Guascor Energy

Guascor Energy Diesel & Gas Engines

Marine

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Contents

1. Diesel

2. Gas

1.1 Power Definition

Guascor Energy diesel engines ratings stated in this document are based on ISO3046-1:2002(E), ISO3046-3:2006(E) and ISO15550:2002(E) standards.
These ratings have been measured (including all engine driven mechanical pumps).

Abbreviations ICFN / IFN

I = ISO Standard (3046)

C = Continuous

F = Fuel stop power

N = Net power

Our Guascor Energy diesel engines are designed following the reference conditions. On vessels approved and/or surveyed by IACS members, "standard design conditions" are to be observed.

Standard reference conditions ISO 15550:2002

- Total barometric pressure: 100 kPa / 1.000 mbar
- Air temperature: 25ºC (77ºF) / 298 K
- Relative humidity: 30%
- Charge air coolant (raw): 25ºC (77ºF) / 298 K
- Charge air coolant (treated): 29ºC (84ºF) / 302 K

Standard design conditions ISO 3046-1:2002 & 3046-3:2006

- Total barometric pressure: 100 kPa / 1,000 mbar
- Air temperature: 45ºC (113ºF) / 318 K
- Relative humidity: 60%
- Charge air coolant (raw): 32ºC (89ºF) / 305 K
- Charge air coolant (treated): 36ºC (96ºF) / 309 K

1.2 Rating Definitions
Propulsion

A - Rating (unrestricted continuous duty)

Rated power intended for continuous use in applications requiring uninterrupted service with high load factors; this is an ISO standard (continuous) fuel stop power (ICFN)

Typical load factors:	80-100% of rated power
Full load operation time:	100% of time or 24/24h
Operation time:	5.000 - 8.000 h/year
Operation type:	Displacement hull vessels for unrestricted use at full speed and load
Typical applications:	Fishing trawlers, bottom trawlers, freighters, ankers, tow & push boats, long distance ferries, dredgers, cabin cruiser, research vessels

B - Rating (variable continuous duty)

Rated power intended for use in variable load applications, medium-high load factors; this is an ISO 3046 fuel stop power (IFN)

Typical load factors:	40-80% of rated power
Full load operation time:	80% of time or 10/12h
Operation time:	3.000 - 5.000 h/year
Hull type:	Semi-planning or semi-displacement hulls for restricted use at full load
Typical applications:	Mid-water trawlers, fishing long liners, purse seiners, harbour tow & push boats, passenger cruiser, tugboats, short distance ferries

C - Rating (intermittent duty)

Power intended for use in variable load applications with moderate load factors. This is an ISO 3046 fuel stop power (IFN)

Typical load factors:	20-80% of rated power
Full load operation time:	50% of time or 6/12h
Operation time:	1.500-3.000 h/year
Hull type:	Semi-planning or planning hulls, fast commercial and passenger vessels for restricted use with moderate load factors and high demands on vessel's speed
Typical applications:	Passenger boats, high-speed fishing boats, crew and service boats, moto-pumps, pilot boats

Diesel Electric Propulsion

COP (continuous power)

Rated power (ISO8528) intended for continuous use in applications requiring uninterrupted service with high load factors for an unlimited number of hours per year; 10% overload available in a period of time of 1/12 operation hours and maximum 25 h/year

Typical load factors:	<80% of rated power
Full load operation time:	100% of time or 24/24h
Overload:	110% overload available 1/12h and max. 25 h/ year
Operation time:	5.000 - 8.000 h/year
Typical applications:	Ferries, research vessels, passenger cruiser, tugboats, offshore vessels, freighters, and tankers

Auxiliary and Generator Set

COP (continuous power)

Engines with this rating (ISO 8528) are available for supplying utility power at a constant 100% load for an unlimited number of hours per year. A 10% overload capability for a period of time of 1/12 operation hours and maximum 25 h/year is additionally allowed to that specified on ISO 8528.

Typical load factors:	80-100% of rated power
Full load operation time:	100% of time or 24/24h
Overload:	110% overload available 1/12h and max. 25 h/year
Operation time:	5.000 - 8.000 h/year.

1.3. Fuel Consumption

The fuel consumption values published in this document have been calculated according to ISO8178 standard test cycles (ISO8178 E3 propulsion, E2 electric propulsion, C1 and D2 auxiliary applications). These values must be considered as indicative guidance but not considered absolute values. Fuel consumption may vary as it can be influenced by external factors such as ship application, different environmental conditions, particular propeller design, hull form, etc.

ISO 8178 test cycles and weighting factors

E3 Test Cycle: Main propulsion and auxiliary engines adapted to propeller demand

Mode Number	1	2	3	4	5
% Speed	100	91	80	63	-
% Power	100	75	50	25	-
Weight Factor	0.2	0.5	0.15	0.15	-

E2 Test Cycle: Main propulsion engines at a constant speed

Mode Number	1	2	3	4	5
% Speed	100	100	100	100	-
% Power	100	75	50	25	-
Weight Factor	0.20	0.50	0.15	0.15	-

D2 Test Cycle: Auxiliary engines at a constant speed

Mode Number	1	2	3	4	5
% Speed	100	100	100	100	100
% Power	100	75	50	25	10
Weight Factor	0.05	0.25	0.30	0.30	0.10

C1 Test Cycle: Auxiliary engines at variable speed

Mode Number	1	2	3	4	5	6	7	8
% Speed	100%				Intermediate			Idle
% Torque	100	75	50	10	100	75	50	0
Weight Factor	0.15	0.15	0.15	0.1	0.1	0.1	0.1	0.15

Fuel consumption rates are based on ISO3046-1 with a tolerance of +5% and is based on diesel gasoil B with LHV 42,700 KJ/kg (18358 Btu/lb) when used at 29ºC (85ºF) and weighing 836 g/liter (6,977 lb/US gal)

Extensions of this information should be compared with the specifications indicated in the mentioned standards.

All technical information and data within this document is subject to modification without prior notice.

1.4 Emission Certifications

IMO (International Maritime Organization)

On January 1, 2000, annex VI of MARPOL 73 / 78 went into effect for all marine diesel engines above 130 kW / 177 HP installed on vessels whose keel is laid after January 1 and which do not operate exclusively in national waters. Current revision (Tier II) entered into force from January 1, 2011.

