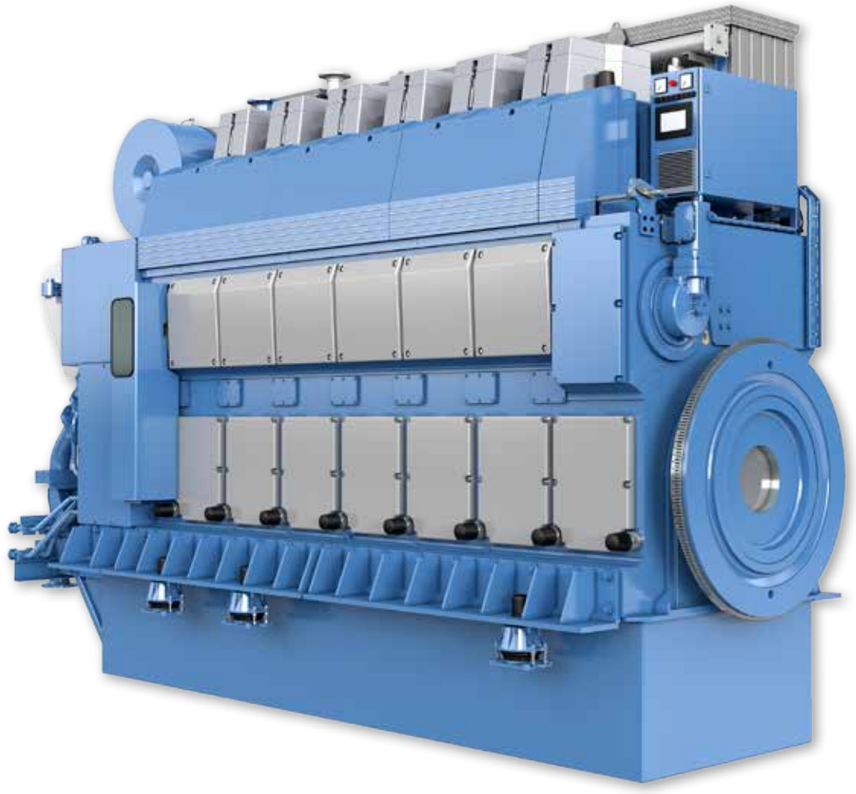
Rolls-Royce

NEW

B33:45 – the most powerful engine in its class

The Bergen B33:45 diesel engine



General description

The new Bergen B33:45 engine from Rolls-Royce carries forward the Bergen range of diesel and gas engines, offering 600 kW per cylinder in a compact engine design. The new engine range offers industry-leading fuel consumption and emission figures, for mechanical propulsion and electrical generation.

Its design was developed after consultation with a broad range of operators to establish what qualities they prize in an engine. The clear answer was life-cycle costs.

The designers focused on five main areas
– achieving the lowest fuel consumption and emissions
– highest power per cylinder in this engine class
– increased power within the same footprint, and potential for fewer cylinders with lower weight and cost
– a compact modular design and a base engine suitable for liquid or gas fuel
– dynamic and extended service intervals

Bergen B33:45 has a bore of 330 mm and a stroke of 450 mm, and runs at 450-750 rpm as a marine propulsion engine on propeller law or 720/750 rpm for 60/50 Hz generator set drive. In-line engines are the first to be produced, with 6, 7, 8 and 9 cylinders spanning a power range from 3,600 kW to 5,400 kW. Vee engines and gas engines sharing many of the design features will follow.

Benefits for shipowners
- Reliable power
- Best in class fuel and lubricating oil consumption
- IMO Tier II and Tier III compliant (with SCR)
- Low life cycle cost
- Load-dependent maintenance schedule
- Fast load response
- Low vibration/structural noise level
- Full equipment health monitoring
- 24/7 support by Rolls-Royce global service network

Benefits for designers and shipyards
- Compact power solution
- Easy installation
- New flexible mounts without welded brackets
- Aligned piping at pump end for ease of connection
- Flexible exhaust routing – 15 degree rotation of connections to turbocharger
- Full power can be taken from either end of crankshaft up to and including the V12 version

The prototype B33:45 on testbed in Bergen.

