DNV·GL

Certificate No:
A-13846
File No:
861.21
Job Id:
262.1-015463-1

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Remote Control System, Water Jet

with type designation(s)
Compact Control System for Waterjet Propulsion Unit, MIO Control Unit, Control devices (lever, knob, joystick, tiller, etc.)

Issued to
ROLLS-ROYCE OY AB
KOKKOLA, Finland

is found to comply with
Det Norske Veritas' Rules for Classification of Ships and High Speed and Light Craft

Application :

Location classes:

Type	Temperature	Humidity	Vibration	EMC	Enclosure
MIO Control Unit	**D**	**B**	**B**	**B**	**C**
Control devices (lever, knob, joystick, tiller, etc.)	**D**	**B**	**A**	**B**	**C**

This Certificate is valid until **2016-12-31**.
Issued at **Høvik** on **2014-09-23**

DNV GL local station: **Turku**

Approval Engineer: **Poul Tranborg**

for **DNV GL**
Digitally Signed By: Sneen, Ståle
Location: DNV GL Høvik, Norway
Signing Date: 2014-09-26, on behalf of

Odd Magne Nesvåg
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.
If any person suffers loss or damage which is proven to have been caused by any negligent act or omission of the Society, then the Society shall pay compensation to such person for his proven direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question. The maximum compensation shall never exceed USD 2 million.
In this provision the "Society" shall mean DNV GL AS as well as all its direct and indirect owners, affiliates, subsidiaries, directors, officers, employees, agents and any other person or entity acting on behalf of DNV GL AS.

© DNV GL 2014. DNV GL and the Horizon Graphic are trademarks of DNV GL AS.

Product description

The Compact Control System is applicable for Rolls-Royce's waterjets.
The system is designed to suit patrol boats, yachts, ferries, and similar vessels.
The system can be configured from a range of standardized jet components to suit a particular vessel.
Control devices are calibrated and, in case of A3- and FF-series Waterjets, key hydraulic components are usually installed on the jets at the factory.
All bridge control devices are connected directly to CAN bus by standard CAN+power cable.
The system has standard interfaces to engines, gears and autopilot, with an option for Tunnel Thruster, Voyage Data Recorder and DP. Options of either manual or automatic interceptor control, that link interceptor movements to steering commands, are available. For the operator, control stations can be configured to suit individual requirements and preferences for the human/machine interface. Users can select from a joystick, twin levers or steerable lever control devices mounted in the console or on the arms of the chair. An optional color touch screen presents system status and performance data. As each propulsion line is independent there is ample redundancy, and a number of interlocks enhance safety.

Control station configurations:
- 1 to 3 control station indoor or outdoor
- 1 x twin lever or 2 x steerable lever per station
- One or two steering device per station
- Joystick possibility at all stations
- Touch screen for non-critical functions (optional)
- Backup system with 1 to 3 control stations (optional)

Waterjet configurations:
- Twin installation
- Twin + Booster (non-steerable) installation
- Quad installation

Sofware of the Control System is divided into six modules that interact via CAN bus:
-MIO Control Units
    Main-software
    Bow thruster -software
    Back up-software
-Control panels
    Knob, lever, joystick... with CAN board software inside the panels
-Display
-Bridge interface unit

The control system consists of one or more of the following modules:

NO	Product	Type Designation	Name
1	Control Panel	RRM000211282	Booster lever
2	Control Panel	RRM000212341	Single lever with idle knob
3	Control Panel	RRM000211271	Twin lever with idle knob
4	Control Panel	RRM000212258	Mirrored twin lever with idle knob
5	Control Panel	RRM000212262	Quad lever with idle knob
6	Control Panel	RRM000212291	Mirrored quad lever with idle knob
7	Control Panel	RRM000211517	3-axis joystick with spring return
8	Control Panel	RRM000212339	Single steering knob
9	Control Panel	RRM000211526	Twin steering knob
10	Control Panel	RRM000212268	Quad steering knob
11	Control Panel	RRM900002660	Steering column
12	Control Panel	RRM000213038	Single steering wheel panel
13	Control Panel	RRM000211513	Twin steering wheel panel
14	Control Panel	RRM000210161	Quad steering wheel panel
15	Control Panel	RRM000213498	Single tiller
16	Control Panel	RRM000211305	Twin tiller

