

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Remote Control System, Propulsion, Thruster and Steering

with type designation(s)
K-Thrust 720

Issued to

Kongsberg Maritime AS
Kongsberg, Norway

is found to comply with
DNV GL rules for classification – Ships

Application :

The Type Approval applies to system design principle and programmed functions.

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

Location classes are listed in the certificate.

Issued at **Høvik** on **2019-02-21**

for **DNV GL**

This Certificate is valid until **2021-02-20**.

DNV GL local station: **Sandefjord**

Approval Engineer: **Jabber Abbas**

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Jan Tore Grimsrud
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

K-Thrust 720 RCS system is a flexible and scalable thruster remote control system that can be tailored to suit a variety of different vessel requirements with regards to system segregation and redundancy.

Each propulsion unit, steering gear or thruster has its own separate remote control sub system. A complete remote control system (RCS) for a propulsion plant consists of several parallel RCS'. Common functions for command transfer and control mode selection at each control position synchronise the parallel sub systems.

The Type Approval is valid for the following main modes and functions:

Modes:

- Manual Lever control
- Auto Pilot mode with input from external auto pilot
- Speed Pilot mode with input from external speed pilot
- Manual Heading (Wheel) mode with input from wheel/tiller/miniwheel/rudder lever
- DP mode with input from dynamic positioning control system
- IJS mode with input from independent joystick control system

Functions:

- Remote control of propulsion, thruster and steering gear
- Command responsibility transfer between control positions and individual transfer between ECR and Bridge
- Command change over between control systems (as listed above under modes)
- Alarm indication

Optional modes and functions:

- Power Mode / Torque mode
- Load Control Sharing mode
- Bumpless transfer between control positions and to Lever control from other control systems.
- Synchronous Control between two or more propulsion units, steering gears or thrusters.
- RCS Steering Gear Alarm System

Additional information related to modes and functions can be found in K-Thrust 720 Propulsion and Thruster Remote Control System Product Description.

Software:

Current software version is 4.1.0. The release label is constructed by three digits; x.y.z, where

- x denotes major release
- y denotes minor release
- z denotes update

Hardware (that a delivery may consist of):

Module type	Product Description	Product no.	HW module descr. No.	Location Classes	Compass Safe Distance	DNV GL TA reference***
Telegraph	Push Button Telegraph - PBT	(8100278) 8100318 8100333	Datasheet 330199	C/B/B/B/**		KM TAA0000017
	INELTEH Emergency Engine Telegraph – EET1	360014 360015 360017 360018 386632 386635	361104			GL 58 974 - 08 HH

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Lever	Azimuth Lever with display	405846	412948	B*/B/A/B/A	1000 mm	KM TAA0000017
	Azimuth Lever	416533	412948	B*/B/A/B/A	1000 mm	KM TAA0000017
	Single Lever with display	405842	412948	B*/B/A/B/A	1300 mm	KM TAA0000017
	Single Lever	416531	412948	B*/B/A/B/A	200 mm	KM TAA0000017
	Dual Lever with display	405844	412948	B*/B/A/B/A	1300 mm	KM TAA0000017
	Dual Lever	416532	412948	B*/B/A/B/A	200 mm	KM TAA0000017
	Lever display	416534	412948	B*/B/A/B/A	1100 mm	KM TAA0000017
	Lever telegraph unit - LTU11	364330		D/B/B/B/**	800 mm	KM TAA0000017
	Lever telegraph and speedset unit - LTU11ME	389505		B/B/A/B/**	600 mm	KM TAA0000017
Mini Wheel	Mini Wheel with display	412364	412948	B*/B/A/B/A	1000 mm	KM TAA0000017
	Mini Wheel	417835	412948	B*/B/A/B/A	1000 mm	KM TAA0000017
Joystick	KC 06-K	355346 355287	307003	IP22: B/B/A/NA/A (IP56 and IP67: D/B/A/NA/C)		TAA00001WJ
Panel	Lever Panel (RBUS) - COP-05	316986	328210	D/B/A/B/**	50 mm	KM TAA0000044
	Lever Panel (RBUS IP56) - COP-05	327263	334094	D/B/A/B/**		KM TAA0000044
	K-Master Alarm Panel	346999	348019	B*/B/A/B/**		KM TAA000004C
	K-Master I/O controller	344382	348029	B*/B/A/B/**		KM TAA000004C
	K-Master Touch Control Panel - 13.3" HD 13T21 KMD-DR1-CORP	356680	349793	A*/B/A/B/**	800 mm	KM TAA000004C
	Direct Wiring Panel	345857	334102	B*/B/A/B/**	50 mm	KM TAA0000044
	Direct Wiring IO Controller	345847	334102	B*/B/A/B/**	100 mm	KM TAA0000044
	Thruster Command Panel	406412	412460	D/B/A/B/A	1200 mm	KM TAA000004C
IO unit	Remote Serial line interface module - RSER200-4	603444	300993	B*/B/A/B/**	50 mm	KM TAA0000044
	RBUS Hub Module - RHUB200-5	603442	300994	B*/B/A/B/**	50 mm	KM TAA0000044
	Remote Multi	324400	330111	B*/B/A/B/**	50 mm	KM TAA0000044

