← Check out the video of engine assembly process!

2023

MITSUI E&S

MITSUI-MAN B&W MARINE TWO-STROKE ENGINE ME Program 2023

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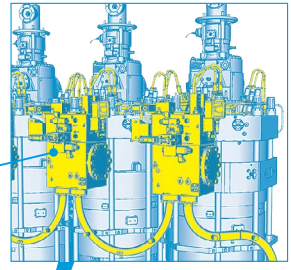
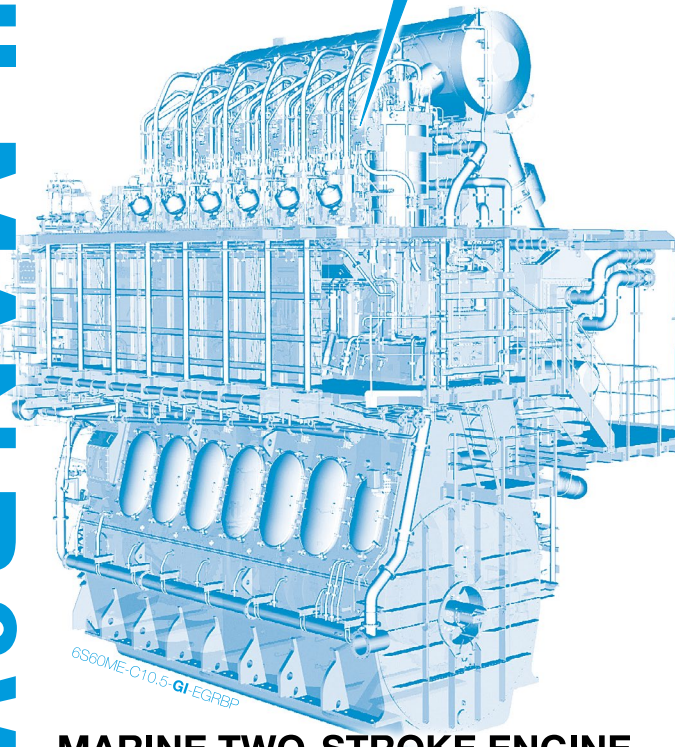


ME-GI Component



MARINE TWO-STROKE ENGINE

ME Program 2023

MITSUI E&S Co., Ltd.

https://www.mes.co.jp/

Engineering & Services for Evolution & Sustainability

2023年4月、純粋持株会社体制を解消し、株式会社三井E&Sマシナリーから 株式会社三井E&S に社名を変更しました。新生 三井E&Sとして強く生まれ変わり、成長していく企業へ

In April 2023, we ceased to be a pure holding company and changed the company name from Mitsui E&S Machinery to MITSUI E&S Co., Ltd. We will make a fresh start as MITSUI E&S towards our evolution into a growing company.

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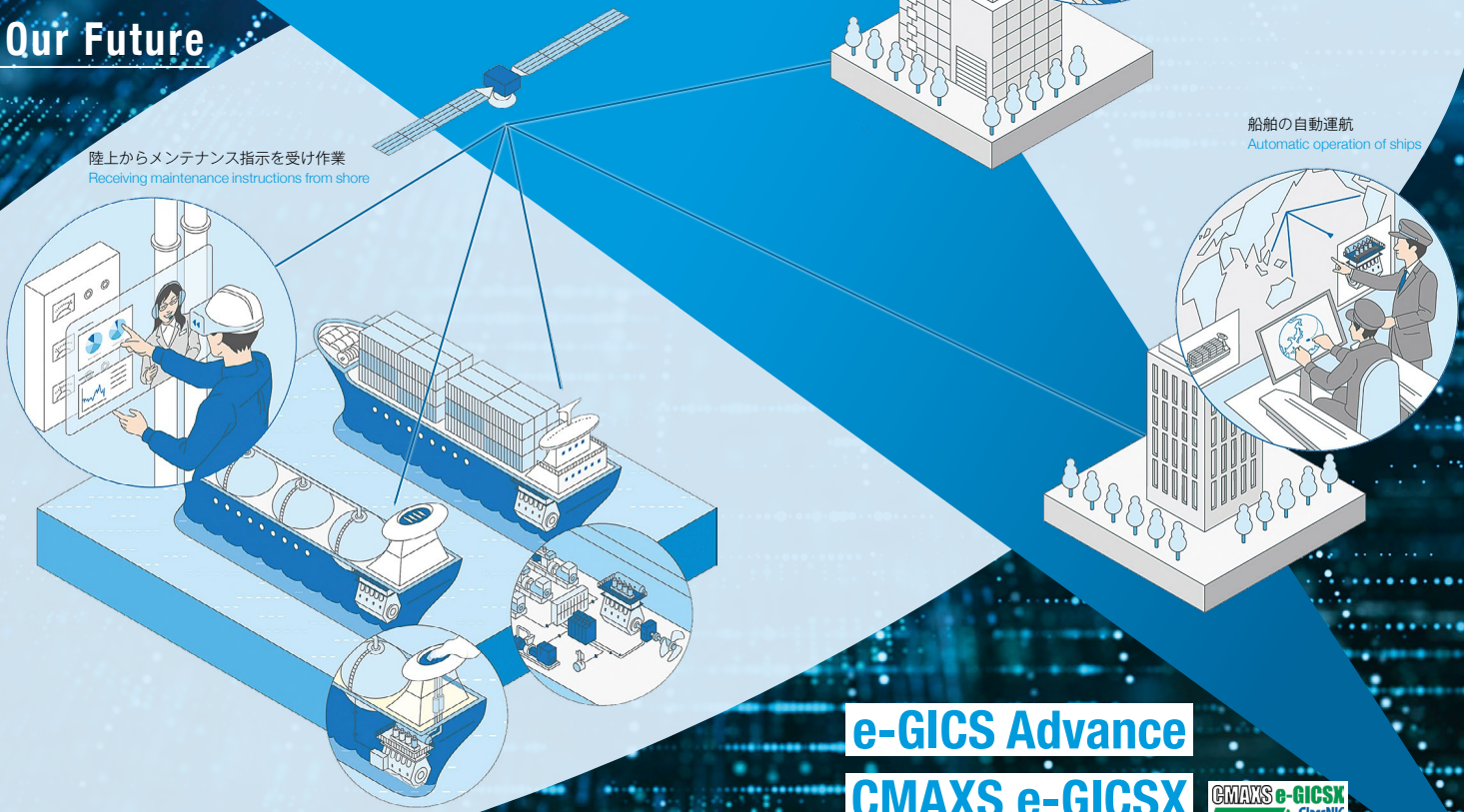
IoT/M2M

Preventive Maintenance
Using IoT/M2M and Big Data

ビッグデータによる予防保全

Our Future



e-GICS Advance

CMAXS e-GICSX

CMAXS e-GICSX ClassNK

e-GICS Advance

CMAXS e-GICSX

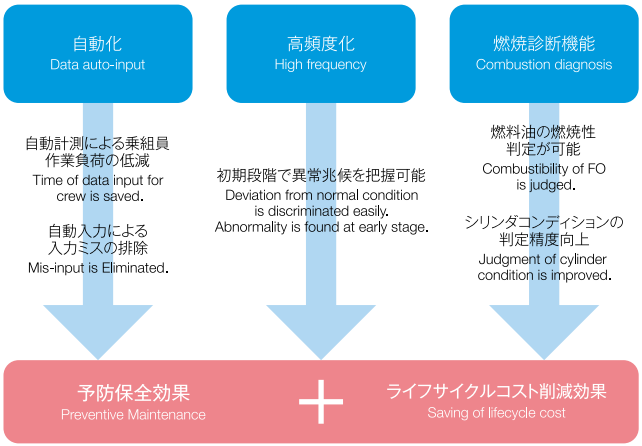
IoT/M2M及びビッグデータを活用した機関状態監視システム

Engine Monitoring System by Utilizing IoT/M2M and Big Data Analysis

e-GICS Advance、CMAXS e-GICSXは、船舶の推進機関の状態を、自動収集したセンサデータをモニタリングしながら解析・診断することで把握するシステムです。これにより、機関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、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 system that monitors, analyzes and diagnoses the condition of a ship's propulsion engine by automatically collected sensor data. These systems enables 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

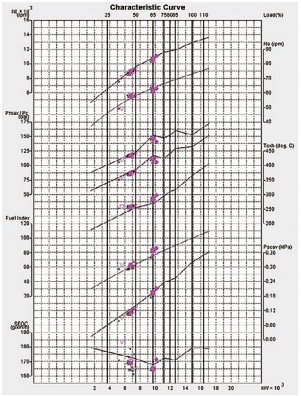


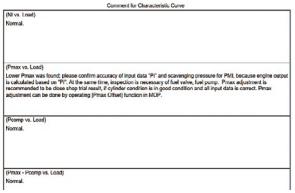
性能診断（性能診断＋燃焼診断＋AI異常検知）

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

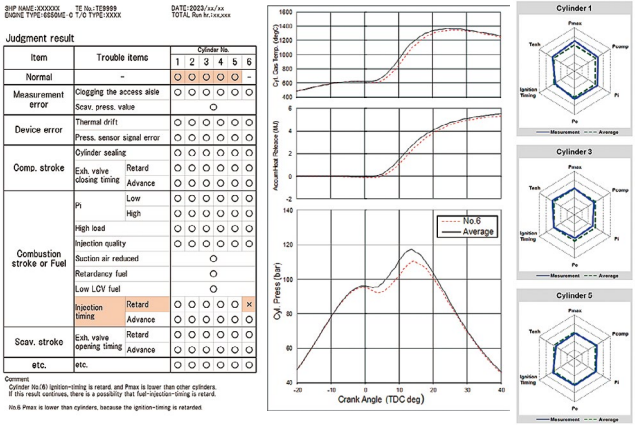
機関に設置された複数のセンサデータに気象・海象等の航海データ等の情報を加え、そのビッグデータをAIの機械学習と最新の解析技術を用いて解析・監視することで、タイムリーに的確な異常検知を行います。更に、このAI異常検知結果を加味した性能診断結果と、燃焼診断結果を総合的に評価することで、機関の状態を的確に診断します。
e-GICS AdvanceではAIを陸上サーバに配置して、異常検知精度を高めるモデルの更新をタイムリーに行い、CMAXS e-GICSXはAIを船上に配置してリアルタイムの異常検知を可能にしています。

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.

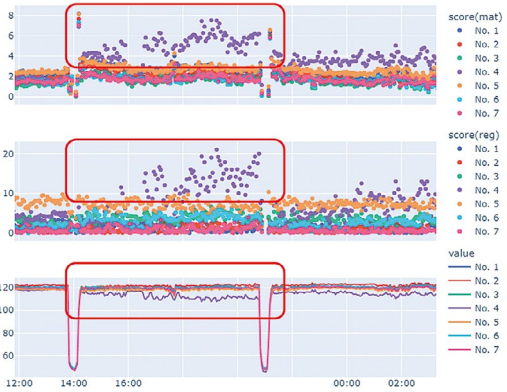




Sample of Performance diagnosis results



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の認証を取得しております。

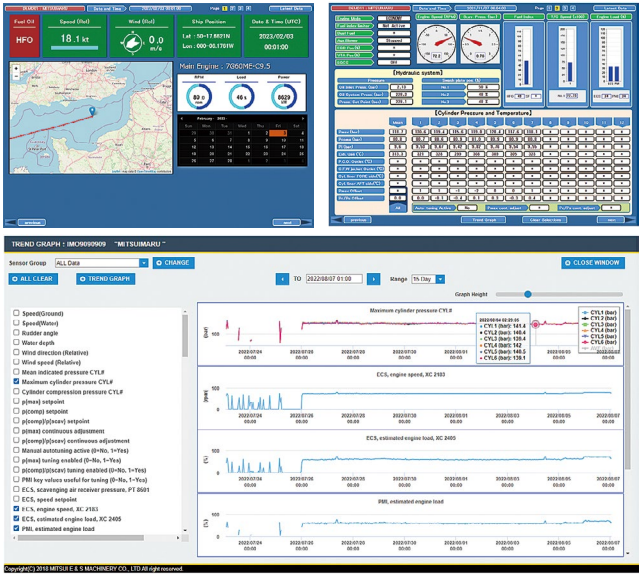
Our information security management system with portal management function is ISMS/ISO27001 certified.

IoT/M2M
ビッグデータによる予防保全
Preventive Maintenance Using IoT/M2M and Big Data

ダッシュボード Dashboard

機関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上に表示し、筒内圧、シリンダ注油設定など本船の運転状況を陸上から閲覧可能となっており、トレンドグラフ表示も可能となっています。

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.

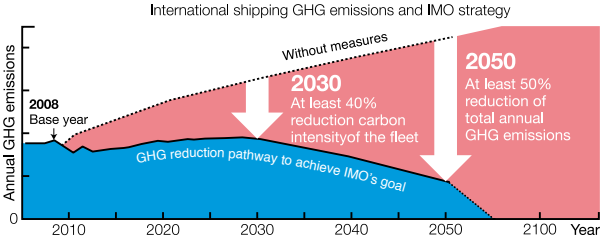


Sample of Dashboard screen

発展 Development

e-GICS Advance、CMAXS e-GICSXは、船舶安全運航に貢献するソリューションのプラットフォームとして、CBM（Condition Based Maintenance）スキームに必要な保全管理システムを装備してCBMの導入をサポートし、更に、予備品管理や運航サポートなど様々なサービスへの発展を進めていきます。

e-GICS Advance, CMAXS e-GICSX, as a solution platform that contributes to safe ship operation, is equipped with the maintenance management system required for the CBM (Condition Based Maintenance) scheme and supports the introduction of CBM. In addition, various services will be continued to develop such as spare parts management and operation support.



