

From: [Air.Pollution Control](#)
To: [APC Permitting](#)
Subject: FW: Corrections to Permit Request.
Date: Thursday, March 14, 2024 12:33:22 PM
Attachments: [davis.const@sharp-sbstn.com_03142024_120547PM.pdf](#)

From: Tyler Davis <tylerd@vdctn.com>
Sent: Thursday, March 14, 2024 12:00 PM
To: Air.Pollution Control <Air.Pollution.Control@tn.gov>
Cc: Jimmie Horton <Jimmie.Horton@tn.gov>
Subject: [EXTERNAL] Corrections to Permit Request.

***** 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 see the attached revised information. I have also copied Mr. Horton on this email as he was the one that reached out to me with correction needed. Please let me know at your earliest convenience if I need to send anything further. I appreciate your help in getting this permit started.

Thanks,

Tyler Davis
Vic Davis Construction Inc.
President
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.</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.tv.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.tv.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.tv.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)

All Listed machines are portable and run off independent diesel generators.

McCloskey R230 screener - screen #1

Barford 36 x 80 stacker - stacker #1

Barford 36 x 80 stacker - stacker #2

* Manufacturer technical specs / information Attached.

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 tons	June - August	Sept. - Nov.

TYPE OF PERMIT REQUESTED (check appropriate box)

14. Operating permit <input type="checkbox"/>	Date construction started	Date completed	Date of ownership change (if applicable)
	Last permit number(s)	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 AS SOON AS possible	Completion date 60 days after start date.
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:

NA

This is a first time application for this site.
No previous permits for air pollution have been applied for for this site.

16. Comments

This is a first time request for this site. We would like to screen shale material to meet a certain size spec. for a job that need structural fill. The process would take 60 days to screen the material onsite. The project calls for approximately 15,000 tons of material. Vic Davis Construction asks that this permit be reviewed as an "Insignificant Activity" permit. This is a temporary one time use for this site.

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

3/14/24

Signer's name (type or print)

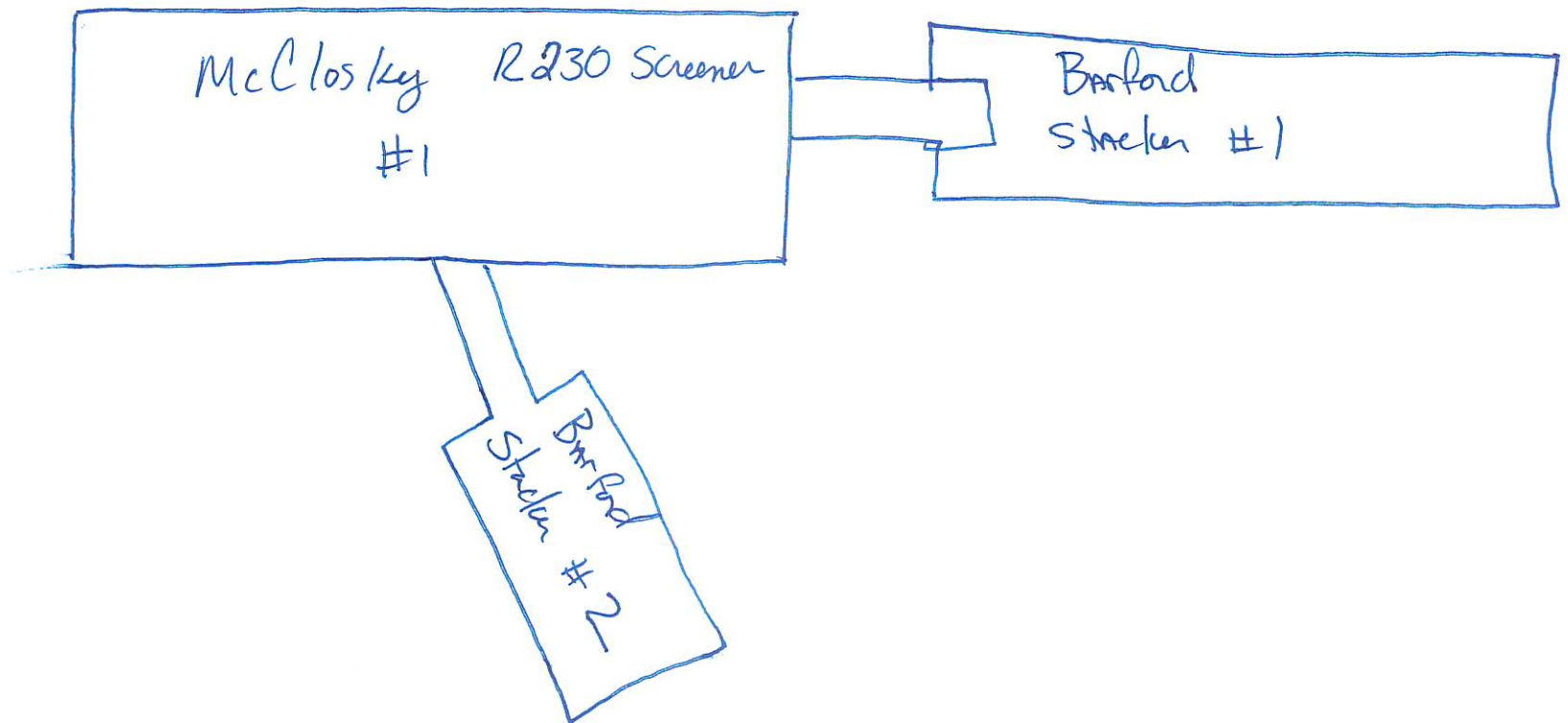
Title

Phone number with area code

Tyler Davis

OWNER

423-817-7338



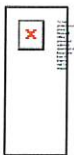
Tyler Davis

From: Mark Donlon <mark.donlon@commonwealthequipment.com>
Sent: Thursday, March 14, 2024 11:54 AM
To: Tyler Davis
Subject: Fwd: Emissions R230 McCloskey Screen Scalper
Attachments: R230 Emissions.pdf

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R230 McCloskey Screen Scalper



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ANNA KOEPKE

BILLING REPRESENTATIVE
Commonwealth Equipment Corp.
36 Hazleton Street
Ashley, PA 18706

Office: 877-217-4474, ext. 414
Mobile: 570-417-1097
www.CommonwealthEquipment.com

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EMISSIONS DATA [66627721]**DECEMBER 16, 2019**

For Help Desk Phone Numbers Click here
(/tmi/tmihome/TMContactInfo.htm)

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)	66627721
Sales Model	ENGINE C6.6
Regulatory Build Date	December 10, 2014

As Shipped Data

Engine Arrangement Number	308-5596
Advertised Power	173.7HP/2200RPM/T2952
Liters	403CU IN

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)

Current Date: 12/16/2019, 4:33:14 PM

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Data Privacy Statement.



ERCR-49887 Emissions Certification Information Request Uday Kumar S G to: tbaker
12/17/2019 04:21 AM

Uday Kumar S G commented:

Greetings,

	Cycle Total, g/kW.h
CO:	1.7700
HC:	0.1250
NOx, Corrected:	3.5100
NOx + HC, Corrected:	3.6350
Parts., Corrected:	0.2220

Please find the attached Emission data.

Regards

Engine Certification 1

Disclaimer: The information provided has been compiled from sources believed to be reliable and is accurate to the best of Caterpillar's knowledge; however, Caterpillar does not guarantee the accuracy, completeness, and validity of the information and cannot be held liable for any errors or omissions. All information provided should be independently verified and confirmed, and you should not rely solely upon the information provided. One potential method to independently verify the information provided is to examine the emissions label located on the engine.

New Emissions Resources: Caterpillar is improving the way you get access to the engine emissions and regulatory information you need. Caterpillar has launched two new applications aimed at providing faster delivery of product regulatory specific information such as the regulatory status, certification family and emissions certificates for Caterpillar built products. These applications are:

- The new CAT Compliance Mobile App. Caterpillar's first engine emissions compliance data mobile app is ready to download and will deliver real-time engine emissions status data and certificate information right to your fingertips, 24/7.
- The new Caterpillar Engine Emissions Certificate Repository web site. Caterpillar has developed a new web application where users may enter the serial number, engine family name or approval number of a CAT engine or machine product to quickly see and/or download the engine emissions certificate.

With these new applications, Caterpillar intends to not only improve the accessibility of information for the users who need it most, but also build on our commitment to success by offering new streamlined channels to data and support from those who champion it.


To access the new CAT Compliance mobile application, please visit your Google Android or Apple app store and search ""CAT Compliance.""

