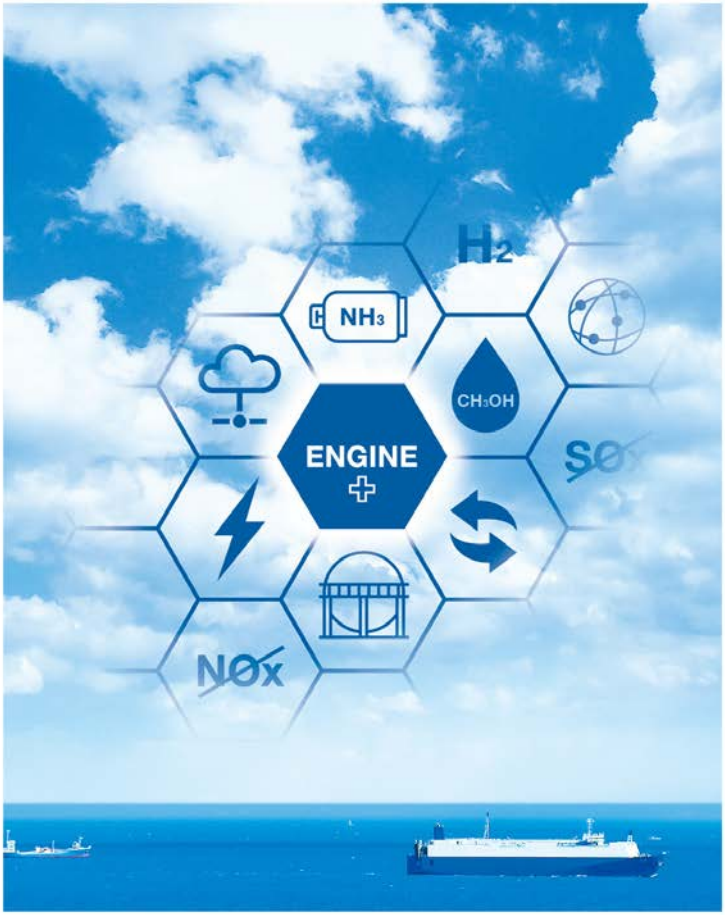
MITSUI E&S



MARINE PROPULSION SYSTEM

Program 2024

船舶推進システムの
トータルサプライヤーへ

船の心臓部を担い、世界の海上物流を前進させ続けることが私たちの使命です。
信頼のエンジンを中核として、温室効果ガスの削減を実現する環境技術や、
代替燃料の供給装置、DX、安定した運航を支えるアフターサービスまでを担い、
船舶推進システムのトータルサプライヤーとして、お客様に貢献いたします。

Comprehensive Supplier of Marine Propulsion Systems

Our mission is to continue to advance the world's maritime logistics and transportation by playing a central role in the heart of the ship. With our reliable engines at the core, we offer environmental technology to reduce greenhouse gas emissions, alternative fuel supply systems, DX, and after-sales service to support efficient ship operations. We contribute to our customers as a total supplier of ship propulsion systems.

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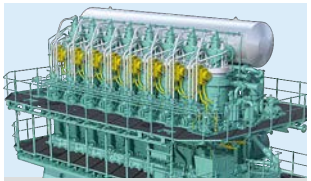
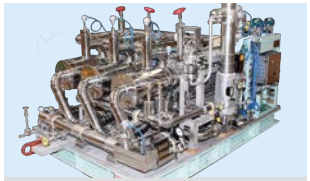
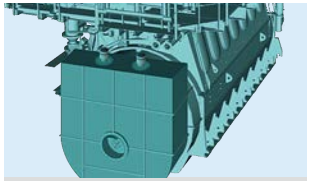
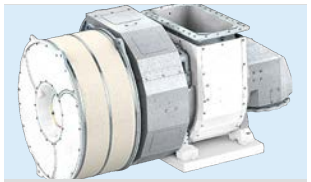
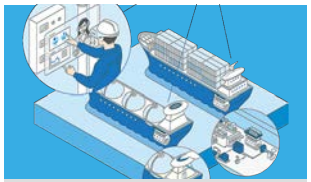








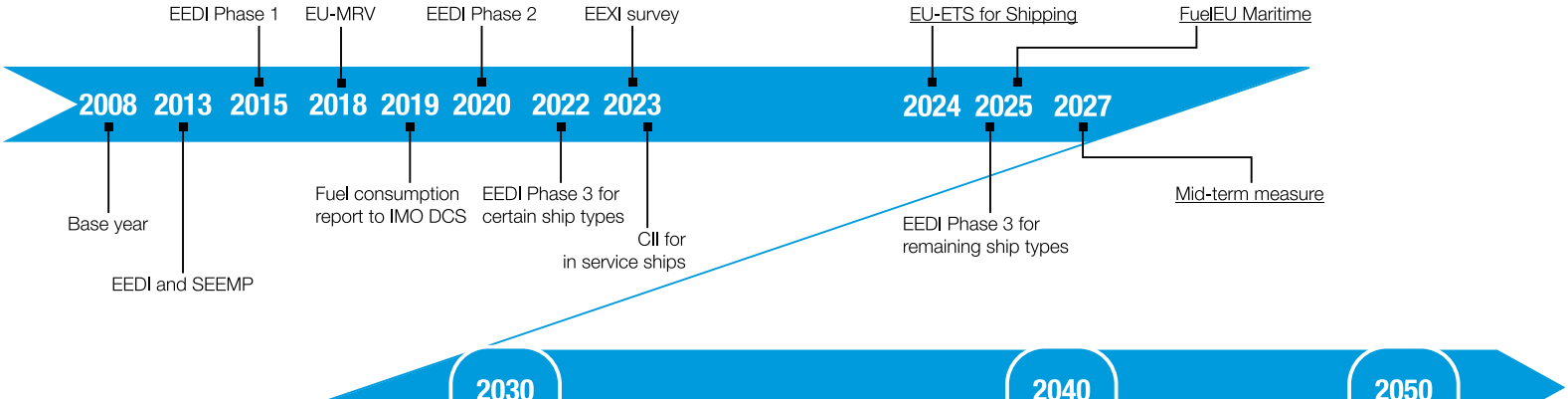


強まるGHG規制
燃料転換が拡大へ

IMO（国際海事機関）は温室効果ガス（GHG）削減戦略を改定し、2100年としていたネットゼロ達成を2050年頃とすることを採択しました。GHG規制は加速し、IMOは2027年から中期対策を、EUは海運EU-ETSとFuelEU Maritimeを新たに導入します。ニーズが高まる低炭素・ゼロエミッション燃料利用に三井E&Sが対応いたします。

Increasing GHG Regulations Make Fuel Conversion Mandatory

The IMO (International Maritime Organization) has revised its greenhouse gas (GHG) reduction strategy, adopting a target date of around 2050 for achieving net zero emissions, which had been set at 2100. GHG regulations will be accelerated, with the IMO introducing mid-term measures from 2027 and the EU introducing new shipping EU-ETS and FuelEU Maritime. MITSUI E&S will respond to the growing needs for low-carbon and zero-emission fuel use.



2030 Target

20-30% GHG reduction

40% Efficiency improvement

25%* Zero emission fuels

2040 Target

70-80% GHG reduction

45%* Efficiency improvement

72%* Zero emission fuels

2050 Target

Net-zero
GHG emission

*ClassNK estimates

二元燃料エンジン

Dual Fuel Engines

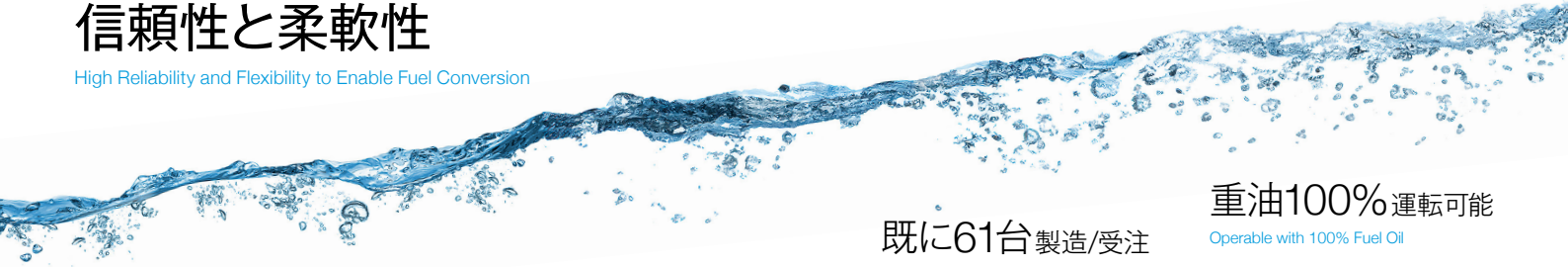
高い信頼を獲得してきた重油焚きエンジンをベースに
多彩な燃料を活用して、
時代の変化に対応する二元燃料エンジン。
船の脱炭素化の切り札です。

Based on the tried and true fuel oil engine, this dual fuel engine responds to the changing times by utilizing a variety of fuels. This is the key to decarbonizing ships.

Yellow parts : added parts for ME-GI

燃料転換を実現する信頼性と柔軟性

High Reliability and Flexibility to Enable Fuel Conversion



多様な燃料に対応

Utilizes a Variety of Fuels

当社の二元燃料エンジンには、燃料ガスを使用するGI（Gas Injection）形エンジンと、低引火点（LFL: Low Flashpoint Liquid）燃料を使うLGI（Liquid Gas Injection）形エンジンがあります。そのため、メタン（天然ガス、LNG）、エタン、メタノール、液化石油ガス（LPG）といった様々な燃料に対応できます。

We offer two types of dual fuel engines: Gas Injection (GI) engines that use fuel gas and Liquid Gas Injection (LGI) engines that use Low Flashpoint Liquid (LFL) fuel. They can be used with a variety of fuels, including methane (natural gas, LNG), ethane, methanol, and liquefied petroleum gas (LPG).

	Fuel Type	Fuel Designation
ME-GI Gas Injection	Methane	-GI
	Ethane	-GIE

	Fuel Type	Fuel Designation
ME-LGI Liquid Gas Injection	Methanol	-LGIM
	LPG	-LGIP

GHG削減に寄与

Significant GHG Reduction

代替燃料は重油よりCO_2排出量が少ないことが最大の特長です。当社のメタン焚きエンジンはメタンスリップが少なく、実質的なGHG削減に大きく貢献できます。さらに、CO_2を出さないゼロエミッション燃料として期待されているアンモニア焚きエンジンの開発も進めています。代替燃料のメタンやメタノールは硫黄分をほとんど含まないため、燃料転換によってSOx規制がクリア可能です。同時にPMも大幅に削減できます。

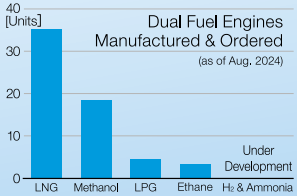
The main advantage of alternative fuels is that they emit less CO2 than heavy fuel oil. Furthermore, our methane dual fuel engines have low methane slip and can contribute significantly to real GHG reduction. We are also developing ammonia dual fuel engines, which are expected to be a zero-emission fuel that does not emit CO2. Methane and methanol, which are alternative fuels, contain almost no sulfur, so SOx regulations can be met through fuel conversion. At the same time, PM can be significantly reduced.

既に61台製造/受注

61 Units Manufactured/Ordered

三井E&Sは1994年に世界に先駆けてメタン焚きエンジンを開発し、様々な二元燃料エンジンを既に61台受注しています（2024年8月時点）。当社の二元燃料エンジンは、業界をリードしてきた重油焚きのME形をベースにし、そこにGI/LGI関連部品を追加する形式であるため、高い信頼性があります。

MITSUI E&S was the first in the world to develop a methane dual fuel engine in 1994 and has already received orders for 61 dual fuel engines (as of August 2024). Our dual fuel engines are highly reliable because they are based on the industry-leading fuel oil ME engines, to which we add GI/LGI components.



重油100%運転可能

Operable with 100% Fuel Oil

燃料転換の大きな課題は代替燃料の経済的な確保にあり、燃料の価格や調達状況に合わせた運用の柔軟性が重要です。当社の二元燃料エンジンは、重油のみを使用する「燃料油運転モード」と、燃料ガス／LFL燃料と少量の燃料油（パイロット油）を使用する「二元燃料運転モード」の2つの運転モードがあり、お客様の状況に合わせた運用が可能です。運航中のモード切替にも対応し、GI形エンジンでは代替燃料の使用割合の柔軟な設定も可能です。

A major challenge in fuel conversion is securing alternative fuels economically, and operational flexibility to match fuel prices and availability is critical. Our dual fuel engines have two operating modes: “fuel oil mode” which uses only fuel oil, and “dual fuel mode,” which uses both fuel gas or LFL fuel and a small amount of fuel oil (as pilot oil), allowing operation according to customer conditions. The system also supports mode switching during operation and flexible settings for the ratio of alternative fuels used.

メタン／LNG焚きエンジン(GI)

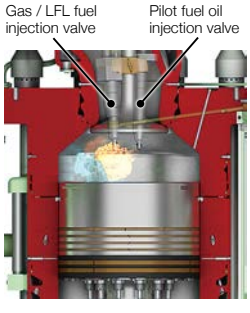
Methane Dual Fuel Engines (GI)

メタンスリップを極小化

Minimize Methane Slip

メタンは入手性に優れた代替燃料であり、船の低炭素化の重要な選択肢です。ただしCO_2の25倍の温室効果があるため、未燃メタンの大気中への流出（メタンスリップ）が問題となります。三井E&SのGI形エンジンは、ディーゼルサイクルを採用し、メタンを上死点で噴射して燃やしきることで、メタンスリップを極小化します。GI形エンジンは、着火不良やノッキングが起きにくく、燃料ガスの性状に運転が左右されにくいのも特長です。

Combustion chamber for GI/LGI



Methane is a readily available alternative fuel and an important low-carbon option for ships. However, because methane has a greenhouse effect 25 times that of CO_2, the release of unburned methane into the atmosphere (methane slip) is a problem. MITSUI E&S' GI engine uses a diesel cycle to minimize methane slip by injecting methane at the top dead center and burning it completely. GI engines are also characterized by their resistance to ignition failure and knocking, and their operation is not easily affected by the properties of the fuel gas.

パイロット油を半減

Pilot Oil Reduced by Half

二元燃料エンジンには代替燃料の他に一定量のパイロット油（燃料油）が必要なため、できる限り少ないパイロット油での運航を実現することが、一層のGHG排出削減につながります。そこで最新のGI形エンジンでは、ガス運転時の燃料噴射孔の一部をふさいで、L1点でのパイロット油消費量を3%から1.5%へと半減させています。

Dual fuel engines require a certain amount of pilot oil (fuel oil) in addition to alternative fuels, so operating with as little pilot oil as possible leads to further GHG emission reductions. Therefore, the latest GI engines have halved the pilot oil consumption at the L1 point from 3% to 1.5% by partially blocking the fuel injection holes during gas operation.

メタノール焚きエンジン(LGIM)

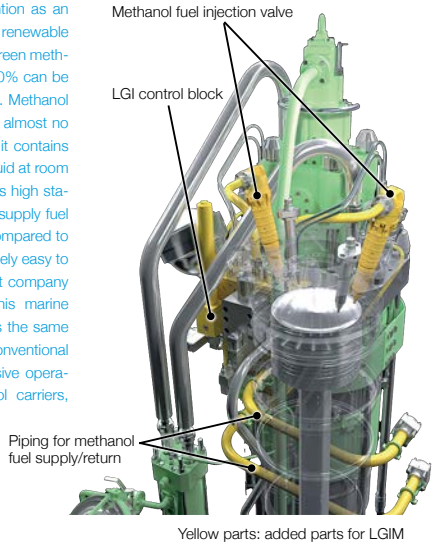
Methanol Dual Fuel Engines (LGIM)

燃料の取り扱いが容易

Easy Fuel Handling

代替燃料として急速に注目を浴びているメタノールは、再エネ水素やバイオマス由来のグリーンメタノールの場合、WtW（Well to Wake）で最大90%のGHG削減を期待できます。メタノールはNOxの排出も少なく、硫黄が含まれていないためSOxやすすの排出もほとんどありません。さらに、常温常圧で液体であり、安定性が高いために貯蔵が容易で、13barという低い圧力で燃料供給が可能です。他の代替燃料と比較して取り扱いが容易なのが特長です。この舶用メタノールエンジンを、世界で初めて製造したのは三井E&Sであり、従来の重油焚きエンジンと同等もしくは若干上回る効率を実現しています。既にメタノール運搬船向けの豊富な運転実績があり、新しい選択肢でありながら信頼性も非常に高いのが特長です。

Methanol is rapidly gaining attention as an alternative fuel, and in the case of renewable hydrogen and biomass-derived green methanol, GHG reductions of up to 90% can be expected at WtW (Well to Wake). Methanol also has low NOx emissions and almost no SOx or soot emissions because it contains no sulfur. On top of that, it is a liquid at room temperature and pressure, and its high stability makes it easy to store and supply fuel at pressures as low as 13 bar. Compared to other alternative fuels, it is extremely easy to handle. MITSUI E&S was the first company in the world to manufacture this marine methanol engine, which achieves the same or slightly higher efficiency than conventional fuel oil engines. It has an extensive operational track record for methanol carriers, making it a new option that is also extremely reliable.

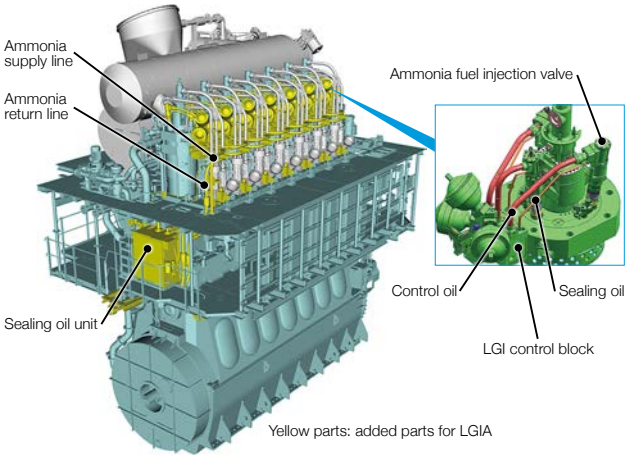


Yellow parts: added parts for LGIM

Ammonia

アンモニア焚きエンジン(LGIA)

Ammonia Dual Fuel Engines (LGIA) Under Development



実績あるLGIPをベースに開発中

Under Development Based on Proven LGIP

分子構造に炭素を含まないアンモニアは、燃焼させてもCO_2を排出しません。硫黄も含まないためSOxやすすもほぼ排出しません。常温でも8.6barで液化するので、LNGのような極低温が不要なのも特長であり、脱炭素で重要な役割を果たしうる燃料として期待されています。アンモニアは難燃性であることが大きな課題ですが、その解決にはパイロット燃料を使用した着火方式が有効です。開発中のエンジンは、液化石油ガス運搬船で実績を積み上げてきたLGIP形をベースにしています。

Ammonia, which contains no carbon in its molecular structure, does not emit CO2 when burned. It also contains no sulfur, so it emits almost no SOx or soot. It liquefies at 8.6 bar at room temperature, so it does not require cryogenic temperatures like LNG. Ammonia's flame retardancy is a major issue, and the ignition method using pilot fuel, which is one of our specialties, is effective in solving this issue. The engine under development is based on the LGIP type, which has a proven track record in liquefied petroleum gas carriers.

当社初号機の陸上試験 2024年開始へ

From 2024, Shop Test of Our 1st Engine Will Start

2023年7月からライセンサーであるMAN Energy Solutionsが、アンモニア焚きエンジンの単気筒試験を実施しており、当社でも2024年中に初号機の陸上試験を開始予定です。単気筒試験の結果では、アンモニア焚きのパイロット油消費量は他のLGIエンジンと同等であり、温室効果ガスの一種である一酸化二窒素（N_2O）の発生は非常に低く抑えられています。NOxは重油での運転と同等もしくは若干低い程度です。

Since July 2023, the licensor, MAN Energy Solutions, has been conducting single-cylinder tests, and we plan to begin land-based testing of the first unit during 2024. The results of the single-cylinder test show that the ammonia dual fuel engines pilot oil consumption is comparable to other LGI engines, and the generation of dinitrogen monoxide (N_2O), a greenhouse gas, is very low; NOx emissions are similar to or slightly lower than those of heavy fuel oil operation.

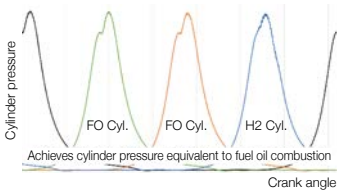
Hydrogen

水素焚き 100%負荷試験に成功

Hydrogen Combustion at 100% Load Test Succeeded

ME-GIエンジンである当社テストエンジン4S50ME-T9.7の1シリンダを水素燃焼用に改造し、100%負荷での運転に成功しました。水素漏洩などの不具合もなく、ガス燃料焚きエンジンをベースにした水素利用に一歩近づきました。

One cylinder of our test engine, 4S50ME-T9.7, an ME-GI engine, was converted for hydrogen combustion and successfully operated at 100% load. There were no hydrogen leaks or other problems. We are one step closer to hydrogen utilization based on gas-fueled engines.



本事業は2021年度にダイハツディーゼル株式会社と共に採択された国土交通省補助事業「海事産業集約連携促進技術開発費補助金」を基に実施しました。
The development of the technologies have been supported by the Ministry of Land, Infrastructure, Transport and Tourism subsidy project "Maritime Industry Aggregation and Coordination Promotion Technology Development Support Project", which was adopted jointly with Daihatsu Diesel Co., Ltd. in fiscal 2021.

燃料供給装置

Fuel Supply System

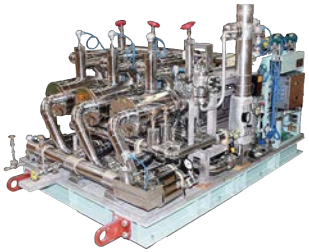
燃料転換の実現には、新たな燃料供給装置が不可欠です。
代替燃料を安心してお使いいただくために
新たな装置を積極的に開発・提供していきます。

New fuel supply system is essential to achieve fuel conversion.
We are actively develop and provide new equipment to ensure
the safe use of alternative fuels.

