# 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) 2021/1398(1) (2) (of the European Parliament and of the Council) (1)

EU Type Approval No: ***e24*2016/1628*2021/1398SHA1/P*0537*00***

Reason for ~~extension~~/~~refusal~~/~~withdrawal~~ (1): ***- N/A***

## SECTION I

| | | |
|---|---|---|
| 1.1. | Make (trade name(s) of manufacturer): | ***ZOMAX*** |
| 1.2. | Commercial name(s) (if applicable): | ***N/A*** |
| 1.3. | Company name and address of manufacturer: | ***Zhejiang Zomax Garden Machinery Co., Ltd. No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China*** |
| 1.4. | Name and address of manufacturer's authorised representative (if any): | ***Brumar S.r.l.<br>a Socio Unico Loc. Valgera 110/B - 14100 ASTI (AT) - Italy*** |
| 1.5. | Name(s) and address(es) of assembly/manufacture plant(s): | ***Same as above 1.3*** |
| 1.6. | Engine type designation/~~engine family designation/FT~~ ([1]): | ***ZM1E40FA<br>Commercial names: 1E40FA*** |
| 1.7. | Category and sub-category of the engine type/~~engine family~~ (1) (4): | ***Category: NRSh<br>Sub-category: NRSh-v-1a*** |
| 1.8. | Emissions durability period category: | ~~***Not Applicable/Cat 1/Cat 2/Cat 3***~~ ***(1)*** |
| 1.9. | Emissions stage: | ***V/ ~~SPE~~*** |
| 1.10. | Engine for snow throwers (5): | ~~***Yes***~~***/No (1)*** |



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EU Type Approval No: ***e24*2016/1628*2021/1398SHA1/P*0537*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): | ***13.06.2022*** |
| 3. | Number(s) of test report(s): | ***22-00980-CX-SHA-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: | ***03rd August, 2022*** |
| | Name and signature (or visual representation of an 'advanced electronic signature' according to Regulation (EU)No 910/2014, including data for verification): | |

NATIONAL STANDARDS AUTHORITY OF IRELAND
NSAI Certification
TRANSPORT DEPARTMENT

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)'.



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**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(Single)*** (1) |
| 2.6 | Main Cooling medium: | ***Air/~~Water/Oil~~*** (1) |
| 2.7. | Method of air aspiration: | ***naturally aspirated/~~pressurecharged/ 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): | ***N/A*** |
| 2.8.4. | Lubricant added to fuel: | ***Yes/~~No~~*** (1)<br>***2T, FC***<br>***40:1*** |
| 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) |



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| | | |
|---|---|---|
| 2.10. | Miscellaneous devices: | |
| 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): | *N/A* |
| 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): | *N/A* |
| 2.11.9. | Other devices or features that have a strong influence on emissions (specify): | *N/A* |



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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: | ***ZM1E40FA*** | ***N/A*** |
| 3.1.2. | Engine type designation shown on engine mark: Yes/No (1) | ***Yes*** | ***N/A*** |
| 3.1.3. | Location of the manufacturer's statutory marking: | ***Refer to drawing No. 001*** | ***N/A*** |
| 3.2.1. | Declared rated speed (rpm): | ***9000*** | ***N/A*** |
| 3.2.1.2. | Declared rated net Power (kW): | ***1.6*** | ***N/A*** |
| 3.2.2. | Maximum power speed (rpm): | ***9000*** | ***N/A*** |
| 3.2.2.2. | Maximum net power (kW): | ***1.6*** | ***N/A*** |
| 3.2.3. | Declared maximum torque speed (rpm): | ***7000*** | ***N/A*** |
| 3.2.3.2. | Declared maximum torque (Nm): | ***1.9*** | ***N/A*** |
| 3.6.3. | Number of Cylinders: | ***1*** | ***N/A*** |
| 3.6.4. | Engine total swept volume ($cm^3$): | ***40.2*** | ***N/A*** |
| 3.8.5. | Device for recycling crankcase gases: ~~Yes~~/ No (1) | ***No*** | ***N/A*** |
| 3.11.3.12. | Consumable reagent: ~~Yes~~/No (1) | ***No*** | ***N/A*** |
| 3.11.3.12.1. | Type and concentration of reagent needed for catalytic action: | ***N/A*** | ***N/A*** |
| 3.11.3.13. | NOx sensor(s): ~~Yes~~/No (1) | ***No*** | ***N/A*** |
| 3.11.3.14. | Oxygen sensor: ~~Yes~~/No (1) | ***No*** | ***N/A*** |
| 3.11.4.7. | Fuel borne catalyst (FBC): ~~Yes~~/No (1) | ***No*** | ***N/A*** |



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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: | ***- 2.0*** | ***N/A*** |
| 3.8.3.2. | Maximum charge air cooler outlet temperature at 100 % speed and 100 % load (deg. C): | ***N/A*** | ***N/A*** |
| 3.8.3.3. | Maximum allowable pressure drop across charge cooler at 100 % engine speed and at 100 % load (kPa) (if applicable): | ***N/A*** | ***N/A*** |
| 3.9.3. | Maximum permissible exhaust gas backpressure at 100 % engine speed and at 100 % load (kPa): | ***5.5*** | ***N/A*** |
| 3.9.3.1 | Location of measurement: | ***Inlet of muffler*** | ***N/A*** |
| 3.11.1.2. | Maximum temperature drop from exhaust system or turbine outlet to first exhaust after-treatment system (deg. C) if stated: | ***N/A*** | ***N/A*** |
| 3.11.1.2.1. | Test conditions for measurement: | ***N/A*** | ***N/A*** |

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 × ECU torque: ***~~Yes~~/No*** [1]

3.8.2. ECU torque correction factor in case that dynamometer torque less than 0,93 × 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. | 265.6 | -* | -* | 42.1 | N/A | N/A | G3 |
| NRTC Final test result with DF | - | - | - | - | - | - | - |

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

11.2. $CO_2$ result: ***1010.2 g/kWh***



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EU Type Approval No: ***e24*2016/1628*2021/1398SHA1/P*0537*00***

11.3. In service monitoring reference values [9]

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

11.3.2. Reference $CO_2$ 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.



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# Index to the Information Package

| | |
|---|---|
| Date of issue: | ***03rd August, 2022*** |
| Date of latest amendment: | ***N/A*** |
| Reason for extension/revision: | ***N/A*** |

1. Additional conditions, and advisory notes on legal alternatives.

2. Test report(s)

| | |
|---|---|
| - numbers(s): | ***22-00980-CX-SHA-00*** |
| - date of issue: | ***13.06.2022*** |
| - date of latest amendment: | ***N/A*** |

3. Information document

| | |
|---|---|
| - number(s): | ***ZM1E40FA-ext.00*** |
| - date of issue: | ***18.05.2022*** |
| - date of latest amendment: | ***N/A*** |

Documentation: ***58 pages***



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EU Type Approval No: ***e24*2016/1628*2021/1398SHA1/P*0537*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.


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# T e s t  R e p o r t

## No.: 22-00980-CX-SHA-00

**Test in accordance with the regulation of the European Parliament and the Council on requirements**

**relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery**

| | | |
|---|---|---|
| **Regulation (EU) 2016/1628** | dated | **14.09.2016** |

Including all amendments of Commission Delegated/Implementing up to

| | | |
|---|---|---|
| **Regulation (EU) 2018/987** | dated | **27.04.2018** |
| **Regulation (EU) 2018/988** | dated | **27.04.2018** |
| **Regulation (EU) 2021/1398** | dated | **04.06.2021** |

| **Approval status** | |
|---|---|
| ☑ | Granting of a type approval |
| ☐ | Extension/correction to type approval no. : --- |

## I. General

| | | |
|---|---|---|
| Make (trade name of manufacturer) | : | ZOMAX |
| Engine type designation~~/engine family designation/FT~~ | : | ZM1E40FA<br>Commercial names: 1E40FA |
| Engine Category and subcategory | : | Category: NRSh<br>Sub-category: NRSh-v-1a |
| Name and address of manufacturer | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| Name and address of manufacturer's representative (if applicable) | : | Brumar S.r.l. a Socio Unico<br>Loc. Valgera 110/B - 14100 ASTI (AT) - ITALY |
| Address(es) of assembly plant(s) | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| Location and method of affixing of the approval mark | : | Location: Refer to drawing No. 001 of Information folder<br>Method: By engraving and/or labelling |

## II. Test results

Refer to the Annex II

## III. Enclosures

Information folder No. ZM1E40FA-ext.00 dated 18.05.2022 (dd.mm.yyyy)

## IV. Statement of conformity

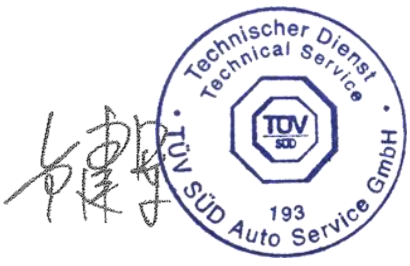
The mentioned information folder and the type described therein are in accordance with the test basis mentioned above. Sampling plan or method result from the requirements of the test basis. The worst-case configuration was selected in accordance with process description "Requirements for Test Reports (AS-PB-T-02)". Valid decision rule in accordance with ILAC G8:2019, 4.2.1: in question of meeting the limits the measurement uncertainty was ignored.

The manufacturer is responsible for the information (III.) and the test specimens provided by him. The test results relate only to the test specimens as received and mentioned (II.). The test specimens are representative for the type described (III.).

The test report may be reproduced and published in full and by the client only. It can be reproduced partially with the written permission of the test laboratory only.

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

| Approval authority | Country | Registration number |
|---|---|---|
| Kraftfahrt-Bundesamt (KBA) | Germany | KBA-P 00100-10 |
| Vehicle Certification Agency (VCA) | United Kingdom | VCA-TS-006 |
| Approval Authority of the Netherlands (RDW) | The Netherlands | RDWT-082-xx |
| National Standards Authority of Ireland (NSAI) | Ireland | Technical Service Number: 49 |
| Société Nationale de Certification et d'Homologation (SNCH) | Luxembourg | 13/B(g) |
| Swedish Transport Agency (STA) | Sweden | TT 0024 |




München, 13.06.2022 (dd.mm.yyyy)

Jianjun Lu

# Annex I Reason of Extension

Correction of : ---

Modification of : ---

Addition of : ---

Deletion of : ---

# Annex II Test results

## 1. General information

| | | | |
|---|---|---|---|
| 1.1. | Make (trade name(s) of manufacturer) | : | ZOMAX |
| 1.2. | Commercial name(s) (if applicable) | : | N/A |
| 1.3. | Company name and address of manufacturer | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| 1.4. | Name of technical service | : | TÜV SÜD Auto Service GmbH |
| 1.5. | Address of technical service | : | Westendstraße 199<br>D-80686 München |
| 1.6. | Location of test | : | Nanjing Depurate Catalyst Co., Ltd. |
| 1.7. | Date of test | : | 27.05.2022 - 11.06.2022 |
| 1.8. | Test report number | : | 22-00980-CX-SHA-00 |
| 1.9. | Information document reference number (if available) | : | ZM1E40FA-ext.00 |
| 1.10. | Test report type | : | Primary test~~/additional test/supplementary test~~ |
| 1.10.1. | Description of the purpose of the test | : | New approval test |

## 2. General engine information (test engine)

| | | | |
|---|---|---|---|
| 2.1. | Engine type designation~~/engine family designation/FT~~ | : | ZM1E40FA<br>Commercial names: 1E40FA |
| 2.2. | Engine identification number | : | ZM1E40FA22040007 |
| 2.3. | Engine category and subcategory | : | Category: NRSh<br>Sub-category: NRSh-v-1a |
| 2.4. | Worst case rationale | : | Tests are performed on the single engine.<br>Carburettor (Make: WALBRO, Model: WT805) with highest fuel delivery at maximum torque speed is selected for the tests. |

2.5. Test equipment

| | | |
|---|---|---|
| Make, type and series no. of analyser | : | HORIBA / MEXA-7200D / S2000931110000010<br>[Valid until: 21.09.2022] |
| Make, type and series no. of dynamometer | : | KEDA / HACD-3 / HA3-14046<br>[Valid until: 10.08.2022] |

**3. Documentation and information Check list (primary test only)**

| | | | |
|---|---|---|---|
| 3.1. | Engine mapping documentation reference | : | G3 cycle, tested at rated speed, manufacturer's declared rated power, rated speed checked before carrying out emission test, and the check results meet the relevant requirements in paragraph 5, annex VI, 2017/654/EU. |
| 3.2. | Deterioration factor determination documentation reference | : | See Appedix 1 |
| 3.3. | Infrequent regeneration factors determination documentation reference, where applicable | : | N/A |
| 3.4. | $NO_x$ control diagnostic demonstration documentation reference, where applicable | : | N/A |
| 3.5. | Particulate control diagnostic demonstration documentation reference, where applicable | : | N/A |
| 3.6. | For engine types and engine families that use an Electronic Control Unit (ECU) as part of the emission control system anti-tampering declaration documentation reference | : | N/A |
| 3.7. | For engine types and engine families that use mechanical devices as part of the emission control system anti-tampering and adjustable parameters declaration and demonstration documentation reference | : | Tamper-proof carburetor |

| | | | |
|---|---|---|---|
| 3.8. | Manufacturer intends to use Electronic Control Unit (ECU) torque signal for in-service monitoring | : | ~~Yes/~~No |
| 3.8.1. | Dynamometer torque greater than or equal to 0.93 × Electronic Control Unit (ECU) torque | : | ~~Yes/~~No |
| 3.8.2. | Electronic Control Unit (ECU) torque correction factor in case that dynamometer torque less than 0.93x Electronic Control Unit (ECU) torque | : | N/A |

