Certificate No: **2606011110541247**
TL Project No: **26-0707**

TYPE APPROVAL CERTIFICATE

This is to certify that the

INTERNAL COMBUSTION ENGINES

Manufacturer	:	**Rolls-Royce Solutions GmbH**
Address	:	**1. Maybachplatz 1, 88045, Friedrichshafen/ Germany**
Product Type	:	**BRS 2000**
Reference Rule	:	**TL Rules, Part B, Chapter 4-1, Automation, 01.01.2022** **TL Rules, Part E, Chapter 103 - Metallic Materials, Special Materials for Naval Ships, 01.01.2022** **TL Rules, Part E, Chapter 104 - Naval Ship Technology, Propulsion Plants, 01.01.2022** **TL Rules, Part E, Chapter 105 - Naval Ship Technology, Electrical Installations, 01.01.2022** **TL Rules, Part E, Chapter 106 - Naval Ship Technology, Automation, 01.01.2022** **TL Rules, Part B, Chapter 5, Electric , 01.01.2024** **TL Rules, Part A, Chapter 2, Material, 01.07.2024** **TL Rules, Part B, Chapter 4 - Machinery, 01.01.2026**

Subject to the conditions referred to in the following pages, this certificate is valid until **07.04.2031**

Surveyor: **Sezer Mahir TUĞCU**

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Issued at **İSTANBUL** on **05.06.2026**

This document is electronically signed and does not require a manual signature

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Emrah SÖĞÜTÇÜ
New Building Division Manager
TÜRK LOYDU

Expire Date of Previous Certificate: 07.04.2026

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This certificate is subject to terms and conditions described below:
Any significant change in design or construction may render this Certificate invalid. Certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested. This certificate is not valid for products without marking above mentioned. The manufacturer should notify TÜRK LOYDU of any modifications or changes to equipment in order to obtain valid certificate. This certificate shows that tested specimens as representative of the product complies of the TÜRK LOYDU rules, and relevant international instruments that apply to it.

Product	**: INTERNAL COMBUSTION ENGINES**
Product Description	**: Four stroke, v-engine, non-reversible, trunk-piston, with supercharging, with charge air cooling, constant-pressure charging system, direct injection, injection operation by cams, valve operation by cams, liquid fuel.**
Approval No / Date	**: - PAE-EPAS/024246/26-0707/MY, 12.03.2026** **- PAE-EPAS/024871/26-0707/ŞÜ, 18.05.2026** **- PAE-EPAS/024902/26-0707/ŞÜ 21.05.2026**
Application	**: Propulsion, multi engine plant / auxiliary / emergency**
Number of Cylinders	**: 8, 12, 16**
Stroke	**: 150 mm**
Bore	**: 130 mm**
Method of Operation	**: Four Stroke**
Kind of Starting Device	**: Air/ Battery**
Kind of Cooling	**: Water**
Fuel Type	**: Diesel Oil**
Last Inspection Date	**: 01.06.2026**
Performed Tests	**: - Quality Audit** **- Controls according to Approved Drawings** **- Subcomponent Controls (crankshaft, pistons, connecting rod etc.)** **- Functional Test** **- Fire protection controls** **- Leakage Control** **- Turbocharger checks** **- Type Test report title is "Typprüfung der DDC-MTU Dieselmotorenbaureihe 2000". Date of test 1997-03-03 to 1997-11-27. (Test engine: Model 16V2000, Serial no. 536 000 290& 536 000 208)** **were found satisfactory.**
Test Place	**: 1. Maybachplatz 1, 88045, Friedrichshafen/ Germany 2. Friedrich-List-Str.8, 39122 Magdeburg, Germany**
Application/Limitation	**: 1--Product description** **The engine is a liquid-cooled four-stroke diesel engine, with direct injection, sequential turbocharging and charge-air cooling.The engine is monitored by an engine control and monitoring unit (EMU). Monitoring in the engine room is carried out by the engine control and monitoring unit (MSC).** **The approval is based on MTU BR 2000 Engine series type with main characteristic as stated below:** **Engine Type : BRS 2000** **Number of Cylinders : 8V / 12V / 16V** **Diameter of Cylinder (mm) : 130** **Stroke (mm) : 150** **The following values were taken as basis in crankshaft calculations.** **Power :1492.0 kW** **Power per Cylinder : 93.3 kW** **Speed :2350.0 rpm** **Max. firing pressure : 180.0 bar** **Displacement (cylinder) : 1.99 litres** **Technical data** **- Four-stroke cycle, four-valve direct-injection engine** **- 8, 12 or 16 cylinders** **- 90° V-angle** **- Power rating** **-- 385 kW to 1492 kW** **-- 50 kW to 93.25 kW per cylinder** **- Engine speed** **- 1500 rpm to 2350 rpm + 50 rpm speed margin** **- Counterclockwise rotation** **- Electronically controlled unit injection pumps** **- Sequential turbocharging with charge-air cooling**