MHP—高圧LNGポンプ

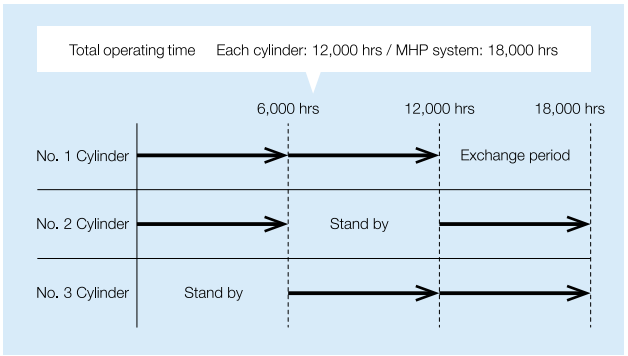
MITSUI High Pressure LNG Pump

ガス燃料焚きエンジン（ME-GI）の燃料供給機器として、独自開発したLNG燃料高圧ポンプがMHPシステムです。油圧駆動を採用し、高圧ポンプの各シリンダを個別に動作制御可能です。その結果、1本のシリンダをStand-by状態にでき、単一ユニットで冗長性を持たせられます。運転時のシリンダ動作速度を低速設計にし、シリンダを長寿命化しました。低速サイクルからの起動や緊急時の急速停止動作を制御することで、LNG吐出圧力の急上昇を防止できます。



High pressure LNG pump

We have originally developed and released the High Pressure LNG Pump (MHP system) as a fuel supply device for the dual fuel engines (ME-GI). The MHP system uses Hydraulic Drive Unit to control the operation of each cylinder of the High Pressure LNG Pump individually. This allows one cylinder to remain in stand-by mode, providing redundancy in a single unit. The cylinder operating speed during operation is designed to be slow, extending the cylinder's life-span. A sudden rise in LNG discharge pressure can be prevented by controlling start-up from a slow-speed cycle and quick stop operation in an emergency.



Life-span image of cylinder operation

MHPシリーズ仕様 MHP Series Specifications

主機の要求流量に合わせ、下記のようにシリンダ本数を選定します。同設計のシリンダをすべての型式に採用していますので、迅速なシリンダ交換が可能です。

According to the required flow rate of the main engine, the number of cylinders can be selected as shown in the table below. Cylinder used for all models have a same design, so cylinder can be replaced quickly.

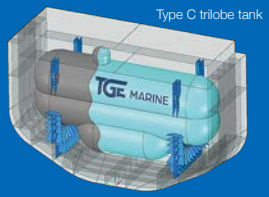
Cylinder No. →	MHP-3	MHP-4	MHP-5
TYPE			
Engine output [MW]	~ 18.6	~ 27.9	~ 37.2
Cylinder No.	3	4	5
Operation Cylinder No.	2	3	4
Flow rate [L/min]	~ 70	~ 105	~ 140
Flow rate [kg/h] (@460kg/m^3)	~ 1,932	~ 2,898	~ 3,864

＊エンジン出力は参考値とし、うちシリンダ 1 本をスタンバイ機として用いる。シリンダーは 12,000 運転時間メンテナンスフリー。オプション仕様：シリンダ全数運転（Stand-by 無し）も可能。例／適用主機：～46.5MW/ ポンプユニット（5 シリンダー運転）。 46.5MW を越える場合には、MHP を複数台搭載します

＊The engine output is a reference value, and one cylinder is standby. Cylinder is maintenance free for 12,000 run-hours. Optional specifications: Full cylinder operation (without stand-by) is also possible. (E.G.) Applicable main engine: up to 46.5 MW/pump unit (5-cylinder run). If the output exceeds 46.5 MW, multiple MHPs are installed.

TGE MARINE

TGEマリンガスエンジニアリングは、液化ガス運搬船、バンカー船、FSRU向けの、液化ガスシステム・タンクの設計・エンジニアリングを専門にしています。LNG、LPG、LEG（液化エチレンガス）、アンモニア、CO_2など、あらゆるタイプの液化ガスシステムを提供しています。代替燃料やCO_2輸送など、持続可能な未来のための技術開発・ソリューション提供を積極的に行っています。



Type C trilobe tank

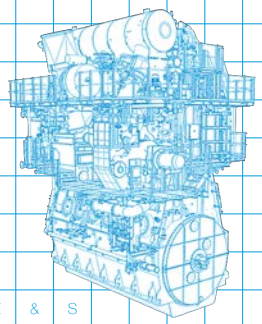
+40 years of experience

250+ Ships Gas tanker

400+ Units Gas tank

100+ Units Gas fuel system

TGE Marine is the leading liquefied gas systems' provider, specializing in the design and engineering of cargo handling systems and tanks for any type of liquefied gas carriers, bunker vessels and FSRUs. We offer all types of liquefied gas systems, including LNG, LPG, LEG (Liquefied Ethylene Gas), ammonia and CO2. We are actively developing technologies and providing solutions for a sustainable future, including alternative fuels and CO2 transportation.



省エネ技術

Energy Saving Technologies

お客様の運航コストを削減する省エネ技術に、
EcoEGRや軸発電機といった新たな手法が登場しています。
従来の燃料消費率の最適化方法については
p.89をご覧ください。

Energy-saving technologies that reduce your operating costs; new technologies such as EcoEGR and shaft generators are emerging. See p. 89 for information on how to optimize conventional fuel consumption rates.

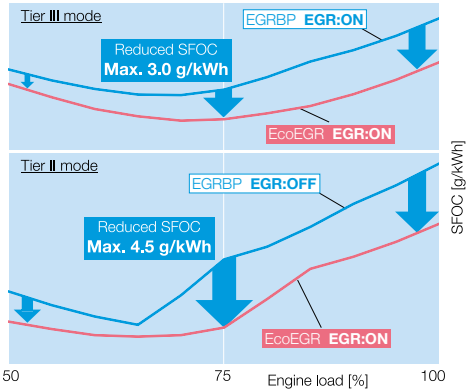
EcoEGR

EGRで燃費もNOxも改善する

Improvement of Fuel Consumption and NOx Emission with EGR

従来のエンジンチューニングでは、燃料消費率とNOx排出はトレードオフの関係にありました。この限界を打破する画期的なシステムがEcoEGRです。EcoEGRは「EGR（排気再循環）のNOx低減機能を全海域で有効活用する」という設計思想を導入。エンジンチューニングを燃料消費率優先で最適化した上で、Tier II、Tier III全海域でEGRを稼働しNOxを削減することで、燃料消費率改善とNOx削減を両立させています。このシステムはEEDI改善に大きく貢献します。二元燃料エンジンでもEcoEGRは採用可能です（ME-GIE及びME-LGIPエンジンを除く）。

Specific fuel consumption and NOx emission have been in a trade-off relation with conventional engine tuning. An EcoEGR system is breakthrough technology which overcomes this relationship. The EcoEGR has introduced a design concept of "effectively utilizing the EGR NOx reduction function in all sea areas". Both specific fuel consumption improvement and NOx reduction can be achieved by optimizing the specific fuel consumption preferentially by operating EGR in all Tier II and Tier III emission control areas to reduce NOx. EEDI can be greatly improved by applying this system. The option of EcoEGR is also available for the dual fuel engines except for the ME-GIE type and ME-LGIP type.



Comparison of SFOC curve with EcoEGR (ex. EGRBP vs EcoEGR)

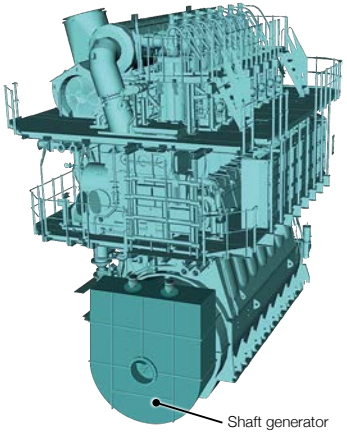
軸発電機
Shaft Generator

高効率なメインエンジンを発電にも利用
Highly Efficient Main Engine Also Used for Power Generation

船舶の推進力を担うメインエンジンは、高効率で多様な燃料が使用可能です。軸発電機はそのメインエンジンのクランク軸動力を発電に使用することで、船舶全体の省エネ化に貢献します。軸発電機はクランク軸のFore端に追加します。IMOなどの規制強化で省エネ促進の必要性は増しており、軸発電機には以下のような多様な利点があります。

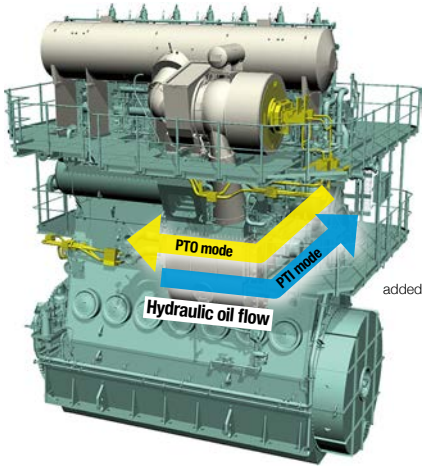
- EEDIの改善、規制強化への対応
- 発電機エンジン運転回避によるOPEX削減（メンテナンス、SCR尿素）
- 乗組員の負担軽減
- 代替燃料利用で先行するメインエンジンの有効活用

The main engine, which is responsible for propulsion of a ship, is highly efficient and can use a wide variety of fuels. Shaft generators use the crankshaft power of the main engine to generate electricity, thereby contributing to energy conservation throughout the ship. The shaft generator is added to the Fore end of the crankshaft. The need to promote energy conservation is increasing due to stricter IMO and other regulations, and shaft generators offer a variety of advantages, including the following



- EEDI improvements, compliance with stricter regulations
- OPEX reduction through avoidance of generator engine operation (maintenance, SCR urea)
- Reduce crew workload
- Effective use of main engine ahead of alternative fuel use

THS2—廃熱回収装置
Turbo Hydraulic System type2

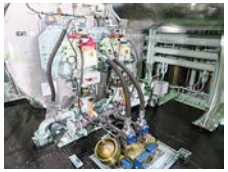


Yellow parts :
added parts for THS2

燃料消費率を最大2%削減
Max. 2% Fuel Saving

舶用エンジンに搭載される過給機は、高効率化により排ガスの余剰エネルギーを有効利用可能です。弊社が独自開発したTHS（Turbo Hydraulic System）は、その余剰エネルギーを油圧動力として回収・利用します。THSは一般的な廃熱回収装置と比較して非常にコンパクトで、機関室設計に大きな変更を必要としません。THS2は従来のTHSを踏襲しME-Cエンジンに特化したシステムで、Tier IIIエンジンにも適用可能です。また、EcoEGRと併用できます。THS2は次頁の2種類の運転モードを持ちます。

Turbocharger with THS2



Ordered Experience

Conventional type	23	All deliverd
THS2	1	

The surplus exhaust gas energy can be utilized thanks to the recent improvement of the efficiency of turbochargers for marine engines. THS (Turbo Hydraulic System), developed independently by MITSUI E&S, recovers surplus energy and uses it as hydraulic power. THS is very compact compared to other waste heat recovery systems and does not require large modifications to the engine room. The THS2 system is the successor to original THS and is specifically designed for

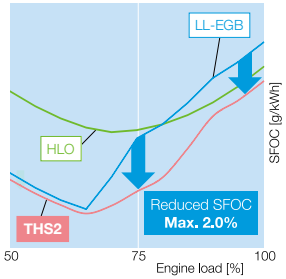
ME-C engines, but can also be applied to Tier III engines. THS2 can also be used in conjunction with EcoEGR and has two modes of operation.

PTOモード ― 油圧動力供給&主機アシスト

PTO mode - Hydraulic oil power supply and assists the engine rotation

50%負荷以上ではPTO（Power Take Out）modeを使用可能です。回収した油圧動力はエンジン内で使用され、燃料消費率を最大2%削減しEEDIを改善します。加えて余剰動力をクランク軸側に送り、主機の回転をアシストすることも可能です。

The PTO (Power Take Out) mode can be applied at 50% load or more. THS is a system which uses power hydraulically recovered from the surplus gas energy. The specific fuel consumption can be reduced by max. 2% and EEDI can be improved by the THS. In addition, it is also possible to assist the engine rotation by sending surplus power to crankshaft side.



Comparison of SFOC curve with THS2

PTIモード ― 油圧流れ逆転で過給機アシスト Option

PTI mode - Assist the T/C rotation by reversing the flow of hydraulic oil

低負荷域ではPTI（Power Take In）モードを適用可能です。過給機の回転を加勢し掃気圧を上昇させることで、補助ブロワを停止した状態で運航できる負荷範囲を拡げることができ、更なる減速運航に貢献します。さらに、主機負荷／回転速度を向上させ、加速時間を短縮することもできます。

The PTI (Power Take In) mode can be applied in the low load range. Turbocharger speed is increased and the scavenging pressure is also increased. As a result, the engine load range which is operated with the auxiliary blower stopped can be extended, contributing to further slow steaming. In addition, the engine load/speed can be increased and so that the acceleration time can be shortened.

Concept of PTI mode

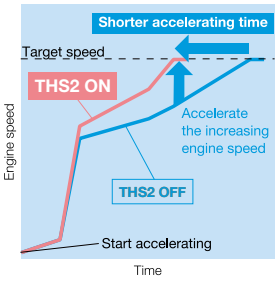
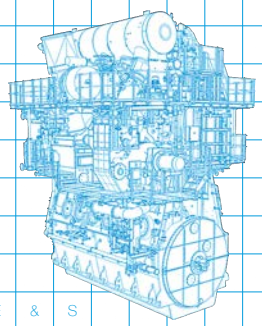


Image of improved acceleration performance by THS2



三井-MAN B&W

エンジンラインナップ

MITSUI-MAN B&W Engine Lineup

7つの新しいエンジンがラインナップに加わりました。
二元燃料エンジンが充実し、特にメタノール焚きエンジンの
ラインナップを拡充しました。

Seven new engines have been added to the lineup.
The dual fuel engine lineup has been expanded,
especially methanol dual fuel engines.

エンジン形式命名規則

Engine Type Designation

6 S 70 ME-C 10.5 - GI - EGRBP

Tier III technology

(blank)	Tier II only
EcoEGR	EGR in Tier III and Tier II mode
EGRBP	EGR with bypass matching
EGRTC	EGR with T/C cut out
HPSCR	High-pressure SCR
LPSCR	Low-pressure SCR

Fuel injection concept

(blank)	Fuel oil only
GI	Gas injection methane
GIE	Gas injection ethane
LGIM	Liquid gas injection methanol
LGIP	Liquid gas injection LPG

Dot (.) number

Mark number

Concept

ME-C	Electronically controlled

Diameter of piston in cm

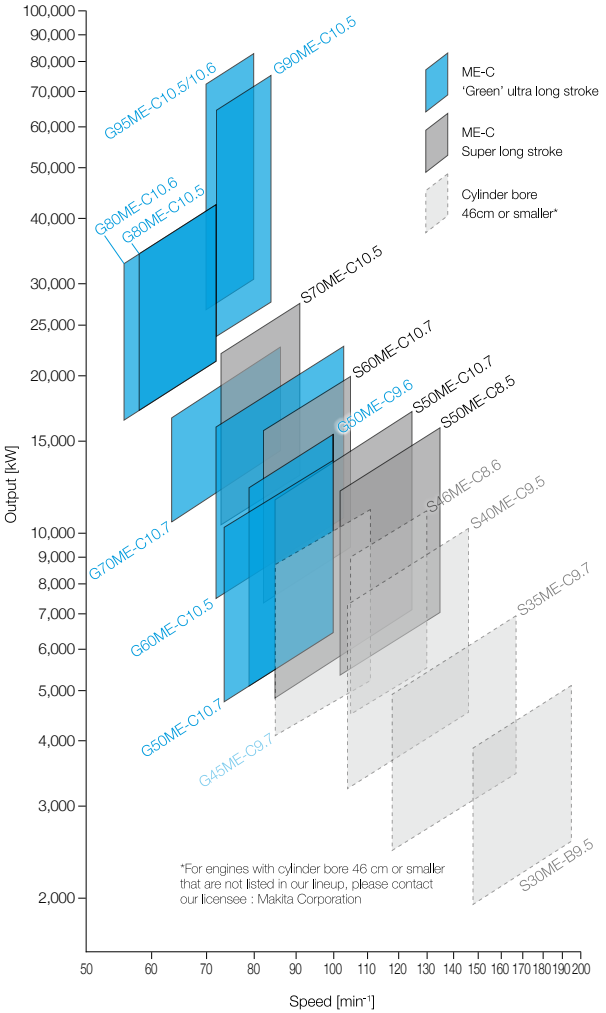
Stroke/bore ratio

G	'Green' ultra long stroke
S	Super long stroke

Number of cylinders

出力·回転速度の範囲

Output and Speed Range



ME形エンジンの特長

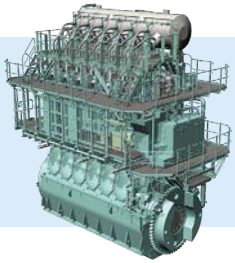
Features of the ME Program

「燃費の向上」「NOx等の排出抑制」「部分負荷時の最適化」「シリンダ油消費量の削減」などを、電子制御による精密なコントロールにより、高いレベルへと引き上げるのがME形エンジンです。弊社が提供するエンジンはすべてME形です。

ME engines can achieve greater performance: “reduction of fuel consumption”, “reduction of NOx emissions”, “optimization at part load” and “reduction of cylinder oil consumption” through precise electronic control. We only supply ME type engines.

電子制御項目 Electronically Controlled Item

燃料噴射
始動空気弁
排気弁
シリンダ注油



Fuel Injection
Starting Valves
Exhaust Valves
Cylinder Lubrication

エンジン出力 Engine Output

本カタログに記載しているエンジン出力は kWです。kWとPS（メートル馬力）との換算は、1 PS = 75 kgfm/s = 0.7355 kW です。各エンジンの諸元表に記載しているエンジン出力は、下記の熱帯条件においても有効です。

The engine output figures in the catalog are stated in kW. For conversion between kW and PS (metric horsepower), please note that 1 PS = 75 kgfm/s = 0.7355 kW. The engine outputs stated in the specification tables for each engine are also valid for the following tropical conditions.

過給機ブロワ入口温度／Turbocharger blower inlet temperature	45 °C
空気冷却器冷却水入口温度／Air cooler cooling water inlet temperature	32 °C
大気圧／Atmospheric pressure	1,000 hPa

燃料消費率 SFOC

本カタログに記載している燃料消費率の条件および、使用燃料の低発熱量（LCV）、SFOC保証のトレランスは次のとおりです。SFOC保証点は50%～100%の範囲の負荷点で選択可能です。

The fuel consumption rate conditions, Low Calorific Value (LCV) of the fuel used, and SFOC guarantee tolerances listed in this catalog are as below. The SFOC guarantee point can be selected at a load point in the range of 50% to 100%.

ISO 15550:2002 and ISO 3046-1:2002	
過給機ブロワ入口温度／Turbocharger blower inlet temperature	25 °C
空気冷却器冷却水入口温度／Air cooler cooling water inlet temperature	25 °C
大気圧／Atmospheric pressure	1,000 hPa
過給機出口後の排気背圧（連続最大出力時） Exhaust gas back pressure (at the Maximum continuous rating)	3.0 kPa

Fuel LCV

Fuel type	Fuel designation	LCV [kJ/kg]
Fuel Oil	(blank)	42,700
Methane	-GI	50,000
Ethane	-GIE	47,500
Methanol	-LGIM	19,900
LPG	-LGIP	46,000

SFOC gurantee tolerance

100% - 85%	+5% Tolerance
< 85% - 65%	+6% Tolerance
< 65 % - 50 %	+7% Tolerance

SFOC保証は、1つの負荷点かつ1つの運転モードに対してのみ与えられます。対応可能な運転モードは以下の表のとおりです。

The SFOC guarantee point can only be given in one (1) load point and in one (1) operating mode. The supported operation modes are as shown in the table below.

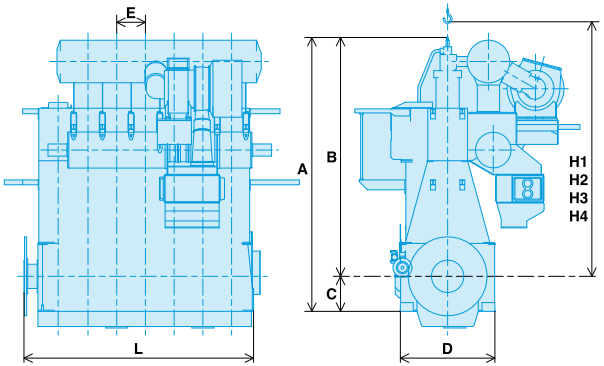
Available operating mode for SFOC guarantee

IMO NOx	二元燃料エンジン Dual fuel engine	Tier III技術 Tier III technologies	SFOC保証対応可能な運転モード Available operating mode for SFOC guarantee			
			重油モード Fuel oil mode		二元燃料運転モード* Dual fuel mode	
			Tier III	Tier II	Tier III	Tier II
Tier II engine	Without	Without		Available		
	With	Without		Available		Available
Tier III engine	Without	With	Available	Available		
	With	With	Available	Available	Available	Available

* 二元燃料運転モードの場合は、パイロット油消費率とパイロット油の低発熱量で換算されたガス/LFL燃料消費率の合計値で保証されます。
* In dual fuel operation mode, the guaranteed value is the sum of the specific pilot oil consumption and specific gas/LFL fuel consumption. Specific gas/LFL fuel consumption is converted by the LCV of the pilot oil.

主要寸法･乾燥質量

Main Dimensions and Dry Masses



本カタログに記載しているエンジンの主要寸法[mm]は、ガイダンス寸法です。解放高さ寸法は下記になります。

H1 垂直吊り高さ（シリンダカバー締付用スタッド付）
H2 斜め吊り高さ（シリンダカバー締付用スタッド付）
H3 斜め吊り高さ
（MAN Energy Solutions SE社ダブルジブクレーン使用の場合）
H4 垂直吊り高さ
（MAN Energy Solutions SE社ダブルジブクレーン使用の場合）

Tier IIIエンジンの質量は、エンジン上に直接搭載されるTier III技術関連部品の質量を含みます。エンジン質量は、標準過給機、標準回転勢車を装備した場合におけるものであり、モーメントコンペンセータ、チューニングホイール等といったオプション項目や設計点により、10%程度増量することがあります。

Main dimensions in this catalog are given in mm, for guidance only. Dismantling height;
H1: vertical lift, with cylinder cover studs.
H2: tilted lift, with cylinder cover studs.
H3: tilted lift, using MAN Energy Solutions SE double-jib crane
H4: vertical lift, using MAN Energy Solutions SE double-jib crane
The masses for Tier III engines include the masses of components of Tier III technology directly integrated on the engine. The masses are stated for engines with standard turbocharger(s), a standard turning wheel and can vary up to 10% depending on the design and options chosen such as moment compensators, tuning wheel, etc.

