

**SYSTEM & PROCEDURE  
FOR  
COMPLIANCE TO EMISSION LIMITS  
FOR  
PETROL AND KEROSENE RUN GENERATOR SETS UPTO 19 kW**



**CENTRAL POLLUTION CONTROL BOARD**

*(Ministry of Environment & Forests, Govt. of India)*

Website: [cpcb.nic.in](http://cpcb.nic.in)

**11<sup>th</sup> August 2014**

## FOREWORD

Ministry of Environment, Forests and Climate Change (MoEF & CC) had notified emission limits for Petrol and kerosene driven Genset engines vide GSR No. 682(E), dated 5<sup>th</sup> October 1999 under the Environment (protection) Act, 1986. This GSR was amended vide GSR 280(E), dated 11<sup>th</sup> April 2008. Now these limits have been revised vide GSR No. 535(E) dated 07<sup>th</sup> August 2013. As per this notification, CPCB is the Nodal Agency and is mandated to prepare compliance and testing procedure to settle disputes and technical difficulties in execution of these rules.

Existing “System & Procedure for Compliance to Regulations for Petrol and Kerosene run Generator sets up to 19 kW” is more than 14 years old. In consonance with the changes in the emission limits, this document needs to be modified. The document has accordingly been modified and is added with new sections to overcome the difficulties witnessed by the stakeholders.

The document is divided into three parts. The first part is notification incorporating its amendments from time to time by the Ministry of Environment, Forests and Climate Change. The Second part is Certification System & Procedure. This part is basically an administrative part to regulate the emission limits of new Genset engines at manufacturing stage. On compliance of the specified limit, Type Approval Certificate (TA) is issued by the Certification Agency (Specified in the notification in Part – I of this document) to an industry for its complied family / model Genset engines. After obtaining TA, the industry has to obtain Conformity of Production Certificate (COP) during every COP year (1<sup>st</sup> August of a calendar year to 31<sup>st</sup> July of the succeeding calendar year). The third part of the document is the description of equipments and procedures to be adopted in compliance testing process. This part is to be executed by the Certification Agencies.

The document has been revised on recommendation of the “Standing Committee on Emission for off Road Vehicles and Construction Equipments” in consultation with Certification Agencies (ARAI & ICAT) and stake holders.

I hope the document will help all the manufacturers of Petrol and Kerosene run Generator sets up to 19 kW and Certification Agencies in obtaining / issuing TA and COP certificates more systematically and scientifically.

(SHASHI SHEKHAR)

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## SCOPE

This document lays down the requirements, system & procedure for compliance to the regulation vide notification G.S.R. No. 535(E), at serial no. 88, for new generator sets (up to 19 kW) run on petrol and kerosene, dated 07<sup>th</sup> August 2013, issued by Ministry of Environment and Forests, Government of India. The details are covered as under:

- Part I** - Notification/ Applicability and Requirements
- Part II** - Certification System and Procedures
- Part III** - Test Equipment and Procedures

The system & procedure laid down here cover not only generator sets but also spark ignitions engines (petrol / kerosene as fuel) up to 19 kW for non-road application, as there is proposal to extend the regulation to such engines also.

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**PART I**

**NOTIFICATION/ APPLICABILITY AND REQUIREMENTS**

**The 7<sup>th</sup> August, 2013**

**1. NOTIFICATION**

**G.S.R. 535(E)**— In exercise of the powers conferred by sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, namely:-

1. (1) These rules may be called the Environment (Protection) (Second Amendment) Rules, 2013.  
(2) They shall come into force on the date of their publication in the Official Gazette.
2. In the Environment (Protection) Rules, 1986, in Schedule I,-
  - (a) For serial number 88, relating to "Emission standards for New Generator Sets (Upto 19 kilowatt) Run on Petrol and Kerosene with Implementation Schedule" and entries relating thereto, the following serial number and entries shall be substituted, namely,-  
"88 Generator Sets Run on Petrol and Kerosene

**A. EMISSION STANDARDS**

The emission standards for Generator sets on Petrol and Kerosene shall be as follows:-

<b>Class</b>	<b>Displacement (cc)</b>	<b>CO (g/kW-hr)</b>	<b>HC+NOx(g/kW-hr)</b>
1	Upto 99	≤250	≤12
2	>99 and upto 225	≤250	≤10
3	>225	≤250	≤08

- (i) Test method shall be as specified in SAE J 1088 Or ISO 8178:Part 1: Test –bed measurement of gaseous and particulate emissions by CVS method and the measurement mode shall be D1-3 mode cycle specified under ISO 8178: Part 4 (Weighting Factor of 0.3 for 100 percent load, 0.5 for 75 percent load and 0.2 for 50 percent load).

## ii) CERTIFICATION AGENCIES

Any of the following institutions shall test and certify emission standards for the petrol and kerosene based generator sets, at manufacturing stage, namely: -

- (a) The Automotive Research Association of India, Pune (Maharashtra);
  - (b) The International Centre for Automotive Technology, Manesar (Haryana);
  - (c) The Indian Oil Corporation, Research and Development Centre, Faridabad (Haryana);
  - (d) The Indian Institute of Petroleum, Dehradun (Uttarakhand); and
  - (e) The Vehicle Research Development Establishment, Ahmednagar, (Maharashtra).
- iii) Type Approval or Conformity of Production certificates in respect of emission standards, issued prior to the date of publication of this notification and valid upto the 31<sup>st</sup> May 2014 or beyond, shall be re-issued considering above revised norms by the respective certification agency.

## B. NOISE LIMITS

- (i) The noise limit for new generator sets run with petrol and kerosene shall be as follows:-

	Noise Limits
Sound Power Level $L_{wa}$	86 dBA

- (ii) Any of the following institutions shall undertake 'type approval' and for Verification of conformity of production' for noise norms for petrol and kerosene Gensets, namely:-
- (a) The Automotive Research Association of India, Pune (Maharashtra);
  - (b) The International Centre for Automotive Technology, Manesar, (Haryana);
  - (c) The Fluid Control Research Institute, Palghat (Kerala);
  - (d) The National Test House, Ghaziabad (Uttar Pradesh);
  - (e) The National Aerospace Laboratory, Bangalore (Karnataka); and
  - (f) The Naval Science and Technology Laboratory, Visakhapatnam (Andhra Pradesh).

## C. GENERAL CONDITIONS

1. **Applicability.** - The stipulations in respect of emissions and noise referred to in entry A and entry B shall apply to all new generator sets using petrol and kerosene as fuel, manufactured in or, imported into India.

Provided that this provision shall not apply to,-

- (a) Genset manufactured or, imported for the purpose of exports outside India;  
or,
- (b) Gensets intended for the purpose of Research and Development and not for sale or, captive use in India.

2. **Requirement of certification.**- Every manufacturer or importer (hereinafter referred to as manufacturer) of genset (hereinafter referred to as product) to which these conditions apply shall have a separate valid certificate of type approval for all the product models for emission as well as noise norms being manufactured or imported.
3. **Verification of conformity of production.**- Every manufacturer shall submit its products to the verification for conformity of production for emission and noise, by any of the institutions, as applicable, every conformity of production year.
4. **Sale of generator sets not complying with these conditions.**- The sale of product model, not having valid type approval certificate, or not complying with the emission or noise norms, as determined by the verification for conformity of production, shall continue to be prohibited in India.
5. **Requirement of conformance labelling.**-
  - (1) The manufacturer of the product shall affix a conformance label on the product containing the following requirements, namely:-
    - (i) The label shall be durable and legible;
    - (ii) The label shall be affixed on a part necessary for normal operation of the product and not normally requiring replacement during the product life.
  - (2) The conformance label must contain the following information, namely:-
    - (i) Name and address of the manufacturer (even, if the address is described in the owner's manual);
    - (ii) Statement that this product conforms to the Environment (Protection) Rules, 1986; and
    - (iii) Type approval certificate number and time phase of the regulation (namely from the January 2014, the January 2016 or the January 2017).
    - (iv) Rated & Maximum output of the genset in KVA



## **6. NODAL AGENCY**

- 1 The Central Pollution Control Board shall be the nodal agency for implementation of these stipulations.
- 2 In case of any dispute or difficulty in implementation of these rules the matter shall be referred to the nodal agency.
- 3 The nodal agency shall constitute a Standing Committee for emission related issues and a National Committee for noise related issues, respectively to advise it on all matters related to the implementation of these rules including the dispute, if any.

