



**RECOMMENDATIONS  
REGARDING  
LIABILITY**

- ASSURED  
PROPERTIES
- PUBLICATIONS
- FUELS

**RECOMMANDATIONS  
CONCERNANT  
LA RESPONSABILITE**

- CARACTERISTIQUES  
GARANTIES
- PUBLICATIONS
- COMBUSTIBLES

**C I M A C**

## Previous publications

1. Recommendations for Internal Combustion Acceptance Test – 1961 \*)  
(out of print)  
German version is available
2. Recommendations for Gas Turbine Acceptance Test – 1968  
(English and French version)  
Price: ffrs. 35.00 (plus postage)
3. Recommendations for the Measurement of the Overall Noise of reciprocating Engines – 1970  
(English and French version)  
Price: ffrs. 35.00 (plus postage)
4. Recommendations for SI Units for Diesel Engines and Gas Turbines – 1975  
(English and French version)  
Price: ffrs. 35.00 (plus postage)
5. Recommendations for Supercharged Diesel Engines: \*)  
Part I – Engine De-rating on Account of Ambient Conditions  
Part II – Engine Acceptance Tests  
(English version only)  
(not printed)
6. Lexicon on Combustion Engines, Technical Terms of the Internal Combustion Engine and Gas Turbine Industries – 1977  
(in Dutch, English, French, German, Italian, Spanish)  
Price: ffrs. 80.00 (plus postage)

\*) Contents of these CIMAC Recommendations is more or less completely adopted in ISO 3046, part 1 – 5

## Publications jusqu'à présent

1. Recommendations pour les Essais de Réception des Moteurs à Combustion Interne – 1961 \*)  
(épuisé)  
Version allemande est à la disposition
2. Recommendations pour les Essais de Réception des Turbines à Gaz ) 1968  
(textes français et anglais)  
Prix: ffrs. 35.00 (port non compris)
3. Recommendations pour la Mesure du Bruit total des Moteurs à Combustion Interne – 1970  
(textes français<sup>1</sup> et anglais)  
Prix: ffrs. 35.00 (port non compris)
4. Recommendations pour l'Emplois des Unités SI dans la Technique des Moteurs Diesel et des Turbines à gaz – 1975  
(textes français et anglais)  
Prix: ffrs. 35.00 (port non compris)
5. Recommendations pour les Moteurs Diesel suralimentés \*)  
Part I – Détarage de la puissance en fonction des conditions ambiantes  
Part II – Essais de réception des moteurs  
(version anglaise seulement)  
(pas imprimées)
6. Lexique des termes Techniques des Machines à Combustion, Industrie des Moteurs à Combustion Interne & Industrie des Turbines à Gaz  
(en Allemand, Anglais, Espagnol, Français, Hollandais et Italien)  
(Prix: ffrs. 80.00 (port non compris)

\*) Contenus des CIMAC Recommendations sont impliquées plus ou moins dans le ISO 3046, part 1 – 5



These publications can be ordered from the:

per: Secretary General  
Syndicat des Constructeurs de Moteurs à Combustion Interne  
10, avenue Hoche;  
75382 Paris Cedex 08  
Tel. (1) 563.02.00 poste 3565 Telex: FEDEMEC 280900

or from:

per: German National Committee of CIMAC  
Fachgemeinschaft Kraftmaschinen im VDMA  
D-6000 Frankfurt/Main 71  
Postfach 71 08 64  
Tel. (069) 6603 351 Telex: 411321, Telefax: 069 6603511

Ces publications peuvent être demandées de:

ou de:

CIMAC is owner of the copyright.

The publication may not be duplicated or reproduced without written consent of CIMAC, nor may it be communicated or made accessible to third parties.

CIMAC est le possesseur du droits d'édition.

La publication ne devrait pas copier ou reproduire sans autorisation écrite, en plus ne pas communiquer ou accéder à une troisième partie.

The CIMAC consists of the following member associations:

Le CIMAC est constitué par les associations membres suivantes:

GERMANY – ALLEMAGNE	FACHGEMEINSCHAFT KRAFTMASCHINEN IM VDMA Lyoner Straße 18 – 6000 Frankfurt/Main-Niederrad 71 – Postfach 71 08 64
AUSTRIA – AUTRICHE	FACHVERBAND DER MASCHINEN- UND STAHL- UND EISENBAUINDUSTRIE ÖSTERREICHS Wien, Wiedener Hauptstraße 63
BELGIUM – BELGIQUE	FABRIMETAL – GROUPE 9 21, rue des Drapiers – Bruxelles 5
CHINA – CHINE	THE CHINESE SOCIETY FOR INTERNAL COMBUSTION ENGINES 2500 Jun Gong Road – Shanghai
DENMARK – DANEMARK	JERNETS ARBEJDSGIVER FORENING Nørre Volgade 34 – Copenhagen K
SPAIN – ESPAGNE	GUASCOR S. A. Edificio Guascor – Guascor Building – Zumaya (Gipúzcoa)
U.S.A. – ETATS UNIS	AMERICAN SOCIETY OF MECHANICAL ENGINEERS Diesel and Gas Engine Power Division – Gas Turbine Division 345 East 47 Street – New York, N. Y. 10017
FINLAND – FINLANDE	FINNISH NATIONAL COMMITTEE OF CIMCAC Federation of Finnish Metal and Engineering Industries Eteläranta 10 – Helsinki 13
FRANCE – FRANCE	SYNDICAT DES CONSTRUCTEURS DE MOTEURS A COMBUSTION INTERNE 10, avenue Hoche – 75382 Paris CEDEX 08
GREAT BRITAIN – GRANDE-BRETAGNE	BRITISH NATIONAL COMMITTEE OF CIMAC c/o British Engine Group of SMMT Forbes House – Halkin Street – London SW1X 7DS
ITALY – ITALIE	A. N. I. M. A. Piazza Diaz 2 – 201 23 Milano
JAPAN – JAPAN	JAPAN INTERNAL COMBUSTION ENGINE FEDERATION 11-5, 1-Chome, Shinbashi, Minato-ku – Tokyo 105
NORWAY – NORVEGE	A/S NORSK ELEKTRISK & BROWN BOVERI Postboks 1174, Sentrum – Oslo 1
NETHERLANDS – PAYS-BAS	VERENIGING VOOR DE METAAL- EN DE ELEKTROTECHNISCHE INDUSTRIE FME, G.V.M. / Bredewater 20 – 2715 CA Zoetermeer Adresse postal: Postbox 190 – 2700 AD Zoetermeer
POLAND – POLOGNE	POLISH SOCIETY OF MECHANICAL ENGINEERS AND TECHNICIANS SIMP, COMBUSTION ENGINE SECTION ul. Świętokrzyska 14 A – 00-050 Warszawa
SWEDEN – SUEDE	FÖRENINGEN SVENSKA TILLVERKARE AV FÖRBRÄNNINGSMASKINER SVENSKA NATIONELLA CIMAC-KOMMITTEN Västerbergsgatan 3 – 431 39 Molndal
SWITZERLAND – SUISSE	SOCIETE SUISSE DES CONSTRUCTEURS DE MACHINES Kirchenweg 4 – Zürich – Case Postale

