
3.1	Engine Identification			
3.1.1	Engine type designation	50/6/2800	6164/2800	6165/2800
3.1.2	Engine type designation shown on engine marking: yes/no	yes	yes	yes
3.1.3	Location of the statutory marking:	The serial number is engraved onto an aluminium plate which may be located on either the right or left hand side of the cylinder block, it is held in place by 2 rivets. The serial number is electronically issued in sequence at the beginning of the engine assembly process.	The serial number is engraved onto an aluminium plate which may be located on either the right or left hand side of the cylinder block, it is held in place by 2 rivets. The serial number is electronically issued in sequence at the beginning of the engine assembly process.	The serial number is engraved onto an aluminium plate which may be located on either the right or left hand side of the cylinder block, it is held in place by 2 rivets. The serial number is electronically issued in sequence at the beginning of the engine assembly process.
3.1.4	Method of attachment of the statutory marking:	The EU Certificate number is shown on a plastic self adhesive label fitted to the firing case front cover of the engine.	The EU Certificate number is shown on a plastic self adhesive label fitted to the firing case front cover of the engine.	The EU Certificate number is shown on a plastic self adhesive label fitted to the firing case front cover of the engine.
3.1.5	Drawings of the location of the engine identification number (complete example with dimensions):	See Attachment	See Attachment	See Attachment
3.2	Performance Parameters			
3.2.1	Declared rated speed (rpm):	2800	2800	2800
3.2.1.1	Fuel delivery/stroke (mm/°) for diesel engine, fuel flow (g/h) for other engines, at rated net power:	46.6 ±5%	42.7 ±5%	39.3 ±5%
3.2.1.2	Declared rated net power (kW):	55	50	45
3.2.2	Maximum power speed (rpm):	2800	2800	2800
3.2.2.1	Fuel delivery/stroke (mm/°) for diesel engine, fuel flow (g/h) for other engines, at maximum net power:	46.6 ±5%	42.7 ±5%	39.3 ±5%
3.2.2.2	Maximum net power (kW):	65	60	45
3.2.3	Declared maximum torque speed (rpm):	1600	1600	1600
3.2.3.1	Fuel delivery/stroke (mm/°) for diesel engine, fuel flow (g/h) for other engines, at maximum torque speed:	58 ±5%	53.6 ±5%	49.6 ±5%
3.2.3.2	Declared maximum torque (Nm):	270	252	235
3.2.4	Declared 100 % test speed:	2800	2800	2800
3.2.5	Declared intermediate test speed:	1680	1680	1680
3.2.6	Idle speed (rpm):	1000±200rpm	1000±200rpm	1000±200rpm
3.2.7	Maximum no load speed (rpm):	2940±140rpm	2840±140rpm	2840±140rpm
3.2.8	Declared minimum torque (Nm):	N/A	N/A	N/A
3.3	Run-in procedure			
3.3.1	Run-in time:	55	N/A	N/A
3.3.2	Run-in cycle:	See attachment	N/A	N/A
3.4	Engine test			
3.4.1	Specific factors required: Yes/No	No	N/A	N/A
3.4.1.1	Description, including photographs and/or drawings, of the system for mounting the engine on the test bench including the power transmission shaft for connection to the dynamometer:	N/A	N/A	N/A
3.4.2	Exhaust mixing chamber permitted by manufacturer: Yes/No	N/A	N/A	N/A
3.4.2.1	Exhaust mixing chamber description, photograph and/or drawing:	N/A	N/A	N/A
3.4.3	Manufacturers chosen NRSC: RMC/Discrete mode	RMC	N/A	N/A
3.4.4	Additional NRSC: E2/O2/C1	N/A	N/A	N/A
3.4.5	Number of pre-conditioning cycles prior to transient test:	4	N/A	N/A
3.4.6	Pre conditioning for RMC NRSC: Steady-state operation/RMC:	RMC	N/A	N/A
3.4.6.1	In case of RMC, number of pre-conditioning RMC prior to RMC NRSC test:	2	N/A	N/A
3.5	Lubrication system			
3.5.1	Lubricant temperature			
3.5.1.1	Minimum (deg. C):	-40	-40	-40
3.5.1.2	Maximum (deg. C):	125 (continuous)/135 (intermittent)	125 (continuous)/135 (intermittent)	125 (continuous)/135 (intermittent)
3.6	Combustion Cylinder			
3.6.1	Bore (mm):	84	84	84
3.6.2	Stroke (mm):	100	100	100
3.6.3	Number of cylinders:	4	4	4
3.6.4	Engine total swept volume (cm³):	2216	2216	2216
3.6.5	Swept volume per cylinder as % of parent engine:	100	100	100
3.6.6	Volume/ratio compression ratio:	17.3:1 ±0.6 / -0.6	17.3:1 ±0.6 / -0.6	17.3:1 ±0.6 / -0.6
3.6.7	Combustion system description:	Electronic controlled high pressure multi shot injection, inclined injector, multi hole, re entrant combustion bowl	Electronic controlled high pressure multi shot injection, inclined injector, multi hole, re entrant combustion bowl	Electronic controlled high pressure multi shot injection, inclined injector, multi hole, re entrant combustion bowl
3.6.8	Drawings of combustion chamber and piston crown:	5698403	5698403	5698403
3.6.9	Minimum cross sectional area of inlet and outlet ports (mm²):	804 mm²/531 mm²	804 mm²/531 mm²	804 mm²/531 mm²
3.6.10	Valve timing			
3.6.10.1	Maximum lift and angles of opening and closing in relation to dead centre or equivalent data:			
	Maximum lift inlet (mm):	8.5	8.5	8.5
	Maximum lift Exhaust (mm):	8.8	8.9	8.8
	Inlet valve opening (deg BTDC):	13 BTDC	13 BTDC	13 BTDC
	Inlet valve closing (deg ABDC):	43 ABDC	43 ABDC	43 ABDC
	Exhaust valve opening (deg BBDC):	43 BBDC	43 BBDC	43 BBDC
	Exhaust valve closing (deg ATDC):	13 ATDC	13 ATDC	13 ATDC