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- Triple-walled, water cooled exhaust manifolds
- Electric starter
- Resilient, height-adjustable engine mounting
- Service block with pumps, filters, heat exchangers, battery-charging generator, coolant expansion tank etc.
- Electronic engine management system.
1. Drivability
? Application group 1A: Vessels with unrestricted continuous operation.
2. Application group 1B: Fast vessels with high load factor
3. Application group 1DS: Fast vessels with low load factor
4. Application group 3A: On-board power generation with unrestricted continuous operation
5. Application group 3B: On-board power generation with continuous variable load operation.
6. Application group 3C: Short time operation - overload capability.
7. The main engine types in group 1A are: 8V/12V/16V 2000 M60 and M61, (50kW/cyl.)
8. The auxiliary engine types in group 3A are: 8V/12V/16V 2000 M50A, M50B, M51A and M51B. (41.5kW/cyl. for 50 Hz, 50kW/cyl. for 60 Hz.)
--For the other application groups and functional descriptions of the engines, see document 20.1.24 in EPAS.
The ambient conditions are ;
1. Seawater temperature: +32 °C
Temperature range: 0°C ÷ +45 °C
2. Atmospheric pressure: 1 bar
3. Suction air temperature: +45 °C
4. Relative humidity: 60 %
5. For electric componen Ts: 0°C ÷ +55 °C
6.
İnclination limits (degrees) Athwartships Fore --and--Aft.
Static Dynamic Static Dynamic
Main and Auxiliary enginery ± 15,0° ± 22,5° ± 5,0° ± 7,5°
Emergency power supply ± 22,5° ± 22,5° ±10,0° ±10,0°
3--Limitation
3.1.1--The engines must be able to continuously deliver the nominal power at the nominal speed under the ship's service conditions. (Engines in operating groups 1A and 3A provide this.) For the use of engines with special applications other than these, special approval is required. (DS, 1B, 3B and 3C operating group engines require special approval for use on TL Class ships.)
3.1.2--In order for these engines to be used on ships with single-engine propulsion applications, the control of the engine (in case of failure of the regulator or actuator) must be done with another independent control system. In other words, two separate engine control systems should be arranged. The main engines must be fitted with stand-by cooling pumps that operate independently.If this equipments is not on the engine, the ships should be equipped with more than one main engine.

3.2-- Other Conditions;
3.2.1-Flexible hoses with couplings are to be type approved.

Others **: Continuation of Application/Limitation*:**

3.2.2-Engine safety, control and monitoring systems, including sensors and actuators are not covered by this type approval certificate. Documentation for engine safety, control including speed governing and monitoring systems shall be submitted for approval according to the TL ?Part B- Chapter 4-1?Section 2 (July 2022) or TL-Part E Chapter 106 -Section 2 (Jan 2022) (It is only required for Türk Loydu's product certificate.)
3.2.3-Electric cables and cabling are not covered by this approval and must be verified to comply to the TL ?Part B- Chapter
5?Section 9 (Jan 2024) or TL-Part E-Chapter 105-Section 9 (Jan 2022). (It is only required for Türk Loydu's product certificate.)
3.2.4-MTU and Rolls-Royce Solutions GmbH is responsibilty to inform the shipbuilders and/or their subcontractors about the installation, use, general

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maintenance of the approved equipment and the conditions of this approval.
3. 3--Service Restriction:
3.3.1--Unit Certification (Türk Loydu?s product certification) is required for this product to be used on TL-classed ships.
3.3.2--Signalization and protection related to the engine shall be subjected to Türk Loydu approval in each particular case and will depend on service applied and the degree of the vessel's automation. These engines can be installed on ships with automation notation provided that all the conditions specified in our rules are followed. For this purpose, equipment that meets the requirements of the Automation Rules must be on the engine and our surveyors must check whether these requirements are met during FAT or ship trials.
3.3.3?Equipment must be provided for enabling -turning gear engaged- signal.
4--Comments
4.1--Torsional vibration analysis for the unit of each to be installed on ships must be carried out by the relevant organizations and It must be approved by the class.
4.2--The fitting of Rules required protective devices is to be verified at installation on board a vessel in class with the Türk Loydu as well as the Rule required quantity of pump units depending on actual installation arrangements.
4.3--For engines intended to be used for emergency services, supplementary tests in accordance with regulations of the Administration whose flag the vessel flies may be required.
4.4--Products requiring witnessed testing by a Surveyor as part of their Certification for use on a vessel,or facility classed by Türk Loydu,as defined in the applicable section of the Rules,will continue to require witnessed testing Each engine produced in future where Türk Loyducertification is required is to be shop tested in the presence of our Surveyor.
4.5?Minimum tensile strenght of crankshaft material is 930 N/mm2.
4.6--This certificate does not cover the following plans which are to be reviewed for each installation:
4.6.1- Schematic diagram of engine control and safety system. Electronic monitoring and control system(s) ? software and hardware
4.6.2- Piping diagram of fuel oil system,lubricating oil system and coolimg water system.
4.6.3- Governor Arrangements.
4.6.4- Turbocharger.
4.6.5- Flexible Hoses.
4.6.6- The electrical and electronic equipment located within areas protected by local Fixed Pressure Water-spraying or Water-mist Fire Extinguishing system and those with in adjacent areas exposed to direct spray are to have a degree of protection not less than IP 44.
4.6.7- Crankcase explosion relief devices
4.6.8- Oil mist detection and alarm devices
4.6.9- Fuel management system (where dual fuel arrangements are fitted)
4.6.10- Engine driven pumps
4.6.11- Engine mounted filters
4.7--The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
4.8--Use of the Product for non-Türk Loydu units is subject to agreement between the manufacturer and intended client.

	Type of Product	Rated Power	Rated RPM	Mean Effective Pressure
1	BRS 2000	61.3 [kW/cyl.]	1800 [rpm]	22.7 [bar]
2	BRS 2000	57.9 [kW/cyl.]	1800 [rpm]	22.5 [bar]
3	BRS 2000	48.1 [kW/cyl.]	1500 [rpm]	22.4 [bar]

4	BRS 2000	47.9 [kW/cyl.]	1500 [rpm]	22.4 [bar]

Approval Conditions **: -**

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