For further details and access to the new Caterpillar Engine Emissions Certificate Repository web site, please visit the ""Caterpillar Engine Emissions Certificate Repository"" here: <https://emissions.cat.com/>

Uday Kumar S G updated a comment:

Greetings,

Please find the attached Emission data.



	Cycle Total, g/kW.h
CO:	1.7700
HC:	0.1250
NOx, Corrected:	3.5100
NOx + HC, Corrected:	3.6350
Parts., Corrected:	0.2220

Regards

Engine Certification 1

Disclaimer: The information provided has been compiled from sources believed to be reliable and is accurate to the best of Caterpillar's knowledge; however, Caterpillar does not guarantee the accuracy, completeness, and validity of the information and cannot be held liable for any errors or omissions. All information provided should be independently verified and confirmed, and you should not rely solely upon the information provided. One potential method to independently verify the information provided is to examine the emissions label located on the engine.

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For further details and access to the new Caterpillar Engine Emissions Certificate Repository web site, please visit the ""Caterpillar Engine Emissions Certificate Repository"" here: <https://emissions.cat.com/>

Uday Kumar S G changed the status to Resolved.

Uday Kumar S G resolved this as Done.

INDUSTRIAL ENGINE PERFORMANCE DATA [66627721]**DECEMBER 17, 2019**For Help Desk Phone Numbers [Click here](#)

Performance Number: P2952A

Change Level: 00 ▼

Sales Model: C6.6 DIT**Combustion: DI****Aspr: T****Engine Power: 174 HP****Speed: 2,200 RPM**

After Cooler: AA

Manifold Type:

Governor Type:

After Cooler Temp(F): 131

Turbo Quantity:

Engine App: IN

Turbo Arrangement:

Application Type: INDUSTRIAL

Engine Rating: IN

Strategy:

Rating Type:

Certification: EPA TIER 3 -**General Performance Data 1**

ENGINE SPEED RPM	ENGINE POWER BHP	ENGINE TORQUE LB.FT	ENGINE BMEP PSI	FUEL BSFC LB/BHP-HR	FUEL RATE GPH	INTAKE MFLD P IN-HG	INTAKE AIR FLOW CFM	EXH STACK TEMP DEG F	EXH GAS FLOW CFM
2,200	174	415.25	155.48	0.39	9.63	39.18	424.84	916.7	981.75

General Performance Data 2

ENGINE SPEED RPM	ENGINE POWER BHP	COMPRESS OUT TEMP DEG F	CHARGE AIRFLOW LB/MIN
2,200	174	286.7	30.86
2,000	174	288.68	29.17
1,800	168	273.92	25.33
1,600	155	277.16	22.97
1,400	137	255.2	18.61
1,200	108	199.4	12.43
1,000	76	153.86	8.27
800	47	120.74	5.78

Engine Heat Rejection Data

ENGINE SPEED RPM	ENGINE POWER BHP	REJ TO JW BTU/MN	REJ TO ATMOS BTU/MN	REJ TO EXHAUST BTU/MN	FROM AFT CLR BTU/MN
2,200	174	4,310.7	1,046.4	6,989.3	1,170.9
2,000	174	4,003.6	1,137.4	6,432.0	1,121.5
1,800	168	4,009.3	1,023.7	6,198.8	887.7
1,600	155	3,662.4	688.1	5,453.8	818.4
1,400	137	3,611.2	727.9	4,868.1	561.9
1,200	108	3,304.1	750.7	3,446.3	210.4
1,000	76	2,650.1	369.6	2,115.6	46.6
800	47	1,780.0	1,780.0	1,160.2	11.4

EMISSIONS DATA

EPA TIER 3 - ***** J1
 No notes were found for this certification...

REFERENCE EXHAUST STACK DIAMETER

0 IN

WET EXHAUST MASS

1,920.2 LB/HR

WET EXHAUST FLOW (-- STACK TEMP)

--

WET EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG)

--

DRY EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG)

--

FUEL FLOW RATE

--

RATED SPEED "Potential site variation"

TOTAL NOX (AS NO2) LB/HR	TOTAL CO LB/HR	TOTAL HC LB/HR	PART MATTER LB/HR
0.01	.0000	.0000	.0000

The powers listed above and all the Powers displayed are Corrected Powers

Identification Reference and Notes

Engine Arrangement:		Lube Oil Press @ Rated Spd(PSI):	65.1
Effective Serial No:		Piston Speed @ Rated Eng SPD(FT/Min):	--
Primary Engine Test Spec:		Max Operating Altitude(FT):	0.0
Performance Parm Ref:		PEEC Elect Control Module Ref	
Performance Data Ref:	P2952A	PEEC Personality Cont Mod Ref	
Aux Coolant Pump Perf Ref:			
Cooling System Perf Ref:		Turbocharger Model	
Certification Ref:	EPA TIER 3	Fuel Injector	
Certification Year:		Timing-Static (DEG):	--
Compression Ratio:	16.2	Timing-Static Advance (DEG):	--
Combustion System:	DI	Timing-Static (MM):	--
Aftercooler Temperature (F):	131	Unit Injector Timing (MM):	--
Crankcase Blowby Rate(CFH):	--	Torque Rise (percent)	23.4
Fuel Rate (Rated RPM) No Load(Gal/HR):	--	Peak Torque Speed RPM	1400
Lube Oil Press @ Low Idle Spd(PSI):	45.0	Peak Torque (LB.FT):	512.6

Reference
Number: P2952A

EPA TIER 3 J1

Parameters
Reference:

Caterpillar Confidential: **Green**
Content Owner: Commercial Processes Division
Web Master(s): [PSG Web Based Systems Support](#)
Current Date: 12/17/2019, 6:48:24 AM
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Tyler Davis

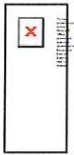
From: Mark Donlon <mark.donlon@commonwealthequipment.com>
Sent: Thursday, March 14, 2024 11:51 AM
To: Tyler Davis
Subject: Emissions for Barford 36x80 Tracked Stacker BF80T-844
Attachments: BF80T 844 Emissions 1.pdf; BF80T 844 Emissions 2.pdf; BF80T 844 Emissions 3.pdf

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attached is Emissions for Barford 36x80 Tracked Stacker BF80T-844

#1



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Commonwealth Equipment Corp.
36 Hazleton Street
Ashley, PA 18706

Office: 877-217-4474, ext. 414
Mobile: 570-417-1097
www.CommonwealthEquipment.com

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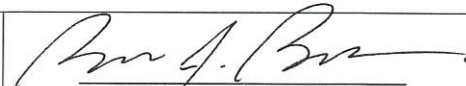


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2021 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

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/FT ⁽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:	Engine Back Pressure Valve Out		
3.11.1.2.	Maximum temperature drop from exhaust system or turbine outlet to first exhaust after-treatment system (deg. C) if stated:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.1.2.1.	Test conditions for measurement:	Per A&I guide	Per A&I guide	Per A&I guide

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	C1
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>

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 2/16

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: --



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 3/16

II. Prüfprotokoll Test report

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

1.1. Fahrzeugausführung (Code): ---
Sort of vehicle (code):

1.2. Angaben über den Motor *Engine data*

1.2.1. Marke: Perkins Engines Company Ltd.
Make of engine (404J-E22TA), also branded as
(Caterpillar C2.2)

1.2.2. Klasse und Unterklasse des Motors: NRE-v-4
Engine category and subcategory:

1.2.3. Typ / Ausführung: NRE4V2.22HPA (family)
Type / sort

1.2.4. Stammmotor: 5076/2800
Parent engine:

1.2.5. Nummer: J3400260
Number:

1.2.6. Maximale Nutzleistung bei Drehzahl: 55 kW/ 2800 min⁻¹
Maximum net power at speed:

1.2.7. Nennwert der Nutzleistung bei Drehzahl: 55 kW/ 2800 min⁻¹
Rated net power at speed:

1.2.8. Maximales Drehmoment bei Drehzahl: 270 Nm/ 1600 min⁻¹
Maximum torque at speed:

1.2.9. Zylinderzahl 4
Number of cylinders:

1.2.10. Gesamthubraum: 2216 cm³
Total cylinder displacement:

1.2.11. Lage der Zylinder in Block in-line
Position of the cylinder in the block:

1.2.12. Arbeitsweise: four stroke
Combustion cycle:



Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 4/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

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



Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 5/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

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:



Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 6/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

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: <i>Intermediate speed:</i>	1600 min ⁻¹
4.2.3.	Nenndrehzahl: <i>Rated speed:</i>	2800 min ⁻¹
4.2.4.	Drehzahl bei Höchstleistung: <i>Speed at max. power:</i>	2800 min ⁻¹
4.3.	Für die Prüfung verwendeter Bezugskraftstoff <i>Reference fuel used for test</i>	
4.3.1.	Cetanzahl / <i>Cetane</i> (ASTM D-613)	52,2
4.3.2.	Schwefelgehalt / <i>Sulphur content</i>	1,0 ppm (mg/kg)
4.3.3.	Dichte / <i>Density</i>	835,8 kg/m ³