- IMO apply to sea going vessels
- IMO apply on engines rated above 130 kW / 177 mHP
- Emergency on-board engines are exempt to accomplish IMO regulations

CCNR (Central Commission for the Navigation on the Rhine)

Effective January 1, 2003, the CCNR regulates exhaust emissions limits for all marine diesel engines above 37kW / 50HP installed on inland waterway-going vessels running through the Rhine or its tributary rivers. Members of the CCNR include: Belgium, Netherlands, Germany, France, Luxembourg, and Switzerland. Current revision (CCNR II) entered into force effective January 1, 2007.

- CCNR rules apply to inland waterway-going vessels
- Applies on engines rated above 37 kW / 50 mHP
- Equivalent to EU directive for non-road mobile machinery 97 / 68 / EC, as amended by directive 2004 / 26/EC, mutual recognition agreement effective July 1, 2007

Abbreviations

This document contents the following abbreviations which will appear on subsequent pages to identify the emission regulation compliance of each engine type and/or rating.

- N.C. Not compliant or not applicable
- N.A. Not applicable
- IMO1 IMO Tier I compliant (see IMO2) EIAPP certificates available for engine replacement only for all diesel engines placed on a vessel before December 31, 2010
- IMO2 IMO Tier II compliant; EIAPP certificates available since January 1, 2011

- CCNR2 CCNR Stage II compliant
- DEP Diesel electric propulsion
- COP Continuous power
- mHP Metric horsepower (DIN)
- kW Kilowatt
- KVA Kilovolt amper

1.5 Marine Classification Societies

Guascor Energy marine engines, gen-sets and gear boxes are designed and built according to the rules of major marine classification societies worldwide. Approvals from major marine classification societies worldwide include:

- **ABS** American Bureau of Shipping
- **BV** Bureau Veritas
- **LR** Lloyds Register

Some marine products or ratings may differ depending upon class society.

For more information on emission or marine classification society certifications, please contact your local Guascor Energy sales representative

1.6 Marine Product Summary

Propulsion

kW	HP	RPM	Type	Rating	Page
184	250	1.800	L-18FN	A	18
412	560	1.600	L-18ST	A	18
441	600	1.800		A	18
452	615	1.800		A	18
478	650	1.800	L-24FT	A	19
552	750	1.600	L-24ST	A	19
577	785	1.800		A	19
588	800	1.800		A	19
610	830	1.800		A	19
662	900	1.800	L-36FT	A	20
735	1.000	1.800	L-36ST	A	20
824	1.120	1.600		A	20
868	1.180	1.800		A	20
882	1.200	1.800		A	20
934	1.270	1.800	L-48FT	A	21
1.103	1.500	1.600	L-48ST	A	21
1.155	1.571	1.800		A	21
1.177	1.600	1.800		A	21
1.221	1.660	1.800		A	21
191	260	1.800	L-18FN	B	18
353	480	1.800	L-18FT	B	18
474	645	1.800	L-18ST	B	18
493	670	1.800	L-24FT	B	19
635	864	1.800	L-24ST	B	19
706	960	1.800	L-36FT	B	20
949	1.290	1.800	L-36ST	B	20
993	1.350	1.800	L-48FT	B	21
1.268	1.725	1.800	L-48ST	B	21
504	685	1.800	L-18ST	C	18
662	900	1.800	L-24ST	C	19
1.000	1.360	1.800	L-36ST	C	20
1.029	1.400	1.800	L-48FT	C	21
1.324	1.800	1.800	L-48ST	C	21

Auxiliary Engines Variable Speed

kW	HP	RPM	Type	Rating	Page
412	560	1.600	L-18ST	A	32
441	600	1.800	L-18ST	A	32
452	615	1.800	L-18ST	A	32
353	480	1.800	L-18ST	B	32
474	645	1.800	L-18ST	B	32
504	685	1.800	L-18ST	C	32
478	650	1.800	L-24ST	A	33
552	750	1.600	L-24ST	A	33
577	785	1.800	L-24ST	A	33
588	800	1.800	L-24FT	A	33
610	830	1.800	L-24ST	A	33
493	670	1.800	L-24ST	B	33
635	864	1.800	L-24ST	B	33
662	900	1.800	L-24ST	C	33
662	900	1.800	L-36FT	A	34
824	1.120	1.600	L-36ST	A	34
868	1.180	1.800	L-36ST	A	34
882	1.200	1.800	L-36ST	A	34
706	960	1.800	L-36ST	B	34
949	1.290	1.800	L-36ST	B	34
1.000	1.360	1.800	L-36ST	C	34
934	1.270	1.800	L-48FT	A	35
1.103	1.500	1.600	L-48ST	A	35
1.155	1.571	1.800	L-48ST	A	35
1.177	1.600	1.800	L-48FT	A	35
1.221	1.660	1.800	L-48ST	A	35
993	1.350	1.800	L-48ST	B	35
1.268	1.724	1.800	L-48ST	B	35
1.029	1.400	1.800	L-48ST	C	35
1.324	1.800	1.800	L-48ST	C	35

Gearboxes

Gear box type	Reduction Ratio	Power		Rating	RPM	Page
		kW	mHP			
R-160	1,53 – 4,91	294	400	A	1.800	24
		324	440	B	1.800	24
R-240	2,9 – 4,95	515	700	A	1.800	25
		566	770	B	1.800	25
R-240E	3,56 – 6,08	441	600	A	1.800	26
		485	660	B	1.800	26
R-360	2,04 – 6,00	662	900	A	1.800	27
		728	990	B	1,800	27
R-360E	7,2	515	700	A	1.800	28
		566	770	B	1.800	28
	8,9	441	770	A	1.800	28
		485	660	B	1.800	28
R-500	2,7 – 7,03	1.228	1.670	A	1.800	29
		1.351	1.837	B	1.800	29

Marine Power Generation Engines

kW	HP	rpm	Type	Rating	Page
294	400	1.500	L-18FT	A	38
346	470	1.800	L-18FT	A	38
396	539	1.500	L-18ST	A	38
441	600	1.800	L-18ST	A	38
426	579	1.500	L-24FT	A	39
478	650	1.800	L-24FT	A	39
510	694	1.500	L-24ST	A	39
540	734	1.500	L-24ST	A	39
577	785	1.800	L-24ST	A	39
588	800	1.800	L-24ST	A	39
588	800	1.500	L-36FT	A	40
699	950	1.800	L-36FT	A	40
765	1.040	1.500	L-36ST	A	40
800	1.088	1.500	L-36ST	A	40
866	1.180	1.800	L-36ST	A	40
883	1.200	1.800	L-36ST	A	40
846	1.150	1.500	L-48FT	A	41
934	1.270	1.800	L-48FT	A	41
1.020	1.388	1.500	L-48ST	A	41
1.050	1.428	1.500	L-48ST	A	41
1.154	1.570	1.800	L-48ST	A	41
1.177	1.600	1.800	L-48ST	A	41

