

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Pumps

with type designation(s)

RCMG Series Marine Centrifugal Pumps (RCMG 80, RCMG 100, RCMG 150, RCMG 200)

issued to

Dalian Deep Blue Pump Co., Ltd.

Dalian, Liaoning, China

is found to comply with

DNV class programme DNV-CP-0505 – Type approval – Pumping units

DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers

DNV offshore standards

Application:

Product(s) approved by this certificate is/are accepted for installation on all vessels and offshore units handling liquefied LNG and LPG and classed by DNV.

Type:	Max. working press.:	Operating media:	Temperature range:
RCMG 80	14 bar	LNG; LPG; LN2	from -165 deg C to +45 deg C (operational)
RCMG 100	14 bar	LNG; LPG; LN2	from -165 deg C to +45 deg C (operational)
RCMG 150	18 bar	LNG; LPG; LN2	from -165 deg C to +45 deg C (operational)
RCMG 200	18 bar	LNG; LPG; LN2	from -165 deg C to +45 deg C (operational)

Issued at **Høvik** on **2024-06-28**

This Certificate is valid until **2029-06-27**.

for **DNV**

DNV local unit: **Dalian NB & CMC**

Approval Engineer: **Yury Ilchenko**

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.



Product description

Pumps models RCMG 80, RCMG 100, RCMG 150 and RCMG 200 are submerged type centrifugal pumps designed for liquefied gas operation, lubricated and cooled by the pumped media. The pumps are intended for installation in caissons equipped with the foot valve. Electric motor is integrated in the pump body.

Application/Limitation

The pump design is approved for handling liquefied gases (LNG and LPG) on board ships and offshore units within following operating ranges:

Type	RCMG 80	RCMG 100	RCMG 150	RCMG 200
Volumetric rate of flow	30 – 90 m ³ /h	90 – 230 m ³ /h	150 - 350 m ³ /h	300 – 660 m ³ /h
Delivery head	80 – 165 mlc	80 – 165 mlc	80 – 240 mlc	80 – 240 mlc
Min design temperature °)	-196°C	-196°C	-196°C	-196°C
Operating temperature	-165°C to +65°C	-165°C to +65°C	-165°C to +65°C	-165°C to +65°C
Differential pressure	3.9 – 8.1 bar	3.9 – 8.1 bar	3.9 – 8.1 bar	3.9 – 8.1 bar
Rated power, kW				
Shaft rotation, rpm	3600 - 4200	3600 - 4200	3600 - 4200	3600 – 4200
Materials	Austenitic stainless steel / Aluminum / martensitic stainless steel	Austenitic stainless steel / Aluminum / martensitic stainless steel	Austenitic stainless steel / Aluminum / martensitic stainless steel	Austenitic stainless steel / Aluminum / martensitic stainless steel
*) – this temperature addresses materials suitability and acceptance for cryogenic testing conditions				

Type approval documentation

DRW No	Rev	Title
DBP-GD-00678-RCMG 100	-	Rotor Lateral Analysis Report RCMG 100
DBP-GD-00683-RCMG 100	-	Rotor Torsional Analysis Report RCMG 100
PIP23DZ0023001001	-	Inspection and test plan
DBP-GD-00675-RCMG 100	-	Whole Machine Natural Frequency Analysis Report
DBP-OR-00269	-	Type Test Program RCMG 100
RC-M Series Marine Pump functional description	-	RC-M Series Marine Pump functional description of the product
110012142	-	BEARING SUPPORT
110012226	-	CABLE
110012153	-	DISCHARGE COVER
11001216	-	DIFFUSER
110012158	-	INDUCTION
110012200	-	VALVE PLATE
110012196	-	VALVE BODY
110012155	-	IMPELLER
110012197	-	VALVE BODY
110012182	-	FOOT VALVE
110012165	-	SUCTION SECTION
110012135	-	MOTOR COVER
110012139	-	MOTOR FRAME
110012173	-	SHAFT
110012212	B	HEAD PLATE
110011619	B	GENERAL ARRANGMENT
110011618	-	PUMP
110012205	B	HEAD PLATE

Tests carried out

Testing program for the pump is according to DNV-CG-0505. In-service experience was also taken into consideration (ref. DNV-RU-SHIP Pt.5 Ch.7 Sec.5 §13.5.1)

Marking of product

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

Periodical assessment

The pump is subject to periodical surveys in service following HSSC (IMO Resolution A.1140(31)). A renewal assessment will be performed at renewal of this certificate.

In case where the type approved product is manufactured at other companies, the periodical assessment shall verify that the type approval applicant has a quality control system for consistent production at their licensees/subcontractors. Furthermore, periodical assessment shall be carried out randomly at these companies.

Other conditions

The pump minimum design temperature is -196°C. This temperature is limited for cryogenic testing and pump commissioning for cryogenic service. For cases the pumps need to be used in temperatures below -165°C, formal Administration acceptance will be required.

Each manufactured pump for liquefied gas service pump shall be certified during production and DNV Product Certificate issued (ref. DNV-RU-SHIP Pt.5 Ch.7 Sec.5 [§13.5.2])

The pump shall be used only with electrically non-conductive fluids in LNG and LPG groups of products.