		60702800	81642800	81322800
3.6.10.2.	Reference and/or setting range:	0.15-0.25	0.15-0.25	0.15-0.25
3.6.10.3.	Variable valve timing system: Yes/No	No	No	No
3.6.10.3.1.	Type: continuous/on/off	N/A	N/A	N/A
3.6.10.3.2.	Gain phase shift angle:	N/A	N/A	N/A
3.6.11.	Porting configuration			
3.6.11.1.	Position, size and number:	cross-flow, 1 inlet, 1 exhaust	cross-flow, 1 inlet, 1 exhaust	cross-flow, 1 inlet, 1 exhaust
	Inlet (mm)	36	36	36
	Exhaust (mm)	30	30	30
3.7.	Cooling system			
3.7.1.	Liquid cooling			
3.7.1.1.	Nature of liquid:	50:50 mixture - Ethylene glycol / propylene glycol and water	50:50 mixture - Ethylene glycol / propylene glycol and water	50:50 mixture - Ethylene glycol / propylene glycol and water
3.7.1.2.	Circulating pumps: Yes/No	Yes	Yes	Yes
3.7.1.2.1.	Type(s):	Single integrated gear driven centrifugal pump	Single integrated gear driven centrifugal pump	Single integrated gear driven centrifugal pump
3.7.1.2.2.	Drive ratio(s):	1.25:1	1.25:1	1.25:1
3.7.1.3.	Minimum coolant temperature at outlet (deg. C):	No minimum temperature specification	No minimum temperature specification	No minimum temperature specification
3.7.1.4.	Maximum coolant temperature at outlet (deg. C):	112 (N- 2°C)	112 (N- 2°C)	112 (N- 2°C)
3.7.2.	Air cooling			
3.7.2.1.	Yes/No	N/A	N/A	N/A
3.7.2.1.1.	Type(s):	N/A	N/A	N/A
3.7.2.1.2.	Drive ratio(s):	N/A	N/A	N/A
3.7.2.2.	Maximum temperature at reference point (deg. C):	N/A	N/A	N/A
3.7.2.2.1.	Reference point location	N/A	N/A	N/A
3.8.	Aspiration			
3.8.1.	Maximum allowable intake depression at 100 % engine speed and at 100 % load (kPa)			
3.8.1.1.	With clean air cleaner:	5	5	5
3.8.1.2.	With dirty air cleaner:	7.5	7.5	7.5
3.8.1.3.	Location of measurement:	Between air cleaner outlet and turbocharger inlet	Between air cleaner outlet and turbocharger inlet	Between air cleaner outlet and turbocharger inlet
3.8.2.	Pressure charge(s): Yes/No	Yes	Yes	Yes
3.8.2.1.	Type(s):	5800403, 5800404, 5803396, 5803397, 5814034, 5814035, 5814040, 5814041	5800403, 5800404, 5803396, 5803397, 5814034, 5814035, 5814040, 5814041	5800403, 5800404, 5803396, 5803397, 5814034, 5814035, 5814040, 5814041
3.8.2.2.	Description and schematic diagram of the system (e.g. maximum charge pressure, waste gate, VGT, Twin turbo, etc.):	Turbocharged N - Single W - wastegate	Turbocharged N - Single W - wastegate	Turbocharged N - Single W - wastegate
3.8.3.	Charge air cooler: Yes/No	Yes	Yes	Yes
3.8.3.1.	Type: air-to-air/water-to-air (specify)	Air	Air	Air
3.8.3.2.	Maximum charge air cooler outlet temperature at 100 % speed and 100 % load (deg. C):	50	50	50
3.8.3.3.	Maximum allowable pressure drop across charge cooler at 100 % engine speed and at 100 % load (kPa):	10kpa	10kpa	10kpa
3.8.4.	Intake throttle valve: Yes/No	No	No	No
3.8.5.	Carbox for recirculating carbonyl gases: Yes/No	Yes	Yes	Yes
3.8.5.1.	If yes, description and drawings:	See Attachment	See Attachment	See Attachment
3.8.5.2.	If no, compliance with paragraph 8.10 of Annex VI to Delegated Regulation (EU) 2017/854: Yes/No	N/A	N/A	N/A
3.8.6.	Inlet path	N/A	N/A	N/A
3.8.6.1.	Description of inlet path, (with drawings, photographs and/or part numbers):			
3.8.7.	Air filter	N/A	N/A	N/A
3.8.7.1.	Type:			
3.8.8.	Intake air-silencer	N/A	N/A	N/A
3.8.1.1.	Type:			
3.9.	Exhaust system			
3.9.1.	Description of the exhaust system (with drawings, photos and/or part numbers as required):	N/A	N/A	N/A
3.9.2.	Maximum exhaust temperature (deg. C):	720	720	720
3.9.3.	Maximum permissible exhaust backpressure at 100 % engine speed and at 100 % load (kPa):	16.25	14.1	14.1
3.9.3.1.	Location of measurement:	Engine Back Pressure Valve Out	Engine Back Pressure Valve Out	Engine Back Pressure Valve Out
3.9.4.	Exhaust backpressure at loading level specified by manufacturer for variable restriction after-treatment at start of test (kPa):	16.25	14.1	14.1
3.9.4.1.	Location and speed/load conditions:	Between engine and aftertreatment at full load rated speed	Between engine and aftertreatment at full load rated speed	Between engine and aftertreatment at full load rated speed
3.9.5.	Exhaust throttle valve: Yes/No	No	No	No
3.10.	Miscellaneous devices: Yes/No	Yes	Yes	Yes
3.10.1.	Exhaust gas recirculation (EGR)	Yes	Yes	Yes
3.10.1.1.	Characteristics: cooled/uncooled, high pressure/low pressure/other (specify):	Water cooled EGR. High pressure loop. EGR valve is on the inlet side of the EGR cooler.	Water cooled EGR. High pressure loop. EGR valve is on the inlet side of the EGR cooler.	Water cooled EGR. High pressure loop. EGR valve is on the inlet side of the EGR cooler.
3.10.2.	Water injection			
3.10.2.1.	Operation principle:	N/A	N/A	N/A
3.10.3.	Air injection			
3.10.3.1.	Operation principle:	N/A	N/A	N/A
3.10.4.	Others			
3.10.4.1.	Types	N/A	N/A	N/A