**4. Reference fuel(s) used for test (complete relevant subparagraph(s))**

*4.1. Liquid fuel for spark-ignition engines*

| | | | |
|---|---|---|---|
| 4.1.1. | Make | : | Anhui Super Beauty Chemical Science Co., Ltd. |
| 4.1.2. | Type | : | E10 |
| 4.1.3. | Octane number RON | : | 97.3 |
| 4.1.4. | Octane number MON | : | 86.8 |
| 4.1.5. | Ethanol content (%) | : | 9.78 |
| 4.1.6. | Density at 15 Deg.C (kg/m$^3$) | : | 750.5 |

*4.2. Liquid fuel for compression-ignition engines*

| | | | |
|---|---|---|---|
| 4.2.1. | Make | : | N/A |
| 4.2.2. | Type | : | N/A |
| 4.2.3. | Cetane number | : | N/A |
| 4.2.4. | Fame content (%) | : | N/A |
| 4.2.5. | Density at 15 Deg.C (kg/m$^3$) | : | N/A |

*4.3. Gaseous fuel – LPG*

| | | | |
|---|---|---|---|
| 4.3.1. | Make | : | N/A |
| 4.3.2. | Type | : | N/A |
| 4.3.3. | Reference fuel type | : | ~~Fuel A/Fuel B~~ |
| 4.3.4. | Octane number MON | : | N/A |

*4.4. Gaseous fuel- Methane/biomethane*

| | | | |
|---|---|---|---|
| 4.4.1. | Reference fuel type: $G_R$/$G_{23}$/$G_{25}$/$G_{20}$ | : | N/A |

| | | | |
|---|---|---|---|
| 4.4.2. | Source of reference gas | : | ~~specific reference fuel/pipeline gas with admixture~~ |
| 4.4.3. | For specific reference fuel | | |
| 4.4.3.1. | Make | : | N/A |
| 4.4.3.2. | Type | : | N/A |
| 4.4.4. | For pipeline gas with admixture | | |
| 4.4.4.1. | Admixture(s): | : | ~~Carbon dioxide/Ethane/Methane/ Nitrogen/Propane~~ |
| 4.4.4.2. | The value of Sλ for the resulting fuel blend: | : | N/A |
| 4.4.4.3. | The Methane Number (MN) of the resulting fuel blend | : | N/A |
| *4.5.* | *Dual fuel engine (in addition to relevant sections above)* | | |
| 4.5.1. | Gas energy ratio on test cycle | : | N/A |

**5. Lubricant**

| | | | |
|---|---|---|---|
| 5.1. | Make(s) | : | Mobil |
| 5.2. | Type(s) | : | 2T FC |
| 5.3. | SAE viscosity | : | 5W/40 |
| 5.4. | Lubricant and fuel are mixed | : | yes/~~no~~ |
| 5.4.1. | Percentage of oil in mixture | : | 1:40 |

**6. Engine Speed**

| | | | |
|---|---|---|---|
| 6.1. | 100% speed (rpm) | : | 9000 |
| 6.1.1. | 100% speed determined by | : | Declared rated speed/~~Declared MTS/Measured MTS~~ |
| 6.1.2. | Adjusted MTS if applicable (rpm) | : | N/A |
| 6.2. | Intermediate speed (rpm) | : | N/A |
| 6.2.1. | Intermediate speed determined by | : | ~~Declared intermediate speed/Measured intermediate speed/60% of 100% speed/75% of 100% speed /85% of 100% speed~~ |
| 6.3. | Idle speed (rpm) | : | 3200 |

## 7. Engine Power

7.1. Engine driven equipment (if applicable)

~~7.1.1. 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 shown in Table 1:~~

**~~Table 1~~**

**~~Power absorbed by engine auxiliaries~~**

| ~~Auxiliary type and identifying details~~ | ~~Power absorbed by auxiliaries (kW) at indicated engine speed (complete relevant columns)~~ | | | | | | |
|---|---|---|---|---|---|---|---|
| | ~~Idle~~ | ~~63%~~ | ~~80%~~ | ~~91%~~ | ~~Inter-mediate~~ | ~~Max. power~~ | ~~100%~~ |
| ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Total ($P_{r,i}$):~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |

~~7.1.2. Power absorbed at indicated engine speeds by auxiliaries linked with operation of the machine that cannot be removed for the test (as specified by the manufacturer) to be shown in Table 2:~~

**~~Table 2~~**

**~~Power absored by non-road mobile machinery auxiliaries~~**

| ~~Auxiliary type and identifying details~~ | ~~Power absorbed by auxiliary (kW) at indicated engine speed (complete relevant columns)~~ | | | | | | |
|---|---|---|---|---|---|---|---|
| | ~~Idle~~ | ~~63%~~ | ~~80%~~ | ~~91%~~ | ~~Inter-mediate~~ | ~~Max. power~~ | ~~100%~~ |
| ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Total ($P_{r,i}$):~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |

7.2. Engine net power to be stated in Table 3

**Table 3**

**Engine net power**

| Condition | Engine net Power (kW) at indicated engine speed (complete relevant columns) | | |
|---|---|---|---|
| | Intermediate | Max. power | 100% |
| Maximum power measured at specified test speed ($P_{m,i}$) | N/A | 1.6 | 1.6 |
| Total auxiliary power from table 1 ($P_{f,i}$) | N/A | 0 | 0 |
| Total auxiliary power from table 2 ($P_{r,i}$) | N/A | 0 | 0 |
| Net engine power $Pi = P_{m,i} - P_{f,i} + P_{r,i}$ | N/A | 1.6 | 1.6 |

**8. Conditions at test**

8.1. $f_a$ within range 0.93 to 1.07 : Yes~~/No~~

8.1.1. If $f_a$ is not within specified range state altitude of test facility and dry atmospheric pressure : N/A

8.2. Applicable intake air temperature range : 20 to 30~~/0 to -5(snow throwers only)/-5 to -15(snowmobiles only)/20 to 35(NRE greater than 560 kW only)~~ : Yes

**9. Information concerning the conduct of the NRSC test:**

9.1 Cycle (mark cycle used with X) to be stated in Table 4:

**Table 4**

**NRSC test cycle**

| Cycle | C1 | C2 | D2 | E2 | E3 | F | G1 | G2 | G3 | H |
|---|---|---|---|---|---|---|---|---|---|---|
| Discrete mode | - | - | - | - | - | - | - | - | x | - |
| RMC | - | - | - | - | - | - | - | - | N/A | - |

The length of each mode : 3 minutes

Sampling time for each mode : 2 minutes

9.2. Dynamometer setting (kW) to be stated in Table 5:

**Table 5**

**Dynamometer setting**

| % Load at point or % of rated power (as applicable) | Dynamometer setting (kW) at indicated engine speed after adjustment for auxiliary power(1) (complete relevant columns) | | | | | |
|---|---|---|---|---|---|---|
| | Idle | 63% | 80% | 91% | Inter-mediate | 100% |
| 5% | - | - | - | - | - | - |
| 10% | - | - | - | - | - | - |
| 25% | - | - | - | - | - | - |
| 50% | - | - | - | - | - | - |
| 75% | - | - | - | - | - | - |
| 100% | - | - | - | - | - | 1.6 |

(1) 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 out in Tables 1 and 2 of this Appendix.

9.3. NRSC Emission results

9.3.1. Deterioration Factor (DF): calculated~~/assigned~~

9.3.2. Specify the DF values and the cycle weighted emission results in the following table

*Note*: In the event that a discrete mode NRSC is run where the $K_{ru}$ or $K_{rd}$ factors have been established for individual modes then a table showing each mode and the applied $K_{ru}$ or $K_{rd}$ should replace the shown table

**Table 6**

**NRSC cycle DF values and weighted emissions results**

| DF mult~~/add~~ | CO | HC | $NO_x$ | $HC+NO_x$ | PM | PN |
|---|---|---|---|---|---|---|
| | 1.00 | -* | -* | 1.07 | N/A | N/A |
| Emissions | CO (g/kWh) | HC (g/kWh) | $NO_x$ (g/kWh) | $HC+NO_x$ (g/kWh) | PM (g/kWh) | PN #/kWh |
| Test result ~~with/~~without regeneration | 265.63 | 39.10 | 0.35 | 39.45 | N/A | N/A |
| $k_{ru}/k_{rd}$ mult~~/add~~ | N/A | N/A | N/A | N/A | N/A | N/A |
| test result with infrequent regeneration adjustment ( IRAFs) | N/A | N/A | N/A | N/A | N/A | N/A |
| **Final test result with DF** | 265.6 | -* | -* | 42.1 | N/A | N/A |

9.3.3. Cycle weighted $CO_2$ (g/kWh) : 1010.2

9.3.4. Cycle weighted $NH_3$ (ppm) : N/A

~~9.4. Additional control area test points (if applicable) to be stated in Table 7:~~

**~~Table 7~~**

**~~Additional control area test points~~**

| ~~Emissions at test point~~ | ~~Engine Speed~~ | ~~Load (%)~~ | ~~CO (g/kWh)~~ | ~~HC (g/kWh)~~ | ~~$NO_x$ (g/kWh)~~ | ~~HC+$NO_x$ (g/kWh)~~ | ~~PM (g/kWh)~~ | ~~PN n/kWh~~ |
|---|---|---|---|---|---|---|---|---|
| ~~Test result 1~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Test result 2~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Test result 3~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |

9.5. Sampling systems used for the NRSC test

9.5.1. Gaseous emissions : Sampling system for diluted exhaust

9.5.2. PM : N/A

9.5.2.1. Method : ~~single/multiple filter~~

9.5.3. Particle number : N/A

## 10. Information concerning the conduct of the NRTC test (if applicable)

~~10.1. Cycle (mark cycle with X) to be stated in Table 8:~~

**~~Table 8~~**

**~~Transient test cycle~~**

| | |
|---|---|
| ~~NRTC~~ | ~~-~~ |
| ~~LSI-NRTC~~ | ~~-~~ |

~~10.2. NRTC deterioration factors:~~

~~10.2.1. Deterioration Factor (DF)~~ : ~~calculated/fixed~~

~~10.2.2. DF values and the emissions results to be stated in Table 9 or in Table 10~~

~~10.3. NRTC emission results~~

**~~Table 9~~**

**~~DF values and the emission results for NRTC~~**

| ~~DF mult/add~~ | ~~CO~~ | ~~HC~~ | ~~$NO_x$~~ | ~~$HC+NO_x$~~ | ~~PM~~ | ~~PN~~ |
|---|---|---|---|---|---|---|
| | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Emissions~~ | ~~CO (g/kWh)~~ | ~~HC (g/kWh)~~ | ~~$NO_x$ (g/kWh)~~ | ~~$HC+NO_x$ (g/kWh)~~ | ~~PM (g/kWh)~~ | ~~PN #/kWh~~ |
| ~~Cold start~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Hot start test result with/without regeneration~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Weighted test result~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~$k_{ru}/k_{rd}$ mult/add~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| ~~Weighted test result with IRAFs~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| **~~Final test result with DF~~** | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |

~~10.3.1 Hot cycle $CO_2$ (g/kWh) :~~

~~10.3.2. Cycle weighted $NH_3$ (ppm) :~~

~~10.3.3. Cycle work for hot start test (kWh) :~~

~~10.3.4. Cycle $CO_2$ for hot start test (g) :~~

~~10.4. LSI-NRTC emission results~~

**~~Table 10~~**

**~~DF values and the emissions results for LSI-NRTC~~**

| ~~DF mult/add~~ | ~~CO~~ | ~~HC~~ | ~~$NO_x$~~ | ~~$HC+NO_x$~~ | ~~PM~~ | ~~PN~~ |
|---|---|---|---|---|---|---|
| | - | - | - | - | - | - |
| ~~Emissions~~ | ~~CO (g/kWh)~~ | ~~HC (g/kWh)~~ | ~~$NO_x$ (g/kWh)~~ | ~~$HC+NO_x$ (g/kWh)~~ | ~~PM (g/kWh)~~ | ~~PN #/kWh~~ |
| ~~test result with/without regeneration~~ | - | - | - | - | - | - |
| ~~$k_{ru}/k_{rd}$ mult/add~~ | - | - | - | - | - | - |
| ~~Weighted test result with IRAFs~~ | - | - | - | - | - | - |
| **~~Final test result with DF~~** | - | - | - | - | - | - |

~~10.4.1. Cycle $CO_2$ (g/kWh) :~~

~~10.4.2. Cycle $NH_3$ (ppm) :~~

~~10.4.3. Cycle work (kWh) :~~

~~10.4.4. Cycle $CO_2$ (g) :~~

~~10.5. Sampling system used for the NRTC test :~~

~~10.5.1. Gaseous emissions :~~

~~10.5.2. PM :~~

~~10.5.3. Particle number :~~

## 11. Final emission result

11.1 Cycle emissions results to be stated in Table 11.

**Table 11**

**Final emissions results**

| Emissions | CO (g/kWh) | HC (g/kWh) | $NO_x$ (g/kWh) | HC+$NO_x$ (g/kWh) | PM (g/kWh) | PN #/kWh | Test Cycle(1) |
|---|---|---|---|---|---|---|---|
| NRSC final result with DF(2). | 265.6 | -* | -* | 42.1 | N/A | N/A | G3 |
| NRTC Final test result with DF(3) | - | - | - | - | - | - | - |

11.2 $CO_2$ result (g/kWh) (4) : 1010.2

11.3. In service monitoring reference values (5) : N/A

11.3.1. Reference work (kWh) (6) : N/A

11.3.2. Reference CO2 mass (g) (7) : N/A

*(Footnote markers, footnotes and explanatory notes not to be stated on the test report)*

( 1 ) For NRSC indicate the cycle noted in point 9.1 (Table 4); for transient test indicate cycle noted in point 10.1 (Table 8).