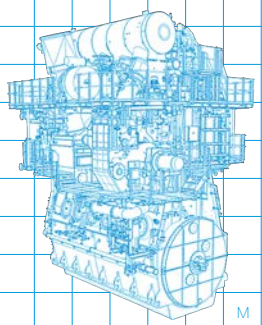
燃料別のエンジン一覧

Engine Lineup by Fuel

エンジン形式 Engine type	燃料種別 Fuel type				
	重油 Fuel Oil	メタン Methane	メタノール Methanol	LPG	エタン Ethane
	-	GI	LGIM	LGIP	GIE
G95ME-C10.6	p.35				
G95ME-C10.5	p.36	p.49	p.63		
G90ME-C10.5	p.37	p.50			
S90ME-C10.5	p.77				
G80ME-C10.6	p.38				
G80ME-C10.5	p.39	p.51	p.64		
G70ME-C10.7	p.40		p.65		
G70ME-C10.5	p.77	p.52			
S70ME-C10.5	p.41	p.53			
G60ME-C10.5	p.42	p.54	p.66	p.71	
G60ME-C9.5					p.75
S60ME-C10.7	p.43		p.67		
S60ME-C10.6	p.77				
S60ME-C10.5	p.77	p.55	p.78		
S60ME-C8.5	p.78				
G50ME-C10.7	p.44				
G50ME-C9.6	p.45	p.56	p.68	p.72	
G50ME-C9.5					p.76
S50ME-C10.7	p.46		p.69		
S50ME-C10.6	p.78				
S50ME-C9.7	p.78	p.57			
S50ME-C9.6			p.78		
S50ME-C8.5	p.47	p.58			
G45ME-C9.5		p.59			
S35ME-C9.7		p.60			

■ 従来形エンジン Conventional Engine

* 当社ラインアップに記載の無い46ボア以下のエンジンについてはサブライセンシのマキタへお問い合わせ下さい
* For engines with cylinder bore 46 cm or smaller that are not listed in our lineup, please contact our licensee : Makita Corporation



重油焚きエンジン
Fuel Oil Engines

各重油焚きエンジンの主要目について次頁より示します。

Main data for each fuel oil engines are shown on the following pages.

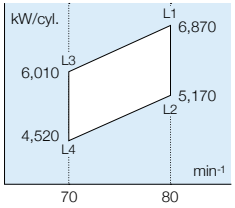
G95ME-C10.6

Bore: 950mm
Stroke: 3,460mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
6	41,220	31,020	36,060	27,120
7	48,090	36,190	42,070	31,640
8	54,960	41,360	48,080	36,160
9	61,830	46,530	54,090	40,680
10	68,700	51,700	60,100	45,200
11	75,570	56,870	66,110	49,720
12	82,440	62,040	72,120	54,240



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
Low load	SEQ	151.4	154.9	163.5	148.5	150.6	158.5

Tier III Engine

* The SFOC lower than 65% load in Tier II mode is the value with T/C cut-out

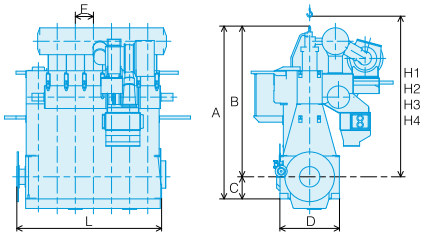
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G95ME-C10.6-EGRTC**	Tier III	158.4	157.9	161.0	155.5	153.6	156.0
	Tier II	151.4	154.9	163.5	148.5	150.6	158.5
LPSCR **G95ME-C10.6-LPSCR**	Tier III	155.4	157.9	161.0	152.5	153.6	156.0
	Tier II	151.4	154.9	163.5	148.5	150.6	158.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1
[mm]	14,813	12,753	2,060	5,380	**	16,310

** 6-9 cyl. :1,574, 10-12cyl.: 1,574 / 1,670 (fore / aft of HPS chain drive)

Cylinders:		6	7	8	9	10	11	12
L [mm]		11,907	13,481	16,058	17,632	19,819	21,489	23,159
Dry Mass [t]		1,220	1,360	1,615	1,780	1,950	2,130	2,320
Added Dry Mass	EGRTC [t]	16	17	18	19	20	21	31
	LPSCR [t]	-	-	-	-	-	-	-



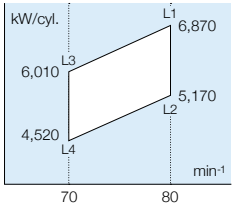
G95ME-C10.5

Bore: 950mm
Stroke: 3,460mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
6	41,220	31,020	36,060	27,120
7	48,090	36,190	42,070	31,640
8	54,960	41,360	48,080	36,160
9	61,830	46,530	54,090	40,680
10	68,700	51,700	60,100	45,200
11	75,570	56,870	66,110	49,720
12	82,440	62,040	72,120	54,240



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	158.4	156.9	161.0	155.5	152.6	156.0
Part load	EPT	156.4	155.4	163.5	153.5	151.1	158.5
Low load	EPT	154.4	156.4	163.5	151.5	152.1	158.5

Tier III Engine

* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G95ME-C10.5-EGRTC**	Tier III	160.4	159.9	165.0	157.5	155.6	160.0
	Tier II	154.4	156.4	163.0	151.5	152.1	158.0
LPSCR **G95ME-C10.5-LPSCR**	Tier III	155.4	157.4	164.5	152.5	153.1	159.5
	Tier II	154.4	156.4	163.5	151.5	152.1	158.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1
[mm]	14,813	12,753	2,060	5,380	**	16,310

** 6-9 cyl. :1,574, 10-12cyl.: 1,574 / 1,670 (fore / aft of HPS chain drive)

Cylinders:		6	7	8	9	10	11	12
L [mm]		11,907	13,481	16,058	17,632	19,819	21,489	23,159
Dry Mass [t]		1,220	1,360	1,615	1,780	1,950	2,130	2,320
Added Dry Mass	EGRTC [t]	16	17	18	19	20	21	31
	LPSCR [t]	-	-	-	-	-	-	-

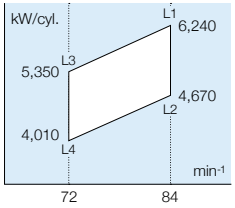
G90ME-C10.5

Bore: 900mm
Stroke: 3,260mm

Engine Output [kW]

MEP L1-L3: 2.15 MPa
L2-L4: 1.61 MPa

Cyl.	L1	L2	L3	L4
6	37,440	28,020	32,100	24,060
7	43,680	32,690	37,450	28,070
8	49,920	37,360	42,800	32,080
9	56,160	42,030	48,150	36,090
10	62,400	46,700	53,500	40,100
11	68,640	51,370	58,850	44,110
12	74,880	56,040	64,200	48,120



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	162.4	160.9	165.0	159.5	156.6	160.0
Part load	EGB	160.4	159.4	167.5	157.5	155.1	162.5
Low load	EGB	158.4	160.4	167.5	155.5	156.1	162.5

Tier III Engine

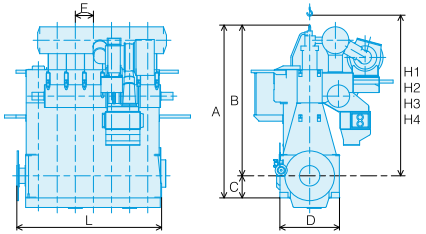
* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G90ME-C10.5-EGRTC**	Tier III	164.4	163.9	169.0	161.5	159.6	164.0
	Tier II	158.4	160.4	167.0	155.5	156.1	162.0
LPSCR **G90ME-C10.5-LPSCR**	Tier III	159.4	161.4	168.5	156.5	157.1	163.5
	Tier II	158.4	160.4	167.5	155.5	156.1	162.5

Main Dimensions and Mass

Dimensions:		A	B	C	D	E	H1
	[mm]	14,337	12,452	1,885	5,110	1,490	14,725

Cylinders:		6	7	8	9	10	11	12
L	[mm]	11,410	12,900	14,390	16,550	18,040	19,530	21,020
Dry Mass	[t]	1,050	1,170	1,330	1,470	1,610	1,750	1,890
Added Dry Mass	EGRTC [t]	17	17	18	18	20	20	20
	LPSCR [t]	-	-	-	-	-	-	-



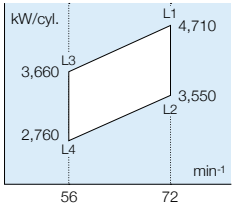
G80ME-C10.6

Bore: 800mm
Stroke: 3,720mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
6	28,260	21,300	21,960	16,560
7	32,970	24,850	25,620	19,320
8	37,680	28,400	29,280	22,080
9	42,390	31,950	32,940	24,840



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	158.4	156.9	161.0	155.5	152.6	156.0
Low load	EGB	154.4	154.9	165.0	151.5	150.6	160.0

Tier III Engine

* The SFOC lower than 65% load in Tier II mode is the value with T/C cut-out

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G80ME-C10.6-EGRTC**	Tier III	156.4	155.9	162.0	153.5	151.6	157.0
	Tier II	154.4	154.9	165.0	151.5	150.6	160.0
HPSCR **G80ME-C10.6-HPSCR**	Tier III	154.4	154.9	165.5	151.5	150.6	160.5
	Tier II	154.4	154.9	165.0	151.5	150.6	160.0
LPSCR **G80ME-C10.6-LPSCR**	Tier III	156.9	156.4	165.5	154.0	152.1	160.5
	Tier II	154.4	154.9	165.0	151.5	150.6	160.0

Main Dimensions and Mass

Dimensions:		A	B	C	D	E	H1
	[mm]	14,415	12,455	1,960	5,018	1,400	16,300

Cylinders:		6	7	8	9
L	[mm]	10,875	12,275	13,675	16,020
Dry Mass	[t]	900	1,000	1,110	1,240
Added Dry Mass	EGRTC [t]	14	14	14	15
	HPSCR [t]	4	5	5	**
	LPSCR [t]	-	-	-	-

** HPSCR is available on request

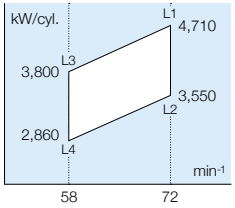
G80ME-C10.5

Bore: 800mm
Stroke: 3,720mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
6	28,260	21,300	22,800	17,160
7	32,970	24,850	26,600	20,020
8	37,680	28,400	30,400	22,880
9	42,390	31,950	34,200	25,740



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	160.4	158.9	163.0	157.5	154.6	158.0
Part load	EPT	158.4	157.4	165.5	155.5	153.1	160.5
Low load	EPT	156.4	158.4	165.5	153.5	154.1	160.5

Tier III Engine

* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

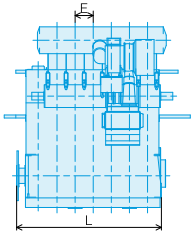
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G80ME-C10.5-EGRTC**	Tier III	162.4	161.9	167.0	159.5	157.6	162.0
	Tier II	156.4	158.4	165.0	153.5	154.1	160.0
HPSCR **G80ME-C10.5-HPSCR**	Tier III	157.9	159.4	166.0	155.0	155.1	161.0
	Tier II	156.4	158.4	165.5	153.5	154.1	160.5
LPSCR **G80ME-C10.5-LPSCR**	Tier III	157.4	159.4	166.5	154.5	155.1	161.5
	Tier II	156.4	158.4	165.5	153.5	154.1	160.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1
[mm]	14,415	12,455	1,960	5,018	1,400	16,300

Cylinders:		6	7	8	9
L [mm]		10,875	12,275	13,675	16,020
Dry Mass [t]		900	1,000	1,110	1,240
Added Dry Mass	EGRTC [t]	14	14	14	15
	HPSCR [t]	4	5	5	**
	LPSCR [t]	-	-	-	-

** HPSCR is available on request



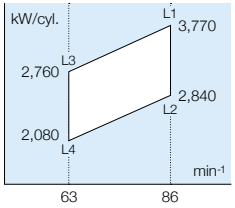
G70ME-C10.7 New Engine

Bore: 700mm
Stroke: 3,256mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	18,850	14,200	13,800	10,400
6	22,620	17,040	16,560	12,480



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	160.4	158.9	163.0	157.5	154.6	158.0
Low load	EGB	156.4	158.4	165.5	153.5	154.1	160.5

Tier III Engine

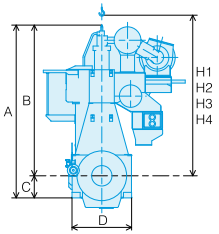
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G70ME-C10.7-EGRBP**	Tier III	163.4	162.9	168.0	160.5	158.6	163.0
	Tier II	156.4	158.4	166.0	153.5	154.1	161.0
HPSCR **G70ME-C10.7-HPSCR**	Tier III	157.9	159.4	166.0	155.0	155.1	161.0
	Tier II	156.4	158.4	165.5	153.5	154.1	160.5

Main Dimensions and Mass

* Available on request

Dimensions:	A	B	C	D	E	H1
[mm]	*	*	1,750	4,470	1,166	

Cylinders:		5	6
L [mm]		8,645	9,811
Dry Mass [t]		593	672
Added Dry Mass	EGRBP [t]	*	*
	HPSCR [t]	*	*



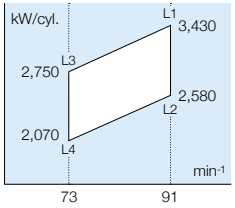
S70ME-C10.5

Bore: 700mm
Stroke: 2,800mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	17,150	12,900	13,750	10,350
6	20,580	15,480	16,500	12,420
7	24,010	18,060	19,250	14,490
8	27,440	20,640	22,000	16,560



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	164.4	162.9	167.0	161.5	158.6	162.0
Part load	EGB	162.4	161.4	169.5	159.5	157.1	164.5
Low load	EGB	160.4	162.4	169.5	157.5	158.1	164.5

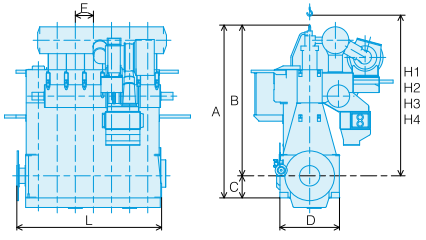
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S70ME-C10.5-EGRBP**	Tier III	167.4	166.9	172.0	164.5	162.6	167.0
	Tier II	160.4	162.4	170.0	157.5	158.1	165.0
HPSCR **S70ME-C10.5-HPSCR**	Tier III	161.9	163.4	170.0	159.0	159.1	165.0
	Tier II	160.4	162.4	169.5	157.5	158.1	164.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1
[mm]	11,470	9,950	1,520	4,012	1,098	12,675

Cylinders:		5	6	7	8
L [mm]		7,446	8,544	9,642	10,740
Dry Mass [t]		460	510	545	615
Added Dry Mass	EGRBP [t]	11	11	12	12
	HPSCR [t]	4	5	6	7



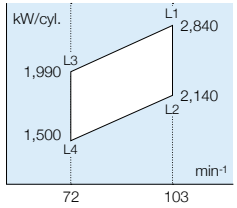
G60ME-C10.5

Bore: 600mm
Stroke: 2,790mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	14,200	10,700	9,950	7,500
6	17,040	12,840	11,940	9,000
7	19,880	14,980	13,930	10,500
8	22,720	17,120	15,920	12,000



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	161.4	159.9	164.0	158.5	155.6	159.0
Part load	EPT	159.4	158.4	166.5	156.5	154.1	161.5
Low load	EPT	157.4	159.4	166.5	154.5	155.1	161.5

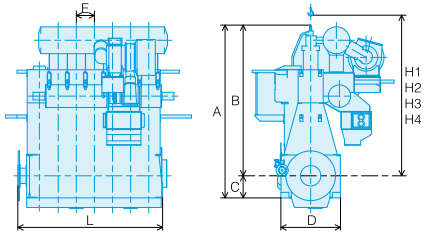
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G60ME-C10.5-EGRBP**	Tier III	164.4	163.9	169.0	161.5	159.6	164.0
	Tier II	157.4	159.4	167.0	154.5	155.1	162.0
HPSCR **G60ME-C10.5-HPSCR**	Tier III	158.9	160.4	167.0	156.0	156.1	162.0
	Tier II	157.4	159.4	166.5	154.5	155.1	161.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H4
[mm]	11,274	9,774	1,500	4,090	1,080	12,650	11,975

Cylinders:		5	6	7	8
L [mm]		7,385	8,465	9,545	10,625
Dry Mass [t]		395	440	490	555
Added Dry Mass	EGRBP [t]	10	10	11	11
	HPSCR [t]	3	4	5	5



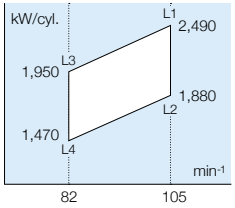
S60ME-C10.7 New Engine

Bore: 600mm
Stroke: 2,400mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	12,450	9,400	9,750	7,350
6	14,940	11,280	11,700	8,820
7	17,430	13,160	13,650	10,290
8	19,920	15,040	15,600	11,760



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	160.4	158.9	163.0	157.5	154.6	158.0
Low load	EGB	156.4	158.4	165.5	153.5	154.1	160.5

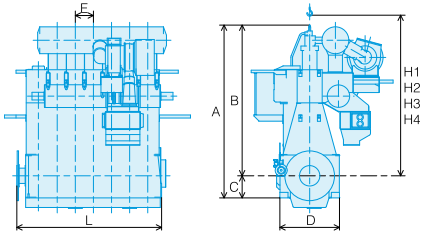
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S60ME-C10.7-EGRBP**	Tier III	163.4	162.9	168.0	160.5	158.6	163.0
	Tier II	156.4	158.4	166.0	153.5	154.1	161.0
HPSCR **S60ME-C10.7-HPSCR**	Tier III	157.9	159.4	166.0	155.0	155.1	161.0
	Tier II	156.4	158.4	165.5	153.5	154.1	160.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,825	8,525	1,300	3,420	940	10,900		

Cylinders:		5	6	7	8
L [mm]		6,547	7,487	8,427	9,367
Dry Mass [t]		320	345	370	410
Added Dry Mass	EGRBP [t]	10	10	11	11
	HPSCR [t]	6	6	6	6



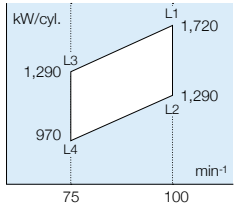
G50ME-C10.7

Bore: 500mm
Stroke: 2,500mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	8,600	6,450	6,450	4,850
6	10,320	7,740	7,740	5,820
7	12,040	9,030	9,030	6,790
8	13,760	10,320	10,320	7,760



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	161.4	159.9	164.0	158.5	155.6	159.0
Low load	EGB	157.4	159.4	166.5	154.5	155.1	161.5

Tier III Engine

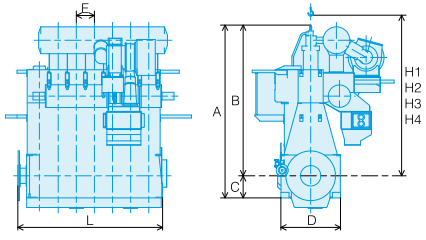
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G50ME-C10.7-EGRBP**	Tier III	164.4	163.9	169.0	161.5	159.6	164.0
	Tier II	157.4	159.4	167.0	154.5	155.1	162.0
HPSCR **G50ME-C10.7-HPSCR**	Tier III	158.9	160.4	167.0	156.0	156.1	162.0
	Tier II	157.4	159.4	166.5	154.5	155.1	161.5

Main Dimensions and Mass

* Available on request

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,962	8,757	1,205	*	872	11,350	10,649	9,825

Cylinders:		5	6	7	8
L [mm]		5,779	6,651	7,523	8,395
Dry Mass [t]		211	246	276	311
Added Dry Mass	EGRBP [t]	12	12	13	13
	HPSCR [t]	6	6	7	7



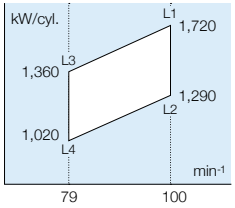
G50ME-C9.6

Bore: 500mm
Stroke: 2,500mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	8,600	6,450	6,800	5,100
6	10,320	7,740	8,160	6,120
7	12,040	9,030	9,520	7,140
8	13,760	10,320	10,880	8,160
9	15,480	11,610	12,240	9,180



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	165.4	163.9	168.0	162.5	159.6	163.0
Part load	EGB	163.4	162.4	170.5	160.5	158.1	165.5
Low load	EGB	161.4	163.4	170.5	158.5	159.1	165.5

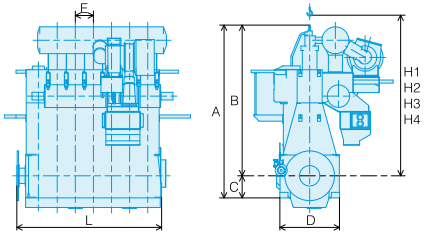
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G50ME-C9.6-EGRBP**	Tier III	168.4	167.9	173.0	165.5	163.6	168.0
	Tier II	161.4	163.4	171.0	158.5	159.1	166.0
HPSCR **G50ME-C9.6-HPSCR**	Tier III	162.9	164.4	171.0	160.0	160.1	166.0
	Tier II	161.4	163.4	170.5	158.5	159.1	165.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,962	8,757	1,205	3,776	872	11,350	10,649	9,825

Cylinders:		5	6	7	8	9
L [mm]		5,779	6,651	7,523	8,395	9,267
Dry Mass [t]		211	246	276	311	346
Added Dry Mass	EGRBP [t]	12	12	13	13	13
	HPSCR [t]	6	6	7	7	7



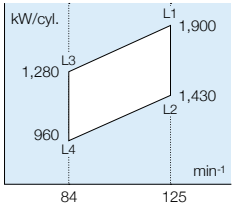
S50ME-C10.7 New Engine

Bore: 500mm
Stroke: 2,214mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	9,500	7,150	6,400	4,800
6	11,400	8,580	7,680	5,760
7	13,300	10,010	8,960	6,720
8	15,200	11,440	10,240	7,680
9	17,100	12,870	11,520	8,640



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	160.4	158.9	163.0	157.5	154.6	158.0
Low load	EGB	156.4	158.4	165.5	153.5	154.1	160.5

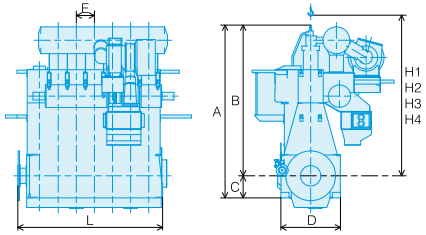
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S50ME-C10.7-EGRBP**	Tier III	163.4	162.9	168.0	160.5	158.6	163.0
	Tier II	156.4	158.4	166.0	153.5	154.1	161.0
HPSCR **S50ME-C10.7-HPSCR**	Tier III	157.9	159.4	166.0	155.0	155.1	161.0
	Tier II	156.4	158.4	165.5	153.5	154.1	160.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,320	8,130	1,190	3,350	875	10,232		

Cylinders:		5	6	7	8	9
L [mm]		5,757	6,632	7,507	8,382	9,257
Dry Mass [t]		195	226	262	293	324
Added Dry Mass	EGRBP [t]	12	12	13	13	13
	HPSCR [t]	6	6	6	6	6



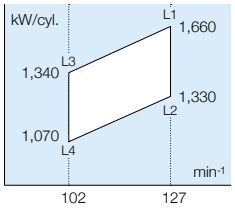
S50ME-C8.5

Bore: 500mm
Stroke: 2,000mm

Engine Output* [kW]

MEP L1-L3: 2.00 MPa
L2-L4: 1.60 MPa

Cyl.	L1	L2	L3	L4
5	8,300	6,650	6,700	5,350
6	9,960	7,980	8,040	6,420
7	11,620	9,310	9,380	7,490
8	13,280	10,640	10,720	8,560
9	14,940	11,970	12,060	9,630



* For 10, 11 and 12 Cyl. engines, please contact us.