**Members of the Working Group „Liability“**

**Les membres de la Group de Travail „Responsabilité“**



**GERMANY – ALLEMAGNE**

**Mr. A. Schiff**, Chairman  
M.A.N., Augsburg

**Mr. M. Schwarz**  
Klöckner–Humboldt–Deutz AG, Köln

**Mr. H. Fiedler**  
Krupp MaK Maschinenbau GmbH, Kiel

**Dr. H. Prugger**, Secretary  
M.A.N., Augsburg

**AUSTRIA – AUTRICHE**

**Dr. U. Pfeiffer**  
Simmering–Graz–Pauker AG, Wien

**BELGIUM – BELGIQUE**

**Mr. A. Vermeiren**  
**Mr. J. Westerlinck**  
Anglo Belgian Corporation N.V., Gent

**DENMARK – DANEMARK**

**Mr. J. Andersen**  
M.A.N. – B & W Diesel A/S, Copenhagen

**FINLAND – FINLANDE**

**Mr. M. Tulkki**  
**Mr. A. Pankakoski**  
Oy Waertsilae AB, Turku

**FRANCE – FRANCE**

**Mr. M. Tacquet**  
DUVANT CREPELLE, Valenciennes

**Mr. Reyraud**  
S.A.C.M., Mulhouse

**GREAT BRITAIN – GRANDE BRETAGNE**

**Mr. P. G. Hammersley**  
B.I.C.E.M.A., London

**ITALY – ITALIE**

**Mr. V. Levi**  
Grande Motori Trieste – Gruppo Fincantieri,  
Trieste

**JAPAN – JAPON**

**Dr. H. Fujita**  
**Mt. T. Motooka**  
Japan International Combustion Federation,  
Tokyo

**NETHERLANDS – PAYS–BAS**

**Mr. G. A. W. van Overbeek de Meijer**  
Stork–Werkspoor Diesel B.V., Amsterdam

**SWEDEN – SUEDE**

**Mr. K. G. Andersson**  
**Mr. O. Felten**  
AB Volvo Penta, Göteborg

**Mr. O. Samuel**  
Nordstjernan AB, Stockholm

**SWITZERLAND – SUISSE**

**Mr. H. Stücheli**  
Gebrüder Sulzer AG, Winterthur

**Mr. E. Schwarz**  
Brown, Boveri & Cie AG, Baden

## Foreword of the President

On June 10th, 1981, Dr. Eberle of the Swiss National Committee proposed to the Permanent Committee the formation of a Working Group „Legislation“. Mr. Schiff of the German National Committee offered during the discussion in the Permanent Committee to prepare a more precise, limited scope for this Working Group. This proposal was accepted by the Permanent Committee, and it was decided to found a Working Group „Liability“. Mr. Schiff was willing to act as Chairman. The objective of this activity – in particular with regard to large engines – was to achieve uniformity of the very different ideas in the various CIMAC countries in so far as liability problems are concerned.



In a relatively short time this Working Group has succeeded in systemizing the complex material and defined recommendations for three areas, that is „Assured Properties“, „Publications“, and „Fuels“. These recommendations give a convenient survey of the points which have to be considered in the three areas, if the corresponding agreements are to be comprehensive and the legitimate interests of the engine industry taken into account.

I would like to thank the Working Group under Mr. Schiff for the prompt and excellent work they have done. I hope and wish that these recommendations will be generally applied worldwide.

C. C.J . French

## Préface du Président

Le 10 juin 1981, le Dr. Eberle, membre du Comité national suisse, proposait au Comité Permanent l'installation d'un groupe de travail „Législation“. Lors des discussions au sein du Comité Permanent, M. Schiff, membre du Comité national allemand, s'offrait à préparer un document sur le champ d'activité plus précis et plus restreint pour ce groupe de travail. Cette proposition était acceptée par le Comité Permanent, et il était décidé d'installer un groupe de travail „Responsabilité“. M. Schiff était d'accord de prendre la présidence. L'objectif de cette activité – en particulier au regard des grandes moteurs – était d'harmoniser les idées très divergentes sur les problèmes de la responsabilité qui existent dans les différents pays membres de CIMAC.

Dans une période relativement courte, ce groupe de travail a réussi à systématiser ce matériel complexe, et formulé des recommandations sur trois domaines tels que „Garantie assurée“, „Publications“ et „Combustibles“. Ces recommandations donnent un sommaire convenable sur les points qui sont à considérer dans ces trois domaines si les contrats correspondants doivent être compréhensifs et les intérêts légitimes de l'industrie de moteurs pris en considération.

J'aimerais bien remercier ce groupe de travail sous la présidence de M. Schiff de son excellent et prompt travail. J'espère et je souhaite que ces recommandations seront employées généralement à travers le monde.

C. C.J . French

## Summary

In the United States as in Europe legislature attaches increasing importance to questions of liability and it is the duty of the manufacturers to guard themselves against these new demands.

The present recommendation tries to determine the limits of the liability and compiles a list of precautions to be taken by the engine manufacturer starting from drafting a contract and the certification for the product.

These precautions refer to the following:

- The guaranteed characteristics, such as power output, fuel consumption, consumption of lubricants, quality of exhaust gas, pollution, noise, vibrations, etc.
- The published papers, such as installation guide, operation handbook, maintenance book, etc.
- The fuels used and their treatment.

## Résumé

Aux Etats-Unis comme en Europe, le législateur attache une importance grandissante aux questions de responsabilité et il est du devoir des constructeurs de se prémunir face à ces nouvelles exigences.

La présente recommandation s'efforce de fixer les limites de la responsabilité et dresse une liste des précautions à prendre par le constructeur de moteurs lors de la rédaction des contrats et de la documentation fournie avec le produit.

Ces précautions concernent:

- les caractéristiques garanties telles que puissance, consommation en combustible et en lubrifiant, qualité de gaz d'échappement, pollution, bruit, vibrations, etc..
- les documents publiés tels que Guide l'installateur, Manuel de conduite, Manuel d'entretien, etc..
- les combustibles utilisés et leur traitement.