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 7/16

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

Nenn Drehzahl / 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):	***	***	***	***	***	***	***

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 8/16

- 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 Höchstleistung ($P_{m,i}$) (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 Engine net power $P_i = P_{m,i} - P_{f,i} + P_{r,i}$	45,2	55	55

6. Bedingungen bei der Prüfung
Conditions at test

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

Ja
yes

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 9/16

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

Meereshöhe der Prüfeinrichtung (m) Entfällt
Altitude of test facility (m) not applicable

Trockener Luftdruck (kPa) Entfällt
Dry atmospheric pressure (kPa) not applicable

6.2. Zulässiger Temperaturbereich für die 20 ... 30
Einlassluft (°C)
Applicable intake air temperature range (°C)

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

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 10/16

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

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)
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 / Net power (P)	37 kW ≤ P < 56 kW					

* = values are not multiplied with 10¹²

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 11/16

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

Emissionen Emissions	CO (g/kWh)	HC (g/kWh)	NO_x (g/kWh)	HC+NO_x (g/kWh)	PM (g/kWh)	PN (#/kWh) (x 10¹²)
Prüfergebnis ohne Regeneration <i>Test result without</i> <i>regeneration</i>	0,0057	0,0041	3,1238	3,1279	0,0003	0,0933
DF additiv <i>additiv</i>	1,57	1,5	1,0	-	1,0	1,0
k_{ru}/k_{rd} multiplikativ <i>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>	0,0056	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					

^{*)} 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):

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 12/16

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) additiv</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)

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 13/16

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-Probennahme
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 1012)	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

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 14/16

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

1. Beschreibungsbogen Nr. NRE4V2.22HPA_Regulation EU 2016_1628 einschließlich Anlagen
Description form no. NRE4V2.22HPA_Regulation EU 2016_1628 including Enclosures

2. Motorabbildungskurve / *Engine mapping*

3. 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.
Motortyp / type of engine: 5076/2800
Familie / Family: NRE4V2.22HPA

Seite / page 15/16

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

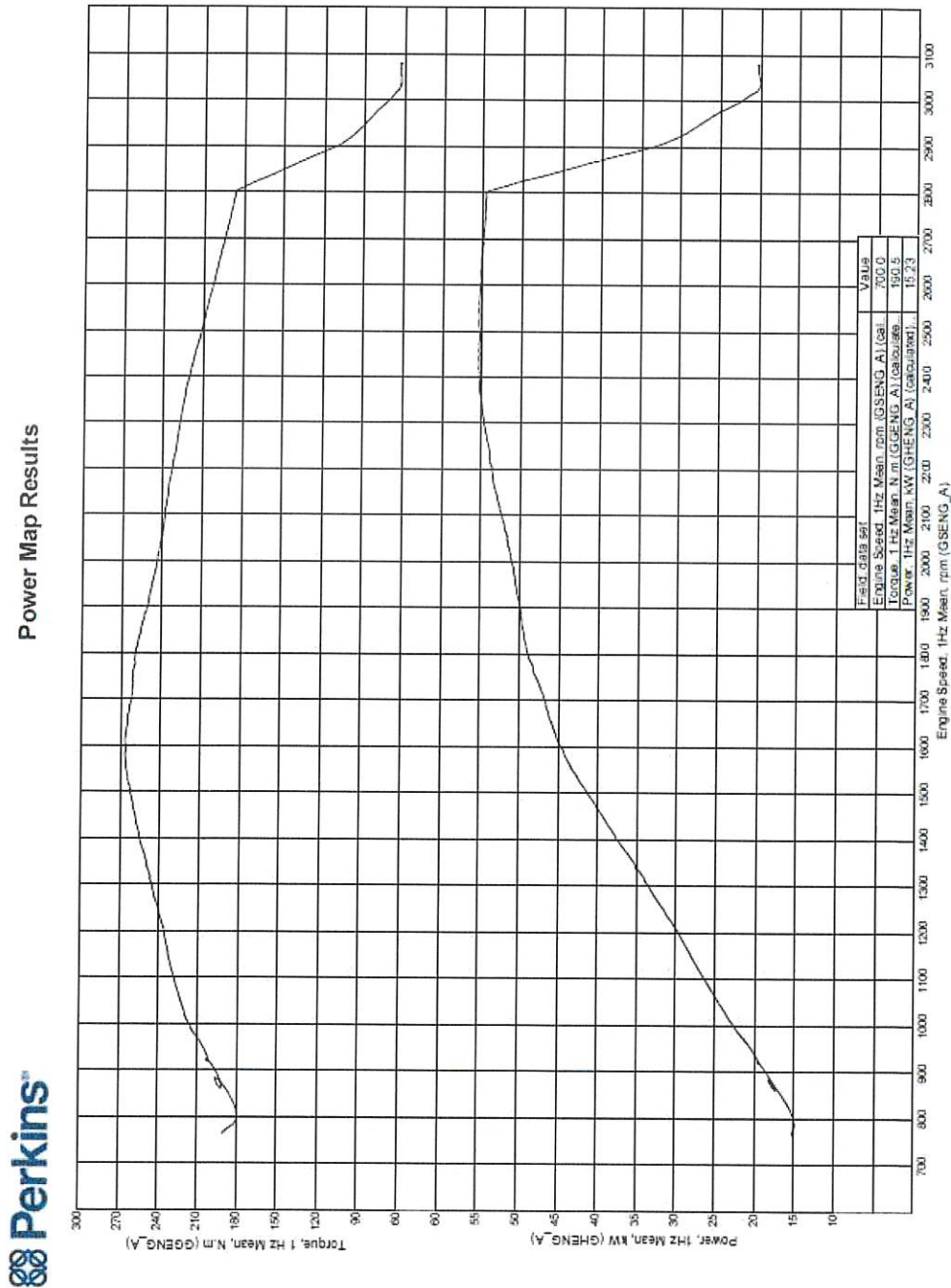
Munich, 06.09.2019

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/FF:	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	5076/2800	6184/2800	6182/2600
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):	2900	2800	2800
3.2.1.1	Fuel delivery/stroke (mm3) for diesel engine, fuel flow (g/h) for other engines, at rated net power:	46.8 ±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 (mm3) 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):	55	50	45
3.2.3	Declared maximum torque speed (rpm):	1800	1600	1600
3.2.3.1	Fuel delivery/stroke (mm3) for diesel engine, fuel flow (g/h) for other engines, at maximum torque speed:	58 ±5%	53.6 ±5%	48.9 ±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:	1600	1600	1600
3.2.6	Idle speed (rpm):	1000±200rpm	1000±200rpm	1000±200rpm
3.2.7	Maximum no load speed (rpm):	2840±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:	65	N/A	N/A
3.3.2	Run-in cycle:	See attachment	N/A	N/A
3.4	Engine test			
3.4.1	Specific fixture 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 riding chamber permitted by manufacturer: Yes/No	N/A	N/A	N/A
3.4.2.1	Exhaust riding 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: F2/O2/KC1	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	Volumetric compression ratio:	17.3:1 ±0.8/-0.8	17.3:1 ±0.8/-0.8	17.3:1 ±0.8/-0.8
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:			
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)	8.9	8.9	8.9
	Inlet valve opening (deg BTDC)	15 BTDC	15 BTDC	15 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

3.6.10.2.	Reference and/or setting range:	5978/2860	6164/2859	6162/2859
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.	Cam 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)	30	30	30
	Exhaust (mm)	30	30	30
3.7.	Cooling systems			
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 (+/- 2°C)	112 (+/- 2°C)	112 (+/- 2°C)
3.7.2.	Air cooling			
3.7.2.1.	fan: 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 charges(s): Yes/No	Yes	Yes	Yes
3.8.2.1.	Type(s):	5900403, 5600404, 5803395, 5803397, 5814034, 5814035, 5814040, 5814041	5900403, 5600404, 5803396, 5803397, 5814034, 5814035, 5814040, 5814041	5900403, 5600404, 5803395, 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.	Device for recycling evaporated 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 6.10 of Annex VI to Delegated Regulation (EU) 2017/854: Yes/No	N/A	N/A	N/A
3.8.5.3.	Inlet path	N/A	N/A	N/A
3.8.5.4.	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 sensor	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)			
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