「GHG排出ゼロ」船 2030年投入も

気温上昇を2°C未満に抑えるというパリ協定に
基づき採択されたIMOの温室効果ガス(GHG)削減戦略は、
2030年までに燃費効率を40%改善し、
2050年までに海運全体のGHG排出量を半減させる
としています。船の寿命を考えれば、
2030年には実質的なゼロエミッション船の投入を
開始する必要があると言われています。
2023年1月より、新造船だけでなく既存船への規制
も開始されたため、早い段階でGHG削減を見す
えた機関選定を行うことが重要です。

GHG Zero Emission Ship Introduced by 2030

The IMO's GHG reduction strategy, adopted under the Paris Agreement to keep the temperature rise below 2 °C, requires 40% improvement in fuel efficiency by 2030 and halves GHG emissions by 2050. Considering the life of the ship, it is said that the introduction of the virtually zero emission vessels must begin by 2030. From January 2023, in order to ensure the effectiveness of the reduction, regulations started to apply to existing ships as well as new ships, and selecting the engine which can reduce GHG at an early stage is important.

GHG削減

GHG Reduction

Our Solution

二元燃料機関 ▶ p.85

Dual Fuel Engine

メタンやエタンといった燃料ガスやメタノール、LPGなどの低引火点燃料を使用可能な二元燃料機関は、大幅に温室効果ガス排出を削減できます。燃料油のみでの運転も可能であり、ディーゼルサイクルが採用される高圧のME-GI/LGI機関では、燃料油運転時も重油焚き機関と同等の高効率運転が可能です。

The dual fuel engines can use fuel gas such as methane and ethane or low flashpoint fuel such as methanol and LPG, which can significantly reduce GHG. In addition, operation by fuel oil only is available and the high-pressure ME-GI/LGI engine applying diesel cycle can operate with the same high efficiency as the fuel oil burning engine even during fuel oil operation.

THS2 ▶ p.83

排ガスの余剰エネルギーを油圧動力として回収し、それを機関内で使用することにより、最大2%燃費を削減し、EEDI改善に貢献します。

By recovering the surplus exhaust gas energy as hydraulic power and using it in the engine, fuel consumption can be reduced by max. 2%, thereby contributing to EEDI improvement.

アンモニア焚き二元燃料機関 ▶ p.87

Ammonia Burning Dual Fuel Engine

アンモニア焚きの二元燃料機関を開発中です。アンモニア燃料は炭素分を含まないので、GHG排出ゼロを実現するための技術として有望視されています。

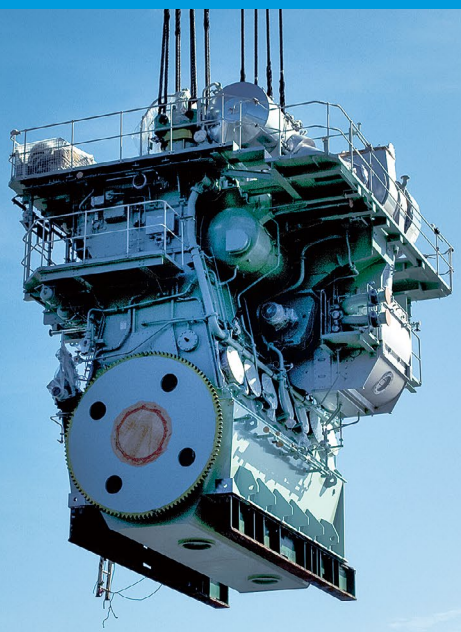
Ammonia burning dual fuel engines are under development. Ammonia fuel does not contain carbon, so it is regarded as a promising technology for achieving zero GHG emissions.

EcoEGR ▶ p.79

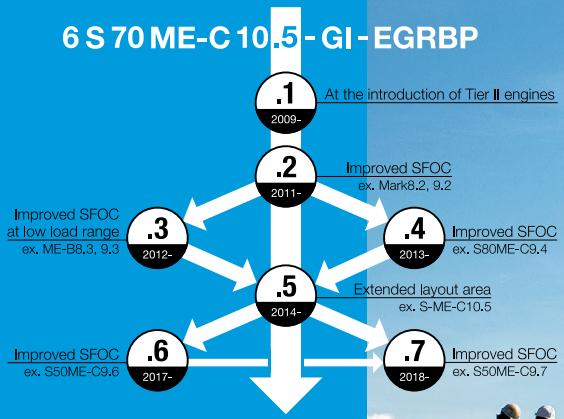
機関チューニングにおいて、NOx削減と燃費とはトレードオフの関係にあり、従来のNOx削減は燃費の悪化を招いてきました。しかし、EcoEGR機関では従来停止していたNOx一般海域でもEGRを用いるというチューニングを行うことで、NOx削減と燃費改善を同時に実現しています。

In engine tuning, NOx reduction and fuel consumption are in a trade-off relationship. Therefore, conventional NOx reduction has led to a worsening fuel consumption. However, for the engine with EcoEGR, NOx reduction and fuel consumption improvement can be realized simultaneously by tuning with EGR in NOx global area where EGR is stopped for the conventional EGR engines.

製品ラインナップ
PRODUCT LINEUP



ドットナンバーの変遷 History of .(dot) Number



機関形式命名規則
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 / GA	Gas injection / gas admission methane
GIE	Gas injection ethane
LGIM	Liquid gas injection methanol
LGIP	Liquid gas injection LPG

Dot (.) number

Mark number

Concept

ME-C	Electronically controlled
ME-B	Exhaust valve controlled by camshaft

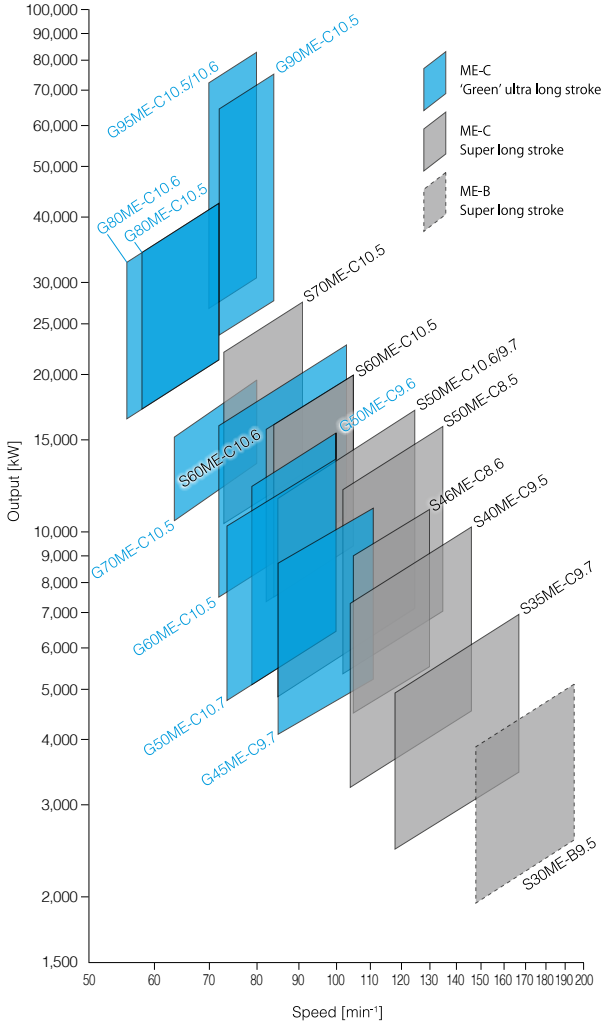
Diameter of piston in cm

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 (for Fuel Oil Engines)



ME形機関 The ME Program

「燃費の削減」「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形機関です。弊社が提供する機関はすべてME形機関です。ME-C形機関とME-B形機関とでは、下記のように電子制御部分が異なります。

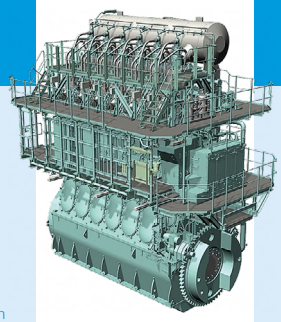
ME type engines can realize higher level of "reduction of fuel consumption", "reduction of NOx emissions", "optimization at part load" and "reduction of cylinder oil consumption" by a electronically precise control. The engines supplied by us are all ME type engines. The electronically control parts are different between ME-C type engine and ME-B type engine as follows.

各形式の電子制御項目
Electronically Controlled Item

ME-C

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



ME-B

燃料噴射
排気弁
(高負荷域のみ)
シリンダ注油

Fuel Injection
Exhaust Valves
(at high-load range)
Cylinder Lubrication

機関出力 Engine Output

本カタログに記載している機関出力は 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。各機関の諸元表に記載している機関出力は、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 output stated in the tables is available up to tropical conditions at sea level, i.e.:

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は、下記の条件によるものです。
The SFOC figures stated in this catalog are based on the following condition.

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
燃料油低発熱量（LCV）Fuel oil lower caloric value (LCV)	42,700 kJ/kg
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

GI形、GA形、LGI形機関における使用燃料の低発熱量は次のとおりです。
The LCV figures of fuel utilized for GI type, GA type and LGI type engines are as follows.

燃料の種類 Fuel type	Fuel designation	低発熱量 LCV [kJ/kg]
メタン Methane	-GI / -GA	50,000
エタン Ethane	-GIE	47,500
メタノール Methanol	-LGIM	19,900
LPG	-LGIP	46,000

50%～100%の範囲の負荷点でSFOC保証点を選択可能です。SFOC保証のトレランスは次のとおりです。
We offer the option of selecting the SFOC guarantee at a load point in the range between 50% and 100%. SFOC guarantee tolerances are as follows:

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ることに留意してください。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. Available operating modes are as follows.

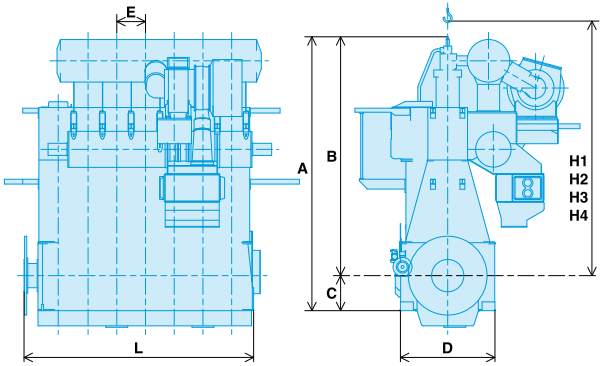
Available operating mode for SFOC guarantee

IMO NOx	二元燃料機関 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。
* Specific fuel consumption at dual fuel mode can be guaranteed by the sum of specific pilot oil consumption and specific gas/LFL fuel consumption; specific gas / LFL fuel consumption is converted by lower calorific value of pilot oil.

主要寸法・乾燥質量

Main Dimensions and Dry Masses

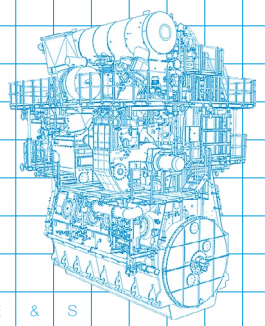


本カタログに記載している機関の主要寸法[mm]は、ガイダンス寸法です。解放高さ寸法は下記になります。

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機関の機関質量は、機関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。機関質量は、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 stated 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, with using MAN Energy Solutions SE double-jib crane
H4: vertical lift, with 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.



主機関ラインナップ一覧

Engine Lineup List

主機関形式 Engine type	燃料種別 Fuel type					
	重油 Fuel Oil	**メタン／LNG** Methane / LNG		**メタノール** Methanol	**LPG**	**エタン** Ethane
	-	GI	GA	LGIM	LGIP	GIE
G95ME-C10.6	p.21					
G95ME-C10.5	p.22	p.43		p.57		
G90ME-C10.5	p.23	p.44				
S90ME-C10.5	p.71					
G80ME-C10.6	p.24					
G80ME-C10.5	p.25	p.45		p.58		
G70ME-C10.5	p.26	p.46	p.47			
G70ME-C9.5	p.71					
S70ME-C10.5	p.27	p.48				
G60ME-C10.5	p.28	p.49			p.63	
G60ME-C9.5						p.69
S60ME-C10.6	p.29					
S60ME-C10.5	p.30	p.50			p.64	
S60ME-C8.5	p.71					
G50ME-C10.7	p.31					
G50ME-C9.6	p.32	p.51		p.59	p.65	
G50ME-C9.5						p.70
S50ME-C10.6	p.33					
S50ME-C9.7	p.34	p.52				
S50ME-C9.6	p.71			p.60		
S50ME-C8.5	p.35	p.53				
S46ME-C8.6	p.36					
S46ME-B8.5	p.71					
G45ME-C9.7	p.37					
G45ME-C9.5		p.54				
S40ME-C9.5	p.38					
S35ME-C9.7	p.39	p.55			p.66	
S30ME-B9.5	p.40					

■ 従来型機関 Conventional Engine

重油焚き機関

Fuel Oil Engines

各重油焚き機関の主要目について次頁より示します。

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

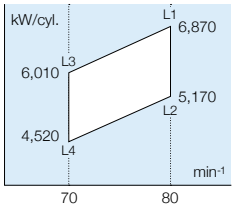
G95ME-C10.6

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

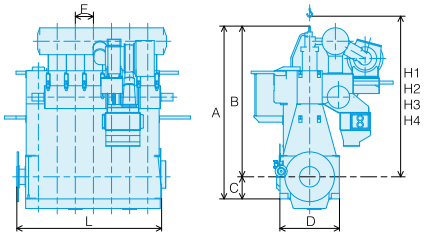
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G95ME-C10.6-EGRTC**	Tier III	158.4	157.9	161.0	155.5	153.6	156.0
	Tier II	151.4	154.9	163.5	148.5	150.6	158.5
LPSCR **G95ME-C10.6-LPSCR**	Tier III	155.4	157.9	161.0	152.5	153.6	156.0
	Tier II	151.4	154.9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