## CONTENTS

	Page
<b>Foreword</b> . . . . .	8
<b>General remarks</b> . . . . .	8
<b>A. Recommendations regarding assured properties</b> . . . . .	9
Introduction . . . . .	9
Retesting . . . . .	9
Compensation . . . . .	9
Cancellation . . . . .	9
General limitation of liability . . . . .	9
1. General . . . . .	9
2. References . . . . .	10
3. Power and testing of engines . . . . .	10
4. Specific fuel consumption and method of measurement . . . . .	10
5. Lubricating oil consumption . . . . .	11
6. Exhaust gas temperature and exhaust gas flow . . . . .	11
7. Chemical composition of emission gases . . . . .	12
8. Air-borne noise level . . . . .	12
9. Vibration . . . . .	12
10. Speed fluctuations . . . . .	13
11. Lifetime of components (wear parts) . . . . .	13
<b>B. Recommendations regarding publications</b> . . . . .	14
Introduction . . . . .	14
<b>I. Installation instructions</b> . . . . .	14
1. Definition . . . . .	14
2. General . . . . .	14
3. List of recommended instructions . . . . .	15
<b>II. Operation manual</b> . . . . .	16
1. Definition . . . . .	16
2. General . . . . .	16
3. List of recommended instructions . . . . .	16
<b>III. Maintenance manual</b> . . . . .	17
1. Definition . . . . .	17
2. General . . . . .	17
3. List of recommended instructions . . . . .	17
<b>IV. Spare parts catalogue</b> . . . . .	18
1. Definition . . . . .	18
2. General . . . . .	18
3. Contents of spare parts catalogue . . . . .	18
<b>C. Recommendations regarding fuels and fuel treatments</b> . . . . .	19
Introduction . . . . .	19
1. General . . . . .	19
2. Recommendations for the contract . . . . .	19
3. Recommendations for the Installation Instruction . . . . .	19
4. Recommendations for the Operation Manual . . . . .	19
5. Sampling procedure . . . . .	19
6. Compatibility . . . . .	19

## TABLE DES MATIERES

	Page
<b>Avant-propos</b> . . . . .	8
<b>Remarques generales</b> . . . . .	8
<b>A. Recommendations concernant les caracteristiques garanties</b> . . . . .	9
Introduction . . . . .	9
Répétition des essais . . . . .	9
Compensations . . . . .	9
Annulation . . . . .	9
Limitation générale de la responsabilité . . . . .	9
1. Généralités . . . . .	9
2. Références . . . . .	10
3. Puissance et essai des moteurs . . . . .	10
4. Consommation spécifique de combustible et méthode de mesure . . . . .	10
5. Consommation d'huile de lubrification . . . . .	11
6. Température et débit des gaz d'échappement . . . . .	11
7. Composition chimique des gaz d'échappement . . . . .	12
8. Niveau de bruits aériens . . . . .	12
9. Vibrations . . . . .	12
10. Fluctuations de vitesse . . . . .	13
11. Durée de vie des composants . . . . .	13
<b>B. Recommendations concernant les publications</b> . . . . .	14
Introduction . . . . .	14
<b>I. Instructions pour l'installation</b> . . . . .	14
1. Définition . . . . .	14
2. Généralités . . . . .	14
3. Instructions recommandées . . . . .	15
<b>II. Guide de conduite</b> . . . . .	16
1. Définition . . . . .	16
2. Généralités . . . . .	16
3. Instructions recommandées . . . . .	16
<b>III. Manuel d'entretien</b> . . . . .	17
1. Définition . . . . .	17
2. Généralités . . . . .	17
3. Instructions recommandées . . . . .	17
<b>IV. Catalogue des pièces de rechange</b> . . . . .	18
1. Définition . . . . .	18
2. Généralités . . . . .	18
3. Contenu du catalogue des pièces de rechange . . . . .	18
<b>C. Recommendations concernant les combustibles et leur traitement</b> . . . . .	19
Introduction . . . . .	19
1. Généralités . . . . .	19
2. Recommendations pour le contrat . . . . .	19
3. Recommendations pour les instructions d'installation . . . . .	19
4. Recommendations pour le Guide de conduite . . . . .	19
5. Prélèvement d'échantillons . . . . .	19
6. Compatibilité . . . . .	19

## FOREWORD

Because of growing concern amongst manufacturers regarding the developing situation in the United States and Europe on changes to law in respect of liability for defective or dangerous products, the CIMAC has requested a Working Group to elaborate recommendations in reaction to these developments to reduce liability exposure.

The harsher attitude of law and court towards the manufacturer regarding defective and dangerous products extends especially to the non-contractual relation (product liability), but also has its impact on the contractual one.

Product liability is often defined as the liability for damage to property or personal injury caused by defects \*) in a product, apart from damage to the product itself.

Claims of product liability are generally raised by a third party without any contractual relation to the party claimed to be liable. Consequently, it is not possible to disclaim or limit the product liability by a provision of contract. According to the legislation in many countries, no statute of limitations applies to product liability, so a claim may be raised several years after the product has been brought onto the market.

In cases of product liability, certain legal systems decide the liability question still on a tort base in which proven fault of the manufacturer is a necessary element, while other systems favour in the same case the theory of strict liability in tort, that is, liability irrespective of

fault. Strict liability in those countries is imposed for reasons of public policy, which requires that the loss caused by defective products be placed on those who create the risk and reap the profit by placing a defective product in the stream of commerce. Between these extremes of judgement on liability, there are several differences in degree.

The change to a less favourable attitude by the Law and the Courts towards manufacturers in product liability cases does, regretfully, have its repercussions in cases of contractual liability.

Contractual liability can be defined as a liability of the contracting party towards the other party for damages caused by non attainment of parameters stipulated in the contract (including product specifications, possible governmental regulations, warranties, etc.).

A consequence of the change to the law detrimental to the manufacturer is that it has given rise to a multitude of claims against manufacturers.

At this stage of the developing situation it is not possible to state precisely the extent of legal obligations likely to be placed on manufacturers.

There are however, steps which can be adopted in preparation for such changes, some which have a direct bearing on the likely legal consequences of the changes in law, and others which could be described as steps for the avoidance of problems in future.

## GENERAL REMARKS

This Recommendation applies to reciprocating internal combustion engines not derived from high volume production and used for marine applications, off shore, power plants, rail traction etc.

Engines derived from high volume production and intended to propel for example road vehicles, tractors, agricultural and garden equipment, construction and

earthmoving machinery, pleasure boats and other small craft, small and/or mobile generator sets etc. are not covered by this Recommendation.

Even if the initial negotiation correspondence is in the language of the customer, the contract documentation should be in the language of the manufacturer or in English.

---

\*) The term „defect“ is used here in a legal sense and may have a different meaning in many countries.



## A. RECOMMENDATIONS REGARDING ASSURED PROPERTIES

### Introduction

The manufacturer has to supply a product in accordance with contractual specifications and regulations.

Owing to the consequences which might result from the non-attainment of certain properties, expressly stipulated in the contract or assumed, the parties should take particular care to determine and specify in detail the technical conditions on which their transaction is based.

The contracting parties should, among other things, be particularly aware of their responsibilities when quoting properties which they agree to guarantee and should make only such commitments as they really believe they can fulfil and which can be verified. For this reason, application of this CIMAC Recommendation as well as international and national standards is advisable.

The assurance of properties of the product involves substantial financial risks to the manufacturer, which makes it necessary to define the consequences of non-compliance and to make provisions in the contract with respect to such closely connected subjects as retesting, compensation and cancellation, which become important in that situation especially as the law differs from country to country.