Industry-leading fuel consumption and reduced emissions

Specific fuel oil consumption is 175 g/kWh at 85% MCR and 177 g/kWh at full load. These engines are economical down to very low loads, without visible smoke and comply with IMO Tier II and Tier III rules.

IMO Tier III NOx emission requirements are achieved with Selective Catalytic Reduction (SCR) technology. The system uses urea to convert the NOx into nitrogen and water vapour. An SCR system was part of the development programme and NOx levels within IMO levels have been successfully validated running from 10 - 100% load. The control unit is integrated into the engine controller and compact SCR units will come in various sizes to match the engine power selected.

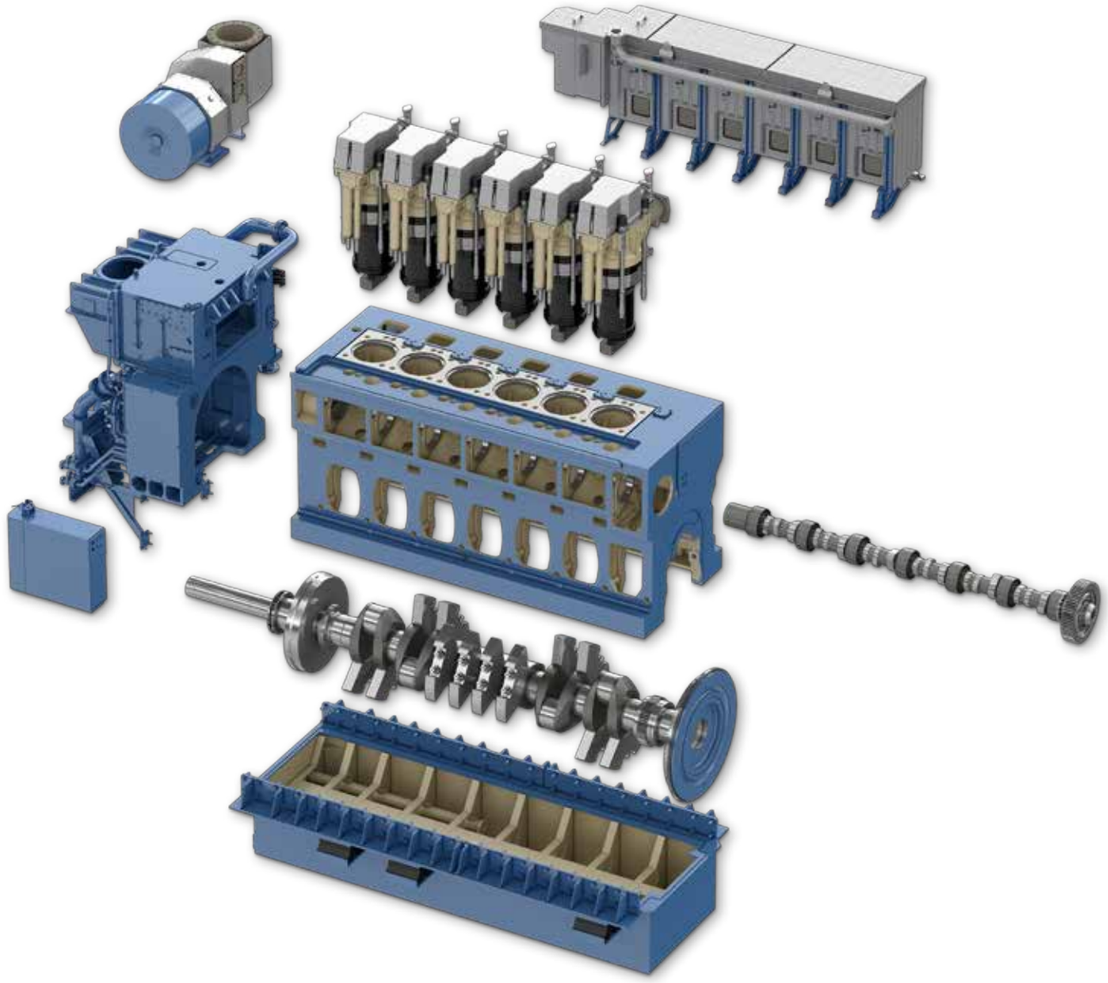
Great effort has been made to enhance maintenance friendliness and to make the engine easy to keep clean.