	6076/2806	6164/2800	6182/2800
3.11. Exhaust after-treatment system			
3.11.1. Location			
3.11.1.1. Place(s) and maximum/minimum distance(s) from engine to first after-treatment device:	After turbo	After turbo	After turbo
	Minimum distance	NA	NA
	Maximum distance	Defined by exhaust gas temp loss constrained	Defined by exhaust gas temp loss constrained
3.11.1.2. Maximum temperature drop from exhaust or turbine outlet to first after-treatment device (deg. C) if stated:	Per ADI guide	Per ADI guide	Per ADI guide
3.11.1.2.1. Test conditions for measurement:	Per ADI guide	Per ADI guide	Per ADI guide
3.11.1.3. Minimum temperature at inlet to first after-treatment device (deg. C), if stated:	Per ADI guide	Per ADI guide	Per ADI guide
3.11.1.3.1. Test conditions for measurement:	Per ADI guide	Per ADI guide	Per ADI guide
3.11.2. Catalyst catalyst			
3.11.2.1. Number of catalytic converters and elements:	2, DOC, DPF	2, DOC, DPF	2, DOC, DPF
3.11.2.2. Dimensions and volume of the catalytic converter(s):	DOC 172.0 x 101.6 mm / 2.4 l	DOC 172.0 x 101.6 mm / 2.4 l	DOC 172.0 x 101.6 mm / 2.4 l
3.11.2.3. Total charge of precious metals (g):	1E4717Q	1E4717Q	1E4717Q
3.11.2.4. Relative concentration of each compound:	BASF Technology No - BASF-TEX-1903	BASF Technology No - BASF-TEX-1903	BASF Technology No - BASF-TEX-1903
3.11.2.5. Substrate (structure and material):	Monolith, Ceramic	Monolith, Ceramic	Monolith, Ceramic
3.11.2.6. Cell density (cells/cm ²):	DOC 48.5 cells/cm ²	DOC 48.5 cells/cm ²	DOC 48.5 cells/cm ²
3.11.2.7. Type of casing for the catalytic converter(s):	Stainless Steel Can	Stainless Steel Can	Stainless Steel Can
3.11.3. Catalytic exhaust after-treatment system for NOx or three way catalyst			
3.11.3.1. Type:	N/A	N/A	N/A
3.11.3.2. Number of catalytic converters and elements:	N/A	N/A	N/A
3.11.3.3. Type of catalytic action:	N/A	N/A	N/A
3.11.3.4. Dimensions and volume of the catalytic converter(s):	N/A	N/A	N/A
3.11.3.5. Total charge of precious metals:	N/A	N/A	N/A
3.11.3.6. Relative concentration of each compound:	N/A	N/A	N/A
3.11.3.7. Substrate (structure and material):	N/A	N/A	N/A
3.11.3.8. Cell density:	N/A	N/A	N/A
3.11.3.9. Type of casing for the catalytic converter(s):	N/A	N/A	N/A
3.11.3.10. Method of regeneration:	N/A	N/A	N/A
3.11.3.10.1. Infrequent regeneration: Yes/No:	N/A	N/A	N/A
3.11.3.11. Normal operating temperature range (deg. C):	N/A	N/A	N/A
3.11.3.12. Consumable reagent: Yes/No:	N/A	N/A	N/A
3.11.3.12.1. Type and concentration of reagent needed for catalytic action:	N/A	N/A	N/A
3.11.3.12.2. Lowest concentration of the active ingredient present in the reagent that does not activate warning system (GDIing) (%vol):	N/A	N/A	N/A
3.11.3.12.3. Normal operational temperature range of reagent:	N/A	N/A	N/A
3.11.3.12.4. International standard:	N/A	N/A	N/A
3.11.3.13. NOx sensor(s): Yes/No:	No	No	No
3.11.3.13.1. Type:	N/A	N/A	N/A
3.11.3.13.2. Location(s):	N/A	N/A	N/A
3.11.3.14. Oxygen sensor(s): Yes/No:	N/A	N/A	N/A
3.11.3.14.1. Type:	N/A	N/A	N/A
3.11.3.14.2. Location(s):	N/A	N/A	N/A
3.11.4. Particulate after-treatment system			
3.11.4.1. Type of filtration: wall-flow non-wall-flow/other (specify)	Ceramic wall flow DPF with passive regeneration	Ceramic wall flow DPF with passive regeneration	Ceramic wall flow DPF with passive regeneration
3.11.4.2. Type:	3298370, 5516557, 5552444, 5550407, 5404873, 5502542, 5515513, 5559709, 5404873, 5238506, 5516557	5298370, 5516557, 5552444, 5550407, 5404873, 5502542, 5515513, 5559709, 5404873, 5238506, 5516557	5298370, 5516557, 5552444, 5550407, 5404873, 5502542, 5515513, 5559709, 5404873, 5238506, 5516557