## **7. COMPLIANCE AND TESTING PROCEDURE**

- (1) The compliance and testing procedure as published from time to time, if reviewed by Central Pollution Control Board shall be followed.
- (2) The Central Pollution Control Board may revise the compliance and testing procedure.
- (3) The institutes referred to in paragraph A and B above shall submit the testing and certification details in respect of emission or, noise, as applicable to the Central Pollution Control Board, annually and the Central Pollution Control Board shall be free to depute its official(s) to oversee the testing.

## PART II

### CERTIFICATION SYSTEM & PROCEDURES

#### **8.0 MODEL FAMILY**

- 8.1 For the purpose of type approval certification and verification of conformity of production, the manufacturer's product range will be divided into model families, consisting of basic models and its variant.
- 8.2 The determination of an engine/genset family and the decision regarding parent engine/genset shall be taken according to the guidelines given in ISO 8178 –7 (Reciprocating internal combustion engines – exhaust emission measurement – part 7: engine/genset family determination). However, the decision of selection of parent engine/genset and family classification by the authorized agency shall be final.
- 8.3 For the purpose of identification, the manufacturer shall designate the families as F1, F2, F3 ..... Fn.

#### **9.0 APPLICATION FOR TYPE APPROVAL**

- 9.1 The manufacturer for the first time shall apply to Nodal Agency as per Annexure – 1 and on written acceptance of the application by the nodal agency; the Certification Agency will process the application for Type Approval. For each product model, the manufacturer must submit an application to one selected Certification Agency only for all of its product models.
- 9.2 If any manufacturer wants to change the Certification Agency, he shall apply to the Nodal Agency well in advance with justification(s). The Nodal Agency, after consultation with the existing Certification Agency may approve the change, if found justified. If approved, the nodal agency shall inform to all the concerned parties.
- 9.3 On receipt of information for change in Certification Agency, from the Nodal Agency, the previous Certification Agency shall authenticate all the relevant documents of the models (Type Approvals as well as COP verification) and forward the same to the new Certification Agency. The new Certification Agency shall be responsible for carrying out the Type Approval testing and COP verification for the manufacturer, in future.
- 9.4 Till the Nodal Agency gives approval for change in the Certification Agency, the previous Certification Agency will continue to carry out Type Approval and COP tests for the said manufacturer.

9.5 The application to Certification Agency shall be made in the format prescribed in Annexure 2 and must be completed in all respect. Test result, if any, of the emission test done in accordance with the requirement of this document may also be submitted along with the application.

## **10.0 TYPE APPROVAL**

- 10.1 The concerned certification agency shall review the application for the model which belongs to a family already certified.
- 10.1.1 Whether the model belongs to a family of model(s) already certified and even if so, whether specific testing of the model is necessary prior to certification.
- 10.1.2 Whether the emission test data supplied with the application is adequate and reasonable for granting certification (by certified test agencies).
- 10.2 The manufacturer shall submit the details of the parent model and its variants for considering them as a family, with justification, to the Certification Agency.
- 10.3 The application must be signed by the authorized representative of the manufacturer.
- 10.4 If the model does not belong to a family already certified, the Certification Agency shall proceed with the testing of the model for Type Approval
- 10.5 If the model belongs to a family already certified, the Certification Agency shall decide whether the specific testing of the model is required. In case the specific testing of the model is not required, the Type Approval certificate for the family may be extended to include the model; if the emission test data supplied with the application is adequate and reasonable for granting certification.
- 10.6 The certification agency shall intimate its decision to the applicant within one month of receipt of the application, indicating need and plan (schedule) of testing for type approval, if necessary for certification, with a copy marked to the nodal agency (It should be ensured by the applicant to provide correct and adequate data to the agency in prescribed format)
- 10.7 The manufacturer shall submit a product sample for testing, as intimated by the certification body. A prototype can be submitted; however it must be completely built and conforming to the design to be product ionized.
- 10.8 The testing shall be done as per the procedure and specifications given in Part III of this document.

10.9 The product sample / prototype shall be deemed to have passed the test if the emission levels of all the species are within their respective limits.

However, if the product sample / prototype fail to complete the test or meet the acceptance criteria, as above, the manufacturer has the option to repair / modify or replace the same. If the design modifications reflect changes in the specifications given in the application, a revised application shall be submitted.

If the manufacturer is unable to repair / modify / replace the product sample / prototype within a reasonable time (upto a maximum of 1 month duration), the application for certification shall be deemed as withdrawn and a fresh application shall have to be submitted.

10.10 After verification / testing for type approval, the certification agency shall submit a type approval report to the manufacturer within one month from the date of testing indicating acceptance or rejection decision and reasons thereof.

10.11 The manufacturer is under the obligation to ensure the production strictly as per approved technical specifications, declared at the time of submission of application for type approval.

## **11.0 CERTIFICATE OF TYPE APPROVAL**

11.1 Subsequent to type approval, the certification body shall issue the certificate of type approval for the model as per format prescribed in Annexure 3. Copy of the Certificate shall also be forwarded to the nodal agency.

11.2 The certificate shall be deemed to be valid for the model included therein; unless explicitly withdrawn through a separate written order by the nodal agency.

11.3 After the issue of the Type Approval certificate of a family, the same shall be valid till:

11.3.1 the engine specifications change as mentioned in Annexure-2; and

11.3.2 Further amendments to the notification.

11.3.3 COP is missed- certification agency is to refer the industry to Nodal Agency

11.4 All the Type Approval tests shall be conducted in the test agency laboratory. In case, the required test facilities are accredited by the test agency, the Type Approval / COP tests can be carried out at manufacturer's laboratory also if reasons call for. In case the test is to be carried out in any overseas test facilities, the same shall be informed to the Nodal Agency by the Certification agency. The Certification Agency will submit a copy of the accreditation letter highlighting the details of test facilities available in the manufacturers' laboratory.

11.5 In case the manufacturer approaches the test agency for the first time, such manufacturers should complete the COP tests within three months from the commencement of commercial production or importation of 100 units, whichever is earlier.

## 12.0 VERIFICATION OF CONFORMITY OF PRODUCTION (COP)

12.1 Each manufacturer shall subject its product range to the verification for COP, every year. For this, the year shall mean the period from 1<sup>st</sup> August of a calendar year to 31<sup>st</sup> July of the succeeding calendar year.

12.2 The same Certification Agency will be responsible for COP as selected at the time of Type Approval.

12.3 In case of domestic manufacturer, the verification of COP shall be done as per the following plan:

Total no. of Families of the Domestic Manufacturer	No. of Families to be Tested per Year
1~3	1
4~7	2
8~11	3
12~15	4

12.4 In case of importer, the verification of COP shall be done for each family once in a COP year or for every 250 units imported, whichever is more. The importer should give import schedule to test agency in advance.

12.5 Testing shall be done on sample(s) randomly selected by the certification agency, from production / import units of model for each family to be tested as above.

12.6 If the importer is not of Indian origin, the importer should establish a base office in India, which is to be declared in the initial application submitted to Nodal Agency in Annexure-1. This base office will be responsible for quality assurance.

12.7 The certification agency shall intimate to the manufacturer the schedule for sampling / testing. In case of imports, the importer will confirm to the certification agency the schedule for imports and the certification agency shall intimate the schedule for sampling / testing. The copy of schedule shall be forwarded to the nodal agency by the certification body.