Main particulars - Bergen B33:45

Bore:	330 mm
Stroke:	450 mm
Speed:	720 or 750 rpm for generator sets 450 - 750 rpm for propulsion engines
Power/cyl:	Marine: 600 kW for both 720 and 750 rpm Land: 540 kW for 750 rpm
Variants:	Marine: L6, L7, L8, L9 V12 (potentially V10 and V14) Land: V16 and V20
BMEP:	26 bar for 720 rpm, 25 bar for 750 rpm
Piston speed:	11.25 m/s
Fuel (ISO 8217):	MGO, MDO, and HFO
SFOC (ISO 3046):	177 g/kWh at 100% load 175 g/kWh at 85% load
Specific LO cons:	0.5 g/kWh

Typical applications:
- Anchor-handlers and tug supply vessels
- Subsea construction vessels
- Drill ships
- Semi-submersibles
- Seismic survey vessels
- Accommodation units
- Heavy lift ships
- RoPax ferries
- Cruise vessels
- Cargo ships
- Fishing vessels

Advanced engine technology



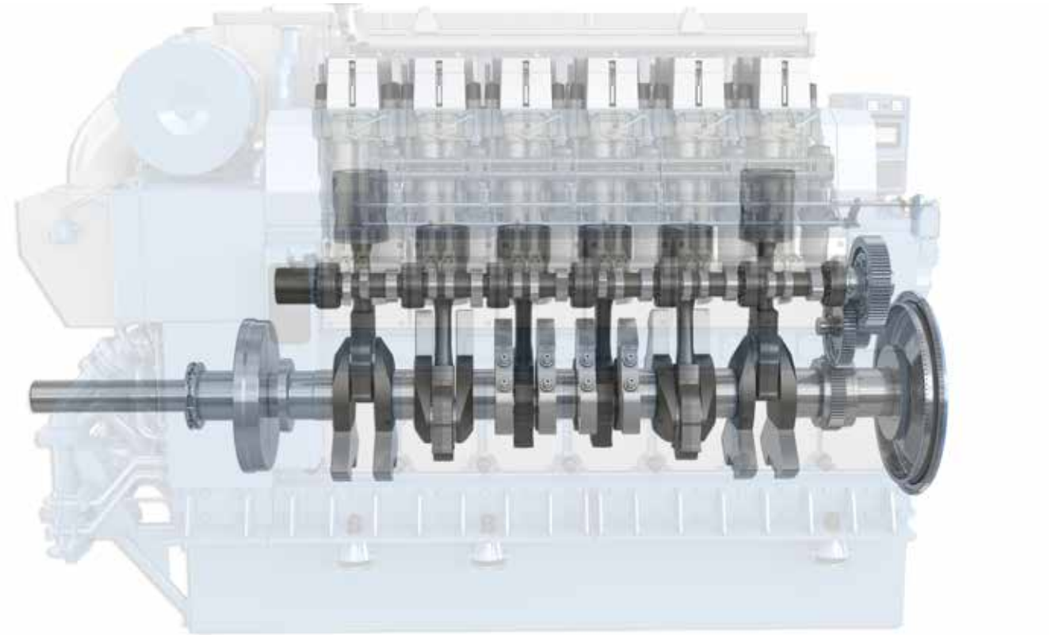
Compact and modularised design

Throughout the B33:45 a modular design approach has been employed, giving an engine that is rational to produce, resulting in a competive cost per kilowatt and straightforward overhauling.

The crankcase is designed to incorporate air and oil galleries to minimise the number of external pipes with increased stiffness of the engine block. The design ensures very low levels of vibration. The crankcase carries the fully balanced crankshaft which has bolt-on balance weights and is dimensioned so that full power can be taken from either end up to and including the V12 version.

Complete cylinder units, comprising the head, liner, piston and upper conrod can be withdrawn for overhaul in one unit.
A three-piece conrod allows a piston to be drawn without disturbing the big end bearing. Advanced design methods allow material to be used efficiently without excessive weight.
CFD and inputs from world-leading Rolls-Royce Power Systems R&D, which pools Bergen and MTU knowledge enabled fuel and emissions targets to already be met early in prototype running.
The strengthened gear driven camshaft is made up from individual cylinder sections for ease of replacement. Variable valve timing gives optimum response to load changes with reduced visible smoke even at low loads.

