DNV·GL

Certificate No:
TAA00002JW

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Engine Safety, Control and Alarm System

with type designation(s)
MACS Modular Alarm- and Control System for Diesel and DF Engines

Issued to
Caterpillar Motoren GmbH & Co. KG
Kiel, Schleswig-Holstein, Germany

is found to comply with
DNV GL rules for classification – Ships, offshore units, and high speed and light craft

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.
Temperature
Humidity
Vibration
EMC
Enclosure
see page 2

Issued at **Hamburg** on **2019-12-13**
This Certificate is valid until **2021-12-12**.
DNV GL local station: **Hamburg CMC**

Approval Engineer: **Jens Dietrich**

for **DNV GL**

Joannis Papanuskas
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Place of system manufacture

The system is manufactured / assembled, mounted and tested at:
Rostock: Caterpillar Motoren Rostock GmbH, Werftallee 13, 18119 Rostock/Germany,
Kiel: Caterpillar Motoren GmbH & Co. KG, Falckensteiner Str. 2-4, 24159 Kiel/Germany.

Product description

Engine Monitoring-, Control- and Safety system consists of following main components :

Component	**Description**	**Type Approval of main components ***
Local Control Panel	Main local HMI containing DCU / SDU ***)	TAA00000Z6
Engine Cabinet PLC EC	Control Cabinet	TAA0000194
Engine Terminal Box PLC TB	On-engine Control Box	TAA0000194
PLC Safety (EPS)	Engine Protection System ***)	TAA0000194
ICPM	In-Cylinder Pressure Monitoring Module	TAA0000242
RTD Module	On-engine PT100 module	TAA00001VK
TC Module	On-engine Thermocouple module	TAA00001VK
Backup Display **)	Local Indicators backup panel	TAA00000Z6
*) These are the TA numbers valid at the date of issue of this TA. When the TA numbers are renewed during the period of validity of this TA, the new TA number applies. **) Mandatory for Single Main Engine Application. ***) SDU only for Diesel Engines, PLC Safety only for DF Engines.		

System functions: Start-/Stop Control, Engine and GVU Automation, Monitoring and Alarm functions, Safety functions.

System Software: PLC TB: 01.03.xxx, PLC EC: 01.01.xxx, PLC Safety 01.01.xxx.

Clause for application software control
When the type approved software is revised (affecting all future deliveries) DNV GL is to be informed by forwarding updated software version documentation. If the changes are judged to affect functionality for which rule requirements apply a new functional type test may be required and the certificate may have to be renewed to identify the new software version.
All changes in software are to be recorded as long as the system is in use on board. The records of all changes are to be forwarded to DNV GL for evaluation and approval.
Major changes in the software are to be approved before being installed in the computer.

Location classes					
Component	**Temperature**	**Humidity**	**Vibration**	**EMC**	**Enclosure**
Local Control Panel	B	B	A	A	****)
Engine Cabinet PLC EC	B	B	A	A	****)
Engine Terminal Box PLC TB	B	B	A	A	****)
PLC Safety (EPS)	B	B	B	A	****)
ICPM	D	B	B	A	IP66
RTD Module	B	B	B	A	IP56
TC Module	B	B	B	A	IP56
Backup Display ***)	B	B	A	A	****)
) for Single Main Engine Application **) Required protection and vibration dampers according to the Rules to be provided upon installation on board.					

Application/Limitation

1. This certificate covers Hardware and Base System Software.
2. MACS for MaK engines in Diesel and DF Application
3. This certificate is valid only for systems applications made and delivered by production facilities listed under Place of Manufacture for engines listed above provided they hold a valid DNV GL Type Approval Certificate.
4. The used electronic governor module(s) (ECM) is / are not covered by this type approval and are subject to separate product certification unless excluded in the respective type approval certificate.
5. For Single Main Engine Application a back-up governor is required.
6. HMI for alarm presentation and handling according to DNV GL Rules requirements shall be provided separately.
7. The required control and monitoring of the engine gas supply pipe double wall (gas detection, ventilation) described in DNV GL Pt.6 Ch.2 Sec.5 is not covered by this certificate.
8. The suitability of ex-protection with required sensors/barriers is not covered by this certificate.

Approval conditions

The following documentation of the actual application is to be submitted for approval in each case:

- Reference to this DNV GL Type Approval Certificate
- Reference to valid hardware DNV GL Type Approval Certificate numbers, if they are different than the ones listed on table under Product description
- Information about engine type and intended application (propulsion, auxiliary, emergency, etc.)
- Software version used in specific delivery
- System block diagram showing overall system layout and separation between Safety System and Control and Monitoring
- Instrument list showing all measuring points including identification of which automatic safety actions can be overridden
- For DF engines: List of sensors/barriers used in zones with for explosion hazards defined by IGF code, CAT document 8-SK-00xx, Proof of intrinsic safety.
- Power supply arrangement (may be part of the System block diagram)
- Overview on interfaces to external systems
- Single Main Engine Application: Documentation / drawings covering the independent back-up governor.
- Test program for certification test

Product certification
Each delivery of the application system **is to be** certified according to Pt.4 Ch.9. The certification test is to be performed at the manufacturer of the application system before the system is shipped to the yard. The tests shall be performed based on the approved test program mentioned above. After the certification the clause for application software control will be put into force.
Correct configuration and set up for each delivery to be tested during commissioning after installation.

Tests carried out

-MACS Functional tests on engines VM46DF, M32E, M46DF, M34DF.
-Tests according to DNV GL CG-0339 are covered by the certificates mentioned under product description.

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)

- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Periodical assessment is to be performed at renewal of this certificate.

END OF CERTIFICATE