### Retesting

When at the first test(s) the manufacturer is unable to attain the contractual performances, he should have the right to undertake at his expense the necessary repairs and improvements to attain the performances specified in the contract.

Insertion of provisions for the guarantee of assured properties of the product beyond the time of successful passing the acceptance tests, raises extremely complex problems and should be avoided.

If by reason of any act or omission of the buyer the manufacturer would be prevented from carrying out the acceptance tests, the consequence should be that the buyer is obliged to take over the product without acceptance tests.

### Compensation

The legal/financial consequences should be fixed in the contract, in case certain assured properties are not reached in retests, generally by stipulating payment of a

pre-estimated compensation (liquidated damages), with stipulation of the basis of calculation of the compensation and the maximum amount per assured property and the total amount which may become due with respect to all assured properties together, all this to the exclusion of any actual damage.

The word „penalty“ or any such wording should be used only if it is stipulated simultaneously that the penalty is agreed to be to the exclusion of any further damages.

Payment of any compensation should be excluded when the buyer has not sustained or will not sustain any damage. A compensation shall be to the exclusion of any other remedy of the buyer in respect of the manufacturer's default.

### Cancellation

The consequences of a possible rejection of the product in the case of non-attainment of assured properties should be seriously considered.

In the event of non-attainment of assured properties beyond certain limits, which non-attainment could upset the basis of the transaction, the possibility of cancellation becomes eminent.

It is very important to define stated limits carefully and to define also the financial consequences of cancellation. Cancellation should only be possible when the non-attainment of the assured properties concerned bear influence to the usefulness of the product and the basis of the transaction.

In general the financial consequences should be limited to the repayment of the purchase price. In certain exceptional cases, an additional payment of a fixed amount might be agreed upon.

### General limitation of liability

It is strongly recommended and accepted within the engine industry to stipulate in the contract that the manufacturer, in case of default, should never be liable for any consequential loss and/or indirect damage, such as, but not limited to, loss of profit, loss of production and cost of replacing facilities.

≈≈≈≈≈≈≈≈≈≈≈≈≈≈≈≈

### 1 General

For a clear, comprehensive and detailed statement on engine properties CIMAC recommends to follow the content of this instruction. The manufacturer/seller of an engine should select the applicable properties for each individual case, depending on the engine type and size, the application and special requirements of inspecting and/or legislative authorities and/or classification societies, specified by the customer.

The specified properties shall be as far as possible based on international standards. The applicable standards shall be clearly stated.

Furthermore, it is recommended to state in each case that the properties are assured only under the condition that

- the engine is correctly installed and run in
- the engine is properly cleaned and in good overall condition
- maintenance is properly carried out
- operation is in accordance with manufacturer's instructions.

## 2 References

- ISO 3046/1 RIC engines (RIC = Reciprocating internal combustion) – Performance  
Part 1 Standard reference conditions and declarations of power, fuel consumption and lubricating oil consumption
- ISO 3046/2 RIC engines – Performance  
Part 2 Test methods met
- ISO 3046/3 RIC engines – Performance  
Part 3 Test measurements
- ISO 3046/4 RIC engines – Performance  
Part 4 Speed governing
- ISO 3046/5 RIC engines – Performance  
Part 5 Torsional vibrations
- ISO 6798/1 Acoustics – Measurement of airborne noise emitted by RIC engines – Survey and engineering method (under preparation) <sup>1)</sup>
- ISO 8178 RIC engines – Exhaust gas smoke – Definitions and methods of measurement (under preparation) <sup>1)</sup>
- ISO 8217 Petroleum products – Fuels (class F) – Marine fuels – Specifications (under preparation) <sup>1)</sup>
- ISO 8528/1 RIC engines – RIC engine driven generating sets (under preparation) <sup>1)</sup>

## 3 Power and testing of engines

### 3.1 Power

#### 3.1.1 Declaration of power

- Kind of power (e.g. brake power, net brake power)
- Kind of power output (e.g. continuous power, overload power, fuel stop power)
- Kind of statement of power including ambient reference conditions (e.g. ISO power, service power)
- The corresponding engine speed or speeds
- The type and specification of fuel (see section „C“)

#### 3.1.2 Tolerances of power

- If neither a tolerance is specified nor a standard is referred to that includes such a tolerance, the value of power shall be understood as minimum-value.
- If a power tolerance is stated, it may depend on the application of the engine  
the method of manufacture

#### 3.1.3 Quality of fuel

The engine can deliver the declared power using a fuel quality and a fuel treated as specified by the engine manufactured (see also section „C“).

### 3.2 Testing of engines

One of the listed alternatives shall be specified.

#### 3.2.1 Category of test

- Acceptance test
  - Type test
  - Special test (performance test or endurance test or efficiency test etc.)
- } e.g. according to relevant ISO standard

#### 3.2.2 Number of engines to be tested for power

Alternatives:

- A representative engine of the production line
- One engine of the total number of engines of the contract
- . . . % of the engines of the contract
- Each engine of the contract

<sup>1)</sup> If an ISO standard is still under preparation when this CIMAC Recommendation is applied, the engine manufacturer should provide an appropriate specification of his own.

### 3.2.3 Place of test

- Engine manufacturer's test bed
- Independent test laboratory
- On site

### 3.2.4 Test method

The following shall be specified using the relevant ISO standards:

- Extent of test
- Load cycle
- Duration of test
- Test conditions
- Measurement technique
- Measurement tolerances
- Test procedure

#### 3.2.4.1 Method of power measurement

- Speed
- Torque: hydraulic brake  
electric brake  
other specified torque measuring system
- or electric power of voltage, current and power factor measured at the generator terminal provided the exact generator efficiency is known.

#### 3.2.4.2 Instruments and devices for power measurement

to be supplied by . . . (e.g. engine manufacturer, generator manufacturer etc.) in case the engines are not tested on the manufacturer's test bed.

Calibration

- in accordance with the Quality Assurance System of engine manufacturer (preferred method)
- in accordance with a specified standard
- is carried out at time intervals specified by the engine manufacturer or specially for the engine test.

#### 3.2.4.3 Test supplies

Specify the kinds and quantities of fuel, lubricating oil, electricity etc. needed for the test and state who shall be responsible for and pay the supplies.

### 3.2.5 Method of power correction

The appropriate method of power correction with the corresponding calculation method shall be specified by the engine manufacturer for corrections

- between actual test ambient and ISO reference conditions
- between ISO reference and site ambient conditions.

## 4 Specific fuel consumption and method of measurement

### 4.1 Specific fuel consumption

#### 4.1.1 Declaration of specific fuel consumption

The specific fuel consumption shall be guaranteed only for one specified load. The following are to be stated:

- The power
- The corresponding engine speed
- The lower calorific value of the fuel
- Ambient reference conditions (barometric pressure, air temperature, relative humidity, inlet temperature of charge air coolant)
- Maximum exhaust gas back pressure
- Tolerance

#### 4.1.2 Method of correction between ISO reference and test ambient conditions

An appropriate method of correction for differences between ISO reference and actual ambient conditions on the test bed shall be specified by the engine manufacturer.