17	Control Panel	RRM000213580	Quad tiller
18	Control Panel	RRM000212295	Twin clutch panel with idle knob
19	Control Panel	RRM000210120	Quad clutch panel with idle knob
20	Control Panel	RRM000212932	Bow thruster panel
21	Control Panel	RRM000212912	Backup panel
22	Control Panel	RRM900002279	Steering indicator (separately TA'ed, MED-GL 94221–10)
23	Panel PC	RRM900000820	Display 7" (separately TA'ed, ref. A-11984)
24	Panel PC	RRM000227414	Display 10.4" (separately TA'ed, ref. A-13761)
25	Controller	RRM900000924	MIO Control Unit (this TA)
26	CAN repeater box	RRM000225858	CAN repeater (separately TA'ed, A-11983)
27	Backup control relay box	RRM900000925	Relaybox

Approval conditions

The Type Approval covers the design principle and the hardware listed above that has not been separately Type Approved.

For each system intended to be installed in a DNV classed vessel the following documentation of the actual application is to be submitted for approval:

- Reference to this Type Approval Certificate
- System block diagram
- Power supply arrangement (may be part of the System block diagram)
- Main parts list
- Input/output list
- Test program for certification test

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.

Clause for application software control

All software modifications made after the certification test and as long as the system is in use onboard, are to be recorded. The records, together with the software version(s) in use are to be available for evaluation at request by DNV. Major software changes are to be approved before being installed onboard.

Application/Limitation

The minimum system configuration is for two independent port and starboard waterjets.

Indication with alarm for oil pressure, oil temp, bearing oil level, bearing temp as required by the Rules Pt.4 Ch.5 Sec.2 E201 Table E1 and alarm for controller failure can either be arranged conventionally by indicators, lamps and pushbuttons or through the the optional touch screen, if the delivery includes such.

The hydraulic pump for steering of each jet is mechanically driven so the Rule requirements for electric motor starter alarms are not applicable.

The means to emergency stop the propulsion from the navigating bridge/operating compartment are to be aranged separately to this remote control system, ref. DNV Rules for High Speed, Light Craft and Naval Surface Craft Pt.4 Ch.13 Sec.2 E202.

For high speed cargo vessels and passenger vessels category B the backup control option shall be installed. For passenger vessels backup control shall be arranged from the operating compartment, ref.

Pt.5 Ch.1 Sec.7 B101. For cargo vessels backup control shall be arranged from the operating compartment or from the engine control space such as an engine control room outside the operating compartment, ref. Pt.5 Ch.3 Sec.6 B101.

Type Approval documentation

Drawing No.	Rev.	DNV No.	Title
DMN000200849		1	User manual Rolls-Royce compact control system for waterjets
DMN000214724	D	2	Functional discription Rolls-Royce compact control system for waterjets
040068-200-001		12	Application Reference Manual - Rolls-Royce Compact Control System
		13	Factory FMEA Test
		14	FAT flowchart
		15	Performance test for (check list)
		16	StartUp Checklist
		11	Component List RR
		7	Data Sheets for Relays, Relay Sockets & Sensors
DNV Report No. 2012-3186	01	4	EMC and environmental testing of Maritime Field Interface I/O controller Revision GS1.6
273782-1		19	EMC Test Report (tiller, steering wheel panel and column, joystick)
273782-2		20	Mechanical and environmental Test Report (steering wheel panel/knob/column, tiller, lever, joystick)
273782-3		21	Enclosure Test report (tiller, steering wheel panel and column, joystick)

Tests carried out

Applicable tests according to Standard for Certification No. 2.4, April 2006.

Functional Type Test with a representative test configuration consisting of two propulsion jets and three control stations conducted at the manufacturers training centre on 2014.09.02.

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 at least every second year and at renewal of this certificate.

END OF CERTIFICATE