This engine type has the extended layout area, please see page 103

SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	168.5	166.1	170.0	164.5	160.1	164.0
Part load	EGB	165.5	164.6	171.5	161.5	158.6	165.5
Low load	EGB	163.5	165.6	171.5	159.5	159.6	165.5

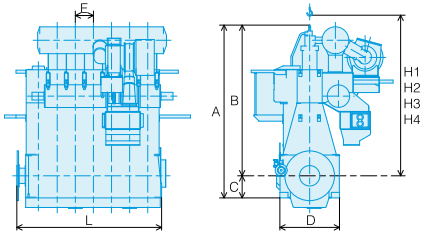
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S50ME-C8.5-EGRBP**	Tier III	171.5	170.1	175.0	167.5	164.1	169.0
	Tier II	163.5	165.6	172.0	159.5	159.6	166.0
HPSCR **S50ME-C8.5-HPSCR**	Tier III	165.0	166.6	172.0	161.0	160.6	166.0
	Tier II	163.5	165.6	171.5	159.5	159.6	165.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	8,707	7,619	1,088	3,150	850	9,500	8,828	8,250

Cylinders:		5	6	7	8	9
L [mm]		5,589	6,439	7,289	8,139	8,989
Dry Mass [t]		180	210	240	270	295
Added Dry Mass	EGRBP [t]	12	12	13	13	13
	HPSCR [t]	4	4	5	6	7



Fuel Oil
LNG
Methanol
LPG
Ethane

メタン／LNG焚き二元燃料エンジン

Methane Dual Fuel Engines (ME-GI)

GI形エンジンを適用可能な機種については、燃料ガス消費率等を併せて示します。
以下の燃料消費率の値を、二元燃料エンジンの表に示しています。

For models to which GI engines can be applied, GI figures such as fuel gas consumption rates are also provided. The following specific fuel consumption rates are shown in the tables for dual fuel engines.

重油運転モード Fuel oil mode	SFOC: 燃料油消費率 Specific fuel oil consumption
二元燃料運転モード Dual fuel mode	SGC: 燃料ガス消費率 Specific gas consumption
	SPOC: パイロット油消費率 Specific pilot oil consumption

G95ME-C10.5-GI

Bore: 950mm
Stroke: 3,460mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G95ME-C10.5-GI	Dual Fuel	126.8 + 3.9	126.3 + 3.0	132.8 + 2.5	123.3 + 5.2	121.8 + 4.0	127.9 + 3.3
	Fuel Oil	157.4	159.9	164.0	154.5	155.6	159.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRTC* G95ME-C10.5-GI-EGRTC	Tier III	Dual Fuel	131.2 + 3.8	131.5 + 2.9	134.6 + 2.4	127.6 + 5.1	127.0 + 3.9	129.6 + 3.2
		Fuel Oil	158.4	157.9	161.0	155.5	153.6	156.0
	Tier II	Dual Fuel	125.2 + 3.8	126.3 + 2.9	132.9 + 2.4	121.6 + 5.1	121.9 + 3.9	127.9 + 3.2
		Fuel Oil	157.4	159.9	164.0	154.5	155.6	159.0
LPSCR G95ME-C10.5-GI-LPSCR	Tier III	Dual Fuel	128.6 + 3.8	131.5 + 2.9	134.6 + 2.4	125.0 + 5.1	127.0 + 3.9	129.6 + 3.2
		Fuel Oil	155.4	157.9	161.0	152.5	153.6	156.0
	Tier II	Dual Fuel	126.9 + 3.8	127.8 + 2.9	133.7 + 2.4	123.3 + 5.1	123.3 + 3.9	128.8 + 3.2
		Fuel Oil	157.4	160.2	165.0	154.5	155.9	160.0

* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

Added Dry Mass

Cylinders:	6	7	8	9	10	11	12
GI [t]	8	9	10	11	12	13	14

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI

Please see page 36

G90ME-C10.5-GI

Bore: 900mm
Stroke: 3,260mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G90ME-C10.5-GI	Dual Fuel	130.2 + 4.0	129.6 + 3.1	136.2 + 2.5	126.5 + 5.3	125.1 + 4.1	131.2 + 3.4
	Fuel Oil	161.4	163.9	168.0	158.5	159.6	163.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRTC* G90ME-C10.5-GI-EGRTC	Tier III	Dual Fuel	134.5 + 3.9	134.8 + 3.0	137.9 + 2.5	130.9 + 5.2	130.3 + 4.0	133.0 + 3.3
		Fuel Oil	162.4	161.9	165.0	159.5	157.6	160.0
	Tier II	Dual Fuel	128.5 + 3.9	129.7 + 3.0	136.2 + 2.5	124.9 + 5.2	125.2 + 4.0	131.3 + 3.3
		Fuel Oil	161.4	163.9	168.0	158.5	159.6	163.0
LPSCR G90ME-C10.5-GI-LPSCR	Tier III	Dual Fuel	131.9 + 3.9	134.8 + 3.0	137.9 + 2.5	128.3 + 5.2	130.3 + 4.0	133.0 + 3.3
		Fuel Oil	159.4	161.9	165.0	156.5	157.6	160.0
	Tier II	Dual Fuel	130.2 + 3.9	131.1 + 3.0	137.1 + 2.5	126.6 + 5.2	126.7 + 4.0	132.1 + 3.3
		Fuel Oil	161.4	164.2	169.0	158.5	159.9	164.0

* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

Added Dry Mass

Cylinders:	6	7	8	9	10	11	12
GI [t]	7	8	9	10	11	12	13

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI

Please see page 37

G80ME-C10.5-GI

Bore: 800mm
Stroke: 3,720mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G80ME-C10.5-GI	Dual Fuel	128.5 + 4.0	128.0 + 3.0	134.5 + 2.5	124.9 + 5.2	123.5 + 4.0	129.5 + 3.3
	Fuel Oil	159.4	161.9	166.0	156.5	157.6	161.0

Tier III Engine

Tier III technology / Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRTC* G80ME-C10.5-GI-EGRTC	Tier III	Dual Fuel	132.8 + 3.9	133.1 + 3.0	136.3 + 2.4	129.3 + 5.1	128.7 + 3.9	131.3 + 3.2
		Fuel Oil	160.4	159.9	163.0	157.5	155.6	158.0
	Tier II	Dual Fuel	126.9 + 3.9	128.0 + 3.0	134.6 + 2.4	123.3 + 5.1	123.5 + 3.9	129.6 + 3.2
		Fuel Oil	159.4	161.9	166.0	156.5	157.6	161.0
HPSCR G80ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	130.3 + 3.9	131.4 + 3.0	135.4 + 2.4	126.7 + 5.1	127.0 + 3.9	130.5 + 3.2
		Fuel Oil	157.4	157.9	162.0	154.5	153.6	157.0
	Tier II	Dual Fuel	128.6 + 3.9	128.0 + 3.0	135.4 + 2.4	125.0 + 5.1	123.5 + 3.9	130.5 + 3.2
		Fuel Oil	159.4	161.9	167.0	156.5	157.6	162.0
LPSCR G80ME-C10.5-GI-LPSCR	Tier III	Dual Fuel	130.3 + 3.9	133.1 + 3.0	136.3 + 2.4	126.7 + 5.1	128.7 + 3.9	131.3 + 3.2
		Fuel Oil	157.4	159.9	163.0	154.5	155.6	158.0
	Tier II	Dual Fuel	128.5 + 3.9	129.5 + 3.0	135.4 + 2.4	125.0 + 5.1	125.0 + 3.9	130.5 + 3.2
		Fuel Oil	159.4	162.2	167.0	156.5	157.9	162.0

* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

Added Dry Mass

Cylinders:	6	7	8	9
GI [t]	6	7	8	9

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI

→ Please see page 39

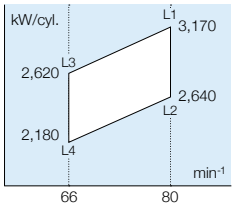
G70ME-C10.5-GI

Bore: 700mm
Stroke: 3,256mm

Engine Output [kW]

MEP L1-L3: 1.90 MPa, L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	15,850	13,200	13,100	10,900
6	19,020	15,840	15,720	13,080



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G70ME-C10.5-GI	Dual Fuel	130.1 + 3.9	129.8 + 3.0	135.4 + 2.4	127.9 + 4.7	127.1 + 3.6	132.3 + 2.9
	Fuel Oil	161.2	164.0	167.0	159.4	161.4	163.9

Tier III Engine

Tier III technology / Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G70ME-C10.5-GI-EGRBP	Tier III	Dual Fuel	136.0 + 3.9	136.7 + 3.0	138.8 + 2.4	133.9 + 4.7	134.0 + 3.6	135.7 + 2.9
		Fuel Oil	164.2	164.0	166.0	162.4	161.4	162.9
	Tier II	Dual Fuel	130.1 + 3.9	129.8 + 3.0	137.1 + 2.4	127.9 + 4.7	127.1 + 3.6	134.0 + 2.9
		Fuel Oil	161.2	164.0	169.0	159.4	161.4	165.9
HPSCR G70ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	131.8 + 3.9	133.3 + 3.0	136.2 + 2.4	129.6 + 4.7	130.5 + 3.6	133.2 + 2.9
		Fuel Oil	159.2	160.0	163.0	157.4	157.4	159.9
	Tier II	Dual Fuel	130.1 + 3.9	129.8 + 3.0	136.2 + 2.4	127.9 + 4.7	127.1 + 3.6	133.2 + 2.9
		Fuel Oil	161.2	164.0	168.0	159.4	161.4	164.9
LPSCR G70ME-C10.5-GI-LPSCR	Tier III	Dual Fuel	131.8 + 3.9	135.0 + 3.0	137.1 + 2.4	129.6 + 4.7	132.2 + 3.6	134.0 + 2.9
		Fuel Oil	159.2	162.0	164.0	157.4	159.4	160.9
	Tier II	Dual Fuel	130.1 + 3.9	131.3 + 3.0	136.2 + 2.4	127.9 + 4.7	128.6 + 3.6	133.2 + 2.9
		Fuel Oil	161.2	164.3	168.0	159.4	161.7	164.9

Main Dimensions and Mass

Dimensions:			
	A	[mm]	12,700
	B	[mm]	10,950
	C	[mm]	1,750
	D	[mm]	4,470
	E	[mm]	1,044
	H1	[mm]	14,150

Cylinders:			5	6
	L	[mm]	7,399	8,443
	Dry Mass	[t]	525	590
Added Dry Mass	EGRBP	[t]	11	11
	HPSCR	[t]	3	3
	LPSCR	[t]	-	-
	GI	[t]	5	6

S70ME-C10.5-GI

Bore: 700mm
Stroke: 2,800mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S70ME-C10.5-GI	Dual Fuel	133.6 + 4.0	133.1 + 3.0	139.6 + 2.5	130.0 + 5.3	128.6 + 4.0	134.6 + 3.3
	Fuel Oil	164.4	162.9	167.0	161.5	158.6	162.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S70ME-C10.5-GI-EGRBP	Tier III	Dual Fuel	139.6 + 4.0	139.9 + 3.0	144.7 + 2.5	136.0 + 5.3	135.4 + 4.0	139.8 + 3.3
		Fuel Oil	167.4	166.9	172.0	164.5	162.6	167.0
	Tier II	Dual Fuel	133.6 + 4.0	136.1 + 3.0	143.0 + 2.5	130.0 + 5.3	131.6 + 4.0	138.1 + 3.3
		Fuel Oil	160.4	162.4	170.0	157.5	158.1	165.0
HPSCR S70ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	134.9 + 4.0	136.9 + 3.0	143.0 + 2.5	131.3 + 5.3	132.4 + 4.0	138.1 + 3.3
		Fuel Oil	161.9	163.4	170.0	159.0	159.1	165.0
	Tier II	Dual Fuel	133.6 + 4.0	136.1 + 3.0	142.6 + 2.5	130.0 + 5.3	131.6 + 4.0	137.6 + 3.3
		Fuel Oil	160.4	162.4	169.5	157.5	158.1	164.5

Added Dry Mass

Cylinders:	5	6	7	8
GI [t]	5	6	7	8

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI

→ Please see page **41**

G60ME-C10.5-GI

Bore: 600mm
Stroke: 2,790mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G60ME-C10.5-GI	Dual Fuel	131.1 + 3.9	130.6 + 3.0	137.1 + 2.5	127.5 + 5.2	126.1 + 4.0	132.1 + 3.3
	Fuel Oil	161.4	159.9	164.0	158.5	155.6	159.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G60ME-C10.5-GI-EGRBP	Tier III	Dual Fuel	137.1 + 3.9	137.4 + 3.0	142.2 + 2.5	133.5 + 5.2	132.9 + 4.0	137.3 + 3.3
		Fuel Oil	164.4	163.9	169.0	161.5	159.6	164.0
	Tier II	Dual Fuel	131.1 + 3.9	133.5 + 3.0	140.5 + 2.5	127.5 + 5.2	129.1 + 4.0	135.6 + 3.3
		Fuel Oil	157.4	159.4	167.0	154.5	155.1	162.0
HPSCR G60ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	132.4 + 3.9	134.4 + 3.0	140.5 + 2.5	128.8 + 5.2	129.9 + 4.0	135.6 + 3.3
		Fuel Oil	158.9	160.4	167.0	156.0	156.1	162.0
	Tier II	Dual Fuel	131.1 + 3.9	133.5 + 3.0	140.1 + 2.5	127.5 + 5.2	129.1 + 4.0	135.1 + 3.3
		Fuel Oil	157.4	159.4	166.5	154.5	155.1	161.5

Added Dry Mass

Cylinders:	5	6	7	8
GI [t]	5	5	6	7

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI

→ Please see page **42**

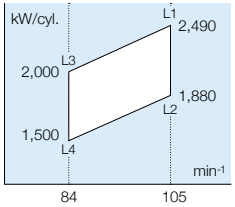
S60ME-C10.5-GI

Bore: 600mm
Stroke: 2,400mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	12,450	9,400	10,000	7,500
6	14,940	11,280	12,000	9,000
7	17,430	13,160	14,000	10,500
8	19,920	15,040	16,000	12,000



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S60ME-C10.5-GI	Dual Fuel	134.5 + 4.0	133.4 + 3.0	138.8 + 2.5	130.9 + 5.2	129.0 + 4.0	133.8 + 3.3
	Fuel Oil	165.4	163.3	166.0	162.5	159.0	161.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S60ME-C10.5-GI-EGRBP	Tier III	Dual Fuel	140.4 + 4.0	140.3 + 3.0	143.9 + 2.5	136.9 + 5.2	135.8 + 4.0	138.9 + 3.3
		Fuel Oil	168.4	167.3	171.0	165.5	163.0	166.0
	Tier II	Dual Fuel	133.6 + 4.0	136.4 + 3.0	141.3 + 2.5	130.0 + 5.2	132.0 + 4.0	136.4 + 3.3
		Fuel Oil	160.4	162.8	168.0	157.5	158.5	163.0
HPSCR S60ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	134.9 + 4.0	137.3 + 3.0	141.3 + 2.5	131.3 + 5.2	132.8 + 4.0	136.4 + 3.3
		Fuel Oil	161.9	163.8	168.0	159.0	159.5	163.0
	Tier II	Dual Fuel	133.6 + 4.0	136.4 + 3.0	140.9 + 2.5	130.0 + 5.2	132.0 + 4.0	136.0 + 3.3
		Fuel Oil	160.4	162.8	167.5	157.5	158.5	162.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,825	8,525	1,300	3,420	940	10,950		10,125

Cylinders:		5	6	7	8
L [mm]		6,502	7,442	8,382	9,322
Dry Mass [t]		305	330	355	395
Added Dry Mass	EGRBP [t]	10	10	11	11
	HPSCR [t]	6	6	6	6
	GI [t]	5	5	6	7

G50ME-C9.6-GI

Bore: 500mm
Stroke: 2,500mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G50ME-C9.6-GI	Dual Fuel	134.4 + 4.0	133.9 + 3.1	140.5 + 2.5	130.8 + 5.3	129.4 + 4.1	135.5 + 3.4
	Fuel Oil	165.4	163.9	168.0	162.5	159.6	163.0

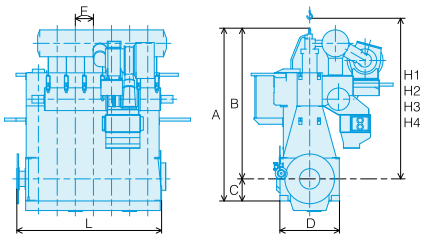
Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G50ME-C9.6-GI-EGRBP	Tier III	Dual Fuel	140.4 + 4.0	140.7 + 3.1	145.6 + 2.5	136.8 + 5.3	136.2 + 4.1	140.6 + 3.4
		Fuel Oil	168.4	167.9	173.0	165.5	163.6	168.0
	Tier II	Dual Fuel	134.4 + 4.0	136.9 + 3.1	143.9 + 2.5	130.8 + 5.3	132.4 + 4.1	138.9 + 3.4
		Fuel Oil	161.4	163.4	171.0	158.5	159.1	166.0
HPSCR G50ME-C9.6-GI-HPSCR	Tier III	Dual Fuel	135.7 + 4.0	137.8 + 3.1	143.9 + 2.5	132.1 + 5.3	133.2 + 4.1	138.9 + 3.4
		Fuel Oil	162.9	164.4	171.0	160.0	160.1	166.0
	Tier II	Dual Fuel	134.4 + 4.0	136.9 + 3.1	143.5 + 2.5	130.8 + 5.3	132.4 + 4.1	138.5 + 3.4
		Fuel Oil	161.4	163.4	170.5	158.5	159.1	165.5

Added Dry Mass

Cylinders:	5	6	7	8	9
GI [t]	4	4	5	5	6

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI
→ Please see page 45



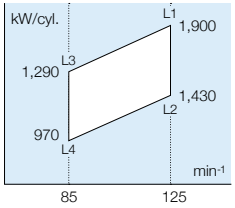
S50ME-C9.7-GI

Bore: 500mm
Stroke: 2,214mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	9,500	7,150	6,450	4,850
6	11,400	8,580	7,740	5,820
7	13,300	10,010	9,030	6,790
8	15,200	11,440	10,320	7,760
9	17,100	12,870	11,610	8,730



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S50ME-C9.7-GI	Dual Fuel	132.2 + 3.0	131.9 + 3.9	137.9 + 2.5	127.7 + 4.0	128.3 + 5.2	133.0 + 3.3
	Fuel Oil	161.8	162.4	165.0	157.5	159.5	160.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S50ME-C9.7-GI-EGRBP	Tier III	Dual Fuel	137.9 + 3.9	139.0 + 3.0	143.1 + 2.5	134.3 + 5.2	134.5 + 4.0	138.1 + 3.3
		Fuel Oil	165.4	165.8	170.0	162.5	161.5	165.0
	Tier II	Dual Fuel	131.9 + 3.9	135.1 + 3.0	141.4 + 2.5	128.3 + 5.2	130.7 + 4.0	136.4 + 3.3
		Fuel Oil	158.4	161.3	168.0	155.5	157.0	163.0
HPSCR S50ME-C9.7-GI-HPSCR	Tier III	Dual Fuel	133.2 + 3.9	136.0 + 3.0	141.4 + 2.5	129.6 + 5.2	131.5 + 4.0	136.4 + 3.3
		Fuel Oil	159.9	162.3	168.0	157.0	158.0	163.0
	Tier II	Dual Fuel	131.9 + 3.9	135.1 + 3.0	140.9 + 2.5	128.3 + 5.2	130.7 + 4.0	136.0 + 3.3
		Fuel Oil	158.4	161.3	167.5	155.5	157.0	162.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,320	8,130	1,190	3,350	875	10,232		8,850

Cylinders:		5	6	7	8	9
L [mm]		5,757	6,632	7,507	8,382	9,257
Dry Mass [t]		193	223	259	289	320
Added Dry Mass	EGRBP [t]	12	12	13	13	13
	HPSCR [t]	4	4	5	6	7
	GI [t]	4	4	5	5	6