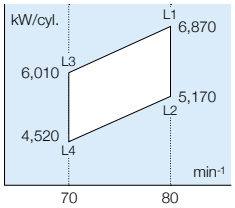
G95ME-C10.5

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]	-	-	-	-	-	-	-

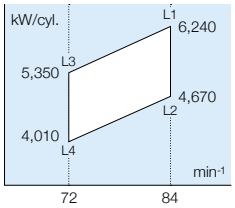
G90ME-C10.5

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

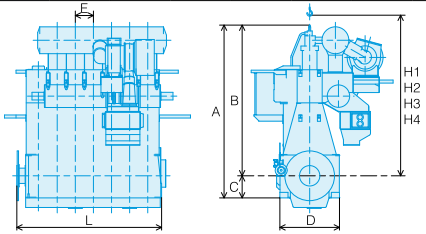
* The SFOC lower than 75% load in Tier II mode is the value with T/C cut-out

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]	-	-	-	-	-	-	-



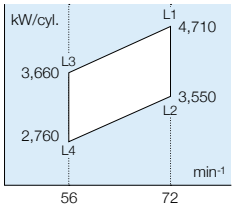
G80ME-C10.6

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]	-	-	-	-

** Available on request for HPSCR

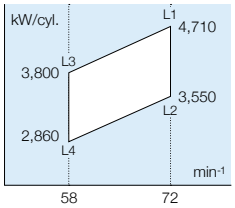
G80ME-C10.5

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

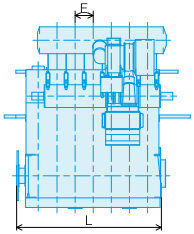
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRTC* **G80ME-C10.5-EGRTC**	Tier III	162.4	161.9	167.0	159.5	157.6	162.0
	Tier II	156.4	158.4	165.0	153.5	154.1	160.0
HPSCR **G80ME-C10.5-HPSCR**	Tier III	157.9	159.4	166.0	155.0	155.1	161.0
	Tier II	156.4	158.4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

** Available on request for HPSCR



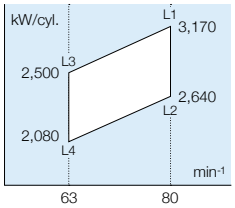
G70ME-C10.5

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	12,500	10,400
6	19,020	15,840	15,000	12,480



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	160.5	158.6	163.0	158.4	155.4	158.9
Part load	EGB	158.5	157.1	165.5	156.4	153.9	161.4
Low load	EGB	156.5	158.1	165.5	154.4	154.9	161.4

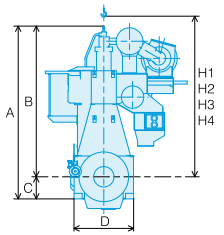
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G70ME-C10.5-EGRBP**	Tier III	163.5	162.6	168.0	161.4	159.4	163.9
	Tier II	156.5	158.1	166.0	154.4	154.9	161.9
HPSCR **G70ME-C10.5-HPSCR**	Tier III	158.0	159.1	166.0	155.9	155.9	161.9
	Tier II	156.5	158.1	165.5	154.4	154.9	161.4
LPSCR **G70ME-C10.5-LPSCR**	Tier III	157.5	159.1	166.5	155.4	155.9	162.4
	Tier II	156.5	158.1	165.5	154.4	154.9	161.4

Main Dimensions and Mass

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



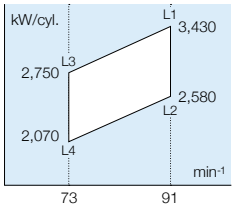
S70ME-C10.5

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

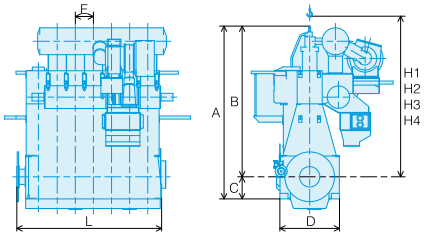
Tier III Engine

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



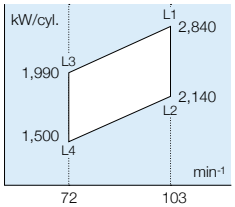
G60ME-C10.5

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

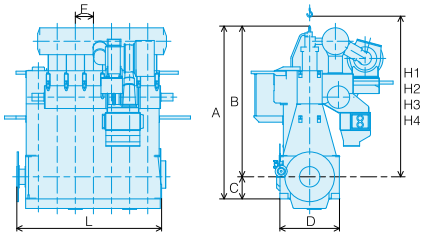
Tier III Engine

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



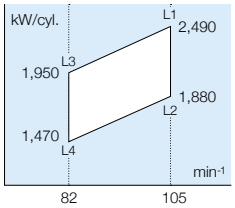
S60ME-C10.6

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	-	157.4	155.9	160.0	154.5	151.6	155.0
Low load	EGB	153.4	153.9	164.0	150.5	149.6	159.0

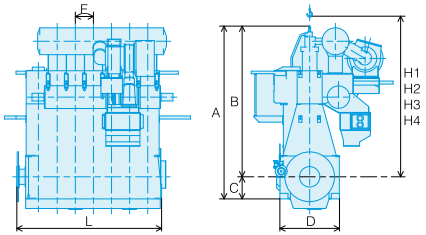
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S60ME-C10.6-EGRBP**	Tier III	156.4	155.9	165.0	153.5	151.6	160.0
	Tier II	153.4	153.9	165.0	150.5	149.6	160.0
HPSCR **S60ME-C10.6-HPSCR**	Tier III	153.4	153.9	164.5	150.5	149.6	159.5
	Tier II	153.4	153.9	164.0	150.5	149.6	159.0

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		10,350

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



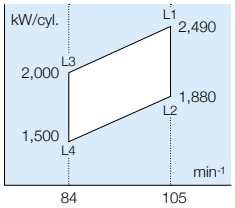
S60ME-C10.5

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



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	164.5	162.1	166.0	160.5	156.0	159.0
Part load	EGB	161.5	160.6	167.5	157.5	154.5	160.5
Low load	EGB	159.5	161.6	167.5	155.5	155.5	160.5

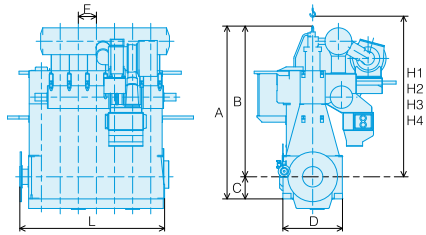
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S60ME-C10.5-EGRBP**	Tier III	167.5	166.1	171.0	163.5	160.0	164.0
	Tier II	159.5	161.6	168.0	155.5	155.5	161.0
HPSCR **S60ME-C10.5-HPSCR**	Tier III	161.0	162.6	168.0	157.0	156.5	161.0
	Tier II	159.5	161.6	167.5	155.5	155.5	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	10,950		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



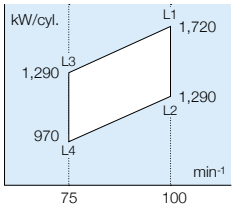
G50ME-C10.7 New Engine

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

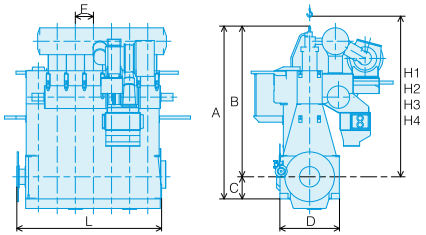
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G50ME-C10.7-EGRBP**	Tier III	164.4	163.9	169.0	161.5	159.6	164.0
	Tier II	157.4	159.4	167.0	154.5	155.1	162.0
HPSCR **G50ME-C10.7-HPSCR**	Tier III	158.9	160.4	167.0	156.0	156.1	162.0
	Tier II	157.4	159.4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



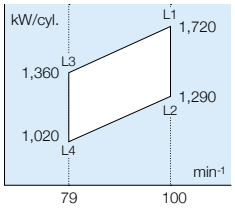
G50ME-C9.6

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

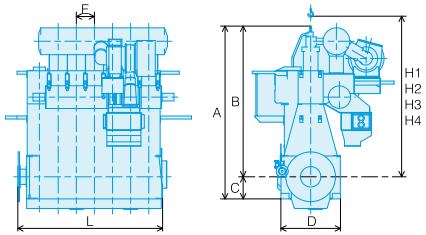
Tier III Engine

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



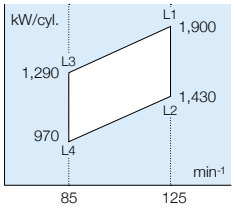
S50ME-C10.6

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



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

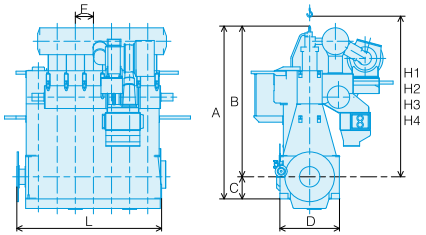
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S50ME-C10.6-EGRBP**	Tier III	157.4	156.9	166.0	154.5	152.6	161.0
	Tier II	154.4	154.9	166.0	151.5	150.6	161.0
HPSCR **S50ME-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

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



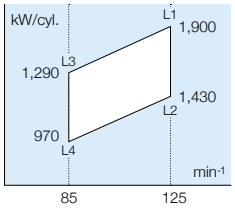
S50ME-C9.7

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



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	161.5	160.6	165.0	157.5	154.5	158.0
Part load	EGB	159.5	159.1	167.5	155.5	153.0	160.5
Low load	EGB	157.5	160.1	167.5	153.5	154.0	160.5

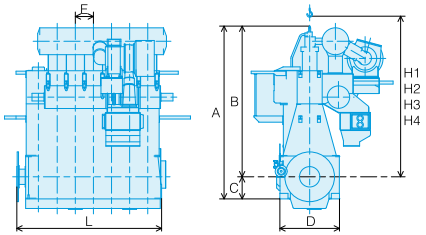
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S50ME-C9.7-EGRBP**	Tier III	164.5	164.6	170.0	160.5	158.5	163.0
	Tier II	157.5	160.1	168.0	153.5	154.0	161.0
HPSCR **S50ME-C9.7-HPSCR**	Tier III	159.0	161.1	168.0	155.0	155.0	161.0
	Tier II	157.5	160.1	167.5	153.5	154.0	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		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



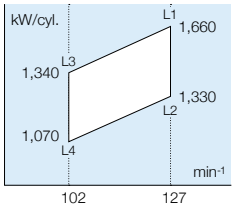
S50ME-C8.5

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 99

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

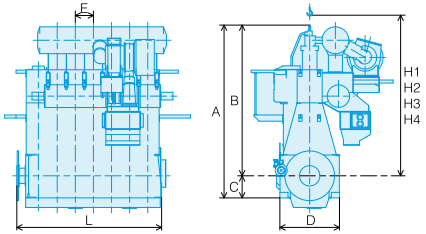
Tier III Engine

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

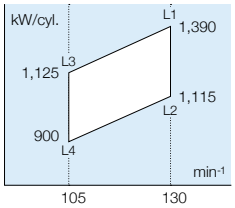


S46ME-C8.6

Bore: 460mm
Stroke: 1,932mm

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

Cyl.	L1	L2	L3	L4
5	6,950	5,575	5,625	4,500
6	8,340	6,690	6,750	5,400
7	9,730	7,805	7,875	6,300
8	11,120	8,920	9,000	7,200



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	165.5	163.1	167.0	161.5	159.1	163.0
Part load	EGB	163.5	161.6	169.5	159.5	157.6	165.5
Low load	EGB	161.5	162.6	169.5	157.5	158.6	165.5

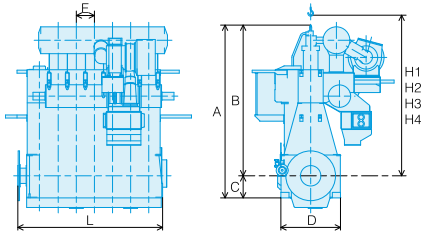
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **S46ME-C8.6-EGRBP**	Tier III	168.5	167.1	172.0	164.5	163.1	168.0
	Tier II	161.5	162.6	170.0	157.5	158.6	166.0
HPSCR **S46ME-C8.6-HPSCR**	Tier III	163.0	163.6	170.0	159.0	159.6	166.0
	Tier II	161.5	162.6	169.5	157.5	158.6	165.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	8,117	7,131	986	2,924	782	9,150	8,480	7,925

Cylinders:		5	6	7	8
L [mm]		5,139	5,921	6,703	7,485
Dry Mass [t]		150	168	191	211
Added Dry Mass	EGRBP [t]	12	12	12	12
	HPSCR [t]	3	3	4	4



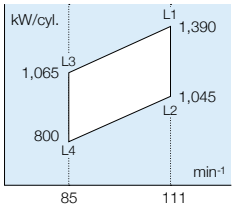
G45ME-C9.7

Bore: 450mm
Stroke: 2,250mm

Engine Output [kW]

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

Cyl.	L1	L2	L3	L4
5	6,950	5,225	5,325	4,000
6	8,340	6,270	6,390	4,800
7	9,730	7,315	7,455	5,600
8	11,120	8,360	8,520	6,400



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

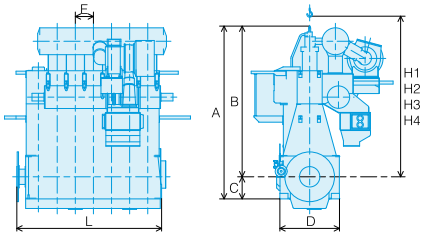
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
EGRBP **G45ME-C9.7-EGRBP**	Tier III	165.4	164.9	170.0	162.5	160.6	165.0
	Tier II	158.4	160.4	168.0	155.5	156.1	163.0
HPSCR **G45ME-C9.7-HPSCR**	Tier III	159.9	161.4	168.0	157.0	157.1	163.0
	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	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]		165	186	209	238
Added Dry Mass	EGRBP [t]	12	12	12	12
	HPSCR [t]	3	3	4	4