( 2 ) Copy the 'Final test result with DF' results from Table 6.

( 3 ) Copy 'Final test result with DF' results from Table 9 or 10, as applicable.

( 4 ) For an engine type or engine family that is tested on both the NRSC and a transient cycle, indicate the hot cycle CO 2 emissions values from the NRTC noted in point 10.3.4 or the CO 2 emissions values from the LSI-NRTC noted in point 10.4.4. For an engine only tested on an NRSC indicate the CO 2 emissions values given in that cycle noted in point 9.3.3.

( 5 ) Only applicable to engines of sub-categories NRE-v-5 and NRE-v-6 tested on NRTC.

( 6 ) Indicate the cycle work for hot start test value from the NRTC noted in point 10.3.3.

( 7 ) Indicate the cycle CO 2 for hot start test value from the NRTC noted in point 10.3.4.

## Appendix 1 Determination of deterioration factor

Engine type ZM1E40FA (engine No: ZM1E40FA22040007)

| | New stabilized engine | engine after 50 hours' aging cycle | DF |
|---|---|---|---|
| CO | 265.63 g/kWh | 238.35 g/kWh | 1.00 |
| HC | 39.10 g/kWh | 41.36 g/kWh | -* |
| $NO_x$ | 0.35 g/kWh | 0.69 g/kWh | -* |
| HC + NOx | 39.45 g/kWh | 42.05 g/kWh | 1.07 |

* Separate DF for HC and NOx are not required for engine categories and sub-categories NRSh and NRS, except for NRS-v-2band NRS-v-3.

**Aging cycle** (started at 30.05.2022)
[only as sample, the complete file is available]

| ZM1E40FA | Durability test equipment No:HACD-3（KEDA03） | | | | | | | Run By: Xieyi, Liubenrong<br>Record by: Guolongping | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Durability data | Durability hours | Load percent | Durability time | parameters | | | | | | | | | |
| | h | % | min | Engine speed | torque | power | Fuel flow | Fuel flow rate | Temperature of spark plug washer | Air pressure | Ambient temperature | Relative humidity | Durability time record |
| | | | | r/min | N.m | kW | kg/h | g/kW.h | ºC | kPa | ºC | % | |
| 2022.05.30 | 0 | 100 | 2 | 9003 | 1.66 | 1.56 | 0.729 | 467 | 230 | 100.3 | 28.4 | 71.1 | 8:00 |
| | 2 | 100 | 2 | 9005 | 1.67 | 1.57 | 0.731 | 466 | 231 | 100.3 | 28.4 | 71.1 | 10:00 |
| | 4 | 100 | 2 | 9006 | 1.66 | 1.57 | 0.730 | 465 | 231 | 100.4 | 29.1 | 71.0 | 12:00 |
| | 6 | 100 | 2 | 9001 | 1.66 | 1.56 | 0.728 | 467 | 234 | 100.4 | 29.5 | 71.0 | 14:00 |
| | 8 | 100 | 2 | 8998 | 1.67 | 1.57 | 0.726 | 462 | 235 | 100.4 | 29.1 | 71.0 | 16:00 |
| | 10 | 100 | 2 | 9002 | 1.65 | 1.56 | 0.729 | 467 | 235 | 100.4 | 28.7 | 71.0 | 18:00 |
| | 12 | 100 | 2 | 9004 | 1.65 | 1.56 | 0.730 | 468 | 236 | 100.4 | 28.6 | 71.1 | 20:00 |
| | 14 | 100 | 2 | 9001 | 1.67 | 1.57 | 0.733 | 467 | 235 | 100.4 | 28.0 | 71.1 | 22:00 |
| 2022.05.31 | 16 | 100 | 2 | 9006 | 1.66 | 1.57 | 0.734 | 468 | 236 | 100.4 | 27.3 | 71.1 | 00:00 |
| | 18 | 100 | 2 | 9005 | 1.67 | 1.57 | 0.733 | 467 | 235 | 100.5 | 27.1 | 71.1 | 02:00 |
| | 20 | 100 | 2 | 9007 | 1.67 | 1.58 | 0.735 | 465 | 235 | 100.5 | 27.3 | 71.1 | 04:00 |
| | 22 | 100 | 2 | 9006 | 1.67 | 1.57 | 0.732 | 466 | 237 | 100.5 | 27.1 | 71.1 | 06:00 |
| | 24 | 100 | 2 | 9006 | 1.65 | 1.56 | 0.731 | 469 | 235 | 100.4 | 27.8 | 71.0 | 08:00 |
| | 26 | 100 | 2 | 9003 | 1.66 | 1.56 | 0.730 | 468 | 236 | 100.4 | 28.1 | 71.0 | 10:00 |
| | 28 | 100 | 2 | 9005 | 1.66 | 1.57 | 0.727 | 463 | 239 | 100.4 | 28.3 | 71.0 | 12:00 |
| | 30 | 100 | 2 | 9002 | 1.67 | 1.57 | 0.729 | 464 | 238 | 100.4 | 28.8 | 71.0 | 14:00 |
| | 32 | 100 | 2 | 9003 | 1.65 | 1.56 | 0.726 | 465 | 240 | 100.4 | 28.4 | 71.0 | 16:00 |
| | 34 | 100 | 2 | 9001 | 1.66 | 1.56 | 0.730 | 468 | 239 | 100.4 | 28.7 | 71.0 | 18:00 |
| | 36 | 100 | 2 | 9005 | 1.66 | 1.57 | 0.731 | 466 | 237 | 100.4 | 28.7 | 71.0 | 20:00 |
| | 38 | 100 | 2 | 9006 | 1.65 | 1.56 | 0.729 | 467 | 239 | 100.4 | 28.4 | 71.1 | 22:00 |
| 2022.06.01 | 40 | 100 | 2 | 9007 | 1.66 | 1.57 | 0.732 | 466 | 237 | 100.5 | 27.6 | 71.1 | 00:00 |
| | 42 | 100 | 2 | 9004 | 1.68 | 1.58 | 0.730 | 462 | 238 | 100.5 | 27.4 | 71.1 | 02:00 |
| | 44 | 100 | 2 | 9005 | 1.68 | 1.58 | 0.731 | 463 | 237 | 100.5 | 27.4 | 71.1 | 04:00 |
| | 46 | 100 | 2 | 9003 | 1.68 | 1.58 | 0.729 | 461 | 239 | 100.5 | 27.3 | 71.1 | 06:00 |
| | 48 | 100 | 2 | 9006 | 1.67 | 1.57 | 0.728 | 464 | 240 | 100.4 | 28.0 | 71.0 | 08:00 |
| | 50 | 100 | 2 | 9007 | 1.68 | 1.58 | 0.730 | 462 | 240 | 100.4 | 28.3 | 71.0 | 10:00 |
| | Emission test (50h) | | | | | | | | | | | | |

# PARTIAL MODEL INFORMATION DOCUMENT

No.: ZM1E40FA-ext.00

# ZOMAX

**ZHEJIANG ZOMAX GARDEN MACHINERY CO., LTD.**

**ENGINE TYPE :** **ZM1E40FA**

**SUBJECT :** **NRMM EMISSION**

**LEGAL BASIS :** **2016/1628/EU**

Date : 2022-05-18[YYYY-MM-DD]

Approval : Huang xinyue



e24*2016/1628*2021/1398SHA1/P*0537*00

**AMENDMENT**

| Version | Approval No. | Modification / Correction | Date |
|---|---|---|---|
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |

**CONTENT**

**Part A**

**1. General information**

| | | | |
|---|---|---|---|
| 1.1. | Make (trade name(s) of manufacturer) | : | ZOMAX |
| 1.2. | Commercial name(s) (if applicable) | : | N/A |
| 1.3. | Company name and address of manufacturer | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| 1.4. | Name and address of manufacturer's authorised representative (if any) | : | Brumar S.r.l. a Socio Unico<br>Loc. Valgera 110/B - 14100 ASTI (AT) - ITALY |
| 1.5. | Name(s) and address(es) of assembly/manufacture plant(s) | : | Same as above 1.3 |
| 1.6. | Engine type designation~~/engine family designation/FT~~ | : | ZM1E40FA<br>Commercial names: 1E40FA |
| 1.7. | Category and sub-category of the engine type/~~engine family~~ | : | Category: NRSh<br>Sub-category: NRSh-v-1a |
| 1.8. | Emissions durability period category | : | Cat 1 (Consumer products) |
| 1.9. | Emissions stage | : | V~~/Special Purpose Engine (SPE)~~ |
| 1.10. | In case of NRS <19 kW only, engine family consisting exclusively of engine types for snow throwers | : | ~~Yes/~~No |
| 1.11. | Reference power is | : | ~~rated net power/~~maximum net power |
| 1.12. | Primary NRSC test cycle | : | ~~C1/C2/D2/E2/E3/F/G1/G2/~~G3~~/H~~ |
| 1.12.1. | In case of variable speed IWP category only, Additional propulsion test cycle | : | Not applicable~~/E2/E3~~ |
| 1.12.2. | In case of IWP category only, additional auxiliary NRSC test cycle | : | Not applicable~~/D2/C1~~ |
| 1.13. | Transient test cycle | | Not applicable~~/NRTC/LSI-NRTC~~ |
| 1.14. | Restrictions on use (if applicable) | : | N/A |

**Part B**

| | | | |
|---|---|---|---|
| **2.** | **Common design parameters of engine family** | | |
| 2.1. | Combustion Cycle | : | ~~four stroke cycle/~~two stroke cycle~~/rotary/other (specify)~~ |
| 2.2. | Ignition Type | : | ~~Compression ignition/~~spark ignition |
| **2.3.** | **Configuration of the cylinders** | | |
| 2.3.1. | Position of the cylinders in the block | : | Single~~/V/in-line/opposed/radial/other(specify)~~ |
| 2.3.2. | Bore centre to centre dimension (mm) | : | N/A |
| **2.4.** | **Combustion chamber type/design** | | |
| 2.4.1. | Open chamber/divided chamber/other(specify) | : | Hemispheric chamber |
| 2.4.2. | Valve and porting configuration | : | Refer to drawing No. 002 |
| 2.4.3. | Number of valves per cylinder | : | One in and one out |
| 2.5. | Range of swept volume per cylinder ($cm^3$) | : | See item 3.6.4. in Part C |
| 2.6. | Main Cooling medium | : | Air~~/Water/Oil~~ |
| 2.7. | Method of air aspiration | : | naturally aspirated~~/pressure charged/pressure charged with charge cooler~~ |
| **2.8.** | **Fuel** | | |
| 2.8.1. | Fuel Type | : | ~~Diesel (non-road gas-oil)/Ethanol for dedicated compression ignition engines (ED95)/~~Petrol (E10)~~/Ethanol (E85)/Natural gas/Biomethane/Liquid Petroleum Gas (LPG)~~ |
| 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~~ |
| 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) | : | N/A |
| 2.8.4. | Lubricant added to fuel | : | Yes~~/No~~ |
| 2.8.4.1. | Specification | : | 2T, FC |
| 2.8.4.2. | Ratio of fuel to oil | : | 40:1 |
| 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)~~ : |
| 2.9. | Engine management systems | : | mechanical~~/electronic control strategy~~(2) |

| | | | |
|---|---|---|---|
| **2.10.** | **Miscellaneous devices** | | |
| 2.10.1. | Exhaust gas recirculation: Yes/No<br>(if yes, complete section 3.10.1. and provide a schematic diagram of the location and order of the devices) | : | No |
| 2.10.2. | Water injection: Yes/No<br>(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: Yes/No<br>(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: Yes/No<br>(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~~/No~~** |
| 2.11.1. | Oxidation catalyst<br>(if yes, complete section 3.11.2.) | : | Yes~~/No~~ |
| 2.11.2. | DeNOx system with selective reduction of NOx (addition of reducing agent)<br>(if yes, complete section 3.11.3.) | : | ~~Yes/~~No |
| 2.11.3. | Other DeNOx systems<br>(if yes, complete section 3.11.3.) | : | ~~Yes/~~No |
| 2.11.4. | Three-way catalyst combining oxidation and NOx reduction<br>(if yes, complete section 3.11.3.) | : | ~~Yes/~~No |
| 2.11.5. | Particulate after-treatment system with passive regeneration<br>(if yes, complete section 3.11.4.) | : | ~~Yes/~~No |
| 2.11.5.1. | Wall-flow/non-wall-flow | : | N/A |
| 2.11.6. | Particulate trap with active regeneration<br>(if yes, complete section 3.11.4.) | : | ~~Yes/~~No |
| 2.11.6.1. | Wall-flow/non-wall-flow | : | N/A |
| 2.11.7. | Other particulate after-treatment systems<br>(if yes, complete section 3.11.4.) | : | ~~Yes/~~No |
| 2.11.8. | Other after-treatment devices (specify)<br>(if yes, complete section 3.11.5.) | : | ~~Yes/~~No |
| 2.11.9. | Other devices or features that have a strong influence on emissions<br>(if yes, complete section 3.11.7.) | : | ~~Yes/~~No |