		96762800	81842800	51622800
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	NA
	Maximum distance	Defined by exhaust gas temp loss constrained	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 A&I guide	Per A&I guide	Per A&I guide
3.11.1.2.1.	Test conditions for measurement:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.1.3.	Minimum temperature at inlet to first after-treatment device (deg. C), if stated:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.1.3.1.	Test conditions for measurement:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.2.	Oxidation 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 101.8 mm / 2.4 l	DOC 172.0 x 101.8 mm / 2.4 l	DOC 172.0 x 101.8 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-1803	BASF Technology No - BASF-TEX-1803	BASF Technology No - BASF-TEX-1803
3.11.2.5.	Substrate (structure and material):	Monolith, Ceramic	Monolith, Ceramic	Monolith, Ceramic
3.11.2.6.	Cell density (cells/cm²):	DOC 46.5 cells/cm²	DOC 46.5 cells/cm²	DOC 46.5 cells/cm²
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 (CDrive) (%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:	5298070, 5516657, 5652444, 5550407, 5404873, 5502542, 5515613, 5599709, 5404873, 5235596, 5516657	5298070, 5516657, 5652444, 5550407, 5404873, 5502542, 5515613, 5599709, 5404873, 5235596, 5516657	5298070, 5516657, 5652444, 5550407, 5404873, 5502542, 5515613, 5599709, 5404873, 5235596, 5516657

	50792860	61842800	81992860
3.11.4.3.	Dimensions and capacity of the particulate after-treatment system:	172.0 x 152.4 mm / 3.5 l	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 DOC	In same can, immediately after DOC
	Minimum distance from engine	Defined by DOC	Defined by DOC
	Maximum distance from engine	Defined by DOC	Defined by DOC
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
3.11.4.5.1.	Infrequent regeneration: Yes/No	YES	YES
3.11.4.5.2.	Minimum exhaust gas temperature for initiating regeneration procedure (deg. C):	Depends on SV, 250 - 400	Depends on SV, 250 - 400
3.11.4.6.	Catalytic coating: Yes/No	N/A	N/A
3.11.4.6.1.	Type of catalytic action:	N/A	N/A
3.11.4.7.	Fuel borne catalyst (FBO): Yes/No	N/A	N/A
3.11.4.8.	Normal operating temperature range (deg. C):	147 - 600	147 - 600
3.11.4.9.	Normal operating pressure range (kPa):	9.5 - 23	8.1 - 19.7
3.11.4.10.	Storage capacity soot/ash (g):	Soot - 21g	Soot - 21g
3.11.4.10.1.	Oxygen sensor(s): Yes/No	N/A	N/A
3.11.4.10.2.	Type:	N/A	N/A
3.11.4.11.	Location(s):	N/A	N/A
3.11.5.	Other after-treatment devices	N/A	N/A
3.11.5.1.	Description and operation:	N/A	N/A
3.11.6.	Infrequent Regeneration		
3.11.6.1.	Number of cycles with regeneration	2	2
3.11.6.2.	Number of cycles without regeneration	117	117
3.11.7.	Other device(s) or device(s):	NA	NA
3.11.7.1.	Type(s)	NA	NA
3.12.	Fuel feed for liquid-fuelled CI or, where applicable, dual-fuel engines		
3.12.1.	Feed pump		
3.12.1.1.	Pressure (kPa) or characteristic diagram:	103.5kPa MAX	103.5kPa MAX
3.12.2.	Injection system		
3.12.2.1.	Pump		
3.12.2.1.1.	Type(s):	6594332	6594332
3.12.2.1.2.	Rated pump speed (rpm):	1400	1400
3.12.2.1.3.	mm³ per stroke or cycle at full injection at rated pump speed:	48.8 ±5%	42.7 ±5%
3.12.2.1.4.	Torque peak pump speed (rpm):	800	800
3.12.2.1.5.	mm³ per stroke or cycle at full injection at torque peak pump speed:	58 ±5%	63.6 ±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.
3.12.2.1.7.	Method used: on engine/on pump bench	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
3.12.2.2.2.	Static Timing	10.7° BTDC	8.8° BTDC
3.12.2.2.3.	Injection phasing		
3.12.2.2.4.	Length(s) (mm):	1192	1192
3.12.2.2.5.	Internal diameter (mm):	3	3
3.12.2.4.	Common rail: Yes/No	Yes	Yes
3.12.2.4.1.	Type:	Direct Diesel Injection	Direct Diesel Injection
3.12.3.	Injector(s)		
3.12.3.1.	Type(s):	5593942	5593942
3.12.3.2.	Opening pressure (kPa):	Electronically controlled up to a maximum of 200000kPa	Electronically controlled up to a maximum of 200000kPa
3.12.4.	ECU: Yes/No	Yes	Yes
3.12.4.1.	Type(s):	5595314	5595314
3.12.4.2.	Software calibration number(s):	A4220	A4284
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 J1939-73	SAE J1939	SAE J1939
3.12.5.	Governor		
3.12.5.1.	Type(s):	Electronic Control	Electronic Control
3.12.5.2.	Speed at which cut-off starts under full load:	2800 ± 5	2800 ± 5
3.12.5.3.	Maximum no-load speed:	2840±140rpm	2840±140rpm
3.12.5.4.	Min speed:	1000±200rpm	1000±200rpm
3.12.6.	Cold-start system: Yes/No	YES	YES
3.12.6.1.	Type(s):	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)
3.12.7.	Fuel temperature at the inlet to the fuel injection pump		
3.12.7.1.	Minimum (deg. C):	-25	-25
3.12.7.2.	Maximum (deg. C):	75	75

	5870/2800	6194/2800	6162/2800
3.13.	Fuel feed for liquid fuel spark ignition engine	N/A	N/A
3.13.1.	Catchwater	N/A	N/A
3.13.1.1.	Type(s):	N/A	N/A
3.13.2.	Port fuel injection:	N/A	N/A
3.13.2.1.	single-point / multi-point	N/A	N/A
3.13.2.2.	Type(s):	N/A	N/A
3.13.3.	Direct injection:	N/A	N/A
3.13.3.1.	Type(s):	N/A	N/A
3.13.4.	Fuel temperature at location specified by manufacturer	N/A	N/A
3.13.4.1.	Location:	N/A	N/A
3.13.4.2.	Minimum (deg. C)	N/A	N/A
3.13.4.3.	Maximum (deg. C)	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
3.14.1.	Fuel LPG / NG-HUNG-1 / NG-HL/LNG/Fuel specific LNG	N/A	N/A
3.14.2.	Pressure regulator(s)/vaporizer(s)	N/A	N/A
3.14.2.1.	Type(s):	N/A	N/A
3.14.2.2.	Number of pressure reduction stages	N/A	N/A
3.14.2.3.	Pressure in final stage minimum and maximum (kPa)	N/A	N/A
3.14.2.4.	Number of main adjustment points:	N/A	N/A
3.14.2.5.	Number of fine adjustment points:	N/A	N/A
3.14.3.	Fuelling system: mixing unit/gas injection/liquid injection/direct injection	N/A	N/A
3.14.3.1.	Mixture strength regulation	N/A	N/A
3.14.3.1.1.	System description and/or diagram and drawings:	N/A	N/A
3.14.4.	Adaptation:	N/A	N/A
3.14.4.1.	Number:	N/A	N/A
3.14.4.2.	Type(s):	N/A	N/A
3.14.4.3.	Location:	N/A	N/A
3.14.4.4.	Adjustment possibilities:	N/A	N/A
3.14.5.	Fuel manifold injection	N/A	N/A
3.14.5.1.	Injection: single-point/multi-point	N/A	N/A
3.14.5.2.	Injection: continuous/simultaneously timed/sequentially timed	N/A	N/A
3.14.5.3.	Injection equipment	N/A	N/A
3.14.5.3.1.	Type(s):	N/A	N/A
3.14.5.3.2.	Adjustment possibilities:	N/A	N/A
3.14.5.4.	Supply pump	N/A	N/A
3.14.5.4.1.	Type(s):	N/A	N/A
3.14.5.5.	Injector(s)	N/A	N/A
3.14.5.5.1.	Type(s):	N/A	N/A
3.14.6.	Direct injection	N/A	N/A
3.14.6.1.	Injection pump/pressure regulator	N/A	N/A
3.14.6.1.1.	Type(s):	N/A	N/A
3.14.6.1.2.	Injection timing (specify):	N/A	N/A
3.14.6.2.	Injector(s)	N/A	N/A
3.14.6.2.1.	Type(s):	N/A	N/A
3.14.6.2.2.	Opening pressure or characteristic diagram:	N/A	N/A
3.14.7.	Electronic Control Unit (ECU)	N/A	N/A
3.14.7.1.	Type(s):	N/A	N/A
3.14.7.2.	Adjustment possibilities:	N/A	N/A
3.14.7.3.	Software calibration number(s):	N/A	N/A
3.14.8.	Approval of engines for several fuel compositions	N/A	N/A
3.14.8.1.	Self-adaptive feature: Yes/No	N/A	N/A
3.14.8.2.	Calibration for a specific gas composition: NG-HUNG-LNG-HL/ LNG/Fuel specific LNG	N/A	N/A
3.14.8.3.	Transformation for a specific gas composition: NG-HL/NG-LT/NG-HLT	N/A	N/A
3.14.9.	Fuel temperature pressure regulator final stage	N/A	N/A
3.14.9.1.	Minimum (deg. C):	N/A	N/A
3.14.9.2.	Maximum (deg. C):	N/A	N/A
3.15.	Ignition system	N/A	N/A
3.15.1.	Ignition coil(s)	N/A	N/A
3.15.1.1.	Type(s):	N/A	N/A
3.15.1.2.	Number:	N/A	N/A
3.15.2.	Spark plug(s)	N/A	N/A
3.15.2.1.	Type(s):	N/A	N/A
3.15.2.2.	Gap setting:	N/A	N/A
3.15.3.	Magneto	N/A	N/A
3.15.3.1.	Type(s):	N/A	N/A
3.15.4.	Ignition timing control: Yes/No	N/A	N/A
3.15.4.1.	Static advance with respect to top dead centre (crank angle degrees):	N/A	N/A
3.15.4.2.	Advance curve or map:	N/A	N/A
3.15.4.3.	Electronic control: Yes/No	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) 2017/654.