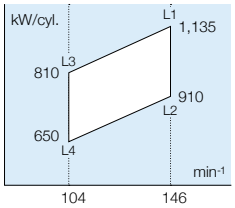
S40ME-C9.5

Bore: 400mm
Stroke: 1,770mm

Engine Output [kW]

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

Cyl.	L1	L2	L3	L4
5	5,675	4,550	4,050	3,250
6	6,810	5,460	4,860	3,900
7	7,945	6,370	5,670	4,550
8	9,080	7,280	6,480	5,200
9	10,215	8,190	7,290	5,850



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	172.5	170.1	174.0	168.5	166.1	170.0
Part load	EGB	169.5	168.6	175.5	165.5	164.6	171.5
Low load	EGB	167.5	169.6	175.5	163.5	165.6	171.5

Tier III Engine

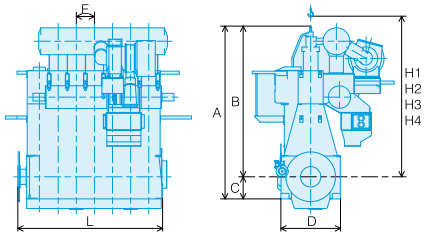
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
HPSCR **S40ME-C9.5-HPSCR**	Tier III	169.0	170.6	176.0	165.0	166.6	172.0
	Tier II	167.5	169.6	175.5	163.5	165.6	171.5

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	7,430	6,480	950	2,650	700	8,250		7,200

Cylinders:		5	6	7	8	9
L [mm]		4,698	5,398	6,098	6,798	7,498
Dry Mass [t]		107	126	142	157	189
Added Dry Mass	HPSCR [t]	3	3	4	4	*

* Not available with HPSCR



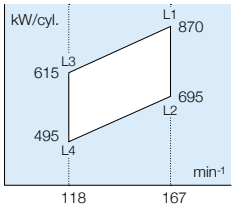
S35ME-C9.7

Bore: 350mm
Stroke: 1,550mm

Engine Output [kW]

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

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



SFOC [g/kWh]

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	169.5	167.1	171.0	165.5	163.1	167.0
Part load	EGB	166.5	165.6	172.5	162.5	161.6	168.5
Low load	EGB	164.5	166.6	172.5	160.5	162.6	168.5

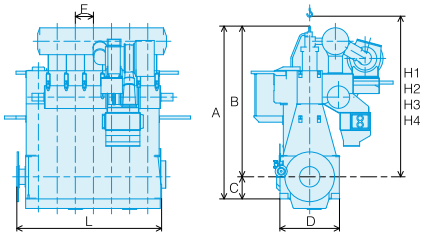
Tier III Engine

Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
HPSCR **S35ME-C9.7-HPSCR**	Tier III	166.0	167.6	173.0	162.0	163.6	169.0
	Tier II	164.5	166.6	172.5	160.5	162.6	168.5
LPSCR **S35ME-C9.7-LPSCR**	Tier III	165.5	167.6	173.5	161.5	163.6	169.5
	Tier II	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]	-	-	-	-



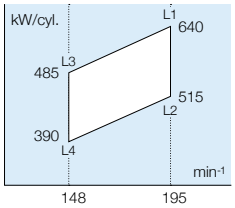
S30ME-B9.5

Bore: 300mm
Stroke: 1,328mm

Engine Output [kW]

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

Cyl.	L1	L2	L3	L4
5	3,200	2,575	2,425	1,950
6	3,840	3,090	2,910	2,340
7	4,480	3,605	3,395	2,730
8	5,120	4,120	3,880	3,120



SFOC* [g/kWh]

* The SFOC excludes the consumption of the electric HPS

Tier II Engine

Optimized load range	Tuning	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
High load	-	175.5	173.2	176.0	171.5	169.2	172.0

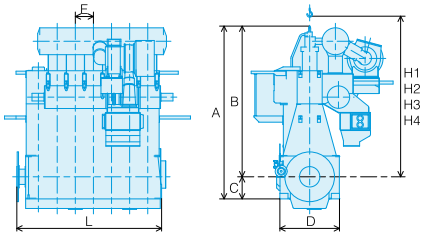
Tier III Engine

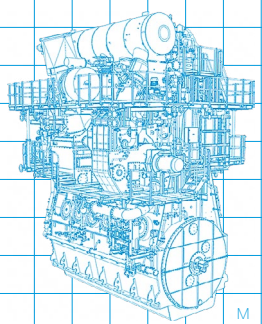
Tier III technology **Engine type**	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
HPSCR **S30ME-B9.5-HPSCR**	Tier III	177.0	174.2	176.5	173.0	170.2	172.5
	Tier II	175.5	173.2	176.0	171.5	169.2	172.0

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	5,604	4,892	712	1,980	538	6,300		5,625

Cylinders:		5	6	7	8
L [mm]		3,703	4,241	4,779	5,317
Dry Mass [t]		61	69	77	86
Added Dry Mass	HPSCR [t]	3	3	4	4





メタン／LNG焚き二元燃料機関

Methane Dual Fuel Engines (ME-GI/GA)

GI/GA形機関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、二元燃料機関の表に示しています。

For the engines applicable to GI / GA type, GI / GA figures such as specific fuel gas consumption are included. The following specific fuel consumption figures 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 22

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 23

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 25

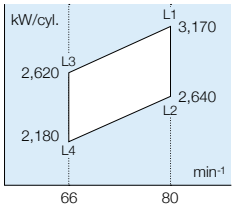
G70ME-C10.5-GI

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	128.6 + 3.9	127.8 + 3.0	134.6 + 2.4	126.2 + 4.7	124.6 + 3.6	130.6 + 2.9
	Fuel Oil	159.5	161.6	166.0	157.4	158.4	161.9

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	134.6 + 3.9	134.7 + 3.0	138.0 + 2.4	132.1 + 4.7	131.4 + 3.6	134.0 + 2.9
		Fuel Oil	162.5	161.6	165.0	160.4	158.4	160.9
	Tier II	Dual Fuel	128.6 + 3.9	127.8 + 3.0	136.3 + 2.4	126.2 + 4.7	124.6 + 3.6	132.3 + 2.9
		Fuel Oil	159.5	161.6	168.0	157.4	158.4	163.9
HPSCR G70ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	130.3 + 3.9	131.2 + 3.0	135.4 + 2.4	127.9 + 4.7	128.0 + 3.6	131.5 + 2.9
		Fuel Oil	157.5	157.6	162.0	155.4	154.4	157.9
	Tier II	Dual Fuel	128.6 + 3.9	127.8 + 3.0	135.4 + 2.4	126.2 + 4.7	124.6 + 3.6	131.5 + 2.9
		Fuel Oil	159.5	161.6	167.0	157.4	158.4	162.9
LPSCR G70ME-C10.5-GI-LPSCR	Tier III	Dual Fuel	130.3 + 3.9	132.9 + 3.0	136,3 + 2.4	127.9 + 4.7	129.7 + 3.6	132.3 + 2.9
		Fuel Oil	157.5	159.6	163.0	155.4	156.4	158.9
	Tier II	Dual Fuel	128.6 + 3.9	129.3 + 3.0	135.4 + 2.4	126.2 + 4.7	126.0 + 3.6	131.5 + 2.9
		Fuel Oil	159.5	161.9	167.0	157.4	158.7	162.9

Added Dry Mass

Cylinders:	5	6
GI [t]	5	6

Main Dimensions
Dry Masses
Added Dry Masses Except for GI
→ Please see page 26

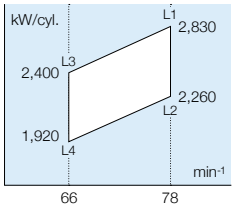
G70ME-C10.5-GA

Bore: 700mm
Stroke: 3,256mm

Engine Output [kW]

MEP L1-L3: 1.74 MPa
L2-L4: 1.39 MPa

Cyl.	L1	L2	L3	L4
5	14,150	11,300	12,000	9,600
6	16,980	13,560	14,400	11,520



equivalent SFOC*, SFOC [g/kWh]

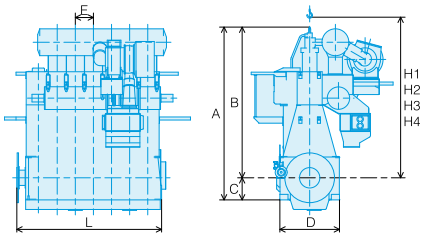
Tier III technology Engine type	Mode		L1 / L3			L2 / L4		
			50%	75%	100%	50%	75%	100%
EGRBP G70ME-C10.5-GA-EGRBP	Dual Fuel*		162.0 / 163.5	161.0 /162.6	166.0 / 167.5	155.2 / 156.8	154.4 / 155.9	159.2 / 160.8
	Fuel Oil	Tier III	171.9	171.0	179.0	169.8	168.9	176.8
		Tier II	170.1	169.2	177.1	168.0	167.1	175.0

* Dual fuel mode : Total value of SPOC + SGC (coverted by LCV of pilot oil)

Main Dimensions and Mass

Dimensions:	A	B	C	D	E	H1
[mm]			1,750	4,470	1,044	

Cylinders:		5	6
L [mm]		7,513	8,557
Dry Mass [t]		525	590
Added Dry Mass	EGRBP [t]	11	11
	GA [t]	5	5



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 27

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 28

S60ME-C10.5-GI

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-C10.5-GI	Dual Fuel	133.7 + 4.0	132.5 + 3.0	138.8 + 2.5	129.2 + 5.2	126.4 + 4.0	132.1 + 3.3
	Fuel Oil	164.5	162.1	166.0	160.5	156.0	159.0

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	139.7 + 4.0	139.3 + 3.0	143.9 + 2.5	135.2 + 5.2	133.3 + 4.0	137.2 + 3.3
		Fuel Oil	167.5	166.1	171.0	163.5	160.0	164.0
	Tier II	Dual Fuel	132.8 + 4.0	135.4 + 3.0	141.3 + 2.5	128.3 + 5.2	129.4 + 4.0	134.7 + 3.3
		Fuel Oil	159.5	161.6	168.0	155.5	155.5	161.0
HPSCR S60ME-C10.5-GI-HPSCR	Tier III	Dual Fuel	134.1 + 4.0	136.3 + 3.0	141.3 + 2.5	129.6 + 5.2	130.3 + 4.0	134.7 + 3.3
		Fuel Oil	161.0	162.6	168.0	157.0	156.5	161.0
	Tier II	Dual Fuel	132.8 + 4.0	135.4 + 3.0	140.9 + 2.5	128.3 + 5.2	129.4 + 4.0	134.3 + 3.3
		Fuel Oil	159.5	161.6	167.5	155.5	155.5	160.5

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 30

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 32

S50ME-C9.7-GI

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-C9.7-GI	Dual Fuel	131.1 + 3.9	131.2 + 3.0	137.9 + 2.5	126.6 + 5.2	125.2 + 4.0	131.3 + 3.3
	Fuel Oil	161.5	160.6	165.0	157.5	154.5	158.0

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	137.1 + 3.9	138.0 + 3.0	143.1 + 2.5	132.6 + 5.2	132.0 + 4.0	136.4 + 3.3
		Fuel Oil	164.5	164.6	170.0	160.5	158.5	163.0
	Tier II	Dual Fuel	131.1 + 3.9	134.2 + 3.0	141.4 + 2.5	126.6 + 5.2	128.1 + 4.0	134.7 + 3.3
		Fuel Oil	157.5	160.1	168.0	153.5	154.0	161.0
HPSCR S50ME-C9.7-GI-HPSCR	Tier III	Dual Fuel	132.4 + 3.9	135.0 + 3.0	141.4 + 2.5	127.9 + 5.2	129.0 + 4.0	134.7 + 3.3
		Fuel Oil	159.0	161.1	168.0	155.0	155.0	161.0
	Tier II	Dual Fuel	131.1 + 3.9	134.2 + 3.0	140.9 + 2.5	126.6 + 5.2	128.1 + 4.0	134.3 + 3.3
		Fuel Oil	157.5	160.1	167.5	153.5	154.0	160.5

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 34

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	133.6 + 8.1	133.2 + 6.2	140.0 + 5.1	128.4 + 10.1	126.7 + 7.7	133.8 + 6.4
	Fuel Oil	168.5	166.1	170.0	164.5	160.1	164.0

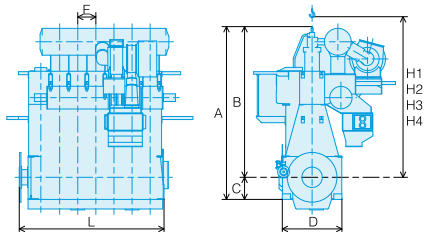
Tier III Engine

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	139.5 + 8.1	140.0 + 6.2	145.1 + 5.1	134.4 + 10.1	133.6 + 7.7	138.9 + 6.4
		Fuel Oil	171.5	170.1	175.0	167.5	164.1	169.0
	Tier II	Dual Fuel	132.7 + 8.1	136.2 + 6.2	142.5 + 5.1	127.6 + 10.1	129.7 + 7.7	136.3 + 6.4
		Fuel Oil	163.5	165.6	172.0	159.5	159.6	166.0
HPSCR S50ME-C8.5-GI-HPSCR	Tier III	Dual Fuel	134.0 + 8.1	137.0 + 6.2	142.5 + 5.1	128.9 + 10.1	130.6 + 7.7	136.3 + 6.4
		Fuel Oil	165.0	166.6	172.0	161.0	160.6	166.0
	Tier II	Dual Fuel	132.7 + 8.1	136.2 + 6.2	142.1 + 5.1	127.6 + 10.1	129.7 + 7.7	135.9 + 6.4
		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 35