A Pump Line Nozzle fuel system handles MGO, MDO and HFO with 1,800 bar injection pressure in an arrangement that minimises the number of connections and prevents pollution of fuel oil into the lube oil system.



100% power can be taken off either end of the crankshaft (up to and including V12 versions).

Turbocharging is based on the multipulse system, with exhaust pipes enclosed in an insulated box to reduce heat transfer to the engine room, and two stage charge air cooling. The engine control system is developed in-house. It monitors and controls all key engine functions and exhaust aftertreatment.

Dynamic service intervals

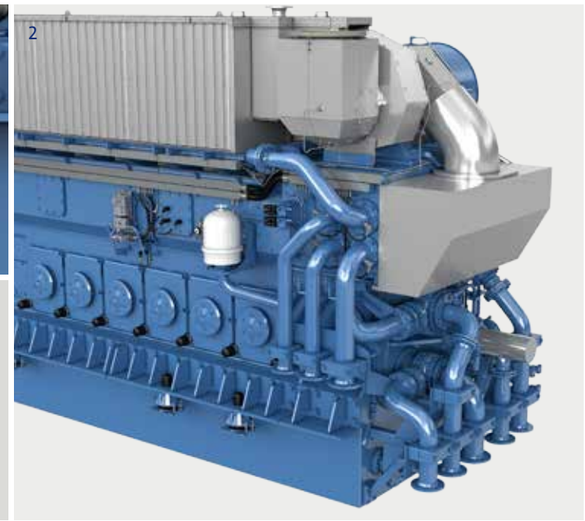
B33:45 engines are designed for 25,000 hrs between major maintenance when operating within a defined load window. Using health monitoring can enable engine overhaul intervals to be aligned with vessels' re-classification. When overhauls are finally needed, owners can benefit from the Bergen worldwide exchange pool system which offers cylinder heads, injection components and other parts by exchange and later return, with warranty.

Easy installation

Pipes are well supported by a steel frame connected to the front end module and sump. Pipework incorporates Class compliant compensators. Pipes are aligned for reduced complexity and speed of installation and give an extended lifetime for bellows and compensators.

Standard brackets are provided for rigid or flexible engine mounting, involving no welding.

Turbocharger exhaust outlet and air inlet connections can be rotated in 15 degree steps to simplify duct installation and add flexibility to routing.

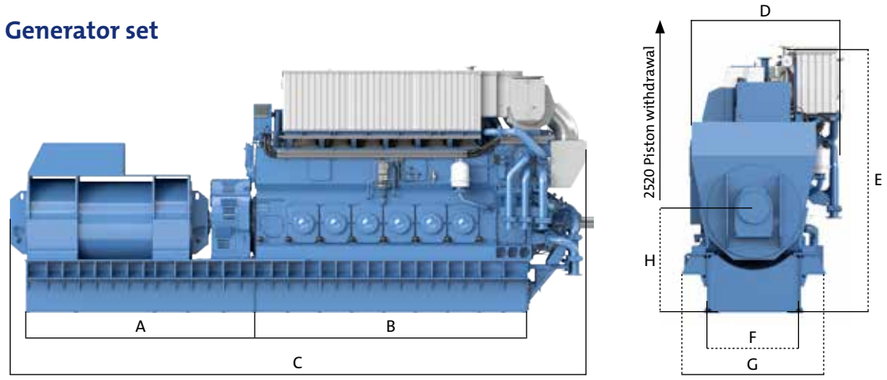


1. Flexible engine mounting with no need of welding during installation.

2. Front end pump module for easy and standardised installation.

Principal dimensions

Generator set

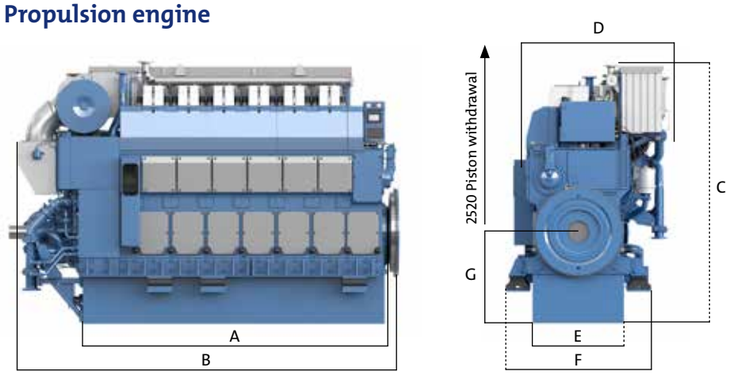


Principal dimensions:
All dimensions in millimetres

Engine type	A	B	C	D	E	F	G	H	Weight dry gen set
B33:45L6A	3891	4535	9385	2377	4012	1440	2138	1470	62900 kg
B33:45L7A	3891	5055	9905	2377	4012	1440	2138	1470	73400 kg
B33:45L8A	3941	5575	10475	2486	4159	1440	2138	1470	82500 kg
B33:45L9A	3941	6095	10995	2486	4159	1440	2138	1470	92800 kg

Dimensions given apply for resiliently mounted engines.
Overall length will determine the choice of alternator.

Propulsion engine



Principal dimensions:
All dimensions in millimetres

Engine type	A	B	C	D	E	F	G	Weight dry engine
B33:45L6	4535	5622	3892	2227	1354	2138	1350	40210 kg
B33:45L7	5055	6142	3892	2227	1354	2138	1350	46910 kg
B33:45L8	5575	6682	4039	2320	1354	2138	1350	53610 kg
B33:45L9	6095	7182	4039	2320	1354	2138	1350	60310 kg

Weight (dry) excludes flywheel and transport foundation.
Dimensions given apply for resiliently mounted engines.

NORTHERN EUROPE

DENMARK

Aalborg
Tel: +45 99 30 36 00

FINLAND

Helsinki
Tel: +358 9 4730 3301

Kokkola
(Waterjets)
Tel: +358 6 832 4500

Rauma
(Propulsion/Deck Machinery)
Tel: +358 2 837 91

FRANCE

Paris
(Naval Marine)
Tel: +33 147 221 440

Rungis
Tel: +33 1 468 62811

GERMANY

Hamburg
(Sales and Service)
Tel: +49 40 780 91 90

THE NETHERLANDS

Rotterdam
Tel: +31 10 40 90 920

NORWAY

Aalesund
(Head Office, Commercial Marine)

(Control Systems)

(Ship Design, Fish, Specialised and Merchant)

(Rudders)
Tel: +47 815 20 070

(Training Centre)
Tel: +47 70 23 51 00

Bergen
(Engines)

(Foundry)

(Steering Gear)
Tel: +47 815 20 070

(Power Electric Systems)
Tel: +47 55 50 62 00

Brattvaag
(Deck Machinery and Steering Gear)
Tel: +47 815 20 070

Hjørungavåg
(Deck Machinery Seismic and Subsea)
Tel: +47 70 01 33 00

Longva
(Automation)
Tel: +47 815 20 070

Molde
(Cranes)
Tel: +47 70 31 15 00

Oslo
(Repr. Office)
Tel: +47 815 20 070

Ulsteinvik
(Design & Ship Technology, Offshore)