(2) Refer to section 2.4.13 in Annex IX (engine family definition).

Information Document for (EU) 2016/1628

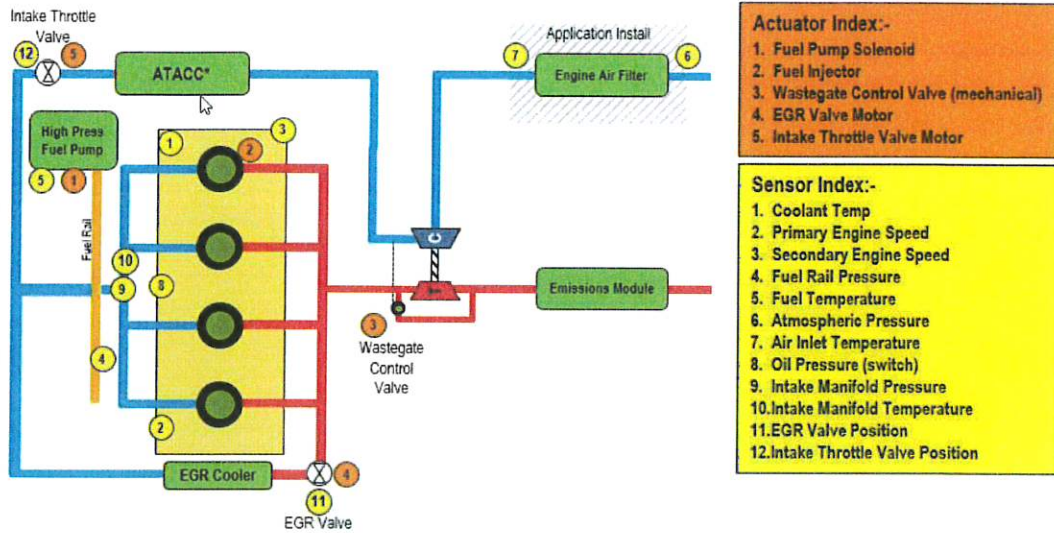
NRE4V2.22HPA

<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

INDEX

A 2.10.1. Engine Schematics

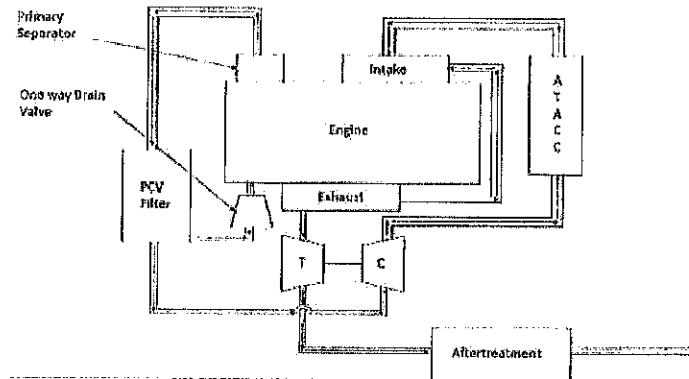
404J-E22TA Engine schematics



B 3.8.5.1

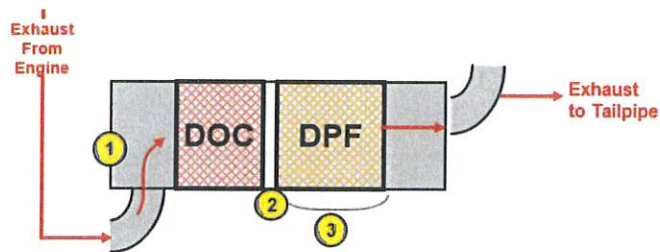
Device for recycling Crankcase Gases

Closed Circuit Breather



C 2.11. Exhaust After-treatment System Schematics

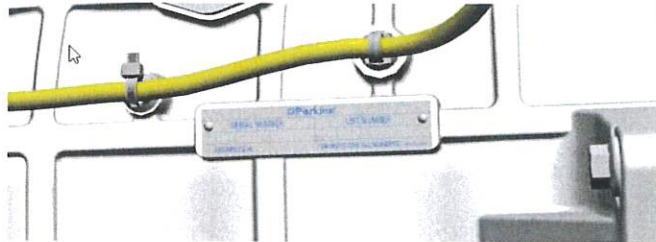
404J-E22TA After-treatment System Schematics



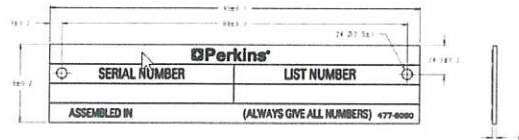
- 1 - DOC Inlet Temperature
- 2 - DPF Inlet Temperature
- 3 - Delta P Sensors

D 3.1.5 Location of the Engine Identification Number

Engine Identification Number location



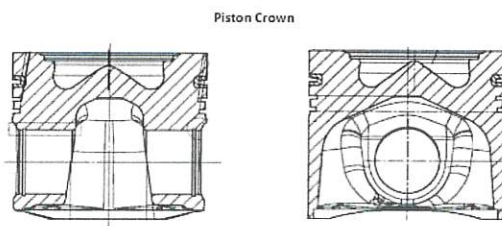
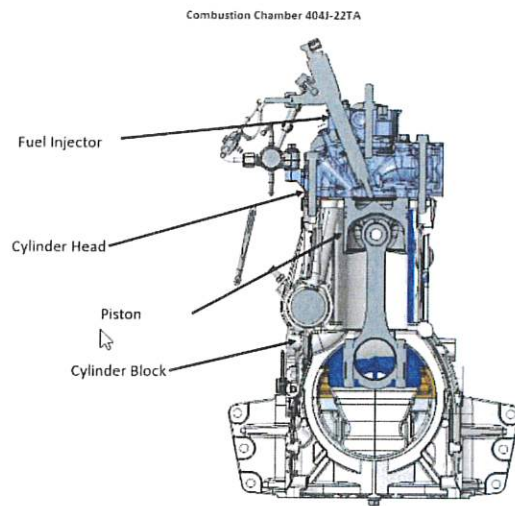
Engine Identification Plate layout