G45ME-C9.5-GI

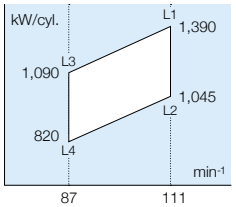
Bore: 450mm
Stroke: 2,250mm

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	133.6 + 8.1	133.2 + 6.2	140.0 + 5.1	127.9 + 10.8	126.2 + 8.2	132.6 + 6.8
	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	139.5 + 8.1	140.0 + 6.2	145.1 + 5.1	133.8 + 10.8	133.1 + 8.2	137.7 + 6.8
		Fuel Oil	171.5	170.1	175.0	167.5	164.0	168.0
	Tier II	Dual Fuel	132.7 + 8.1	136.2 + 6.2	142.5 + 5.1	127.0 + 10.8	129.2 + 8.2	135.1 + 6.8
		Fuel Oil	163.5	165.6	172.0	159.5	159.5	165.0
HPSCR G45ME-C9.5-GI-HPSCR	Tier III	Dual Fuel	134.0 + 8.1	137.0 + 6.2	142.5 + 5.1	128.3 + 10.8	130.1 + 8.2	135.1 + 6.8
		Fuel Oil	165.0	166.6	172.0	161.0	160.5	165.0
	Tier II	Dual Fuel	132.7 + 8.1	136.2 + 6.2	142.1 + 5.1	127.0 + 10.8	129.2 + 8.2	134.7 + 6.8
		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

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

Added Dry Mass

Cylinders:	5	6	7	8
GI [t]	3	3	4	4

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

→ Please see page 39

メタノール焚き二元燃料機関

Methanol Dual Fuel Engines (ME-LGIM)

LGIM形機関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、二元燃料機関の表に示しています。

For the engines applicable to LGIM type, LGIM figures such as specific methanol consumption are included. The following specific methanol consumption figures 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	301.8 + 12.8	314.6 + 9.8	331.4 + 8.1	286.6 + 17.0	298.6 + 13.0	315.0 + 10.7
	Fuel Oil	153.4	156.4	162.5	150.5	152.1	157.5

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	316.8 + 12.8	322.1 + 9.8	336.8 + 8.1	301.6 + 17.0	306.1 + 13.0	320.4 + 10.7
		Fuel Oil	160.4	159.9	165.0	157.5	155.6	160.0
	Tier II	Dual Fuel	303.9 + 12.8	314.6 + 9.8	332.5 + 8.1	288.7 + 17.0	298.6 + 13.0	316.1 + 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 22

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	305.7 + 12.9	318.6 + 9.9	335.5 + 8.2	290.4 + 17.2	302.5 + 13.1	319.0 + 10.8
	Fuel Oil	155.4	158.4	164.5	152.5	154.1	159.5

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	320.8 + 12.9	326.1 + 9.9	340.8 + 8.2	305.5 + 17.2	310.1 + 13.1	324.4 + 10.8
		Fuel Oil	162.4	161.9	167.0	159.5	157.6	162.0
	Tier II	Dual Fuel	307.9 + 12.9	318.6 + 9.9	336.6 + 8.2	292.6 + 17.2	302.5 + 13.1	320.1 + 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 25

G50ME-C9.6-LGIM

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-LGIM	Dual Fuel	326.3 + 13.3	329.8 + 10.2	342.5 + 8.4	310.6 + 17.8	313.3 + 13.6	325.7 + 11.2
	Fuel Oil	165.4	163.9	168.0	162.5	159.6	163.0

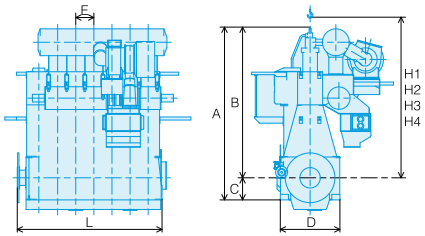
Tier III Engine

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	332.8 + 13.3	338.3 + 10.2	353.2 + 8.4	317.0 + 17.8	321.9 + 13.6	336.5 + 11.2
		Fuel Oil	168.4	167.9	173.0	165.5	163.6	168.0
	Tier II	Dual Fuel	317.8 + 13.3	328.7 + 10.2	348.9 + 8.4	302.0 + 17.8	312.3 + 13.6	332.2 + 11.2
		Fuel Oil	161.4	163.4	171.0	158.5	159.1	166.0

Added Dry Mass

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

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIM
→ Please see page 32



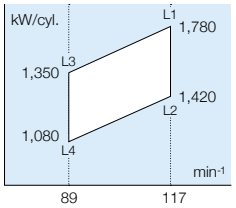
S50ME-C9.6-LGIM

Bore: 500mm
Stroke : 2,214mm

Engine Output [kW]

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

Cyl.	L1	L2	L3	L4
5	8,900	7,100	6,750	5,400
6	10,680	8,520	8,100	6,480
7	12,460	9,940	9,450	7,560
8	14,240	11,360	10,800	8,640
9	16,020	12,780	12,150	9,720



SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S50ME-C9.6-LGIM	Dual Fuel	322.4 + 13.3	327.2 + 10.1	340.4 + 8.4	306.6 + 16.6	308.9 + 12.7	323.0 + 10.5
	Fuel Oil	163.5	162.6	167.0	159.5	156.6	161.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
EGRBP S50ME-C9.6-LGIM-EGRBP	Tier III	Dual Fuel	328.8 + 13.3	335.8 + 10.1	351.1 + 8.4	313.0 + 16.6	317.4 + 12.7	333.7 + 10.5
		Fuel Oil	166.5	166.6	172.0	162.5	160.6	166.0
	Tier II	Dual Fuel	313.8 + 13.3	326.2 + 10.1	346.9 + 8.4	298.0 + 16.6	307.8 + 12.7	329.4 + 10.5
		Fuel Oil	159.5	162.1	170.0	155.5	156.1	164.0

Main Dimensions and Mass

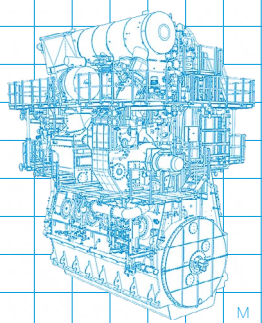
Dimensions:	A	B	C	D	E	H1	H2	H3
[mm]	9,320	8,130	1,190	3,350	875	10,250		8,850

Cylinders:		5	6	7	8	9
L [mm]		5,757	6,632	7,507	8,382	9,257
Dry Mass [t]		190	220	255	285	315
Added Dry Mass	EGRBP [t]	12	12	13	13	13
	LGIM [t]	*	*	*	*	*

* Available on request

Next LGIM Engines (under development)

G45ME-C9.7-LGIM
G60ME-C10.5-LGIM
S60ME-C10.5-LGIM
G70ME-C-LGIM



LPG焚き二元燃料機関

LPG Dual Fuel Engines (ME-LGIP)

LGIP形機関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、二元燃料機関の表に示しています。

For the engines applicable to LGIP type, LGIP figures such as specific fuel gas consumption are included. The following specific fuel consumption figures 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 28

S60ME-C10.5-LGIP

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-C10.5-LGIP	Dual Fuel	140.5 + 13.2	141.2 + 10.1	146.4 + 8.3	132.8 + 17.5	132.5 + 13.3	137.4 + 11.0
	Fuel Oil	164.5	162.1	166.0	160.5	156.0	159.0

Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR S60ME-C10.5-LGIP-HPSCR	Tier III	Dual Fuel	137.2 + 13.2	141.6 + 10.1	148.2 + 8.3	129.5 + 17.5	132.9 + 13.3	139.2 + 11.0
		Fuel Oil	161.0	162.6	168.0	157.0	156.5	161.0
	Tier II	Dual Fuel	135.8 + 13.2	140.7 + 10.1	147.8 + 8.3	128.1 + 17.5	132.0 + 13.3	138.8 + 11.0
		Fuel Oil	159.5	161.6	167.5	155.5	155.5	160.5

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 30

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 32

S35ME-C9.7-LGIP

Bore: 350mm
Stroke : 1,550mm

SGC + SPOC, SFOC [g/kWh]

Tier II Engine

Engine type	Mode	L1 - L3			L2 - L4		
		50%	75%	100%	50%	75%	100%
S35ME-C9.7-LGIP	Dual Fuel	144.7 + 13.6	145.5 + 10.4	150.8 + 8.6	137.9 + 17.0	139.4 + 13.0	145.1 + 10.7
	Fuel Oil	169.5	167.1	171.0	165.5	163.1	167.0

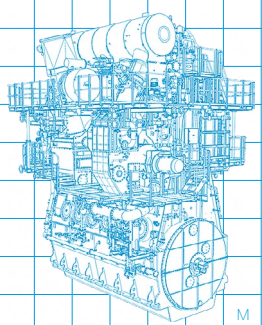
Tier III Engine

Tier III technology Engine type	Mode		L1 - L3			L2 - L4		
			50%	75%	100%	50%	75%	100%
HPSCR S35ME-C9.7-LGIP-HPSCR	Tier III	Dual Fuel	141.5 + 13.6	146.0 + 10.4	152.7 + 8.6	134.6 + 17.0	139.8 + 13.0	146.9 + 10.7
		Fuel Oil	166.0	167.6	173.0	162.0	163.6	169.0
	Tier II	Dual Fuel	140.1 + 13.6	145.1 + 10.4	152.2 + 8.6	133.2 + 17.0	138.9 + 13.0	146.5 + 10.7
		Fuel Oil	164.5	166.6	172.5	160.5	162.6	168.5

Added Dry Mass

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

Engine Output
Speed Range
Main Dimensions
Dry Masses
Added Dry Masses Except for LGIP
→ Please see page 39



GIE形機関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、二元燃料機関の表に示しています。

For the engines applicable to GIE type, GIE figures such as specific fuel gas consumption are included. The following specific fuel consumption figures 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機関

Ethane Dual Fuel Engines (ME-GIE)

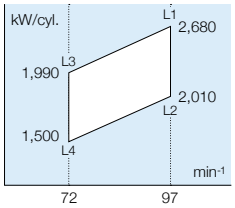
G60ME-C9.5-GIE

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

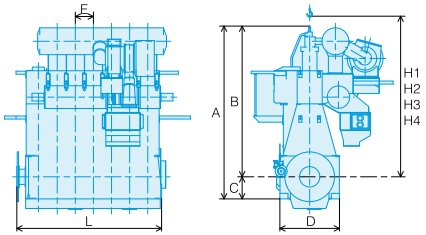
Tier III Engine

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	8



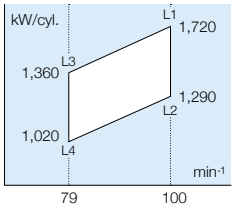
G50ME-C9.5-GIE

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

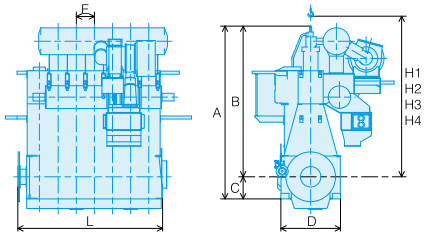
Tier III Engine

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



従来形機関 Conventional Engines

以下に記載する機関は、より効率の高い新形機関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。しかしながら、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、より新しい機関形式の選定を推奨いたします。Tier Ⅱ機関, Tier Ⅲ機関および二元燃料機関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 shall be replaced by newer and more efficient engines in future, consequently, are not scheduled to be listed in a future catalog. However, we will continue to produce these engine models as individual case. For new project, selection of latest engine type is recommended. For availability for Tier II, Tier III and dual fuel engines, please contact us.

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-C9.5

Bore: 700 mm, Stroke: 3,256 mm

5 - 8 cyl.		L1	L2	L3	L4
Output / cyl.	kW	3,640	2,740	2,720	2,050
Speed	min-1	83	83	62	62
MEP	MPa	2.10	1.58	2.10	1.58
SFOC (Tier II, High load)	g/kWh	167.0	160.0	167.0	160.0

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-C9.6

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	161.0	167.0	161.0

S46ME-B8.5

Bore: 460 mm, Stroke: 1,932 mm

5 - 8 cyl.		L1	L2	L3	L4
Output / cyl.	kW	1,380	1,105	1,125	900
Speed	min-1	129	129	105	105
MEP	MPa	2.00	1.60	2.00	1.60
SFOC (Tier II, High load)*	g/kWh	170.0	166.0	170.0	166.0

* The SFOC excludes the consumption of the electric HPS

排ガス過給機 Exhaust Gas Turbochargers

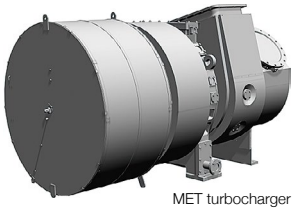
MET過給機が新たに自社製過給機のラインナップに加わりました。TCA/TCT過給機とともに三井-MAN B&W機関においてより最適な過給機をご提供いたします。

MET turbocharger is added to lineup of turbocharger made by MES. We provide best turbocharger solution of TCA, TCT and MET for MITSUI-MAN B&W engine.

MET-MB / MET-MBⅡ過給機

MET-MB/MET-MBⅡ 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。また、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形式を適宜拡充していく予定です。



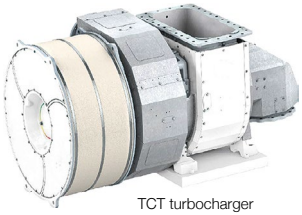
MET turbocharger

MET-MB/MET-MBII are axial turbocharger with high reliability and maintainability. The compressor capacity of MET-MBII is improved up to 16% from MET-MB and this capacity contributes downsizing of turbocharger. MET series will be appropriately expanded as needed.

TCT形過給機

TCT Turbocharger

TCT過給機は従来のTCA形過給機をベースに堅牢性を維持したまま最大47%過給機質量を軽量化したコンパクトな軸流過給機です。TCA過給機より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。TCT30/70/80形も順次リリース予定です。



TCT turbocharger

TCT turbocharger is compact axial turbocharger which is reduced up to 47% weight of turbocharger with keeping robustness based on TCA turbocharger design. The maintainability of TCT is improved by longer overhaul maintenance interval than TCA. “TCT30/70/80 type” will also be released sequentially.