3.11.4.3.	Dimensions and capacity of the particulate after-treatment system:	60752390 172.0 x 152.4 mm / 3.5 l	61842390 172.0 x 152.4 mm / 3.5 l	61822800 172.0 x 152.4 mm / 3.5 l
3.11.4.4.	Location place(s) and maximum and minimum distance(s) from engine:	In same can, immediately after DDC	In same can, immediately after DDC	In same can, immediately after DDC
	Minimum distance from engine:	Defined by DDC	Defined by DDC	Defined by DDC
	Maximum distance from engine:	Defined by DDC	Defined by DDC	Defined by DDC
3.11.4.5.	Method or system of regeneration, description and/or drawing:	Soot levels are monitored using delta p sensors	Soot levels are monitored using delta p sensors	Soot levels are monitored using delta p sensors
3.11.4.5.1.	Infrequent regeneration: Yes/No	YES	YES	YES
3.11.4.5.2.	Minimum exhaust gas temperature for initiating regeneration procedure (deg. C):	Depends on 6V, 250 - 400	Depends on 5V, 250 - 400	Depends on 6V, 250 - 400
3.11.4.6.	Catalytic coating: Yes/No	N/A	N/A	N/A
3.11.4.6.1.	Type of catalytic action:	N/A	N/A	N/A
3.11.4.7.	Fuel home catalyst (FBC): Yes/No	N/A	N/A	N/A
3.11.4.8.	Normal operating temperature range (deg. C):	147 - 600	147 - 600	147 - 600
3.11.4.9.	Normal operating pressure range (kPa)	9.5 - 23	6.1 - 19.6	6.1 - 19.7
3.11.4.10.	Storage capacity coefficient (g)	Soot - 21g	Soot - 21g	Soot - 21g
3.11.4.10.1.	Oxygen sensor(s): Yes/No	N/A	N/A	N/A
3.11.4.10.2.	Type:	N/A	N/A	N/A
3.11.4.11.	Location(s):	N/A	N/A	N/A
3.11.5.	Other after-treatment devices:	N/A	N/A	N/A
3.11.5.1.	Description and operation:	N/A	N/A	N/A
3.11.6.	Infrequent Regeneration			
3.11.6.1.	Number of cycles with regeneration	2	2	2
3.11.6.2.	Number of cycles without regeneration	117	117	117
3.11.7.	Other device(s) or feature(s)	NA	NA	NA
3.11.7.1.	Type(s)	NA	NA	NA
3.12.	Fuel feed for liquid-fueled CI or, where applicable, dual-fuel engines			
3.12.1.	Fuel pump			
3.12.1.1.	Pressure (kPa) or characteristic diagram:	103.8kPa MAX	103.8kPa MAX	103.8kPa MAX
3.12.2.	Injection system			
3.12.2.1.	Pump:			
3.12.2.1.1.	Type(s):	5594332	5594332	5594332
3.12.2.1.2.	Rated pump speed (rpm):	1400	1400	1400
3.12.2.1.3.	mm3 per stroke or cycle at full injection at rated pump speed	46.6 ±5%	42.7 ±5%	38.3 ±5%
3.12.2.1.4.	Torque peak pump speed (rpm):	800	800	800
3.12.2.1.5.	mm3 per stroke or cycle at full injection at torque peak pump speed	59 ±5%	53.6 ±5%	49.9 ±5%
3.12.2.1.6.	Characteristic diagram:	see 3.12.2.1.1. to 3.12.2.1.5.	see 3.12.2.1.1. to 3.12.2.1.5.	see 3.12.2.1.1. to 3.12.2.1.5.
3.12.2.1.7.	Method used: on engine/pump bench	on engine	on engine	on engine
3.12.2.2.	Injection timing			
3.12.2.2.1.	Injection timing curve:	electronic controlled timing map	electronic controlled timing map	electronic controlled timing map
3.12.2.2.2.	Static Timing:	10.7°BTDC	9.5°BTDC	8.1°BTDC
3.12.2.3.	Injection piping			
3.12.2.3.1.	Length(s) (mm):	1192	1192	1192
3.12.2.3.2.	Internal diameter (mm):	3	3	3
3.12.2.4.	Common rail: Yes/No	Yes	Yes	Yes
3.12.2.4.1.	Type:	Direct Diesel Injection	Direct Diesel Injection	Direct Diesel Injection
3.12.3.	Injector(s)			
3.12.3.1.	Type(s):	5583942	5583942	5583942
3.12.3.2.	Opening pressure (kPa):	Electronically controlled up to a maximum of 20000kPa	Electronically controlled up to a maximum of 20000kPa	Electronically controlled up to a maximum of 20000kPa
3.12.4.	ECU: Yes/No	Yes	Yes	Yes
3.12.4.1.	Type(s):	5596314	5596314	5596314
3.12.4.2.	Software calibration number(s):	AA220	AA284	AA265
3.12.4.3.	Communication standard(s) for access to data stream information: ISO 27145 with ISO 15765-4 (CAN-based)/ISO 27145 with ISO 13400 (TCP/IP based)/SAE J1939-75	SAE J1939	SAE J1939	SAE J1939
3.12.5.	Governor			
3.12.5.1.	Type(s):	Electronic Control	Electronic Control	Electronic Control
3.12.5.2.	Speed at which cut-off starts under full load:	2800 ± 5	2840 ± 5	2800 ± 5
3.12.5.3.	Maximum no-load speed:	2940±140rpm	2840±140rpm	2840±140rpm
3.12.5.4.	Idle speed:	1000±200rpm	1000±200rpm	1000±200rpm
3.12.6.	Cold-start system: Yes/No	YES	YES	YES
3.12.6.1.	Type(s):	Glowplugs	Glowplugs	Glowplugs
3.12.6.2.	Description:	Optional glowplugs for ambient temperature down to -25°C (filled by Perkins as customer option)	Optional glowplugs for ambient temperature down to -25°C (filled by Perkins as customer option)	Optional glowplugs for ambient temperature down to -25°C (filled by Perkins as customer option)
3.12.7.	Fuel temperature at the inlet to the fuel injection pump			
3.12.7.1.	Minimum (deg. C):	-25	-25	-25
3.12.7.2.	Maximum (deg. C):	75	75	75

