



Certificate No:
TAS000032A

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Cranes, gen.

with type designation(s)
Control system for offshore knuckle boom crane 10T

Issued to
SMST Designers & Constructors B.V.
Drachten, Friesland, Netherlands

is found to comply with
DNV GL standard DNVGL-ST-0378 – Standard for offshore and platform lifting appliances

Application :

Offshore crane with motion compensated knuckle boom

Issued at **Høvik** on **2021-05-21**

This Certificate is valid until **2026-05-20**.

for **DNV**

DNV local station: **Netherlands CMC**

Approval Engineer: **Khurram Saeed Khaliq**

Aldo Matteucci
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.

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 300,000 USD.



Form code: TA 251

Revision: 2021-03

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Product description

Control system comprising of electrical, hydraulic, control and monitoring systems for 10T Knuckle boom crane with motion compensation..

The control system functionality is as per:

- Knuckle boom crane: 1700218-C-05-01 rev A.
- Motion compensated knuckle: 1800750-C-05-03 rev B.

Software revision (at the time of issuance of the Type Approval Certificate).

PLC: 1700220-S-02x

HMI: 1700220-S-03x

MAC: 1700220-S-18x

The current software numbers and versions are listed in master document 1700220-S-01 Rev.C dated 03-02-2020 "Software Life Cycle – Control systems".

Application/Limitation

The Type Approval covers the control system design/topology required to implement the functionality, redundancy and safety requirements as per 1700218-C-05-01 rev A, 1800750-C-05-03 rev B and pertinent/relevant requirements as per DNVGL-ST-0378 section 8.

This type approval evaluates the suitability of the control system for the intended application and completeness of testing scope when installed on the crane covered by TAS000022C. Usage on any other crane is not covered by this type approval and shall be subject to case-by-case evaluation.

When the type approved software is revised (affecting all future deliveries), the updated software version documentation shall be submitted to DNVGL for evaluation. If the changes are judged to affect functionality for which rule requirements apply, a new functional/failure test may be required. The Type approval certificate may have to be renewed to identify the new software version.

All changes in software shall be recorded as long as the system is in use on board. Documentation of major changes shall be forwarded to DNV GL for evaluation and approval before implemented on board. Software and hardware change handling shall be as per DNVGL-RU-SHIP Pt4. Ch9. Sec 1.5.

The Type Approval is not covering the following:

- Any modes/functions or components either defined as 'optional' or not included in the functional description, ref 1700218-C-05-01 rev A and 1800750-C-05-03 rev B. When/if fitted, their impact on the functionality and redundancy design intent of the type approved control system shall be subject to case-by-case evaluation by DNVGL.
- Component design and certification; the components for the hydraulic, electrical and control and monitoring systems shall be delivered with appropriate certification as per DNVGL-ST-0378 table 2-3.

Type Approval documentation

Document No.	Rev.	Title
1800502-B-92-10	D	Overall document database - HPU-M (690V)
1800502-B-92-01	D	Cable Block Diagram - HPU-M (690V)
1800733-B-80-20	F	Hydraulic diagram - Crane M - 2200
1800502-B-90-01	D	Cable Block Diagram - HPU-M (440V)
1800733-B-80-30	A	Hydraulic diagram - Crane M - 2200 Slewlock
1800502-B-90-10	D	Overall document database - HPU-M (440V)
1800502-S-01	D	Software life cycle - Control systems
1800502-B-80-20	H	Hydraulic Diagram HPU - M type (without LP) and water cooling

18005-02-C-08		Safety Diagram - HPU (M and L)
1800610-B-80-10	G	Hydraulic diagram - 2t-5t Winch
1800502-B-80-10	D	Hydraulic Diagram HPU - M type (with LP) and water cooling
1800752-C-08	B	Safety Diagram - Motion Compensated Crane
1800752-S-01	A	Software life cycle - Control systems
1800752-B-80-60	E	Hydraulic diagram - Motion compensated knuckle - M
2001040-20-B-80-70	B	Hydraulic diagram - Winch 5t
1800610-C-08	D	Safety diagram - Primary Winch
1800715-B-91-10	B	Overall document database - MCC-M
1800502-B-80-40	B	Hydraulic Diagram HPU - M type (without LP) and air cooling
1800715-B-91-01	B	Cable Block Diagram - MCC-M Master
1800715-B-91-10-25	B	Cable list
1800502-B-80-49	d	HPU-M Parlist
1700218-C-05-01	A	Functional description - Knuckle boom crane with motion compensated knuckle
1800502-B-90-10-23	D	Material List - HPU-M (440V)
1800502-B-80-19	E	HPU-M Partlist
1800502-B-92-10-23	D	Material List - HPU-M (690V)
1800610-C-80-15	A	Hydraulic Description - Primary Winch
1800502-B-80-29	I	HPU-M Parlist
1800700-C-05-02	B	Operational procedures - Knuckle Boom Crane
1800733-B-80-29	G	Crane M 2200 Partlist
1800733-B-80-39	A	Slewlock Partlist
1800715-B-91-10-23	B	Material list
1800750-C-05-03	B	Function description - Motion Compensated Knuckle
1800752-B-80-69	F	MCK-M - Partlist
2001040-20-B-80-79	B	Winch Partlist
1800610-B-80-19	H	Winch Partlist
1800733-E-01-01	A	Factory Acceptance Test

Tests carried out

Complete functional and failure testing as per DNVGL-ST-0378 sec 14 and type approved est procedures/safety diagrams shall be performed for each delivery of a fully assembled 10T offshore knuckle boom crane with motion compensation.

The motion compensated system shall be subject to a functional and failure testing as per DNVGL-ST-0378 sec. 14.6 and approved test procedures. It is expected that it may not be practical for all tests to be performed at site, hence, if some testing is to be performed in simulated environment, the requirements in DNVGL-ST-0378 sec. 14.6 and table 2.1 "Simulators test package" shall be followed. Test set-up shall be agreed with the DNV CMC Surveyor.

With reference to the approved test procedure, particular focus shall be placed on the following Motion compensated system performance test:

- The design dynamic factor and side/offlead angles deviate from the requirement in DNVGL-ST-0378 sec. 8.2.2 and 8.2.3 and are based on a SMST specified minimum Motion Compensating (MC) system accuracy; the MC system accuracy limiting curve shall be identified, i.e. the curve beyond which accuracy drops: measured accuracy shall be higher than the design value used for calculating DAF for both upper and lower limits of the operating Hs range:
 - o It shall be proven that the recommended range of rigging lengths the MC system will not cause swnging loads.

Certification

A DNVGL Product Certificate (form code CG2) will be issued for the fully assembled crane upon successful completion of the onboard testing scope.

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNVGL-CP-0338.