S50ME-C8.5-GI

Bore: 500mm
Stroke: 2,000mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S50ME-C8.5-GI	Dual Fuel	129.0 + 13.5	129.7 + 10.3	137.1 + 8.5	122.7 + 16.8	122.4 + 12.9	130.1 + 10.6
	Fuel Oil	168.5	166.1	170.0	164.5	160.1	164.0

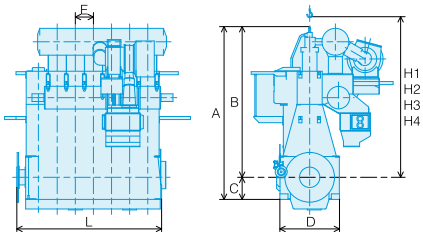
Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S50ME-C8.5-GI-EGRBP	Tier III	Dual Fuel	134.9 + 13.5	136.5 + 10.3	142.2 + 8.5	128.7 + 16.8	129.2 + 12.9	135.3 + 10.6
		Fuel Oil	171.5	170.1	175.0	167.5	164.1	169.0
	Tier II	Dual Fuel	128.1 + 13.5	132.6 + 10.3	139.6 + 8.5	121.8 + 16.8	125.3 + 12.9	132.7 + 10.6
		Fuel Oil	163.5	165.6	172.0	159.5	159.6	166.0
HPSCR S50ME-C8.5-GI-HPSCR	Tier III	Dual Fuel	129.4 + 13.5	133.5 + 10.3	139.6 + 8.5	123.1 + 16.8	126.2 + 12.9	132.7 + 10.6
		Fuel Oil	165.0	166.6	172.0	161.0	160.6	166.0
	Tier II	Dual Fuel	128.1 + 13.5	132.6 + 10.3	139.2 + 8.5	121.8 + 16.8	125.3 + 12.9	132.3 + 10.6
		Fuel Oil	163.5	165.6	171.5	159.5	159.6	165.5

Added Dry Mass

Cylinders:	5	6	7	8	9
GI [t]	6	6	7	7	7

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for GI
→ Please see page 47



G45ME-C9.5-GI

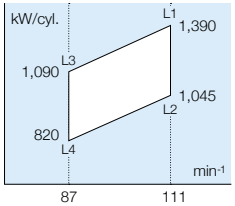
Bore: 450mm
Stroke: 2,250mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Tier II Engine

Cyl.	L1	L2	L3	L4
5	6,950	5,225	5,450	4,100
6	8,340	6,270	6,540	4,920
7	9,730	7,315	7,630	5,740
8	11,120	8,360	8,720	6,560



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G45ME-C9.5-GI	Dual Fuel	129.0 + 13.5	129.7 + 10.3	137.1 + 8.5	121.7 + 17.9	121.6 + 13.7	128.7 + 11.3
	Fuel Oil	168.5	166.1	170.0	164.5	160.0	163.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G45ME-C9.5-GI-EGRBP	Tier III	Dual Fuel	134.9 + 13.5	136.5 + 10.3	142.2 + 8.5	127.7 + 17.9	128.4 + 13.7	133.8 + 11.3
		Fuel Oil	171.5	170.1	175.0	167.5	164.0	168.0
	Tier II	Dual Fuel	128.1 + 13.5	132.6 + 10.3	139.6 + 8.5	120.9 + 17.9	124.6 + 13.7	131.3 + 11.3
		Fuel Oil	163.5	165.6	172.0	159.5	159.5	165.0
HPSCR G45ME-C9.5-GI-HPSCR	Tier III	Dual Fuel	129.4 + 13.5	133.5 + 10.3	139.6 + 8.5	122.2 + 17.9	125.4 + 13.7	131.3 + 11.3
		Fuel Oil	165.0	166.6	172.0	161.0	160.5	165.0
	Tier II	Dual Fuel	128.1 + 13.5	132.6 + 10.3	139.2 + 8.5	120.9 + 17.9	124.6 + 13.7	130.8 + 11.3
		Fuel Oil	163.5	165.6	171.5	159.5	159.5	164.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,063	7,894	1,169	3,260	784	10,220		9,250

Cylinders:		5	6	7	8
L [mm]		5,209	5,993	6,777	7,561
Dry Mass [t]		163	183	206	234
Added Dry Mass	EGRBP [t]	12	12	12	12
	HPSCR [t]	3	3	4	5
	GI [t]	4	4	5	5

S35ME-C9.7-GI

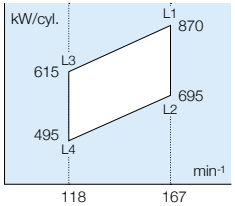
Bore: 350mm
Stroke: 1,550mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.68 MPa

Tier II Engine

Cyl.	L1	L2	L3	L4
5	4,350	3,475	3,075	2,475
6	5,220	4,170	3,690	2,970
7	6,090	4,865	4,305	3,465
8	6,960	5,560	4,920	3,960



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S35ME-C9.7-GI	Dual Fuel	129.7 + 13.6	130.5 + 10.4	137.9 + 8.6	123.4 + 17.0	124.8 + 13.0	132.6 + 10.7
	Fuel Oil	169.5	167.1	171.0	165.5	163.1	167.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR S35ME-C9.7-GI-HPSCR	Tier III	Dual Fuel	130.2 + 13.6	134.3 + 10.4	140.4 + 8.6	123.8 + 17.0	128.7 + 13.0	135.2 + 10.7
		Fuel Oil	166.0	167.6	173.0	162.0	163.6	169.0
	Tier II	Dual Fuel	128.9 + 13.6	133.5 + 10.4	140.0 + 8.6	122.6 + 17.0	127.8 + 13.0	134.8 + 10.7
		Fuel Oil	164.5	166.6	172.5	160.5	162.6	168.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	6,501	5,670	831	2,300	612	7,200		6,275

Cylinders:		5	6	7	8
L [mm]		4,107	4,719	5,331	5,943
Dry Mass [t]		77	87	98	108
Added Dry Mass	HPSCR [t]	3	3	4	4
	LPSCR [t]	-	-	-	-
	GI [t]	3	3	4	4

「三井品質」
を
支える人々

PEOPLE BEHIND MITSUI QUALITY

燃料転換を支える超精密加工

ULTRA-PRECISION MACHINING TO SUPPORT FUEL CONVERSION

二元燃料エンジンで使用する低引火燃料は、発熱量、圧縮性、粘度、引火点の低下などの特性が重油と大きく異なります。燃料それぞれに合わせた噴射量などの精密な制御や、燃料漏洩量の低減が必要であり、それを実現したのが新型燃料弁「FBIV(Fuel Booster Injection Valve)」です。FBIVの燃料圧縮を担う部分に求められる加工精度はミクロン単位。それを実現するためにサブミクロンレベルの研削を少しずつ繰り返し、求める精度を実現しています。加工作業は、削るというより磨くレベル。担当者はミクロンレベルに感覚を研ぎ澄まし、燃料転換を実現する心臓部の製作に臨んでいます。

The characteristics of low-flash fuels used in dual fuel engines differ greatly from those of heavy fuel oils in terms of calorific value, compressibility, viscosity, and flash point reduction. The new type of fuel valve, FBIV (Fuel Booster Injection Valve), has been developed to achieve the precise control of the injection amount and reduction of fuel leakage required for each fuel. In order to achieve this, grinding at the submicron level is repeated little by little to achieve the required precision. The machining process is at the level of polishing rather than grinding. The person in charge sharpens his/her senses to the micron level to manufacture the heart of the fuel conversion.

メタノール焚き二元燃料エンジン

Methanol Dual Fuel Engines (ME-LGIM)

LGIM形エンジンを適用可能な機種については、メタノール消費率等を併せて示します。以下の燃料消費率の値を、二元燃料エンジンの表に示しています。

For models to which LGIM engines can be applied, LGIM figures such as fuel methanol consumption rates are also provided. The following specific fuel consumption rates are shown in the tables for dual fuel engines.

重油運転モード Fuel oil mode	SFOC: 燃料油消費率 Specific fuel oil consumption
二元燃料運転モード Dual fuel mode	SGC: 燃料ガス消費率 Specific gas consumption
	SPOC: パイロット油消費率 Specific pilot oil consumption

G95ME-C10.5-LGIM

Bore: 950mm
Stroke: 3,460mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G95ME-C10.5-LGIM	Dual Fuel	297.5 + 12.8	306.0 + 9.8	329.3 + 8.1	282.3 + 17.0	290.0 + 13.0	312.9 + 10.7
	Fuel Oil	154.4	156.4	163.5	151.5	152.1	158.5

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRTC G95ME-C10.5-LGIM-EGRTC	Tier III	Dual Fuel	310.4 + 12.8	315.6 + 9.8	332.5 + 8.1	295.1 + 17.0	299.6 + 13.0	316.1 + 10.7
		Fuel Oil	160.4	159.9	165.0	157.5	155.6	160.0
	Tier II	Dual Fuel	297.5 + 12.8	306.0 + 9.8	328.2 + 8.1	282.3 + 17.0	290.0 + 13.0	311.8 + 10.7
		Fuel Oil	154.4	156.4	163.0	151.5	152.1	158.0

Added Dry Mass

Cylinders:	6	7	8	9	10	11	12
LGIM [t]	9	10	11	12	13	14	15

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 36

G80ME-C10.5-LGIM

Bore: 800mm
Stroke: 3,720mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G80ME-C10.5-LGIM	Dual Fuel	301.4 + 12.9	310.0 + 9.9	333.3 + 8.2	286.2 + 17.2	294.0 + 13.1	316.9 + 10.8
	Fuel Oil	156.4	158.4	165.5	153.5	154.1	160.5

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRTC* G80ME-C10.5-LGIM-EGRTC	Tier III	Dual Fuel	314.3 + 12.9	319.7 + 9.9	336.6 + 8.2	299.0 + 17.2	303.6 + 13.1	320.1 + 10.8
		Fuel Oil	162.4	161.9	167.0	159.5	157.6	162.0
	Tier II	Dual Fuel	301.4 + 12.9	310.0 + 9.9	332.3 + 8.2	286.2 + 17.2	294.0 + 13.1	315.8 + 10.8
		Fuel Oil	156.4	158.4	165.0	153.5	154.1	160.0

* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

Added Dry Mass

Cylinders:	6	7	8	9
LGIM [t]	7	8	9	10

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 39

G70ME-C10.7-LGIM

New Engine

Bore: 700mm
Stroke: 3,256mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G70ME-C10.7-LGIM	Dual Fuel	310.0 + 12.9	311.1 + 9.9	328.0 + 8.2	294.7 + 17.2	295.0 + 13.1	311.5 + 10.8
	Fuel Oil	160.4	158.9	163.0	157.5	154.6	158.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G70ME-C10.7-LGIM-EGRBP	Tier III	Dual Fuel	316.5 + 12.9	321.8 + 9.9	338.7 + 8.2	301.2 + 17.2	305.8 + 13.1	322.2 + 10.8
		Fuel Oil	163.4	162.9	168.0	160.5	158.6	163.0
	Tier II	Dual Fuel	301.4 + 12.9	310.0 + 9.9	334.4 + 8.2	286.1 + 17.2	294.0 + 13.1	318.0 + 10.8
		Fuel Oil	156.4	158.4	166.0	153.5	154.1	161.0

Added Dry Mass

Cylinders:	5	6
LGIM [t]	*	*

* Available on request

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 40

G60ME-C10.5-LGIM

New Engine

Bore: 600mm
Stroke: 2,790mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G60ME-C10.5-LGIM	Dual Fuel	317.9 + 13.3	319.2 + 10.1	336.1 + 8.4	302.4 + 17.6	302.9 + 13.4	319.5 + 11.1
	Fuel Oil	164.4	162.9	167.0	161.5	158.6	162.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G60ME-C10.5-LGIM-EGRBP	Tier III	Dual Fuel	324.4 + 13.3	329.9 + 10.1	346.9 + 8.4	308.8 + 17.6	313.7 + 13.4	330.3 + 11.1
		Fuel Oil	167.4	166.9	172.0	164.5	162.6	167.0
	Tier II	Dual Fuel	309.4 + 13.3	318.1 + 10.1	342.6 + 8.4	293.8 + 17.6	301.9 + 13.4	326.0 + 11.1
		Fuel Oil	160.4	162.4	170.0	157.5	158.1	165.0

Added Dry Mass

Cylinders:	5	6	7	8
LGIM [t]	5	5	6	7

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 42

S60ME-C10.7-LGIM

New Engine

Bore: 600mm
Stroke: 2,400mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S60ME-C10.7-LGIM	Dual Fuel	310.0 + 12.9	311.1 + 9.9	328.0 + 8.2	294.8 + 17.1	295.1 + 13.1	311.6 + 10.8
	Fuel Oil	160.4	158.9	163.0	157.5	154.6	158.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S60ME-C10.7-LGIM-EGRBP	Tier III	Dual Fuel	316.5 + 12.9	321.8 + 9.9	338.7 + 8.2	301.2 + 17.1	305.8 + 13.1	322.3 + 10.8
		Fuel Oil	163.4	162.9	168.0	160.5	158.6	163.0
	Tier II	Dual Fuel	301.4 + 12.9	310.0 + 9.9	334.4 + 8.2	286.2 + 17.1	294.0 + 13.1	318.0 + 10.8
		Fuel Oil	156.4	158.4	166.0	153.5	154.1	161.0

Added Dry Mass

Cylinders:	5	6	7	8
GI [t]	5	5	6	7

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 43

G50ME-C9.6-LGIM

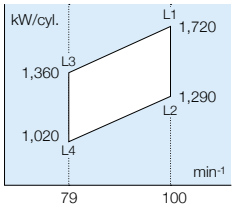
Bore: 500mm
Stroke: 2,500mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Tier II Engine

Cyl.	L1	L2	L3	L4
5	8,600	6,450	6,800	5,100
6	10,320	7,740	8,160	6,120
7	12,040	9,030	9,520	7,140



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G50ME-C9.6-LGIM	Dual Fuel	319.9 + 13.3	321.2 + 10.2	338.2 + 8.4	304.1 + 17.8	304.8 + 13.6	321.4 + 11.2
	Fuel Oil	165.4	163.9	168.0	162.5	159.6	163.0

Tier III Engine

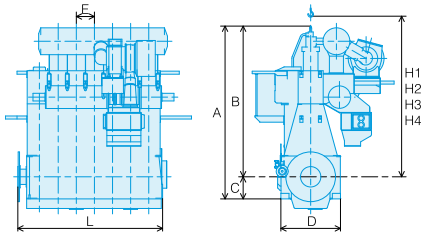
Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP G50ME-C9.6-LGIM-EGRBP	Tier III	Dual Fuel	326.3 + 13.3	331.9 + 10.2	348.9 + 8.4	310.6 + 17.8	315.5 + 13.6	332.2 + 11.2
		Fuel Oil	168.4	167.9	173.0	165.5	163.6	168.0
	Tier II	Dual Fuel	311.3 + 13.3	320.1 + 10.2	344.6 + 8.4	295.6 + 17.8	303.7 + 13.6	327.9 + 11.2
		Fuel Oil	161.4	163.4	171.0	158.5	159.1	166.0

Added Dry Mass

Cylinders:	5	6	7
LGIM [t]	7	7	8

Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 45



S50ME-C10.7-LGIM

New Engine

Bore: 500mm
Stroke: 2,214mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S50ME-C10.7-LGIM	Dual Fuel	312.0 + 13.0	313.1 + 9.9	330.0 + 8.2	296.6 + 17.3	297.0 + 13.2	313.5 + 10.9
	Fuel Oil	161.4	159.9	164.0	158.5	155.6	159.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S50ME-C10.7-LGIM-EGRBP	Tier III	Dual Fuel	318.4 + 13.0	323.8 + 9.9	340.7 + 8.2	303.0 + 17.3	307.7 + 13.2	324.2 + 10.9
		Fuel Oil	164.4	163.9	169.0	161.5	159.6	164.0
	Tier II	Dual Fuel	303.4 + 13.0	312.0 + 9.9	336.5 + 8.2	288.0 + 17.3	295.9 + 13.2	319.9 + 10.9
		Fuel Oil	157.4	159.4	167.0	154.5	155.1	162.0

Added Dry Mass

Cylinders:	5	6	7	8	9
GI [t]	7	7	8	9	10

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM

→ Please see page 46

LPG焚き二元燃料エンジン

LPG Dual Fuel Engines (ME-LGIP)

LGIP形エンジンを適用可能な機種については、LPG消費率等を併せて示します。以下の燃料消費率の値を、二元燃料エンジンの表に示しています。

For models to which LGIP engines can be applied, LGIP figures such as fuel gas consumption rates are also provided. The following specific fuel consumption rates are shown in the tables for dual fuel engines.

重油運転モード Fuel oil mode	SFOC: 燃料油消費率 Specific fuel oil consumption
二元燃料運転モード Dual fuel mode	SGC: 燃料ガス消費率 Specific gas consumption
	SPOC: パイロット油消費率 Specific pilot oil consumption

G60ME-C10.5-LGIP

Bore: 600mm
Stroke : 2,790mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G60ME-C10.5-LGIP	Dual Fuel	137.8 + 13.0	139.2 + 9.9	144.6 + 8.2	131.1 + 17.3	132.2 + 13.2	137.5 + 10.9
	Fuel Oil	161.4	159.9	164.0	158.5	155.6	159.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR G60ME-C10.5-LGIP-HPSCR	Tier III	Dual Fuel	135.4 + 13.0	139.6 + 9.9	147.4 + 8.2	128.8 + 17.3	132.7 + 13.2	140.3 + 10.9
		Fuel Oil	158.9	160.4	167.0	156.0	156.1	162.0
	Tier II	Dual Fuel	134.0 + 13.0	138.7 + 9.9	146.9 + 8.2	127.4 + 17.3	131.7 + 13.2	139.8 + 10.9
		Fuel Oil	157.4	159.4	166.5	154.5	155.1	161.5

Added Dry Mass

Cylinders:	5	6	7	8
LGIP [t]	5	5	6	7

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIP

→ Please see page 42

G50ME-C9.6-LGIP

Bore: 500mm
Stroke : 2,500mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G50ME-C9.6-LGIP	Dual Fuel	141.2 + 13.3	142.7 + 10.2	148.2 + 8.4	134.4 + 17.8	135.6 + 13.6	140.9 + 11.2
	Fuel Oil	165.4	163.9	168.0	162.5	159.6	163.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR G50ME-C9.6-LGIP-HPSCR	Tier III	Dual Fuel	138.9 + 13.3	143.1 + 10.2	150.9 + 8.4	132.0 + 17.8	136.0 + 13.6	143.7 + 11.2
		Fuel Oil	162.9	164.4	171.0	160.0	160.1	166.0
	Tier II	Dual Fuel	137.5 + 13.3	142.2 + 10.2	150.5 + 8.4	130.6 + 17.8	135.1 + 13.6	143.2 + 11.2
		Fuel Oil	161.4	163.4	170.5	158.5	159.1	165.5

Added Dry Mass

Cylinders:	5	6	7	8	9
LGIP [t]	6	6	7	8	9

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIP

→ Please see page 45

「三井品質」
を
支える人々

PEOPLE BEHIND MITSUI QUALITY

大海原への卒業試験

GRADUATION TEST TO THE OCEAN

造船所で船舶に搭載されたエンジンの、最終試験となるのが「海上試運転」です。まずは岸壁で3～5日間かけて新品のエンジンに潤滑油や冷却水などを流し、安全な起動のために各部の動作を確認します。洋上では、起動試験、耐久負荷試験、スピードテスト、機関室無人化試験、保護装置試験などを実施します。試験中は機関室や機関制御室で、計器データ、異音、異臭、振動、流体漏れを五感を研ぎ澄ませて確認します。責任の重い「卒業試験」は、知識と技術そして鋭敏な感覚がないと務まりません。試験は通常数日ですが、試験項目の多いエンジンでは、約3カ月に及んだこともあります。

The final test of an engine installed on a ship at the shipyard is a sea trial run. First, lubricating oil and cooling water are poured into the new engine for 3 to 5 days at the wharf to check the operation of each part for safe startup. At sea, startup tests, endurance load tests, speed tests, engine room unmanned tests, and protection device tests are conducted. During the tests, we check instrument data, unusual noises, odors, vibrations, and fluid leaks in the engine room and engine control room with all of our senses. The "graduation test," which is a heavy responsibility, requires knowledge, skill, and a keen sense of perception. The test usually takes only a few days, but for engines with many test items, it can take up to three months.

GIE形エンジンを適用可能な機種については、燃料ガス消費率等を併せて示します。
以下の燃料消費率の値を、二元燃料エンジンの表に示しています。

For models to which GIE engines can be applied, GIE figures such as fuel gas consumption rates are also provided. The following specific fuel consumption rates are shown in the tables for dual fuel engines.

