



TYPE APPROVAL CERTIFICATE

Certificate no.:
TAA00002BA
Revision No:
1

This is to certify:
that the Monitoring System

with type designation(s)
TT-Sense thrust and torque measuring system, Control box 0399-0428, Rotor 200 mm to 1000 mm

issued to
VAF Instruments B.V.
Dordrecht, Zuid-Holland, Netherlands

is found to comply with
DNV 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.

Location classes:

Type	Temperature	Humidity	Vibration	EMC	Enclosure
Control box 0399-0428	A	B	A	A	B
Rotor 200 mm to 1000 mm	A	B	B	A	B

Issued at **Høvik** on **2024-10-15**

for **DNV**

This Certificate is valid until **2029-06-18**.

DNV local unit: **Netherlands CMC**

Approval Engineer: **Ståle Sneen**

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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to USD 300 000.



Form code: TA 251

Revision: 2023-09

www.dnv.com

Page 1 of 3

Product description

TT-Sense thrust and torque measuring system comprising a control box (stator) and rotor equipment as follows:

Control box 0399-0428 at stator part

Power supply:	115 or 230 VAC, 50 or 60 Hz +/- 10%
Power consumption:	40 VA maximum
Input:	2.4 GHz fully protected encrypted signal
Outputs:	RS 485 for MODBUS protocol, Optional 4-20 mA isolated current output, Optional Ethernet port for service purposes only.
Dimensions:	407 x 360 x 119 mm

Rotor equipment

Material mounting rings:	carbon steel (C45E)
Material outside cover:	polyurea coated high density foam
Material compensator arms:	carbon steel (C45E)
Material protection tube:	aluminium
Shaft speed detection:	accelerometer signal
Output:	2.4 GHz fully protected encrypted signal
Dimensions:	200 mm to 1000 mm, depending on shaft diameter
Operating temperature:	0°C to 60°C
Measuring tolerance:	Thrust [kN]: < 1.0% FS Torque [kNm]: < 0.25% FS Power [kW]: < 0.25% FS

The TT-Sense measuring system can be mounted on propeller or drive shafts. When a shaft is subject to thrust or torque this will result in a small strain at the shaft surface. LEDs and extremely accurate optical cells can detect these small movements of the surface in axial and tangential directions. The measured values are, together with temperature and rpm data, transferred continuously from the rotating shaft to the stator part through a 2.4 GHz wireless data connection. Power transmission from the stator to the rotating shaft is performed by means of induction.

The stator part consists of a bracket, a power transmission coil, a data signal receiver and a control box equipped with digital and analogue output connections. These outputs can be linked directly to the vessels data network, monitoring or control system.

Radio specification

Bluetooth Adaptive Frequency Hopping between 79 channels in the 2.4 GHz ISM-band (2402 MHz - 2480 MHz). Typical radio transmitting power is 4 dBm / 2.5 mW from a directional antenna.

Approval conditions

The Type Approval covers hardware listed under Product description. When the hardware is used in applications to be classed by DNV, 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 DNV rules for classification of ships Pt.4 Ch.9 Control and monitoring systems.

Application/Limitation

Installation of TT-Sense is to be performed as described in the Technical Manual 674.

Type Approval documentation

VAF Instruments functional test report TT-Sense dated 2018-10-29 and 2019-04-17
 EMC test report DARE!! 18C0990RPT02 dated 2019-04-08
 EMC partial test report Kiwa Dare 20240160RPT01 dated 2024-05-16
 Climatic test report Sebert Trillingstechniek M18.005-P18.004 dated 2018-11-30
 Vibration test report Sebert Trillingstechniek M18.004-P18.003 dated 2018-11-23
 Vibration test report Sebert Trillingstechniek M19.001-P19.001 dated 2019-02-05
 IPx4 test report for TT-Sense rotor enclosure by VAF Instruments witnessed by DNV GL 2015-11-24
 TT-Sense Optical Thrust and Torque Measuring Systems Product Bulletin 663, Doc. No. PB-663-GB-0119
 TT-Sense serial numbers 182652 and higher Technical Manual 674, Doc. No. TIB-674-GB-0723
 Type approval renewal assessment report for TAA00002BA, Netherland CMC 2024-07-02

Tests carried out

Applicable tests according to class guideline DNV-CG-0339, August 2021.

Marking of product

Manufacturer: VAF Instruments BV
Type No.: TT-Sense
Serial No.: Unique. The approval covers serial numbers 18.2652 and higher.
Supply: 115/230 VAC, 50/60 Hz

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 the certificate.

END OF CERTIFICATE