- 12.8 A minimum quantity of 50 nos. for domestic manufacturers should be available for random sampling selection. This limit shall be minimum 10 units in case of imports.
- 12.9 If a manufacturer wishes to discontinue a particular model in a COP year, the manufacturer should inform the test agency immediately so as to update the models /families record for the COP year.
- 12.10 The testing shall be done as per the procedure and specification given in Part III of this document.
- 12.11 During the testing, if a sample fails to complete the test or is found to be defective for reasons other than emission result, the results of the sample shall be discarded and another sample shall be selected. If max power is not met on first sample, two samples are required for verification of power and emission test to be done in any one of two.
- 12.12 COP verification shall be carried out for each plant of the indigenous manufacturer. For imported Gensets, the COP testing shall be carried out for each genset family manufactured in each country of origin and plant wise.
- 12.13 The manufacturer shall complete all the COP activities (such as random selection, initial running-in, emission testing, & documentation/certification) as per specified schedule. The COP certificate shall not be issued in case of non-adherence of the specified schedule.
- 12.14 Following table gives the deadline for the respective COP year for the COP activities. However manufacturer can take early action on each activity.

Sr. No	Activity	Last date(*)
1	Submission of Production/Import Details to test Agency	3 months before the end of COP year
2	Random Selection and Initial Running in	2 months before the end of COP year
3	Submission of engines, Technical details & Emission testing (Including extended COP if any)	1 month before the end of COP year
4	Completion of Certification/Document preparation	Before last date of COP year

- 12.15 It is the responsibility of the Genset /Engine manufacturer for the completion of the COP activities for the Gensets/engines models produced/imported from the beginning of the COP year. In such situations engine manufacturer shall intimate test Agency regarding the tentative production/import plan before three months of end of COP year.

12.16 The manufacturer shall inform the certification agency regarding the stoppage of production of a specific model. In case this has not been anticipated at the start of the COP period, this should be intimated at least six months before the end of COP year so that selection of Genset for COP can be completed by the certification agency before stoppage of production.

The manufacturer shall provide all the assistance required by the Certification Agency for completing the tests. This information should also be communicated to Nodal Agency.

12.17 The latest updated technical specifications, procedure of pre-delivery inspection (PDI), running – in and servicing of the Gensets, shall also be submitted before the selection of genset, if there has been revisions after the previous COP/Type Approval.

12.18 Pre-delivery inspection, as per owners' instruction manual / service manual, will be carried out by the manufacturer as per the procedure declared at the time of Type Approval, and as amended and intimated to the concerned Certification Agency from time to time, on the selected genset(s) model, under the control of the Certification Agency.

12.19 The running-in of the Gensets shall be carried out as per the manufacturer's recommendation submitted during the type approval and as amended and intimated to the concerned certification agency from time to time, under the control of the certification agency. The running-in may also be carried in Genset manufacturer / manufacturers place under the control of test agency. After this, the manufacturer will be permitted by the Certification Agency to carry out all the adjustments recommended in his user's / service manual and as amended and intimated to the concerned Certification Agency from time to time, under the control of the certification agency.

12.20 In case of failure of any major component during the running-in or testing, the Certification Agency may permit to replace the component, only once, which has failed and which do not affect the performance and the emission of engine. In case of failure of components affecting the performance and emissions of the engine, random selection and testing should be done once again. If the randomly selected Gensets or replaced component fails again, the said model is deemed withdrawn.

12.21 The supplier shall submit the randomly selected gensets to test agency within four weeks of completion of running in/selection for the emission compliance tests. The test agency should endeavor to complete the further testing of selected sample within 4 weeks after the submission of gensets-

12.22 The testing shall be done as per the procedure and specifications given in Part III of this document.

### **12.23 EXEPTION FROM COP :**

In the following case, the Gensets shall be exempted from COP for the prevailing COP year.

12.23.1 If Type Approval is obtained during last quarter of the COP year.

12.23.2 In case of no production/import, the manufacturer shall submit a declaration to test Agency and Nodal Agency for no production/import of a particular family model six months before end of the same COP year and if the manufacturer wants COP for the same family again, the permission may be obtained from the Nodal Agency.

12.23.3 If there is no production/import of particular family/models for two consecutive years immediately after obtaining Type Approval and the COP test is requested for the third year, then the manufacturer shall approach Nodal Agency to obtain approval for the extension of the validity of Type Approval.

12.23.4 Exemption of COP for a particular family model may be available for one time only.

### **13.0 SAMPLE SIZE & DECISION CRITERIA FOR VERIFICATION OF COP**

13.1 The number of samples to be tested shall be minimum as necessary to arrive at a decision on whether the production units comply with the emission limits.

13.2 A sample is said to have failed for particular specie if the test result of the sample for the specie exceeds the applicable emission limits.

13.3 The production / import units of all models in the family shall be deemed to comply with the emission limits if the number of failed samples as defined in 13.2 above for each specie is less than or equal to the pass decision no., appropriate to the cumulative no. of samples tested for that specie, as given in the following Table.



Cumulative Samples	Pass No. (No. of failures)	Fail No. (No. of failures)	Cumulative Samples	Pass No. (No. of failures)	Fail No. (No. of failures)
1	( <sup>1</sup> )	( <sup>2</sup> )	16	6	11
2	( <sup>1</sup> )	( <sup>2</sup> )	17	7	12
3	( <sup>1</sup> )	( <sup>2</sup> )	18	7	12
4	0	( <sup>2</sup> )	19	8	13
5	0	( <sup>2</sup> )	20	8	13
6	1	6	21	9	14
7	1	7	22	10	14
8	2	7	23	10	15
9	2	8	24	11	15
10	3	8	25	11	16
11	3	8	26	12	16
12	4	9	27	12	17
13	5	10	28	13	17
14	5	10	29	14	17
15	6	11	30	16	17

(<sup>1</sup>): Series not able to pass at this stage

(<sup>2</sup>): Series not able to fail at this stage

- 13.4 Once a compliance or non-compliance decision is made for particular specie, the result of testing of subsequent samples for that specie shall not influence the decision.

#### 14.0 TECHNICAL SPECIFICATION TO BE CHECKED AFTER COP TESTS:

- 14.1 Description of the Engine- Make/ type/working principle/Cylinder capacity/cooling system.
- 14.2 Air filter Make /type :
- 14.3 Anti-pollution device description:
- 14.4 Carburettor/ /feed pump Make/Type/ID/Main Jet Size/Pilot Jet size/Venturi Size
- 14.5 Ignition System Make/type:
- 14.6 Spark plug Make/Type:
- 14.7 After completion of all tests for verification of COP, the certification body shall prepare and submit a verification of COP report to the nodal agency giving the families and models selected and the decision .Copy of the report shall also be given to the manufacturer.

## **15.0 ANALYSIS & CORRECTIVE ACTIONS FOR NON-COMPLIANCE**

- 15.1 If the verification of COP report of the certification body for a model family indicates non-compliance, the manufacturer must analyze the reasons for non-compliance, plan and take corrective actions in design, production line and units already produced, if possible and submit a report to the nodal agency with a copy to the concerned certification body, within 4 weeks of the verification of COP report.
- 15.2 If the manufacturer is unable to diagnose the reasons for non-compliance within stipulated time and / or feels that the problem is not relevant to any or all other models in the family, this shall be clearly stated in the report.

## **16.0 CONSEQUENCES OF NON-COMPLIANCE**

- 16.1 Based on the diagnosis and corrective action plan submitted by manufacturer the nodal agency may take any of the following actions:
- 16.2 Allow continuation of production / import of all models in the family if it is satisfied with the corrective actions planned / taken by the manufacturer with or without additional verification of COP in due course.
- 16.3 Allow continuation of production / imports of some or all other models of the family if it determines that the reasons for non-compliance of the tested model are not relevant to these models, with or without additional verification of verification of COP in due course.
- 16.4 Stop production / import of any or all models in the family till compliance is demonstrated by the manufacturer, through a re-verification of COP if so desired by the nodal agency.
- 16.6 The manufacturer shall be given an opportunity to explain its views before taking a final decision.

## PART III

### TEST EQUIPMENT & PROCEDURES

#### 17.0 OVERVIEW

- 17.1 This part specifies the test equipment, setup, procedure, calculation method and other relevant technical details to be used for determination of weighted average specific emission of a “product”.
- 17.2 Emission being an engine related phenomenon, testing of completed genset or its engine alone its prescribed.
- 17.3 Determination of weighted average specific emission, prescribed herein is derived from :
- ISO 8178 “Reciprocating internal combustion engines-exhaust emission measurement – Part I: Test bed measurement of gaseous and particulate exhaust emissions by RAW / CVS test method.

