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Marine & Offshore Solution Guide

Diesel Engines, Propulsion Systems,
Generator Sets, Automation

Edition 1 / 17
valid from 03/2017



Power. Passion. Partnership.



MTU: Power. Passion. Partnership.

MTU is the core brand of Rolls-Royce Power Systems AG, which is a world-leading provider of high- and medium-speed diesel and gas engines, complete drive systems, distributed energy systems and fuel injection systems for the most demanding requirements. Especially within the shipping sector the company has established a long and successful partnership with some ten thousands of engines in operation around the globe on all seas. Based on its innovative capabilities, its reliability and system expertise, MTU combines unique propulsion system know-how and a large range of products of excellent quality. Together with MTU's full product and customer services the benefit is yours, as highest availability is on your disposal, no matter where you are based.

For more information about MTU Products please contact our marine experts:

www.mtu-online.com/contact

MTU applies a policy of continual products and systems improvements. Please note, specifications are subject to change without notice. All dimensions are approximate. Details are subject to options selected. Please contact your MTU distributor for current information and binding data.



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Selection guideline

Marine and offshore service & supply

MTU application group >		1A	1B	1D	1DS
v Mechanical propulsion engines					
Yacht	Planing			■	■
	Semi planing			■	■
	Small displacement		■	■	■
	Large displacement > 120 ft.	■	■	■	■
Cargo ships & tankers	Inland freighters	■			
	Coastal ships	■			
Passenger ships	Sea-river ships	■			
	Tourist boats	■	■		
	Passenger ferries		■		
RoPax ferries	Cabin cruisers	■	■		
	Double-ended ferries	■	■		
	Fast ferries < 50 m	■	■		
Tugs & push boats	Fast ferries > 50 m		■		
	Tow & push boats	■			
	Harbour tugs	■	■		
Offshore vessels & crew boats	Coastal tugs	■			
	Escort tugs	■	■		
	Crew boats	■	■		
	Offshore supply vessels	■	■		
	Anchor handling tugs	■	■		
	Pilot boats	■	■		
	Trawler (fishing vessels)	■	■		
	Firefighting vessels	■	■	■	
	Rescue vessels	■	■	■	
	Research vessels	■	■	■	
	Dredgers	■	■		
	Cable laying vessels	■			

MTU application group >		1A	1B	1D	1DS
v Mechanical propulsion engines					
Marine	Fast attack crafts			■	■
Naval	Corvettes			■	■
Vessels	Frigates and Destroyers		■	■	■
	Amphibious crafts		■	■	■
	Large amphibious and support vessels	■	■	■	
	Mine countermeasure vessels			■	
Patrol boats	Small patrol crafts		■	■	■
	Coastal patrol crafts	■	■	■	■
	Large patrol vessels > 120 ft.	■	■	■	■

MTU application group >		3A/3B	3A/3B
v Power generation and diesel-electric propulsion		50 Hz	60 Hz
On-board powergen		■	■
Diesel-electric propulsion		■	■
Emergency powergen		■	■

The guideline on page 6 - 7 gives a rough overview which MTU application groups can be considered for which type of vessel or business model. To allocate which MTU application group suits your demands best, the intended annual usage and the expected load profile have to be considered.

Selection guideline

Offshore exploration & production

Diesel engines for:

- Heavy lift vessel
- Diving support vessel
- Pipe-laying vessel
- Cable-laying vessel
- Subsea support vessel
- Well intervention vessel
- Accommodation vessel
- Drill ship
- Wind converter platform
- Fixed platform
- Tension-leg platform
- Jack-up rig
- Spar
- NUI
- Conductor support system
- Compliant power
- FLNG
- Semi-submersible
- FPSO
- Windfarm substation platforms

Diesel engines for power generation

Power generation - constant speed

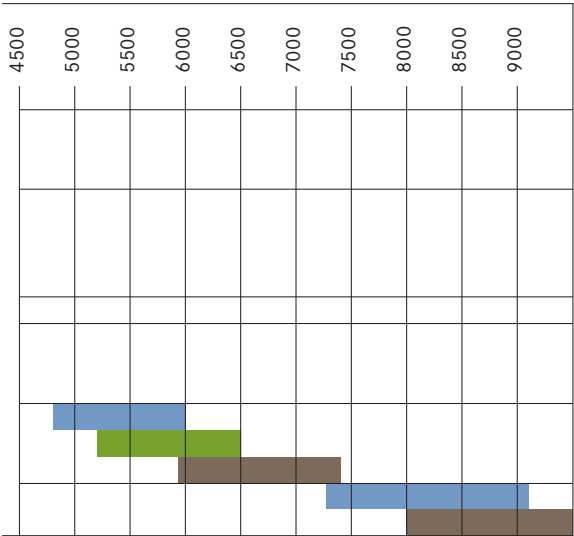
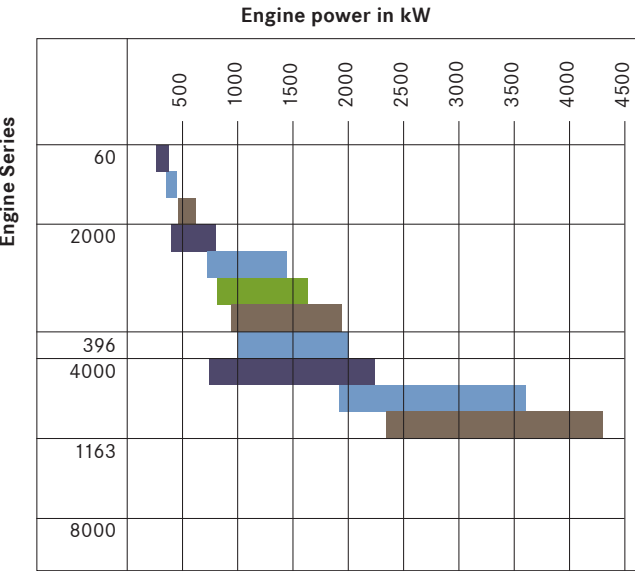
MTU application group >	3A	3B	3C
√ Power generation	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz
Power generation	x	x	x
Electric firepump drives		x	x
Electric drilling drives	x	x	

The guideline above gives a rough overview which MTU application groups can be considered for which type of vessel or business model. To allocate which MTU application group suits your demands best, the intended annual usage and the expected load profile have to be considered.

Power range

Marine and offshore service & supply

Main propulsion:



Engine power in kW

Engines	1A	1B	1D	1DS
60	261-373	354-447	–	466-615
2000	400-800	720-1440	810-1630	932-1939
396	–	1000-2000	–	–
4000	746-2240	1920-3600	–	2340-4300
1163	–	4800-6000	5200-6500	5920-7400
8000	–	7280-9100	–	8000-10000

1A - Diesel engines for vessels with unrestricted continuous operation

Average load: 70 - 90% of rated power; Rating definition: ICFN, fuel stop;

Typical annual usage: unrestricted*

1B - Diesel engines for fast vessels with high load factors

Average load: 60 - 80% of rated power; Rating definition: ICFN, fuel stop;

Typical annual usage: 5000 hours*

1D - Diesel engines for fast vessels with intermittent load factors

Average load: ≤ 60% of rated power; Rating definition: ICFN, fuel stop;

Typical annual usage: 3000 hours*

1DS - Diesel engines for fast vessels with low load factors

Average load: ≤ 60% of rated power; Rating definition: ICFN, fuel stop;

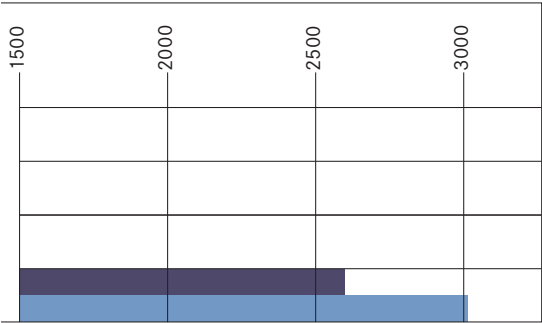
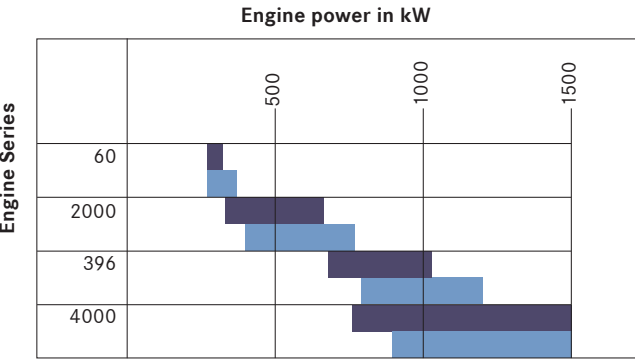
Typical annual usage: 1500 hours*

* MTU application groups (page 6-9) only indicate which MTU diesel engine suits your demands best. For your type of vessel, you can also choose engines from other MTU application groups than stated in the selection guideline.

Power range

Marine and offshore service & supply

Marine on-board power generation, diesel-electric drives and generator sets:



Engine power in kW

Engines	3A/3B	3A/3B
Frequency	50 Hz	60 Hz
60	271-322	271-370
2000	332-770	400-930
396	680-1030	790-1200
4000	760-2600	895-3015

3A/3B - Diesel engines for onboard power generation and diesel-electric drive

Continuous operation 50 Hz; Rating definition: ICXN, 10% overload capab.

Continuous operation 60 Hz; Rating definition: ICXN, 10% overload capab.

MTU application groups (page 6-9) only indicate which MTU diesel engine suits your demands best. For your type of vessel, you can also choose engines from other MTU application groups than stated in the selection guideline.

Genset power in kW*

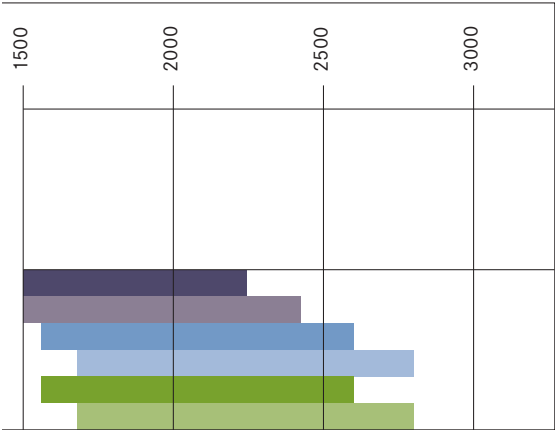
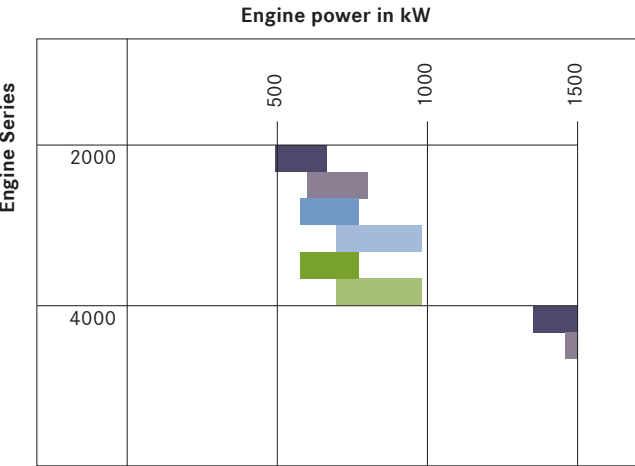
Gensets	3A/3B	3A/3B
Frequency	50 Hz	60 Hz
MG 2000	310-730	370-880
MG 4000	720-1690	850-2150

* alternator efficiency of 96% considered, excluding parasitic losses

Power range

Offshore exploration & production

Diesel engines and gensets for power generation:



Engine power in kW

Engines	3A	3A	3B	3B	3C	3C
Frequency	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
2000	498-664	600-800	575-770	695-980	575-770	695-980
4000	1350-2245	1455-2425	1560-2600	1680-2800	1560-2600	1680-2800

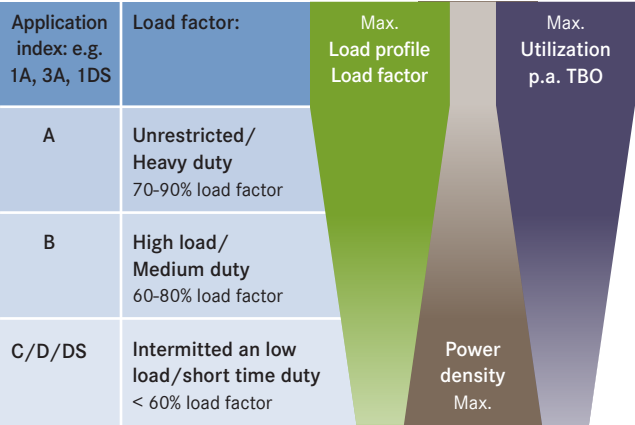
Genset power in kW*

Gensets	3A	3A	3B	3B	3C	3C
Frequency	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
PP 4000	1295-2155	1395-2330	1500-2500	1615-2690	1500-2500	1615-2690

* alternator efficiency of 96% considered, excluding parasitic losses

MTU application groups (page 6-9) only indicate which MTU diesel engine suits your demands best. For your type of vessel, you can also choose engines from other MTU application groups than stated in the selection guideline.