		6076/2000	6164/2000	6182/2000
3.13.	Fuel feed for liquid fuel spark ignition engine	N/A	N/A	N/A
3.13.1.	Carburettor	N/A	N/A	N/A
3.13.1.1.	Type(s):	N/A	N/A	N/A
3.13.2.	Fuel fuel injection:	N/A	N/A	N/A
3.13.2.1.	Single-point / multi-point	N/A	N/A	N/A
3.13.2.2.	Type(s):	N/A	N/A	N/A
3.13.3.	Direct injection:	N/A	N/A	N/A
3.13.3.1.	Type(s):	N/A	N/A	N/A
3.13.4.	Fuel temperature at injection specified by manufacturer	N/A	N/A	N/A
3.13.4.1.	Location:	N/A	N/A	N/A
3.13.4.2.	Minimum (deg. C)	N/A	N/A	N/A
3.13.4.3.	Maximum (deg. C)	N/A	N/A	N/A
3.14.	Fuel feed for gaseous fuel engines or where applicable, dual fuel engines (in the case of systems laid out in a different manner, supply equivalent information)	N/A	N/A	N/A
3.14.1.	Fuel: LPG /NG-H/NG-L, NG-H/L, NG-Fuel specific LNG	N/A	N/A	N/A
3.14.2.	Pressure regulator(s)/injector(s)	N/A	N/A	N/A
3.14.2.1.	Type(s):	N/A	N/A	N/A
3.14.2.2.	Number of pressure reduction stages	N/A	N/A	N/A
3.14.2.3.	Pressure in fuel stage minimum and maximum: (kPa)	N/A	N/A	N/A
3.14.2.4.	Number of main adjustment points:	N/A	N/A	N/A
3.14.2.5.	Number of fine adjustment points:	N/A	N/A	N/A
3.14.3.	Fuelling system: mixing unit/gas injection/liquid injection/direct injection	N/A	N/A	N/A
3.14.3.1.	Mixture strength regulation	N/A	N/A	N/A
3.14.3.1.1.	System description: and/or diagram and drawings:	N/A	N/A	N/A
3.14.4.	Mixing unit:	N/A	N/A	N/A
3.14.4.1.	Number:	N/A	N/A	N/A
3.14.4.2.	Type(s):	N/A	N/A	N/A
3.14.4.3.	Location:	N/A	N/A	N/A
3.14.4.4.	Adjustment possibilities:	N/A	N/A	N/A
3.14.5.	Inlet manifold injection	N/A	N/A	N/A
3.14.5.1.	Injection: single-point/multi-point	N/A	N/A	N/A
3.14.5.2.	Injection: continuous/simultaneously timed/sequentially timed	N/A	N/A	N/A
3.14.5.3.	Injection equipment	N/A	N/A	N/A
3.14.5.3.1.	Type(s):	N/A	N/A	N/A
3.14.5.3.2.	Adjustment possibilities:	N/A	N/A	N/A
3.14.5.4.	Supply pump	N/A	N/A	N/A
3.14.5.4.1.	Type(s):	N/A	N/A	N/A
3.14.5.5.	Injectors	N/A	N/A	N/A
3.14.5.5.1.	Type(s):	N/A	N/A	N/A
3.14.6.	Direct injection	N/A	N/A	N/A
3.14.6.1.	Injection pump/pressure regulator	N/A	N/A	N/A
3.14.6.1.1.	Type(s):	N/A	N/A	N/A
3.14.6.1.2.	Injection timing (specify):	N/A	N/A	N/A
3.14.6.2.	Injectors	N/A	N/A	N/A
3.14.6.2.1.	Type(s):	N/A	N/A	N/A
3.14.6.2.2.	Operating pressure or characteristic diagram:	N/A	N/A	N/A
3.14.7.	Electronic Control Unit (ECU)	N/A	N/A	N/A
3.14.7.1.	Type(s):	N/A	N/A	N/A
3.14.7.2.	Adjustment possibilities:	N/A	N/A	N/A
3.14.7.3.	Software calibration number(s):	N/A	N/A	N/A
3.14.8.	Approvals of engines for several fuel compositions	N/A	N/A	N/A
3.14.8.1.	Self-adaptive feature: Yes/No	N/A	N/A	N/A
3.14.8.2.	Calibration for a specific gas composition: NG-H/NG-L/NG-H/L specific LNG	N/A	N/A	N/A
3.14.8.3.	Transformation for a specific gas composition: NG-H/NG-L/NG-H/L	N/A	N/A	N/A
3.14.9.	Fuel temperature pressure regulator final stage	N/A	N/A	N/A
3.14.9.1.	Minimum (deg. C):	N/A	N/A	N/A
3.14.9.2.	Maximum (deg. C):	N/A	N/A	N/A
3.15.	Ignition system	N/A	N/A	N/A
3.15.1.	Ignition coil(s)	N/A	N/A	N/A
3.15.1.1.	Type(s):	N/A	N/A	N/A
3.15.1.2.	Number:	N/A	N/A	N/A
3.15.2.	Spark plug(s)	N/A	N/A	N/A
3.15.2.1.	Type(s):	N/A	N/A	N/A
3.15.2.2.	Gap setting:	N/A	N/A	N/A
3.15.3.	Magneto	N/A	N/A	N/A
3.15.3.1.	Type(s):	N/A	N/A	N/A
3.15.4.	Ignition timing control: Yes/No	N/A	N/A	N/A
3.15.4.1.	Stable advance with respect to top dead centre (crank angle degrees):	N/A	N/A	N/A
3.15.4.2.	Advance curve or map:	N/A	N/A	N/A
3.15.4.3.	Electronic control: Yes/No	N/A	N/A	N/A