Sampling of raw or dilution(CVS: Constant Volume Sampler)exhaust gases for measurement of emissions and use of carbon balance or air & fuel flow rate method for calculation of mass emission rates is prescribed considering the availability and simplicity of the equipment involved. However, other established methods of emission measurement and calculation of mass emission rates may be used, subject to the approval of the nodal agency.

Testing shall be conducted by the testing agency based on availability of testing facility (Raw or CVS emission measurement) as per mutual agreement between testing agency & manufacturer.

- 17.4 Determination of weighted average specific emission prescribed herein involves:
- 17.4.1 Running in of the product as per manufacturer’s recommendation, for stabilization of emission levels.
  - 17.4.2 Operation of the product at various prescribed loads, representative of actual usage load conditions, till temperature stabilization is achieved.
  - 17.4.3 Measurement of molar concentration of CO, CO<sub>2</sub>, HC, NO<sub>x</sub> in exhaust, fuel consumption rate and load at each load after temperature stabilization.

Additionally, measurements of molar concentration of O<sub>2</sub> in the exhaust and combustion inlet air flow rate if the mass emission rates are being calculated by air & fuel flow rate method.

- 17.4.4 Calculation of mass emission rates in gram-per-hour at each load.
- 17.4.5 Calculation of weighted average specific emissions in grams-per-kilowatt-
- 17.4.6 Hour of engine brake output.

## 18.0 SPECIFICATION OF TEST EQUIPMENT AND SETUP

- 18.1.1 The equipment and setup necessary for testing of exhaust emissions of genset/ engine as per method prescribed herein, consists of:
  - 18.1.2 Resistive load bank for electrical loading of the genset, equipped with voltmeter, ammeter and frequency meter for measurement of the load. (Required only if the testing has to be done on genset).
  - 18.1.3 Engine dynamometer, in case the testing has to be performed on the engine alone.
  - 18.1.4 Exhaust gas analyzers for measurement of molar concentrations of CO, CO<sub>2</sub>, HC, NO<sub>x</sub> and O<sub>2</sub>.
  - 18.1.5 Arrangement for sampling raw or dilution (CVS) exhaust gases, their conditioning for and transfer to analyzers.
  - 18.1.6 Apparatus for measurement of fuel consumption rate.
  - 18.1.7 Instruments for measurement of:
    - Ambient air pressure and humidity
    - Engines inlet air and other temperatures
    - Temperatures of exhaust sample
  - 18.1.8 Instrumentation and setup for measurement of engine inlet air flow rate.
  - 18.1.9 Requirement of type, accuracy, calibration, etc of the equipment shall be as under:
- 18.2 Requirement of type, accuracy, calibration, etc. of these equipment shall be as under:

### 18.2.1 Resistive Load Bank

- a) The load bank shall be a single phase (for single phase Gensets only) or 3 phase load circuit, with each phase consisting of:
  - A combination of stable resistive elements of appropriate rating, wired such that the total load current is adjustable to any value up to 125% of max. full throttle current per phase of the genset under test with accuracy of  $\pm 0.1$  Amp.
    - I. The resistive elements shall be capable of withstanding continuous energisation at 150% of the rated voltage of the genset without overheating.
    - II. The ratings of other circuit elements such as switches, cord setc., shall be consistent with the highest current/voltage to which they may be subjected in actual operation.
  - A voltmeter, frequency meter and ammeter for measuring the output voltage and frequency of the genset and the total load current respectively.
    - I. Voltmeter and ammeter shall be AC RMS meters, direct acting analogue I digital type conforming to IS 1248 (part 2), accuracy class 0.5. The range and rating shall be appropriate for the genset output to be measured.
    - II. Frequency meter shall be direct acting analogue (pointer)/ digital type conforming to IS 1248 (part 4), accuracy class 1. The range of frequency meter shall be 45 - 65 Hz.
    - III. The meters should be calibrated once in a year. The calibration must be traceable to within the specified accuracy with respect to NPL/International standard.
- b) The entire circuit shall be housed in a suitable enclosure for safety and convenience of operation. The configuration shall ensure that under normal conditions:
  - I. Accidental touches to live/ hot parts are not possible.
  - II. There shall be no possibility of short-circuiting. The insulation resistance between each independent conducting path and between conducting

path and body of the enclosure shall be 10  $\mu\Omega$  min. Further, the insulation system shall withstand 1500 V AC for 1 minute without breakdown and shall be consistent with the maximum temperature to which it may be subjected in operation.

- III. The resistive elements and the enclosure do not overheat. If necessary, a cooling fan of adequate capacity shall be provided.

### 18.2.2 Dynamometer

- a) The dynamometer must be capable of performing the test cycle prescribed in Annexure 5 on the engine to be tested. The accuracy of brake torque and speed measurement shall be within  $\pm 2\%$  of the point value.
- b) The calibration of torque measuring instrument shall be checked prior to each test as per the method recommended by the manufacturer of dynamometer.

Calibration must be checked at minimum three points approximately corresponding to the actual torques being applied in the testing.

- c) The calibration of speed measuring instrument shall be checked once in a year or at least within a year prior to testing.

### 18.2.3 Exhaust Gas Analyzers

- a) The species to be analyzed and the type of the analyzers to be used shall be as under:

SPECIES TO BE MEASURED		TYPE OF ANALYZER
<b>CO</b>	Molar concentration in dry exhaust (%)	NON DISPERSIVE INFARED ABSORPTION (NDIR)
<b>CO<sub>2</sub></b>	Molar concentration in dry exhaust (%)	NON DISPERSIVE INFARED ABSORPTION (NDIR)
<b>HC</b>	Molar concentration in wet exhaust (ppm)	HEATED FLAME IONIZATION DETECTOR (HFID)
<b>O<sub>2</sub></b>	Molar concentration in dry or wet exhaust (%)	PARAMAGNETIC (PMD), ZIRCONIA (ZRDO) OR ELECTROCHEMICAL (ECS)
<b>NO<sub>x</sub></b>	Molar concentration in dry or wet exhaust (ppm)	CHEMILUMINESCENT DETECTOR (CLA) OR HEATED CHEMILUMINESCENT DETECTOR (HCLA)

#### b) Analyzer accuracy and specification

- The analyzers must have a measuring range which allows them to measure the concentration of exhaust gas sample species with an accuracy of  $\pm 2\%$ .
- The NO<sub>x</sub> analyzer shall consist of a NO<sub>2</sub> to NO convertor. The efficiency of the convertor must be at least 95%.
- The HFID analyzer shall be set to a temperature between 185 ~ 197°C.

### **c) Initial and periodic calibration**

Prior to initial use and monthly thereafter or within a month prior to the emission testing the analyzers must be calibrated on all normally used ranges as follows:

Check the efficiency of NO<sub>x</sub> converter as recommended by the analyzer manufacturer.

- Warm up the analyzers for a minimum of two hours.
- Tune the NDIR analyzers and optimize the HFID analyzer response as per the method recommended by the analyzer manufacturer.
- Introduce the calibration gases directly at the analyzers. Use the same flow rates and pressures as when analyzing samples. The analytical and calibration gases shall be as per specification given in 18.2.4 of this part.
- Using purified dry air or nitrogen the analyzers shall be set at zero.
- Calibration each normally used operating range with calibration gases having nominal concentrations between 10% and 90% of that range. A minimum of 5 uniformly spaced points covering the range shall be checked.
- For each range calibrated if the deviation from a least squares best fit Straight line is 2% or less of the value at each data point; calculate concentration values by use of a single calibration factor for that range. If the deviation exceeds 2% at any point, use the best-fit non linear equation which represents the data to within 2% of each test point to determine concentration.