A correction shall be made for any difference between the lower calorific value of the fuel used in the test and that specified under 4.1.1.

#### 4.1.3 Quality of fuel

The engine can meet the declared specific fuel consumption using a fuel quality and a fuel treated as specified by the engine manufacturer (see also section „C“).

### 4.2 Method of measurement

#### 4.2.1 Test fuel

- Tests on engine manufacturer’s test bed or in independent laboratories: fuel chosen by the engine manufacturer, depending on supplies, test facilities and legal restrictions.
- Tests on site: fuel supplied by the customer in accordance with 4.1.3.

#### 4.2.2 Number of engines on which fuel consumption shall be measured

Alternatives:

- A representative engine of the production line
- One engine of the total number of engines of the contract
- . . . % of engines of the contract
- Each engine of the contract

#### 4.2.3 Measurement procedure

4.2.3.1 It shall be stated that the measurement of the specific fuel consumption is based on the measurement of power (see 3.2.4) and the measurement of the quantity of the fuel consumed. The latter is done

- with a balance
- with a flowmeter
- by other specified methods.

4.2.3.2 It shall be specified that the characteristics of the fuel consumed shall be determined by

- test samples: number and quantity (to be taken after the last filter)
- evaluation of the lower calorific value and the fuel characteristics by a recognized, independent laboratory or a laboratory agreed upon with the manufacturer and customer.

#### 4.2.4 Instruments and apparatus

It shall be specified that the instruments and apparatus used for the fuel consumption measurement

- are supplied by . . . . . (e. g. engine manufacturer)
- have tolerances in accordance with . . . . . (e. g. an ISO standard)
- are calibrated
  - in accordance with the Quality Assurance System of the engine manufacturer
  - in accordance with a specified standard
  - at time intervals specified by the engine manufacturer or specially for the engine test.

## 5 Lubricating oil consumption

This section does not apply to engines where the lubricating oil is mixed directly with the gasoline.

State that the lubricating oil consumption is influenced by various factors such as lubricating oil quality, run in condition of the engine, maintenance, wear, load cycling etc.

If any figures have to be given, state clearly that they are approximate figures for a specified lubricating oil (system oil, cylinder oil etc.), not applicable for test bed conditions and that they are „for guidance only“.

- Limit lubricating oil consumption figures to a specified load and speed or range of load and speed.
- When lubricating oil consumption has to be stated, it should be expressed as consumed quantity in mass units per unit of time (e. g. g/h) or percentage of mass of the fuel consumption.
- If a lubricating oil consumption figure is declared, specify the necessary test method and tolerances and state that lubricating oil used for routine oil changes should not be counted.

## 6 Exhaust gas temperature and exhaust gas flow

### 6.1 General

The exhaust gas temperature and flow are given as guidance only for the purpose of

- designing the exhaust line system
- designing heat recovery system.

### 6.2 Measurements

In cases where the exhaust gas temperature and flow have to be declared, these values shall be measured at the manufacturer’s test bed and the following shall be specified:

- Location on the engine where the temperature and flow are measured
- Power and speed or power and speed range
- Ambient conditions including charge air coolant temperature
- Type of fuel
- Exhaust gas back pressure
- Exhaust gas temperature measured with mercury thermometers or thermocouples
- Method of determining exhaust gas flow (e. g. by calculation, by tests etc.)
- Tolerances

### 6.3 Correction

The manufacturer should assist the customer with an appropriate correction of exhaust gas volume flow for actual ambient conditions, charge-air coolant temperatures and exhaust gas back pressure.

## 7 Chemical composition of emission gases

### 7.1 Extent of statements

The chemical composition of emission gases shall only be stated to the extent required by the customer or the legislation, normally limited to one or more of the following:

- Nitrogen oxides( $\text{NO}_x$ ):
  - Carbon monoxide( $\text{CO}$ ):
  - Hydrocarbons (HC):
- } . . . g/kWh or ppm corrected to 15 volume % <sup>2)</sup> oxygen on dry basis
- Particulates: . . . g/kWh or  $\text{mg}/\text{m}^3$
  - or Smoke index: smoke number . . .
  - or Smoke opacity: . . . % or  $\text{m}^{-1}$
  - Sulfur dioxides ( $\text{SO}_x$ ): g/kWh or ppm calculated depending on the sulphur content of the fuel used
  - Ash:  $\text{mg}/\text{m}^3$  calculated depending on the ash content of the fuel used

It shall be clearly stated whether the specified limitations are valid only for a specified power or for the whole range of power (partial loads).

### 7.2 Tolerances

- Either: specified values shall not be exceeded
- or: specified values have a tolerance of . . . %

### 7.3 Measurements

- According to ISO . . . (document in preparation: Draft Proposal ISO/DP 8178)
- and/or according to a recognized standard (e. g. US-EPA).
- Time of measurements:
  - together with the specific fuel consumption tests
  - within . . . days after engine is placed in operation
  - after a run-in period specified by the manufacturer
- Accurate position of taking the test samples of exhaust gases.
- Analysis of the fuel consumed, whether it is reference fuel or other fuel.
- Quality of lubricating oil and fuel to oil ratio in engines where the lubricating oil is mixed directly with the gasoline.

### 7.4 Legislation

Legislation requirements may differ widely depending on size, place and application of engines.

## 8 Air-borne noise level

The manufacturer is not in a position to specify the sound power or pressure level which will appear in the engine room or on a vehicle and around the actual exhaust pipe aperture, as he neither has information about the relevant stereoscopic and acoustic conditions nor does he have influence on them.

If, due to special requirements of the customer, inspecting and/or legislative authorities and/or classification societies restrictions to the max. permissible sound level exist, which might impose special measures (for example the use of engine sound boxes), these shall provided by the customer.

If the manufacturer has to state the air-borne noise level of the engine he shall declare:

- the mean sound power of the engine or
- the mean sound pressure level of the engine, corrected to free-field conditions,

whichever applies, at the declared power and engine speed not exceeding . . . dB (A) with a standard deviation of  $\pm$  . . . dB (A) on the manufacturer's test bed.

For the value of the standard deviation, the acoustic measurement conditions of the manufacturer's test bed shall be taken into account.

Specific requirements, for example the measurement of intake and exhaust noise, shall be specified if not expressly mentioned in the reference standard.

If the intake and exhaust noise are measured separately, their values and tolerances shall be stated.

This section does not apply when noise measurements are required on complete products including the engine.

## 9 Vibration

If required, the following shall be stated in the contract:

- Full statement of vibration requirements (e. g. torsional vibrations, lateral vibrations, longitudinal vibrations, etc.)
- Necessary data for calculation to be made available by the parties involved
- Responsibility for the vibration calculations
- Responsibility for any modification required
- Which party carries out vibrational measurements after installation if required

In some cases vibration statements are based on manufacturer's experience.

2) Different reference values may be applied in some countries.