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**Part C**

**3. Essential characteristics of the engine type(s)**

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| **3.1** | **Engine Identification** | | | | | | | |
| 3.1.1. | Engine type designation | | | X | ZM1E40FA | | | |
| 3.1.2. | Engine type designation shown on engine marking: | | | X | Yes | | | |
| 3.1.3. | Location of the statutory marking: | | | X | Refer to drawing No. 001 | | | |
| 3.1.4. | Method of attachment of the statutory marking: | | | X | By engraving and/or labelling | | | |
| 3.1.5. | Drawings of the location of the engine identification number (complete example with dimensions): | | | X | Refer to drawing No. 001 | | | |
| **3.2.** | **Performance Parameters** | | | | | | | |
| 3.2.1. | Declared rated speed (rpm): | X | | | 9000 | | | |
| 3.2.1.1. | ~~Fuel delivery/stroke ($mm^3$) for diesel engine,~~ fuel flow (g/h) for other engines, at rated net power: | | | X | 730 | | | |
| 3.2.1.2. | Declared rated net power (kW): | X | | | 1.6 | | | |
| 3.2.2. | Maximum power speed(rpm): | | | X | Same as above 3.2.1. | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.2.2.1. | ~~Fuel delivery/stroke ($mm^3$) for diesel engine,~~ fuel flow (g/h) for other engines, at maximum net power | | | X | Same as above 3.2.1.1. | | | |
| 3.2.2.2. | Maximum net power (kW): | X | | X | Same as above 3.2.1.2. | | | |
| 3.2.3. | Declared maximum torque speed (rpm): | X | | | 7000 | | | |
| 3.2.3.1. | ~~Fuel delivery/stroke ($mm^3$) for diesel engine,~~ fuel flow (g/h) for other engines, at maximum torque speed: | | | X | 650 | | | |
| 3.2.3.2. | Declared maximum torque (Nm): | X | | | 1.9 | | | |
| 3.2.4. | Declared 100% test speed: | X | | | 9000 | | | |
| 3.2.5. | Declared Intermediate test speed: | X | | | N/A | | | |
| 3.2.6. | Idle speed (rpm) | X | | | 3200±300 | | | |
| 3.2.7. | Maximum no load speed (rpm): | X | | | 12500 | | | |
| 3.2.8. | Declared minimum torque (Nm) | X | | | N/A | | | |
| **3.3.** | **Run-in procedure** | | | | | | | |
| 3.3.1. | Run in time: | X | | | 1 hour | | | |
| 3.3.2. | Run-in cycle: | X | | | G3 | | | |
| **3.4.** | **Engine test** | | | | | | | |
| 3.4.1. | Specific fixture required: Yes/No | X | | | No | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 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: | X | | | N/A | | | |
| 3.4.2. | Exhaust mixing chamber permitted by manufacturer: Yes/No | X | | | No | | | |
| 3.4.2.1. | exhaust mixing chamber description, photograph and/or drawing: | X | | | N/A | | | |
| 3.4.3. | Manufacturers chosen NRSC: RMC/Discrete mode | X | | | Discrete mode | | | |
| 3.4.4. | Additional NRSC: E2/D2/C1 | X | | | N/A | | | |
| 3.4.5. | Number of pre-conditioning cycles prior to transient test | X | | | N/A | | | |
| 3.4.6. | Pre-conditioning for RMC NRSC: Steady-state operation/RMC | X | | | N/A | | | |
| 3.4.6.1. | In case of RMC, number of pre-conditioning RMC prior to RMC NRSC test | X | | | N/A | | | |
| **3.5.** | **Lubrication system** | | | | | | | |
| 3.5.1. | *Lubricant temperature* | | | | | | | |
| 3.5.1.1. | Minimum (deg. °C): | X | | | N/A | | | |
| 3.5.1.2. | Maximum (deg. °C): | X | | | N/A | | | |
| **3.6.** | **Combustion Cylinder** | | | | | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.6.1. | Bore(mm): | | | X | 40 | | | |
| 3.6.2. | Stroke(mm): | | | X | 32 | | | |
| 3.6.3. | Number of cylinders: | | | X | 1 | | | |
| 3.6.4. | Engine total swept volume ($cm^3$): | | | X | 40.2 | | | |
| 3.6.5. | Swept volume per cylinder as % of parent engine: | | | X | 100% | | | |
| 3.6.6. | Volumetric compression ratio: | | | X | 8:1 | | | |
| 3.6.7. | Combustion system description: | | | X | Spark ignition | | | |
| 3.6.8. | Drawings of combustion chamber and piston crown: | | | X | Refer to drawing no. 002 | | | |
| 3.6.9. | Minimum cross sectional area of inlet and outlet ports ($mm^2$): | | | X | Inlet 204$mm^2$, Outlet 166$mm^2$ | | | |
| 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: | | | X | Refer to drawing No. 005 | | | |
| 3.6.10.2. | Reference and/or setting range: | | | X | N/A | | | |
| 3.6.10.3. | Variable valve timing system: Yes/No | | | X | No | | | |
| 3.6.10.3.1. | Type: continuous/(on/off) | | | X | N/A | | | |
| 3.6.10.3.2. | Cam phase shift angle: | | | X | N/A | | | |
| 3.6.11. | Porting configuration | | | | | | | |
| 3.6.11.1. | positon, size and number: | | | X | Refer to drawing No. 002 | | | |
| **3.7.** | **Cooling system** | | | | | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.7.1. | *Liquid cooling* | | | | N/A | | | |
| 3.7.1.1. | Nature of liquid: | | | X | No | | | |
| 3.7.1.2. | Circulating pumps: Yes/No | | | X | N/A | | | |
| 3.7.1.2.1. | type(s): | | | X | N/A | | | |
| 3.7.1.2.2. | Drive ratio(s): | | | X | N/A | | | |
| 3.7.1.3. | Minimum coolant temperature at outlet (deg. °C): | X | | | N/A | | | |
| 3.7.1.4. | Maximum coolant temperature at outlet (deg. °C): | X | | | | | | |
| 3.7.2. | *Air cooling* | | | | | | | |
| 3.7.2.1. | fan: Yes/No | | | X | Yes | | | |
| 3.7.2.1.0. | Make: | | | X | XINYA | | | |
| 3.7.2.1.1. | type(s): | | | X | 4.009.0012.09 | | | |
| 3.7.2.1.2. | Drive ratio(s): | | | X | 1:1 | | | |
| 3.7.2.2. | Maximum temperature at reference point (deg. °C): | | | X | 240 | | | |
| 3.7.2.2.1. | Reference point location | | | X | Spark plug washer | | | |
| **3.8.** | **Aspiration** | | | | | | | |
| 3.8.1. | Maximum allowable intake depression at 100% engine speed and at 100% load (kPa) | X | X | | | | | |
| 3.8.1.1. | With clean air cleaner: | X | X | | -2.0 | | | |
| 3.8.1.2. | With dirty air cleaner: | X | X | | -2.0 | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.8.1.3. | Location, of measurement: | X | X | | Behind air filter | | | |
| 3.8.2. | Pressure charger(s): Yes/No | | | X | No | | | |
| 3.8.2.0. | Make: | | | X | N/A | | | |
| 3.8.2.1. | Type(s): | | | X | N/A | | | |
| 3.8.2.2. | Description and schematic diagram of the system (e.g. maximum charge pressure, waste gate, VGT, Twin turbo, etc.): | | | X | N/A | | | |
| 3.8.3. | Charge air cooler: Yes/No | X | X | | No | | | |
| 3.8.3.1. | Type: air-air/air-water/other(specify) | | X | | N/A | | | |
| 3.8.3.2. | Maximum charge air cooler outlet temperature at 100% speed and 100% load (deg. °C): | X | X | | N/A | | | |
| 3.8.3.3. | Maximum allowable pressure drop across charge cooler at 100% engine speed and at 100% load (kPa): | X | X | | N/A | | | |
| 3.8.4. | Intake throttle valve: Yes/No | | | X | Yes | | | |
| 3.8.5. | Device for recycling crankcase gases: Yes/No | | | X | No | | | |
| 3.8.5.1. | If yes, description and drawings: | | | X | N/A | | | |
| 3.8.5.2. | If no, compliance with paragraph 6.10 of Annex VI to Delegated Regulation (EU) 2017/654: Yes/No | X | | | N/A | | | |
| 3.8.6. | Inlet path | | | | | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.8.6.1. | Description of inlet path, (with drawings, photographs and/or part numbers): | | | X | Refer to drawing No. 008 | | | |
| 3.8.7. | Air filter | | | X | Yes | | | |
| 3.8.7.0. | Make: | | | X | QIXING | | | |
| 3.8.7.1. | Type: | | | X | 4.005.0012.07 | | | |
| 3.8.8. | Intake air-silencer | | | | N/A | | | |
| 3.8.1.0. | Make: | | | X | N/A | | | |
| 3.8.1.1. | Type: | | | X | N/A | | | |
| **3.9.** | **Exhaust system** | | | | | | | |
| 3.9.1. | Description of the exhaust system (with drawings, photos and/or part numbers as required): | | | X | Refer to drawing No. 007 | | | |
| 3.9.2. | Maximum exhaust temperature (deg. °C): | X | | | 677 | | | |
| 3.9.3. | Maximum permissible exhaust backpressure at 100% engine speed and at 100% load (kPa): | X | X | | 5.5 | | | |
| 3.9.3.1. | Location of measurement: | X | X | | Inlet of muffler | | | |
| 3.9.4. | Exhaust backpressure at loading level specified by manufacturer for variable restriction after-treatment at start of test (kPa): | X | | | N/A | | | |
| 3.9.4.1. | Location and speed/load conditions: | X | | | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.9.5. | Exhaust throttle valve: Yes/No | | | X | No | | | |
| **3.10.** | **Miscellaneous devices: Yes/No** | | | | No | | | |
| 3.10.1. | *Exhaust gas recirculation (EGR)* | | | | N/A | | | |
| 3.10.1.1. | Characteristics: cooled/uncooled, high pressure/low pressure/other (specify): | | | X | N/A | | | |
| 3.10.2. | *Water injection* | | | | N/A | | | |
| 3.10.2.1. | Operation principle: | | | X | N/A | | | |
| 3.10.3. | Air injection | | | | N/A | | | |
| 3.10.3.1. | Operation principle: | | | X | N/A | | | |
| 3.10.4. | Other(s) | | | | N/A | | | |
| 3.10.4.1. | Type(s): | | | X | N/A | | | |
| **3.11.** | **Exhaust after-treatment system** | | | | | | | |
| 3.11.1. | *Location* | | X | | Inside the muffler | | | |
| 3.11.1.1. | Place(s) and maximum/minimum distance(s) from engine to first after-treatment device: | | X | | 18mm | | | |
| 3.11.1.2. | Maximum temperature drop from exhaust or turbine outlet to first after-treatment device (deg. °C) if stated: | X | X | | N/A | | | |
| 3.11.1.2.1. | Test conditions for measurement: | X | X | | N/A | | | |
| 3.11.1.3. | Minimum temperature at inlet to first after-treatment device (deg. C), if stated: | X | X | | N/A | | | |
| 3.11.1.3.1. | Test conditions for measurement: | X | X | | N/A | | | |
| 3.11.2. | Oxidation catalyst | | | | | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.11.2.1. | Number of catalytic converters and elements: | | | X | 1 | | | |
| 3.11.2.2. | Dimensions and volume of the catalytic converter(s): | | | X | Ø28*20mm, 12.32cm$^3$ | | | |
| 3.11.2.3. | Total charge of precious metals: | | | X | 13.06mg | | | |
| 3.11.2.4. | Relative concentration of each compound: | | | X | Pt/Pd/Rh=1/1/0 | | | |
| 3.11.2.5. | Substrate (structure and material): | | | X | 0Cr21Al6 | | | |
| 3.11.2.6. | Cell density: | | | X | 300 cpsi | | | |
| 3.11.2.7. | Type of casing for the catalytic converter(s): | | | X | SUS441 | | | |
| 3.11.3. | *Catalytic exhaust gas after treatment system for ~~$NO_x$ or~~ three way catalyst* | | | | | | | |
| 3.11.3.0. | Make: | | | X | N/A | | | |
| 3.11.3.1. | Type: | | | X | N/A | | | |
| 3.11.3.2. | Number of catalytic converters and elements: | | | X | N/A | | | |
| 3.11.3.3. | Type of catalytic action: | | | X | N/A | | | |
| 3.11.3.4. | Dimensions and volume of the catalytic converter(s): | | | X | N/A | | | |
| 3.11.3.5. | Total charge of precious metals: | | | X | N/A | | | |
| 3.11.3.6. | Relative concentration of each compound: | | | X | N/A | | | |
| 3.11.3.7. | Substrate (structure and material): | | | X | N/A | | | |
| 3.11.3.8. | Cell density: | | | X | N/A | | | |
| 3.11.3.9. | Type of casing for the catalytic converter(s): | | | X | N/A | | | |
| 3.11.3.10. | Method of regeneration: | X | | X | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.11.3.10.1. | Infrequent regeneration: Yes/No: | X | | | No | | | |
| 3.11.3.11. | Normal operating temperature range (deg. °C): | X | X | | N/A | | | |
| 3.11.3.12. | Consumable reagent: Yes/No | | | X | No | | | |
| 3.11.3.12.1. | Type and concentration of reagent needed for catalytic action: | | | X | N/A | | | |
| 3.11.3.12.2. | Lowest concentration of the active ingredient present in the reagent that does not activate warning system ($CD_{min}$) (%vol): | | | X | N/A | | | |
| 3.11.3.12.3. | Normal operational temperature range of reagent: | | X | | N/A | | | |
| 3.11.3.12.4. | International standard: | | X | X | N/A | | | |
| 3.11.3.13. | $NO_x$ sensor(s): Yes/No | | | X | No | | | |
| 3.11.3.13.0. | Make: | | | X | N/A | | | |
| 3.11.3.13.1. | Type: | | | X | N/A | | | |
| 3.11.3.13.2. | Location(s) | | | X | N/A | | | |
| 3.11.3.14. | Oxygen sensor(s): Yes/No | | | X | No | | | |
| 3.11.3.14.0. | Make: | | | X | N/A | | | |
| 3.11.3.14.1. | Type: | | | X | N/A | | | |
| 3.11.3.14.2. | Location(s): | | | X | N/A | | | |
| 3.11.4. | *Particulate trap* | | | | N/A | | | |
| 3.11.4.1. | Type of filtration: through flow/partial flow/wall flow/other (specify) | | | X | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.11.4.2'. | Make: | | | X | N/A | | | |
| 3.11.4.2. | Type: | | | X | N/A | | | |
| 3.11.4.3. | Dimensions and capacity of the particulate trap: | | | X | N/A | | | |
| 3.11.4.4. | Location place(s) and maximum and minimum distance(s) from engine: | | X | | N/A | | | |
| 3.11.4.5. | Method or system of regeneration, description and/or drawing: | | | X | N/A | | | |
| 3.11.4.5.1. | Infrequent regeneration: Yes/No | | | X | No | | | |
| 3.11.4.5.2. | Minimum exhaust gas temperature for initiating regeneration procedure (deg. °C): | | | X | N/A | | | |
| 3.11.4.6. | Catalytic coating: Yes/No | | | X | No | | | |
| 3.11.4.6.1. | Type of catalytic action: | | | X | N/A | | | |
| 3.11.4.7. | Fuel borne catalyst (FBC): Yes/No | | | X | No | | | |
| 3.11.4.8. | Normal operating temperature range (deg. °C): | | | X | N/A | | | |
| 3.11.4.9. | Normal operating pressure range (kPa) | | | X | N/A | | | |
| 3.11.4.10. | Storage capacity soot/ash [g]: | | | X | N/A | | | |
| 3.11.4.11. | Oxygen sensor(s): Yes/No | | | X | N/A | | | |
| 3.11.4.11.1. | Type: | | | X | N/A | | | |
| 3.11.4.11.2. | Location(s): | | | X | N/A | | | |
| 3.11.5. | *Other systems* | | | | N/A | | | |
| 3.11.5.1. | Description and operation: | | | X | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.11.6. | Infrequent Regeneration | | | | N/A | | | |
| 3.11.6.1. | Number of cycles with regeneration | X | | | N/A | | | |
| 3.11.6.2. | Number of cycles without regeneration | X | | | N/A | | | |
| 3.11.7. | Other device(s) or feature(s) | | | | N/A | | | |
| 3.11.7.1. | Type(s): | | | X | N/A | | | |
| **3.12.** | **Fuel feed for liquid-fuelled CI or, where applicable, dual-fuel engines** | | | | | | | |
| 3.12.1. | *Feed pump* | | | | N/A | | | |
| 3.12.1.1. | Pressure (kPa) or characteristic diagram: | | | X | N/A | | | |
| 3.12.2. | *Injection system* | | | | N/A | | | |
| 3.12.2.1. | Pump | | | | N/A | | | |
| 3.12.2.1.0. | Make: | | | X | N/A | | | |
| 3.12.2.1.1. | Type(s): | | | X | N/A | | | |
| 3.12.2.1.2. | Rated pump speed (rpm): | | | X | N/A | | | |
| 3.12.2.1.3. | $mm^3$ per stroke or cycle at full injection at rated pump speed: | | | X | N/A | | | |
| 3.12.2.1.4. | Torque peak pump speed (rpm): | | | X | N/A | | | |
| 3.12.2.1.5. | $mm^3$ per stroke or cycle at full injection at torque peak pump speed | | | X | N/A | | | |
| 3.12.2.1.6. | Characteristic diagram: | | | X | N/A | | | |
| 3.12.2.1.7. | Method used: on engine/on pump bench | | | X | N/A | | | |
| 3.12.2.2. | Injection timing | | | | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.12.2.2.1. | Injection timing curve: | | | X | N/A | | | |
| 3.12.2.2.2. | Static Timing: | | | X | N/A | | | |
| 3.12.2.3. | Injection piping | | | | N/A | | | |
| 3.12.2.3.1. | Length(s) (mm): | | | X | N/A | | | |
| 3.12.2.3.2. | Internal diameter (mm): | | | X | N/A | | | |
| 3.12.2.4. | Common rail: Yes/No | | | X | No | | | |
| 3.12.2.4.0. | Make: | | | X | N/A | | | |
| 3.12.2.4.1. | Type: | | | X | N/A | | | |
| 3.12.3. | *Injector(s)* | | | | N/A | | | |
| 3.12.2.0. | Make: | | | X | N/A | | | |
| 3.12.3.1. | Type(s): | | | X | N/A | | | |
| 3.12.3.2. | Opening pressure (kPa): | | | X | N/A | | | |
| 3.12.4. | *Electronic control unit (ECU): Yes/No* | | | X | No | | | |
| 3.12.4.0. | Make: | | | X | N/A | | | |
| 3.12.4.1. | Type(s): | | | X | N/A | | | |
| 3.12.4.2. | Software calibration number(s): | | | X | N/A | | | |
| 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 | X | | X | N/A | | | |
| 3.12.5. | *Governor* | | | | N/A | | | |
| 3.12.5.0. | Make: | | | X | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.12.5.1. | Type(s): | | | X | N/A | | | |
| 3.12.5.2. | Speed at which cut-off starts under full load: | | | X | N/A | | | |
| 3.12.5.3. | Maximum no-load speed: | | | X | N/A | | | |
| 3.12.5.4. | Idle speed: | | | X | N/A | | | |
| 3.12.6. | *Cold-start system: Yes/No* | | | X | No | | | |
| 3.12.6.0. | Make: | | | X | N/A | | | |
| 3.12.6.1. | Type(s): | | | X | N/A | | | |
| 3.12.6.2. | Description: | | | X | N/A | | | |
| 3.12.7. | Fuel temperature at the inlet to the fuel injection pump | | | | N/A | | | |
| 3.12.7.1. | Minimum (deg. °C): | X | | | N/A | | | |
| 3.12.7.2. | Maximum (deg. °C): | X | | | N/A | | | |
| **3.13.** | **Fuel feed for liquid fuel spark ignition engine** | | | | | | | |
| 3.13.1. | *Carburettor* | | | | Refer to drawing No. 004 | | | |
| 3.13.1.0. | Make: | | | X | WALBRO、ZOMAX | | | |
| 3.13.1.1. | Type(s): | | | X | WT805、WT1004、MP16B40、MP16BZ40、MP16B40T、MP16BZ40T、ZP112 | | | |
| 3.13.2. | *Port fuel injection:* | | | | N/A | | | |
| 3.13.2.1. | single-point / multi-point | | | X | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.13.2.2'. | Make: | | | X | N/A | | | |
| 3.13.2.2. | Type(s): | | | X | N/A | | | |
| 3.13.3. | *Direct injection:* | | | | N/A | | | |
| 3.13.3.0. | Make: | | | X | N/A | | | |
| 3.13.3.1. | Type(s): | | | X | N/A | | | |
| 3.13.4. | *Fuel temperature at location specified by manufacturer* | | | | N/A | | | |
| 3.13.4.1. | Location: | X | | | N/A | | | |
| 3.13.4.2. | Minimum (deg. °C) | X | | | N/A | | | |
| 3.13.4.3. | Maximum (deg. °C) | X | | | 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)** | | | | | | | |
| 3.14.1. | *Fuel: LPG /NG-H/NG-L /NG-HL/LNG/Fuel specific LNG* | X | | X | N/A | | | |
| 3.14.2. | *Pressure regulator(s)/vaporiser(s)* | | | | N/A | | | |
| 3.14.2.0. | Make: | | | X | N/A | | | |
| 3.14.2.1. | Type(s) | | | X | N/A | | | |
| 3.14.2.2. | Number of pressure reduction stages | | | X | N/A | | | |
| 3.14.2.3. | Pressure in final stage minimum and maximum. (kPa) | | | X | N/A | | | |
| 3.14.2.4. | Number of main adjustment points: | | | X | N/A | | | |