Marine Power Generation Sets

kVA	kWe	Hz	Type	Rating	Page
345	276	50	L-18FT	COP	44
460	368	50	L-18ST	COP	
500	400	50	L-24FT	COP	45
640	512	50	L-24ST	COP	
700	560	50	L-36FT	COP	46
860	688	50	L-36ST	COP	
950	760	50	L-36ST	COP	
1.000	800	50	L-48FT	COP	47
1.100	880	50	L-48ST	COP	
1.250	1.000	50	L-48ST	COP	
400	320	60	L-18FT	COP	44
520	416	60	L-18FT	COP	
560	448	60	L-24ST	COP	45
690	552	60	L-24ST	COP	
830	664	60	L-36FT	COP	46
950	760	60	L-36ST	COP	
1.050	840	60	L-36ST	COP	
1.100	880	60	L-48FT	COP	47
1.200	960	60	L-48ST	COP	
1.300	1.040	60	L-48ST	COP	
1.400	1.120	60	L-48ST	COP	

Marine Electric Propulsion Gensets

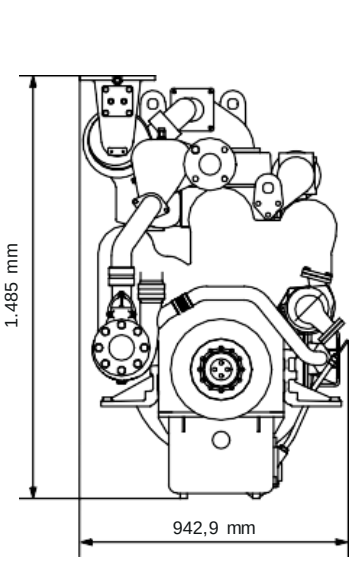
kVA	kWe	Hz	Type	Rating	Page
310	248	50	L-18FT	COP	50
345	276	50	L-18FT	COP	
400	320	50	L-18ST	COP	
460	368	50	L-18ST	COP	
500	400	50	L-24FT	COP	51
600	480	50	L-24ST	COP	
640	512	50	L-24ST	COP	
700	560	50	L-36FT	COP	52
860	688	50	L-36ST	COP	
950	760	50	L-36ST	COP	
1.000	800	50	L-48FT	COP	53
1.100	880	50	L-48ST	COP	
1.250	1.000	50	L-48ST	COP	
360	288	60	L-18FT	COP	50
400	320	60	L-18FT	COP	
440	352	60	L-18ST	COP	
520	416	60	L-18ST	COP	
560	448	60	L-24FT	COP	51
600	480	60	L-24ST	COP	
650	520	60	L-24ST	COP	
675	540	60	L-24ST	COP	
690	552	60	L-24ST	COP	
830	664	60	L-36FT	COP	52
950	760	60	L-36ST	COP	
1.050	840	60	L-36ST	COP	
1.100	880	60	L-48FT	COP	53
1.200	960	60	L-48ST	COP	
1.300	1.040	60	L-48ST	COP	
1.400	1.120	60	L-48ST	COP	

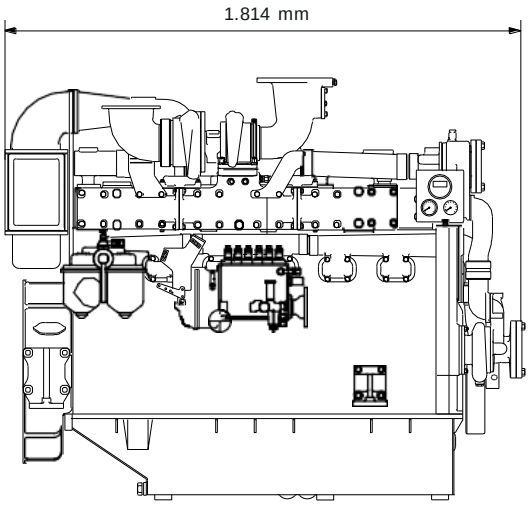
Hydraulic Clutch

kW	HP	rpm	Type	Rating	Page
294	400	1.800	E160	A	60
662	400	1.800	E360	A	60
728	440	1.800	E360	B	61
324	440	1.800	E160	B	61

1.6.1 Propulsion Engines

L-18 Series
Propulsion Engines





Main data

Cycle (ISO 8178)	E3 (propulsion)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Nat. aspirated / turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Propulsion ratings

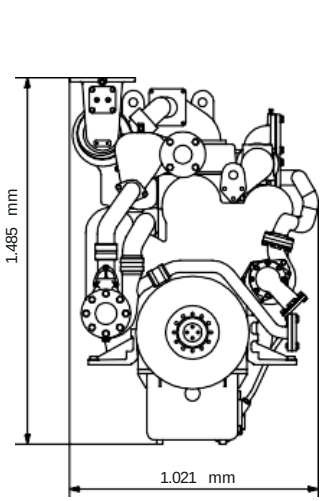
Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	184	250	1.800	N.A.	N.C.
A	412	560	1.600	69,4	IMO2
A	441	600	1.800	77,4	IMO2
A	452	615	1.800	79,3	IMO2
B	191	260	1.800	N.A.	N.C.
B	353	480	1.800	62,1	IMO2
B	474	645	1.800	83,5	IMO2
C	504	685	1.800	89,5	IMO2

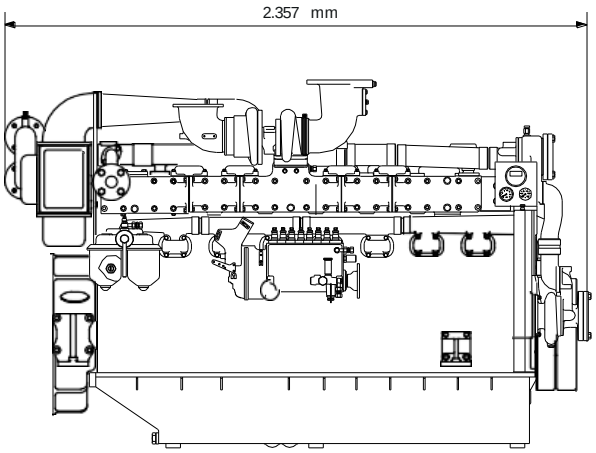
Weight

Dry weight (kg)	2.620

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-24 Series
Propulsion Engines