Explanatory notes to Appendix 3:

(Footnote markers, footnotes and explanatory notes not to be stated on the information document)

- (1) As defined in Annex II to Delegated Regulation (EU) 2017/854.
 (2) Refer to section 2.4.13 in Annex IX (engine family definition).

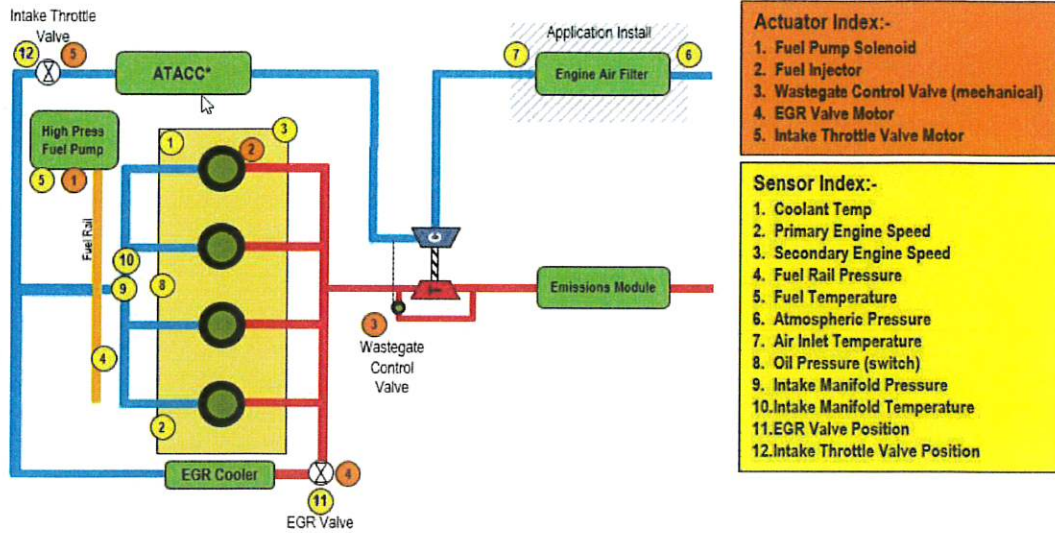
Information Document for (EU) 2016/1628

INDEX

NRE4V2.22HPA		
<u>Attachment</u>	<u>Reference No</u>	<u>Description</u>
A	2.10.1.	Engine Schematics
B	3.8.5.1	Device for recycling Crankcase Gases
C	2.11.	Exhaust After-treatment System Schematics
D	3.1.5	Location of the Engine Identification Number
E	3.3.2	Run In Procedure
F	3.6.8	Drawing of Combustion Chamber and Piston Crown
G	3.8.2.2	Pressure Charging System
H		PCD and NCD Demonstration Test Data