重油運転モード Fuel oil mode	SFOC: 燃料油消費率 Specific fuel oil consumption
二元燃料運転モード Dual fuel mode	SGC: 燃料ガス消費率 Specific gas consumption
	SPOC: パイロット油消費率 Specific pilot oil consumption

エタン焚き二元燃料エンジン

Ethane Dual Fuel Engines (ME-GIE)

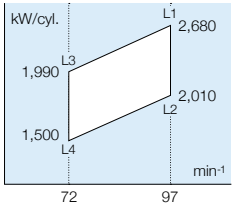
G60ME-C9.5-GIE

Bore: 600mm
Stroke : 2,790mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	13,400	10,050	9,950	7,500
6	16,080	12,060	11,940	9,000
7	18,760	14,070	13,930	10,500
8	21,440	16,080	15,920	12,000



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G60ME-C9.5-GIE	Dual Fuel	139.3 + 13.6	141.2 + 10.4	146.0 + 8.6	131.7 + 18.0	132.7 + 13.7	137.2 + 11.3
	Fuel Oil	168.5	167.5	171.0	164.5	161.4	164.0

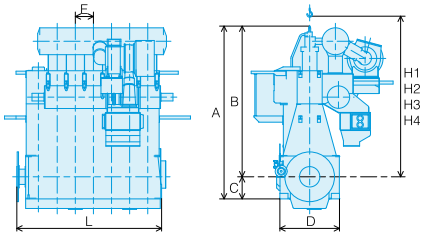
Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR G60ME-C9.5-GIE-HPSCR	Tier III	Dual Fuel	136.1 + 13.6	141.7 + 10.4	147.8 + 8.6	128.6 + 18.0	133.2 + 13.7	139.0 + 11.3
		Fuel Oil	165.0	168.0	173.0	161.0	161.9	166.0
	Tier II	Dual Fuel	134.8 + 13.6	140.8 + 10.4	147.4 + 8.6	127.2 + 18.0	132.3 + 13.7	138.6 + 11.3
		Fuel Oil	163.5	167.0	172.5	159.5	160.9	165.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	11,274	9,774	1,500	4,090	1,080	12,750		11,550

Cylinders:		5	6	7	8
L [mm]		7,385	8,465	9,545	10,625
Dry Mass [t]		395	440	490	555
Added Dry Mass	HPSCR [t]	3	4	5	5
	GIE [t]	5	6	7	7



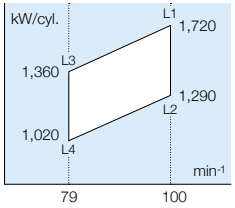
G50ME-C9.5-GIE

Bore: 500mm
Stroke : 2,500mm

Engine Output [kW]

MEP L1-L3: 2.10 MPa
L2-L4: 1.58 MPa

Cyl.	L1	L2	L3	L4
5	8,600	6,450	6,800	5,100
6	10,320	7,740	8,160	6,120
7	12,040	9,030	9,520	7,140
8	13,760	10,320	10,880	8,160
9	15,480	11,610	12,240	9,180



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
G50ME-C9.5-GIE	Dual Fuel	140.1 + 13.7	142.1 + 10.4	146.9 + 8.6	132.4 + 18.2	133.5 + 13.9	138.0 + 11.5
	Fuel Oil	169.5	168.5	172.0	165.5	162.4	165.0

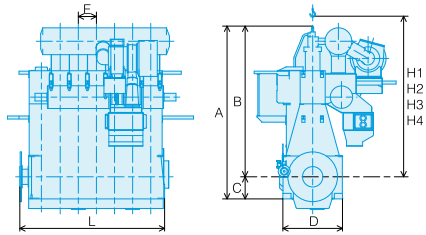
Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR G50ME-C9.5-GIE-HPSCR	Tier III	Dual Fuel	136.9 + 13.7	142.5 + 10.4	148.7 + 8.6	129.3 + 18.2	133.9 + 13.9	139.8 + 11.5
		Fuel Oil	166.0	169.0	174.0	162.0	162.9	167.0
	Tier II	Dual Fuel	135.6 + 13.7	141.6 + 10.4	148.2 + 8.6	127.9 + 18.2	133.0 + 13.9	139.4 + 11.5
		Fuel Oil	164.5	168.0	173.5	160.5	161.9	166.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,962	8,757	1,205	3,776	872	11,300		

Cylinders:		5	6	7	8	9
L [mm]		5,779	6,651	7,523	8,395	9,267
Dry Mass [t]		211	246	276	311	346
Added Dry Mass	HPSCR [t]	6	6	7	7	7
	GIE [t]	4	4	5	5	6



従来形エンジン

Conventional Engines

以下に記載するエンジンは、より効率の高い新形エンジンに将来的に置き換えられるため、今後のカタログには掲載しない予定です。しかし、これら機種は個別対応として今後も製造可能です。新たなプロジェクトに対しては、より新しいエンジン形式の選定を推奨いたします。Tier IIエンジン、Tier IIIエンジンおよび二元燃料エンジンとしての対応可否については、弊社までお問い合わせください。

The engines listed below will not be included in future catalogs as they will be replaced by newer, more efficient engines. However, we will continue to produce these engines on a case-by-case basis. For new projects, we recommend choosing the newer engine types. Please contact us to inquire about Tier II, Tier III and dual fuel engine availability.

S90ME-C10.5

Bore: 900 mm, Stroke: 3,260 mm

5 - 12 cyl.		L1	L2	L3	L4
Output / cyl.	kW	6,100	4,880	5,230	4,180
Speed	min^{-1}	84	84	72	72
MEP	MPa	2.10	1.68	2.10	1.68
SFOC (Tier II, High load)	g/kWh	166.0	160.0	166.0	160.0

G70ME-C10.5

Bore: 700 mm, Stroke: 3,256 mm

5 - 6 cyl.		L1	L2	L3	L4
Output / cyl.	kW	3,170	2,640	2,500	2,080
Speed	min^{-1}	80	80	63	63
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	164.0	160.9	164.0	160.9

S60ME-C10.6

Bore: 600 mm, Stroke: 2,400 mm

5 - 8 cyl.		L1	L2	L3	L4
Output / cyl.	kW	2,490	1,880	1,950	1,470
Speed	min^{-1}	105	105	82	82
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	163.0	158.0	163.0	158.0

S60ME-C10.5

Bore: 600 mm, Stroke: 2,400 mm

5 - 8 cyl.		L1	L2	L3	L4
Output / cyl.	kW	2,490	1,880	2,000	1,500
Speed	min^{-1}	105	105	84	84
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	166.0	161.0	166.0	161.0

S60ME-C10.5-LGIM

Bore: 600 mm, Stroke: 2,400 mm

5 - 8 cyl.		L1	L2	L3	L4
Output / cyl.	kW	2,490	1,880	2,000	1,500
Speed	min^{-1}	105	105	84	84
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	168.0	163.0	168.0	163.0

S60ME-C8.5

Bore: 600 mm, Stroke: 2,400 mm

5 - 8 cyl.		L1	L2	L3	L4
Output / cyl.	kW	2,380	1,900	1,900	1,520
Speed	min^{-1}	105	105	84	84
MEP	MPa	2.00	1.60	2.00	1.60
SFOC (Tier II, High load)	g/kWh	169.0	163.0	169.0	163.0

S50ME-C10.6

Bore: 500 mm, Stroke: 2,214 mm

5 - 9 cyl.		L1	L2	L3	L4
Output / cyl.	kW	1,900	1,430	1,290	970
Speed	min^{-1}	125	125	85	85
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	164.0	159.0	164.0	159.0

S50ME-C9.7

Bore: 500 mm, Stroke: 2,214 mm

5 - 9 cyl.		L1	L2	L3	L4
Output / cyl.	kW	1,900	1,430	1,290	970
Speed	min^{-1}	125	125	85	85
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	165.0	160.0	165.0	160.0

S50ME-C9.6-LGIM

Bore: 500 mm, Stroke: 2,214 mm

5 - 9 cyl.		L1	L2	L3	L4
Output / cyl.	kW	1,780	1,420	1,350	1,080
Speed	min^{-1}	117	117	89	89
MEP	MPa	2.10	1.68	2.10	1.68
SFOC (Tier II, High load)	g/kWh	167.0	163.0	167.0	163.0

排ガス過給機ラインナップ

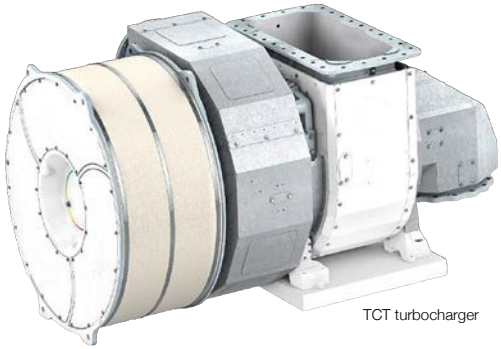
Exhaust Gas Turbochargers Lineup

MET過給機が新たに自社製過給機のラインナップに加わりました。TCT/TCA過給機とともに三井-MAN B&Wエンジンに最適な過給機を提供します。

MET turbochargers have been recently added to our lineup of MES manufactured turbochargers. Together with TCT & TCA, we can provide the optimal turbocharger solution for our MITSUI-MAN B&W engines.

TCT形過給機

TCT Turbocharger



TCT turbocharger

TCT形過給機は従来のTCA形をベースに、堅牢性を維持したまま最大47%軽量化したコンパクトな軸流過給機です。TCA形過給機よりもオーバーホール間隔を延長し、メンテナンス性が向上しています。TCT70/80形も順次リリース予定です。

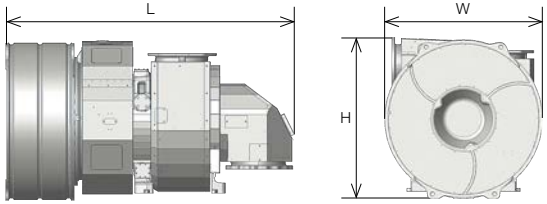
The TCT turbocharger is a compact axial flow turbocharger that is based on the conventional TCA type turbocharger, but it is up to 47% lighter while maintaining robustness of the TCA. It has a longer overhaul interval and improved maintainability than the TCA turbocharger. The TCT70/80 types will be released in due course.

TCTシリーズの仕様 TCT Series Program

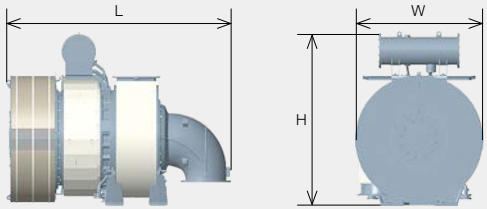
Turbine type	Axial flow turbine
Max. permissible temp.	520 °C
Pressure ratio	up to 4.7

* Under development

Type	Supercharged engine output [kW]	Length [mm]	Width [mm]	Height [mm]
TCT30	7,500	2,040	1,125	1,135
TCT40	9,460	2,290	1,260	1,275
TCT50	12,000	2,580	1,420	1,435
TCT60	15,120	2,900	1,595	1,610
TCT70*	19,040	3,250	1,790	1,805
TCT80*	24,030	3,650	2,010	2,028



TCAシリーズの仕様 TCA Series Program

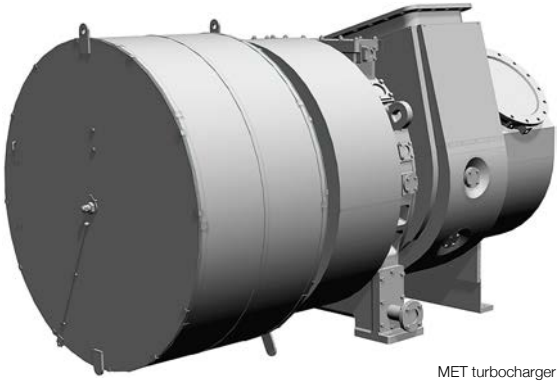


Turbine type	Axial flow turbine
Max. permissible temp.	500 °C
Pressure ratio	up to 4.4

Type	Supercharged engine output [kW]	Length [mm]	Width [mm]	Height [mm]
TCA44	7,000	2,190	1,100	1,614
TCA55	9,600	2,439	1,371	1,989
TCA66	14,000	2,888	1,625	2,191
TCA77	20,000	3,422	1,930	2,692
TCA88	30,000	4,033	2,270	2,950

MET-MB / MET-MBⅡ過給機

MET-MB/MET-MBII Turbocharger



MET turbocharger

MET-MB/MET-MBⅡは高い信頼性とメンテナンス性を有した軸流過給機です。MET-MBⅡはMET-MBに比べ最大16%の大風量化により、過給機を小型軽量化しています。MET過給機については、需要に応じてライセンス生産の形式を適宜拡大していく予定です。

The MET-MB/MET-MBII are axial turbochargers that are both highly reliable and easy-to-maintain. The compressor capacity of the MET-MBII is improved by up to 16% compared to the MET-MB, making it lighter and with a smaller footprint. The MET turbocharger lineup of licensed production will be expanded as needed according to demand.

MET-MB / MET-MBⅡシリーズの仕様

MET-MB/MET-MBII Series Program

Turbine type	Axial flow turbine
Max. permissible temp.	580 °C
Pressure ratio	up to 5.0

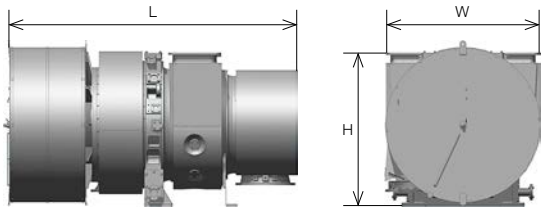
MET-MB Series

Type	Supercharged engine output [kW]	Length [mm]	Width [mm]	Height [mm]
MET33MB	4,600	1,661	899	945
MET37MB	6,300	1,851	998	1,095
MET42MB*	7,700	1,944	1,134	1,155
MET48MB	10,000	2,280	1,255	1,330
MET53MB	12,500	2,504	1,417	1,435
MET60MB	15,500	2,825	1,530	1,540
MET66MB	19,400	3,065	1,785	1,720
MET71MB	22,700	3,143	1,820	1,865
MET83MB	31,100	3,771	2,233	2,180
MET90MB	37,900	4,241	2,465	2,410

MET-MBⅡ Series

Type	Supercharged engine output [kW]	Length [mm]	Width [mm]	Height [mm]
MET33MBII	6,000	1,870	899	945
MET37MBII	7,600	2,080	998	1,095
MET42MBII*	9,300	2,190	1,094	1,171
MET48MBII*	11,900	2,400	1,255	1,330
MET53MBII	14,900	2,610	1,390	1,439
MET60MBII	18,400	2,960	1,530	1,570
MET66MBII*	23,100	3,200	1,718	1,780
MET71MBII	27,100	3,290	1,820	1,865
MET83MBII	37,100	3,940	2,233	2,225
MET90MBII	45,200	4,440	2,465	2,410

*In-house production as of August 2024



NOx対策

NOx Reduction

三井E&Sは窒素酸化物（NOx）、硫黄酸化物（SOx）の
規制をクリアする、多彩な技術を提供可能です。
お客様の船のニーズに合わせて、最適な技術をご提案いたします。

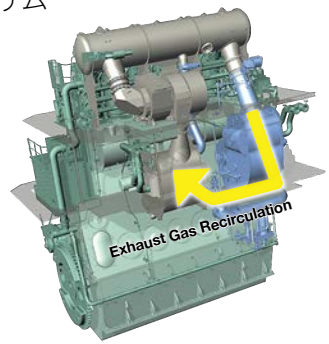
MITSUI E&S can provide a wide range of technologies that meet regulations for nitrogen oxides (NOx) and sulfur oxides (SOx).
We will propose the most suitable technology to meet your ship's needs.

EGR—排気再循環

Exhaust Gas Recirculation

経済性の高いNOx削減システム

Highly Economical NOx Reduction System



EGRは排ガスの一部を冷却・清浄した後、掃気レシーバへ再循環するシステムです。これにより掃気中の酸素含有量が低下して、熱容量が増大し、燃焼温度最高点が低下してNOx生成が低減されます。エンジン形式や過給機台数により、Bypass matchingまたはT/C cut-out matchingのいずれかの方式が適用されます。

Bypass Matching（EGRBP）
過給機1台、シリンダボア70cm以下のエンジン用

T/C Cut-out Matching（EGRTC）
過給機2台以上、シリンダボア80cm以上のエンジン用

In the EGR system, after a cooling and cleaning process, part of the exhaust gas is recirculated to the scavenging air receiver. This replacement decreases the oxygen content and increases the heat capacity of the scavenge air, thus reducing the temperature peak of the combustion and the formation of NOx. Two different methods; bypass matching or T/C cut-out matching are used for the EGR systems depending on the engine type or the number of turbocharger.

Bypass Matching (EGRBP)
1 turbocharger & engines with a cylinder bore size of 70cm or less

T/C Cut-out Matching (EGRTC)
2 or more turbochargers & engines with a cylinder bore size of 80cm or more

The blue part in the right figures shows the parts added by applying the EGR

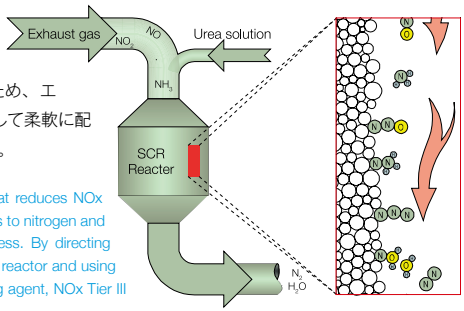
6G60ME-C9.5-**EGRBP**

7G80ME-C9.5-**EGRTC**

SCR—選択的触媒還元

Selective Catalytic Reduction

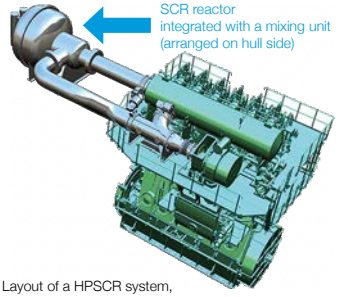
SCRは排ガスに含まれるNOxを窒素と水に還元し無害化する技術です。排ガスをSCR反応器へと導き、尿素水を還元剤とすることで、NOx Tier Ⅲ要件を満たします。SCRシステムには、高圧SCR（HPSCR）と低圧SCR（LPSCR）があります。HPSCRの反応器は過給機上流側に設置するため、エンジンの近くに配置されます。なお、SCR運転の間、使用する燃料の硫黄分を0.1%以下に制限する場合は、LPSCRを選択可能です。LPSCRは過給機出口後の排ガス管に接続されるため、エンジンからSCRを離して柔軟に配置することができます。



SCR is a technology that reduces NOx contained in exhaust gas to nitrogen and water to make it harmless. By directing exhaust gas to the SCR reactor and using urea water as a reducing agent, NOx Tier III requirements are met. SCR systems are available in high pressure SCR (HPSCR) and low pressure SCR (LPSCR). The HPSCR reactor is installed upstream of the turbocharger, so it is located close to the engine. However, if the sulfur content of the fuel used during SCR operation is limited to 0.1% or less, the LPSCR can be selected. The LPSCR is connected to the exhaust pipe after the turbocharger outlet, allowing for flexible placement of the SCR away from the engine.

注記 Note

- SCRシステムはエンジンと連携しますが、SCR系統はエンジン支給品ではありません。システムは弊社からの仕様に基づく必要があります。
- シリンダボア90cm以上の大形エンジンへの高圧SCRの適用については、弊社までお問い合わせください。
- Although SCR system is closely related to the engine, the SCR line is not included in Engine Builder's scope of supply. The system, however, must be based on our specifications.
- Please contact us for the applicability of HPSCR to large engines with a cylinder bore of 90 cm or more.



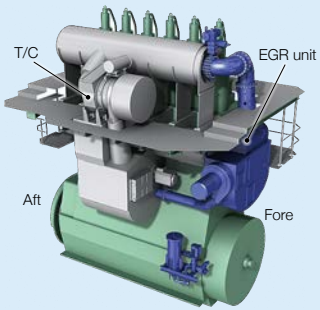
Layout of a HPSCR system,
as supplied by MAN Energy Solutions (MAN SCR-HP)

EGRユニット配置

EGR Unit Arrangement

EGR bypass matching適用エンジンの場合、エンジン上に装備するEGRユニット（プレスプレ、EGRクーラ、EGR用ミストキャッチャ）の配置はエンジン形式に依存します。各エンジン形式におけるEGRユニット配置は 次頁の表をご参照ください。

For engines with EGR bypass matching, the EGR unit (Pre-spray, EGR cooler and EGR mist catcher) arrangement depends on the engine type. Please refer to the next type for EGR arrangement for each engine type.



EGR unit arrangement at Fore end

Engine type		EGR matching	T/C arrangement	EGR unit arrangement
Cyl. bore	Concept			
80 or larger	ME-C	EcoEGR / EGRTC	Exhaust side	Exhaust side
70	ME-C	EcoEGR / EGRBP	Exhaust side	Exhaust side
G60	ME-C	EcoEGR / EGRBP	Exhaust side	Exhaust side *
S60	ME-C	EcoEGR / EGRBP	Exhaust side	Fore end *,**
50 - 45	ME-C	EcoEGR / EGRBP	Exhaust side	Fore end **
			Aft end	Fore end *,**

* EGRユニット配置の代替案については、弊社までお問い合わせください。
** EGR "舶端側" 配置の場合、2次バランサ（舶側モーメントコンペンセータ）は装備不可となりますのでご留意ください。
* Please contact us for alternative designs of EGR unit arrangement.
** For engines with EGR unit arrangement at the Fore end, it will not be possible to arrange moment compensators at the Fore end.

燃料消費率の最適化

Optimization of SFOC

最もよく利用する負荷領域での燃料消費率（SFOC）を低減する、船内での熱需要・電力需要に合わせる――など、お客様のニーズに合わせて燃料を効率よく活用するエンジン最適化方法をご提案します。

We propose engine optimization methods that utilize fuel efficiently in accordance with customer needs, such as “saving the specific fuel oil consumption (SFOC) in the load range most frequently used” and “adjusting to the heat and power demand on board”.

ニーズに応じた最適化

Optimization in Accordance with Customer Needs

Tier IIエンジンでは、最適化させる負荷範囲に応じて、下表の負荷範囲から選択することが可能です。部分負荷最適化（Part-load optimize）または低負荷最適化（Low-load optimize）を適用するためのチューニング方法は、以下の3つがあります。これらのチューニングにより、下のグラフのように部分負荷もしくは低負荷のSFOCは改善されますが、高負荷（High-load）でのSFOC悪化を伴います。

For Tier II engines, it is possible to select from the load ranges in the table below depending on the load range to be optimized. There are three tuning methods for applying part-load optimization or low-load optimization. These tuning methods improve SFOC at part-load or low-load as shown in the graph below, but they are accompanied by a deterioration of SFOC at high-load.

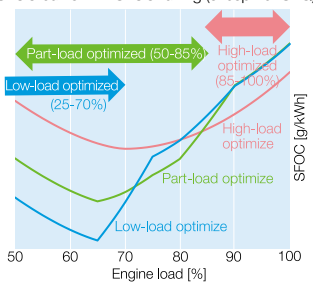
Optimized load range

High-load optimized	85 - 100% load (Standard tuned engine)
Part-load optimized	50 - 85% load
Low-load optimized	25 - 70% load

Tuning method

EGB	Exhaust Gas Bypass
EPT	Engine Process Tuning （only available on G95/G80/G60ME-C10.5）
SEQ	Sequential Tuning （Only available in low-load optimized and on G95ME-C10.6）

SFOC curve with SFOC tuning (except for SEQ)



EGB Option Exhaust Gas Bypass

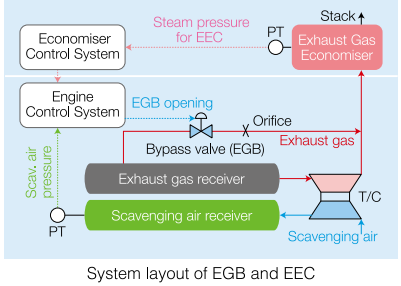
EGBでは、高効率・高圧力比の過給機を選定します。それにより、対象とする負荷領域での掃気圧・Pmax（シリンダ内最大燃焼圧力）を上昇させることが可能となり、SFOCが改善します。一方、高負荷域では過給機の過回転を防ぐために、排気レシーバ上に設置されたEGB弁を開いて排ガスを逃がします。EGB技術を導入時に、より柔軟に排ガス温度を調整する場合、Economiser Energy Control (EEC)を適用可能です。（オプション）


Bypass valve for EGB

For EGB, a turbocharger with high efficiency and high pressure ratio is selected. This makes it possible to increase the scavenging pressure and Pmax (maximum combustion pressure) in the target load range, thereby improving SFOC. On the other hand, in the high load range, the EGB valve installed on the exhaust receiver is opened to release exhaust gases in order to prevent overspeed of the turbocharger. When installing EGB technology, as an option the Economiser Energy Control (EEC) can be applied to adjust the exhaust gas temperature more flexibly.