Main data

Cycle (ISO 8178)	E3 (propulsion)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Propulsion ratings

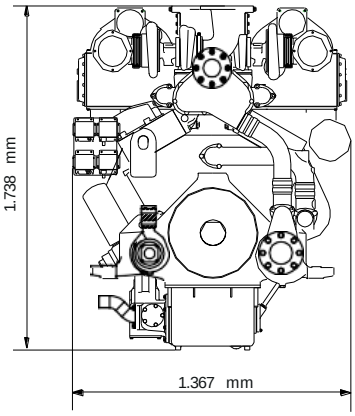
Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	478	650	1.800	80,7	IMO2
A	552	750	1.600	93,0	IMO2
A	577	785	1.800	97,0	CCNR2
A	588	800	1.800	99,1	IMO2
A	610	830	1.800	102,7	IMO2
B	493	670	1.800	83,1	IMO2
B	635	864	1.800	107,2	IMO2
C	662	900	1.800	112,1	IMO2

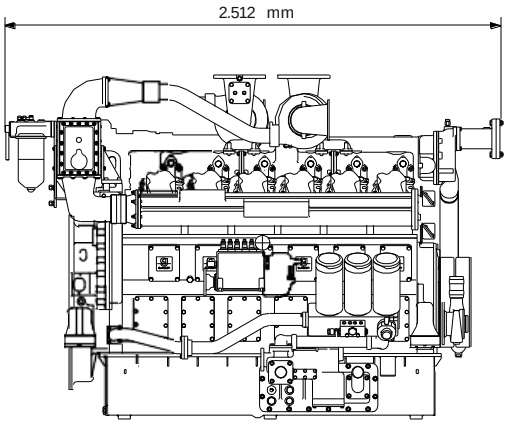
Weight

Dry weight (kg)	3.400

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-36 Series
Propulsion Engines





Main data

Cycle (ISO 8178)	E3 (propulsion)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Propulsion ratings

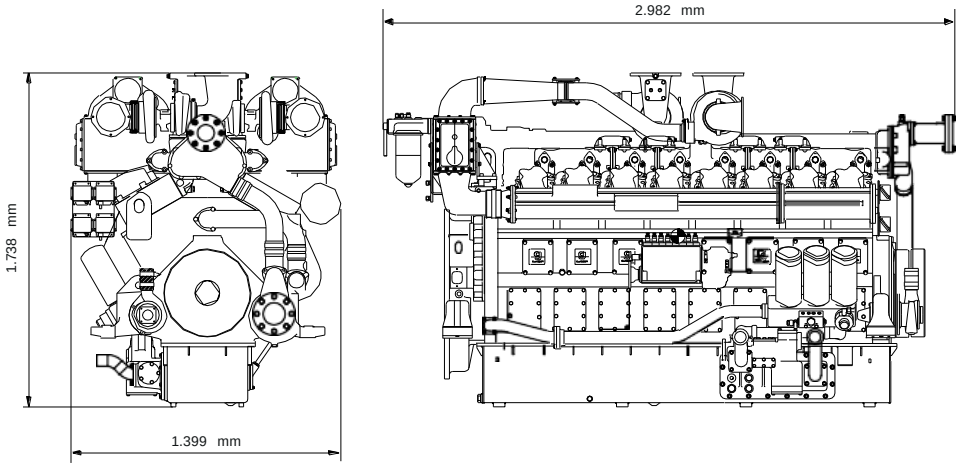
Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	662	900	1.800	114,7	IMO2
A	824	1.120	1.600	139,0	IMO2
A	868	1.180	1.800	150,1	CCNR2
A	882	1.200	1.800	152,6	IMO2
B	706	960	1.800	122,0	IMO2
B	949	1.290	1.800	165,1	IMO2
C	1.000	1.360	1.800	174,6	IMO2

Weight

Dry weight (kg)	4.630

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-48 Series
Propulsion Engines



Main data

Cycle (ISO 8178)	E3 (propulsion)
Disposition / Displacement	16 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Propulsion ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	934	1.270	1.800	156,1	IMO2
A	1.103	1.500	1.600	184,6	IMO2
A	1.155	1.571	1.800	207,2	CCNR2
A	1.177	1.600	1.800	196,1	IMO2
A	1.221	1.660	1.800	203,5	IMO2
B	993	1.350	1.800	165,7	IMO2
B	1.268	1.724	1.800	211,8	IMO2
C	1.029	1.400	1.800	171,6	IMO2
C	1.324	1.800	1.800	211,9	IMO2

Weight

Dry weight (kg / lb)	5.450

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

1.6.2 Gearboxes

R-160

Gearbox

Main data

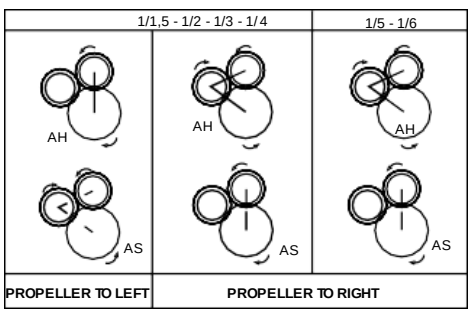
FP gearbox
Hydraulic multi-disc clutches
Case-hardened grinded helical gears
Thrust bearings
Heat exchanger
Oil pressure damper tank
Mounting brackets
Emergency mechanical clutch
Oil filtering full flow

Technical data

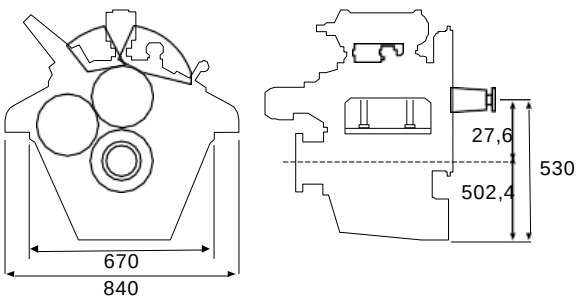
Reduction ratio: 1,53; 2,03; 3,14; 4,06; 4,91; 5,99. Available in both rotations, except for the reductions 4,91 and 5,99, only available right rotation sense.