### **d) Pre test checks**

- A minimum of two hours shall be allowed for warming up the analyzers. It is preferable that power be left "on" continuously in the analyzers.
- Each normally used operating range shall be checked prior to each analysis.
- Using purified dry air or nitrogen the analyzers shall be set at zero. Span gas having a concentration of the constituent that will give a 75% ~ 95% full-scale deflection shall be introduced and the gain shall be set to match the calibration curve. The same flow rate shall be used for calibration, span and exhaust sampling to avoid correction for sample cell pressure.
- The nominal value of the span calibration gas used shall remain within  $\pm 2\%$  of the calibration curve.

If it does not, but remains within  $\pm 5\%$  of the calibration curve, the system parameters' such as gain of the amplifier, tuning of NDIR analyzers, optimisation of HFID analyzer, etc. may be adjusted to bring within  $\pm 2\%$ .

However, if the system does not meet the above requirement the system should be checked, fault, if any, corrected and a new calibration curve should be established.

#### **18.2.4 Analytical and Calibration Gases**

##### a) Pure Gases

The following pure gases shall be available when necessary for calibration and operation:

- Purified nitrogen (purity < 1 ppm C, < 1 ppm CO, < 400 ppm CO<sub>2</sub>, < 0.5 ppm NO)
- Purified oxygen (purity < 3 ppm C, < 1 ppm CO, < 400 ppm CO<sub>2</sub>, < 0.5 ppm NO) Oxygen content between 18 and 21 percent vol;
- Synthetic Air (purity > 99.5 percent vol O<sub>2</sub>)
- Purified hydrogen (and mixture containing hydrogen) (purity < 1 ppm C, < 400 ppm CO<sub>2</sub>)

The shelf life of the gases shall not be exceeded. The expiry date stated by the gas manufacturer must be recorded.

##### b) Calibration and Span gases

Gases having the following chemical composition and concentrations of the species as required for calibration shall be available:

- C<sub>3</sub>H<sub>8</sub> and purified synthetic air
- CO and purified Nitrogen
- CO<sub>2</sub> and purified Nitrogen
- NO and purified Nitrogen ( the amount of NO<sub>2</sub> content in this calibration gas must not exceed 5% of the NO content)

The true concentration of a calibration gas shall be within  $\pm 2\%$  of the stated figure.

The concentration required for calibration may also be obtained by means of a gas divider, diluting with purified nitrogen or with purified synthetic air. The accuracy of the mixing device shall be such that the concentrations of the diluted calibration gases may be determined within  $\pm 2\%$ .

#### **18.2.5 Arrangement for Sampling Raw or dilution(CVS) Exhaust Gases**

- a) The exhaust sampling arrangement shall consist of an extension pipe fitted with an exhaust sample probe connected to the outlet of the normal exhaust system supplied with the product, as shown in Figure 1.



- The inside diameter of the extension pipe shall be larger than that of the tail pipe of the product muffler, and shall be such that its installation does not cause significant rise in the back-pressure. Recommended pipe diameter is shown in Figure 1
- The exhaust sample probe must be located in a position which yields a well mixed homogeneous and truly representative sample of the exhaust and shall be as close as possible to the muffler, to prevent condensation. If necessary, a mixing chamber shall be used between the muffler and the sample probe to ensure complete mixing of the engine exhaust before sample extraction. The internal volume of the mixing chamber must not be less than 10 times the cylinder displacement of the engine under test. The height, width and depth of the chamber shall be nearly equal.
- The extension pipe length beyond the sample location must be minimum 610 mm to eliminate sampling errors due to strong exhaust pulsations pulling air back into the exhaust system.
- The temperature of the inner walls of the extension pipe and mixing chamber must be maintained in the range of 185 °C ~ 400 °C. If necessary, insulation or heating pads shall be provided to achieve the temperature. Thermo couples or other suitable temperature monitoring devices must be installed at appropriate locations to monitor and ensure this requirement.
- The exhaust sample probe must be a straight closed end, stainless steel, multi-hole probe. It's inside diameter must not be greater than the inside diameter of the extension pipe. The wall thickness of the probe must not be greater than 1 mm.
- The probe must extend radially across the extension pipe, covering at least 80% of its diameter.
- The probe must have minimum 3 holes. The spacing of the radial planes for each hole in the probe must be such that they cover approximately equal cross sectional areas of the extension pipe. The angular spacing of the holes must be approximately equal.
- The recommended sizes and whole locations of the probe are given in Figure 2.
- The fittings used to attach the probe to the extension pipe must be as small as practical in order to minimize the heat loss from the probe.

- All the joints in the exhaust sampling arrangement must be leak-proof under the actual operating conditions.
- b) Alternate arrangement to the one described above may be used if it can be shown that it provides a homogenous, truly representative sample of the engine exhaust.
- c) Components of sampling arrangement that are wetted by the sample must be made from chemically cleaned stainless steel or any other inert material.
- d) The arrangement for transferring the sample drawn by the probe to different analyzers must meet the following requirements:
- The maximum internal diameter of the sample line must not exceed 13.2 mm.
  - The temperature of the line leading to HFID analyzer must be maintained same as the detector oven. Suitable heating pads and thermocouples must be provided at appropriate location to maintain this requirement.
  - If HCLA analyzer is used for NO<sub>x</sub>, its sample line temperature must be maintained between 60 °C and 230 °C.
  - All heated lines must be provided with heated filters to extract solid particles from the sample before it is fed to the analyzers.
  - The line leading to NDIR and CLA analyzers must pass through a cold trap to remove the water and then through a filter. The sample gas temperature must be monitored in the cold trap or downstream and must not exceed 7 °C.
  - The inlet to each analyzer must be provided with a metering valve, to permit adjustment of flow rate and flow meters for monitoring.

#### **18.2.6 Fuel Flow Measurement**

- The instrument for measurement of fuel flow rate shall preferably be of gravimetric. The combined accuracy shall be within  $\pm 2\%$  or any other suitable method for fuel flow measurement may be used which gives the measurement accuracy of 2%.
- If volumetric fuel flow rate instrument is used, the temperature of the fuel in the instrument must be monitored and the corresponding fuel density shall be used for calculation of mass flow rate of the fuel.
- For engine with gravity feed fuel system, the arrangement shall be made to maintain the fuel head at the engine fuel inlet to average head in the actual product.

### 18.2.7 Temperature Measurement

Thermocouples or other suitable temperature monitoring devices shall be used for measurement of ambient and engine inlet air temperatures. The measurement accuracy must be within  $\pm 2$  °C.

The measurement location for engine intake air temperature must be within 100 mm of engine intake system.

### 18.2.8 Instrumentation and set up for measurement of engine inlet air flow rate

- a) The engine inlet air flow rate shall be measured with laminar flow meter. The meter must have a range and accuracy suitable for the actual air flow rates to be measured such that the overall measurement accuracy is within  $\pm 2$  % of the reading or  $\pm 1$  % of engine's max value
- b) The meter shall be used in conjunction with a pressure wave damping chamber. The damping chamber shall consist of any vessel having an internal volume not less than 100 times the displacement volume per cylinder of the engine under test.  
The damping chamber shall be installed between the air flow meter and engine air inlet. The joints on either side must be properly sealed to prevent any air leakage at the operating vibrations.
- c) If the set up reduces the engine flow rate because of excessive pressure drop, greater than 100 Pa, an auxiliary blower shall be used to maintain the engine intake air pressure to within  $\pm 50$  Pa of the barometer reading.

## 19 TEST CONDITIONS

19.11 The ambient temperature throughout the test shall be within 20 ~40°C.

19.12 The absolute ambient temperature (designated as T & expressed in Kelvin) and dry atmospheric pressure (designated as Ps & expressed in kPa) must meet the following condition:

$$0.93 < F_a = (99/P_s) \times (T / 298)^{0.7} < 1.07$$

## 19.2 Power Corrections Factors:

Definition: The power correction factor is the coefficient by which the measured power must be multiplied to determine the engine power under the reference atmospheric conditions specified as below

$$P_o = \alpha P$$

Where:

$P_o$  is the corrected power (i.e. power under reference atmospheric conditions);  
 $\alpha$  is the correction factor ( $\alpha_a$  being the correction factor for spark ignition engines)

$P$  is the measured (observed) power (test power)

Reference atmospheric conditions:

Temperature (T): 298K

Dry pressure ( $P_{so}$ ): 99kPa

Note: The dry pressure is based on a total pressure of 100 kPa and water Vapour pressure of 1kPa.

