

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Bearing Wear Monitoring System for 2-Stroke Engine

with type designation(s)

SPECSVISION BWM IPU, SPECSVISION BWM JB-R, JB-T, SPECSVISION BWM GS

Issued to

Specs Corporation

Seongnam-si, Gyeonggi-do, Republic of Korea

is found to comply with

DNV GL rules for classification – Ships, offshore units, and high speed and light craft

Application :

Location classes:

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Type	Temperature	Humidity	Vibration	EMC	Enclosure
SPECSVISION BWM IPU	B	B	A	A	B / IP44
SPECSVISION BWM JB-R, JB-T	B	B	B	A	C / IP66
SPECSVISION BWM GS	B	B	B	A	D / IP68

This Certificate is valid until **2024-06-30**.

Issued at **Busan** on **2019-07-01**

DNV GL local station: **Seoul**

for **DNV GL**

Approval Engineer: **Baeg Soon Choi**

.....
Andreas Kristoffersen
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.

Certificate No: **TAA00002HY**
File No: **863.70**
Job Id: **262.1-017322-2**

Product description

The SPECS Bearing Wear Monitoring (BWM) System consists of Bearing Condition Monitor (BCM) having separate approval, Integrated Processing Unit (IPU), Junction Box-R (JB-R), Junction Box-T (JB-T) and Gap Sensor (GS). This system measures and displays real time wear in any of the three crank-train bearings, water activity and temperature of lubrication oil in 2-stroke engine during engine operation and the electrical potential between shaft and earth. It is a tool for predicting bearing wear and provides early common or slowdown alarm signal if unexpected problem occurs at any of the crank-train bearings such as crosshead, crank and main bearings.

The following hardware units of SPECS Bearing Wear Monitoring (BWM) System are covered by this certificate:

Name	Type Designation
Integrated Processing Unit (IPU)	SPECSVISION BWM IPU
Junction Box-R (JB-R)	SPECSVISION BWM JB-R
Junction Box-T (JB-T)	SPECSVISION BWM JB-T
Gap Sensor (GS)	SPECSVISION BWM GS

The following software is covered by the certificate:

Name	Type Designation	Version
IPU Firmware	SPECSVISION BWM IPU FW	1.1.0
DAPAR for JB-R	SPECSVISION BWM DAPAR FW	1.0.0
Gap Sensor Firmware	SPECSVISION BWM GS FW	1.1.0

Approval conditions

The Type Approval covers hardware and software listed under Product description. When the system is used in applications to be classed by DNVGL, documentation for the actual application is to be submitted for approval by the manufacturer of the application system in each case. Reference is made to DNVGL Rules for Ships Pt.4 Ch.9 Control and Monitoring Systems.

In order to waive possible survey requirements for opening up main crank- and crosshead bearings this approval will not be accepted as the sole basis

Type Approval documentation

Tests carried out

Applicable tests according to DNVGL-CG-0339 November 2016.

Certificate No: **TAA00002HY**
File No: **863.70**
Job Id: **262.1-017322-2**

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 after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of this certificate.

END OF CERTIFICATE