3A/3B/3C	Diesel engines for power generation, electric fire-pump drives and emergency power – constant speed
3A	Continuous Power
50 Hz	Continuous operation power, unrestricted Rating definition: ICXN, 10% overload capability
60 Hz	Continuous operation power, unrestricted; Rating definition: ICXN, 10% overload capability
3B	Prime Power
50 Hz	Continuous operation with variable load Rating definition: ICXN, 10% overload capability
60 Hz	Continuous operation with variable load; Rating definition: ICXN, 10% overload capability
3C	Prime Power limited
50 Hz	Standby operation with variable load Rating definition: ICXN, 10% overload capability
60 Hz	Standby operation with variable load Rating definition: ICXN, 10% overload capability



MTU is working hard to meet and even exceed the increasing demands of ship owners and operators for cost-effective and eco-friendly solutions. One example is the engine TBO (Time Between Overhauls) which we optimize on the basis of field data analysis and close inspection of engines and components that have already proven their reliability in field operation. Depending on the analysis results, we extend maintenance and TBO intervals keeping safe operation assured.

MTU offers product lines specifically tailored to customer requirements. Some are laid out for high power density with ideal power-to-weight-ratios (application groups C, D and DS). Other product lines are specifically configured to achieve maximum service life at lower power densities. These are suitable for applications involving high load factors and runtimes up to 8,000 hours per year (application groups A and B).

Power definition

The rated power of diesel engines stated in this sales program corresponds to ISO 3046-1:2002 (E) and ISO 15550:2002 (E). The power produced at the flywheel will be within the tolerance of 3% - according to ISO 15550:2002 (E) - up to 25°C (77°F) combustion air temperature measured at the air cleaner inlet and up to 25°C (77°F) sea or raw water temperature measured at the seawater pump suction inlet, unless other values mentioned explicitly.

ICFN = ISO standard (continuous) fuel stop power
ICXN = ISO standard (continuous) power exceedable by 10% (ratings also apply to ISO 8665 and SAE J1228 standard conditions)

Barometric pressure: 1000 mbar
Site altitude above sea level: 100 m
Fuel specification: EN 590 to ASTM D 975-00
(Fuel consumption [with all pumps] in accordance with DIN ISO 3046 [except Series 60], values stated for IMO certification.)

General reference conditions for diesel engines and generator sets:

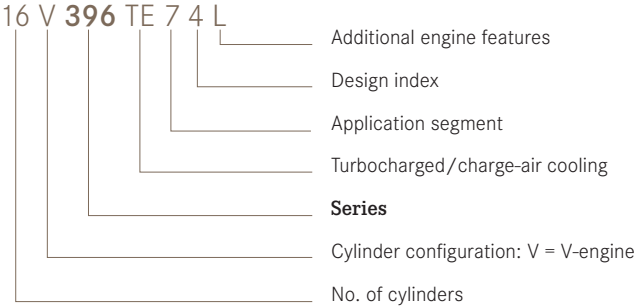
- Intake air temperature 25°C
- Sea water temperature 25°C
- Charge air coolant inlet temperature 45°C up to 65°C without deration

All engines are designed and built according to classification requirements, certificate on request.

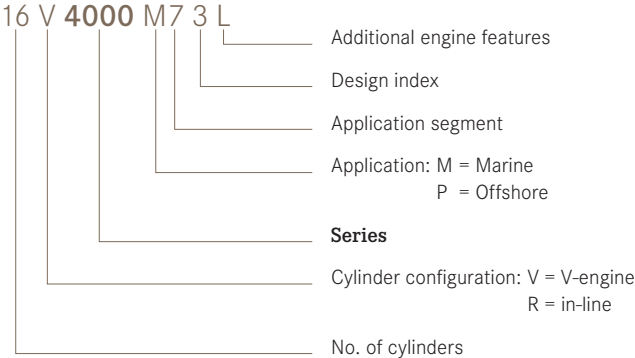
- Classification with:
- Unrestricted service for engines with 10% overload capacity
 - Restricted service for engines without overload capacity

Explanation of the engine designation

Series 396 – Example:

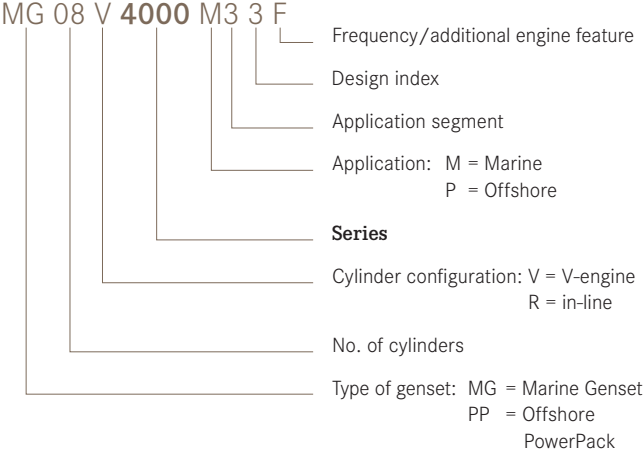


Series 2000 / 4000 / 1163 / 8000 – Example:



Explanation of the genset designation

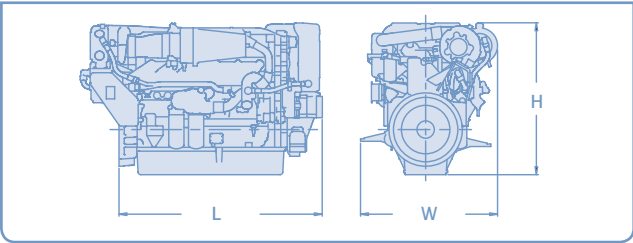
Generator sets with Series 2000 / 4000 – Example:



Turbocharged engines/gensets with	
Separate-circuit charge-air cooling	60 / 2000 P / 4000 P / 1163
Split-circuit charge-air cooling	2000 M / 4000 M / 396 TE / 8000 M
Additional engine/gensets features	
Power uprated	L
Power/speed reduced	R
Frequency	A or F (50 Hz) B or S (60 Hz)



Overview Series 60

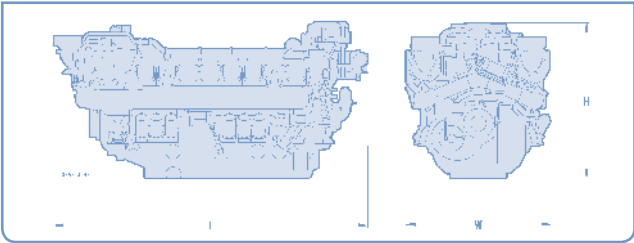


Marine and offshore service & supply

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 6 Cyl./ in-line	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
S60	14.0 (855)	1850 x 1035 x 1160 (73 x 41 x 46)	1633 (3600)

External heat exchanger version as standard, optional engine mounted.

Overview Series 396

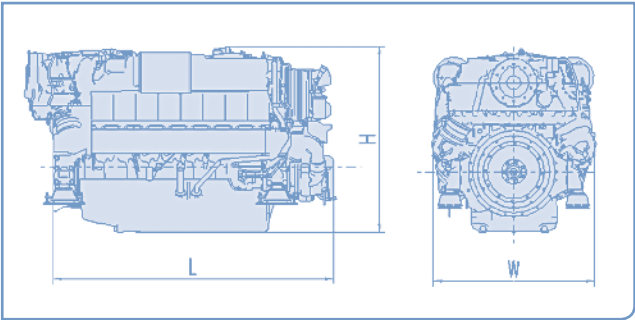
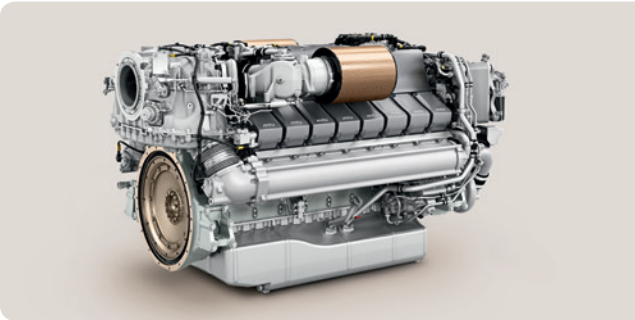


Marine and offshore service & supply

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 90°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
8V 396	31.7 (1933)	2005 x 1525 x 1540 (79 x 60 x 61)	3800 (8377)
12V 396	47.5 (2900)	2535 x 1525 x 1695 (100 x 60 x 67)	4900 (10803)
16V 396	63.4 (3868)	3070 x 1530 x 1660 (121 x 60 x 65)	6140 (13536)

External heat exchanger version as standard, optional engine mounted.

Overview Series 2000



Engines overview

Marine and offshore service & supply

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 90°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
8V 2000	15.9	1435 x 1280 x 1315	1870
M41/51/61	(970)	(57 x 50 x 52)	(4123)
12V 2000	23.9	2105 x 1400 x 1290	2756
M41/51/61/70	(1458)	(83 x 55 x 51)	(6064)
16V 2000	31.8	2525 x 1425 x 1290	3270
M41/51/61/70	(1943)	(99 x 56 x 51)	(7209)

Engine mounted heat exchanger as standard, external heat exchanger version as option.

8V 2000	17.9	1416 x 1130 x 1200	1970
M72/84/93/94	(1093)	(56 x 45 x 47)	(4343)
10V 2000	22.3	1604 x 1165 x 1347	2305
M72/86/96	(1361)	(63 x 46 x 53)	(5082)
12V 2000	26.8	1870 x 1295 x 1350	2810
M72/86/96	(1635)	(74 x 51 x 53)	(6195)
16V 2000	35.7	2258 x 1318 x 1455	3450
M72/86/96	(2179)	(89 x 52 x 57)	(7607)

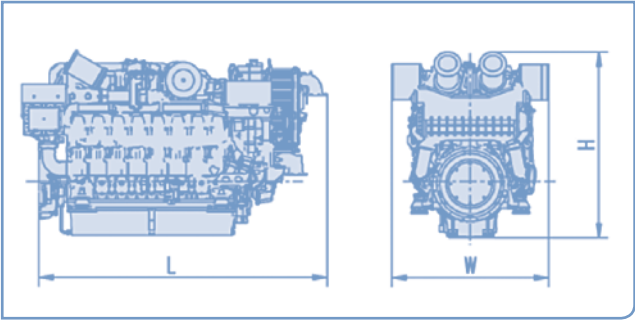
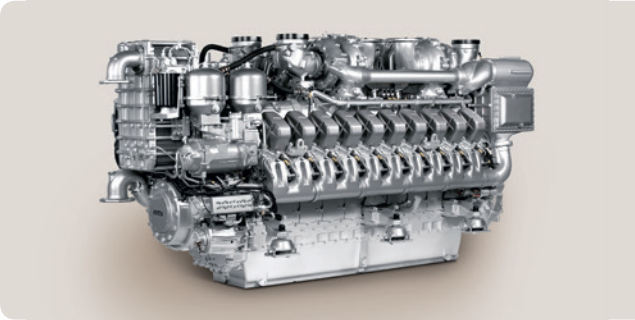
Engine mounted heat exchanger as standard.