## 10 Speed fluctuations

This section is only applicable for direct coupled or geared generators and, if required, it shall be stated in the contract:

- Full statement of speed fluctuation and electrical requirements
- Responsibility for the determination of the compliance with the above requirements
- Necessary data to be made available by the parties involved (e. g. direct or elastic coupling, moment of inertia of the driven masses etc.)
- Which party carries out the measurement after installation if required
- Responsibility for any modification required

## 11 Lifetime of components (wear parts)

### 11.1 Limitations

The lifetime of components should not be guaranteed because the following factors, which influence the lifetime, are to a large extent outside the control of the manufacturer:

- Operational conditions
- Ambient conditions
- Maintenance
- Fuel and lubricating oil system
- Fuel quality and treatment
- Coolant system
- Monitoring system
- etc.

### 11.2 Methods of estimates

Estimates of the lifetime of equipment and parts shall be based on the mean value of an assumed range, because the failures are to be expected at statistic random moments in time under the given conditions.

## B. RECOMMENDATIONS REGARDING PUBLICATIONS

### Introduction

The manufacturer should be more aware of the legal aspects and consequences of the contents of his publications.

The duty of instruction and warning may arise from contract or from the law. In the case of the former, the duty to instruct and warn the customer is a secondary contractual obligation with the duty to supply as a principal obligation.

In the latter case the duty to instruct and warn follows from the general duty to exercise ordinary or reasonable care with regard to society.

Therefore it is essential that a product is brought onto the market with adequate instructions for use and with the necessary warnings regarding special dangers involved.

The instructions or warnings can be given in any suitable form (Instruction Manuals, Inserts, Stickers, etc.). They should comply with standards of clearness, legibility, accuracy, etc., must be easily noticed and

suitable for the user for whom the instructions or warnings are intended, and a wording should be used which is as simple, clear and unambiguous as possible. Furthermore, whenever applicable the words „shall“, „shall not“, „must“ and „must not“ should be used for mandatory requirements and „should“ and „should not“, for pure recommendations.

Much attention should be paid to define carefully the responsibilities between the manufacturer and the shipyard or any other contractor of the installation of the product.

The original version of the publication should be supplied in the language of the manufacturer or in English.

The requirements of the user for translation into another language to meet his needs should be part of the contractual arrangements.

It is advisable to make use of this CIMAC Recommendation when formulating the contents of publications.

## I. Installation Instructions

### 1 Definition

The Installation Instructions is a publication by which the engine manufacturer specifies certain requirements for the installation of his engine in order to achieve a satisfactory functioning of the engine and to minimize the risk of personal injury or damage to property or environment.

### 2 General

The Installation Instructions shall be based on the assumption that the installation contractor is familiar with the installation of engines in general and with the use of tools and commonly used elements, materials and methods therefor.

For an instructive, comprehensive, clear and detailed publication by the engine manufacturer, it is recommended to include the following general introduction in the Installation Instructions:

### Important

- Before starting to install the engine, read these Installation Instructions carefully.
- The manufacturer is only responsible for the contents of Installation Instructions as far as this is applicable to his contracted responsibility area.
- These Installation Instructions have been prepared using the manufacturer's best knowledge and ex-

perience, taking into account safety and environmental aspects.

- Experience, special knowledge and equipment of the installer without objection are required to achieve the best installation for given conditions.
- Failure to comply with these Installation Instructions may result in malfunction of the engine, short life-time of components, personal injury or damage to property or environment, for which the manufacturer takes no responsibility.
- Ensure that everyone involved in the installation of the engine has these Installation Instructions available, reads them and understands them.
- Engine components, such as springs, clips, retaining rings, electric equipment, pipes, etc. involve a risk of damage or personal injury if opened, taken apart, fitted, lifted or transported in an improper way. It is therefore essential that no one attempts to install the engine unless he has the necessary experience of the various tools and commonly used elements, materials and methods in machinery installation.
- If the installation contractor is of the opinion that a part of these Installation Instructions is incomplete, doubtful or not useful, he must immediately contact the manufacturer.
- The manufacturer will not be responsible for any consequences resulting from incorrect translation or interpretation of the original text handed to the customer or user.

### 3 List of recommended instructions

This list is not a complete list of requirements to be included in the Installation Instructions.

It merely emphasizes some items which may be important, depending on the user as well as on the type of application of the engine involved.

Attention should be drawn to safety precautions in a suitable way (symbols, colours, different printing, etc.).

#### 3.1 Instructions to prepare the installation

- General arrangement drawing
- Space requirements for maintenance, safety and access
- List of masses and dimensions of engine or engine components
- Information about torsional vibration characteristics
- Requirements for the engine foundation
- Schematic diagrams with essential data for the layout of the following circuits:
  - compressed air
  - cooling systems
  - lubricating oil systems
  - fuel systems (see also section „C“)
  - electric wiring systems
- Positioning drawing of engine connections such as piping, air suction and exhaust, drive flange, governing, monitoring and controlling, etc.
- Schematic plan for the electric systems of the auxiliaries
- Information about auxiliaries to be delivered by the engine manufacturer
- Essential data for intake air and engine room ventilation
- List of special tools and devices to facilitate handling and commissioning
- Essential data for exhaust system
- Information about pipe support and clamps
- Information about insulation and shielding to meet engine design requirements

Note: The customer and the installation contractor must supply to the manufacturer all relevant data in time to enable the manufacturer to meet his contractual obligations. However, this shall not be regarded as transfer of the responsibility to the manufacturer.

#### 3.2 Instructions for the installation

The installation contractor must inform the manufacturer in time when he is required to deviate from any instruction.

The same applies to unforeseen deviations discovered during the installation.

##### a) Piping system

Manufacturer has to:

- state quality requirements for the different systems (e. g. welding standards, heat treatment, cleaning, non destructive examination).

Installation contractor has to:

- assure the tightness of installed piping
- assure that the safety equipment is correctly adjusted

- assure that the flexible connections are correctly set for working conditions (e. g. reaction forces on turbo-charger, etc.)
- assure the correct positioning of drain cocks
- assure that the requirements for insulation and shielding are met.

##### b) Alignment of the engine and the engine driven machinery

Manufacturer has to state:

- sequence of alignment procedure for main drive and engine driven auxiliaries
- tolerance for the crankshaft deflection and provisions regarding reports.

Installation contractor must assure correct alignment:

- before the engine is bolted down (where applicable in presence of a representative of the classification society)
- after the engine and the driven machinery are bolted down (in case of marine engines when the vessel is afloat)
- of the engine driven auxiliaries after the engine is correctly aligned to the main drive.

#### 3.3 Commissioning

##### a) Preparation for commissioning

- The installation contractor must certify that the installation is complete including painting, cleaning, anticorrosive measures, etc.
- The customer has to supply in time, as specified by the manufacturer, fuel, lubricating oil, water, electric power and all necessary instrumentation and devices.
- The customer has to arrange for the technical personnel of the engine user who will be responsible for the operation after commissioning, to attend the commissioning.
- The manufacturer has to make available an Operation Manual.
- The customer and/or the manufacturer, who has placed the order, has to ensure that the auxiliary equipment is in working condition. For the sophisticated auxiliaries, e. g. electronics, etc., the attendance of specialists is advisable.