Bell Housg. (SAE)	Rotation sense	Rating	Power kW / hP						RPM max.	Weight kg.
			1.200		1.600		1.800			
1,2	A	L / R	196	267	262	356	294	400	2.500	590
1,2	B	L / R	216	293	288	391	324	440	2.500	590

Rotation sense



Dimensions



Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

R-240/R-240V

Single Stage Gearbox

Main data

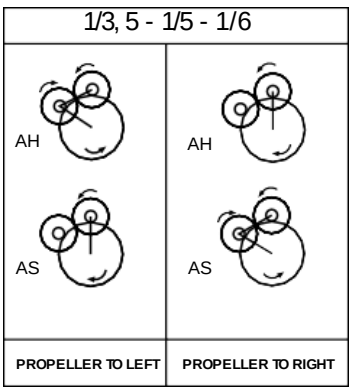
FP gear box
Hydraulic multi-disc clutches
Case-hardened grinded helical gears
Thrust bearings
Heat exchanger
Oil pressure damper tank
Mounting brackets
Emergency mechanical clutch
Oil filtering full flow

Technical data

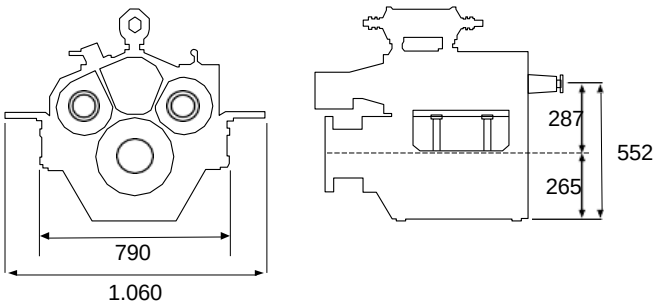
Reduction ratio: 2,90; 3,91; 4,95.

Gear Stages	Bell Housg. (SAE)	Rating	Rotation	Power kW / hP						RPM max.	Weight kg.
				1.200		1.600		1.800			
1	1,1/2,0	A	L / R	343	467	458	622	515	700	2.500	1.035
1	1,1/2,0	B	L / R	378	513	503	688	566	770	2.500	1.035

Rotation sense



Dimensions



Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

R-240E/EV

Double Stage Gearbox

Main data

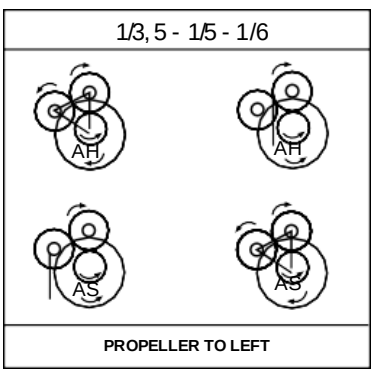
FP gear box
Hydraulic multi-disc clutches
Case-hardened grinded helical gears
Thrust bearings
Heat exchanger
Oil pressure damper tank
Mounting brackets
Emergency mechanical clutch
Oil filtering full flow

Technical data

Reduction ratio: 3,56; 4,80; 6,08.

Gear Stages	Bell Housg. (SAE)	Rating	Rotation	Power kW / hP						RPM max.	Weight kg.
				1.200		1.600		1.800			
2	1,1/2,0	A	L / R	294	400	392	533	441	600	2.500	1.057
2	1,1/2,0	B	L / R	324	440	431	587	485	660	2.500	1.057

Rotation sense



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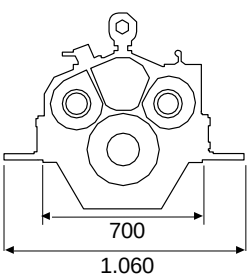
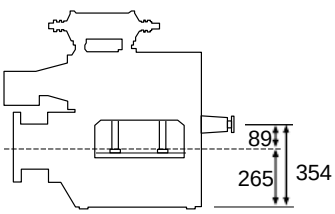




Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

R-360/R-360V

Single Stage Gearbox

Main data

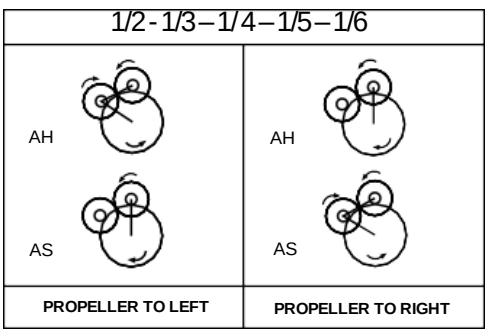
FP gear box
Hydraulic multi-disc clutches
Case-hardened grinded helical gears
Thrust bearings
Heat exchanger
Oil pressure damper tank
Mounting brackets
Emergency mechanical clutch
Oil filtering full flow

Technical data

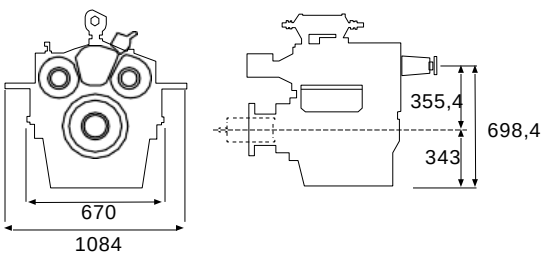
Reduction ratio: 2,04; 3,25; 4,38; 5,1; 6,0.

Pair of gears	Bell Housg. (SAE)	Rating	Rotation sense	Power kW / hP						RPM max.	Weight kg.
				1.200		1.600		1.800			
1	1,1/2,0	A	L / R	441	600	588	800	662	900	2.000	1.270
1	1,1/2,0	B	L / R	485	660	647	880	728	990	2.000	1.270

Rotation sense



Dimensions



Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

R-360E/EV

Double Stage Gearbox

Main data

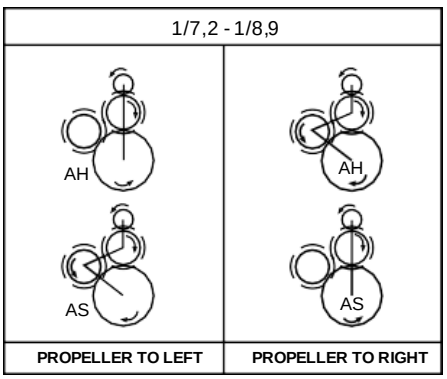
FP gear box
Hydraulic multi-disc clutches
Case-hardened grinded helical gears
Thrust bearings
Heat exchanger
Oil pressure damper tank
Mounting brackets
Emergency mechanical clutch
Oil filtering full flow

Technical data

Reduction ratio: 7,20; 8,90 (Valid for fixed and variable pitch propeller)