Offshore exploration & production

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 90°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
12V 2000	23.9	2165 x 1340 x 1490	2650
P62/82	(1458)	(85 x 53 x 58)	(5842)
16V 2000	31.8	2502 x 1430 x 1495	3060
P62/82	(1943)	(99 x 53 x 59)	(6746)

External heat exchanger version as standard.

Overview Series 4000



Engines overview

Marine and offshore service & supply

Standard stroke (190 mm)

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 90°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
12V 4000	51.7	2870x1850x2185	8410
M53B/73/93	(3155)	(113x73x86)	(18541)
16V 4000	69.0	3510x1850x2185	9890
M53B/73/93	(4210)	(138x73x86)	(21803)
20V 4000	86.2	4040x1470x2440	12900
M53B/73/93	(5260)	(159x58x96)	(28439)

Engine mounted heat exchanger as standard.

Offshore exploration & production

Long stroke (210 mm)

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 90°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
12V 4000	57.2	2530x1590x2065	7300
P63/83	(3491)	(100x63x81)	(16093)
16V 4000	76.3	3000x1590x2065	8800
P63/83	(4656)	(118x63x81)	(19400)
20V 4000	95.4	3470x1590x2065	10680
P63/83	(5822)	(137x63x81)	(23545)

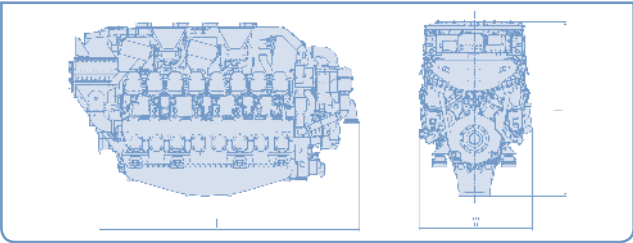
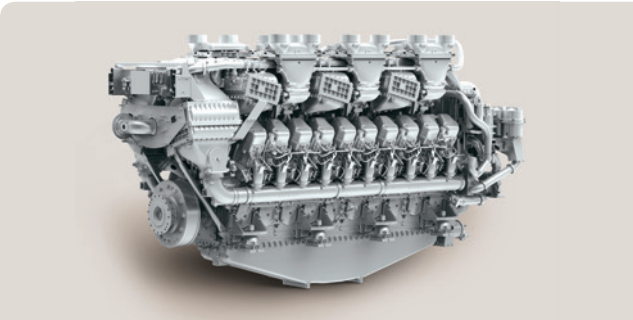
External heat exchanger version as standard.

Long stroke (210 mm)

8V 4000 M23/24/ M33/53/54/63	38.2 (2331)	2386x1615x1972 (94x64x78)	5710 (12588)
12V 4000 M23/ M24/33/34/53/ M54/63/64	57.2 (3491)	2740x1570x2370 (108x62x93)	7600 (16755)
16V 4000 M23/ M24/33/34/43/ M53/54/63/64	76.3 (4656)	3270x1570x2370 (129x62x93)	8950 (19731)

Engine mounted heat exchanger as standard, external heat exchanger version as option.

Overview Series 1163

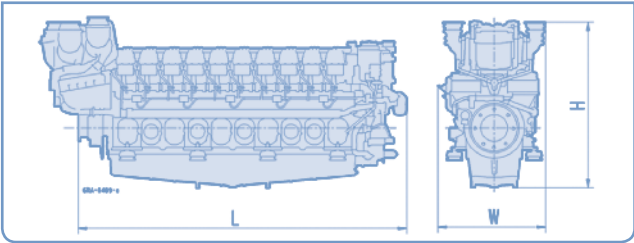
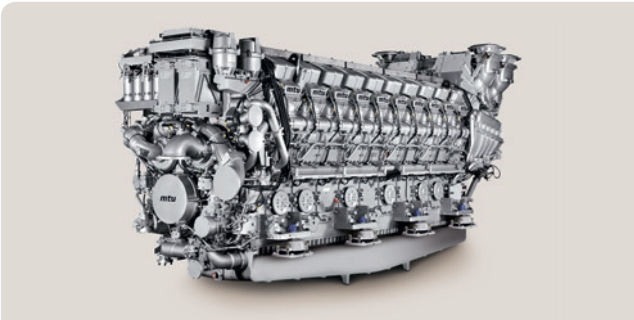


Marine and offshore service & supply

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 60°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
16V 1163	186.1 (11357)	4687x1918x3040 (185x76x120)	20590 (45393)
20V 1163	232.7 (14200)	5353x1918x3040 (211x76x120)	25000 (55116)

External heat exchanger version as standard.

Overview Series 8000

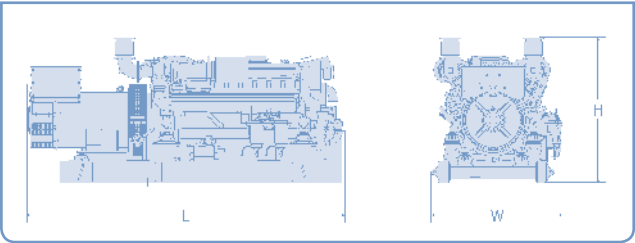
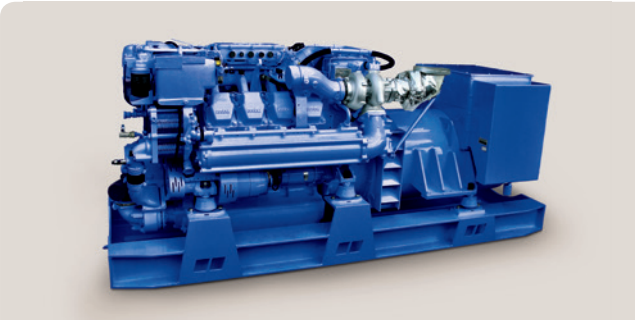


Marine and offshore service & supply

Engine	Displacement	Dimensions, max.	Mass, max.
Cylinder config.: 48°V	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
16V 8000	278 (16965)	5698x2040x3375 (224x80x133)	42000 (92594)
20V 8000	347.4 (21200)	6645x2040x3375 (262x80x133)	49600 (109348)

External heat exchanger version as standard.

Overview Series 2000 genset

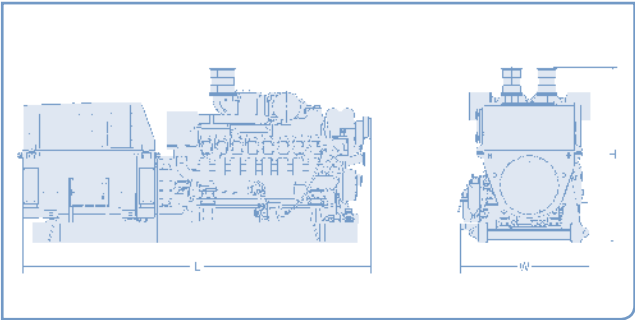
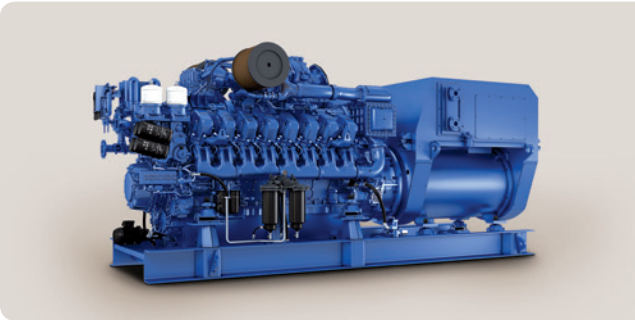


Marine and offshore service & supply

Genset model	Displacement	Dimensions, max.	Mass, max.
	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
MG08V 2000 M51/41	15.9 (970)	2900 x 1680 x 1550 (114 x 66 x 61)	3950 (8708)
MG12V 2000 M51/41	23.9 (1458)	3550 x 1680 x 1680 (140 x 66 x 66)	5400 (11905)
MG16V 2000 M51/41	31.8 (1943)	3900 x 1680 x 1760 (154 x 66 x 70)	6300 (13890)

Engine mounted heat exchanger version as standard, optional external cooling.

Overview Series 4000 genset



Engines overview

Marine and offshore service & supply

Long stroke (210 mm)

Genset model	Displacement	Dimensions, max.	Mass, max.
	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
MG08V 4000	38.2	4250 x 1825 x 2225	11240
M23/24/33	(2331)	(167 x 72 x 87)	(24780)
MG12V 4000	57.2	4700 x 1825 x 2285	14000
M23/24/33/34	(3491)	(185 x 72 x 90)	(30865)
MG16V 4000 M23/	76.3	5700 x 1965 x 2285	18500
M24/33/34/43	(4656)	(225 x 78 x 90)	(40786)

External heat exchanger version as standard, optional engine mounted.

Offshore exploration & production

Long stroke (210 mm)

Genset model	Displacement	Dimensions, max.	Mass, max.
	Total displac. l (cu in)	L x W x H mm (in)	(dry) kg (lbs.)
PP12V4000	57.2	4850 x 1950 x 2450	14500
P63/83	(3491)	(191 x 77 x 96)	(31970)
PP16V4000	76.3	5720 x 1950 x 2450	18500
P63/83	(4656)	(225 x 77 x 96)	(40786)
PP20V4000	95.4	6950 x 1950 x 2450	24300
P63/83	(5822)	(274 x 77 x 96)	(53575)

Diesel engines for mechanic propulsion



mechanic propulsion

Diesel engines for
mechanic propulsion

261 kW - 1342 kW
(350 bhp - 1800 bhp)

Engine model	Rated power			Application group	
	ICFN			1A	1B
	kW	bhp	rpm		
Series 60	60	261	350	1800	
	60	280	375	1800	
	60	298	400	1800	
	60	317	425	1800	
	60	336	450	1800	
	60	354	475	1800	
	60	354	475	2100	
	60	373	500	1800	
	60	399	535	2100	
	60	447	600	2100	
	60	466	625	2300	
	60	499	670	2300	
	60	552	740	2300	
	60	597	800	2300	
	60	615	825	2300	
Series 2000	8V 2000 M61	400	536	1800	
	12V 2000 M61	600	805	1800	
	8V 2000 M72	720	966	2250	
	12V 2000 M70	788	1057	2100	
	16V 2000 M61	800	1070	1800	
	8V 2000 M84	810	1085	2450	
	8V 2000 M84L	895	1200	2450	
	10V 2000 M72	900	1205	2250	
	8V 2000 M94	932	1250	2450	
	10V 2000 M86	1015	1360	2450	
	16V 2000 M70	1050	1408	2100	
	12V 2000 M72	1080	1450	2250	
	10V 2000 M96	1120	1500	2450	
	10V 2000 M96L	1193	1600	2450	
	12V 2000 M86	1268	1700	2450	
	12V 2000 M96	1342	1800	2450	

Application group	Fuel consumption			Emissions		
	at rated power		Optimum	Optimization		
	1D	1DS	g/kWh l/h g/kWh	IMO*	EPA	EU
			206 65 REQ.	II	T2c**	–
			205 69 REQ.	II	T2c**	–
			198 71 REQ.	II	T2c**	–
			197 75 REQ.	II	T2c**	–
			196 80 REQ.	II	T2c**	–
			196 84 REQ.	II	T2c**	–
			203 87 REQ.	II	T2c**	–
			196 88 REQ.	II	T2c**	–
			205 98 REQ.	II	T2c**	–
			210 113 REQ.	II	T2c**	–
			216 121 REQ.	II	T2c**	–
			211 127 REQ.	II	T2c**	–
			215 143 REQ.	II	T2c**	–
			218 157 REQ.	II	T2c**	–
			219 162 REQ.	II	T2c**	–
			205 99 199	II	T2c**	CCNR II
			213 153 200	II	T2c**	CCNR II
			212 184 195	II	T2c**	IIIA
			209 198 197	I**	T2c**	–
			207 200 201	II	T2c**	CCNR II
			218 213 192	II	T2c**	CCNR II
			227 245 194	II	T2c**	–
			215 233 197	II	T2c**	IIIA
			226 254 195	II	T2c**	CCNR II
			219 268 192	II	T3r	RCD 2
			212 267 195	II	T2c**	–
			208 271 195	II	T2c**	IIIA
			220 297 192	II	T3r	RCD 2
			223 320 192	II	T3r	RCD 2
			214 326 196	II	T3r	RCD 2
			215 347 195	II	T3r	RCD 2