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	Purpose IO Module - RMP201-8					
	Remote Multi Purpose module series 420 - RMP420	306712	311165	B*/B/A/B/**	50 mm	KM TAA0000044
	Remote Digital I/O Relay series 420 - RDIOR420	306713	311163	B*/B/A/B/**	50 mm	KM TAA0000044
	Remote Panel Controller series 420 - RPC420	317114	325654	B*/B/A/B/**	950 mm	KM TAA0000044
Controller	Remote Controller Unit series 502 - RCU502	330924	358190	B*/B/A/B/**	150 mm	KM TAA0000044
	Remote Controller Unit series 502i - RCU502i	421768	429804	B*/B/A/B/A	300 mm	This certificate
Switch	Moxa 5-Port Unmanaged Ethernet Switch - EDS-205A	343608	343879	D/B/A/B/**		TAA000021N
	Moxa EtherDevice Switch - EDS-308/305	702485 702631 703659 702630	178001	D/B/A/B/**		TAA000006K
	Moxa SFP module	378893 388849 399666 424338	440212	D/B/A/B/**		TAA000006N
	Ethernet plugin modules - Moxa Port Interface IM-6700A series	438763 438765 402107	439061	D/B/A/B/**		TAA0000043
	Managed Ethernet Switch - Moxa IKS-6728A series	382427	439059	D/B/A/B/**		TAA0000043
	CAN Switch - CS100	396502	396509	B*/B/A/B/A	1000 mm	This certificate
	CAN Switch Connector Module - CC100A	396504	396515	B*/B/A/B/A	1000 mm	This certificate
	CAN Switch Connector Module - CC100B	396633	396515	B*/B/A/B/A	1000 mm	This certificate
	Ethernet Switch - HP 3600-24-	376308	376529	D/B/A/B/**	600 mm	KM TAA0000044

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	SFP v2 EI					
	LAN to CAN Gateway - L2C	404654	Datasheet 409453	D/B/B/B/**	100 mm	KM TAA0000018
Indicator	DEIF Indicators - XL72, XL96 and XL144	Complete list in KM document: 340980/A Table 1	340980	B/B/A/B/**		TAA00001YF MEDB00003AS MEDB00003AN MEDB00003AT MEDB00003AR
	DEIF Panorama Rudder Angle Indicators - TRI-2	441451 441465 441458 441483 441473 441511 441459	441530			MEDB00003AN
	Kwant Controls Rudder Angle Indicators - RSA-6	308792 318483 325564	345098			MEDB00003EV
	DEIF Display Indicator - XDi	Complete list in KM document: 393992/B	393992	D/B/B/B/**		TAA00001GV MEDB00003AS MEDB00003AN MEDB00003AT MEDB00003AR
Personal Computer	MP5810	406283 440134 (Base model)	Maintenance Manual 406444	D/B/A/B/**	500 mm	TAA00000H6
	Panel PC with 12.1" touch screen	402831	416808	B*/B/A/B/A	750 mm	KM TAA0000017 PRS-TE/2070/883236/15/MR
	Panel PC with 7" touch screen	402622	405546	B*/B/A/B/A	450 mm	PRS-TE/2070/883236/15/MR
	NEO CE-HW-01	409251	409277	B*/B/A/B/A	900 mm	TAA00000FC MRA000000R
Power Supply	QUINT-PS/1AC/24DC/10	326396	326403	D/B/C/B/A		TAE000014W
	QUINT-PS/1AC/24DC/20	326574	327446	D/B/C/B/A		TAE000014W
	Trio Diode Module, 12-24VDC 2x10A/1x20A	386113	391243	A/B/A/B/A		TAA000011F
	PULS YR40.241	389002	410028	Not listed in referred TA		GL 12 508 - 10 HH

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	Earth Fault Indicator 16 A – EFI-16	321492	324876	B*/B/A/B/**	500 mm	KM TAA00000W5
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Location classes in the table above are denoted in the following sequence:
Temperature / Humidity / Vibration / EMC / Enclosure class

Where temperature is denoted as “*”, then the module is tested to low temperature -15°C.

Where enclosure class is denoted as “**”, required enclosure protection according to the rules to be provided upon installation onboard.