##### b) Completion of commissioning

###### Without an engineer appointed by the manufacturer

The installation contractor has to appoint an engineer with appropriate qualification and the necessary personnel to take charge of the commissioning.

Among others he will

- carry out thorough cleaning of all pipeline systems after disconnection from the engine until filters remain clean
- check that protective materials for transport and storage have been removed
- check connection and position of all valves, filters and fittings in the pipeline systems
- reconnect the pipelines to the engine, circulate thoroughly and check that the fluids are passing to the relevant engine components
- check functioning and setting of all safety, control and monitoring devices

- recheck the crankshaft deflection as specified by the manufacturer
- follow starting procedure in Operation Manual and run engine strictly in accordance with manufacturer's running instructions
- check that all auxiliaries and safety devices are functioning satisfactorily
- check the installation in operation for abnormal vibrations and noise
- recheck alignment after completion of running in

The installation contractor decides whether the engine and installation is ready for final acceptance test.

#### **With an engineer appointed by the manufacturer**

The installation contractor has to appoint a qualified engineer and the necessary personnel to carry out the procedure as above.

When an engineer is appointed by the manufacturer to attend the commissioning, he shall advise and assist the installation contractor. He takes no responsibility for the execution of the installation work done by the installation contractor.

If the engineer appointed by the manufacturer is not satisfied with the installation and his advice is not followed by the installation contractor, he shall immediately contact the customer.

#### **c) Documentation**

The installation contractor has to furnish to the customer and the manufacturer all relevant documents regarding installation and commissioning.

## **II. Operation Manual**

### **1 Definition**

The Operation Manual is a publication by which the engine user is informed how to start, run and stop the engine, how to use the control instruments provided and how to carry out maintenance work.

The Operation Manual also informs the user on checks and work that has to be carried out before starting and after stopping or for longer periods of standstill of the engine in service.

Instructions for minor repair works may be included.

### **2 General**

For an instructive, comprehensive, clear and detailed publication by the engine manufacturer, it is recommended to include the following general introduction in the Operation Manual:

#### **Important**

- Before the operator attempts to use the engine, he should read this Operation Manual carefully.
- This Operation Manual has been prepared using the manufacturer's best knowledge and experience, taking into account safety and environmental aspects.
- To ensure the best efficiency, reliability and lifetime of the engine and its components, only original spare parts should be used.
- Failure to comply with this Operation Manual may result in malfunction of the engine, short lifetime of components, personal injury or damage to property or environment for which the manufacturer takes no responsibility.
- Ensure that everyone involved in the operation or maintenance of the engine has this Operation Manual available, reads it and understands it.
- Engine components, such as springs, clips, retaining rings, electric equipment, pipes, etc. involve a risk for damage or personal injury if opened, taken apart, fitted, lifted or transported in an improper way. It is therefore essential that no one attempts to do any work on the machinery unless he has the necessary experience of the various common elements used in machinery and is familiar with the use of both ordinary quality tools and special tools necessary to handle the various parts safely.

- The manufacturer will not be responsible for any consequence resulting from incorrect translation or interpretation of the original text handed to the customer or user.

### **3 List of recommended instructions**

This list is not a complete list of information to be included in the Operation Manual.

It merely emphasizes some items which may be important, depending on the type and application of the engine involved.

The recommendations regarding fuel (see section „C''), lubricating oil and water treatment shall be included in the Operation Manual.

The engine manufacturer shall clearly state and describe which minor maintenance and repair work can be carried out by the operating personnel and shall give the necessary safety instructions for this work.

Other maintenance work which cannot be carried out by the operating personnel, shall be described in the Maintenance Manual and must only be carried out by trained personnel.

Attention should be drawn to safety precautions in a suitable way (symbols, colours, different printing, etc.).

Special warnings shall be given, e. g.:

- not to disassemble or readjust speed governors, over-speed devices or any other component which controls or limits the dynamic conditions of the engine unless this is expressly allowed and the procedure is described in the manual.
- not to use provisional substitutes instead of clamps, holders, supports, fastenings or other general machinery equipment.
- not to test functioning of injectors removed from the engine without following the safety requirements of the manual.

#### **3.1 Starting procedure of the engine**

- Starting to be carried out by authorized personnel only.
- Instructions for cold starting of the engine must be followed.



Check that:

- all safety protections are fitted (e. g. covers for moving parts)
- connections of the fuel system are tightened
- tools or other loose parts are removed from the engine
- exhaust gases are directed to open air through free passages
- all cocks and valves are in operating position
- all necessary specified fluids for the operation of the engine are present
- speed control and engine protections (e. g. overspeed protection device) are in working conditions and correctly set
- independent essential auxiliaries are in operating conditions
- the driven machinery is ready for operation
- transmission is ready for operation and is in specified starting position
- nobody is in the vicinity of moving parts
- inflammable fluids are not stored in the vicinity of the engine
- the engine room is free from fuel vapors or other inflammable gases

### 3.2 Engine running

- Instructions for load increase must be followed
- Protection covers for moving parts must not be removed
- Covers on openings which can cause injuries by flame, heat or hot fluids must not be removed

- Cocks, valves, levers or switches must not be operated by non authorized personnel
- Notice abnormal running conditions and react accordingly
- In case of an audible or visible alarm try immediately to find the real reason and react accordingly
- Tools or any other objects must not be handled in the vicinity of moving parts
- Parts of the running engine shall not be cleaned or sprayed with inflammable liquids
- Restrictions for barred speed ranges must be followed
- Engine performance data must be recorded (e. g. by log book)

### 3.3 Stopping procedure of the engine

- Instructions for load decrease of the engine must be followed
- Except in emergency situations, stopping the engine must be done by authorized personnel only
- Check that unintentional restarting is avoided
- Check that independent auxiliaries or systems which will be inspected, are out of service
- Note warnings at the engine before removing any covers
- Wait until parts and fluids are cooled down before starting any maintenance work
- Before any maintenance work is started, make sure that engine cannot be started (e. g. good visible warning plate on control panel)

## III. Maintenance Manual

### 1 Definition

The Maintenance Manual is a publication by which the engine user is informed what maintenance work on the engine is necessary, at what periodicity and how it should be done.

### 2 General

For an instructive, comprehensive, clear and detailed publication by the engine manufacturer, it is recommended to include the following general introduction in the Maintenance Manual:

#### Important

- Before undertaking maintenance work on the engine, this manual should be read carefully.
- This Maintenance Manual has been prepared using the manufacturer's best knowledge and experience, taking into account safety and environmental aspects.
- To ensure the best efficiency, reliability and lifetime of the engine and its components, only original spare parts should be used
- Failure to comply with this Maintenance Manual may result in malfunction of the engine, short lifetime of components, personal injury or damage to property or environment for which the manufacturer takes no responsibility.
- Ensure that everyone concerned with the maintenance of the engine has this Maintenance Manual available, reads it and understands it.

