DNV·GL

Certificate No:
TAM000002C

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Hydraulic Rudder Actuator for Steering Gear

with type designation(s)
SR722, SR723

Issued to
Rolls-Royce Marine AS Deck Machinery and Steering gear - Brattvaag
BRATTVÅG, Norway

is found to comply with
Det Norske Veritas' Rules for Classification of Ships

Application :

The hydraulic actuator may be used for steering gears which according to current Rules may be provided with a single rudder actuator

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

This Certificate is valid until .

Issued at **Høvik** on

for **DNV GL**

DNV GL local station: **Ålesund**

Approval Engineer: **Svein-Olav Hannevik**

Oddvar Deinboll
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.

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Job Id: **262.1-002581-3**
Certificate No: **TAM000002C**

Product description

Type of actuator: Hydraulic rotary vane

Application/Limitation

Type		***SR722-35***	***SR722-45***	***SR722-70***	***SR723-35***	***SR723-44***
Number of vanes, n	[-]	2	2	2	3	3
Design pressure, P_{des}	[bar]	156	156	156	156	156
Design torque, T_{des}	[kNm]	344	344	344	514	514
Max. rule rudder torque, M_{TR}	[kNm]	344	344	344	514	514
Max. working pressure, P_w	[bar]	125	125	125	125	125
Max. working torque, T_w	[kNm]	275	275	275	412	412
Max. rudder angle, θ	[°]	35	45	70	35	44
Min. rudder stock diam., d_{min} [1)]	[mm]	234	234	234	267	267
Max. rudder stock diam., d_{max}	[mm]	340	340	340	340	340
Max. radial force, F_{rad}	[kN]	855	855	855	855	855
Max. axial force, F_a	[kN]	370	370	370	370	370
Max. pump capacity, Q_{max} [2)]	[l/min]	160	160	160	160	160
Required pull-up distance, δ [mm] [3)]						
Rudder stock diameter = 280 mm		25.5	25.5	25.5	-	-
Rudder stock diameter = 300 mm		27.3	27.3	27.3	-	-
Rudder stock diameter = 320 mm		27.8	27.8	27.8	27.8	27.8
Rudder stock diameter = 340 mm		31.2	31.2	31.2	31.2	31.2

1) Based on rudder stock material with yield strength 235 N/mm^2. Note that a larger diameter is normally required due to the capacity of the friction coupling between rudder stock and steering gear rotor.

2) Maximum capacity per pump is due to limitations in allowable pressure rise in the pressure relief valves {Pt.4 Ch.14 Sec.1 B1006}. Allowable pump capacity for steering gears with reduced design pressure will be evaluated case-by-case.

3) For standard rudder stock diameters, pull-up is included in the type approval. Pull-up distance is specified from the point where the initial clearance is closed. For other rudder stock diameters case-by-case approval is required.

NDT testing of highly stressed area of motor housing to be performed according to previously agreed procedure. Note however additional requirements for steering gears required to comply with Pt.4 Ch.14 Sec.1 Appendix A

Type Approval documentation

Marking of product

The product is to be marked with the manufacturer's name or trademark and type number identification

Certificate retention survey

For retention of the Type Approval, a DNV GL surveyor shall perform a survey every second year and before the expiry date of this certificate to verify that the conditions of the type approval are complied with.

The objective of the Periodical Assessment is to verify that the conditions for the Type Approval are not altered since the Type Approval Certificate was issued. The main scope of the Periodical Assessment will normally include:

- Verification of the Type Approval applicant's production and quality system w.r.t. ensuring continued consistent production of the Type Approved products at the Type Approval applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the Type Approval documentation and that this is still used as basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking.

Other conditions

- The approval includes only the hydraulic rudder actuator.
- A steering test is to be carried out under normal working conditions to demonstrate compliance with requirements {Pt.4 Ch.14 Sec.1 I200}.
- Mounting and operation instructions to follow each delivery.

For approval of the complete steering gear the following must be submitted case-by-case:

- Technical data sheet.
- Hydraulic function diagram, piping diagram and electric wiring.
- Operating instructions, including emergency operation.
- Fastening arrangement, including bolting and chocking calculations (yard supply).
- Arrangement of steering gear compartment (yard supply).

END OF CERTIFICATE