***, the type approval certificates denoted with KM (Kongsberg Maritime) in front are used as basis for approval, subsequently the modules are also covered by this certificate. Other modules manufactured by third party maker have reference to valid (at the time of issuance) type approval certificates.

Place of manufacture

- Kongsberg Maritime AS, Kongsberg, Norway
- Kongsberg Maritime AS, Horten, Norway
- Kongsberg Maritime AS, Sandefjord, Norway
- Kongsberg Maritime Inc., New Orleans, USA
- Kongsberg Maritime China Waigaoqiao Ltd., 2F/3F, No. 136 North Fute Road, China (Shanghai) Pilot Free Trade Zone, 200131, China
- Kongsberg Maritime Korea Ltd., Busan, Korea
- Kongsberg Maritime Pte. Ltd., Singapore, Singapore

Approval conditions

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

- Reference to this Type Approval Certificate
- Functional description
- System block diagram
- Power supply arrangement (may be part of the System block diagram)
- Test program for certification
- Alarm list
- List of modules (new hardware will be subject for case by case assessment)

The Type Approval covers hardware and basis software listed under Product description.

The manufacturer will generate release/update notes for each new software revision. The current basis software version is listed under Product Description and KM document “Release Notes K-Thrust 4.1.0”.

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.

Product certificate

Each delivery of the application system is to be certified according to Pt.4 Ch.9 Sec.1. The certification test is to be performed at the manufacturer of the application system before the system is shipped to the yard. After the certification the clause for application software control will be put into force.

Application software control

All changes in software are to be recorded as long as the system is in use on board. Documentation of major changes is to be forwarded to DNV GL for evaluation and approval before implemented on board.

Application/Limitation

"RCS Steering Gear Alarm System" is an optional function and hence it might not be KM scope of supply on a specific delivery. This will then have to be addressed case by case.

Rules for additional class notation(s) (Redundant Propulsion, Dynamic Positioning, etc.) and craft category (if high speed craft) will be addressed case by case.

Type Approval documentation

Please note that the list below only includes selected documentation with the status approved and retrieved online from Kongsberg Maritime web solutions in CDQM-0016 Rev. E TA-K-THRUST-RBUS.

Hardware module descriptions:

- Moxa SFP module. Doc. No. 440212/A
- Direct Wiring Panel and IO Controller. Doc. No. 334102/D
- Thruster Command panel. Doc. No. 412460/B
- Redundancy module YR40.24. Doc. No. 410028/A
- Panel PC 7" 5:3 J1900. Doc. No. 405546/B
- CC100A / CC100B. Doc. No. 396515/B
- CS100. Doc. No. 396509/B
- Display Indicator (Deif), XDi. Doc. No. 393992/B
- Panel PC 12.1". Doc. No. 416808/A
- Trio Diode Module, 12-24VDC 2x10A/1x20A. Doc. No. 391243/A
- INELTEH Emergency Engine Telegraph Type EET1. Doc. No. 361104/B
- K-Master Touch Control Panel 13.3"HD 13T21 KMD-DR1-CORx. Doc. No. 349793/D
- K-Master Alarm Panel. Doc. No. 348019/B
- K-Master I/O controller. Doc. No. 348029/C
- Kwant Controls Rudder Angle Indicators. Doc. No. 345098/B
- DEIF Indicators XL72, XL96 and XL144. Doc. No. 340980/A
- HP 3600-24-SFP v2 EI, 376529/B
- RCU502. Doc. No. 358190/I
- RCU502i. Doc. No. 429804/B
- RMP201-8. Doc. No. 330111/C
- Lever K-Thrust. Doc. No. 412948/B
- Moxa 5-Port Unmanaged Ethernet Switch EDS-205A. Doc. No. 343879/B
- Moxa EtherDevice Switch EDS-308/305. Doc. No. 178001/D
- Moxa Port Interface IM-6700A. Doc. No. 439061/B
- Moxa IKS-6726A/6728A series. Doc. No. 439059/A
- Phoenix Contact QUINT-PS/1AC/24DC/20. Doc. No. 327446/A
- Phoenix Contact QUINT-PS/1AC/24DC/10. Doc. No. 326403/B
- EFI-16 - Earth Fault Indicator 16A. Doc. No. 324876/G
- RPC420. Doc. No. 325654/D
- RMP420. Doc. No. 311165/E
- Indicator Panorama TRI-2. Doc. No. 441530/B
- RSER200-4. Doc. No. 300993/H
- RHUB200-5. Doc. No. 300994/E
- RDIOR420. Doc. No. 311163/D
- Kwant Controls KC 06-K Joysticks. Doc. No. 307003/B
- Kongsberg COP-05 Lever Panel (RBUS). Doc. No. 328210/A
- Kongsberg COP-05 Lever Panel (RBUS IP56). Doc. No. 334094/A
- Computer NEO CE-HW-01. Doc. No. 409277/B
- MP5810 Maintenance Manual. Doc. No. 406444/M