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply

Diesel engines for
mechanic propulsion

746 kW - 2160 kW
(1000 bhp - 2895 bhp)

	Engine model	Rated power			Application group	
		ICFN			1A	1B
		kW	bhp	rpm		
Series 2000	12V 2000 M96L	1432	1920	2450		
	16V 2000 M72	1440	1930	2250		
	16V 2000 M86	1630	2186	2450		
	16V 2000 M96	1790	2400	2450		
	16V 2000 M96L	1939	2600	2450		
Series 396	8V 396 TE74L	1000	1341	1900		
	12V 396 TE74L	1500	2012	1900		
	16V 396 TE74L	2000	2682	1900		
Series 4000	8V 4000 M53R	746	1000	1600		
	8V 4000 M54R	746	1000	1600		
	8V 4000 M54	895	1199	1800		
	8V 4000 M53	920	1234	1800		
	8V 4000 M63	1000	1340	1800		
	12V 4000 M53R	1140	1529	1600		
	12V 4000 M54	1193	1600	1800		
	12V 4000 M53	1380	1851	1800		
	12V 4000 M64	1398	1875	1800		
	16V 4000 M53R	1492	2000	1600		
	12V 4000 M63	1500	2012	1800		
	16V 4000 M53R	1520	2038	1600		
	16V 4000 M54	1685	2260	1800		
	16V 4000 M53	1840	2467	1800		
	16V 4000 M63R#	1920	2575	1600		
	12V 4000 M73	1920	2575	1970		
	16V 4000 M64	1999	2681	1800		
	16V 4000 M63	2000	2680	1800		
	12V 4000 M73L	2160	2895	2050		

Application group	Fuel consumption			Emissions		
	at rated power		Optimum	Optimization		
	1D	1DS	g/kWh	l/h	g/kWh	IMO* EPA EU
			216	373	193	II T3r RCD 2
			206	357	195	II T2c** IIIA
			217	426	193	II T3r RCD 2
			215	463	190	II T3r RCD 2
			216	505	190	II T3r RCD 2
			217	261	213	I** - -
			214	387	203	I** - -
			212	511	199	I** - -
			206	185	196	II T2c** IIIA
			206	185	196	II T3c*** -
			212	228	196	II T3c*** -
			208	231	192	II T2c** IIIA
			209	252	189	II T2c** IIIA
			201	276	200	II T2c** IIIA
			209	300	REQ.	II T3c** -
			201	334	196	II T2c** IIIA
			211	355	REQ.	II T3c** -
			199	358	REQ.	II T2c** IIIA
			201	363	196	II T2c** IIIA
			199	364	198	II T2c** IIIA
			206	417	195	II T3c** -
			199	441	198	II T2c** IIIA
			203	468	203	II - -
			212	490	210	II T2c** -
			202	485	194	II T3c** -
			199	480	192	II T2c** IIIA
			213	554	210	II T2c** -

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply
*** until 30.09.2017
1840 kW with 1600 rpm available on request

mechanic propulsion

Diesel engines for
mechanic propulsion

2240 kW - 10000 kW
(3004 bhp - 13410 bhp)

	Engine model	Rated power			Application	
		ICFN			group	
		kW	bhp	rpm	1A	1B
Series 4000	16V 4000 M63L	2240	3004	1800	■	
	12V 4000 M93	2340	3140	2100		
	16V 4000 M73	2560	3435	1970		■
	12V 4000 M93L	2580	3460	2100		
	16V 4000 M73L	2880	3860	2050		■
	16V 4000 M93	3120	4185	2100		
	20V 4000 M73	3200	4290	1970		■
	16V 4000 M93L	3440	4615	2100		
	20V 4000 M73L	3600	4830	2050		■
	20V 4000 M93	3900	5230	2100		
Series 1163	20V 4000 M93L	4300	5766	2100		
	16V 1163 M74	4800	6437	1250		■
	16V 1163 M84	5200	6975	1280		
	16V 1163 M94	5920	7940	1325		
	20V 1163 M74	6000	8045	1250		■
	20V 1163 M84	6500	8715	1280		
	20V 1163 M94	7400	9925	1325		
	16V 8000 M71L	7280	9762	1150		■
	16V 8000 M91L	8000	10728	1150		
	20V 8000 M71	8200	10995	1150		■
Series 8000	20V 8000 M71L	9100	12205	1150		■
	20V 8000 M91L	10000	13410	1150		

Application	group	Fuel consumption			Emissions		
		at rated power		Optimum	Optimization		
		1D	1DS	g/kWh	l/h	g/kWh	IMO* EPA EU
				195	526	194	II T2c** IIIA
	■			216	609	205	II T2c** -
				218	672	205	II T2c** -
	■			217	675	205	II T2c** -
				220	763	205	II T2c** -
	■			224	842	205	II T2c** -
				213	821	210	II T2c** -
	■			230	953	205	II T2c** -
				212	920	210	II T2c** -
	■			212	996	205	II T2c** -
	■			220	1140	210	II T2c** -
				210	1316	202	II - -
	■			207	1297	200	II - -
	■			212	1512	201	II - -
				208	1504	195	II - -
	■			208	1629	195	II - -
	■			210	1872	195	II - -
				196	1719	188	II T2c** -
	■			198	1908	-	II - -
				190	1877	184	II T2c** -
				196	2149	185	II T2c** -
	■			199	2398	192	II - -

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply

Diesel engines and gensets for
on-board power generation
and electric propulsion



on-board power generation & electric propulsion

Diesel engines and gensets for
on-board power generation
and electric propulsion -
50 Hz @ 1500 rpm

271 kW - 2600 kW
(363 bhp - 3487 bhp)

Series 60	Engine model	Rated power ICXN		Genset model	Rated power		
		kW	bhp			kWe	kVA
Series 2000	60	271	363	—			
	60	322	432	—			
	8V 2000 M51A	332	445	MG08V2000M51A	310	388	
	8V 2000 M41A	385	516	MG08V2000M41A	360	450	
	12V 2000 M51A	498	668	MG12V2000M51A	465	581	
	12V 2000 M41A	575	771	MG12V2000M41A	540	675	
	16V 2000 M51A	664	890	MG16V2000M51A	630	788	
	16V 2000 M41A	770	1033	MG16V2000M41A	690	863	
Series 396				MG16V2000M41A	730	913	
	8V 396 TE54	680	912	●			
	12V 396 TE54	1030	1382	●			
	8V 4000 M23F	760	1019	MG08V4000M23F	720	900	
	8V 4000 M33F	880	1181	MG08V4000M33F	830	1037	
	12V 4000 M23F	1140	1529	MG12V4000M23F	1080	1350	
	12V 4000 M33F	1320	1770	MG12V4000M33F	1260	1575	
	12V 4000 P63	1350	1810	●			
	16V 4000 M23F	1520	2038	MG16V4000M23F	1460	1825	
	12V 4000 P63	1560	2092	●			
	16V 4000 M33F	1760	2360	MG16V4000M33F	1690	2112	
	16V 4000 P63	1800	2414	●			
	16V 4000 P63	2080	2789	●			
	20V 4000 P63	2245	3011	●			
20V 4000 P63	2600	3487	●				

Application group		Fuel consumption				Emissions Optimization	
3A	3B	at 75%		at 100%		IMO *	EPA
		g/kWh	l/h	g/kWh	l/h		
■		199	54	200	72	I**	—
	■	197	63	195	83	I**	—
■		213	64	205	82	II	—
	■	210	73	203	94	II	—
■		208	93	203	122	II	—
	■	205	106	201	139	II	—
■		208	124	206	165	II	—
	■	204	141	199	184	II	—
■		207	127	205	167	II	—
■		205	191	202	251	II	—
■		216	148	207	189	II	—
	■	211	167	205	217	II	—
■		211	217	200	274	II	—
	■	205	244	197	312	II	—
■		204	248	204	331	II	—
■		210	287	201	367	II	—
	■	202	284	202	378	II	—
	■	205	325	199	420	II	—
■		201	326	198	428	II	—
	■	199	373	197	492	II	—
■		210	425	207	558	II	—
	■	206	482	211	659	II	—

50Hz - on-board power generation & electric propulsion

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply
● on request

Diesel engines and gensets for
on-board power generation
and electric propulsion -
60 Hz @ 1800 rpm

271 kW - 2080 kW
(363 bhp - 2789 bhp)

	Engine model	Rated power		Genset model	Rated power		
		ICXN			kWe	kVA	
Series 60	60	271	363	—			
	60	322	432	—			
	60	322	432	—			
	60	370	496	—			
Series 2000	8V 2000 M51B	400	536	MG08V2000M51B	370	463	
	8V 2000 M41B	465	624	MG08V2000M41B	430	538	
	12V 2000 M51B	600	805	MG12V2000M51B	560	700	
	12V 2000 M41B	695	932	MG12V2000M41B	655	819	
	16V 2000 M51B	800	1073	MG16V2000M51B	750	938	
	16V 2000 M41B	930	1247	MG16V2000M41B	810	1013	
Series 396				MG16V2000M41B	880	1100	
	8V 396 TE54	790	1059	●			
	12V 396 TE54	1200	1609	●			
	8V 4000 M24S	895	1200	MG08V4000M24S	850	1062	
	8V 4000 M23S	920	1234	MG08V4000M23S	870	1090	
	8V 4000 M33S	1040	1395	MG08V4000M33S	990	1237	
	12V 4000 M24S	1193	1600	MG12V4000M24S	1140	1425	
	12V 4000 M23S	1380	1851	MG12V4000M23S	1310	1638	
	12V 4000 M34S	1398	1875	MG12V4000M34S	1340	1675	
	12V 4000 P83	1455	1951	●			
	12V 4000 M33S	1560	2092	MG12V4000M33S	1480	1850	
	12V 4000 M53B	1650	2213	●			
	12V 4000 P83	1680	2253	●			
	16V 4000 M24S	1685	2260	MG16V4000M24S	1620	2025	
	16V 4000 M23S	1840	2467	MG16V4000M23S	1750	2188	
	Series 4000	16V 4000 P83	1940	2602	●		
		16V 4000 M34S	1999	2681	MG16V4000M34S	1920	2400
		16V 4000 M33S	2080	2789	MG16V4000M33S	1990	2488

Application group		Fuel consumption				Emissions	
3A	3B	at 75%		at 100%		Optimization	
		g/kWh	l/h	g/kWh	l/h	IMO*	EPA
■		200	49	197	64	II	T2c**
■		200	58	197	76	II	T2c**
	■	196	57	197	76	II	T2c**
	■	196	65	200	89	II	T2c**
■		212	77	207	100	II	–
	■	210	88	208	116	II	–
■		210	113	206	148	II	–
	■	207	130	205	171	II	–
■		207	149	202	194	II	–
	■	204	171	201	224	II	–
■		219	156	217	206	II	–
■		216	233	215	310	II	–
■		219	176	215	231	II	T3c***
■		221	183	211	233	II	T2c**
	■	218	204	210	262	II	T2c**
■		221	237	208	298	II	T3c**
■		215	267	205	340	II	T2c**
	■	223	499	210	352	II	T3c**
■		211	276	203	355	II	T1NRMM**
	■	210	295	206	386	II	T2c**
■		215	319	211	418	II	–
	■	207	313	207	418	II	T1NRMM**
■		REQ.	REQ.	REQ.	REQ.	II	T3c**
	■	214	355	207	457	II	T2c**
■		211	369	205	477	II	T1NRMM**
	■	228	410	202	484	II	T3c**
	■	209	393	203	509	II	T2c**

60Hz – on-board power generation &
electric propulsion

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply
● on request
*** until 30.09.2017

Diesel engines and gensets for
on-board power generation
and electric propulsion –
60 Hz @ 1800 rpm

2200 kW - 3015 kW
(2950 bhp - 4043 bhp)