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

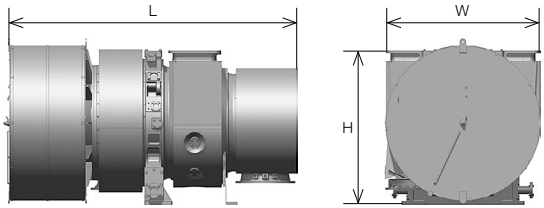
MET-MB Series

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

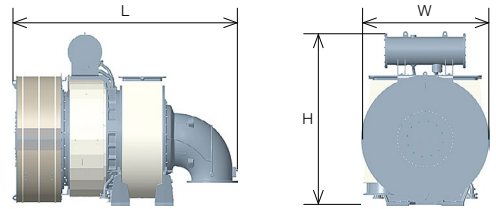
* Domestic production as of March 2023



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

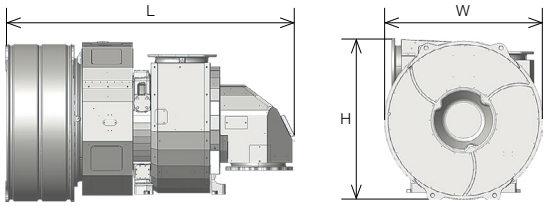


TCTシリーズの仕様 TCT Series Program

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



技術概要
TECHNOLOGY

最適な組み合わせを提案
We will Propose the Optimum Combination of Technologies

三井E&Sは、温室効果ガス（GHG）、窒素酸化物（NOx）、硫黄酸化物（SOx）の規制をクリアする、多種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、最適な技術の組み合わせをご提案いたします。

MITSUI E&S can provide a wide variety of technologies that clear the regulations for GHG, NOx and SOx. We will propose the optimum combination of technologies according to the needs of your ship.

Technology option for GHG, NOx and SOx

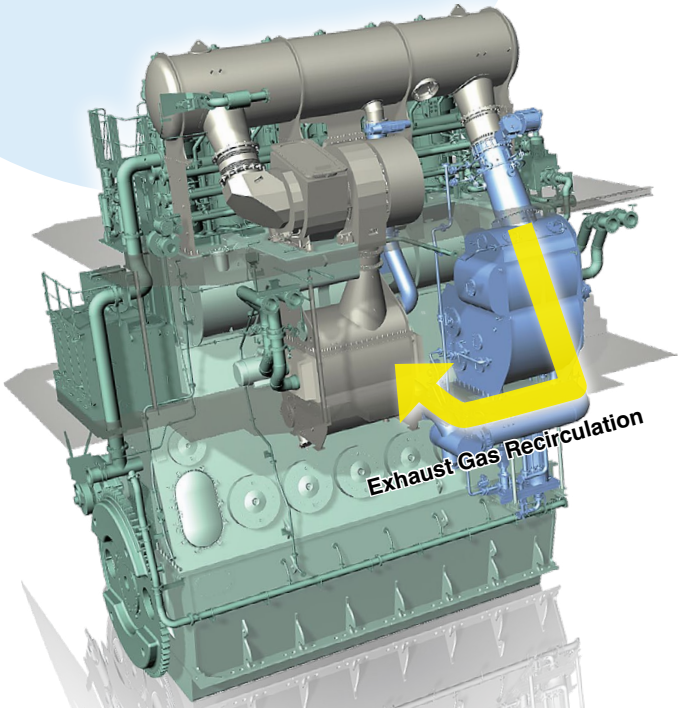
		For GHG	For NOx	For SOx	Page
EGR			○		p.77
EcoEGR		○	○		p.79
SCR			○		p.81
THS2		◎			p.83
Dual Fuel	GI,GIE,LGIM,LGIP	◎		○	p.85
	GA	◎	○	○	p.87
	Ammonia	◎		○	p.87
SFOC Optimization		○			p.91
SOx Scrubber				○	p.100

経済性の高い NOx 削減システム

Highly Economical NOx Reduction System

EGR—排気再循環 For NOx

Exhaust Gas Recirculation



EGRシステムは、排ガスの一部を冷却および清浄した後、掃気レシーバへ再循環させます。これによって掃気中の酸素含有量が低下し、また、熱容量が増大し、その結果、燃焼温度最高点が低下しNOx生成が低減されます。機関形式や過給機台数により、Bypass matchingまたはT/C cut-out matchingのいずれかが適用されます。

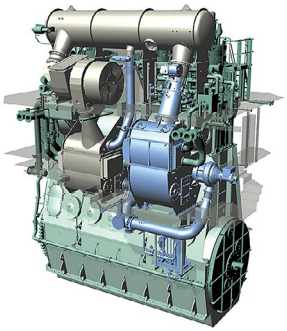
■ **Bypass Matching (EGRBP)**
過給機1台、シリンダボア70 cm以下の機関用

■ **T/C Cut-out Matching (EGRTC)**
過給機2台以上、シリンダボア80 cm以上の機関用

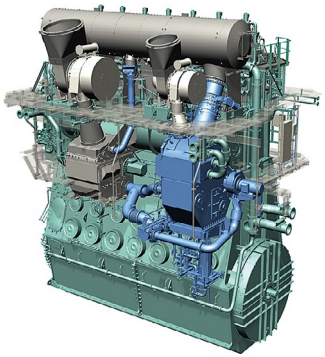
In the EGR system, after a cooling and cleaning process, part of the exhaust gas is recirculated to the scavenging air receiver. This replacement decreases the oxygen content and increases the heat capacity of the scavenge air, thus reducing the temperature peak of the combustion and the formation of 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)
  With only one turbocharger and used for the engines of cylinder bore 70 cm or smaller.
- T/C Cut-out Matching (EGRTC)
  With two or more turbochargers and used for the engines of cylinder bore 80 cm or larger.

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



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



EGRを適用することにより、上図の青色の部品が追加されます。
The blue part in the above figures shows the parts added by applying the EGR

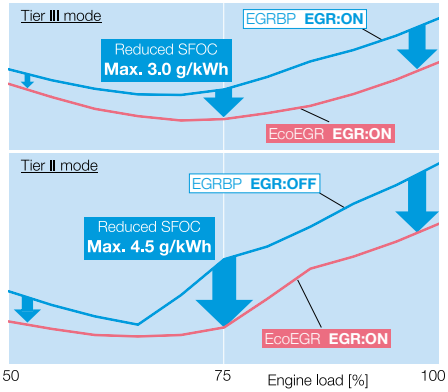
EGRで燃費もNOxも　改善する

Improvement of Fuel Consumption and NOx Emission with EGR

EcoEGR For NOx For GHG

従来の機関チューニングにおいて、燃料消費率とNOx排出と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しています。機関チューニングを燃料消費率優先で最適化するとともに、Tier II、Tier III全海域でEGRを稼働しNOxを削減することによって、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。二元燃料機関でもEcoEGRは採用可能です（ME-GIE及びME-LGIP機関を除く）。

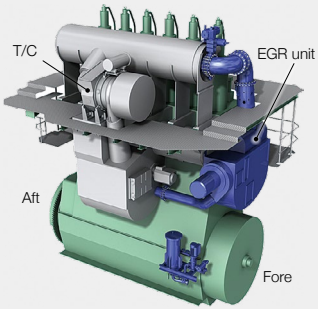
Specific fuel consumption and NOx emission were have been in a trade-off relation with conventional engine tuning. An EcoEGR system is one of breakthrough technology which overcomes this relationship. The EcoEGR has introduced a design concept of "effectively utilizing the EGR NOx reduction function in all sea areas". Both specific fuel consumption improvement and NOx reduction can be achieved by optimizing the specific fuel consumption preferentially while by operating EGR in all Tier II and Tier III emission control areas to reduce NOx. EEDI can be big 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)

EGRユニット配置
EGR Unit Arrangement

EGR bypass matching適用機関の場合、機関上に装備するEGRユニット（プレスプレ、EGRクーラ、EGR用ミストキャッチャ）の配置は機関形式に依存します。各機関形式におけるEGRユニット配置は 次頁の表をご参照ください。



EGR unit arrangement at Fore end

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

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, 65	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 *,**

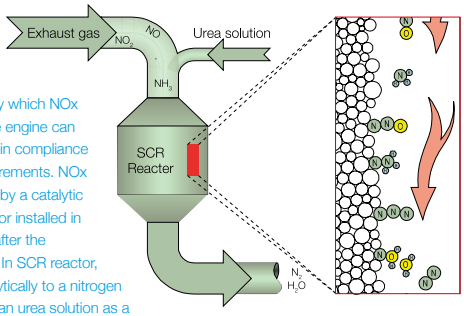
* EGRユニット配置の代替案については、弊社までお問い合わせください。
** EGR "艏端側" 配置の場合、2次バランサ（艏側モーメントコンペンセータ）は装備不可となりますのでご留意ください。
* For alternative design of EGR unit arrangement, please contact us.
** For the engines arranged at EGR unit at Fore end, the option of moment compensators arranged at Fore end is not available.

SCR—選択的触媒還元 For NOx

Selective Catalytic Reduction

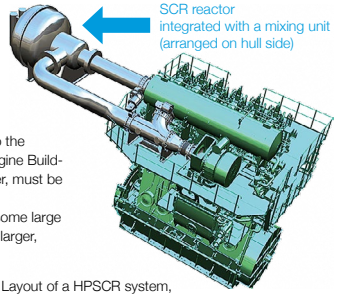
SCRは排ガスに含まれるNOxを窒素と水に還元し無害化する技術です。排ガスをSCR反応器へと導き、尿素水を還元剤とすることで、NOx Tier Ⅲ要件を満たします。SCRシステムには、高圧SCR（HPSCR）と低圧SCR（LPSCR）があります。HPSCRの反応器は過給機上流側に設置するため、機関の近くに配置されます。なお、SCR運転の間、使用する燃料の硫黄分を0.1%以下に制限する場合は、LPSCRを選択可能です。LPSCRは過給機出口後の排ガス管に接続されるため、機関からSCRを離して柔軟に配置することができます。

Selective Catalytic Reduction (SCR) is the one of an exhaust gas treatment methods by which NOx generated in a marine engine can be reduced to a level in compliance with NOx Tier III requirements. NOx reduction is obtained by a catalytic process in SCR reactor installed in the exhaust gas line after the combustion process. In SCR reactor, NOx is reduced catalytically to a nitrogen and water by adding an urea solution as a reducing agent. The SCR systems could be chosen as high-pressure SCR (HPSCR) or low-pressure SCR (LPSCR). HPSCR reactor is installed upstream the turbocharger(s). As the exhaust gas is led from the SCR reactor to the turbocharger, the system is arranged close to the engine. If restricting the sulfur content in a fuel during SCR operation to 0.1% S or less, the LPSCR system can be selected, In that system, SCR line is placed after the turbocharger which provides flexibility for arranging SCR installation.

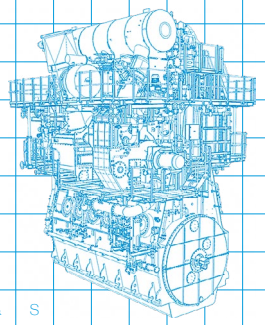


注記 Note

- SCRシステムは機関と連携しますが、SCR系統は機関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90 cm以上の大形機関への高圧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 specifications from us.
- Regarding the application of HPSCR for some large bore engines with cylinder bore 90 cm or larger, please contact us.

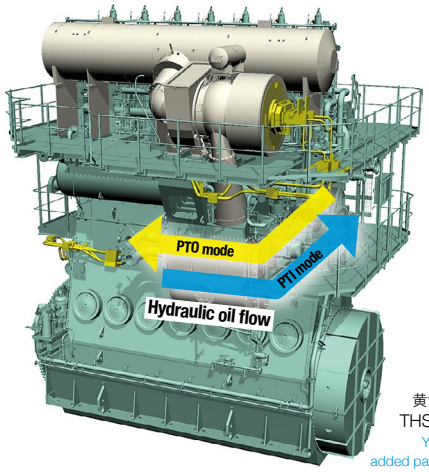


Layout of a HPSCR system,
as supplied by MAN Energy Solutions (MAN SCR-HP)



THS2—廃熱回収装置 For GHG

Turbo Hydraulic System type2



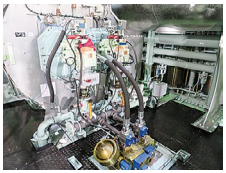
黄色着色部は
THS2追加機器
Yellow parts :
added parts for THS2

燃料消費率を最大2%削減

Max. 2% Fuel Saving

舶用機関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機関に特化したシステムで、Tier III機関にも適用可能です。また、EcoEGRと併用できます。THS2は次の2種類の運転モードを持ちます。

The surplus exhaust gas energy can be utilized thanks to the recent improvement of the efficiency of turbocharger for the marine engine. THS (Turbo Hydraulic System), developed independently by us, is a system which use a power hydraulically recovered from the surplus gas energy. The THS is very compact compared to traditional waste heat recovery system and consequently not requires large modification of the engine room. THS2 is a system specialized ME-C engine, following the conventional THS technology, and is also applicable to Tier III engine. Furthermore, it is used with EcoEGR at the same time. THS2 has the following two operating mode.



Turbocharger with THS2

THS受注実績 Ordered Experience

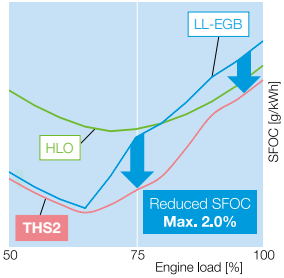
従来型THS Conventional type	23	すべて出荷済 All deliverd
THS2	1	

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機関内で使用され、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 use a power hydraulically recovered from the surplus gas energy and 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.