Test atmospheric conditions:

The atmospheric conditions during the test shall be the following

Temperature (T) : Between 283 K and 313

Pressure (P) : Between 80 kPa and 110 kPa

Determination of correction factor:

(The tests may be carried out in air -conditioned tests rooms where the atmospheric conditions may be controlled.)

The power correction factor  $\alpha_a$  for Positive Ignition Engines (Naturally aspirated or supercharged) obtained by applying the formula:

The correction Factor ( $\alpha_a$ ) is obtained by applying the formula:

$$\alpha_a = (99 / P_s)^{1.2} ( T/298)^{0.6}$$

Where,

$P_s$ = the dry atmospheric pressure in kPa, that is the total barometric pressure minus water vapour pressure and

T= the absolute temperature in Kelvin (K) at the engine air inlet

The formula applies to carburetted engines and to other engines where the management system is designed to maintain relatively constant fuel / air ratio as ambient conditions change.

(The references for Power correction factor are taken from IS 14599:1999 clause 6.4.1)

### **19.3 LUBRICATING OILS AND TEST FUELS**

19.3.1 The engine lubricating oil used shall be as per the manufacturer's recommendations.

19.3.2 Fuel:

The commercially available fuel, gasoline or kerosene as applicable shall be used for testing. As specified in this document no other fuel, shall be used to start and run the genset without consent from CPCB.

19.3.3 Genset component or Parts identification:

All the details of the genset components or parts responsible for emission Performance shall be clearly marked in the English language. All engineering drawings shall be in the English language & appropriately in dimensions in mm.

## **20 TEST PROCEDURE**

### **20.1 Preparations and Pre-Checks**

20.1.1 Check and confirm that the equipment and test setup conforms to the specifications given in 18.0

20.1.2 Carry out the pre-test calibration and other checks as specified in 18.0

20.1.3 If the test has to be carried out on the engine alone, as recommended by the manufacturer:

- Make proper arrangement for mounting and coupling of the engine on the dynamometer. If any modifications are necessary in the mounting of essential engine parts, these shall be done such that they do not affect the performance of the engine
- Calibrate the dynamometer as specified in 18.2.2

20.1.4 Install thermocouples or other suitable temperature measuring devices to monitor the temperatures, which constitute criteria of thermal stability as specified by the manufacturer.

20.1.5 Subject the product to running in, as per the manufacturer's recommendation, to stabilize its emission characteristics. During and after running-in normal maintenance, as specified by the manufacturer, shall be carried-out.

20.1.6 Run the product at mode 1 of test cycle as specified in Annexure - V and note the corresponding maximum output and fuel consumption. Repeat the check after installation of exhaust sampling set up. If the drop in maximum output or increase in fuel consumption rate, due to installation of exhaust sampling system is greater than 5%, modify the exhaust sampling arrangement keeping in mind the essential requirements specified in 18.2.5.

## 20.2 Emission Test

21.2.1 Run the product and adjust the load, engine speed and throttle as per mode 1 of test cycle specified in Annexure 5.

Run the product for a sufficient period of time to achieve thermal stability (Engine temperature to remain within a band of 10 °C for 10 minutes).

21.2.2 After achieving thermal stability, initiate the measurement of fuel consumption rate, air flow rate (optional) and emissions:

- A minimum of 3 readings of fuel consumption rate shall be taken and the duration of each measurement must be minimum 30 seconds. Average of the 3 readings shall be reported.
- Emission values of each specie shall be monitored / recorded for a continuous period of 2 minutes. Average value of the period shall be reported.

Record the appropriate load data

21.2.3 Repeat 21.2.1–21.2.2 for modes 2 & 3 respectively.

20.2.4 The following guidelines must be strictly observed during the testing:

- Modes shall be performed in the numerical order specified in the test cycle (Annexure 5)
- In case of doubt in any mode, may be repeated before switching over to the next mode.
- The load and the engine speed must be maintained as per the test cycle during the period of measurement of emissions, fuel consumption and load. If this requirement is not met, the mode is void and must be completely repeated.
- If a delay of more than one hour occurs between the end of one mode and the beginning of another mode, the test is void and must be completely repeated.
- If at any time, during a mode the test equipment malfunctions or the specifications in 18.0 cannot be met, the test is void and must be aborted. Corrective action should be taken and the test restarted.

## **21 REVIEW OF SPECIFICATIONS**

- 21.1 The nodal agency shall investigate the adequacy and suitability of specifications of ambient temperature and pressure and fuel as laid down in 19.1, 19.2 and 20.2 of this part respectively to ensure accuracy and reproducibility of the results
- 21.2 All other specifications shall also be subject to review as and when necessary based on the experience gained in implementation of emission testing as prescribed in this document.

# ANNEXURE – 1

## Part - 1A

### **NOTARISED AFFIDAVIT ON NON-JUDICIAL STAMP PAPER OF Rs.10/- [To be submitted to the Nodal Agency by a manufacturer approaching for the first time for TA]**

I, ....., Chairman / President / Managing Director / Partner / CEO / Proprietor of M/s ....., having Registered Office at ..... engaged in manufacturing / import of Petrol and/or Kerosene driven Gensets / Genset engines with manufacturing facilities / ware house (in case of importer) at:

- i).....
- ii).....

I am authorized to swear this affidavit for and on behalf of the above named Company. I do hereby solemnly affirm and declare as under:

1. That the deponent is well conversant with the facts and competent to swear this affidavit.
2. That the deponent declares that M/s ..... are manufacturer / importer of Genset engines driven by petrol and/or Kerosene in the brand name
  - i) .....
  - ii) .....  
(Strike out if not applicable)
3. That the deponent declares that M/s ..... are importer of Petrol and/or Kerosene driven Gensets / Genset engines sets from
  - M/s ..... (ii) M/s .....
  - (Complete address)
  - (Strike out if not applicable)
4. That the deponent declares that M/s ..... will obtain Type Approval / Conformity of Production verification only from (Name of the Certification Agency)..... and will not approach any other Certification Agency for Type Approval / Conformity of Production verification for any of their Petrol and/or Kerosene driven Gensets / Genset engine models, without prior permission from the nodal agency.
5. That the deponent declares that none of the Chairman, Managing Director, Partner, Director, Proprietor, Board Member in M/s ..... has been involved with a Company / Firm which has manufactured and sold non-compliant Petrol and Kerosene driven Gensets / Genset engines .
6. That the deponent declares that M/s ..... will manufacture / import and sell only..... ..  
..... make compliant Genset engines driven by petrol and/or kerosene.

(Name & signature with Co. stamp)  
(DEPONENT)

### **VERIFICATION**

Verified at .....on this .....of .....,200.. that the contents of the above affidavit are true and correct to the best of my knowledge and belief and nothing has been concealed therein.

Place:.....  
Date:.....