Series 4000

Engine model	Rated power		Genset model	Rated power	
	ICXN				
	kW	bhp		kWe	kVA
16V 4000 M53B	2200	2950	●		
16V 4000 M43S	2240	3004	MG16V4000M43S	2150	2688
16V 4000 P83	2240	3004	●		
20V 4000 P83	2425	3252	●		
20V 4000 P83	2800	3755	●		
20V 4000 M53B	3015	4043	●		

Application group	Fuel consumption				Emissions	
	at 75%		at 100%		Optimization	
	3A	3B	g/kWh	l/h	g/kWh	l/h
	■		208	414	208	551
	■		208	421	203	548
	■		205	413	204	549
■			211	461	209	608
	■		209	527	215	723
	■		214	583	204	741

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply
● on request

60Hz – on-board power generation &
electric propulsion

Diesel engines and gensets for offshore power generation



offshore power generation

Diesel engines and gensets for offshore power generation – 50 Hz @ 1500 rpm

498 kW - 2600 kW
(668 bhp - 3487 bhp)

Series 4000 P Series 2000 P

Engine model	Rated power		Genset model	Rated power	
	ICXN	bhp		kWe	kVA
12V 2000 P62	498	668	●		
12V 2000 P62	575	771	●		
16V 2000 P62	664	890	●		
16V 2000 P62	770	1033	●		
12V 4000 P63	1350	1810	PP12V4000P63	1295	1620
12V 4000 P63	1560	2092	PP12V4000P63	1500	1875
16V 4000 P63	1800	2414	PP16V4000P63	1730	2160
16V 4000 P63	2080	2789	PP16V4000P63	2000	2500
20V 4000 P63	2245	3011	PP20V4000P63	2155	2695
20V 4000 P63	2600	3487	PP20V4000P63	2500	3120

Application group	Fuel consumption				Emissions	
	at 75%		at 100%		Optimization	
3A 3B 3C	g/kWh	l/h	g/kWh	l/h	IMO *	EPA
■	209	167	207	124	I**	–
■	208	108	205	142	I**	–
■	199	119	197	157	I**	–
■	199	138	197	182	I**	–
■	204	248	204	331	II	–
■	202	284	202	378	II	–
■	201	326	198	428	II	–
■	199	373	197	492	II	–
■	210	425	207	558	II	–
■	206	482	211	659	II	–

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply
● on request

Diesel engines and gensets for offshore power generation – 60 Hz @ 1800 rpm

600 kW - 2800 kW
(805 bhp - 3755 bhp)

	Engine model	Rated power		Genset model	Rated power	
		ICXN			kWe	kVA
		kW	bhp			
Series 2000 P	12V 2000 P82	600	805	●		
	12V 2000 P82	695	932	●		
	16V 2000 P82	800	1073	●		
	16V 2000 P82	930	1247	●		
	16V 2000 P82L	980	1314	●		
Series 4000 P	12V 4000 P83	1455	1951	PP12V4000P83	1395	1745
	12V 4000 P83	1680	2253	PP12V4000P83	1615	2015
	16V 4000 P83	1940	2602	PP16V4000P83	1860	2330
	16V 4000 P83	2240	3004	PP16V4000P83	2150	2690
	20V 4000 P83	2425	3252	PP20V4000P83	2330	2910
	20V 4000 P83	2800	3755	PP20V4000P83	2690	3360

Application group			Fuel consumption				Emissions	
			at 75%		at 100%		Optimization	
3A	3B	3C	g/kWh	l/h	g/kWh	l/h	IMO *	EPA
■			217	117	214	154	II	T2NRMM**
	■	■	216	135	214	179	II	T2NRMM**
■			215	155	214	206	II	T2NRMM**
	■	■	210	176	223	249	II	T2NRMM**
	■	■	211	186	224	264	II	T2NRMM**
■			211	276	203	355	II	T2NRMM**
	■	■	207	313	207	418	II	T2NRMM**
■			211	369	205	477	II	T2NRMM**
	■	■	205	413	204	549	II	T2NRMM**
■			211	461	209	608	II	T1NRMM**
	■	■	209	527	215	723	II	T1NRMM**

* IMO III solution on request
** emission stage has been superseded, local exemptions may apply
● on request



MTU is one of the world's leading manufacturers of propulsion and power generation systems for marine applications: MTU products are used on all the world's oceans and in all marine areas.

For MTU, being a systems supplier means taking complete care of our customer's needs at any point of the life cycle. Our key technologies in diesel engine development and manufacturing comprising:

- Turbo charging units
- Fuel injection systems
- Engine management systems
- Automation systems

The key technologies are completed by validated and proven accessories like:

- Fuel treatment and filtration units
- Resilient engine mounts
- Resilient- and offset compensating couplings
- Gearboxes
- Exhaust silencers

Noise reduction technology

Double resilient mounting systems and active mounting systems are available for applications with the highest acoustic demands, such as comfort yachts or research vessels.

Emissions reduction technology

In addition to low emission diesel engines, MTU offers exhaust after treatment systems to meet the most stringent emissions requirements.

- Diesel particulate filters (DPF) with active regeneration:
 - Active filter regeneration via burner
 - Enabled for low load operation
 - Optimum in system reliability
 - PM-reduction up to 99 %
 - Class certified: LR, GL
 - Typical usage: yachts or commercial vessels with significant low load operation
- Diesel particulate filters (DPF) with passive regeneration:
 - Passive filter regeneration via DOC
 - Uncoated sinter metal filter
 - Compact and weight optimized design
 - PM-reduction higher than 95 %
 - Typical usage: commercial vessels with mainly high load operation like RoRo ferries
- Selective catalytic reduction (SCR) units:
 - Reduction of NO_x emissions of diesel engines
 - Enables customers to achieve IMO Tier III emission levels with current Tier II engines.
- Combined DPF+SCR

The installation space required for conventional silencers can be reduced if the exhaust noise attenuation capabilities of the filter units and catalytic converters are taken into account.

Gas-protected operation

In order to maintain a high level of safety in dangerous, explosive environments, some engines of the 4000 and 8000 Series can be equipped for gas protection around flammable or explosive gases. Engines are equipped with a safety package that meets with the related operational conditions.

For further information, please contact your distributor or visit www.mtu-online.com/contact

Systems solutions marine

Combined propulsion systems

Our engineering expertise and operating experience covers a large range of combined propulsion systems, such as:

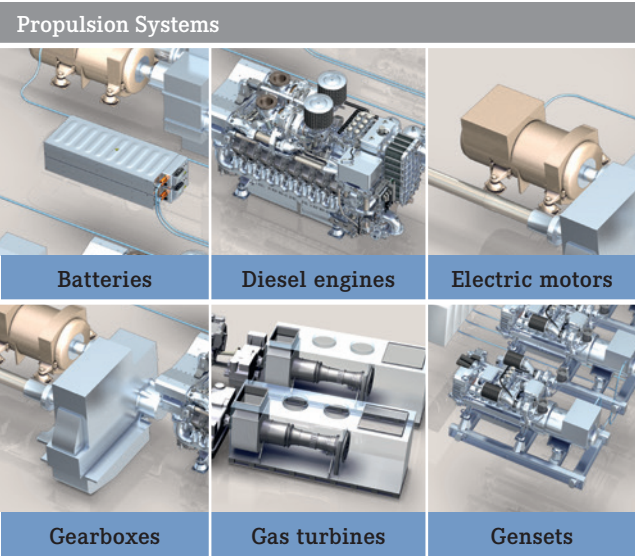
- Combined Diesel and Diesel (CODAD)
- Combined Diesel and/or Gas Turbine (CODAG, CODOG)
- Combined Diesel-Electric and Gas Turbine (CODELAG)
- E-Drive Systems - Combined Diesel and/or Electric or Hybrid

The intelligent combination of diesel engines, electric motors, gas turbines and batteries allows optimal adaptation of the propulsion system to the various operational requirements.

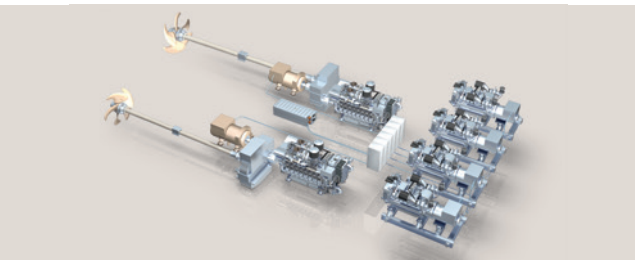
In order to reduce emissions and operating costs, combined systems e.g. diesel-electric propulsion systems are the preferred solution: The mechanical energy produced by the diesel engine is converted into electricity using a generator and then transmitted to the electric motors driving the ship's propellers.

By adding battery modules for energy storage MTU can also provide cutting edge hybrid propulsion systems.

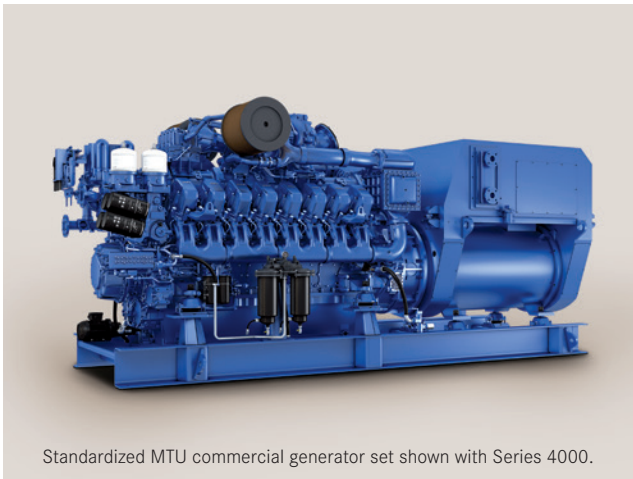
On request, we will serve as the general contractor, taking complete technical and commercial responsibility for the entire propulsion and power generation system as well as the automation system. From project engineering and project management to support and service, MTU is your single source partner for complete solutions.



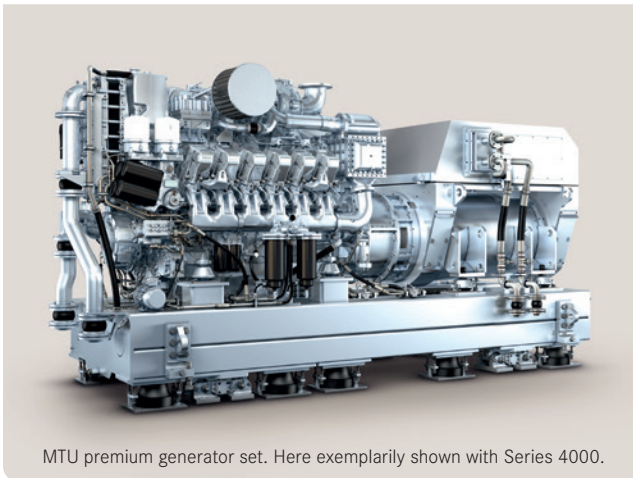
Application example of complete propulsion system



All systems can drive various kinds of propulsors, e.g. FPP, CPP, WJ, Voith Schneider, also in combination with CODAD, CODOG, CODAG, CODELAG or E-Drive propulsion systems.



Standardized MTU commercial generator set shown with Series 4000.



MTU premium generator set. Here exemplarily shown with Series 4000.

MTU gensets are based on MTU Series 2000 and 4000 engines. Whether you are looking for onboard power, diesel-electric or hybrid propulsion, MTU gensets meet the full spectrum of your requirements.

MTU's gensets are available as a constant speed version in 50 or 60 Hz or as a variable speed configuration with added electronics. Our gensets are tailored to the specific needs of each application. Whether you are looking for a standardized cost-effective commercial genset or high-end yacht gensets.

MTU also provides emergency gensets for critical situations at sea, when absolute reliability is essential. In addition to gensets for main propulsion and onboard power, MTU also supplies lower-power gensets which can be installed as separate power units in the engine room.

MTU's genset portfolio covers power outputs from 5 to 3,480 kW.

Your benefits are:

- Gensets based on proven Series 2000 and 4000 engines – of which over 90,000 have been sold worldwide
- Outstanding acoustic optimization for best-in-class comfort (noise and vibration levels can be contractually guaranteed, with all values proven on MTU test benches to minimize risk)
- Featuring special plug-and-play technology such as media plate and integrated piping for very easy installation
- All MTU gensets are classifiable according to e.g. DNV-GL, LRS
- Gensets with high quality finishing and painting dedicated for the yacht market

Automation systems

Integrated ship automation system

MTU Callosum

The integrated ship automation system Callosum provides optimal solutions for all types and sizes of ships to comply various requirements.

Callosum_MC – Monitoring and control system

Callosum_MC monitors and controls the entire drive system, onboard power supply, general areas.



- Visualization and Equipment:
 - FPP/PPP/WJ/VS/POD/SDS/combined systems
 - Joystick control system
 - Dynamic positioning system
 - Integrated bridge system
 - Fire detection system
 - Duty alarm system
 - Machinery telegraph
 - CCTV system
 - Electrical power management system
 - Crew location system
 - Uninterruptible power supply
 - Consoles
 - Switchboards
 - Sensors
- Interfaces:
 - NET-DDE
 - OPC
 - NMEA0183
 - CANopen
 - Modbus

Callosum_DC – Damage control system

Callosum_DC ensures the precise localization of any type of damage caused by fire, flood, collision, grounding.



- Visualization:
 - 3-click technology
 - Static an/or dynamic automated kill cards
 - 3D isometric deck views
 - Plot function
 - Tailor made engineering
 - Situation management
 - Command state board
 - etc.

Callosum_MT – Maintenance support system

Callosum_MT provides support for the maintenance and upkeep onboard – 24 hours a day, 7 days a week.



- Visualization:
 - Online documentation
 - Trending
 - 3D video
 - Check list
 - Fault tree analysis
 - etc.

Callosum_TS – Onboard and land-based training system

Callosum_TS allows training and further education of the crew during ship operation.



- Visualization:
 - Onboard training
 - Land-based training

Automation systems

Standardized propulsion automation systems

BlueVision | NewGeneration

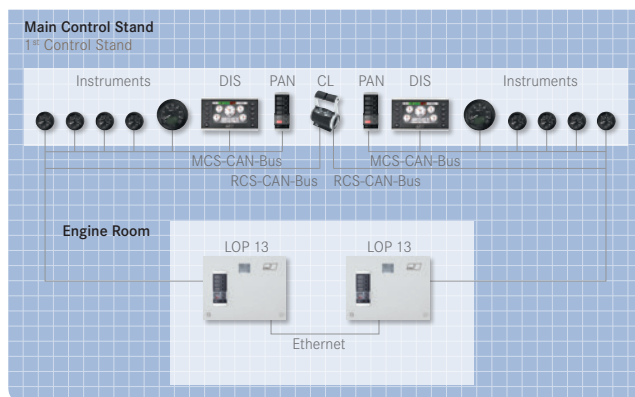
For many years, sophisticated MTU standard automation systems controlled, regulated and monitored the engine functions – always doing a perfect job!

BlueVision | NewGeneration automation solutions more convenient than ever before: easy to customize, easy to integrate, easy to operate.

BlueVision | NewGeneration is available both in the straightforward non-classifiable version **BlueVision_Basic | NewGeneration** and in the expanded classifiable version **BlueVision_Advanced | NewGeneration** – meeting different requirements according to boat design and customer budgets. The modular system design allows a flexible configuration; intelligent data bus technology ensures reliable data exchange and reduces cable efforts. Optimized interfaces between the propulsion and automation systems result in ideal total solutions that guarantee you security, efficiency and reliability.

With **BlueVision | NewGeneration** MTU offers you a complete and convenient system solution individually optimized for your ship, as well as comprehensive service – all from one source.

Thanks to “plug & play”, the system is as easily installed as it is operated.



Simple interfaces connect the Monitoring & Control System **BlueVision | NewGeneration** with the MTU diesel engine (via EIM) and the gearbox.

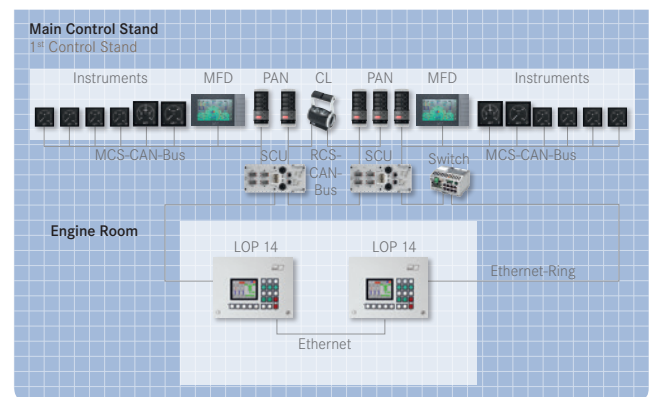
All components are type-approved und type-examination tested in shake / vibration / stress tests.

Customer Benefits

BlueVision_Basic | NewGeneration and **BlueVision_Advanced | NewGeneration** are automation systems for propulsion plants in yachts and workboats with MTU Series 2000 or 4000 engines.

BlueVision | NewGeneration offers the following benefits:

- High operational availability and reliability of the propulsion plant
- High flexibility thanks to modular system structure and open architecture
- Simple, classifiable system in line with current directives
- Quicker and easier commissioning via structured user dialogue
- Type-tested components
- Development in accordance with current standards
- Optimized operation and visualization of the propulsion plant
- Uniform spare part concept across all MTU Series
- Global sales and service network
- Self-learning “Improved Crash-Stop” in order to stop the ship as quickly as possible



Automation systems

Standardized propulsion automation systems

smartline – **blueline** – **bluevision**

Perfectly balanced, standardized control and monitoring systems developed and manufactured inhouse by MTU, ensure that our proven marine propulsion technology functions exactly as you would expect it to. The integration of these cutting-edge automation systems provides optimum complete solutions which guarantee safety, efficiency and reliability. Without exception, MTU can always supply a complete system individually tailored to suit your vessel and backed up by a comprehensive service package – all from a single source.

blueline Series 2000/ 4000



Color display – 7,0"



Propulsion control lever

System for

- Non-classified applications
- FPP and SDS propulsion plants
- CPP and WJ by interface
- One to four engine propulsion plants

Options

- Extended to 4 control stands
- Palm Beach control lever
- Hand-held control unit

smartline Series 2000/ 4000



Color display – 6,5"



Propulsion control lever

System for

- Non-classified applications
- Twin FPP engine installations
- CPP and WJ by interface

Options

- Extended to 6 control stands
- Palm Beach control lever
- Hand-held control unit

bluevision Series 2000/ 4000



TFT color monitor



Propulsion control levers

System for

- Non-classified and classified applications
- FPP, CPP, WJ and VSP propulsion plants
- One to four engine propulsion plants

Options

- Extended to 6 control stands
- Printer
- Hand-held control unit

Automation systems

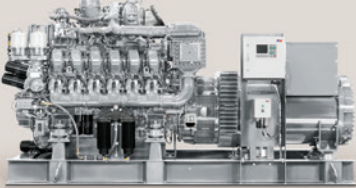
Standardized and system solutions

genoline

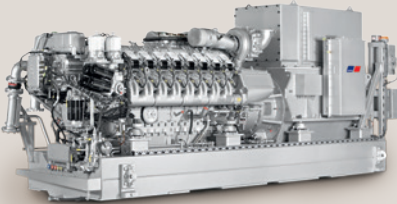
genoline is an MTU non-classified and classified automation system for on-board power generation plants. The modular system design guarantees optimum adaptation of the diesel engine and generator to the diversity of operating conditions for the on board power generation. It is available for MTU Series 2000 and 4000 engines.

genoline offers the following applications


On-board service power
non-classified and classified



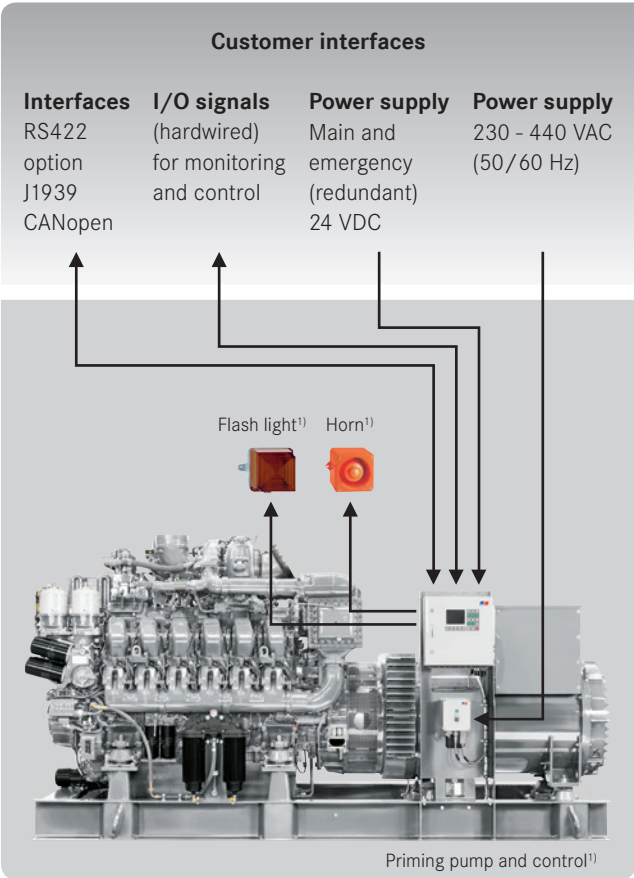
Diesel-electric propulsion plant
non-classified and classified



Special applications
- MIL
- Shock
- EMC
- etc.



genoline automation system is an innovative high-end developed system available in two installation versions, with LOP (Local Operating Panel) or as version with switchboard interface.



1) Optional features

Systems solutions offshore exploration & production

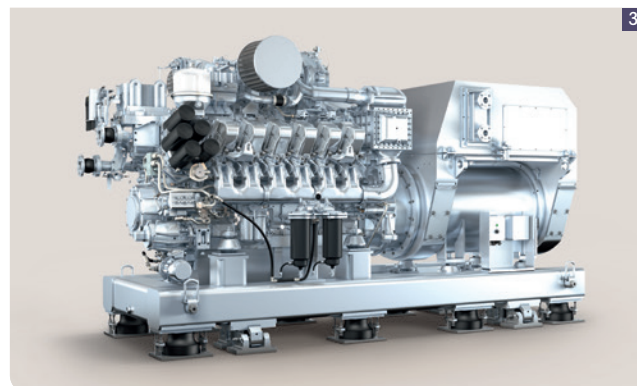
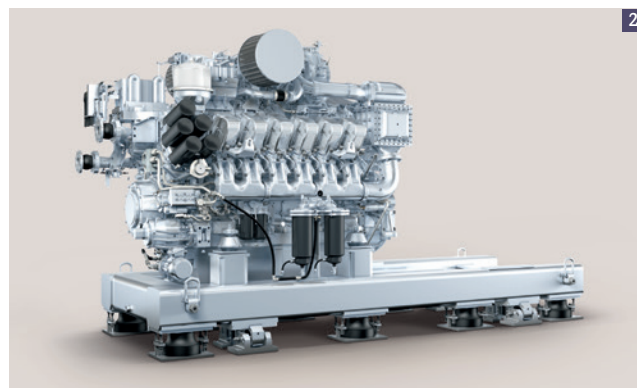
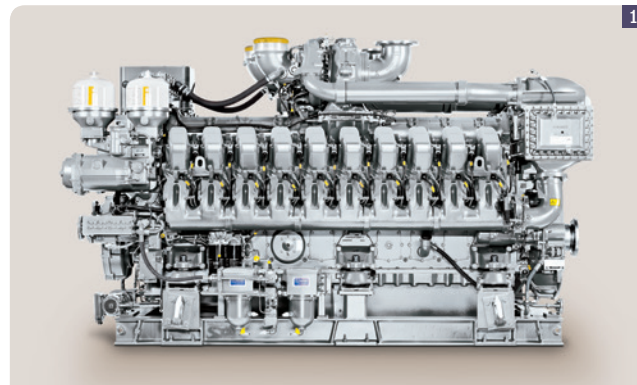
Offshore generator sets

We offer complete solutions from a single supplier. All components are integrated, thoroughly tested and supported. Everything is designed to work together, which prolongs preventive maintenance and overhaul intervals. Decades of experience as an offshore specialist gives us the expertise and flexibility you need to keep your drilling operation productive and profitable.

Our offshore product range includes diesel engines and systems for:

- Generator sets for emergency, essential, auxiliary and main power
- Fire pump drivers for mechanical/hydraulic/electric installations
- Mud pump drivers
- Wellserve power packs
- Nitrogen units
- Cranes
- Cement pumps
- Hydraulic power packs

We also offer customized offshore documentation according to project specific requirements.



MTU systems solutions for offshore exploration & production applications

1 Engine plus system

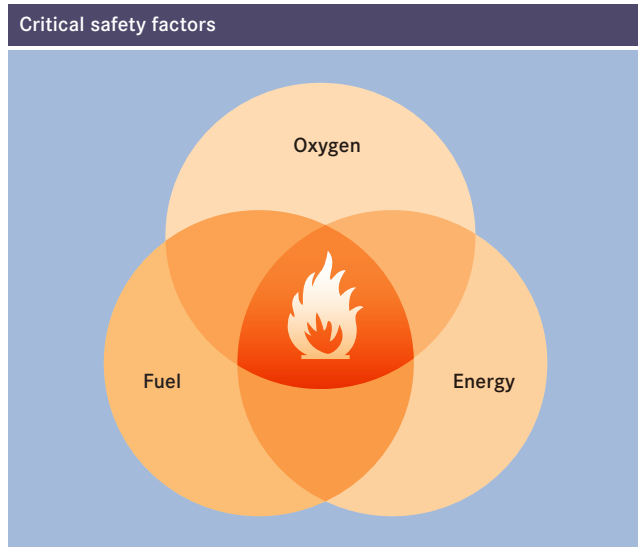
2 Modularized generator drive

3 Standardized generator set

Explosive problem.

Integral solution.

ATEX zone 2 3G IIB T3 certified MTU P-engines



Modifications of MTU P-engines for ATEX zone 2

The combination of three factors makes an explosion possible:

- Oxygen
- Fuel/flammable substance (gas, vapors, mist, or dust)
- Energy/ignition source (devices, electrical plants, hot surfaces)

The exclusion of one of these three factors means the elimination of the risk. In order to guarantee safety in potentially explosive environments, a modification of factor 3 – the engine – is the most efficient solution both technically and economically. MTU engines are designed to minimize or even prevent the risk of high surface temperatures and spark generation.

On request MTU P-engines fulfill the requirements of ATEX zone 2 3G IIB T3 according to directive 94/9/EC. This means that they deliver an extremely high standard of safety in conjunction with superior cost efficiency.



Example of
ATEX certificate for
16V 4000 P63 and
16V 4000 P83 engines

MTU P-engines: certified safety according to ATEX zone 2 3G IIB T3 requirements

MTU P-engines need to fulfill the requirements for ATEX Zone 2 3G IIB T3 according to directive 94/9/EC.

- **Zone 2:** An area in which an explosive mixture of gas is not likely to occur in normal operation and if it occurs it will exist only for a short time
- Category **3G:** Gas (Zone 2)
- Explosion group **IIB:** Explosive mixture of ethylene gas and air
- **T3:** Surface temperature < 200°C equivalent to class I division 2 (North America)

Safety is good.

Redundancy is better.

Redundant controller for fire pump drive systems (NFPA 20)

The NFPA-20 (2016) standard requires redundant engine controllers on fire-pump drive systems in order to prevent interruptions in the fire-pump water jet during an emergency. MTU is the first manufacturer in the world to offer redundant controllers for engines with common rail injection.

In accordance with this standard, the second controller must be installed on the engine and permanently wired. In the event of a fault on the first controller, it must take over the engine control automatically without interrupting the water jet. This measure increases the availability of your fire pumps and consequently the entire system.

The redundant controllers developed by MTU can be used in direct, hydraulic, and diesel-electric drive systems. To redundantly record all engine data required for controlling, a second sensor set is installed on the engine. The ECU7 engine control unit is used as a main and backup controller. Because the injectors and high-pressure fuel control block are not installed redundantly, triggering of these actuators must be switchable between the two controllers: and so the new SBX1 switch box forms the heart of this system.

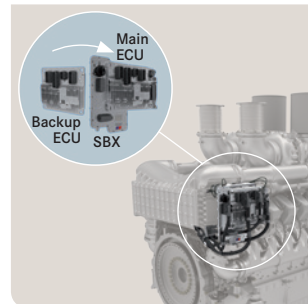
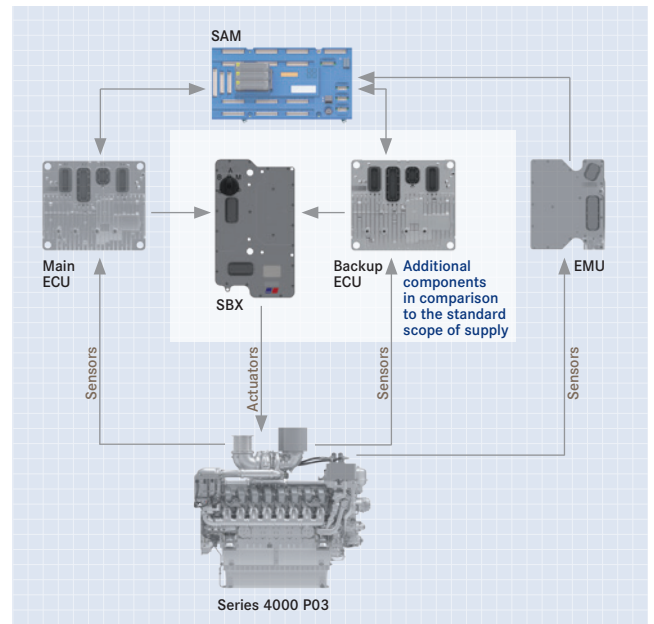
Switching

The MTU engine controller offers the option of manual switching, whereby the controller active at any given moment is displayed optically (via LED). The switching process is designed to guarantee the greatest possible redundancy of the system. Optimal use is made of the ECU7 plugs for logic switching and for supplying the new unit. This results in extremely simple wiring.

If switching is necessary, drops in speed and excessively high rail pressure must be prevented. The MTU system guarantees that these demands are met for all types of applications (direct, diesel-electric, or diesel-hydraulic pump drive), all engine cylinder variants (12V, 16V, or 20V), and for every engine base speed (1,500 rpm for 4000 P63 or 1,800 rpm for 4000 P83).

Benefits:

- Achieving the NFPA20 (2016) norm for Series 4000 P-engines
- Specifically designed for common rail injection
- Increased availability thanks to redundancy
- Simple retrofitting due to plug-and-play
- All components are developed to work together seamlessly
- All from one trusted source and in the quality you expect from MTU

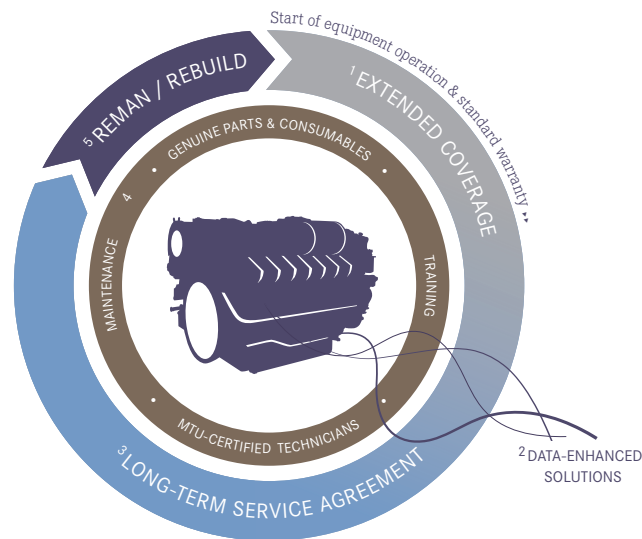


Ensure a long, reliable life.



As your equipment ages, its needs—and yours—change.

MTU **ValueCare** wraps around your MTU investment, providing 360 degrees of customized support, for optimal value at every stage of life.



MTU **ValueCare** can help you:

1. Avoid the unexpected with added protection beyond the standard warranty.
2. Make better decisions faster with data-enhanced tools.
3. Maximize availability and optimize lifecycle costs with an individually tailored Long-term Service Agreement.
4. Improve system performance and extend equipment life with on-demand support from MTU.
5. Keep a good thing going with MTU reman/rebuild solutions.

MTU **ValueCare**

Rely on MTU expertise.

To give your equipment a long and productive life, choose a partner you can trust. Only MTU-certified technicians know how to get the job done right using proven service methods, MTU-specified maintenance schedules and genuine OEM parts and consumables.

From preventive maintenance to complete rebuild, MTU is your true lifecycle partner. Whatever level of support you need, our global network of factory-trained professionals knows all about your equipment, and is ready to prepare a customized plan to help you maximize performance and minimize lifecycle costs.



If you need us a little:

On-Demand Support—including professional inspections and preventive maintenance recommendations from MTU—helps you identify and address problems early, save on repairs or unexpected downtime, and optimize your equipment’s performance and longevity. Inspections include visual assessment, test run and leak check, on-site oil and coolant analysis, diagnostic evaluation and reporting.

If you need us a lot:

Long-term Service Agreements make it easy to plan the cost of maintenance and maximize availability throughout your MTU equipment’s lifecycle. The details, terms and periods of each package are precisely tailored to match your individual needs, with maintenance performed by MTU-certified technicians using only genuine new or remanufactured parts.

Never compromise.

MTU engines and systems are built to last with legendary high standards. When it’s time for service, don’t settle for anything less. For maximum reliability, performance and uptime, choose a name you can trust—MTU.

Parts & Service

The annual cost of maintenance can vary dramatically depending on how and where your equipment is used. When optimal equipment availability and performance are essential, and predictable costs are preferred, Long-term Service Agreements can help.

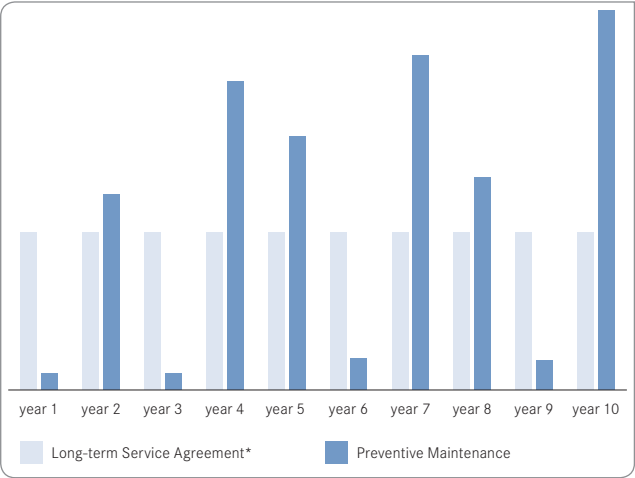
Preventive

All preventive maintenance services up to 10 years according to your approved MTU maintenance schedule, performed by MTU-certified technicians at your local MTU-authorized distributor.

All Inclusive

All preventive maintenance services up to 10 years according to your approved MTU maintenance schedule, performed by MTU-certified technicians at your local MTU-authorized distributor, including all necessary corrective services.

Example: Scheduled Maintenance Costs



*Excludes corrective services

MTU engines—backed by Extended Coverage—provide invaluable peace of mind beyond the standard warranty. With Extended Coverage, you can be assured that the costs of unexpected repairs are covered, with service performed by MTU-certified technicians—upholding resale value and ensuring long-term confidence in your MTU investment.

Extended Coverage protects you from the cost of unexpected repairs beyond your standard warranty, with professional service from MTU-certified technicians and coverage tailored to your needs. Packages can also be extended up to 5 years and are fully transferrable, enhancing resale value. Coverage includes material and labor for troubleshooting, fault clearance and corrective services to engines and on-engine electronics (excluding gearbox, alternators, or similar components). To ensure maximum quality, all repairs are conducted using only genuine MTU parts.

Extended Propulsion Coverage—an exclusive offering for pleasure craft—protects against the cost of unexpected repairs to your complete propulsion system beyond the standard warranty. The package is fully transferable, which enhances resale value. And with expert service performed worldwide by MTU-authorized service centers, you gain invaluable peace of mind.