Datasheets:

- AutoChief® 600, Pushbutton Telegraph (PBT). Doc. No. 330199/B
- L2C, LAN to CAN Gateway. Doc. No. 409453/B

Test reports:

- Test Report K-Master Panel System Report No. E11024.03. Doc. No. 357261/B (Nemko)
- Test for Marine Type Approval of RCU502 (DANAK-1911523 Rev.1). Doc. No. 363084/A
- Nemko Test Report Bridge Workstation (Report No. E12059.00). Doc. No. 370398/A
- TL16112 Test Report Marine Type Approval Testing Atea AS Kongsberg MP5810 PC (Intel Core i3). Doc. No. 425488/A (MS Testing)
- Type approval testing of additional Distributed Processing Units. Doc. No. DANAK-194874
- Type approval testing of ACP, PBT, MPP and MPD modules for New AutoChief C20: Doc. No. DANAK-197329
- Test Report Additional type approval testing of AutoChief AC-C20 Units. Doc. No. DANAK-197561
- Test Report Conducted low frequency interference immunity testing of AutoChief AC-C20 Units. Doc. No. DANAK-197724
- Type approval testing Earth Failure Indicator (EFI). Doc. No. DANAK-1910264
- Supplementary Type approval testing of EFI-16. Doc. No. DANAK-1910281/1
- Test for Marine Type Approval of RMP420 Rev.2. Doc. No. DANAK-1911658/1
- Type approval testing of UTILITY and LEVER Panel for RPC420. Doc. No. 334615/A (DELTA)
- Test for Marine Type Approval of DuraPANEL 7", DuraPANEL 12.1" and DuraMON 7". Doc. No. DANAK-19/15434/A
- Test Report K-Thrust Modules. Doc. No. E16203_00 (Nemko)
- Test Report CAN Distribution Unit (CDU) CS100/CC100A/CC100B/CR100. Doc. No. E15157.02 (Nemko)
- Environmental Test Report Vibration Test of Eldon MAS 120830X KM01. Doc. No. 3010-08-0107 (TI)
- Type approval testing of RMP420 and RDIOR420 (DANAK-198696). Doc. No. 310806/A
- Type approval testing of RPC420 (DANAK-1910136). Doc. No. 319971/A
- Test Report RCU502i. Doc. No. E18081.00 (Nemko)
- Test for Marine Type Approval of STG Panel and STG Panel Controller (DANAK-1910900/A). Doc. No. 354809/-
- Test for Marine Type Approval of L2C. Doc. No. DANAK-19/16085/A
- Environmental tests for RMP201-8 based upon RMP200-8. Doc. No. 332991/A
- EMC and Environmental Testing of Maritime Display (HD13T21 KMD-DR1-CORP). DNV Report No. 2011-3416, Rev.01. Doc. No. 368647/A

K-Thrust 720 system:

- K-Thrust 720 Control Position Cabinet CAN. Doc. No. 425804/A
- Engine Telegraph System. Doc. No. 435241/A
- K-Thrust 720 INELTEH Emergency Telegraph. Doc. No. 425806/A
- K-Thrust 720 Control Position Accessories. Doc. No. 425798/A
- K-Thrust 720 Thruster, Propulsion and Steering Remote Control System Operator Manual Release 4.1. Doc. No. 441551/A
- K-Thrust 720 Control Position. Doc. No. 425797/A
- K-Thrust 720 Propulsion and Thruster Remote Control System Product Description. Doc. No. 409587/C
- FMECA K-Thrust 720 Failure mode, effect, and criticality analysis. Doc. No. 384154/A
- Kongsberg K-Thrust 720 RCS Control Position Maintenance Manual. Doc No. 412924/A
- K-Thrust 720 RCS KFDD Kongsberg Functional Design Document "Vessel Name". Doc. No. 378068/C
- Release Notes K-Thrust 4.1.0. Doc. No. 440099/A
- FAT procedure K-Thrust 720. Doc. No. 412879/D
- K-Thrust 720 Emergency Stop Levers. Doc. No. 388324/B
- K-Thrust 720 Emergency Stop Levers with thermal fuse. Doc. No. 419426/A

Tests carried out

Applicable tests according to class guideline DNVGL-CG-0339, November 2016.

Type approval assessment report, DNV GL Sandefjord 2019-01-07.

Type approval FAT procedure K-Thrust 720. Doc. No. 412879/C_FTR, 2019-01-09.

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Marking of product

The products to be marked with:

- manufacturer name
- model name
- product number

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

A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE