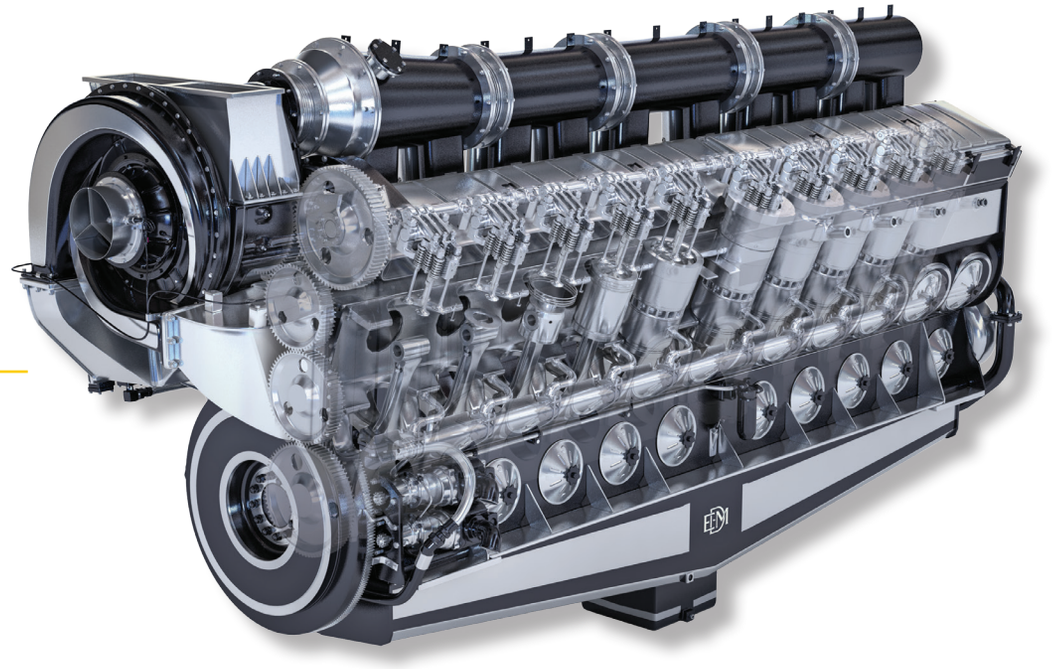
POWER PRODUCTS

MARINE

TWO CYCLE ADVANTAGE

ENDURING DESIGN. LEGENDARY HERITAGE.



The E 23 (IMO II-EPA T3) and E 23B (IMO III-EPA T4F) are available in 8,12,16 and 20 cylinder configurations with continuous power ratings from 1249 bkw (1675 hp) to 3729 bkw (5000 hp).

EMD 710 SERIES ENGINE RATINGS

E 23 / E 23B

Engine	900 RPM BKW	900 RPM BHP	750 RPM BKW	750 RPM BHP
8	1491	2000	1249	1675
	1864	2500		
12	2237	3000	1561	2495
16	2983	4000	2479	3325
20	3729	5000	3098	4155

ENGINES AVAILABLE IN THESE CONFIGURATIONS

Marine applications
Stationary power applications
Drilling applications meeting
MODU inclination requirements

** Intermittent ratings are available. Consult your dealer.*

EMD ENGINES ARE CERTIFIED BY

ABS · BUREAU VERITAS · LLOYD'S REGISTER QUALITY ASSURANCE · CCS CHINA CLASSIFICATION SOCIETY 中国船级社 · DNV·GL

Over 78,000 EMD engines have been delivered worldwide since 1935, making it one of the largest medium speed engine families in the world. Constant innovation and refinement have made the EMD E 23 the most efficient and durable marine engine in its class.

EMD engines are certified to meet emissions standards around the world. Largest Operating Range. Same Power.

Advantage EMD.

DIESEL (E 23/E 23B)

The E 23 has met the challenges of increasingly stringent global emissions standards through continuous optimization of its proven design. With only minor engine changes, and avoiding high cost technologies such as common rail fuel injection, the E 23B uses mature SCR technology to meet US EPA Tier 4F and IMO III, enabling maximum confidence and minimum risk in your daily operations.

DUAL FUEL (E 23 GB)

Dynamic gas blending™ (DGB™) provides the ability to substitute diesel fuel with natural gas at rates as high as 80% while allowing operation with 100% diesel fuel if needed. The engine seamlessly transitions from diesel to gas without interruption of power output. EMD patented DGB™ kits retain power output, transient response, and reliability of the original diesel.

GAS (E 23 GD)

Direct Injected Gas™ (DIG™), a uniquely designed high pressure gas system, is under development. The system utilizes a minimum amount of diesel pilot fuel to enable combustion of natural gas at rates of 95% and greater. Based entirely on the diesel cycle, the EMD DIG™ solution represents one of the cleanest and most fuel efficient natural gas technologies on the horizon.

TUG BOAT POWERED BY THE E 23 ENGINE.

PERFORMANCE ADVANTAGE

SUPERIOR TRANSIENT RESPONSE.

Cool, high density charge air delivered to the E 23 cylinders across the entire operating range enables rapid power response regardless of the operating point. This allows the E 23 to accelerate from idle (200 RPM) to 100% continuous load and speed (900 RPM) in approximately 10 seconds for most fixed pitch applications.

BEST IN-CLASS TRANSIENT RESPONSE

- E 23 offers the performance of a high speed engine with the durability advantage of a medium speed engine.
- Ample power margin throughout the entire operating speed range allows for optimized engine sizing and a single speed reduction gear.
- Avoids engine lugging under demanding vessel maneuvers.
- Accepts 100% block load in constant speed applications.

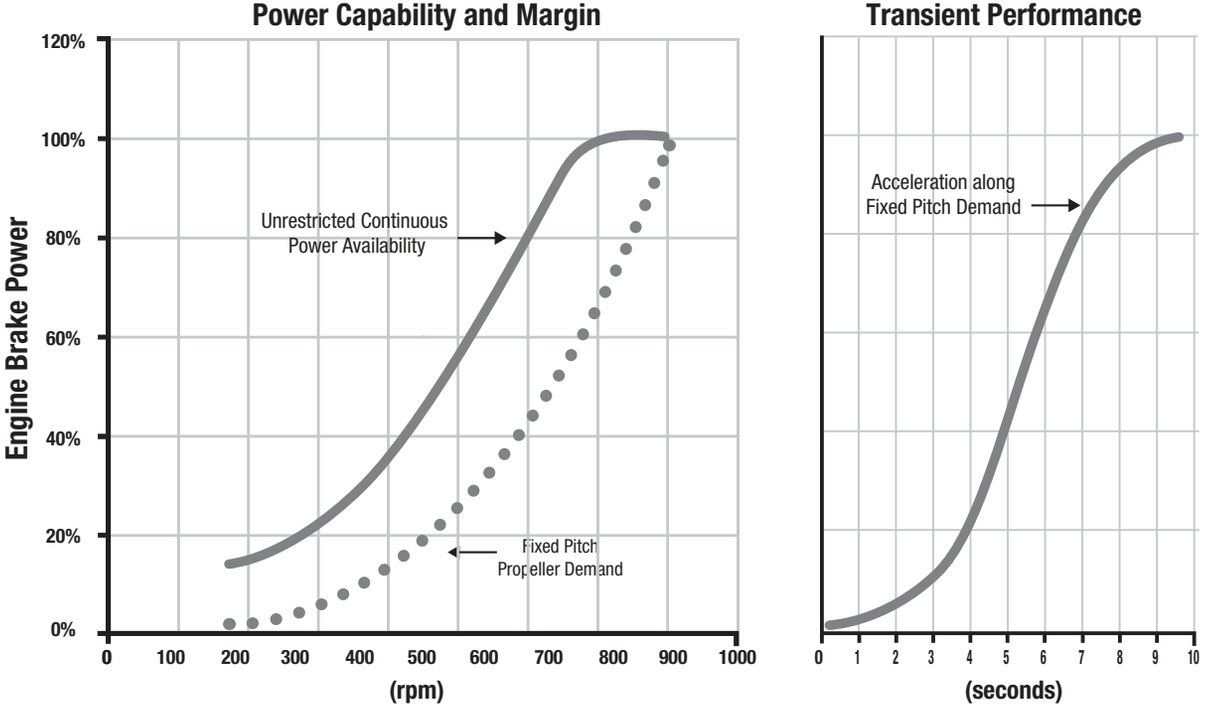
OPERATING RANGE ADVANTAGE

ENHANCED EFFICIENCY AND CONTROL.

ENHANCED VESSEL PERFORMANCE

- Testing in harbor tug service yielded an 11% reduction in duty cycle fuel consumption due to low power absorption at 200 RPM idle.
- Wide Operating Speed Range enables greater thrust control for better vessel maneuverability, enhanced safety of operation, and extended bumper wear.
- Significantly reduces vibration and noise for maximum crew comfort.
- Fewer rotating cycles lead to extended service life of driven components.

VARIABLE SPEED PROPULSION



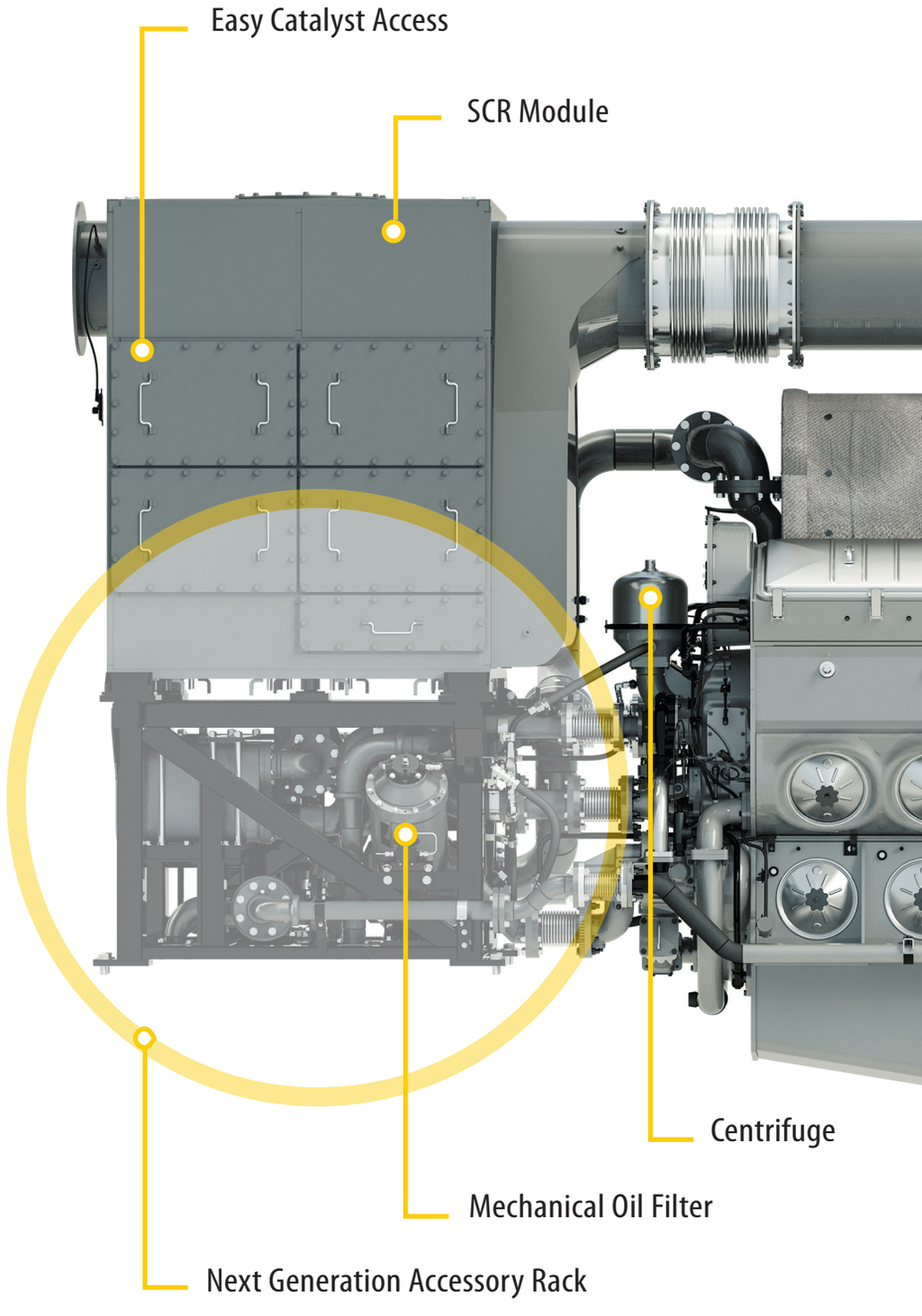
NEXT GENERATION ADVANTAGE

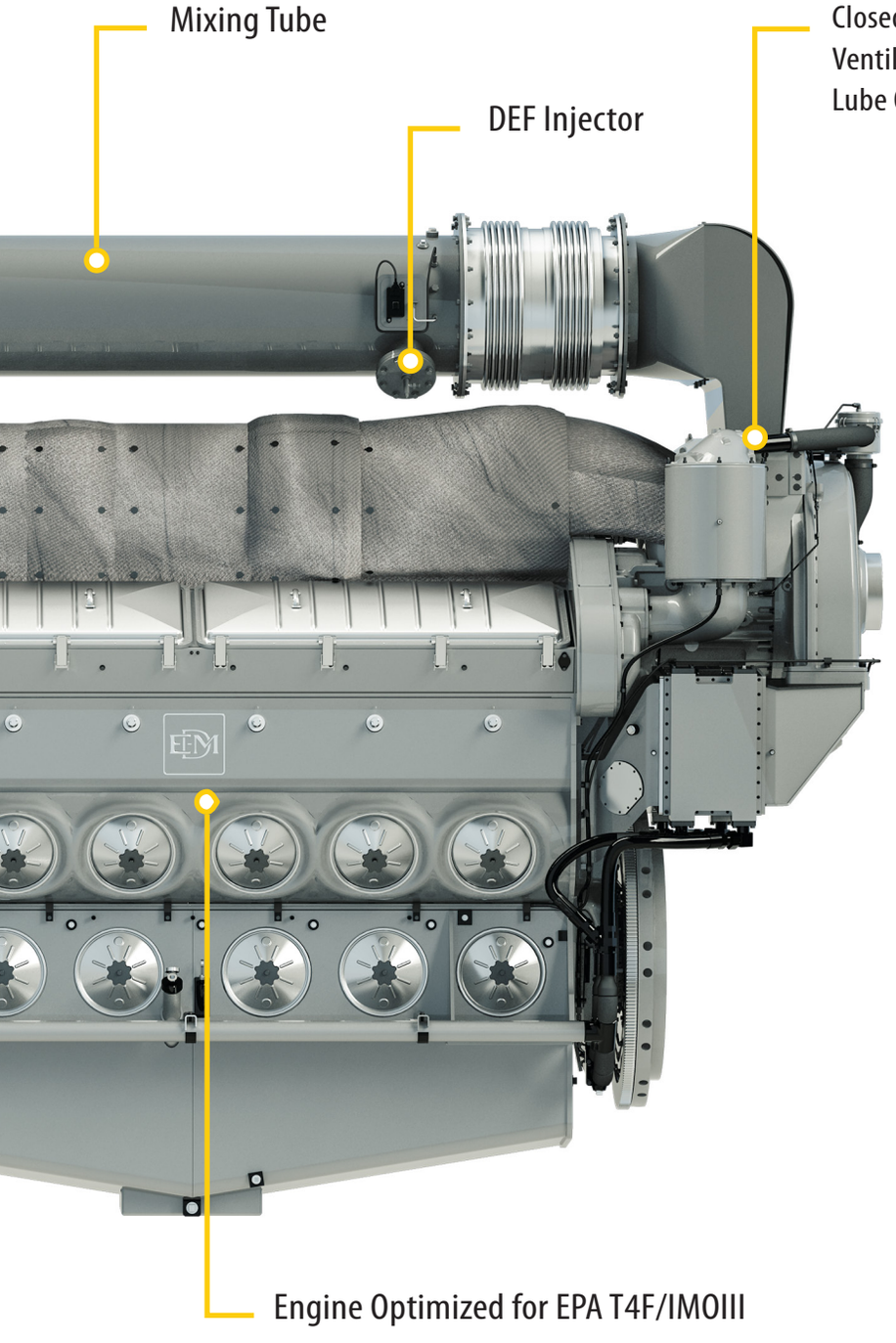
THE E 23B.

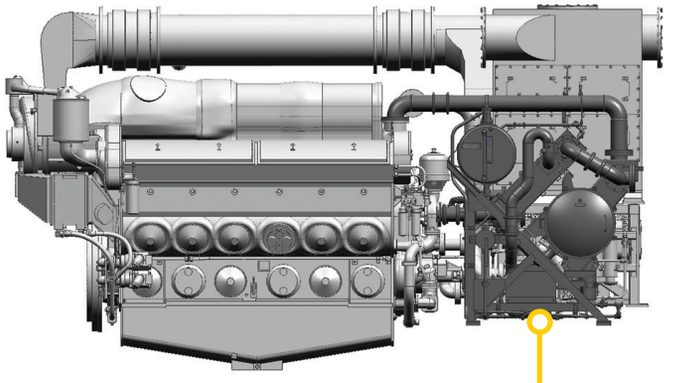
INTEGRATED SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM

A novel approach to a proven, robust technology.

- **Reduces NOx in a compact space**
- **Allows engine to operate at maximum thermal efficiency for fuel consumption improvements up to 7%**
- **Does not significantly affect design or operation of the engine**
- **Enables complete maintenance of the SCR within the engine room**
- **Minimizes vessel engineering and construction costs**
- **Avoids use of complex and high maintenance on-engine technologies such as EGR and common rail fuel injection**







SAME FOOTPRINT –
EPA Tier 4F/IMO III engine (gray)
over EPA Tier 3/IMO II engine (black)

NEXT GENERATION ACCESSORY RACK – SIMPLY INTEGRATED

- **Design retains footprint of EPA T3/IMO II models while providing full structural support for the SCR module.**
- **Mechanical oil filtration reduces operating cost and environmental impact.**
- **Brazed plate lube oil cooler saves space.**
- **PTO space claim accommodates up to 10″ diameter at free end of engine.**
- **Bottom plane cooling water connections minimize installed footprint and eliminate trip hazards.**

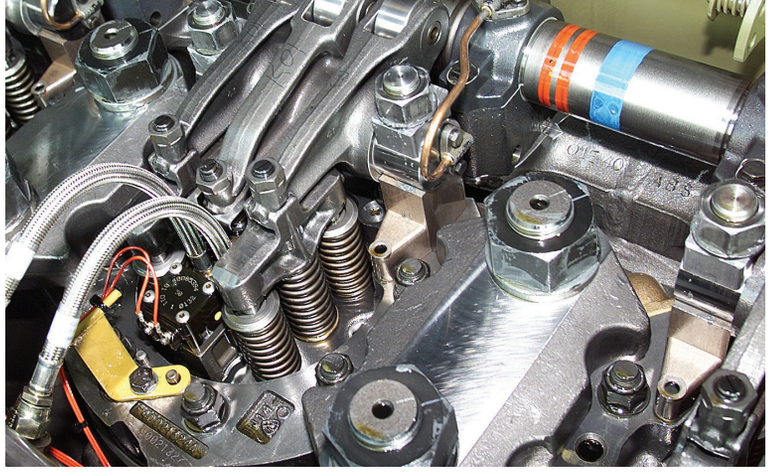
TOTAL COST OF OWNERSHIP ADVANTAGE

MAXIMUM UPTIME.

PARTS - LABOR - FLUIDS -

Downtime is expensive. EMD engines are designed to minimize the amount of time needed for maintenance and repairs in order to maximize your productivity, keeping operational costs to a minimum.

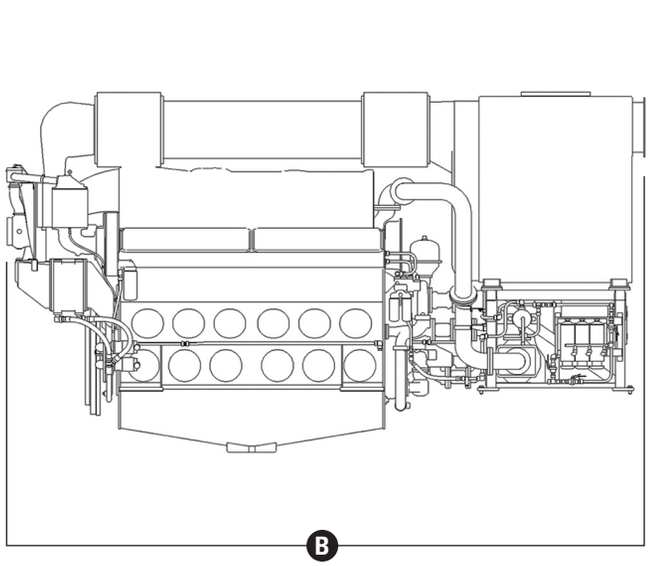
- Reduced fuel consumption over previous models due to EPA T4F / IMO III technologies and low idle speed
- Easy non-invasive inspection of cylinder components for simple predictive maintenance
- Simple overhauls to minimize downtime — Power Assembly (head, liner, piston, rod) can be removed and replaced as one unit in under 4 hours
- Closed loop dosing control system optimizes (Diesel Exhaust Fluid) DEF usage
- No oil change required between overhauls unless indicated by oil sample analysis



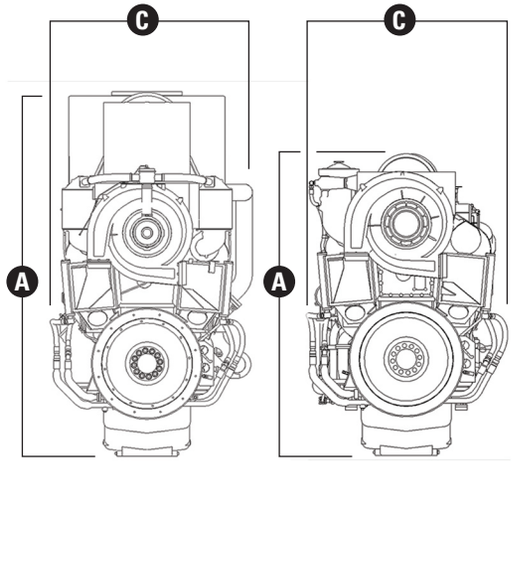
TOTAL COST OF OWNERSHIP

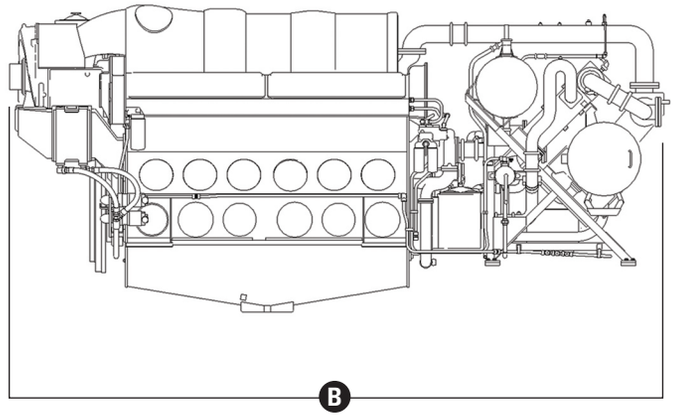
Quantifying ownership costs for the purposes of engine selection and budgeting is a challenging task. In order to simplify this process, a (Total Cost of Ownership) TCO report is available for your planning and comparison needs. The analysis considers many factors including:

- Acquisition cost
- Duty-cycle impacts
- Preventative maintenance parts and labor preferences
- Regional labor and travel rates
- Economic factors such as commodity price and inflation
- Labor estimates for all activities
- Individual part number detail and associated costs



E 23B MARINE ENGINE

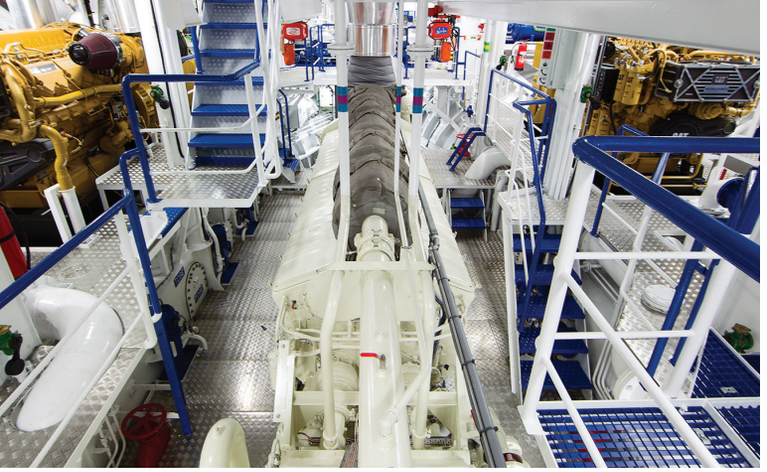




E 23 MARINE ENGINE

E 23 / E 23B TECHNICAL SPECIFICATIONS

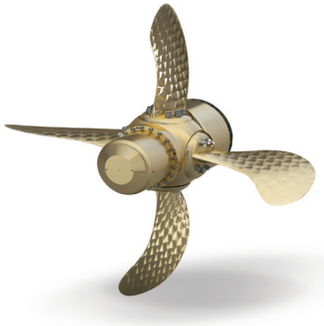
MARINE ENGINE MODEL	A OVERALL HEIGHT		B OVERALL LENGTH		C OVERALL WIDTH		WEIGHT	
	METRIC	US STD	METRIC	US STD	METRIC	US STD	METRIC	US STD
8 E 23	3.246 m	10’ 7-3/16”	5.374 m	6’ 1-3/8”	1.905 m	6’ 3”	14,742 kg	32,500 lbs
12 E 23	3.410 m	11’ 2-1/4”	6.350 m	20’ 10-1/64”	1.905 m	6’ 3”	19,414 kg	42,800 lbs
12 E 23B	3.685 m	12’ 1-5/64”	6.530 m	21’ 7-1/16”	1.905 m	6’ 3”	23,133 kg	51,000 lbs
16 E 23	3.410 m	11’ 2-1/4”	7.331 m	24’ 4-1/64”	1.905 m	6’ 3”	22,589 kg	49,800 lbs
20 E 23	3.642 m	11’ 11-3/8”	8.177 m	26’ 9-29/32”	1.905 m	6’ 3”	25,719 kg	56,700 lbs



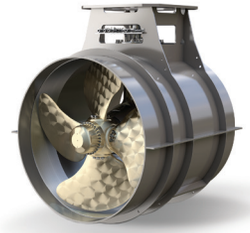
CATERPILLAR SOLUTIONS/ EMD ENGINES

As a product in the expansive Caterpillar Marine portfolio, the EMD engine is also available and compatible with many CAT Marine vessel solutions, including:

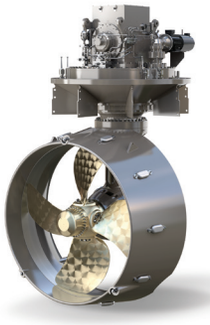
- **CAT Propulsion products, including azimuth and transverse thrusters, controllable pitch main propellers, and diesel-electric hybrid solutions**
- **CAT Connect technologies such as Marine Asset Intelligence and Product Link**
- **Alarm & Protection local engine control panels and remote displays**
- **SOS oil sampling and analysis services**



CONTROLLABLE PITCH PROPELLER



TRANSVERSE THRUSTER



AZIMUTH THRUSTER

EMD Power Products Global Dealer Network

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