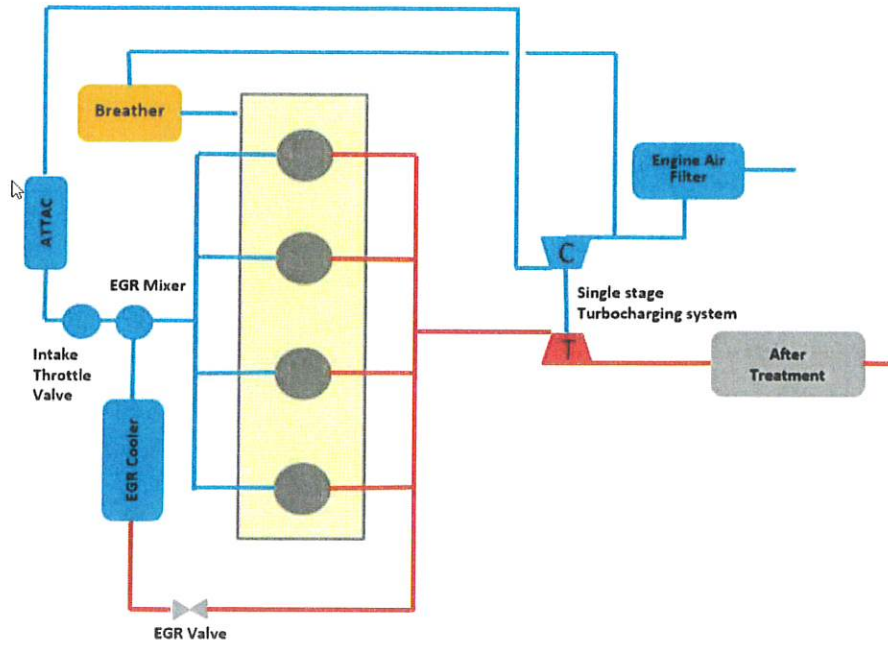


E 3.3.2 Run In Procedure

	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

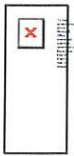
Tyler Davis

From: Mark Donlon <mark.donlon@commonwealthequipment.com>
Sent: Thursday, March 14, 2024 11:52 AM
To: Tyler Davis
Subject: Emissions for Barford 36x80 Tracked Stacker BF80T-850
Attachments: 404J-E22TA Emissions 1 BF80T-850.pdf; 404J-E22TA Emissions 2 BF80T-850.pdf

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attached is Emissions for Barford 36x80 Tracked Stacker BF80T-850 #2



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Commonwealth Equipment Corp.
36 Hazleton Street
Ashley, PA 18706

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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

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.	<i>0,009</i>	<i>0,007</i>	<i>3,15</i>	<i>3,16</i>	<i>0,0004</i>	<i>0,3</i>	<i>CI</i>
NRTC Final test result with DF	<i>0,063</i>	<i>0,016</i>	<i>3,28</i>	<i>3,3</i>	<i>0,0006</i>	<i>0,3</i>	<i>NRTC</i>

(*) 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>



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

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 Granting of a type approval
<input type="checkbox"/>	Nachtrag/Änderung zur Typgenehmigung Nr. Extension/correction to type approval no.

Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 2/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

I. Allgemeine Angaben
General data

0.1	Handelsmarke des Fahrzeugs: <i>Make of vehicle:</i>	
0.2	Fahrzeugtyp: <i>Type of vehicle:</i>	mobile Maschinen und Geräte <i>non road mobile machinery</i>
0.3	Fahrzeugausführung: <i>Sort of vehicle:</i>	entsprechend EG/2016/1628 <i>according directive EU/2016/1628</i>
0.4	Testzyklus Typ: <i>Test cycle:</i>	NRSC Test und NRTC Test <i>nach Anhang XVII EU/2017/654</i> NRSC Test and NRTC Test <i>Acc. annex XVII of EU/2017/654</i>
0.5	Name und Anschrift des Herstellers: <i>Name and address of the manufacturer:</i>	Perkins Engines Company Ltd. Frank Perkins Way Peterborough PE1 – 5FQ / United Kingdom
0.5.1	Name und Anschrift des Vertreters des Herstellers: <i>Name and address of the manufacturer representative</i>	Caterpillar Energy Solutions GmbH Attn: General Manager Research and Development Carl-Benz-Strasse 1 68167 Mannheim Germany
0.6	Bezugs-Nr. des Beschreibungsbogen: <i>Information document reference no.:</i>	NRE4V2.22HPA_Regulation EU 2016_1628
	Ausstellungsdatum: <i>Date of issue:</i>	31.07.2019
	Änderungsdatum: <i>Amendment type:</i>	--



Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 3/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

II. Prüfprotokoll Test report

1. Technische Daten des Prüfobjekts
Technical data of test-object
 - 1.1. Fahrzeugausführung (Code):
Sort of vehicle (code): ---
 - 1.2. Angaben über den Motor
Engine data
 - 1.2.1. Marke:
Make of engine Perkins Engines Company Ltd.
(404J-E22TA), also branded as
(Caterpillar C2.2)
 - 1.2.2. Klasse und Unterklasse des Motors:
Engine category and subcategory: NRE-v-4
 - 1.2.3. Typ / Ausführung:
Type / sort NRE4V2.22HPA (family)
 - 1.2.4. Stammmotor:
Parent engine: 5076/2800
 - 1.2.5. Nummer:
Number: J3400260
 - 1.2.6. Maximale Nutzleistung bei Drehzahl:
Maximum net power at speed: 55 kW/ 2800 min⁻¹
 - 1.2.7. Nennwert der Nutzleistung bei Drehzahl:
Rated net power at speed: 55 kW/ 2800 min⁻¹
 - 1.2.8. Maximales Drehmoment bei Drehzahl:
Maximum torque at speed: 270 Nm/ 1600 min⁻¹
 - 1.2.9. Zylinderzahl
Number of cylinders: 4
 - 1.2.10. Gesamthubraum:
Total cylinder displacement: 2216 cm³
 - 1.2.11. Lage der Zylinder in Block
Position of the cylinder in the block: in-line
 - 1.2.12. Arbeitsweise:
Combustion cycle: four stroke

Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 4/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

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

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 5/16

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:



Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 6/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

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

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 7/16

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

Nenn Drehzahl / *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 <i>Power absorbed by auxiliary (kW) at indicated engine speed</i>						
	Idle	63%	80%	91%	Inter- med.	Max. Power.	100%
	***	***	***	***	***	***	***
	***	***	***	***	***	***	***
	***	***	***	***	***	***	***
Total (Pf,i) (kW):	***	***	***	***	***	***	***

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 8/16

- 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 Höchstleistung ($P_{m,i}$) (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
 f_a within range 0,93 to 1,07

Ja
yes

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 9/16

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

Meereshöhe der Prüfeinrichtung (m) Entfällt
Altitude of test facility (m) not applicable

Trockener Luftdruck (kPa) Entfällt
Dry atmospheric pressure (kPa) not applicable

6.2. Zulässiger Temperaturbereich für die 20 ... 30
Einlassluft (°C)
Applicable intake air temperature range (°C)

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

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 10/16

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

Einstellung des Leistungsprüfstands (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	Nennndrehzahl 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 Leistungsprüfstands 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

Emissionen Emissions	CO (g/kWh)	HC (g/kWh)	NO_x (g/kWh)	HC+NO_x (g/kWh)	PM (g/kWh)	PN (#/kWh) (x 10¹²)
Prüfergebnis ohne Regeneration Test result without regeneration	0,0270	0,0086	3,4900	3,4986	0,0002	0,1814
Prüfergebnis mit Regeneration Test result with regeneration	0,0237	0,0539	4,9417	4,9956	0,0075	10,002 1
Zyklen Anzahl zwis. regen.* Cycles between regeneration	117	117	117	117	117	117
Zyklen Anzahl mit regen* Cycles with regeneration	2	2	2	2	2	2
IRAF Korrektur IRAF adjustment (additive)	-0,0001	0,0008	0,0244	0,0252	0,0001	0,1651
Gewichtete Emission Weighted emission	0,0269	0,0093	3,5144	3,5237	0,0004	0,3465
Leistungsklasse des Stamm Motors / Net power (P)	37 kW ≤ P < 56 kW					

* = values are not multiplied with 10¹²



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 11/16

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 ^{*)} <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					

^{*)} 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):



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 12/16

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) additiv</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)



Techn. Bericht Nr. / Techn. Report no.	19-00885-CP-GBM-00	
Hersteller / Manufacturer:	Perkins Engines Company Ltd.	Seite / page 13/16
Motortyp / type of engine:	5076/2800	
Familie / Family:	NRE4V2.22HPA	

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

7.3.1	Gasförmige Emissionen: Gaseous Emissions:	Rohgas-Probenahme <i>raw gas sampling</i>
7.3.2	PM: <i>PM:</i>	Teilstrom-Probennahme <i>partial flow sampling</i>
	Methode: <i>Method:</i>	Einfachfilter <i>single filter</i>
	Partikelanzahl: <i>Particle number:</i>	Teilstrom-Probenahme <i>partial flow sampling</i>