(Propulsion)
Tel: +47 815 20 070

POLAND

Gdynia
Tel: +48 58 782 06 55

Gniew
(Deck Machinery)
Tel: +48 58 535 22 71

SWEDEN

Kristinehamn
(Propulsion)
Tel: +46 550 840 00

UNITED KINGDOM

Bristol
(Head Office, Naval)
Tel: +44 117 974 8500

(Marine Gas Turbine Support)
Tel: +44 117 979 7242

Dartford
Tel: +44 1322 312 028

Derby
(Head Office, Submarines)
Tel: +44 1332 661 461

Dunfermline
(Motion Control)
Tel: +44 1383 82 31 88

Newcastle
(Bearings)
Tel: +44 191 273 0291

(RAS Systems)
Tel: +44 191 256 2800

Portsmouth
(Marine Electrical Systems)
Tel: +44 2392 310 000

SOUTHERN EUROPE

CROATIA

Rijeka
Navis Consult
Part of Rolls-Royce Marine
Tel: +385 51 500 100

GREECE

Piraeus
Tel: +30 210 4599 688/9

ITALY

Genova
Tel: +39 010 749 391

SPAIN

Bilbao
Tel: +34 944 805 216

Madrid
Tel: +34 913 585 319

Tarragona
Tel: +34 977 296 444

TURKEY

Istanbul
Tel: +90 216 446 9999

AFRICA AND MIDDLE EAST

NAMIBIA

Walvis Bay
Tel: +264 (0) 64 275 440

UNITED ARAB EMIRATES

Dubai
(Sales and Service)
Tel: +971 4 883 3881

(Naval Marine)
Tel: +971 4 299 4343

ASIA PACIFIC

AUSTRALIA

Melbourne
Tel: +61 3 9873 0988

Perth
Tel: +61 8 9336 7910

Sydney
(Naval Marine)
Tel: +61 2 9325 1333

INDIA

Mumbai
Tel: +91 22 6726 3838

MALAYSIA

Kuala Lumpur
(Naval Marine)
Tel: +60 3 2026 1990

NEW ZEALAND

Christchurch
Tel: +64 3 962 1230

SINGAPORE

Singapore
(Head Office, Marine)
Tel: +65 68 62 1901

(Sales and Service)
Tel: +65 68 62 1901

VIETNAM

Vung Tau City
Tel: +84 64 3576 000

NORTHEAST ASIA

CHINA

Dalian
Tel: +86 411 8230 5198

Hong Kong
Tel: +852 2526 6937

Shanghai
(Sales and Service)
Tel: +86 21 2030 2800

(Deck Machinery)
Tel: +86 21 5818 8899

Guangzhou
Tel: +86 20 8491 1696

JAPAN

Kobe
Tel: +81 78 651 6555

Tokyo
Tel: +81 3 3592 0966

REPUBLIC OF KOREA

Busan
Tel: +82 51 831 4100

RUSSIA

St. Petersburg
Tel: +7 812 332 18 55

Vladivostok
Tel: +7 4232 495 484

AMERICAS

BRAZIL

Rio de Janeiro
(Sales and Service)
Tel: +55 21 2707 5900

(Naval Marine)
Tel: +55 21 2277 0100

CANADA

Dartmouth
(Naval Undersea Systems)
Tel: +1 902 468 2928

Peterborough
(Naval Undersea Systems)
Tel: +1 705 743 9249

St. John´s
Tel: +1 709 748 7650

Vancouver
Tel: +1 604 942 1100

CHILE

Santiago
Tel: +56 2 586 4700

MEXICO

Veracruz
Tel: +52 229 272 2240

USA

Annapolis
(Naval Marine Inc)
Tel: +1 410 224 2130

(Shiplift Systems)
Tel: +1 410 224 2130

Galveston
Tel: +1 409 765 4800

Houston
Tel: +1 281 902 3300

Indianapolis
Naval Marine Inc)
Tel: +1 317 230 2000

Long Beach, Cal.
Tel: +1 562 989 0291

Ft Lauderdale
Tel: +1 954 436 7100

New Bedford
(Naval Underseas Systems)
Tel: +1 508 990 4575

New Orleans
Tel: +1 504 464 4561

Pascagoula
(Foundry - Naval Marine Inc)
Tel: +1 228 762 0728

Seattle
Tel: +1 206 782 9190

Walpole
(Naval Marine Inc)
Tel: +1 508 668 9610

Washington
(Naval Marine Inc)
Tel: +1 703 834 1700

© Rolls-Royce plc 2014

The information in this document is the property of Rolls-Royce plc and may not be copied, or communicated to a third party, or used, for any purpose other than that for which it is supplied without the express written consent of Rolls-Royce plc.

Whilst this information is given in good faith based upon the latest information available to Rolls-Royce plc, no warranty or representation is given concerning such information, which must not be taken as establishing any contractual or other commitment binding upon Rolls-Royce plc or any of its subsidiary or associated companies.

ME 0814
Printed in Norway

www.rolls-royce.com

Rolls-Royce plc

Rolls-Royce Commercial Marine
PO Box 1522
NO-6025 Aalesund
Norway
Tel: +47 815 20 070
Fax: +47 70 01 40 05

Rolls-Royce Naval
PO Box 3, Filton
Bristol BS34 7QE
England
Tel: +44 117 974 8500
Fax: +44 117 974 8666

Rolls-Royce Submarines
PO Box 2000, Raynesway
DE21 7XX Derby
England
Tel: +44 1332 661 461
Fax: +44 1332 249 047

www.rolls-royce.com