



GCM34

General Engine operating instructions

Type GCM34

Engine operating instructions	A0
Total Index Book A, B and C	A0.01
Introduction	A0.02
Safety instructions	A0.03
Technical engine data	A1
Governor-data	A1.04
Pressures of the Operating Media	A1.05
Operating Media Temperatures	A1.06
Torsional vibration calculation	A1.09
Acceptance Test Records	A1.10
Operating instructions	A3
Table of contents	A3.01
Introduction	A3.02
Safety Information	A3.03
Initial operation	A3.05
Operational supervision	A3.06
Removal from operation	A3.07
Danger of frost	A3.08
Running-in	A3.10
Fault tracing	A3.11
Emergency operation	A3.12
Operating media	A4
Table of contents	A4.01
Introduction	A4.02
Safety instructions	A4.03
Regulations and care	A4.05
Maintenance	A5
Table of contents	A5.01
Introduction	A5.02
Safety Information	A5.03
Tools	A6
<i>Spare parts catalogue</i>	<i>B0</i>
<i>Total Index Book A, B and C</i>	<i>B0.01</i>
<i>Introduction</i>	<i>B0.02</i>
<i>Spare parts</i>	<i>B1</i>
<i>Table of contents</i>	<i>B1.01</i>

-

<i>Stand-by parts</i>	<i>B2</i>
<i>External documentation</i>	<i>C0</i>
<i>Total Index Book A, B and C</i>	<i>C0.01</i>
<i>Table of contents</i>	<i>C5.01</i>

GCM34

The present operating instructions include notes and guidelines for proper handling of the engine plant. It is matched with the equipment condition and the type of fuel sold.

With regard to operation and maintenance of the engine including the necessary work to be carried out, the operating instructions are subdivided into the following chapters:

- A1 Technical engine data**
- A3 Operating instructions**
- A4 Fuels**
- A5 Maintenance**
- A6 Tools**

With the respective information contained in the individual chapters, the technical personnel is able to maintain the engine in such a manner that regarding its output, reliability, economy and service life optimum operating results can be achieved.

If you need further information or if you have any other questions, we kindly ask you to contact our department service technology.


The operating instructions do not release the personnel in charge of this engine plant from their duty to take care. The recognized rules of technology are to be observed, taking into account overriding regulations, observance of the general safety measures and locally applicable accident prevention regulations. Data or explanations assumed to be the basic knowledge of trained technical and engine room personnel, are not contained.

Caterpillar is not responsible for damage caused by improper operation and maintenance.

These operating instructions are only intended for our customers. All rights reserved for this document. All technical data contained in these operating instructions must neither be reproduced, distributed nor utilized for competitive purposes or disclosed to third parties without our express approval.

Postal address:	Caterpillar Motoren GmbH & Co. KG, P.O. Box 9009, D-24157 Kiel	
Telex:	29 29 93 mak d	(for spares orders and aftersales service only)
Telephone:	0431 - 3995 01	(chief operator)
Telefax:	0431 - 3995-807/808	(after-sales service only)

GCM34

Personnel entrusted with work on the engine/plant must have read the operating instructions and in particular the pages on safety instructions which precede the chapters before beginning work. In order to eliminate danger which may constitute a risk of life and limb of the user or of third parties, all safety regulations which are marked with the  symbol have to be observed in all cases.

Technical instructions and/or operations to be strictly observed are marked in the documents with attention. They warn of possible damage to the machinery or to other material property.

Note refers to special information on appropriate use and work to be carried out



GCM34

Technical engine data

-

Governor-data

GCM34

Lubrication oil

- at the last camshaft bearing
at rated engine speed 4.0 - 5.0 bar

Cooling water

- static admission pressure at least. 4 mWc 2.5 - 5.0 bar

Gas

- Gas pipe train inlet at least. 3.5 bar

GCM34

Engine oil

- At engine inlet 60 - 65 °C
- Heating at nominal output 10 - 14 °C

Coolant

- At engine outlet 80 - 90 °C
- Heating at nominal output 7 - 10 °C

Charge air *1

see also A3.06.05.nn

- Engine inlet:
With water line cooling max. 45 °C
- Engine inlet:
With radiator cooling max. 52 °C

Fuel

max. 30 °C

- *1 The following will result when the maximum charge air temperature is exceeded:
- The engine cannot be started.
 - The engine is stopped immediately.

Torsional vibration calculation

Acceptance test records

Operating instructions

Operating instructions	A3
Table of contents	A3.01
Introduction	A3.02
Safety Information	A3.03
Initial operation Engine	A3.05.00
Safety System Description	A3.05.03.01
Startup Fuel System	A3.05.07.00
Startup Coolant System	A3.05.09.00
Startup General Functional Check	A3.05.15.00
Commissioning Startup	A3.05.18.02
Startup Startup/Loading	A3.05.18.04
Operational supervision Engine	A3.06.00
Operational supervision Lubricating oil system	A3.06.08.00
Operational supervision Cooling water system	A3.06.09.00
Removal from operation Engine	A3.07.00
Danger of frost Engine	A3.08.00
Danger of frost Antifreeze protection	A3.08.01.00
Preservation Engine	A3.09.00.00
Preservation Long-term Preservation	A3.09.02.00
Preservation Depreservation	A3.09.03.00
Running-in Engine	A3.10.00
Fault tracing Engine	A3.11.00
Faulttracing Introduction	A3.11.18.00
Emergency operation Engine	A3.12.00

GCM34

The following operating manual provides information on startup and on ensuring safe and reliable operation as well as information on procedures for longer periods of stoppage up to subsequent startup.