Pair of gears	Bell Housg. (SAE)	Rating	Rotation sense	Power kW / hP						RPM max.	Weight kg.
				1.200		1.600		1.800			
2	1,1/2,0	A	L / R	343	467	458	622	515	700	2.000	1.350
2	1,1/2,0	A	L / R	294	400	392	533	441	600	2.500	1.350
2	1,1/2,0	B	L / R	378	513	503	684	566	770	2.000	1.350
2	1,1/2,0	B	L / R	324	440	431	587	485	660	2.500	1.350

Rotation sense



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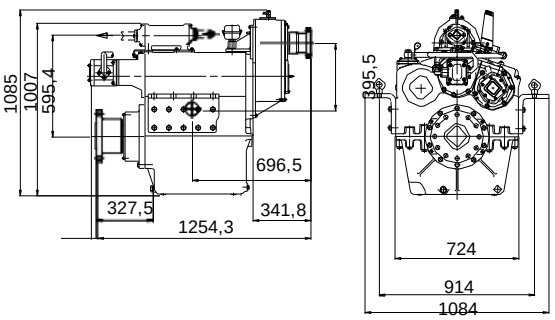


Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

R-500
Gearbox

Main data

FP gear box
Hydraulic multi-disc clutches
Case-hardened grinded helical gears
Thrust bearings
Heat exchanger
Oil pressure damper tank
Mounting brackets
Emergency mechanical clutch
Oil filtering full flow

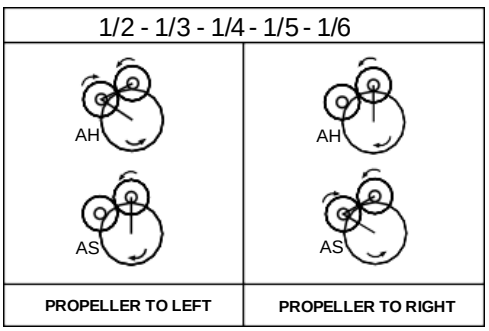
Technical data

Reduction ratio: 2,69; 3,25; 3,97; 4,86; 6,08; 7,03 (Valid for fixed and variable pitch propeller)

Bell Housg. (SAE)	Rating	Rotation sense	Power kW / hP						RPM max.	Weight kg.
			1,200		1,600		1,800			
N.A	A	L / R	819	1.113	1.092	1.483	1.228	1.670	1.900	2.700
N.A	B	L / R	901	1.225	1.201	1.632	1.351	1.837	1.900	2.700

Note: For reduction 7,03 the only rotation sense availble is right.

Rotation sense



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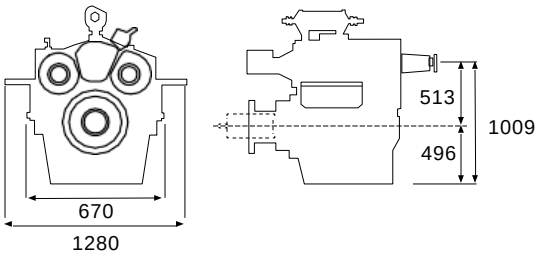
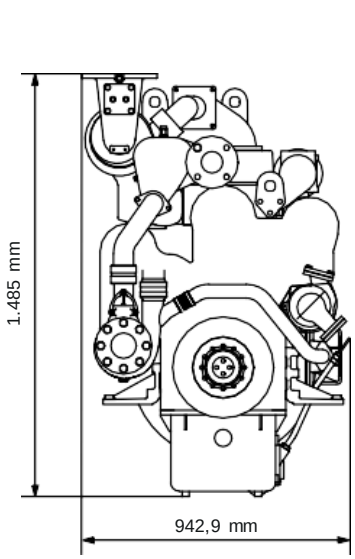


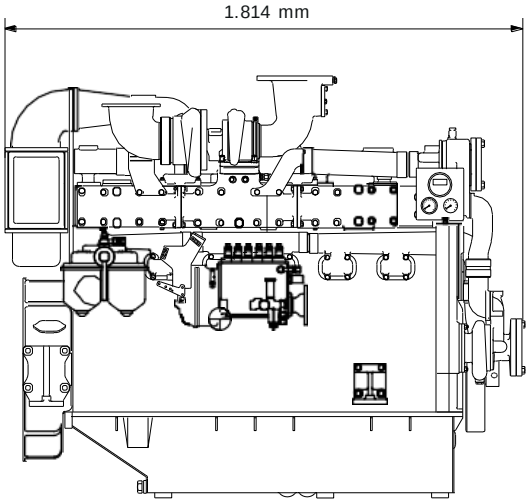
Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

1.6.3 Auxiliary Engines Variable Speed

L-18 Series

Auxiliary Engines Variable Speed





Main data

Cycle (ISO 8178)	C1 (auxiliary)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Auxiliary ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	412	560	1.600	Under review	IMO2
A	441	600	1.800		IMO2
A	452	615	1.800		IMO2
B	353	480	1.800		IMO2
B	474	645	1.800		IMO2
C	504	685	1.800		IMO2

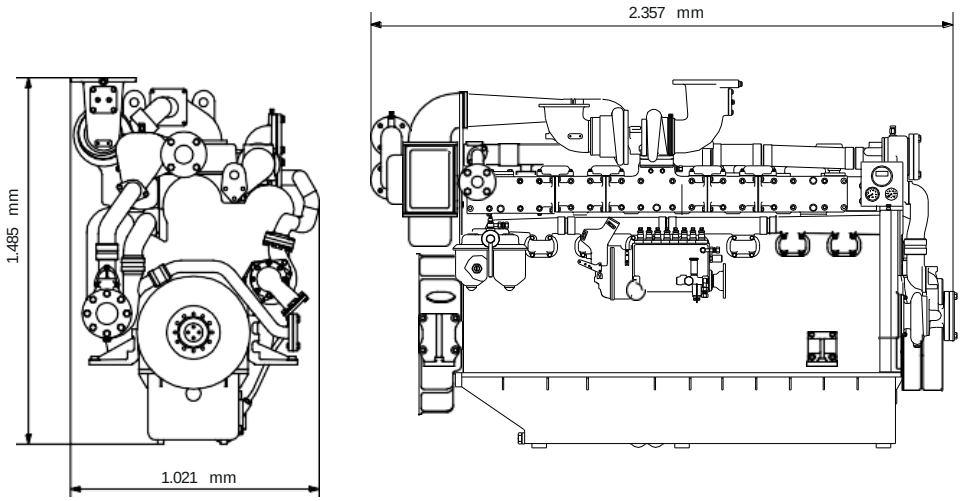
Weight

Dry weight (kg)	2.620

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-24 Series

Auxiliary Engines Variable Speed



Main data

Cycle (ISO 8178)	C1 (auxiliary)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Auxiliary ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	478	650	1.800	Under review	IMO2
A	552	750	1.600		IMO2
A	577	785	1.800		CCNR2
A	588	800	1.800		IMO2
A	610	830	1.800		IMO2
B	493	670	1.800		IMO2
B	635	864	1.800		IMO2
C	662	900	1.800		IMO2