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

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 14/16

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

Seite / page 15/16

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

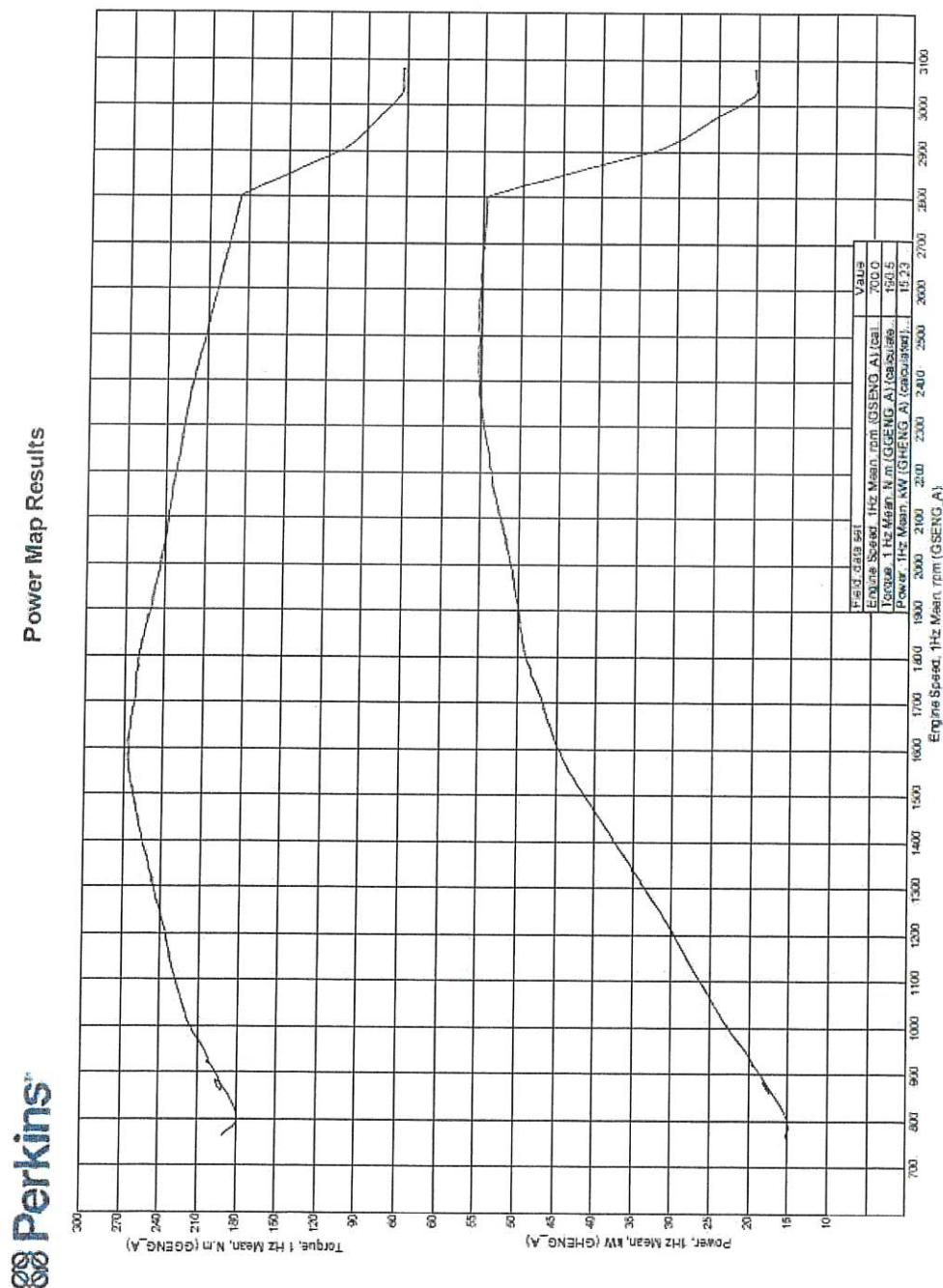
Munich, 06.09.2019

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

		56782000	61542800	51622800
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	NA
	Maximum distance	Defined by exhaust gas temp loss contained	Defined by exhaust gas temp loss contained	Defined by exhaust gas temp loss contained
3.11.1.2.	Maximum temperature drop from exhaust or turbine outlet to first after-treatment device (deg. C) if stated:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.1.2.1.	Test conditions for measurement:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.1.3.	Minimum temperature at inlet to first after-treatment device (deg. C), if stated:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.1.3.1.	Test conditions for measurement:	Per A&I guide	Per A&I guide	Per A&I guide
3.11.2.	Oxidation 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 101.8 mm/2.4l 1E4717Q	DOC 172.0 x 101.8 mm/2.4l 1E4717Q	DOC 172.0 x 101.8 mm/2.4l 1E4717Q
3.11.2.3.	Total charge of precious metals (g):	BASF Technology No - BASF-TEX-1803	BASF Technology No - BASF-TEX-1803	BASF Technology No - BASF-TEX-1803
3.11.2.4.	Relative concentration of each compound:	Monolith, Ceramic	Monolith, Ceramic	Monolith, Ceramic
3.11.2.5.	Substrate (structure and material):	DOC 46.5 cells/ccqm	DOC 46.5 cells/ccqm	DOC 46.5 cells/ccqm
3.11.2.6.	Cell density (cells/ccqm):	Stainless Steel Can	Stainless Steel Can	Stainless Steel Can
3.11.2.7.	Type of casing for the catalytic converter(s):			
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.	Contaminable 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 (CDM%) (N/A):	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.	HClx 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:	5259379, 5516657, 5522444, 5550487, 5404673, 5502842, 5515613, 5599709, 5404873, 5230556, 5516657	5259379, 5516657, 5522444, 5550487, 5404673, 5502842, 5515613, 5599709, 5404873, 5230556, 5516657	5259379, 5516657, 5522444, 5550487, 5404673, 5502842, 5515613, 5599709, 5404873, 5230556, 5516657

		5079/2000	5184/2000	5183/2000
3.11.4.3.	Dimensions and capacity of the particulate after-treatment system:	172.0 x 152.4 mm/3.5 l	172.0 x 152.4 mm/3.5 l	172.0 x 152.4 mm/3.5 l
3.11.4.4.	Location plane(s) and maximum and minimum distance(s) from engine:	In same can, immediately after DOC	In same can, immediately after DOC	In same can, immediately after DOC
	Minimum distance from engine:	Defined by DOC	Defined by DOC	Defined by DOC
	Maximum distance from engine:	Defined by DOC	Defined by DOC	Defined by DOC
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 SV, 250 - 400	Depends on SV, 250 - 400	Depends on SV, 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 borne catalyst (FBO): 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	9.5 - 23	9.5 - 23
3.11.4.10.	Storage capacity soot/wh (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) active(s):	N/A	N/A	N/A
3.11.7.1.	Type(s):	N/A	N/A	N/A
3.12.	Fuel feed for liquid-fueled CI or, where applicable, dual-fuel engines:			
3.12.1.	Feed pump:			
3.12.1.1.	Pressure (kPa) or characteristic diagram:	103.5kPa MAX	103.5kPa MAX	103.5kPa 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.	rated per stroke or cycle at full injection at rated pump speed:	48.8 ±5%	42.7 ±5%	39.3 ±5%
3.12.2.1.4.	Rated peak pump speed (rpm):	620	620	620
3.12.2.1.5.	rated per stroke or cycle at full injection at torque peak pump speed:	58 ±5%	53.8 ±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.	Stallo Timing:	10.7° BTDC	9.5° BTDC	8.1° BTDC
3.12.2.3.	Injection plating:			
3.12.2.3.1.	Length(s) (mm):	1182	1182	1182
3.12.2.3.2.	Internal diameter (mm):	3	3	3
3.12.2.4.	Common rail: Yes/No	Yes	Yes	Yes
3.12.3.	Type:	Direct Diesel Injection	Direct Diesel Injection	Direct Diesel Injection
3.12.3.1.	Type(s):	5593942	5593942	5593942
3.12.3.2.	Opening pressure (kPa):	Electronically controlled up to a maximum of 200000kPa	Electronically controlled up to a maximum of 200000kPa	Electronically controlled up to a maximum of 200000kPa
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	AA264	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 J1939-73	SAE J1939	SAE J1939	SAE J1939
3.12.5.	Glowplug:			
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:	2900 ±5	2600 ±5	2600 ±5
3.12.5.3.	Maximum no-load speed:	2940±140rpm	2940±140rpm	2940±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

		6376/2009	6154/2008	6152/2009
3.13.	Fuel feed for liquid fuel spark ignition engine	N/A	N/A	N/A
3.13.1.	Carburetor	N/A	N/A	N/A
3.13.1.1.	Type(s):	N/A	N/A	N/A
3.13.2.	Port 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 location 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/LNG/Fuel specific LNG	N/A	N/A	N/A
3.14.2.	Pressure regulator(s)/vapouriser(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 final 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.	Fueling 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.	Initial mixture ratio	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 time/s 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 pipe	N/A	N/A	N/A
3.14.5.4.1.	Type(s):	N/A	N/A	N/A
3.14.5.5.	Injector(s)	N/A	N/A	N/A
3.14.5.5.1.	Type(s):	N/A	N/A	N/A
3.14.5.	Direct injection	N/A	N/A	N/A
3.14.6.1.	Injection pressure/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.	Injector(s)	N/A	N/A	N/A
3.14.6.2.1.	Type(s):	N/A	N/A	N/A
3.14.6.2.2.	Opening 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.	Approval of engine 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/NG/Fuel 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 limit 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.	Ignition	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.	Static advance with respect to top dead centre (crank angle degrees):	N/A	N/A	N/A
3.15.4.2.	Advance curve at rpm:	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) 2017/764.