EEC Option Economiser Energy Control

EECシステムはEGBシステム導入時に適用可能なEGB制御方法で、排ガスエコノマイザ（EGE）内のエネルギー（蒸気圧）を制御しています。EGE内の蒸気圧に応じて、最大一最小許容バイパスエリアの範囲内でEGB弁の開度を調整し、排ガス温度を最適化させます。例えば、開度を増大させる場合、エンジンのSFOCは悪化しますが、ボイラ側の追い焚き量を減らすことになり、船全体の運航コスト削減に貢献します。適用可否については、当社までお問い合わせください。



System layout of EGB and EEC

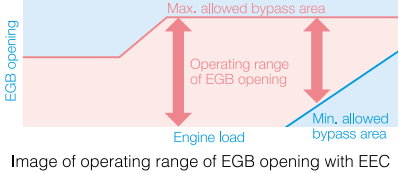


Image of operating range of EGB opening with EEC

The EEC system is an EGB control method which is applicable when EGB system is introduced, and controls the energy (steam pressure) in the exhaust gas economiser (EGE). The exhaust gas temperature will be optimized by adjusting the EGB valve position within the maximum and minimum allowable bypass area depending on the steam pressure in the EGE. For example, if the opening is increased, the engine's SFOC will worsen, but the amount of reheating on the boiler side will be reduced, contributing to reducing the ship's overall operating costs. Please contact us to find out whether it is applicable.

EPT Option Engine Process Tuning

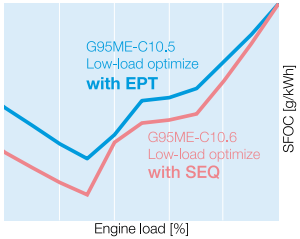
EPT（Engine Process Tuning）では高効率・高圧力比の過給機を選定します。それにより、対象とする 負荷領域での掃気圧・Pmax(シリンダ内最大燃焼圧力)を上昇させることが可能となり、SFOC が改善します。一方、高負荷域では過大な最大爆発圧力を防ぐために、排気弁の閉じるタイミングを遅らせます。G95ME-C10.5、G80ME-C10.5およびG60ME-C10.5形エンジンにのみに適用可能です。なお、より高い排ガス温度が必要な場合には、御要求に応じてEECの適用も可能です。

For EPT (Engine Process Tuning) a turbocharger with high efficiency and high pressure ratio is selected. This makes it possible to increase the scavenging pressure and Pmax (maximum combustion pressure) in the target load range, thereby improving SFOC. On the other hand, in the high load range, the timing of closing the exhaust valve is delayed to prevent excessive maximum combustion pressure. Only applicable to G95ME-C10.5, G80ME-C10.5 and G60ME-C10.5 engines. If a higher exhaust gas temperature is required, EEC can be applied upon request.

注記 Note
- 主管庁は運転モードを任意に移行することを認可していません。運航パターンが変わった際のモードの変更は、船籍国の代行機関（通常は船級）にそのことを報告し承認を受けた場合に許可されます。したがって長期的には、船主は1つのエンジンモードまたはそれ以外を選択できますが、主管庁に通知するという条件が付きます。
- これらのチューニング方法を適用すると、軸系捩り振動に影響を及ぼすことがありますので、弊社まで御相談ください。
- チューニング方法によっては過給機形式が変更となる可能性がありますので留意してください。
- Part-loadまたはLow-load optimizeを適用する場合、SFOC保証点を85%負荷未満とすることを推奨します。
- The authorities do not allow random shifting between the modes. A mode shift in case of a change in operating pattern is permitted if reported and approved by the flag state representative, usually a classification society. Hence, on a longer term basis, the owner can select one or the other of the modes for the engine, provided the authorities are informed.
- Applying these tuning methods may affect the torsional vibration aspect. Please contact us.
- The turbocharger type can be changed depending on engine tuning methods.
- When part-load or low-load optimized is applied, the SFOC guarantee point below 85% load is recommended.

SEQ Sequential Tuning

SEQはシーケンシャル燃料噴射※と過給機カット技術を用いたチューニング方法です。大小2種類の過給機を装備し、部分負荷域において小過給機をカットしSFOC改善を図ります。高負荷域ではシーケンシャル燃料噴射によってNOx排出率を低減し、NOx規制と部分負荷域の燃費率改善の両立を図ります。SEQはLow-load optimize かつG95ME-C10.6形エンジンにのみ適用されます。



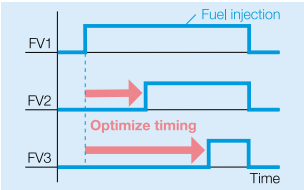
SFOC curve for Low-load, SEQ (vs EPT)

SEQ is a tuning method using sequential fuel injection* and turbocharger cutting technology. Equipped with two types of large and small turbochargers, the small turbocharger is cut in the part-load range to improve SFOC. On the other hand, in the high-load range, the NOx emission rate is reduced by sequential fuel injection, and both NOx regulation compliance and SFOC improvement in the part-load range are achieved. SEQ is available only with low-load optimized mode and only for G95ME-C10.6 type.

※シーケンシャル燃料噴射　Sequential fuel injection

従来エンジンでは、燃料噴射弁は全て同じタイミングで燃料噴射を行っております。シーケンシャル燃料噴射では燃料噴射弁毎に噴射タイミングを制御することによってNOx排出率を低減することができます。NOx排出率とSFOCはトレードオフの関係にありますので、高負荷でシーケンシャル燃料噴射を実施し、NOx排出率が低減した分、SFOCの改善代を得ることができ、NOx規制とSFOC低減の両立が可能となります。シーケンシャル燃料噴射の技術はG95ME-C10.6に加え、G80ME-C10.6, S60ME-C10.6, S50ME-C10.6形エンジンにも適用されます。

In conventional engines, all of fuel injection valves inject fuel at the same timing. In sequential fuel injection, the NOx emission rate can be reduced by controlling the injection timing for each fuel injection valve. Since there is a trade-off between the NOx emission rate and SFOC, it is possible to obtain a margin for improvement of SFOC by performing sequential fuel injection with a high-load and reducing the NOx emission rate. As a result, both NOx regulation and reduction of SFOC can be achieved. Sequential fuel injection technology is applied to G80ME-C10.6, S60ME-C10.6 and S50ME-C10.6 type engines in addition to G95ME-C10.6.



Concept of sequential fuel injection

各形式に適用可能なチューニング

Applicable Tuning Methods for Each Engine Type

Engine type	Applicable tuning method			
	EGB	EGB with EEC	EPT	SEQ
G95ME-C10.6				Applicable
G80ME-C10.6, S60ME-C10.6, S50ME-C10.6	Applicable	Applicable		
G95ME-C10.5, G80ME-C10.5, G60ME-C10.5		Applicable	Applicable	
ME-C engines with cyl. bore 50 cm or larger except for above 7 engine types*	Applicable	Applicable		

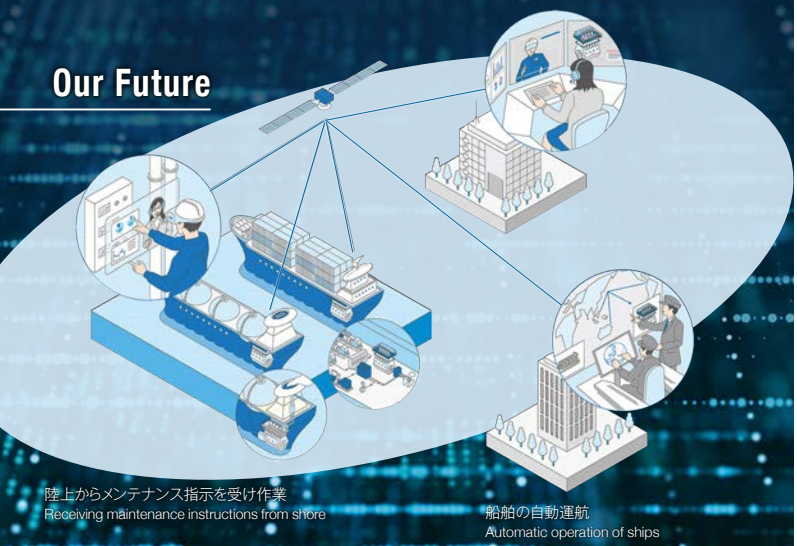
DX

Digital Transformation

脱炭素と並ぶ課題である「船舶のDX」にもぬかりはありません。
e-GICS Advance、CMAXS e-GICSXは各機器のセンサーデータを
自動で収集･診断。エンジン状態を把握することで、異常の兆候を察知します。

We have spared no efforts in our digital transformation (DX) of ships, which is an issue as important as decarbonization. e-GICS Advance and CMAXS e-GICSX automatically collect and diagnose sensor data from each device. By understanding the engine status, it can detect signs of abnormalities.

Our Future



e-GICS Advance
CMAXS e-GICSX

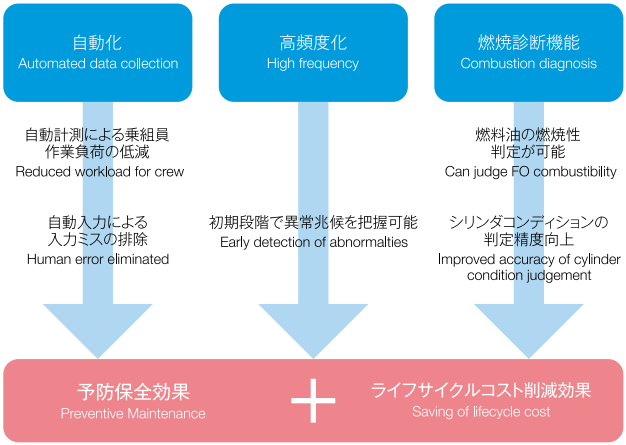
IoT/M2Mおよびビッグデータを活用した エンジン状態監視システム

Engine Monitoring System Using IoT/M2M and Big Data Analysis

e-GICS Advance、CMAXS e-GICSXは、自動収集したセンサデータを解析・診断し、船舶の推進エンジンの状態を把握するシステムです。これにより、エンジンの異常を兆候の段階で捉えることで予防保全を可能にします。船舶の航行に支障を来す重大な不具合を削減すると共に、ライフサイクルコスト低減にも貢献します。

e-GICS Advance and CMAXS e-GICSX are systems that monitor, analyze and diagnose the condition of a ship's propulsion engine by automatically collected sensor data. These systems enable preventive maintenance by detecting engine malfunctions at an early stage, thereby reducing serious malfunctions, that may hinder the ship's navigation, and contributing to the reduction of life cycle costs of ship.

特長 Features

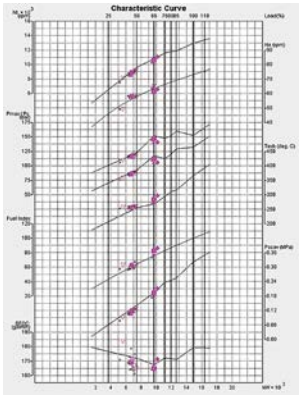


状態診断（性能診断＋燃焼診断＋AI異常検知）

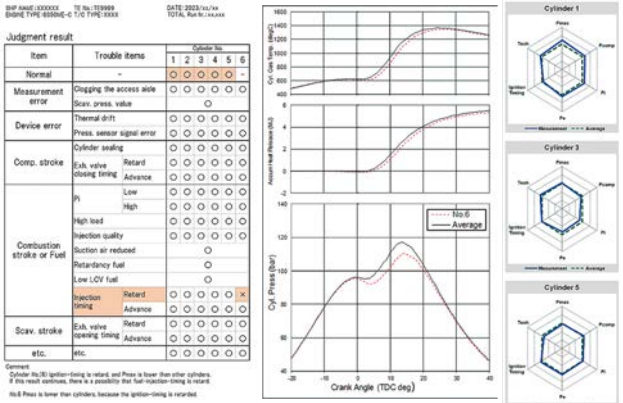
Condition Judgement (Performance Diagnosis, Combustion Diagnosis, AI Anomaly Detection)

エンジンに設置された複数のセンサデータと気象・海象の航海データ等を合わせたビックデータを、AIの機械学習と最新の解析技術を用いて解析・監視し、タイムリーで的確な異常検知を行います。更に、このAI異常検知結果を加味した性能診断結果と、燃焼診断結果を総合的に評価して、エンジンの状態を診断します。e-GICS AdvanceではAIを陸上サーバに配置して、異常検知精度を高めるモデルの更新をタイムリーに行います。CMAXS e-GICSXはAIを船上に配置してリアルタイムな異常検知を可能にしています。

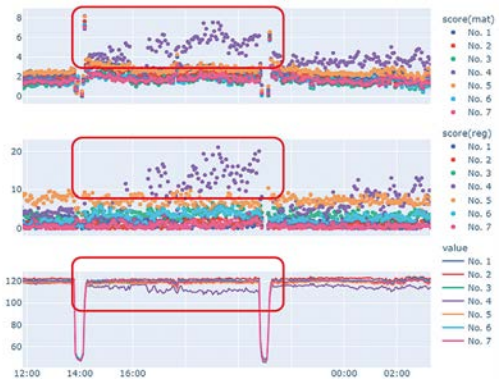
By adding information such as weather, sea conditions and other navigational data to multiple sensor data installed in the engine, and analyzing and monitoring the big data onboard using AI machine learning and the latest analysis technology, the system can detect anomalies in a timely and accurate manner. Furthermore, the system can accurately diagnose the condition of the engine by comprehensively evaluating the results of performance diagnosis that take into account the results of AI anomaly detection and the results of combustion diagnosis.
In e-GICS Advance, the AI is placed on a land-based server for timely model updates to improve the accuracy of anomaly detection, while in CMAXS e-GICSX, the AI is placed onboard to enable real-time anomaly detection.



Sample of Performance diagnosis results



Sample of Combustion diagnosis results



Sample of AI anomaly detection

データセキュリティ　Data Security

ポータル管理機能を用いた当社情報セキュリティーマネージメントシステムは、ISMS/ISO27001の認証を取得しています。

Our information security management system with portal management function is ISMS/ISO27001 certified.

IS 764113 / ISO27001

ダッシュボード Dashboard

エンジン制御システムから取得する運転データをダッシュボードに表示し、筒内圧、シリンダ注油設定などの運転状況を陸上から閲覧可能。トレンドグラフ表示もできます。

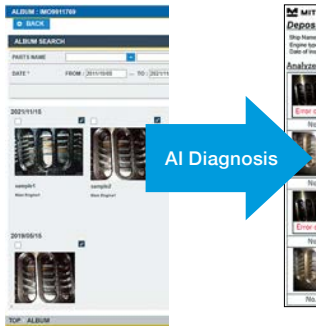
Operating data acquired from the engine control system, such as cylinder pressure and cylinder lubrication settings, can be checked on the Dashboard from land side, and also displays trend chart.

Sample of Dashboard screen

AIシリンダコンディション診断 Cylinder Condition Diagnosis by AI

従来、シリンダコンディションは統一基準での評価が困難であり、診断に熟練を要しましたが、AIによる診断が可能となりました。撮影した点検写真を船内でシステムにアップロードしてAI画像診断を行うことで、統一基準による短時間での自動評価・診断レポートが発行できます。

Evaluation of cylinder condition has been difficult to evaluate based on uniform standards and requires skilled workers. This function uses AI image diagnosis to automatically evaluate the condition based on uniform standards in a short time. It then issues a diagnosis report, by uploading inspection photos taken on-board the ship to the system and requesting a diagnosis.



Upload inspection photos

Sample of Cyl. condition diagnosis report

発展 Development

今後、e-GICS Advanceはリーズナブルなモニタリングシステムとして、AIシリンダコンディション診断をはじめとした更なる機能を付加しながら、様々なシステムとの連携を進めて利便性を向上していきます。CMAXS e-GICSXはハイエンドなモニタリングシステムとして、MESDUのCMAXS LC-Aとの統合、常時筒内圧解析や工学的診断手法の導入により予兆段階での状態悪化を把握し、予防保全率を大幅に向上します。状態悪化検知時の迅速な対処の支援として、推定理由の明示を含む最新の自動原因推定機能（XAI型トラブルシュート機能）が新たに追加されます。これらにより、更なる安全運航に貢献します。

e-GICS Advance, as a reasonable monitoring system, adds further functions such as AI cylinder condition diagnosis, while improving convenience by linking with various systems. As a high-end monitoring system, CMAXS e-GICSX is integrated with MESDU's CMAXS LC-A, and by introducing continuous cylinder pressure analysis and engineering diagnostic methods, it is possible to grasp deterioration at the pre-symptomatic stage, significantly improving the rate of preventive maintenance. In addition, to take prompt action when deterioration is detected, we will release the latest automatic root cause analysis function (XAI-type troubleshooting function) that also shows the estimated reason. These will contribute to further safe operation of ships.

BCM Option

Bearing Condition Monitoring System

摩耗・油中水分監視で事故防止

Monitoring Bearing Wear and Water in Oil

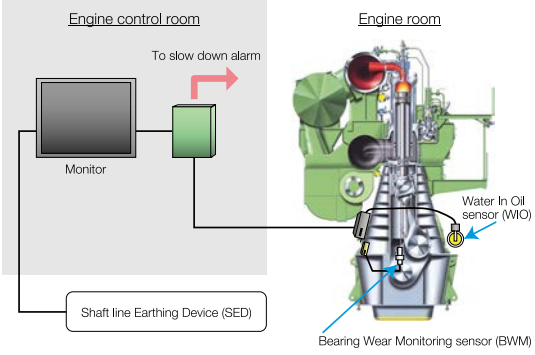
BCMは、クロスヘッド軸受、クランクピン軸受、主軸受の摩耗状態および油中水分を監視することで、クランク軸および上記軸受の重大事故の未然防止を図るシステムです。本システムは、ABS、BV、DNV、LRおよびNKの各船級協会の形式承認を取得しています。また、船級協会によっては、BCMを装備し、そのモニタ値が正常範囲にある間、軸受の解放点検間隔の延長や省略を認めています。BCMは次のシステムより構成されています。

- 軸受摩耗センサ（BWM）
- 油中水分センサ（WIO）
- 軸アース装置（SED）監視（追加オプション対応）

The Bearing Condition Monitoring system (BCM) can be optionally installed to prevent the severe damage of the crankshaft and the crank-train bearings (main, crankpin and crosshead bearings).

BCM is type approved by ABS, BV, DNV, LR and NK. Some of those classification societies have already approved an extension of interval or an omission of bearing overhaul while BCM indication is within the normal operation range. The BCM is composed of the following sub-systems.

- Bearing Wear Monitoring (BWM)
- Water In Oil monitoring (WIO)
- Monitoring of Shaft line Earthing Device (SED) (further option)



機関遠隔操縦装置 BMS-2000Ⅳ Option EMS-200Ⅳ

Engine Remote Control System

ME形エンジンをリモート操縦

Remote Control System for ME Engine

電子制御形舶用エンジン（ME形エンジン）のために開発された遠隔操縦装置です。ME制御装置と連携してエンジンの遠隔操縦を実現し、エンジンの保護機能、船橋・制御室・機側間のテレグラフ通信機能を持っています。
本システムは、各船級(ABS、BV、DNV、LR、NK)の型式承認、CEマーキングを取得しています。

The BMS-2000IV / EMS-200IV is a remote control system developed for electronically controlled marine engines (ME Engine). It works in close cooperation and conjunction with the ME control system to remotely control and protect the engine, and communicating between the bridge, the control room and the engine side by the telegraph system.
The systems are type-approved by ABS, BV, DNV, LR and NK also obtained CE-marking.

特長 Features

- W/H, C/Rに大型カラー液晶表示を採用
- 図面やトラブルシューティング手順表示を標準装備
- ABS、BV、DNV、LR、NKの型式承認を取得
- IACS UR E10 Rev.7に対応
- 船内制御室監視盤へ警報・表示内容を通信化（追加オプション対応）
- 制御室テレグラフ連動操縦を標準採用（BMS-2000Ⅳ）

- Adoption of large color LCD screens to W/H and C/R
- Drawings and troubleshooting procedures are provided as standard
- Type approved by ABS, BV, DNV, LR and NK
- Complies with IACS UR E10 Rev.7
- Alarms and display contents are communicated to the onboard control room monitoring panel (additional options available)
- The telegraph in control room is incorporated in speed control dial as standard on BMS-2000IV

システム構成 Composition of System

BMS-2000Ⅳは次の3つのシステムより構成されています。

■遠隔制御システム（RCS）
ME制御装置と連携して、エンジンの始動･停止･逆転等の制御を行います。

■機関保護システム（EPS）
エンジンを保護する安全装置です。

■テレグラフシステム（ETS）
船橋・制御室・機側間の通信を行います。

The BMS-2000IV is composed of the following three sub-systems.

- Remote Control System (RCS): Works together with the ME Control System (ME-ECS) to control the engine for starting, stopping or reversing.
- Engine Protecting System (EPS): Protects the engine from damage.
- Engine Telegraph System (ETS): Communicates between the bridge, the control room and the engine side through the telegraph lines.

本装置を製造する三井E&Sシステム技研株式会社は、機関遠隔操縦装置シリーズ累計4,500台以上の就航実績を有します。
Mitsui E&S Systems Research Inc., the manufacture for this system, has experience in adoption cumulative total more than 4500 units of Remote Control System series.