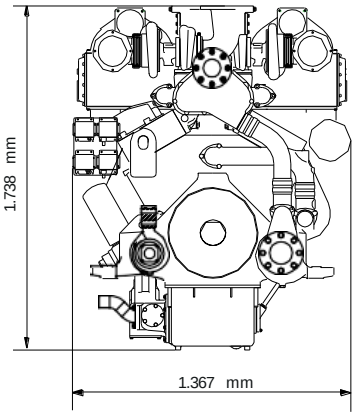
Weight

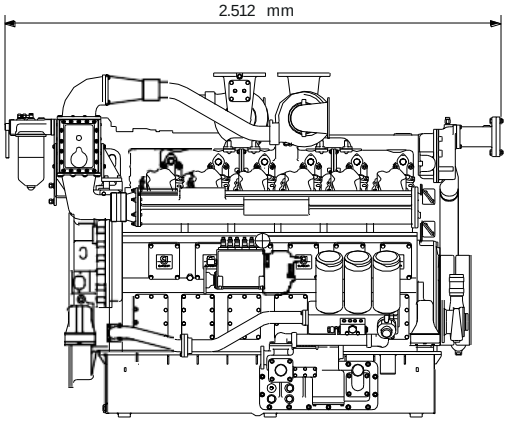
Dry weight (kg)	3.400

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-36 Series

Auxiliary Engines Variable Speed





Main data

Cycle (ISO 8178)	C1 (auxiliary)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Auxiliary ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	662	900	1.800	Under review	IMO2
A	824	1.120	1.600		IMO2
A	868	1.180	1.800		CCNR2
A	882	1.200	1.800		IMO2
B	706	960	1.800		IMO2
B	949	1.290	1.800		IMO2
C	1.000	1.360	1.800		IMO2

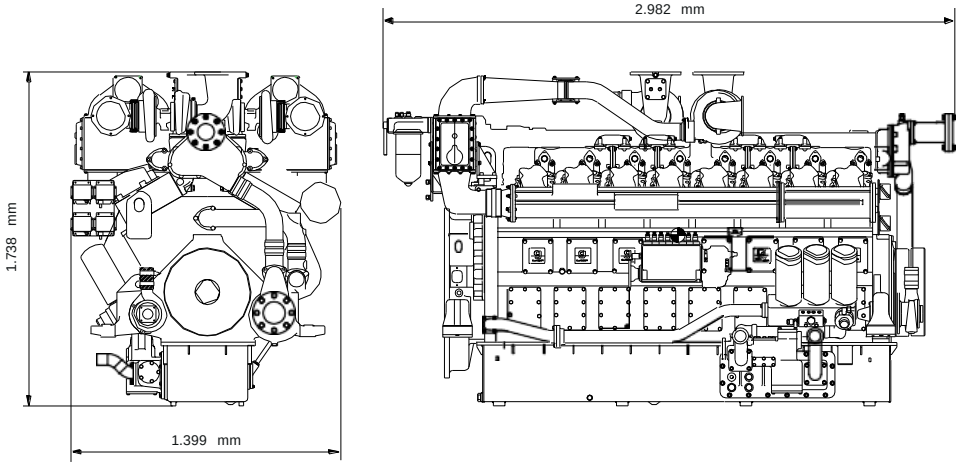
Weight

Dry weight (kg)	4.630

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-48 Series

Auxiliary Engines Variable Speed



Main data

Cycle (ISO 8178)	C1 (auxiliary)
Disposition / Displacement	16 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel direct injection
Aspiration	Turbocharged - aftercooled
Rotation (from flywheel)	Counterclockwise

Auxiliary ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	934	1.270	1.800	Under review	IMO2
A	1.103	1.500	1.600		IMO2
A	1.155	1.571	1.800		CCNR2
A	1.177	1.600	1.800		IMO2
A	1.221	1.660	1.800		IMO2
B	993	1.350	1.800		IMO2
B	1.268	1.725	1.800		IMO2
C	1.029	1.400	1.800		IMO2
C	1.324	1.800	1.800		IMO2

Weight

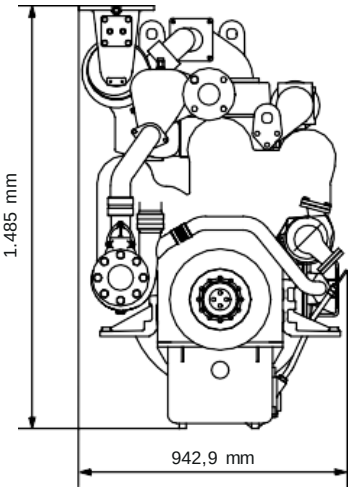
Dry weight (kg / lb)	5.450

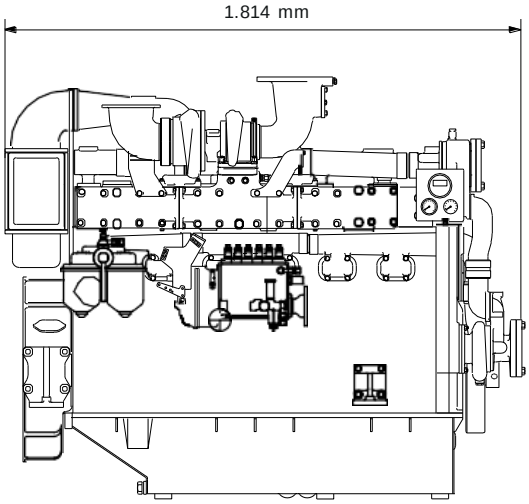
Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

1.6.4 Marine Power Generation Engines

L-18 Series

Marine Power Generation Engines





Main data

Cycle (ISO 8178)	E2 (auxiliary)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Aspiration	Turbocharged and aftercooled
Rotation (from flywheel)	Counterclockwise
For continuous operation	