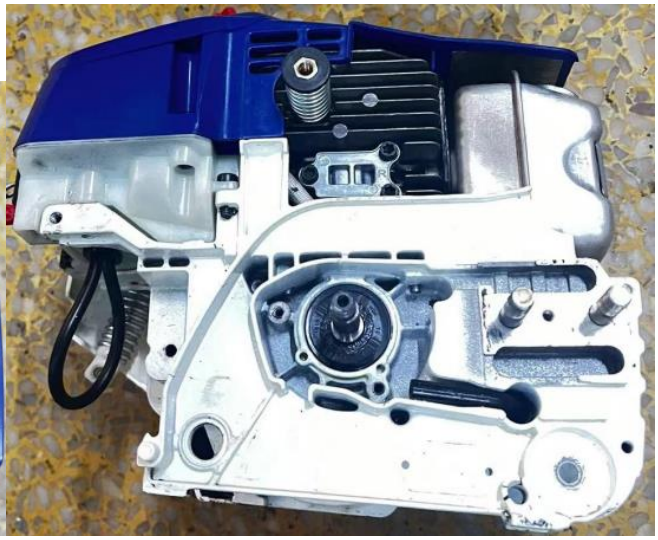
| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.14.2.5. | Number of idle adjustment points: | | | X | N/A | | | |
| 3.14.3. | *Fuelling system: mixing unit/gas injection/liquid injection/direct injection* | | | X | N/A | | | |
| 3.14.3.1. | Mixture strength regulation | | | | N/A | | | |
| 3.14.3.1.1. | System description and/or diagram and drawings: | | | X | N/A | | | |
| 3.14.4. | *Mixing unit* | | | | N/A | | | |
| 3.14.4.1. | Number: | | | X | N/A | | | |
| 3.14.4.2'. | Make: | | | X | N/A | | | |
| 3.14.4.2. | Type(s): | | | X | N/A | | | |
| 3.14.4.3. | Location: | | | X | N/A | | | |
| 3.14.4.4. | Adjustment possibilities: | | | X | N/A | | | |
| 3.14.5. | *Inlet manifold injection* | | | | N/A | | | |
| 3.14.5.1. | Injection: single-point/multi-point | | | X | N/A | | | |
| 3.14.5.2. | Injection: continuous/simultaneously timed/ sequentially timed | | | X | N/A | | | |
| 3.14.5.3. | Injection equipment | | | | N/A | | | |
| 3.14.5.3.0. | Make: | | | X | N/A | | | |
| 3.14.5.3.1. | Type(s): | | | X | N/A | | | |
| 3.14.5.3.2. | Adjustment possibilities: | | | X | N/A | | | |
| 3.14.5.4. | Supply pump | | | | N/A | | | |
| 3.14.5.4.0. | Make: | | | X | N/A | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.14.5.4.1. | Type(s): | | | X | N/A | | | |
| 3.14.5.5. | Injector(s) | | | | N/A | | | |
| 3.14.5.5.0. | Make: | | | X | N/A | | | |
| 3.14.5.5.1. | Type(s): | | | X | N/A | | | |
| 3.14.6. | *Direct injection* | | | | N/A | | | |
| 3.14.6.1. | Injection pump/pressure regulator | | | X | N/A | | | |
| 3.14.6.1.0. | Make: | | | X | N/A | | | |
| 3.14.6.1.1. | Type(s): | | | X | N/A | | | |
| 3.14.6.1.2. | Injection timing (specify): | | | X | N/A | | | |
| 3.14.6.2. | Injector(s) | | | | N/A | | | |
| 3.14.6.2.0. | Make: | | | X | N/A | | | |
| 3.14.6.2.1. | Type(s): | | | X | N/A | | | |
| 3.14.6.2.2. | Opening pressure or characteristic diagram : | | | X | N/A | | | |
| 3.14.7. | *Electronic Control Unit (ECU)* | | | | N/A | | | |
| 3.14.7.0. | Make: | | | X | N/A | | | |
| 3.14.7.1. | Type(s): | | | X | N/A | | | |
| 3.14.7.2. | Adjustment possibilities: | | | X | N/A | | | |
| 3.14.7.3. | Software calibration number(s): | | | X | N/A | | | |
| 3.14.8. | *Approvals of engines for several fuel compositions* | | | | N/A | | | |
| 3.14.8.1. | Self-adaptive feature: Yes/No | X | X | X | No | | | |