Please note the following for the operational data in this operating manual:

Due to special requirements, the engine output may be limited before reaching its maximum capacity. For this reason, we make the following differentiations as per DIN ISO 3046:

- **Maximum continuous power output**
the maximum permissible power output specified for the engine type
- **Nominal output**
the engine output indicated in the acceptance test record
- **Governed output**
the output as limited by the governor system.

Unless indicated otherwise, all output data in this manual refers to the maximum continuous power output, which must be obtained from the manufacturer if not known to the operator of the engine.

The parameters for limiting the engine output are set in the engine electronic system with the engine running at nominal output and engine speed on the test bench. Any deviations will be noted in the acceptance test record (**A1.10**).

The operating personnel must complete all work with the required care and must comply with all safety instructions. No safety equipment or systems may be changed or altered. Any changes or damage must be reported to the respective supervisor or other person in charge immediately. Any changes to the safety equipment and systems required in special cases may only be completed by personnel authorized by Caterpillar.

The initial startup will be completed by one of our installation technicians, who will explain the system to the operating personnel in detail. Detailed questions must be clarified on site on the basis of the operating manual, and all clarifications to the instructions noted. After startup, all significant data and work for the engine should be recorded in an operating log or in DIMOS.

GCM34

Please note the information and recommendations in your operating manual and comply with all of our maintenance instructions. It is only possible to achieve a long engine system service life with consistently economical operation if these recommendations and instructions are followed exactly.

Note:

All bright metal parts must be coated with a thin coat of oil every time the engine is cleaned with grease and oil-cutting substances.

Special attention must be paid to ensure that all bearing surfaces affected by the cleaning procedure are oiled carefully!

GCM34

Safety Information

All Caterpillar engines are built in accordance with the latest technological standards and all recognized safety regulations.

In spite of this, improper operation can lead to

- the endangerment of the health and lives of the system operators or others
- damage to the system and other property
- a reduction in the efficiency and economy of the system

For this reason, the operating personnel must be correspondingly qualified and authorized (certificate of qualification) for the operation of an engine system.

Before starting up a specific system, the operating personnel must familiarize itself with the special characteristics of the system.

If required, training on the special characteristics/requirements of the system can be provided for the customer at the Caterpillar training center.

General Safety Information

The relevant provisions of the accident safety and prevention regulations and the regulations of the respective liability insurance association or institution must be followed for all operating activities. These provisions include:

- Fire alarm and fire fighting facilities!
- All emergency stop system actuating elements must be freely accessible at all times!

The following also applies:

- Alterations and modifications may impair the safety of the system. Changes may only be made by Caterpillar-authorized personnel!
- Any and all activities which may represent a safety risk or hazard are forbidden!
- The engine may only be operated when all safety equipment, including all non-permanent safety equipment, panels, thermal insulation, exhaust systems and the like are in place and functioning!
- The engine/system must be inspected at least once per shift for visible damage and faults. Any changes (including changes in the operating behavior) must be reported to the respective supervisor or other person in charge. Stop the engine immediately if necessary and lock out to prevent restart. Any damage or fault must be corrected immediately!
- In the event of functional faults, the engine/system must be stopped immediately and locked out to prevent restart. Correct all faults immediately!

GCM34

The pertinent national/local safety regulations apply to all fuel systems!

Safety Measures

Before starting the engine:

- **Inspect the system for visible damage, complete a lamp check!**
 - defective instruments, control equipment, control lamps
- **Wipe off all grease and oil carefully!**
- **All safety equipment must be in operating position and must be functional!**
- **Use ear protection!**
- **Make sure that no one is endangered by starting the system/engine before starting the engine!**
- **Set all operating elements at neutral or nmin (speed potentiometer with arresting device)!**

Starting the engine:

- **Check all indicator elements!**
- **The exhaust systems may not be deactivated when the engine is running!**



Initial operation

GCM34

Content:

1. Introduction

2. Safety Equipment of Engine

- 2.1 Explosion Protection Valves
- 2.2 Oil Mist Detector

3. Gas Regulating Unit

- 3.1 Function
- 3.2 Start Procedure
- 3.3 Stop Procedure
- 3.4 Shutdown Procedure
- 3.5 Gas Pressure Test
- 3.6 Gas Leak Test
- 3.7 Emergency Shutdown

4. Engine Electronic System Overview

- 4.1 System Overview
- 4.2 Engine Speed Governing
- 4.3 Ignition Control
- 4.4 Air-Fuel Ratio Control
- 4.5 Start/Stop Sequencing
- 4.6 Engine Monitoring/Protection
- 4.7 Service Tools
- 4.8 Required Service Tools

5. Safety System for the Exhaust Gas Ducts

- 5.1 Scavenging of the Exhaust Gas System
- 5.2 Overpressure Valves
- 5.3 Overpressure Safety Disk



GCM34

1. Introduction

The safety system for the Bramming Fjernvarme gas engine power plant with one Caterpillar genset G16CM34 with 6100 kW(m) @ 750 1/min has several components:

- the gas pressure control unit with the gas admission and venting valves
- the engine control and monitoring system (ECM)
- the generator and plant control and monitoring system (CMG)
- the safety equipment of the engine
- the scavenging ventilator and overpressure valves in the exhaust gas system
- several emergency shutdown push bottoms in the plant