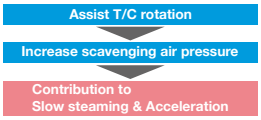
Comparison of SFOC curve with THS2

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 to shorten the acceleration time.



Concept of PTI mode

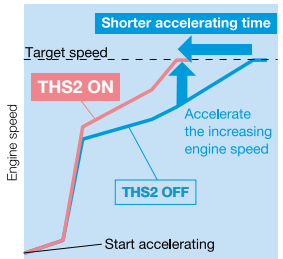


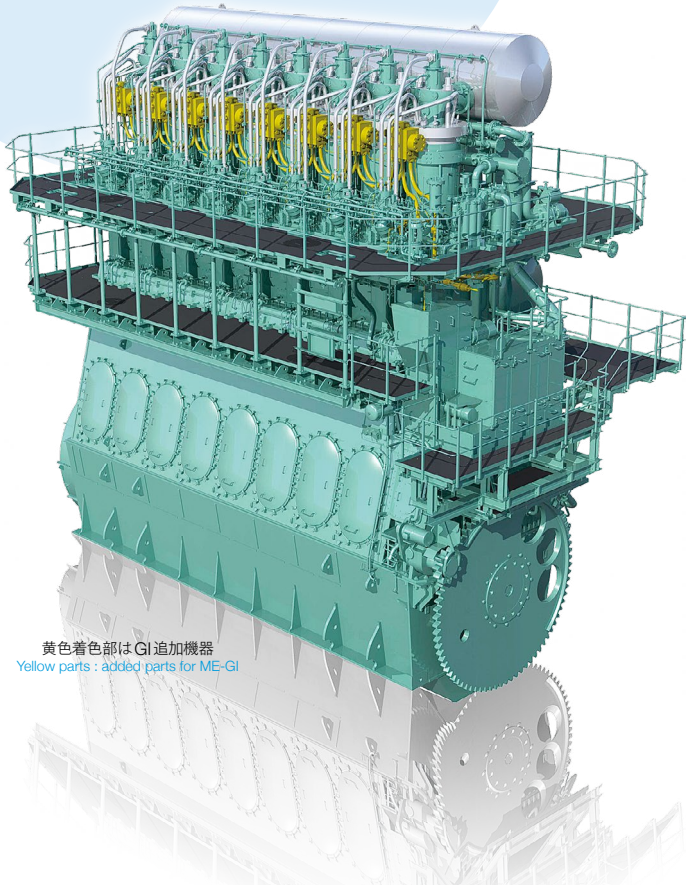
Image of improved acceleration performance by THS2

燃料の転換で　規制を　クリアする

Comply with the Regulations by Fuel Conversion

二元燃料機関 For GHG For SOx

Dual Fuel Engines



黄色着色部はGI追加機器
Yellow parts : added parts for ME-GI

弊社製造の機関は、メタン（天然ガス）、エタンといった燃料ガスやメタノール、液化石油ガス（LPG）などの低引火点燃料を焚ける「二元燃料機関」とすることが可能です。二元燃料機関は従来の重油焚き機関よりCO_2排出量が少ないため、EEDI規制の達成に大きく貢献し、また、そのような燃料ガスや低引火点燃料は硫黄分をほとんど含まないためSOx規制をクリアすることも可能です。さらに、ディーゼルサイクルを採用しているためメタンスリップが少なく、GHG排出削減に貢献します。このように二元燃料機関は、重油からの燃料転換によって多くの環境規制を達成できる次世代形機関です。

二元燃料機関は、メタンやエタンなどの燃料ガスを使用するGI（Gas Injection）形機関と、メタノールやLPGなどの低引火点（LFL）燃料を利用するLGI（Liquid Gas Injection）形機関があります。また、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ます。

We can supply the "dual fuel engine" which utilizes fuel gas such as methane (natural gas), ethane and low flashpoint fuel such as methanol and liquefied petroleum gas (LPG). The dual fuel engines emit CO_2 less than conventional fuel oil burning engines, and thus contribute significantly to the achievement of the EEDI regulations. In addition, using such fuel gas and low flashpoint fuel, which contains almost no sulfur, complies with SOx regulation. Furthermore, using the diesel cycle reduces methane slip and contributes to GHG emission reductions. The dual fuel engines are next-generation engines that can comply with many environmental regulations by converting fuel from fuel oil.
The duel fuel engines have two types, i.e. “GI” (gas injection) type engine which is applied fuel gas such as methane or ethane, and “LGI”(liquid gas injection) type engine which is applied LFL (low flash point) fuel such as methanol or LPG. Two running modes are available, i.e. “fuel oil mode” using only fuel oil and “dual fuel mode” using both fuel gas or LFL fuel and few fuel oil (as pilot oil).

使用燃料の種類により、下記のように燃料呼称が機関形式呼称に加わります。
Depending on the type of fuel utilized, the following fuel designation is added to the engine type designation.

ME-GI ガス燃料焚き機関 Gas Injection	燃料の種類 Fuel type	Fuel designation
	メタン Methane	-GI
	エタン Ethane	-GIE

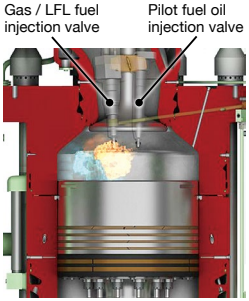
ME-LGI LFL*燃料焚き機関 Liquid Gas Injection	燃料の種類 Fuel type	Fuel designation
	メタノール Methanol	-LGIM
	液化石油ガス LPG	-LGIP

*LFL：低引火点 Low Flashpoint Liquid

ME-GA形機関
ME-GA Type Engines (GA : Gas Admission)

主にLNG運搬船をターゲットとして、新たなメタン焚き二元燃料機関であるGA(Gas Admission)形機関をリリースしました。GA形機関では二元燃料運転モードでオットーサイクルを採用し、GI形機関と比べてより低圧で燃料ガスを供給できます。二元燃料運転モードではオットーサイクルを用いることでNOxの生成を抑え、EGRやSCR無しでNOx Tier III規制をクリアすることが可能です。さらに、既に多くの実績があるEGRを適用することにより、大幅な性能改善（二元燃料／重油運転モードの燃費率改善、メタンスリップ削減）が可能です。

The new methane burning dual fuel engines, GA (Gas Admission) type engines are released, targeting mainly LNG carrier. GA type engine adopts Otto cycle in dual fuel mode and fuel gas can be supplied at lower pressure compared with GI type engine. In dual fuel mode, it is possible to suppress the generation of NOx by using the Otto cycle and clear the NOx Tier III regulation without EGR or SCR. Furthermore, by applying EGR, which has many achievements, it is possible to significantly improve performance (reduced gas/fuel oil consumption in dual fuel/fuel oil mode and methane slip).



Combustion chamber for ME-GI/LGI

機種 Engine type	燃料ガス供給圧力 Pressure	Fuel designation
ME-GI Gas Injection	高圧 High Pressure	-GI
ME-GA Gas Admission	低圧 Low Pressure	-GA

アンモニア焚き二元燃料機関 Under Development
Ammonia Burning Dual Fuel Engines

LGIP形機関の技術を応用したアンモニア焚きの 二元燃料機関を開発中です。アンモニア燃料は炭素分を含みませんので、GHG排出ゼロを実現するための技術として有望視されています。

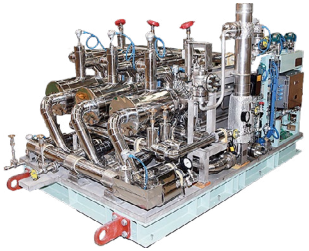
Ammonia burning dual fuel engines using the technology for LGIP type engines are under development. Ammonia fuel does not contain carbon, so it is regarded as a promising technology for achieving zero GHG emissions.

注記 Note
- GI形機関では、あらかじめ設定された値に従ってパイロット油と燃料ガスの比率を選択できるSDF (Specified Dual Fuel)運転が可能です。（オプション）
- 二元燃料機関には低BNと高BNのシリンダ油が供給できるシリンダ油システムが必要です。
- The GI engines can operate with fuel sharing, referred to as SDF (Specified Dual Fuel) operation, where the ratio between pilot oil and fuel gas can be selected according to preset values. (Option)
- The dual fuel engines are required a cylinder lubrication system which can supply both low and high BN lubricating oils.

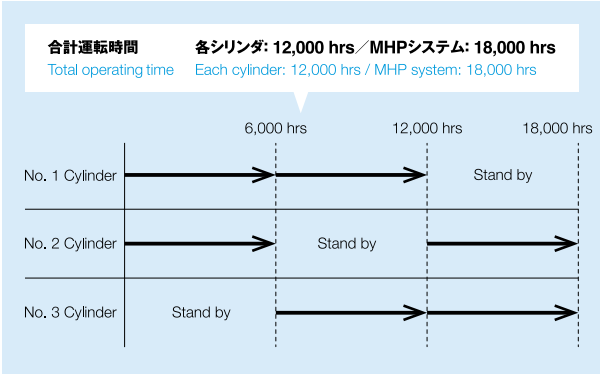
MHP—高圧LNGポンプ For GHG
MITSUI High Pressure LNG Pump

MHPシステム概要
MHP System Outline

ガス燃料焚き機関（ME-GI）の燃料供給機器として弊社が独自開発した高圧LNGポンプ（MHPシステム）をリリースしました。MHPシステムは油圧駆動を採用し、高圧LNGポンプの各シリンダを個別に動作制御可能としています。これにより、冗長性を有したスタンバイシリンダを同一スキッド上に設置できます。また、シリンダ動作速度は低速設計とし、シリンダを長寿命化しております。さらに、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し、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 which are applied LNG(ME-GI). The MHP system uses Hydraulic Drive Unit to control the operation of each cylinder of the High Pressure LNG Pump individually. Thereby standby cylinders can be installed on the same skid. In addition, the cylinder speed is designed to be low, and the life span of the cylinder is extended. Furthermore, our system can prevent LNG discharge pressure sudden rising by control the start-up with a low-speed cycle and emergency stop with rapidly action.



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おりますので、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.

TYPE	MHP-3	MHP-4	MHP-5
	← Cylinder No.		
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)	~ 1,930	~ 2,895	~ 3,860

※エンジン出力は参考値とし、内シリンダ1本をスタンバイ機として用いる。

* The engine output is a reference value, and one cylinder is standby.

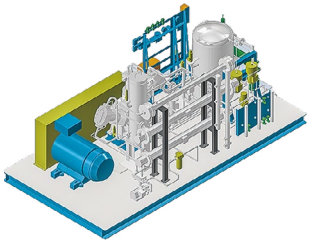
高圧LNGヒーター Under Development
High Pressure LNG Heater

高圧LNGポンプ用の高圧LNGヒーターを開発中です。熱収縮に強いコイル式を採用し、伝熱管内には熱応力低減のための特殊な構造を採用しております。

We are developing a High Pressure LNG Heater for High Pressure LNG Pump. Coil tube type is used against thermal expansion and thermal shrink. Adopting special structure inside the heat transfer tube, also reduce thermal stress.

高圧BOG圧縮機 For GHG
High Pressure BOG Compressor

LNG燃料船向けのBOG (Boil Off Gas)圧縮機をリリースしました。本製品はBOGを高圧に圧縮することで主機の燃料として供給することができます。本技術は余剰BOGを有効活用できる燃料節約技術として注目されています。圧縮機容量はLNG燃料船の余剰BOG処理に適したものとしており、幅広い船種に適用可能です。



We have released a BOG (Boil Off Gas) Compressor for LNG fueled vessels. The product can compress BOG to high pressure and supply it as fuel for the main engine. This technology is attracting attention as energy saving with effective utilization of excess BOG. The capacity is suitable for excess BOG treatment of LNG fueled vessels and applicable for various ship types.

システム概要
System Outline

圧縮機本体には陸上の自動車用CNGステーション向けで多数の実績のある型式を使用し、スナッバーやクーラー等の付帯品を備えた一体型ユニットとして提供します。

The compressor itself is proven type of many delivery records for land automotive CNG stations. We provide the compressor as a integrated unit including associated equipment, e.g. snubbers and coolers.

Compressor unit type	WT3-110GH
Compressor type	W-type 3-stage
Flow rate [kg/h]	250
Discharge pressure [MPaG]	31.5

お客様のニーズに応じた最適化

Optimization in Accordance with Customer Needs

燃料消費率の最適化 For GHG

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機関最適化方法をご提案します。Tier Ⅱ機関では、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4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。

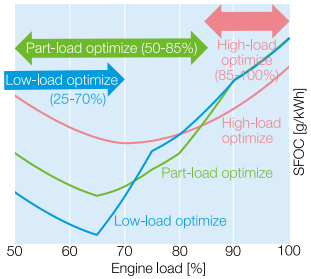
We propose engine optimization methods that utilize fuel efficiently in accordance with customer needs, such as "saving the specific fuel oil consumption (SFOC) in the load range most frequently used" and "adjusting to the heat and power demand on board". For Tier II engines, the load range to be optimized can be selected as below table. Four methods are available to achieve either Part-load optimize or Low-load optimize. These tunings improve the SFOC in part-load or low-load range shown as below figure, at the expense of a higher SFOC in the high-load range.

- 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）

Optimized load range

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

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（シリンダ内最大爆発圧力）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

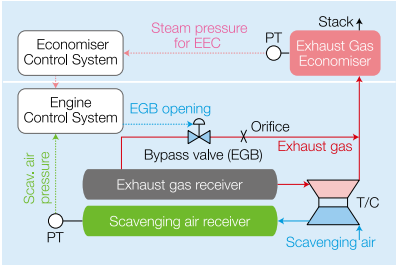
For the EGB, the turbocharger is selected to have high efficiency and high pressure ratio. This makes it possible to increase the scavenging air pressure and Pmax (maximum combustion pressure) in the target load range, and thus improving SFOC. In the high load range, the EGB valve installed on the exhaust receiver is opened to release the exhaust gas in order to prevent the overspeed of turbocharger. When the EGB technology is installed and if adjusting exhaust gas temperature more flexibly, an Economiser Energy Control (EEC) is available as an option.