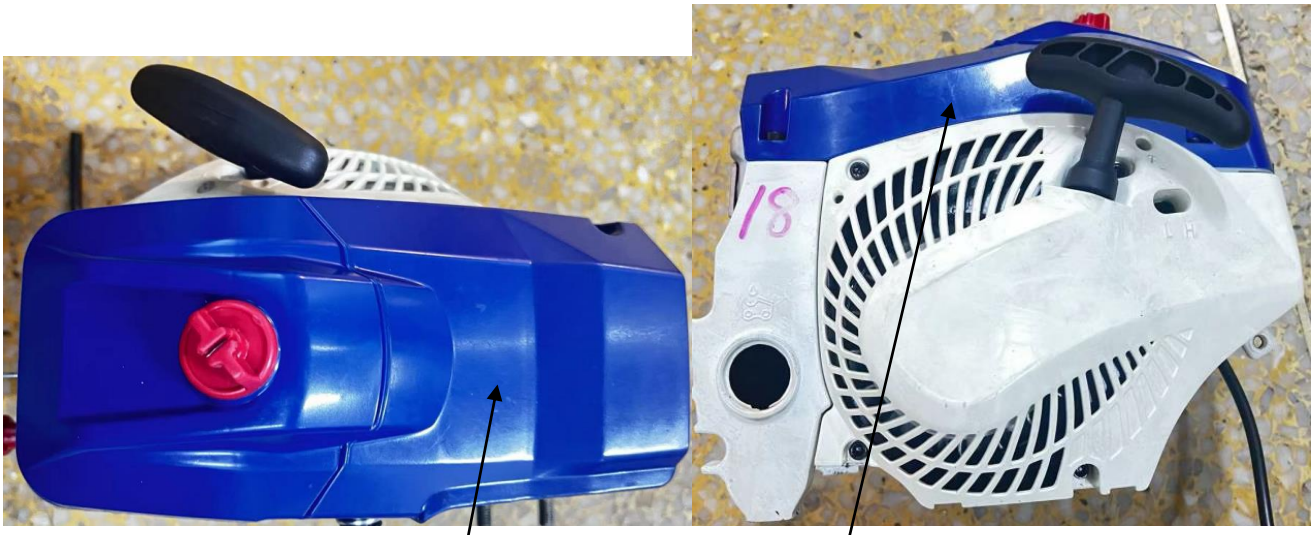
| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.14.8.2. | Calibration for a specific gas composition: NG-H/NG-L/NG-HL/ LNG/Fuel specific LNG | X | X | X | N/A | | | |
| 3.14.8.3. | Transformation for a specific gas composition: NG-HT/NG-LT/NG-HLT | X | X | X | N/A | | | |
| 3.14.9. | *Fuel temperature pressure regulator final stage* | | | | N/A | | | |
| 3.14.9.1. | Minimum (deg. °C): | X | | | N/A | | | |
| 3.14.9.2. | Maximum (deg. °C): | X | | | N/A | | | |
| **3.15.** | **Ignition system** | | | | | | | |
| 3.15.1. | *Ignition coil(s)* | | | | | | | |
| 3.15.1.0. | Make: | | | X | XINYA | | | |
| 3.15.1.1. | Type(s): | | | X | 4.009.0023.28 | | | |
| 3.15.1.2. | Number: | | | X | 1 | | | |
| 3.15.2. | *Spark plug(s)* | | | | | | | |
| 3.15.2.0. | Make: | | | X | CHAMPION、<br>BOSCH、<br>TORCH、<br>DENSO | | | |
| 3.15.2.1. | Type(s): | | | X | RCJ6Y、<br>L8RTF、<br>W22MPR | | | |
| 3.15.2.2. | Gap setting: | | | X | 0.6~0.8 mm | | | |

| Item Number | Item Description | Test | Installation | Homologation | Parent engine/ engine type | Engine types within the engine family (if applicable) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Type 1 | Type 2 | Type 3 |
| 3.15.3. | *Magneto* | | | X | N/A | | | |
| 3.15.3.0. | Make: | | | X | N/A | | | |
| 3.15.3.1. | Type(s): | | | X | N/A | | | |
| 3.15.4. | *Ignition timing control: Yes/No* | | | X | Yes | | | |
| 3.15.4.1. | Static advance with respect to top dead centre (crank angle degrees): | | | X | 28° | | | |
| 3.15.4.2. | Advance curve or map: | | | X | Refer to drawing No. 006 | | | |
| 3.15.4.3. | Electronic control: Yes/No | | | X | No | | | |

**Attachment 1 Photographs of the engines**



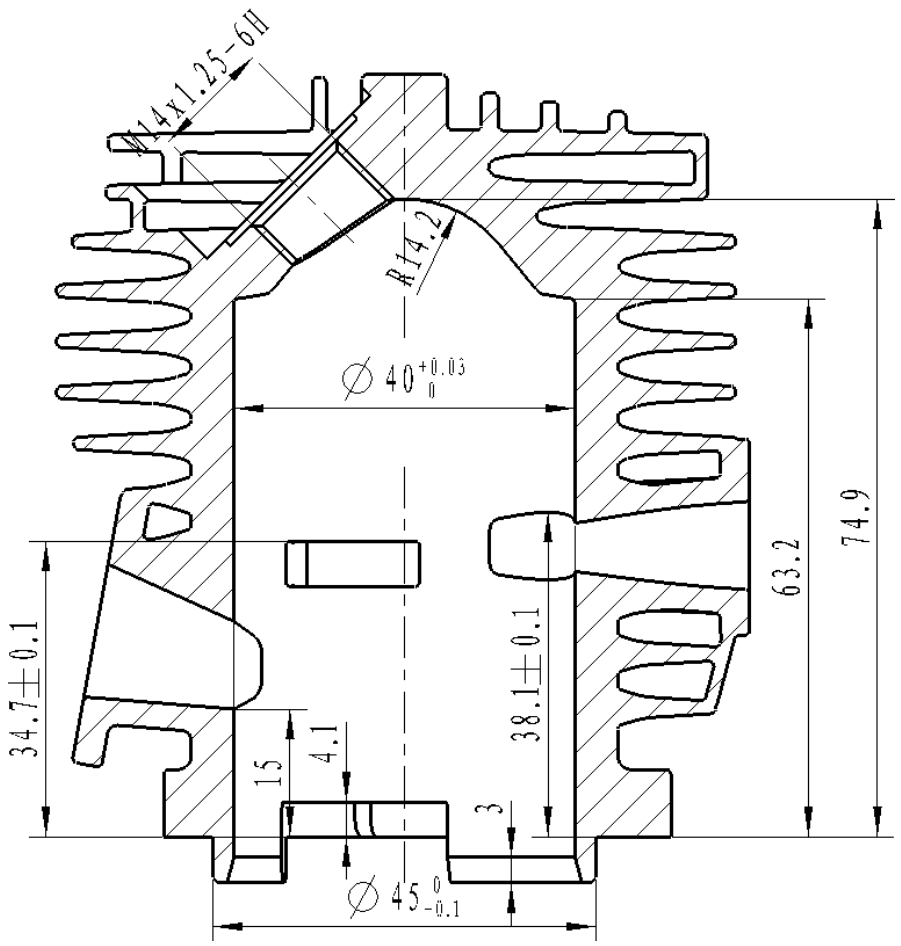
**Attachment 2 Drawings of the engines**




Trade name/Trade mark/Manufacturer name
Engine type
Engine identification number (engine production date inc.)
Approval No./Approval mark: e24*2016/1628*XXXXXXX*XXXX*00 or
e24 XXX/P V-XXX

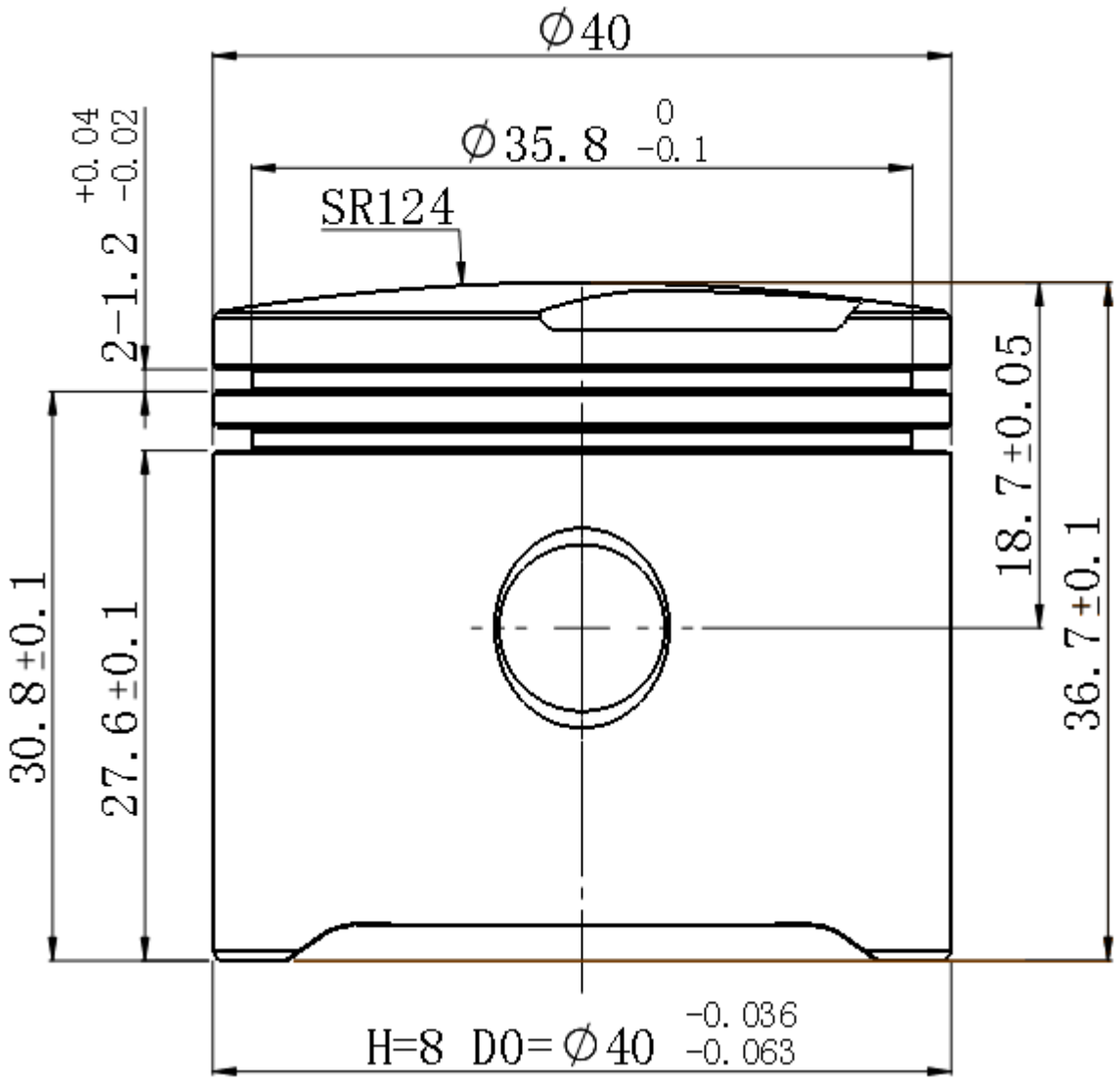
Remarks: this sample only shows the contents that need to be included on the engine marking, the actual layout may adjust according manufacturer's requirement.

| | |
|---|---|
| Engine type | ZM1E40FA |
| Position of statutory marking<br>Position of engine identification number. | |
| Drawing No. | 001 |