(Name & Signature with Co. Seal)  
(DEPONENT)

**ANNEXURE – 1**



## Part - 1B

### FORMAT FOR SUBMISSION OF PROFILE AND DETAILS OF THE MANUFACTURER

#### A. COMPANY DETAILS

- Name of the Company
- Type of Company: Proprietor / Partnership / Private Ltd / Public Ltd
- Name of the Proprietor / Partners / Directors (submit relevant documents)
- Importer / manufacturer
- Registered Office Address with phone number
- Contact Address with phone number, fax number, email etc.
- Name and designation of the authorized person for submission of documents and to deal with the certification agency
- Plant addresses and contact details, in case of manufacturer
- Ware house address, in case of importer
- **(This cannot be changed without prior intimation to Nodal Agency and Certification Agency)**
- Name of the company from whom to import and its contact details , in case of importer
- Plant details, from where to import
- Authenticated copies of following documents to be submitted
  - i) Manufacturing License from Directorate of Industries / Department of Industry (in case of Manufacturer), IEC Code (in case of importer)
  - ii) VAT and CST/GST Registration
  - iii) Excise Registration, in case of manufacturer
  - iv) Consent to establish / operate from respective SPCB /PCC
- No. of employees
- Engineers (if any)
- Last year Turn-over
- Any other business

#### B. Details of Genset engine (Proposed ) manufactured / assembled / imported

Model Names	Nos. produced /imported in current year	Nos. expected to be produced / imported in the next year
-------------	--	---

a)

- b)
- c)
- d)

C. Details of Infrastructure

D. Land :      Owned / Rented  
                         Area (m<sup>2</sup>):

E. Covered Area

F. Machinery for manufacture

- a)
- b)
- c)
- d)

G. Testing facility equipments

- a)
- b) Load bank type and capacity
- c) Measuring Instruments
- d) Any other

H. Quality Control

1. Quality Control Incharge
2. Quality Procedure:  
ISO Certified since when  
(Enclose a copy of Operating Procedure)
3. Pre-delivery Inspection Procedure  
On Gensets (including records Maintained)
4. System of serial numbering and marking on  
Genset and their sub-systems – e.g. all enclosures etc.

5. Any other

Place : .....

Date: .....

(Signature of the  
Chairman /President / Managing Director /Partner / CEO /  
Proprietor)

Seal of the company

**ANNEXURE -2**

**APPLICATION TO TEST AGENCY FOR TYPE APPROVAL**  
**For Petrol and Kerosene run Generator Sets upto 19 kW**

<b>1.0</b>	<b>NAME &amp; ADDRESS OF THE GENSET MANUFACTURER</b>	
<b>2.0</b>	<b>NAME &amp; ADDRESS OF THE ENGINE MANUFACTURER</b>	
<b>2.1</b>	<b>GENSET CATEGORY – Indigenous or Imported</b>	
<b>2.2</b>	<b>ADDRESS OF THE MANUFACTURING PLANT/S</b>	
<b>3.0</b>	<b>PRODUCT CATEGORY</b>	
<b>4.0</b>	<b>MODEL NAME / BRAND NAME</b>	
<b>5.0</b>	<b>GENSET CANOPY TYPE: HALF /FULL</b>	
<b>6.0</b>	<b>CLASS OF THE ENGINE AS SPECIFIED IN THE REGULATION</b>	
<b>7.0</b>	<b>MODEL FAMILY DESIGNATION ASSIGNED TO THE MODEL:-</b>	
<b>8.0</b>	<b>GENSET OUTPUT SPECIFICATIONS</b>	
8.1	No. of phases – <del>one</del>	
8.2	Rated voltage (V)	
8.3	Rated current (A)	
8.4	Rated frequency (Hz)	
8.5	Overall efficiency of the alternator %	
8.6	Max. output declared by manufacturer with tolerance (VA)	
<b>9.0</b>	<b>Alternator Make:</b>	
<b>9.1</b>	<b>No. of Poles used</b>	
<b>10.0</b>	<b>PRODUCTION / IMPORT PLAN (SCHEDULE) AND ESTIMATED VOLUME PER ANNUM</b>	
<b>11.0</b>	<b>DESCRIPTION OF THE ENGINE</b>	
11.1	Make	
11.2	Type	
11.3	Working principle, Four stroke / Two stroke	
11.4	Bore (mm)	
11.5	Stroke (mm)	
11.6	Number of cylinders	
11.7	Engine Displacement (cc)	

11.8	Compression ratio ( with the tolerance)	
11.9	Max. power of the Engine (kW) @ rpm	
11.10	Drawings of combustion chamber and piston crown	
11.11	Minimum cross-sectional area of inlet and outlet ports (mm <sup>2</sup> )	
<b>12.0</b>	<b>Cooling system</b> : Liquid / air cooling	
12.1	Liquid cooling: Max.temp. at Engine Outlet	
12.2	<b>Engine Lub oil Temperature:</b> Minimum: Maximum:	
12.3	Characteristics of air-cooling system	
12.4	Blower : Characteristics of make(s) and type (s)	
12.5	Air ducting (standard production)	
12.6	Temperature regulating system	
12.7	Intake system	
12.8	Intake manifold description	
12.9	Air filter : make & type	
12.	Device for recycling crank-case gases : Description and diagrams	
<b>13.0</b>	<b>ADDITIONAL ANTI-POLLUTION DEVICES (IF ANY, AND IF NOT COVERED BY ANOTHER HEADING) ( Description and diagrams)</b>	
13.1	<b>Catalytic Converter</b>	
	a) Make:	
	b) Type:	
	c) I.D:	
	d) Substrate Dimension:	
	e) Loading:	
13.2	<b>Secondary air Injection system details</b>	
	a) Make:	
	b) Type:	
14.0	<b>Fuel feed system</b>	
	a) Make:	
	b) Type:	

	c) I.D:	
14.1	<b>Carburetor Air screw settings (specify the tolerance)</b>	
14.2	<b>Jets size</b> : a) Main Jet: c) Pilot jet:	
14.3	Carburetor Venturi Diameter (mm)	
14.4	Float-chamber level	
14.5	Mass of float in gms.	
14.6	Float needle	
14.7	Dimensions mixture duct	
14.8	Manual / automatic choke, closure setting	
14.9	Fuel Feed ( By fuel injection) System description Working principle : intake manifold / direct injection / injection pre-chamber / swirl chamber	
14.10	<b>Fuel pump:</b>	
	a) Make	
	b) Type	
	c) I.D.No.	
	d) Injection timing	
14.11	a) Injectors :	
	b) Make	
	c) Type	
	d) Opening pressure (specify tolerance)	
14.12	<b>Governor /ECU/Controller</b>	
	a) Make	
	b) Type, Mechanical /Electronic/Hydraulic	
	c) ID. No.:	
	d) Max. speed without load / min	
e) Idle speed		
14.13	<b>Cold start device</b>	
	a) Make	
	b) Type	
	c) System description	
14.14	<b>Starting aid</b>	
	a) Make	

	b) Type	
	c) System description	
<b>15.0</b>	<b>VALVE TIMING OR EQUIVALENT DATA</b>	
	<ul style="list-style-type: none"> <li>• Maximum lift of inlet valve,(mm)</li> <li>• Maximum lift of Exhaust Valve,(mm)</li> <li>• Angles of Valves (w.r.t. top dead centre):-</li> <li>• Inlet valve opening angle (IVO)</li> <li>• Inlet Valve Closing angle(IVC)</li> <li>• Exhaust valve opening angle (EVO)</li> <li>• Exhaust valve Closing angle (EVC)</li> </ul> ( Valve timing Diagram wrt top centre )	
16.0	<b>Description of reed valves if any (with dimensional drawing)</b>	
16.1	<b>Description (with dimensional drawing) of inlet ports, scavenging and exhaust, with corresponding timing diagram</b>	
<b>17.0</b>	<b>IGNITION</b>	
	a) Ignition system type	
	b) Make	
	c) Type	
	d) Ignition timing (specify the tolerance)	
	e) Contact point gap and dwell-angle (specify the tolerance)	
<b>18.0</b>	<b>EXHAUST SYSTEM</b> Description and diagrams	
<b>19.0</b>	<b>LUBRICATION SYSTEM</b>	
	a) Description of systems	
	b) Position of lubricant reservoir	
	c) Feed system (pump, injection into intake, mixing with fuel, etc.)	
	d) Lubricating pump	
	e) Make	
	f) Type	
	g) Lub oil mixed with fuel	
	h) Oil Percentage in fuel	
	i) Lubricant Used	
	j) Make	
	k) Type	

20.0	<b>ADDITIONAL INFORMATION ON TEST CONDITIONS</b>	
	a) Sparking plugs	
	b) Make	
	c) Type	
	d) Spark gap setting	
	e) Reference spark plug seat temperature at Max. output	
21.0	<b>Ignition coil</b>	
	a) Make	
	b) Type	
22.0	<b>Ignition condenser</b>	
	a) Make	
	b) Type	
23.0	<b>Radio interference suppression equipment</b>	
	a) Make	
	b) Type	

Note:-

- 1) Strike out whichever is not applicable
- 2) In addition to the names of the manufacturers of items mentioned above, the manufacturers shall inform the test agency that carries out the type approval, the names of new alternate manufacturers for these items as and when they are being introduced.