- Engine components such as springs, clips, retaining rings, electric equipment, pipes, etc., involve a risk of damage or personal injury if opened, taken apart, fitted, lifted or transported in an improper way. It is therefore essential that no one attempts to do any work on the engine unless he has the necessary experience of the various tools and commonly used elements, materials and methods in machinery.
- Ensure that all equipment and tools for maintenance are in good condition.
- The maintenance work described in this Maintenance Manual shall only be carried out by trained personnel except where otherwise stated.
- The manufacturer will not be responsible for any consequence resulting from incorrect translation or interpretation of the original text handed to the customer or user.

### 3 List of recommended instructions

This list is not a complete list of information to be included in the Maintenance Manual.

It merely emphasizes some items which may be important, depending on the type and application of the engine involved.

The engine manufacturer shall clearly state and describe which maintenance and repair work can be carried out by the operating personnel and shall give the necessary safety instructions for this work.

If certain maintenance work shall not be carried out by the maintenance personnel, the manufacturer has to give the information how to contact the authorized maintenance station.

Special warnings shall be given, e. g.:

- not to disassemble or readjust speed governors, over-speed devices or any other component which controls or limits the dynamic conditions of the engine unless this is expressly allowed and the procedure is described in the manual.
- not to use provisional substitutes instead of clamps, holders, supports, fastenings or other general machinery equipment.
- not to test functioning of injectors removed from the engine without following the safety requirements of the manual.

Before any maintenance work is started, make sure that the engine cannot be started (e. g. good visible warning plate on control panel).

### 3.1 Maintenance schedule

The manufacturer must provide a maintenance schedule listing all planned maintenance items with their recommended periodicity (hours, kilometers, etc.) assuming that the engine is running at the normal operating conditions.

Note: The manufacturer should include the following sentence after the maintenance schedule:

The maintenance schedule and periodicity intervals are manufacturer's recommendations in order to achieve best efficiency and reliability of the engine and lifetime of components. Periodicity intervals are based on manufacturer's experience.

### 3.2 Description of maintenance work

The description of the maintenance should include among others:

- Work procedure required
- Time required at manufacturer's work
- Spare parts
- Special tools and materials
- Number of persons involved
- Lifting means
- Dimensional limits for further use (wear limits, clearance, etc.)
- Tightening and other methods to be used (torque, elongation, wrench angle, special grinding of valve seats, etc.)
- Mass of components
- For complex operation, diagrams or figures
- Safety rules for maintenance personnel

## IV. Spare Parts Catalogue

### 1 Definition

The Spare Parts Catalogue is a publication by which the engine manufacturer provides information to the user for identification of spare parts. It enables the user to order the parts needed for the operation, maintenance and repair of the engine.

### 2 General

It is recommended to include the following general introduction in the Spare Parts Catalogue:

#### Important

- To ensure the best efficiency, reliability and lifetime of the engine and its components, only original spare parts should be used.

- The manufacturer should pay attention to inform the customer of changes of spare parts which are relevant for the interchangeability of the parts in case of order and also when these parts in customer's stocks must be changed.

### 3 Contents of Spare Parts Catalogue

Spare Parts Catalogue shall include:

- Name of parts
- Code number of parts
- Illustration of each part
- Name, address, telex number, telephone number, etc. of the manufacturer and service stations
- Guidance for ordering parts

## C. RECOMMENDATIONS REGARDING FUELS AND FUEL TREATMENTS

### Introduction

There is a dramatic increase in the number of disputes between engine manufacturer and shipyard, shipyard and shipowner, and shipowner and charterer, regarding the use of and the consequences of the use of fuel outside manufacturer's specification. This also applies to land installation.

To prevent damage when using specified fuels with correct fuel treatment and to make it more easy to establish facts whenever damage to the engine occurs by

supply of incorrect fuel to the injection pump, it is important that the engine manufacturer should provide sufficient information regarding fuel specification, installation specifications and requirements for fuel documentation during operation.

It is advisable to make use of this CIMAC Recommendation for the purpose.

Chapter „C“ ist not applicable to distillate fuels.

≈≈≈≈≈≈≈≈≈≈≈≈≈≈≈≈

### 1 General

The manufacturer cannot be held responsible for damage caused by the use of fuel outside the specification or by fuel uncorrectly treated.

### 2 Recommendations for the contract

It is recommended to include into the contract regarding fuel specifications the following wording:

- The fuel shall be specified according to CIMAC Recommendations on marine fuels and the forthcoming ISO Specification.
- The required quality of fuel to be used in the engines shall be stated in the contract according to the valid CIMAC Recommendations for marine fuels and forthcoming ISO Specification.
- In connection with the specified fuel the engine manufacturer's specification for lubricating oil shall be taken into account.

### 3 Recommendations for the Installation Instruction

It is recommended to include in the Installation Instruction the following wording regarding the fuel system:

- Storage tanks and settling tanks shall have settling properties.
- Day tanks shall have a minimum capacity of fuel for 24 hours of operation as required by the classification societies and related national authorities.
- Heating of tanks shall have sufficient capacity in relation to the specified viscosity of the fuel.
- Heating of fuel in connection with separation and filtration and viscosity controlled endheating shall be in accordance with the specifications of the engine manufacturer.
- Recommendations made by the engine manufacturer regarding the fuel system shall take into account the specified fuel.
- Centrifugal separation is optimally carried out by using two centrifuges. The capacity of the centrifuges has to meet the capacity figures given by the engine manufacturer.
- When using low-grade fuels a lubricating oil centrifugal separator shall be installed.

- Filtering only is insufficient for heavy fuel operation, but it is good practice to install a filter after the separator.

- Homogenizers are used to fragment and to intermix light fractions with the heavy agglomerates of the fuel oil. Homogenizers shall only be used in conjunction with centrifuges.

### 4 Recommendations for the Operation Manual

It is recommended to include in the Operation Manual the following wording regarding fuel documentation:

In order to promote a good performance of the engine plant the operator shall observe the following measures:

- Make a record of quality and quality data obtainable of the fuels and of analyses available.
- Confirm that the fuels used meet with the engine manufacturer's specifications.
- Have a fuel laboratory available.

### 5 Sampling procedure

In order to avoid future disputes about the origin of a defect the following procedure regarding sampling shall be adopted:

- A sample of one litre of every fuel shipment shall be taken, recorded, sealed and held in a locked storage.
- This sample shall be taken from each deliver of fuels at the supply pipe representing the total fueling period.
- The samples shall be kept until the next major inspection or survey.
- The operator shall not destroy the samples until he is satisfied with the condition of the engine at the inspection survey or after repair.

### 6 Compatibility

When blending of fuels is intended by the user the compatibility of two fuels shall be tested before fueling. In case of incompatibility sufficient storage of compatible fuel shall be carried out.