(2) Refer to section 2.4.13 in Annex IX (engine family definition).

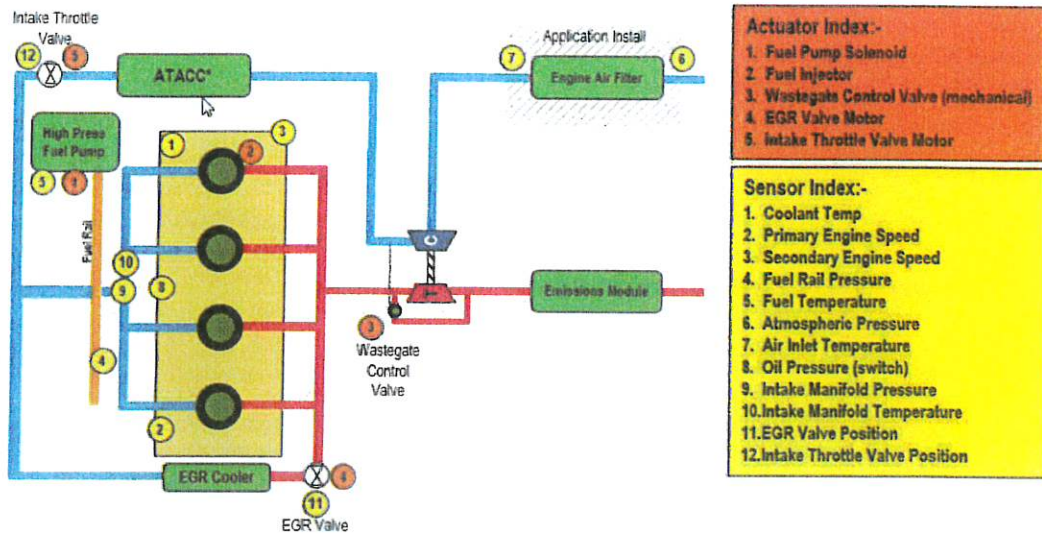
Information Document for (EU) 2016/1628

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

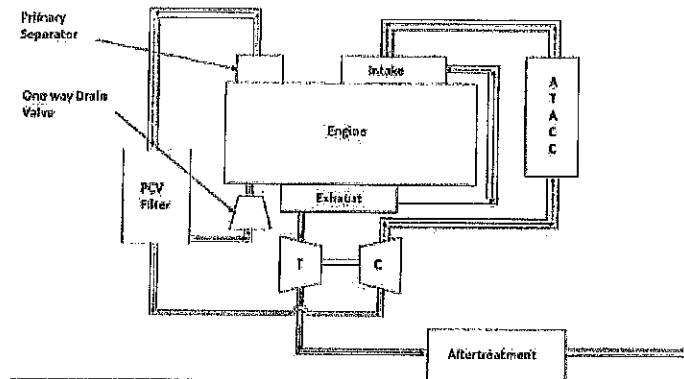
404J-E22TA Engine schematics



B 3.8.5.1

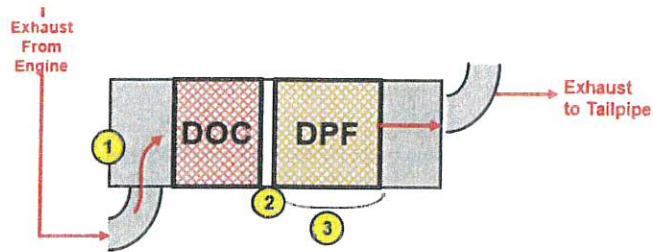
Device for recycling Crankcase Gases

Closed Circuit Breather



C 2.11. Exhaust After-treatment System Schematics

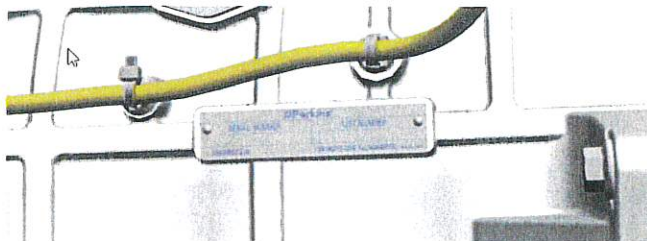
404J-E22TA After-treatment System Schematics



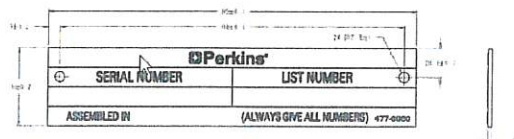
- 1 - DOC Inlet Temperature
- 2 - DPF Inlet Temperature
- 3 - Delta P Sensors

D 3.1.5 Location of the Engine Identification Number

Engine Identification Number location



Engine Identification Plate layout

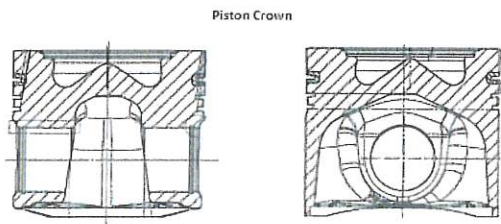
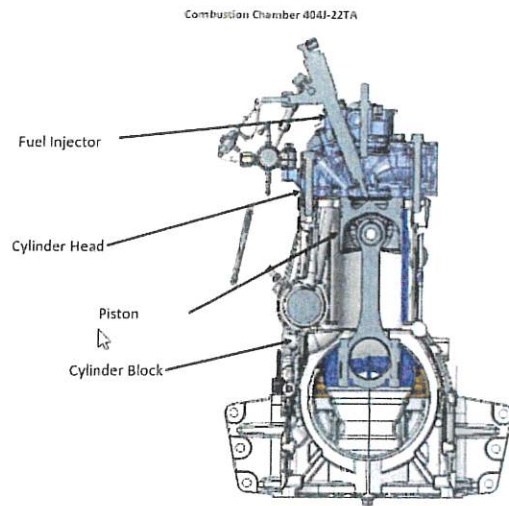


E 3.3.2 Run In Procedure

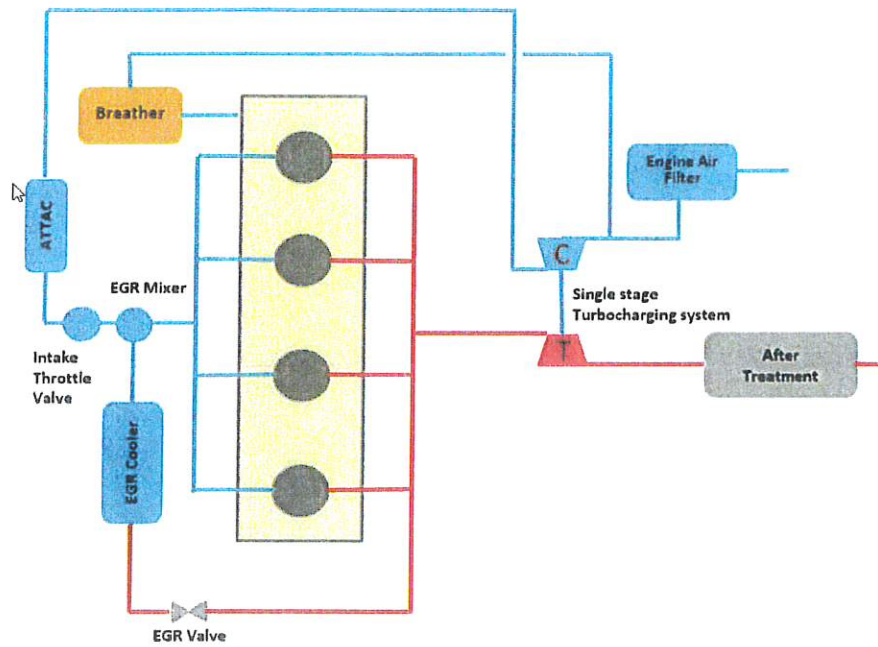
	Engine speed	Engine Load	Duration (s)	Notes
Step 1	Low idle	No load	30	All steps repeated until engine has accumulated 55 run hours
Step 2	High Idle	No load	30	
Step 3	Rated speed	Full load	90	
Step 4	Peak torque speed	Full load	90	

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