A 2.10.1. Engine Schematics

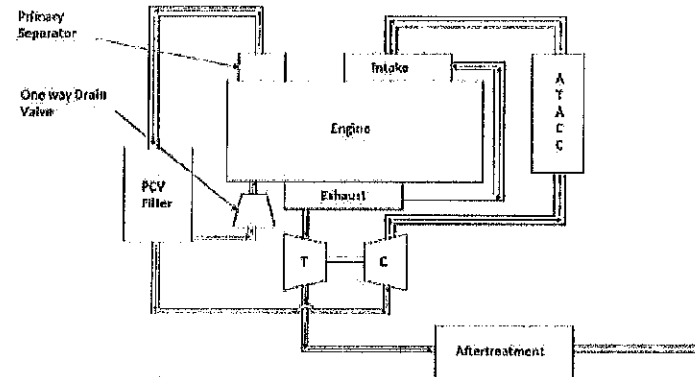
404J-E22TA Engine schematics



B 3.8.5.1

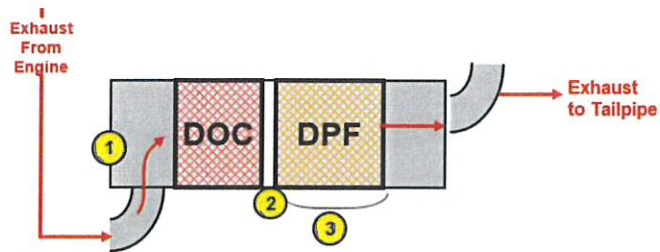
Device for recycling Crankcase Gases

Closed Circuit Breather



C 2.11. Exhaust After-treatment System Schematics

404J-E22TA After-treatment System Schematics



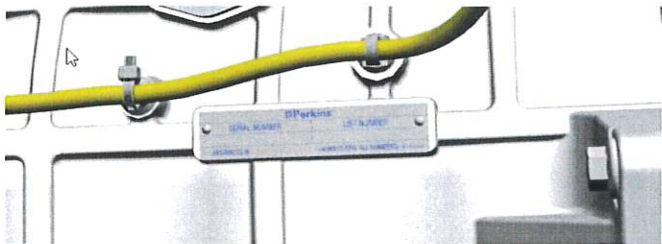
- 1 - DOC Inlet Temperature
- 2 - DPF Inlet Temperature
- 3 - Delta P Sensors

D

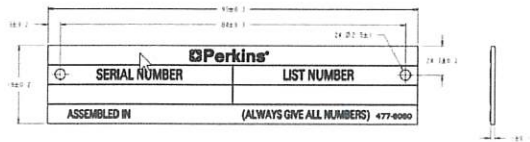
3.1.5

Location of the Engine Identification Number

Engine Identification Number location



Engine Identification Plate layout

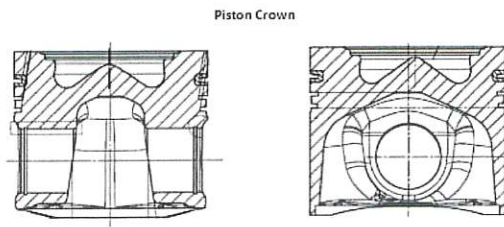
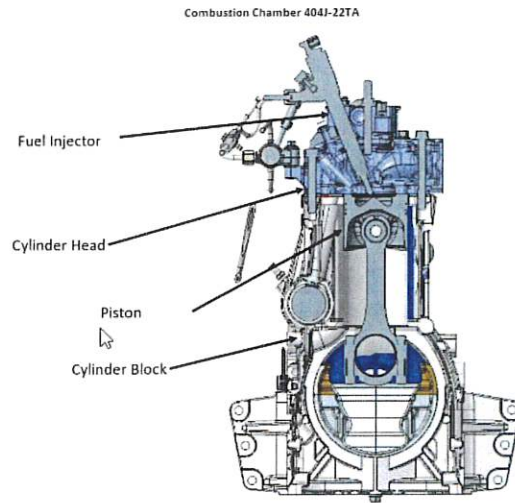