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、機関の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。

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, when increasing the opening of EGB valve, although the EEC system has a penalty of SFOC for

the main engine, a higher exhaust gas temperature results in reducing the additional burning of the boiler and thus contributes to the running cost reduction of the whole vessel.



System layout of EGB and EEC

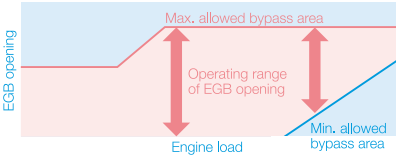


Image of operating range of EGB opening with EEC

EPT Option Engine Process Tuning

EPT（Engine Process Tuining）はHPTとほぼ同じ特徴を持つチューニング方法です。G95ME-C10.5、G80ME-C10.5およびG60ME-C10.5形機関にのみに適用可能です。EPT適用機関では、チューニング方法が従来のEGB/HPTからEPTに置き換わります。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。

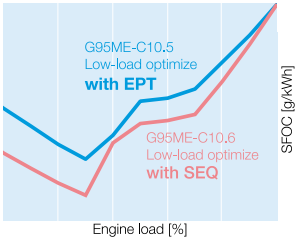
EPT tuning is a tuning method with similar features to HPT tuning. EPT tuning is available only for G95ME-C10.5, G80ME-C10.5 and G60ME-C10.5. For these engines, the tuning method is replaced conventional EGB and HPT to the EPT. If requiring higher exhaust gas temperature, applying EEC is available on 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つの機関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、軸系振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の改善を図ります。一方、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形機関にのみ適用されます。

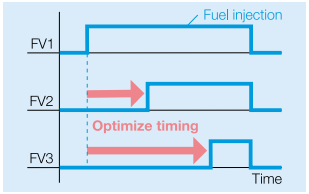


SFOC curve for Low-load, SEQ (vs EPT)

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 and improving SFOC in the part-load range are achieved. SEQ is available only with low-load optimize and only for G95ME-C10.6 type.

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

従来機関では、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形機関にも適用されます。



Concept of sequential fuel injection

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.

各形式に適用可能なチューニング
Available Tuning Methods for Each Engine Type

Engine type	Available tuning method			
	EGB	EGB with EEC	EPT	SEQ
G95ME-C10.6				Available
G80ME-C10.6, S60ME-C10.6, S50ME-C10.6	Available	Available		
G95ME-C10.5, G80ME-C10.5, G60ME-C10.5		Available	Available	
ME-C engines with cyl. bore 35 cm or larger except for above 7 engine types*	Available	Available		
Engine with cyl. bore 30 cm	NOT available **			

* S46ME-C8.6、G45ME-C9.7、S40ME-C9.5およびS35ME-C9.7形機関の場合、所定の過給機性能を満たす場合に限り、これらの機関チューニング方法を適用できます。
** ボア30 cm機関の場合、High-load optimizeのみが選択されます。
* For S46ME-C8.6, G45ME-C9.7, S40ME-C9.5 and S35ME-C9.7 type engines, the these engine tuning methods are available as long as specified turbocharger requirements can be fulfilled.
** For the engines with cylinder bore 30 cm, only High-load optimize is available arranged at Fore end is not available.

WHR Option Waste Heat Recovery

WHRとは過給機の余剰効率を活用した廃熱回収装置の総称です。所定の過給機性能を満たす場合に限り、すべての機関形式にWHRを適用できます。WHRの例を以下に示します。

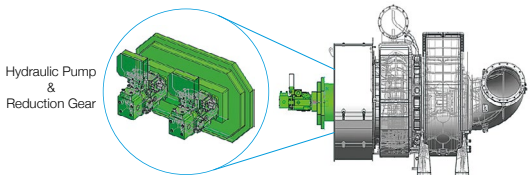
■ **Turbo Hydraulic System (THS)** 排ガスの余剰エネルギーを油圧として回収し、回収した油圧動力でクランク軸を加勢

■ **Turbo Hydraulic System type2 (THS2)** 排ガスの余剰エネルギーを油圧として回収し、ME形機関の高圧サーボ油として利用（83頁参照）

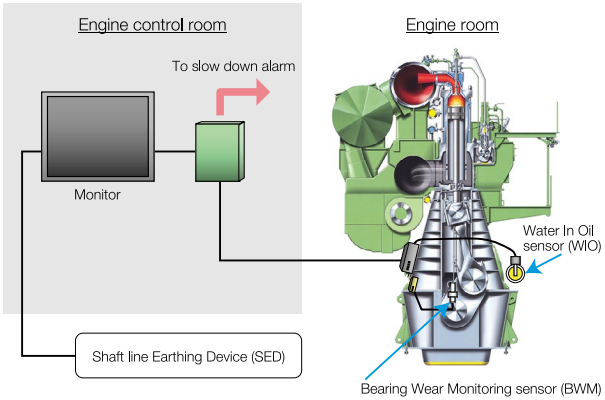
WHR is a generic term for waste heat recovery equipment that utilizes the surplus efficiency of the turbocharger. The WHR is available for all engine types, as long as specified turbocharger requirements can be fulfilled. An example of WHR is shown as below.

- Turbo Hydraulic System (THS)
  The surplus exhaust gas energy is recovered as hydraulic pressure, which assists the rotation of crank shaft.
- Turbo Hydraulic System type2 (THS2)
  The surplus exhaust gas energy is recovered as hydraulic pressure, which is used as high pressure servo oil for the ME type engines. (refer page 83)

Turbocharger with hydraulic pump and reduction gear for THS2



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形機関をリモート操縦

Remote Control System for ME Engine

電子制御形舶用機関（ME形機関）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機関の遠隔操縦を実現し、機関の保護機能、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 are provided as standard
- Type approved by ABS, BV, DNV, LR and NK
- Corresponded to IACS UR E10 Rev.7
- Communicate to the monitor(s) in inboard control room and display alarms and its details (option)
- The telegraph in control room is incorporated in speed control dial as standard on BMS-2000IV and work together

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、機関の始動・停止・逆転等機関の制御を行います。
- **機関保護システム（EPS）**
  機関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.

Mitsui E&S Systems Research Inc.

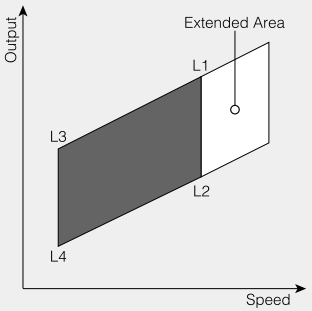
本装置を製造する三井E&Sシステム技研株式会社は、機関遠隔操縦装置シリーズ累計4,500台以上の就航実績を有します。
Mitsui E&S Systems Research Inc., the manufacture for this system, has experience in adoption cumulative total more than 4500 units of Remote Control System series.

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。各機関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形機関は、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

弊社製造の三井-MAN B&W機関の燃料消費率(燃費率)の保証は、多くの機関において連続常用出力(CSO)負荷を燃費率保証点として設定いただいております。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 manufactured by MITSUI E&S Co.,Ltd., the continuous normal output (CSO) load 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.

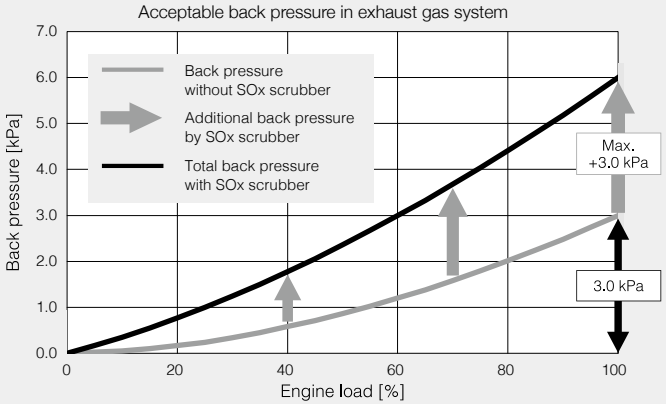
高硫黄燃料とSOxスクラバ適用
Application of High-Sulfur Fuels and SOx Scrubbers

本カタログに記載されている全ての機関に対して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、機関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.

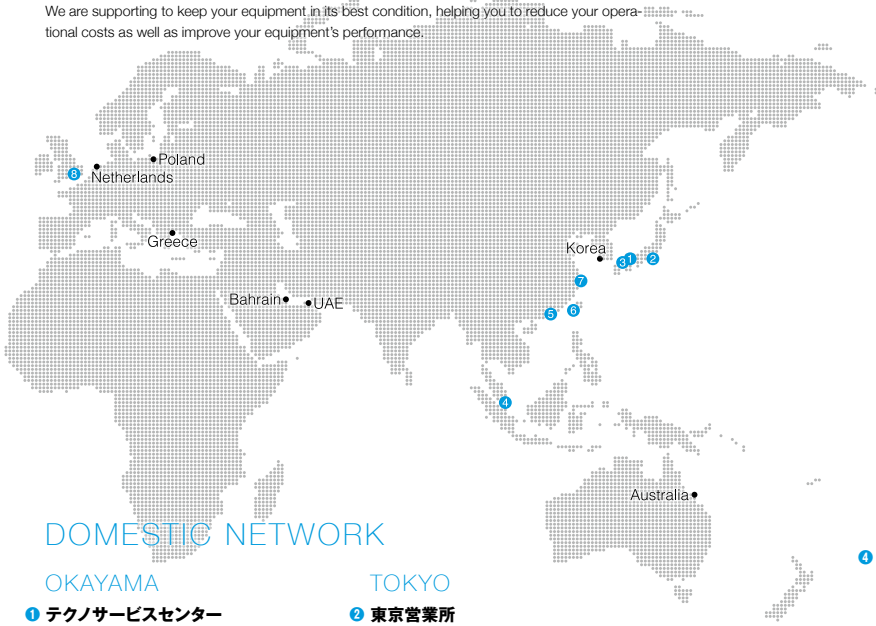
注記
・SOxスクラバを適用する場合、過給機の仕様を変更する必要があります（場合によっては過給機形式が変更となる可能性もあります）。SOxスクラバを搭載する場合は、弊社までご相談ください。
・EGRまたは高圧SCRを適用したTier III機関において、NOx ECA内で高硫黄燃料油を使用する場合、EGR、高圧SCRシステムを高硫黄燃料仕様にする必要があります。EGRおよび高圧SCRについては77～81頁を参照下さい。

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.77-81.



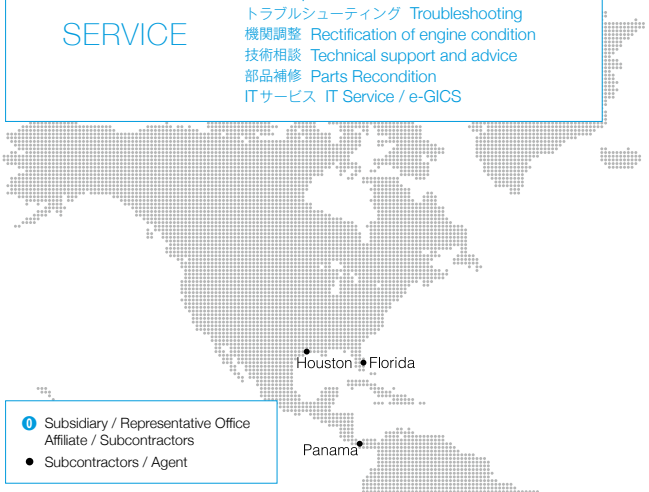
AFTER SERVICE NETWORK

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削減するお手伝いをいたします。国内外のアフターサービス網では、様々なサービスを行っています。
We are supporting to keep your equipment in its best condition, helping you to reduce your operational costs as well as improve your equipment's performance.



SERVICE

- 点検・整備 Inspection & Maintenance
- 修理 Repair
- トラブルシューティング Troubleshooting
- 機関調整 Rectification of engine condition
- 技術相談 Technical support and advice
- 部品補修 Parts Recondition
- ITサービス IT Service / e-GICS



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.
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
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

Hanoi Representative Office
Suite405, 4th floor, Sao Bac Building,
No.4 -Da Tuonog St., Hoan Kiem District,
Hanoi, Vietnam
Tel: +84-4-3938-6181
Fax: +84-4-3938-6180

Mitsui E&S Machinery Europe Limited
80 Coleman Street, London, EC2R 5BJ,
United Kingdom
Tel: +44-20-7104-2280
Fax: +44-20-7104-2279

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機関

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ストローク機関生産「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)

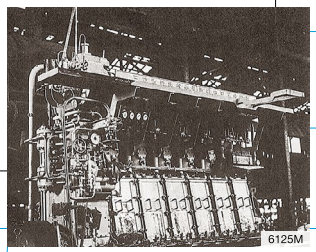
二元燃料機関の連続製造
Continuous production of dual fuel engine utilizing methanol, LNG and ethane

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

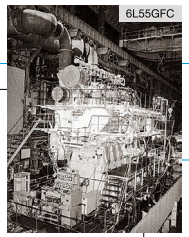
50 mil hp production(2005)

2004

三井-B&W 機関 **1号機**
1st MITSUI-B&W engine



MC形機関1番機
1st MC type engine



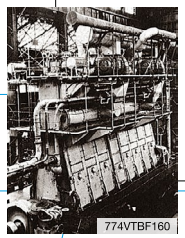
静圧過給方式導入
Introducing constant pressure turbocharging

初の電子制御機関
1st MITSUI-MAN B&W electronically controlled engine

1997

Japan's 1st engine with turbocharger

日本初の過給機付



1983

10 mil hp production(1976)

1978

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

世界初S-MC-C形

Our Future

Ammonia 2024 : Delivery
Halve GHG 2050

1928 1953 1960 1970 1980 1990 2000 2010 2020