

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Electronic fuel injection system**

with type designation(s)

Electronic Speed Control System for Diesel Engines - ADEM V (A5E2v2)

Issued to

**Caterpillar Inc.
Lafayette, IN, USA**

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	D
Humidity	B
Vibration	B
EMC	B
Enclosure	C

Issued at **Hamburg** on **2018-09-24**This Certificate is valid until **2023-09-23**.for **DNV GL**DNV GL local station: **Certification & Inspection Services**Approval Engineer: **Didier Girardin**

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.



Product description

Advanced Diesel Engine Management "ADEM V (A5E2v2)" is an Fuel Injection Control and Speed Governing System, intended for Caterpillar diesel engines series C7.1.

ADEM V (A5E2v2)" consists of the following hardware and software modules:

Hardware: ADEM V (A5E2v2) - Electronic Control Module
Software: ADEM V (A5E2v2) software for Engine serie C7.1
Software version: AK951_xx

xx – version of engine emissions calibration

Maintenance of software is described in the document "Procedure: Engine Control Module (ECM) Software Quality" dated 2018-08-02.

Application/Limitation

1. This certificate is valid only for systems made and delivered in accordance with the Caterpillar Inc. Quality Management System.
2. System approval is required **only** for propulsion and emergency engines.
3. This Type Approval covers **only** Fuel Injection Control and Speed Governing functions of ADEM V (A5E2v2). Other functions shall be approved and certified on case-by-case basis, like required by DNV GL Rules for Ships, HS, LC and NSC Pt.4 Ch.9 and DNV GL Offshore Standard DNV GL-OS-D202.
4. The system intended only for multi-engine propulsion plants, auxiliary and emergency generator purposes.
5. Specifications for routine test and maintenance of sensor according to class rules to be provided by manufacturer.
6. Sufficient mechanical protection and correct installation of sensors to be verified for each installation.
7. List of control & monitored points is in comply with the vessel's main class requirements in DNV GL Rules for Ships, HS, LC and NSC Pt.4 Ch.3 Sec.1, Pt.4 Ch.9 Sec.2 B100 and Pt.6 Ch.3 Sec.3 Table A9.
8. ADEM V (A5E2v2) Fuel Injection Control and Speed Governing System shall be prepared for dual power supply.

Production place

Delphi Hungary Kft.
9700 Szombathely
Zanati Utca No. 29/A Hungary

Approval conditions (propulsion and emergency engines only)

When the type approved software is revised (affecting all future deliveries) DNVGL 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.

Product certificate

A separate product certificate according to Pt.4 Ch.9 will **not be** required provided that:
Hardware, software and Caterpillar Inc. production facilities are covered by present Type Approval
Correct configuration and set up for each delivery to be tested during commissioning after installation.

Job Id: **262.1-026870-1**
Certificate No: **TAA0000209**

Application documentation

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

- Reference to this Type Approval Certificate, root software version AK951 and version for specific delivery AK951_XX
- Information about engine type and intended use (propulsion, emergency)
- System block diagram (showing ECM, actuators, speed sensors and feedback signals)
- Confirmation that power supply arrangement is like stated in Application/Limitation point 8.

Clause for application function control

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. Certification of Application Functions may be required for specific vessel delivery.

Type Approval documentation

Test Reports:	Environmental ETR 1703545-01	dated 2017-10-24
	EMC ETR 1703546-01	dated 2017-09-22
Technical Documentation:	Caterpillar Submittal ADEM V (A5E2v2) dated 2017-08-25	

Tests carried out

Applicable tests according to Class Guideline DNVGL-CG-0339, October 2017.

Functional Type Testing on Caterpillar Engine C7.1, Wimborne, United Kingdom, dated 2018-08-24.

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

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

END OF CERTIFICATE