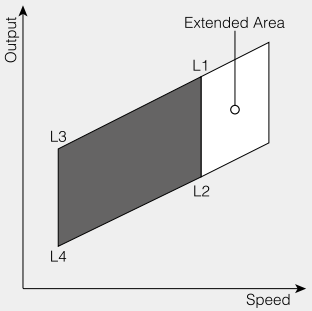
Mitsui E&S Systems Research Inc.

技術補足
TECHNICAL SUPPLEMENT

レイアウトダイアグラム
Layout Diagram

下図のL1、L2、L3、L4点で定義されるレイアウトダイアグラム内の任意の点をMCRとして選ぶことで、船舶の計画にあたって最適な出力および回転速度の組み合わせを得ることができます。各エンジン形式におけるレイアウト点(L1、L2、L3、L4点)の出力および回転速度については、諸元表をご参照ください。

Any MCR point can be chosen within the right layout area defined on L1, L2, L3 and L4 point to obtain an optimum point (combination of output and speed) for laying out the propeller, engine and ship. For engine output and speed of layout points (L1, L2, L3 and L4 point) in each engine type, please refer the page of each engine type.



レイアウトダイアグラムの拡張
Layout Diagram with Extended Area

S50ME-C8.5形エンジンは、御要求によりL1-L2回転速度を左下図のように増加させることが可能です（MEPは変更されません）。

S50ME-C8.5 with increased speed and unchanged MEP are available on request.

Engine type	L1-L2 speed [min-1]	L1 output [kW/cyl.]	L2 output [kW/cyl.]
S50ME-C8.5	127	1,660	1,330
S50ME-C8.5 with Extended Area	135	1,770	1,410

燃料消費率データについて
About SFOC data

三井-MAN B&Wエンジンの燃料消費率(燃費率)は、多くのエンジンにおいて連続常用出力(CSO)を燃費率保証点として設定いただいています。一方、近年ではEEDI規制による75%負荷の燃費 率や、減速運転が主流となったことによるCSO負荷よりも低い負荷における燃費率を注目されることが多くなっています。しかしながら、弊社から提出している各負荷の燃費率データは、それぞれの負荷を保証点として選択した場合の数値を示したものであり、トレランスは保証点として選択された負荷点のみ有効となります。従いまして、それらを連続的に繋げたカーブは、各プロジェクトのエンジンにおける低負荷から高負荷までの傾向を示すものではないことに留意してください。また、実運航を考慮し、CSO負荷ではない負荷の燃費率を重要視される場合は、その負荷を燃費率の保証点として設定することも可能です。

As for the guarantee of SFOC of the MITSUI-MAN B&W engine, the continuous normal output (CSO) is set as the SFOC guarantee point in many engines. On the other hand, in recent years, the SFOC at 75% load according to the EEDI regulation and the low load operation have become mainstream, so the SFOC at the load lower than the CSO load is often focused on.
However, the SFOC of each load submitted by us shows the numerical value when each load is selected as the guarantee point, and the tolerance is valid only for the load point selected as the guarantee point.
In addition, if the SFOC of a load that is not a CSO load is important in consideration of actual operation, that load can be set as a guarantee point of the SFOC.

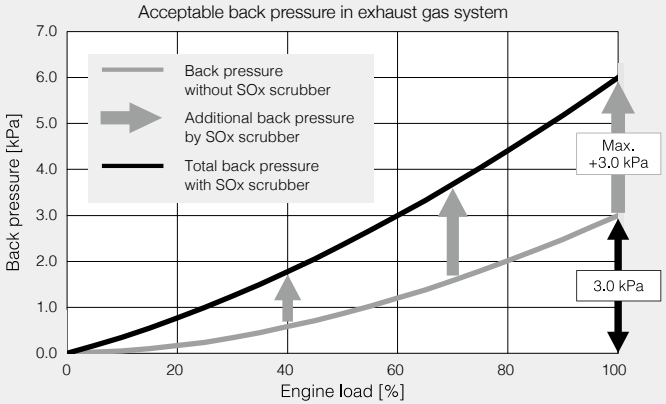
高硫黄燃料とSOxスクラバ適用
Application of High-Sulfur Fuels and SOx Scrubbers

本カタログに記載されている全てのエンジンに対してSOxスクラバを適用させることができます。SOxスクラバ設置は排気背圧の増大を招き、エンジン性能に影響を及ぼします。従って、SOxスクラバ設置による排気背圧の増大を100%負荷で3.0 kPa以内にする必要があります。

SOx scrubbers can be applied to all engines in this catalog. A SOx scrubber installation will increase the back pressure, thereby affecting engine performance. Accordingly, we require that a SOx scrubber installation does not increase the back pressure by more than 3.0 kPa at 100% load.

注記
・SOxスクラバを適用する場合、過給機の仕様を変更する必要があります（場合によっては過給機形式が変更となる可能性もあります）。SOxスクラバを搭載する場合は、弊社までご相談ください。
・EGRまたは高圧SCRを適用したTier IIIエンジンにおいて、NOx ECA内で高硫黄燃料油を使用する場合、EGR、高圧SCRシステムを高硫黄燃料仕様にする必要があります。EGRおよび高圧SCRについては86～87頁を参照下さい。

Note:
- In the case of applying SOx scrubbers, the specification of turbochargers must be changed. (In some cases, the turbocharger type can be changed) In the case of installing SOx scrubber, please contact us.
- For Tier III engines applying EGR or High-pressure SCR, in the case of using high-sulfur fuel in NOx ECA, high-sulfur EGR or SCR system are required. For EGR and high-pressure SCR, please refer pp.86-87.



アフターサービス

After-sales Service

納入後も機器をベストな状態に保ち、機能を最大限活用して運航コストを削減するお手伝いをいたします。技術サービスや部品供給はもちろん保守管理の専門研修や、就航船の燃費改善製品も提供します。

Even after delivery, we will help you keep your equipment in the best condition, maximize its functionality, and reduce operating costs.
In addition to technical service and parts supply, we also provide specialized training in maintenance management and products to improve fuel efficiency for ships in service.

研修プログラム Training Program

長年蓄積してきた技術と経験を生かし、2006年からエンジン保守管理技術の専門研修コースを開講しています。主機・過給機・リモコン・ガバナ等について、座学講義や、実習センターでの解放／組立のトレーニングを提供しています。

We have been offering specialized training courses in engine maintenance and management technology since 2006 based on the wealth of technology and experience we have accumulated over many years. We offer classroom lectures on main engines, turbochargers, remote controls, governors, etc., as well as at our practical courses at training center where we offer training on disassembly/assembly of engine components.

ME-GI基本コース：2日間
ME-GI Basic Course: 2 days

ME-GIエンジンの基礎知識を習得します。二元燃料切替えシーケンス等の制御システムの機能や基本操作、及びガス関連機械部品の整備/保守についての実習コースを含みます。

研修内容

- ME-GIエンジンの一般説明
- ME-GIエンジンの構造、機能の詳細説明
- シミュレータによるMOP基本操作
  （二元燃料切り替えシーケンス説明等）
- ガス気密テスト、及びガス漏洩検知方法
- ガス噴射弁、ウィンドウ弁、パージ弁、ブローオフ弁の解放整備

This course provides basic knowledge of the ME-GI engine. It includes practical courses on control system functions and basic operation, such as dual fuel change-over sequence, as well as maintenance of gas injection parts.

Contents
- General introduction of ME-GI engine
- Details of ME-GI component and working function
- Basic operation of MOP (Change over sequence etc.) by simulator
- Practical training for gas tightness test & gas leak test
- Overhauling for fuel gas valve, window valve, Purge/blow off valve etc.

EGR基本コース：0.5日間
EGR Basic Course: 0.5 days

EGRの基礎知識を習得します。EGR運転シーケンス等の制御システムの機能や基本操作及びEGRユニット、水処理装置の整備保守について、説明します。

研修内容

- EGRの一般説明
- EGR機器の構造、機能の詳細説明
- シミュレータによるMOP基本操作
  （EGR運転シーケンス説明等）
- 掃気エア酸素センサ(OSU)、RTUのpHセンサ校正実習

This course provides basic knowledge of EGR. It includes explanations of the functions and basic operations of the control system, such as the EGR operation sequence, as well as the maintenance of the EGR unit and Water Treatment System.

Contents
- General introduction of EGR
- Details of EGR component and working function
- Basic operation of MOP (EGR operation sequence etc.) by simulator
- Calibration practice for sensor of Oxygen Sensor Unit and pH sensor of RTU

就航船の燃費改善

Providing Fuel-Saving Products to in Service Vessel

経験豊富な当社のエンジニアチームが、お客様のご質問・ご相談にすぐにお応えし、燃料効率の向上、環境保護、そして安全な航行のためのソリューションを提供いたします。代表的な燃費改善・燃費悪化抑制製品には以下のようなものがあります。

Our experienced and knowledgeable team of engineers is ready to answer your questions and provide solutions to improve fuel efficiency, protect the environment, and ensure safe navigation etc. Typical products that improve fuel efficiency or reduce fuel deterioration are as follows.

電気VIT

Electronic control VIT system (E-VIT)

機械式VITをI/P Convertorに換装することで噴射タイミングを最適化。エンジン75%負荷以下の筒内圧を上昇させることで、燃費改善が期待できます。

By replacing the mechanical VIT with an I/P Converter, fuel efficiency can be improved by optimizing the injection timing and increasing the cylinder pressure below 75% load of the main engine.

エコカム

EcoCam system

排気弁側面に電磁弁を増設し、排気弁の開閉に使う油圧を制御します。エンジン60%負荷以下の筒内圧を上昇させることで、燃費改善が期待できます。

By adding a solenoid valve to the exhaust valve and controlling the hydraulic pressure used to open and close the exhaust valve, the EcoCam system increases the cylinder pressure below 60% load of the main engine, which is expected to improve fuel efficiency.

ディレーティング

Derating

主機の圧縮比、カムタイミング変更と過給機の仕様変更等でMCOを再設定します。低負荷域のエンジン性能の最適化をすることで、燃費改善が期待出来ます。

Fuel efficiency can be improved by optimizing engine performance in the low load range by resetting the MCO, changing the compression ratio of the main engine, changing the cam timing, and changing the specifications of the supercharger.

船橋操縦装置の更新

Up-grading of Bridge Maneuvering System

Rough Sea Auto Speed Reduction（ASR）や Auto Engine Load Control（ALC）で、荒天時に自動減速したり、エンジンの負荷を一定にして燃費を抑制します。

Rough Sea Auto Speed Reduction (ASR) and Auto Engine Load Control (ALC) provide automatic deceleration in rough seas and constant load on the main engine to reduce fuel consumption.

部品販売 & 技術サービス

Parts Supply and Technical Services

三井E&Sグループは世界のトップメーカーとして、数多くの舶用エンジンを製造してきました。長年蓄積してきたノウハウを基に、迅速かつ高品質な技術サービスを提供しています。多種多様な主機・過給機を製造している利点を生かし、充実した体制による豊富な品揃え、短納期での部品供給サービスなどを、常に最高の技術レベルで提供しています。

部品販売

- 主機部品
- T/C部品
- リモコン及びガバナ製品
- 主機周りの設備·機器

技術サービス

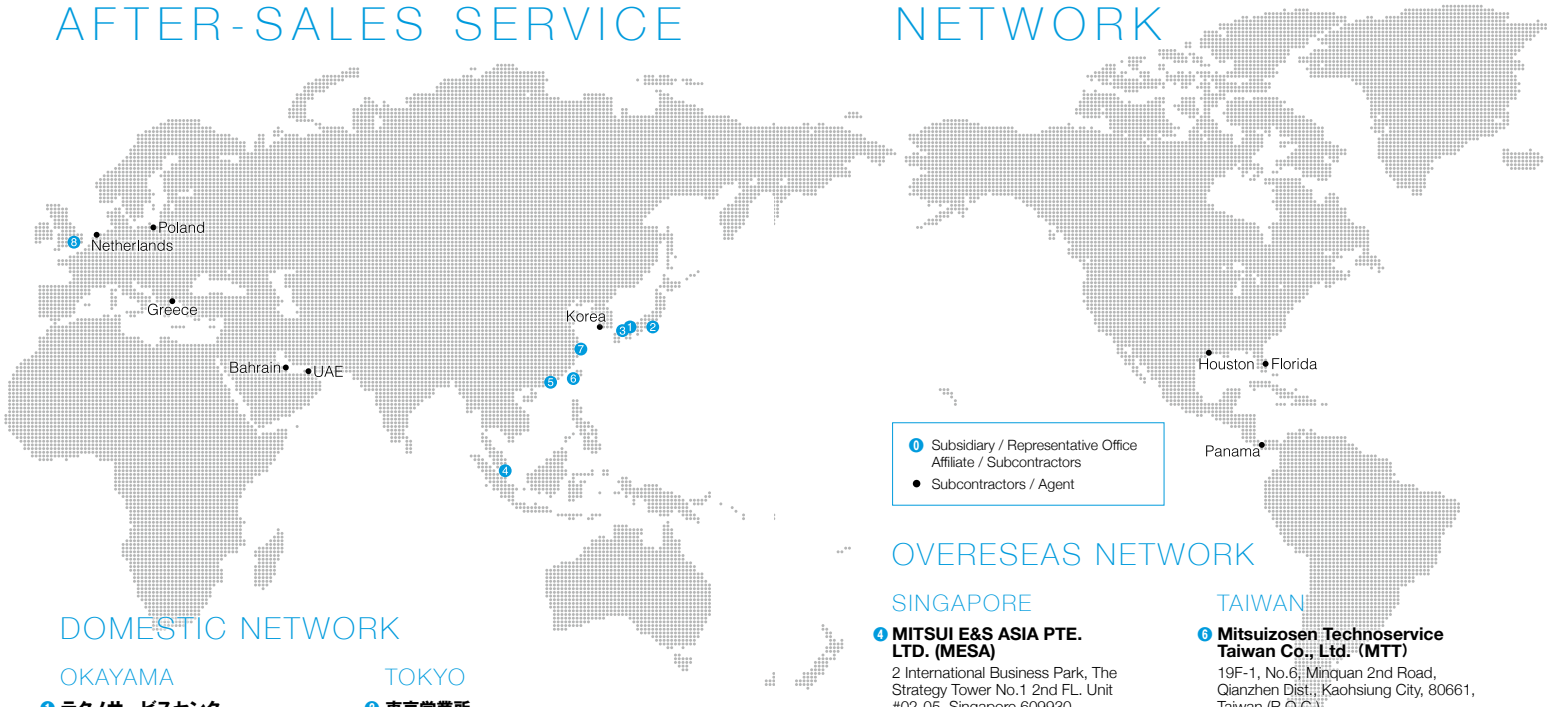
- 技術調査
- 整備·リコンディション
- 修理
- トラブルシュート
- エンジンの状態改善

MITSUI E&S Group have produced a large number of marine engines. We provide quick, high-quality technical services based on our accumulated experience. Over the years we have produced a variety of main engines and turbochargers, allowing us to draw on this experience to provide the highest level of service at all times, including our parts supply with short delivery lead times based on a system that is prepared for anything and keeps ample parts in stock.

Parts Supply
- Main engine parts
- Turbo charger parts
- Remote control & Governor parts
- Facilities and equipment around the main engine

Technical Services
- Technical survey
- Maintenance & recondition
- Trouble shoot
- Improvement engine condition

AFTER-SALES SERVICE NETWORK



DOMESTIC NETWORK

OKAYAMA

❶ テクノサービスセンター

Technoservice Center

〒706-8651
岡山県玉野市玉3-1-1

3-1-1, Tama, Tamano, Okayama, 706-8651, Japan

営業グループ Sales Group
Tel: +81-863-23-2581
Fax: +81-863-23-2085
E-mail: techdesa@mes.co.jp

技術グループ Technical Group
Tel: +81-863-23-2385
Fax: +81-863-23-2349
E-mail: tech_de@mes.co.jp

TOKYO

❷ 東京営業所

Tokyo Office

〒104-8439
東京都中央区築地5-6-4
浜離宮三井ビルディング11階

5-6-4 Tsukiji, Chuo-ku, Tokyo, 104-8439, Japan

Tel: +81-3-3544-3421
Fax: +81-3-3544-3055
E-mail: techdesa@mes.co.jp

HIROSHIMA

❸ 株式会社アヅママシナリー

AZUMA MACHINERY CO., LTD

〒722-0212
広島県尾道市美ノ郷町本郷1-155
（株式会社東化工 尾道事業所 構内）

1-155, Hongo, Minogocho, Onomichi, Hiroshima 722-0212, Japan

Tel: +81-848-38-2770
Fax: +81-848-38-2771

OVERESEAS NETWORK

SINGAPORE

❹ MITSUI E&S ASIA PTE. LTD. (MESA)

2 International Business Park, The Strategy Tower No.1 2nd FL. Unit #02-05, Singapore 609930

Tel: +65-6777-1677
Fax: +65-6773-3677
E-mail: sales@mesasia.com.sg

HONG KONG

❺ Mitsuizosen Technoservice Hongkong Limited (MTH)

Unit Nos.3117-3122, Level31, Metro Plaza Tower1, 223, Hing Fong Road, Kwai Fong, New Territories, Hong Kong

Tel: +852-2610-1282
Fax: +852-2610-1220
E-mail: engine@mthhk.com.hk

EUROPE

❽ MITSUI E&S Machinery Europe Limited (MEL)

80 Coleman Street, London, EC2R 5BJ, United Kingdom

Tel: +44-20-7104-2280
Fax: +44-20-7104-2279

TAIWAN

❻ Mitsuizosen Technoservice Taiwan Co., Ltd.（MTT）

19F-1, No.6, Minquan 2nd Road, Qianzhen Dist., Kaohsiung City, 80661, Taiwan (R.O.C.)

Tel: +886-7-331-2801
Fax: +886-7-332-2218
E-mail: sales@mesmtt.com.tw

CHINA - SHANGHAI

❼ MES TECHNOSERVICE (SHANGHAI) CO., LTD.（MTC）

Room2205, Yuexiu Tower No.388 Fushan Road, Pudong, Shanghai Postcode:200122

Tel: +86-21-5821-0630
Fax: +86-21-5821-0639
E-mail: mestech-sh@mtc-sh.com

CONTACT

本社
Head Office
〒104-8439 東京都中央区築地5-6-4
6-4, Tsukiji 5-chome, Chuo-ku, Tokyo, 104-8439, Japan

岡山営業所
Okayama Sales Office
〒700-0903 岡山市北区幸町8-29 大樹生命ビル14階
8-29, Saiwai-cho, Kita-ku, Okayama, 700-0903, Japan

玉野工場
Tamano Factory
〒706-8651 岡山県玉野市玉3-1-1
1-1, Tama 3-chome, Tamano, Okayama, 706-8651, Japan

SALES DEPT.

本社
Head Office.
Marine Propulsion Systems Sales Dept.
Tel: +81-3-3544-3475
Fax: +81-3-3544-3055
E-mail: meshp_diesel@mes.co.jp

岡山営業所
Okayama Sales Office
Tel: +81-86-233-4131
Fax: +81-86-225-4570

玉野業務グループ
Tamano Office
Tel: +81-863-23-2502
Fax: +81-863-23-2770

TECHNICAL

エンジン設計部
Engine Design Dept.
Tel: +81-863-23-2530
Fax: +81-863-23-2769
E-mail: diesel_project@mes.co.jp

玉野工場 品質保証部
技術調査グループ
Tamano Factory, Quality Assurance Dept.
Technical Investigation Group
Tel: +81-863-23-2534
Fax: +81-863-23-2772
E-mail: demail@mes.co.jp

OVERSEAS

Mitsui E&S (CHINA) CO., LTD.
Room 2512, Shanghai International Trade Centre 2201, Yan An Road (West),Shanghai 200336 China
Tel: +86-21-6208-9201
Fax: +86-21-6208-9601

LICENSEES

株式会社マキタ Makita Corporation

本社
Head Office
〒760-0065
香川県高松市朝日町4-1-1
Asahi-machi 4-1-1, Takamatsu, Kagawa, 760-0065, Japan
Tel: +81-87-821-5501
Fax: +81-87-821-5510

東京事業所
Tokyo Office
〒105-0004
東京都港区新橋5-23-7 三栄ビル5階
Sanei-Bldg 5F, Shimbashi 5-23-7, Minato-ku, Tokyo 105-0004, Japan
Tel: +81-3-6430-9393
Fax: +81-3-6430-9391

累計生産 1億1千万馬力への歩み

三井-MAN B&Wエンジン

MITSUI-MAN B&W Engine History of 110 million Horsepower Production

三井E&Sは、国内企業として初めて単一ブランドの舶用2ストロークエンジン生産「累計1億1000万馬力」を達成しました。1928年の1号機以来90年を超えるご愛顧に感謝し、世界トップメーカーとしての責任を今後も果たしてまいります。

MITSUI E&S is the first Japanese company to achieve single-brand marine two-stroke engine production "total 110 million horsepower." We thank you for your patronage for over 90 years since the first engine in 1928, and will continue to fulfill our responsibilities as the world's top manufacturer.

110 mil hp production
1億1千万馬力達成

2018

2015

80 mil hp production(2012)

二元燃料エンジンの連続製造
Continuous production of dual fuel engine utilizing methanol, LNG and ethane

50 mil hp production(2005)

Tier III EGR適用1番機
1st Tier III engine with EGR

2004

初の電子制御エンジン
1st MITSUI-MAN B&W electronically controlled engine

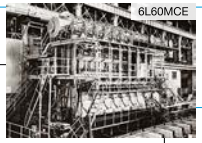
1997

World's 1st S-MC-C type engine

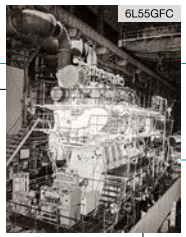
世界初S-MC-C形

1983

MC形エンジン1番機
1st MC type engine



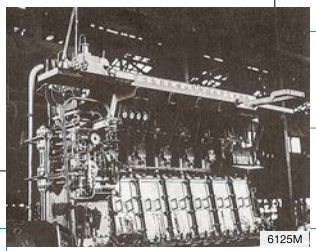
静圧過給方式導入
Introducing constant pressure turbocharging



10 mil hp production(1976)

1978

三井-B&Wエンジン **1号機**
1st MITSUI-B&W engine



Japan's 1st engine with turbocharger

日本初の過給機付

1928 1953 1960 1970 1980 1990 2000 2010 2020

← Check out the video of engine assembly process!

2024

MITSUI E&S