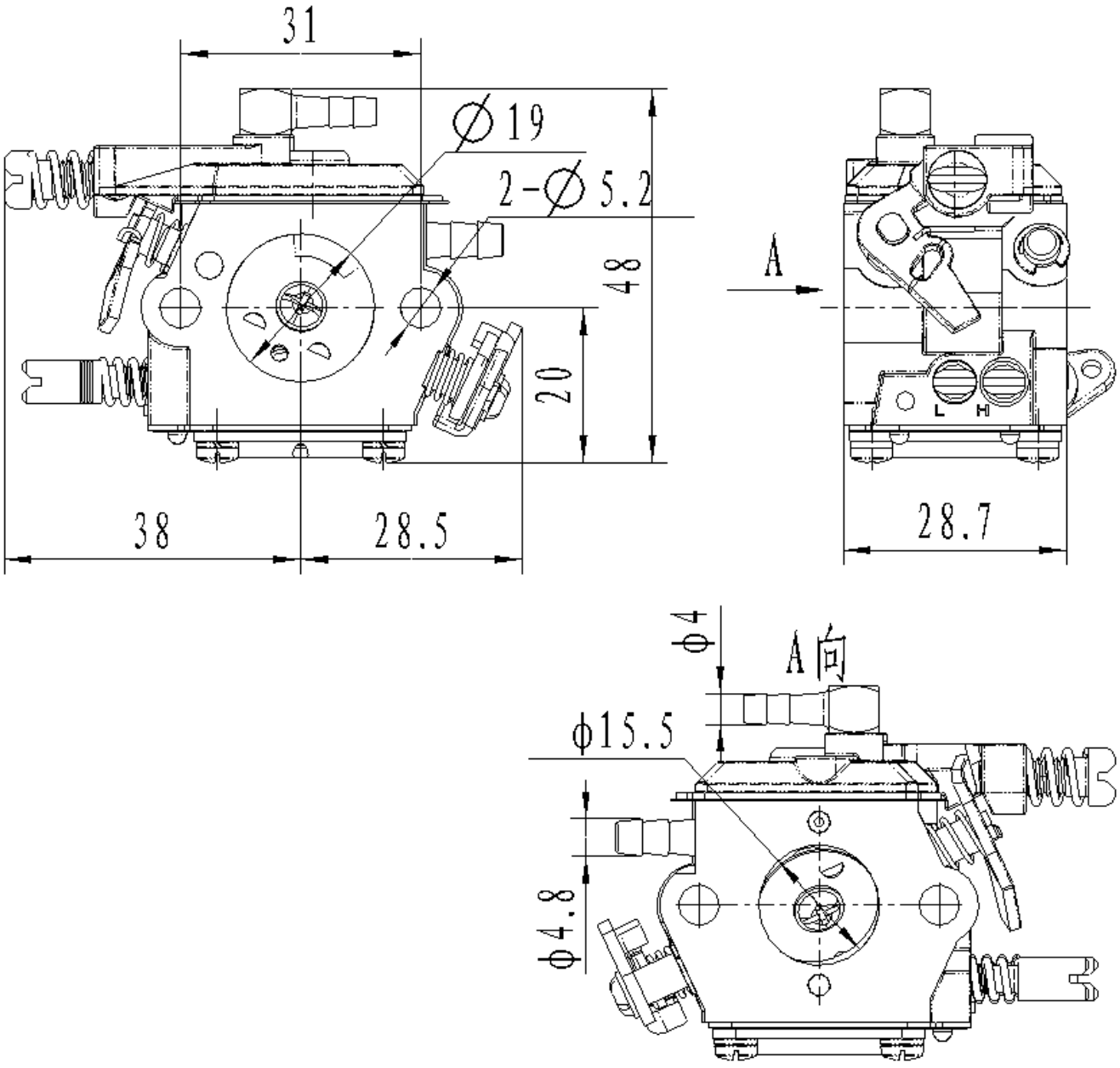

Part No./Factory internal Drawing No.: 4.002.0011.41

| | |
|---|---|
| Engine type | ZM1E40FA |
| Combustion chamber<br>Valve and port configuration | |
| Drawing No. | 002 |

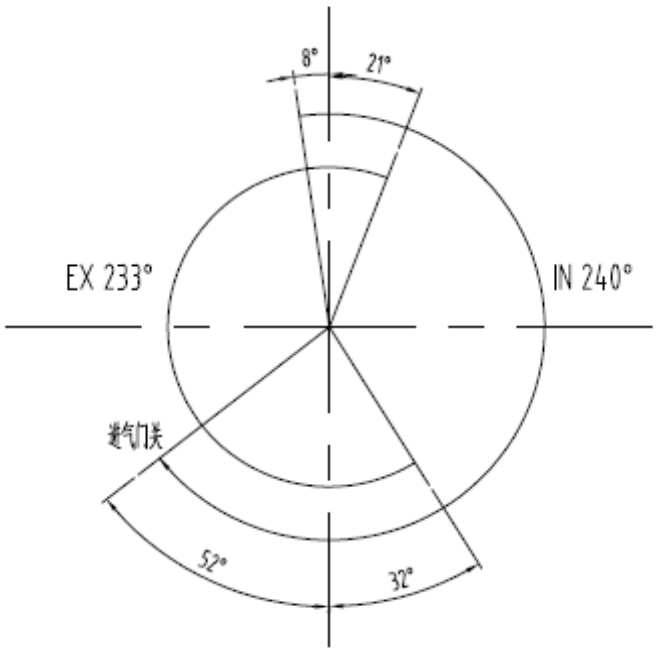



Part No./Factory internal Drawing No.: 4.004.0013.26

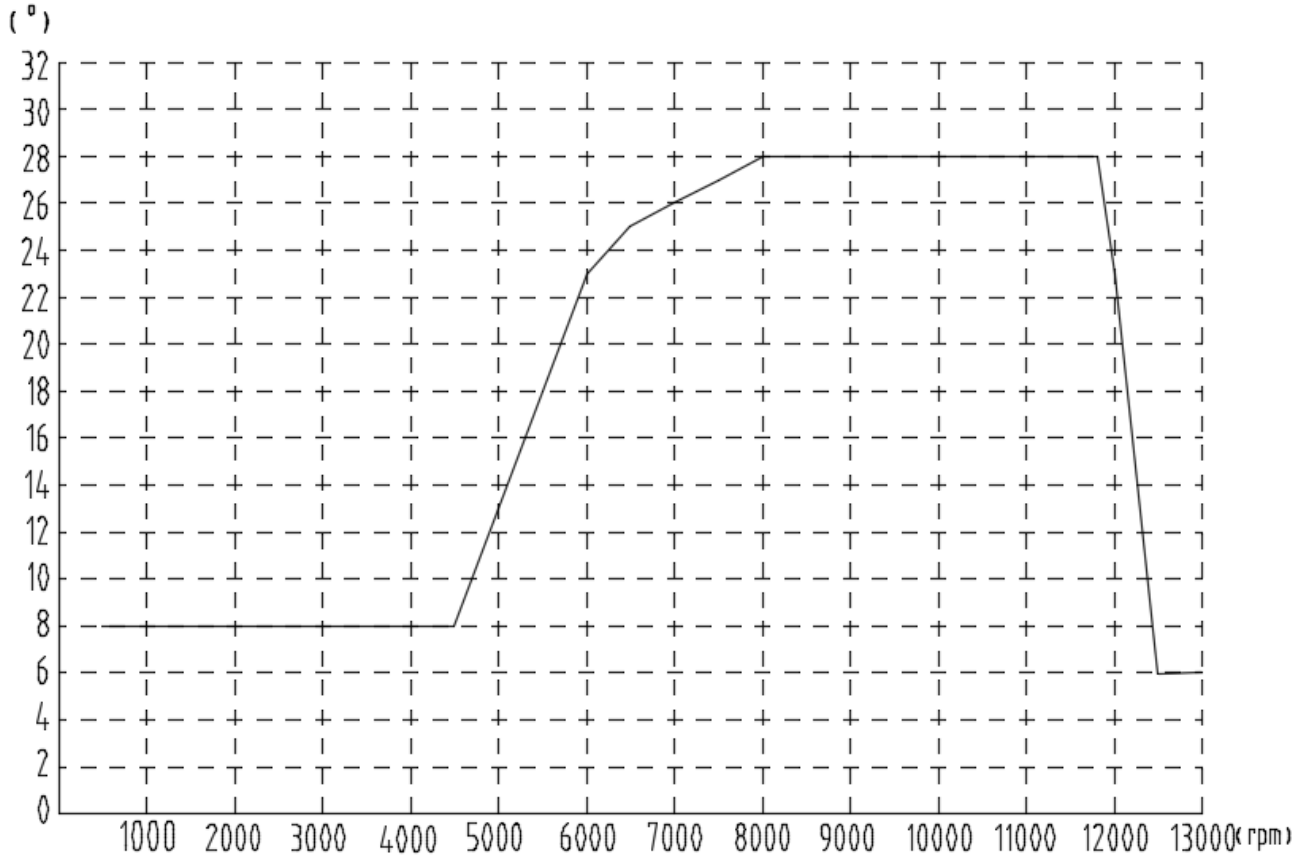
| | |
|---|---|
| Engine type | ZM1E40FA |
| Piston | |
| Drawing No. | 003 |



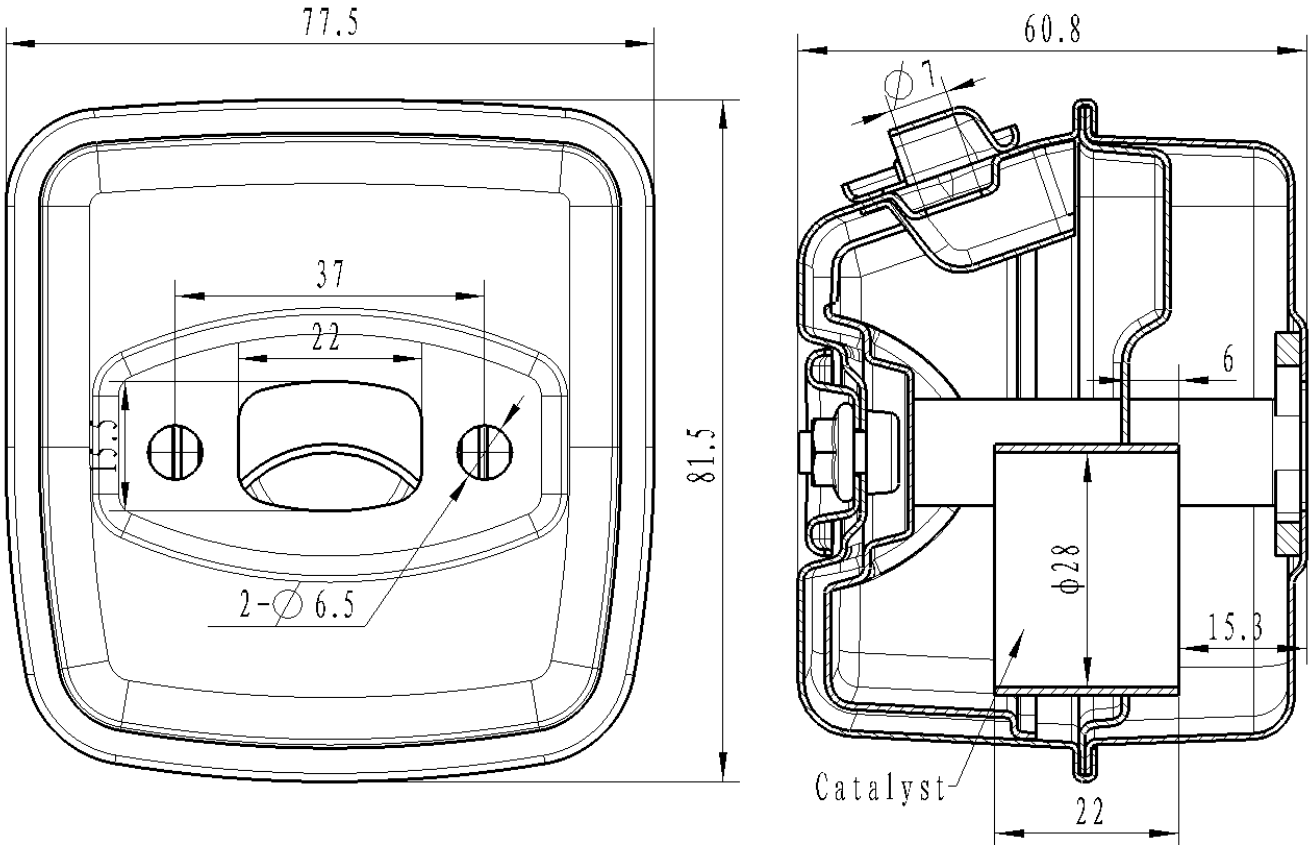

| | |
|---|---|
| Engine type | ZM1E40FA |
| Carburetor | |
| Drawing No. | 004 |




| | |
|---|---|
| Engine type | ZM1E40FA |
| Valve timing | |
| Drawing No. | 005 |