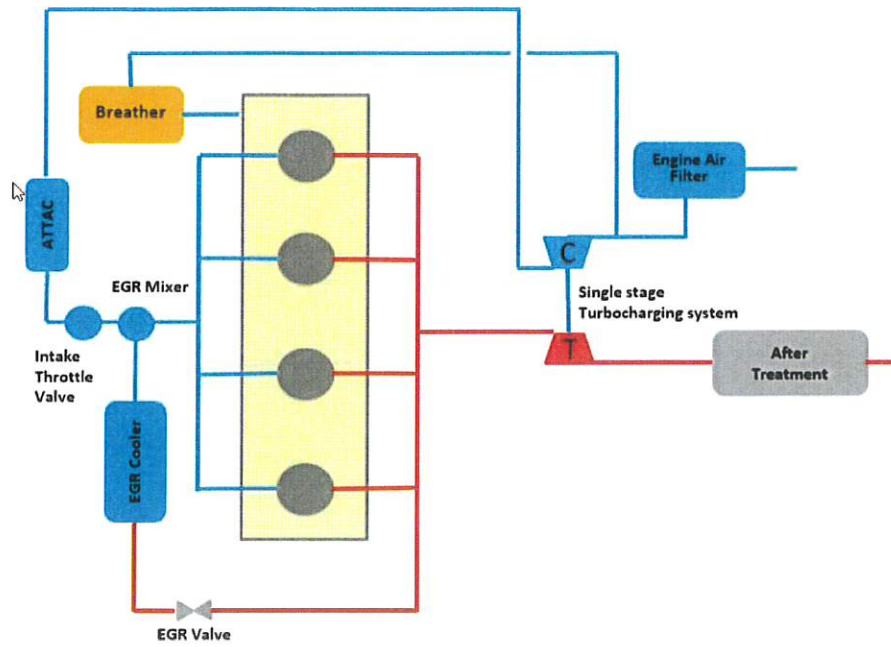
E 3.3.2 Run In Procedure

	Engine speed	Engine Load	Duration (s)	Notes
Step 1	Low idle	No load	30	All steps repeated until engine has accumulated 55 run hours
Step 2	High idle	No load	30	
Step 3	Rated speed	Full load	90	
Step 4	Peak torque speed	Full load	90	

F 3.6.8

Drawing of Combustion Chamber and Piston Crown



G 3.8.2.2 Pressure Charging System

H

PCD and NCD Demonstration Test Data

For NCD and PCD demonstration data, Please refer to the following documents provided in the information pack:

Perkins Stage V Non-Road Particulate Control Diagnostic (PCD) System Information
Section 9. Appendix

Perkins Stage V Non-Road NOx Control Diagnostic (NCD) System Information
Section 8. Appendix

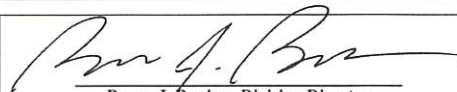


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2021 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: Perkins Engines Co Ltd
(U.S. Manufacturer or Importer)
Certificate Number: MPKXL02.2IR1-039

Effective Date:
09/30/2020
Expiration Date:
12/31/2021


Byron J. Bunker, Division Director
Compliance Division

Issue Date:
09/30/2020
Revision Date:
N/A

Model Year: 2021
Manufacturer Type: Original Engine Manufacturer
Engine Family: MPKXL02.2IR1


Mobile/Stationary Indicator: Both
Emissions Power Category: 37<=kW<56
Fuel Type: Diesel
After Treatment Devices: Diesel Oxidation Catalyst, PTOX-DPF-Active
Non-after Treatment Devices: Electronic/Electric EGR

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Parts 60 and 1039, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Parts 60 and 1039 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Parts 60 and 1039 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Parts 60 and 1039.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Parts 60 and 1039. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Parts 60 and 1039.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

 CALIFORNIA AIR RESOURCES BOARD	PERKINS ENGINES COMPANY LTD.	EXECUTIVE ORDER U-R-022-0276 New Off-Road Compression-Ignition Engines
--	-------------------------------------	---

Pursuant to the authority vested in California Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-19-095;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2021	MPKXL02.2IR1	2.22	Diesel	8000
SPECIAL FEATURES & EMISSION CONTROL SYSTEMS			TYPICAL EQUIPMENT APPLICATION	
Electronic Direct Injection, Turbocharger, Charge Air Cooler, Engine Control Module, Diesel Oxidation Catalyst, Periodic Trap Oxidizer, Exhaust gas Recirculation			Welder, Mini-Excavator	

The engine models and codes are attached.

The following are the exhaust certification standards (STD) and certification levels (CERT) for non-methane hydrocarbon (NMHC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			NMHC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
37 ≤ kW < 56	Tier 4 Final	STD	N/A	N/A	4.7	5.0	0.03	N/A	N/A	N/A
		CERT	--	--	3.5	1.3	0.003	--	--	--

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed on this 16th day of October 2020.



Allen Lyons, Chief
Emissions Certification and Compliance Division

Engine Model Summary Template

Attachment page 1 of 1
EO#: U-R-022-0276
Date: 09/29/2020

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
MPKXL02.2IR1	5076/2800 Parent	404J-E22TA C2.2	74@2800	47.2	29.1	270@1600	58.7	20.7	DDI,TAA,ECM,DOC,PTOX, EGR
MPKXL02.2IR1	6182/2800	404J-E22TA C2.2	60@2800	39.3	24.3	235@1600	49.9	17.6	DDI,TAA,ECM,DOC,PTOX, EGR
MPKXL02.2IR1	6184/2800	404J-E22TA C2.2	67@2800	42.7	26.3	252@1600	53.6	18.9	DDI,TAA,ECM,DOC,PTOX, EGR

TAA = TC + CAC