**ANNEXURE – 3**

**SPECIMEN COPY**

**Type Approval Certificate No.**

**Dated:**

**CERTIFICATE OF TYPE APPROVAL  
FOR  
COMPLIANCE TO MASS EMISSION NORMS  
FOR PETROL & KEROSENE RUN GENERATOR SETS (up to 19Kw)**

1. In order to establish compliance to the provisions of **mass emission limits**, applicable as on date ,documental verification /necessary testing was carried out on the following **Generator set model(s)**, submitted by the manufacture/manufacturer/Assembler refereed below:


2. It is certified that the above mentioned Generator Set model(s) comply with the emission limits applicable for Petrol and Kerosene run genset (**Upto 19 kW**) ,as prescribed under G.S.R. 535(E) dared 7<sup>th</sup> August, 2013, notified by **Ministry of Environment & Forests, Govt. of India:**
3. **Validity of the Certificate:**
4. **Conformity of the certificate:**
5. **This type approval certificate is issued based on the documents produced /submitted by the customer and performance results.....**

**Authorized Signatory,**

(Head)  
Certification Laboratory

(Head)  
Certification Body

(ANNEXURE 4)

SPECIMEN COPY

Certificate No.

Date:

**CERTIFICATE FOR  
CONFORMITY OF PRODUCTION OF GENSET**

**(PETROL & KEROSENE RUN GENERATOR SETS UPTO 19 kW)**

**Company Name**

Based on the verification of documents and tests carried out on the generator models-----  
manufactured & submitted by-----, and randomly selected from ----- Plants,

- 1 *It is certified that the above mentioned genset models complies with the provisions of Verification of the Conformity of Production (CoP) as per para 7.0 of CPCB Document No. PCLS/ /2013-14 and G.S.R. 535(E) dared 7<sup>th</sup> August, 2013, notified by **Ministry of Environment & Forests, Govt. of India:***
- 2 This certificate covers the genset families and its models as listed in Annexure I, declared by the manufacturer to have been produced / planned to be produced, during the stipulated period from -----
- 3 Validity of the certificate:
- 4 Next CoP shall be carried out before -----

Conditions of Issue:

**Authorized Signatory**

(Head)  
Certification Laboratory

(Head)  
Certification Body



## ANNEXURE 5

### TEST CYCLE FOR EMISSION TESTING OF PORTABLE GENSET

<b>MODE NO.</b>	<b>1</b>	<b>2</b>	<b>3</b>
LOAD PERCENT	100	75	50
WEIGHTAGE FACTOR	0.3	0.5	0.2

Notes:

- 100% of load shall correspond to full throttle output of the engine / genset.
- If the emission testing is performed on the engine the torque and speeds for each mode shall be as under:

<b>MODE NO.</b>	<b>1</b>	<b>2</b>	<b>3</b>
TORQUE	As developed by engine at full throttle	75% of Mode 1	50% of Mode 1
SPEED	Rated (or) Corresponding to 50 Hz frequency of AC genset output		

- If the emission testing is performed on the complete genset the output parameters for each mode shall be set as under:

<b>MODE NO.</b>	<b>1</b>	<b>2</b>	<b>3</b>
LOAD CURRENT	Maximum output declared by the manufacturer of the genset with * tolerance (VA) the governor & 50 ±1 Hz	75% of Mode 1	50% of Mode 1
FREQUENCY OF AC OUTPUT	50 ±1Hz		

\*Max. output tolerance up to 5% maximum.

### FIGURE

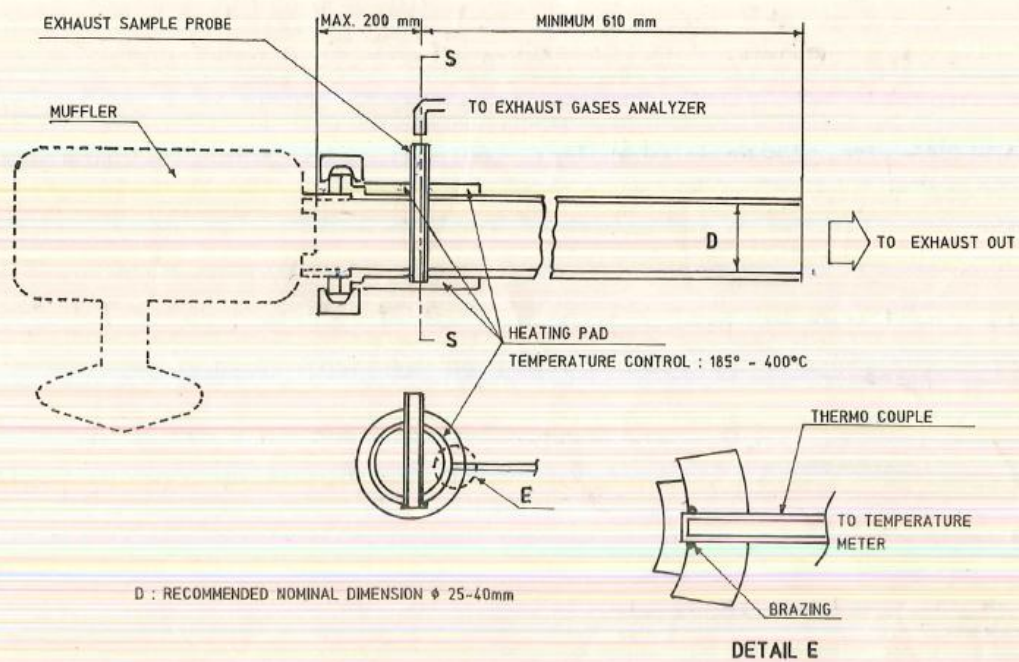


FIG. 1 EXHAUST GAS SAMPLING ARRANGEMENT

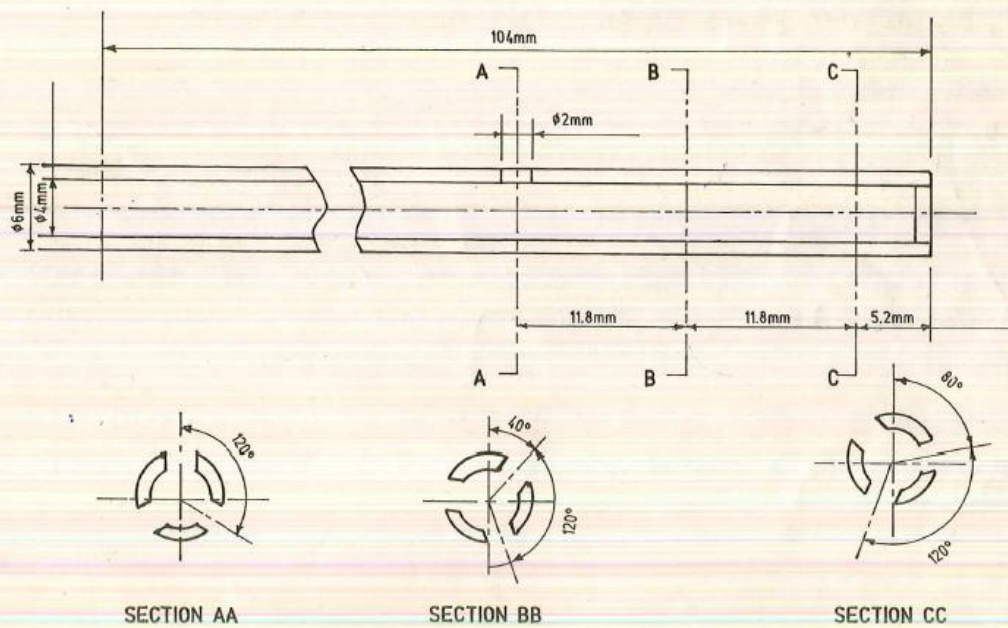


FIG. 2 RECOMMENDED DETAILS OF EXHAUST SAMPLE PROBE