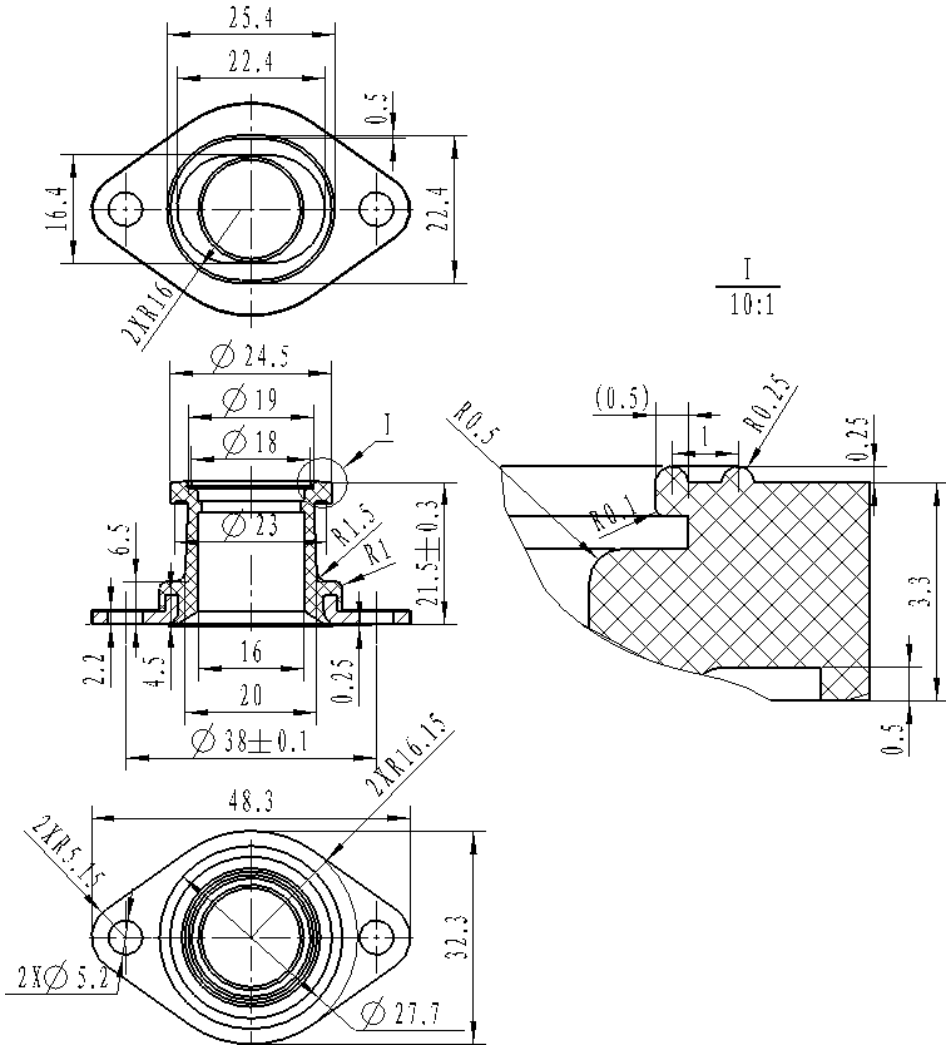



| | |
|---|---|
| Engine type | ZM1E40FA |
| Ignition advance curve | |
| Drawing No. | 006 |



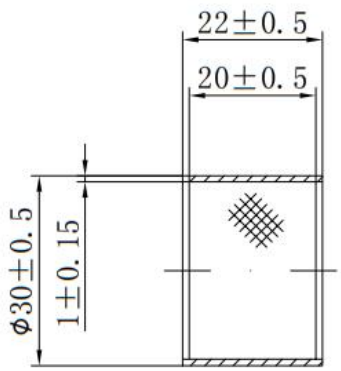

Part No./Factory internal Drawing No.: 4.006.0012.40

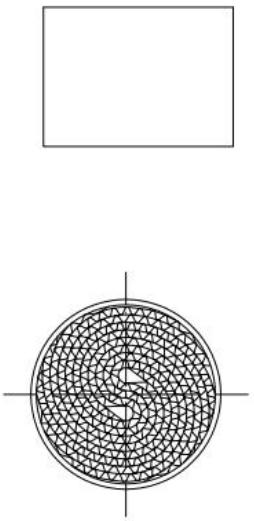
| | |
|---|---|
| Engine type | ZM1E40FA |
| Exhaust System | |
| Drawing No. | 007 |




Part No./Factory internal Drawing No.: 4.005.0023.02

| | | |
|---|---|---|
| | Engine type | ZM1E40FA |
| | inlet path | |
| | Drawing No. | 008 |



## 技术规格
## Technical specification

| | | | | | |
|---|---|---|---|---|---|
| 触媒内芯体积 Catalyst Honeycomb volume (cm3) | 12.32 | | 载体外壳材料 Mantler material | SUS441 | |
| 触媒孔密度 Catalyst cell density (cpsi) | 300 | | 内芯材料 Matrix material | 0Cr21Al6 | |
| 贵金属重量 Noble metals contents | 元素 Element | 标准值 Nominal | 内芯箔片厚度 Matrix foil thickness(mm) | 0.08±0.01 | |
| | Pt(mg) | 6.53 | 孔堵塞率 Hole plugging rate | | |
| | Pd(mg) | 6.53 | | | |
| | Rh(mg) | 0 | 涂层剥落率 Coating peeling rate | < 3.0% | |
| 贵金属成分 Noble metals composition | Pt:Pd:Rh | 1:1:0 | 贵金属含量 Noble metals density | 标称值(g/ft3) Nominal | 30 |
| | | | | 最小值(g/ft3) Minimum | 27 |

| | |
|---|---|
| Engine type | ZM1E40FA |
| Catalyst | |
| Drawing No. | 009 |



e24*2016/1628*2021/1398SHA1/P*0537*00

**Attachment 3 Manufacturer's declaration on compliance with Regulation (EU) 2016/1628**

We, Zhejiang Zomax Garden Machinery Co., Ltd., Hereby declares that the following engine type/engine family complies in all respects with the requirements of Regulation (EU) 2016/1628 of the European Parliament and of the Council, Commission Delegated Regulation (EU) 2017/654, Commission Delegated Regulation (EU) 2017/655 and Commission Implementing Regulation (EU) 2017/656 and does not use any defeat strategy. All emission control strategies comply, where applicable, with the requirements for Base Emission Control Strategy (BECS) and Auxiliary Emission Control Strategy (AECS) set-out in section 2 of Annex IV to Delegated Regulation (EU) 2017/654, and have been disclosed in accordance with that Annex and with Annex I to Implementing Regulation (EU) 2017/656.

| | | | |
|---|---|---|---|
| 1.1. | Make (trade name(s) of manufacturer) | : | ZOMAX |
| 1.2. | Commercial name(s) (if applicable) | : | N/A |
| 1.3. | Company name and address of manufacturer | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| 1.4. | Name and address of manufacturer's authorised representative (if any) | : | Brumar S.r.l. a Socio Unico<br>Loc. Valgera 110/B - 14100 ASTI (AT) - ITALY |
| 1.6. | Engine type designation~~/engine family designation/FT~~ | : | ZM1E40FA<br>Commercial names: 1E40FA |

Place : Wenling

Date : 2022-05-18

Signature : Huangxinyue

**Attachment 4** **Manufacturer's statement on compliance with the exhaust emission limits when use fuels other than the reference fuels**

N/A

**Attachment 5** **Overview of the emission control strategy for electronically controlled engines**

N/A

**Attachment 6** **The functional operational characteristics of the NOx control measures and inducement system**

N/A

**Attachment 7** **The functional operational characteristics of the particulate control measures**

N/A

**Attachment 8 Manufacturer's declaration, and supporting test reports or data, on deterioration factors**

We, Zhejiang Zomax Garden Machinery Co., Ltd., hereby declare that the EDP we chosen is most closely approximates the expected useful lives of the equipment into which the engines are expected to be installed. This conclusion is based on the surveys of the life spans of the equipment in which the subject engines are installed.

| | | | |
|---|---|---|---|
| 1.1. | Make (trade name(s) of manufacturer) | : | ZOMAX |
| 1.2. | Commercial name(s) (if applicable) | : | N/A |
| 1.3. | Company name and address of manufacturer | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| 1.4. | Name and address of manufacturer's authorised representative (if any) | : | Brumar S.r.l. a Socio Unico<br>Loc. Valgera 110/B - 14100 ASTI (AT) - ITALY |
| 1.6. | Engine type designation~~/engine family designation/~~FT | : | ZM1E40FA<br>Commercial names: 1E40FA |
| 1.7. | Category and sub-category of the engine type/~~engine family~~ | : | Category: NRSh<br>Sub-category: NRSh-v-1a |
| 1.8. | EDP hours | : | 50h (Cat 1 (Consumer products)) |

The EDP is carried out on parent engine, please refer TÜV SÜD's test report for details.

Place : Wenling

Date : 2022-05-18

Signature : Huangxinyue

**Attachment 9** **Manufacturer's declaration, and supporting test reports or data, of the infrequent regeneration adjustment factors**

N/A

**Attachment 10** **The physical connector required to receive the torque signal from the engine Electronic control Unit (ECU) during the in-service monitoring test**

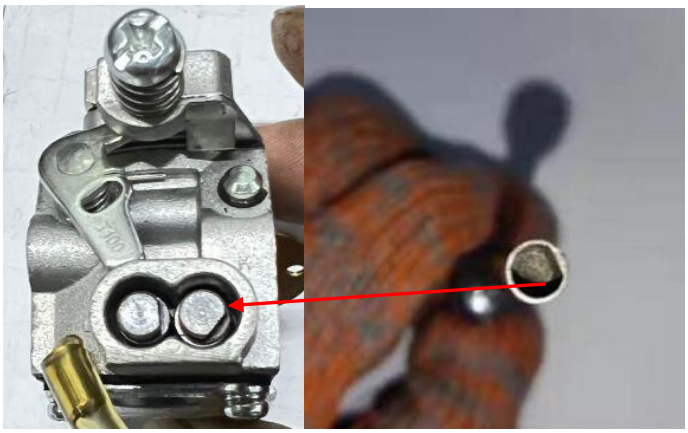
N/A

**Attachment 11 Manufacturer's declaration and supporting data on tampering prevention for emission control systems**

We, Zhejiang Zomax Garden Machinery Co., Ltd., Hereby declares that the emission control strategies of the following engine type/engine family fitted are designed in such a way as to prevent tampering to the extent possible, as referred to in Article 18(4) of Regulation (EU) 2016/1628 of the European Parliament and of the Council and Annex X of Commission Implementing Regulation (EU) 2017/656.

| | | | |
|---|---|---|---|
| 1.1. | Make (trade name(s) of manufacturer) | : | ZOMAX |
| 1.2. | Commercial name(s) (if applicable) | : | N/A |
| 1.3. | Company name and address of manufacturer | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No.48, Aodihu Road, Taiping Street, Wenling City, Zhejiang, China |
| 1.4. | Name and address of manufacturer's authorised representative (if any) | : | Brumar S.r.l. a Socio Unico<br>Loc. Valgera 110/B - 14100 ASTI (AT) - ITALY |
| 1.6. | Engine type designation/~~engine family designation/FT~~ | : | ZM1E40FA<br>Commercial names: 1E40FA |

Technical details :



Method 1:

Only can be adjusted by special tool.

Method 2:

No Air/Fuel Ratio.

Place : Wenling

Date : 2022-05-18

Signature : Huangxinyue

**Attachment 12 List of scheduled for emission-related maintenance requirements**

Proper maintenance is essential for safe, economical and trouble-free operation. It also helps reduce air pollution. In order to keep your gasoline engine in good working condition, it must be periodically serviced. The following maintenance schedule and routine inspection procedures must be carefully followed.

| Engine's maintenance rules during the emission durability test | | |
|---|---|---|
| **Item** | **Time** | **Remark** |
| Air cleaner | Checked every 25h, changed if necessary | Dried after cleaning |
| Spark plug(s) | Checked and cleaned every 25h | Changed if necessary |
| Normal inspection | Any time | At least 1 time every 24h |
| **NOTICE: first of all, for the purpose of protecting human and the product, and prevent the fire or explosion that maybe occurred, it needs to ensure that the engine is stopped before any maintaining.** | | |

**Attachment 13 Declaration of fuel delivery with carburettors**

According to fuel delivery with carburettor types, we use the highest fuel delivery one to emission test. The following are the fuel delivery test data. Please check.

## For type ZM1E40FA

| Carburetor Make | Model | Max torque speed | Fuel flow(g/h) |
|---|---|---|---|
| **WALBRO** | **WT805** | 1.9N.m/7000rpm | **650** |
| | WT1004 | | 640 |
| ZOMAX | MP16B40 | | 641 |
| | MP16BZ40 | | 638 |
| | MP16B40T | | 636 |
| | MP16BZ40T | | 639 |
| | ZP112 | | 642 |

We confirm that the design, construction, raw materials, manufacture, assembly and quality control are completely identical for the carburettors, except that they are made by different manufacturers and different purchasing customers require different models to be named.

Place : Wenling

Date : 2022-05-18

Signature : Huangxinyue