MTU ValueCare

Make better decisions—faster.

Digitization is more than a buzzword—good data fuels smarter decisions. Data-Enhanced Solutions from MTU harness that power, giving you vital information and helpful tools to simplify and streamline MTU equipment ownership, operation and maintenance.

Monitor activity from afar.

Identify faults early and make informed decisions quickly—even thousands of miles from the work site—by accessing vital engine and system information online with Remote Services.

Be proactive.

Remote Services can improve your engine’s performance, and your profitability, by helping you avoid downtime. Using a telemetric device, important data such as oil temperature, current location and hours of duty is recorded and transmitted in near real-time or at predetermined intervals. Through early fault identification, you can act decisively to increase engine efficiency, prevent damage, reduce downtime, identify necessary replacement parts and save on service and repairs. All you need is a computer with an Internet connection.

Be secure.

Your data is handled with the strictest confidentiality. We provide a secure infrastructure and user administration via our MTU security design.

An onboard telemetric device transmits vital equipment data, accessible in near real-time on your computer screen.



MTU ValueCare

Keep a good thing going.

Your MTU equipment was built to last thanks to MTU’s legendary high engineering standards and unwavering commitment to service and support. And after a long and productive life, MTU provides options to help you go even further.

Turn back the clock.

Factory Rebuilds return your original equipment to like-new condition, delivering the same high standards of performance, service life and quality as the original new product. Factory Rebuilds are provided by the same experts who built your original equipment, utilizing the same rigorous standards as our factory remanufacturing process. As a result, your complete system, including gearboxes, loose parts (oil cooler, etc.) and automation/ electronics, is fully restored.

Valid for Series 183, 396, 493, 538, 595, 652, 956, 1163 and various Defense engines.

Exchange and save.

Factory Remanufactured units help you minimize downtime and take advantage of fixed pricing and fixed lead times. They’re faster than an individual overhaul and less expensive than new equipment. Remanufactured products deliver the same high standards of performance, service life and quality as new MTU products, along with identical warranty coverage. And with design and model-related updates, they also feature similar technological advancements.



Service Network

Local support. Worldwide.

Whenever and wherever you need expert support, MTU specialists are available. Our global service network of more than 1,200 locations—backed by our cutting-edge Parts Logistics Centers—provides you this assurance. To find your local MTU distributor, visit www.mtu-online.com.

Customer Assistance Center

Agents are available 24/7 for fast response to your inquiries and any service needs.

info@mtu-online.com

Europe, Middle East, Africa
+49 7541 90-77777

Asia/Pacific
+65 6860 9669

North and Latin America
+1 248 560 8888



Local support. Worldwide.

We ensure that you receive individualized support from our global network of more than 1,200 service centers – anywhere, anytime.

- Global headquarters
- Regional headquarters
- Sales and customer service center

Many countries have implemented environmental legislation to protect people from consequences of polluted air. For this reason an increasing number of countries regulate emissions from specific mobile and stationary sources.

Emission standards may apply internationally, nationally and/or for specific areas. The enforcement of an emission legislation may depend for example on the area where the equipment is used and the way it is operated.

The emission legislations may be categorized by power range and/or cylinder capacity. Emission legislations generally require a certificate which states compliance. Stationary applications may require on-site approvals (on-site emission test) depending on the particular emission legislation.

Please find as follows examples of emission standards which apply to the Marine Industry.

For details please consult the applicable legislation and/or permitting authority.

IMO - International Maritime Organization

MARPOL Annex VI Regulation 13 (NOx) and NOx Technical Code 2008: Marine diesel engines > 130 kW for ships engaged on international voyages to which MARPOL Annex VI applies (= flying the flag of a signatory, or entering waters of the jurisdiction of a signatory to the Annex. Signatory overview see IMO webpage, „Status of Conventions“).

Fixed & floating platforms, including drilling rigs and similar structures, are considered as ships. For those structures IMO regulations are in addition to any controls imposed by the government which has jurisdiction over the waters in which they operate.

Applicability of tiers:

For new ships date of construction of the ship, for engine replacement with non-identical engine or installation of additional engine date of installation. Exemption rules are in place.

Currently applicable emission stages:

- IMO Tier II outside of NOx Emission Control Areas (NOx ECA)
- IMO Tier III is applicable in NOx Emission Control Areas (NOx ECA) only

Emission Control Areas (ECA):

- An ECA may limit NOx, SOx and particulate matter (PM) emissions, or both. MARPOL Annex VI Regulation 14 (SOx and PM emission compliance) requires fuels with less than 1000 ppm (0.1 %) sulphur (since January 1st, 2015).
- The enforcement dates of an ECA will be specified for each ECA individually. For the North American & US Caribbean ECA this has been January 1st, 2016 with regard to NOx.
- Additionally to the North American & US Caribbean, the North Sea and the Baltic Sea are established as ECA for SOx and PM emissions.

US EPA - United States Environmental Protection Agency

40CFR1042: Marine diesel engines > 8 kW for vessels registered (flagged) in the United States.

Applicability of tiers:

Date of engine manufacture. Specific replacement engine rules are in place. Exemption rules are in place.

Currently applicable emission stages:

- < 600 kW EPA Tier 3
- < 1000 kW EPA Tier 3 - replaced by EPA Tier 4 latest by October 1st, 2017
- > 1000 kW EPA Tier 4
- > 600 kW EPA Tier 4 from October 1st, 2017
- Recreational engines: EPA Tier 3

EU - European Union: Commercial Marine

EU Nonroad Directive 97/68/EC as amended by 2012/46/EC: Marine diesel propulsion engines ≥ 37 kW and auxiliary engines > 560 kW installed on vessels operating on inland waterways within EU territories (e.g. Rhine, Danube, Loire etc.).

Currently applicable emission stages:

- EU Stage IIIA
Central Commission for Navigation on the Rhine (CCNR) rules are defined in the Rhine Vessel Inspection Regulation (RheinSchUO) valid for marine diesel engines ≥ 19 kW installed on vessels operating on the Rhine.

Currently applicable emission stages:

- CCNR Stage II
Specific replacement engine rules are in place. Exemption rules are in place. Mutual recognition of CCNR and EU emission regulation is agreed.

EU - European Union: Recreational Marine

EU Recreational Craft Directive (RCD) 94/25/EC as amended by 2003/44/EC and replaced by 2013/53/EU from January 18th, 2016: propulsion engines for recreational crafts from 2.5 to 24 m hull length operating within EU territories.

Applicability of stages:

Date of placing the engine/boat into the market. Exemption rules are in place.

Currently applicable emission stages:

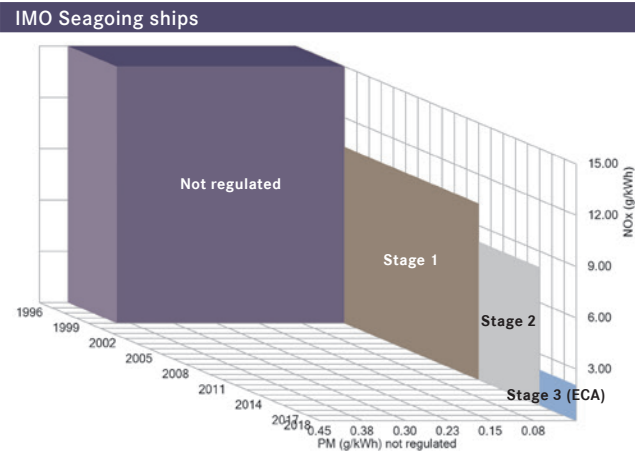
- RCD 2

Additional to afore mentioned emission regulations MTU is able to deliver many engines also for regional emission standards such as BSO (Lake Constance) or SAV (Switzerland) on request.

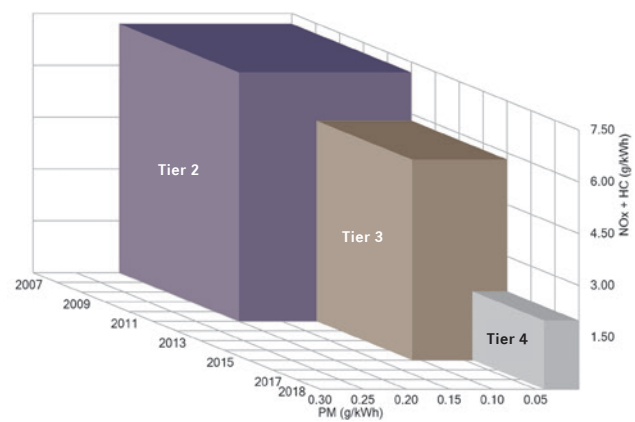
Besides current emission standards MTU is able to deliver also replacement engines with outdated emission standards. Replacement engine rules need to be observed.

Exhaust emissions

Samples for emission stages in marine industry: IMO



EPA



Abbreviations

T3c	EPA Tier 3 for commercial use
T3r	EPA Tier 3 solely for recreational use
CCNR II	European commercial inland waterway transport - mutual recognition with EU IIIA
EU IIIA	European commercial inland waterway transport - mutual recognition with CCNR II
RCD 2	European recreational carft directive
IMO I	International Maritime Organization Stage I (beginning form January 2000)
IMO II	International emission standard outside of emission control areas (ECA)
IMO III	International emission standard within emission control areas (ECA)
T1NRMM	EPA Tier 1 - Nonroad Mobile Machinery
T2NRMM	EPA Tier 2 - Nonroad Mobile Machinery

Please note that the engines and systems (only) comply with country or region specific emission requirements and have appropriate emission certification(s) which are explicitly stated in respective RRPS/MTU defined technical specifications. Any Export/Import/Operation of the engine in countries or regions with different applicable emission law requirements is at the customers responsibility.

Notes

Conversion table

1 kW	= 1.360 PS	g	= 9.80665 m/s ²
1 kW	= 1.341 bhp	π	= 3.14159
1 bhp	= 1.014 PS	e	= 2.71828
1 oz	= 28.35 g		
1 lb	= 453.59 g	1 lb	= 16 oz
1 short ton	= 907.18 kg	1 short ton	= 2000 lbs
1 lb/bhp	= 447.3 g/PS _h	1 ft lb	= 1.356 Nm
1 lb/bhp	= 608.3 g/kWh	1 ft/min	= 0.00508 m/s
1 gal/bhp (US)	= 4264 g/kWh	pDiesel	= 0.83 kg/l
1 kWh	= 860 kcal	1 lb/sqin	= 0.069 bar (1 psi)
1 cal	= 4.187 J	1 mm Hg	= 1.333 mbar (133.3 Pa)
1 BTU	= 1.055 kJ	1 mm H ₂ O	= 0.0981 mbar (9.81 Pa)
1 inch	= 2.540 cm	T (K)	= t (°C) + 273.15
1 sq. inch	= 6.542 cm ²	t (°C)	= 5/9 x (t (°F) -32)
1 cu. inch	= 16.387 cm ³	t (°C)	= 5/4 x t (°R)
1 foot	= 3.048 dm	1 foot	= 12 inches
1 sq. foot	= 9.290 dm ²	1 yard	= 3 feet
1 mile	= 1.609 km	1 mile	= 5280 feet
1 naut. mile	= 1.853 km	1 naut. mile	= 6080 feet
1 UK Gallon	= 4.546 l		
1 US Gallon	= 3.785 l		
1 US Barrel	= 0.159 m ³ = 42 US Gallons		

Energy:	1 J = 1 Ws = 1 VAs = 1 Nm
Power:	1 W = 1 VA = 1 Nm/s
Force:	1 N = 1 kgm/s ²
Pressure:	1 Pa = 1 N/m ² (1 bar = 10 ⁵ Pa)
MEP (bar)	$= \frac{P_{\text{cyl}}(\text{kW}) \times 1200}{n(1/\text{min}) \times V_{\text{cyl}}(\text{l})}$
Torque (Nm)	$= \frac{P_{\text{ges}}(\text{kW}) \times 30000}{n(1/\text{min}) \times \pi}$

Further special sales programs:

- Rail
- PowerGen
- C&I, Agricultural, Mining
- Oil & Gas Industry



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MTU Asia Pte Ltd

MTU America Inc.

Part of the Rolls-Royce Group

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