Auxiliary ratings

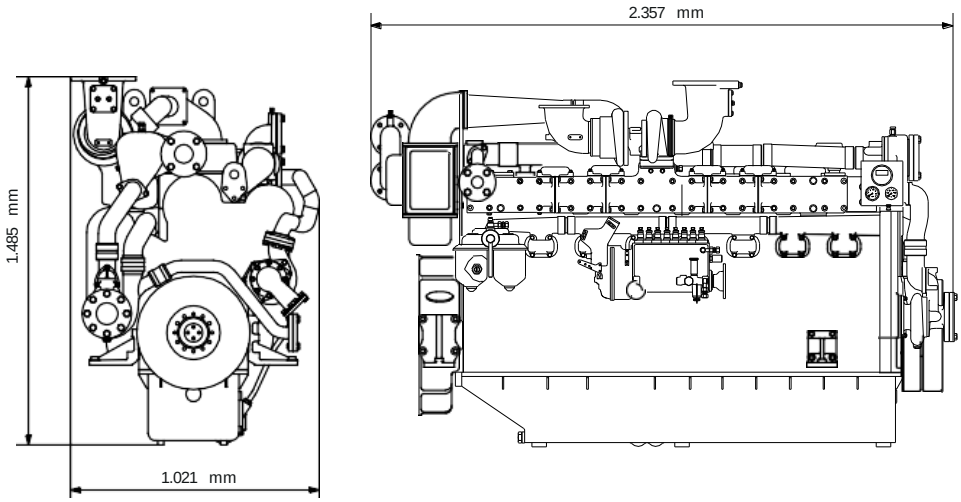
Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	294	400	1.500	50,4	IMO2
A	396	539	1.500	66,13	IMO2
A	346	471	1.800	62,00	IMO2
A	441	600	1.800	77,4	IMO2

Weight

Dry weight (kg)	2.620

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-24 Series
Marine Power Generation Engines



Main data

Cycle (ISO 8178)	E2 (auxiliary)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Aspiration	Turbocharged and aftercooled
Rotation (from flywheel)	Counterclockwise
For continuous operation	

Auxiliary ratings

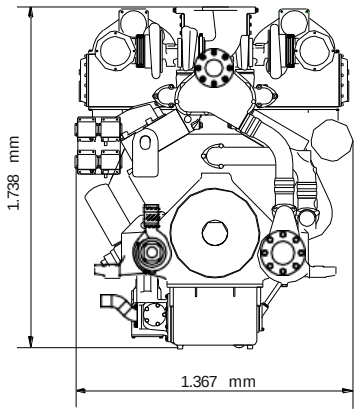
Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	426	579	1.500	71,2	IMO2
A	510	694	1.500	84,3	IMO2
A	540	734	1.500	89,1	IMO2
A	478	650	1.800	80,7	IMO2
A	577	785	1.800	97,0	CCNR2
A	588	800	1.800	99,1	IMO2

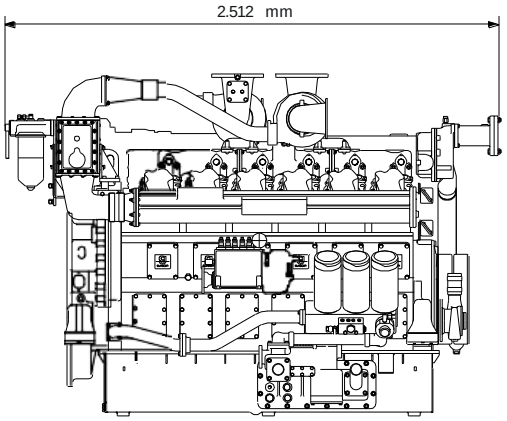
Weight

Dry weight (kg)	3.400

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-36 Series
Marine Power Generation Engines





Main data

Cycle (ISO 8178)	E2 (auxiliary)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Aspiration	Turbocharged and aftercooled
Rotation (from flywheel)	Counterclockwise
For continuous operation	

Auxiliary ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	588	800	1.500	73,9	IMO2 / CCNR2
A	765	1.040	1.500	92,1	CCNR2
A	800	1.088	1.500	95,7	IMO2
A	699	950	1.800	91,1	IMO2
A	866	1.178	1.800	108,1	CCNR2
A	883	1.200	1.800	109,7	IMO2

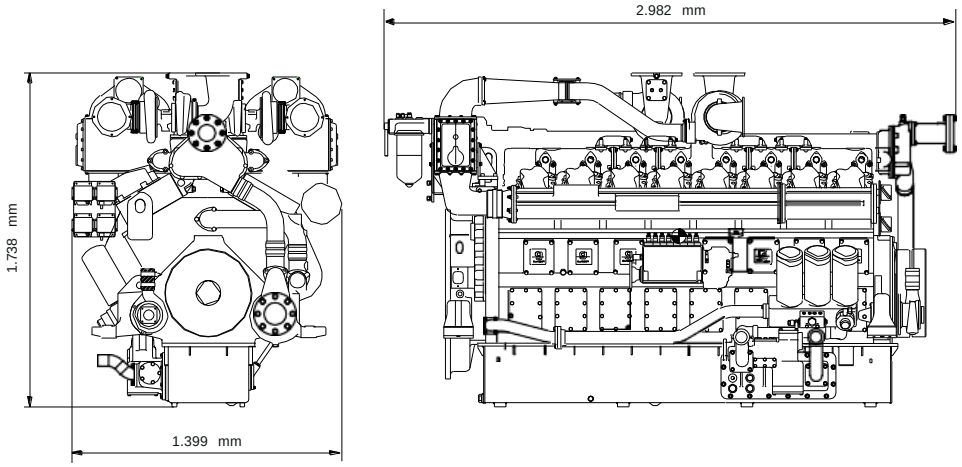
Weight

Dry weight (kg)	4.630

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-48 Series

Marine Power Generation Engines



Main data

Cycle (ISO 8178)	E2 (auxiliary)
Disposition / Displacement	116 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Aspiration	Turbocharged and aftercooled
Rotation (from flywheel)	Counterclockwise

For continuous operation

Auxiliary ratings

Rating	kW	mHP	RPM	Fuel consumption (ISO 8178) L/h	Emissions
A	846	1.151	1.500	101,2	IMO2 / CCNR2
A	1.020	1.388	1.500	119,7	CCNR2
A	1.050	1.428	1.500	123,1	IMO2
A	934	1.270	1.800	122,2	IMO2 / CCNR2
A	1.154	1.570	1.800	144,8	CCNR2
A	1.177	1.601	1.800	147,0	IMO2

Weight

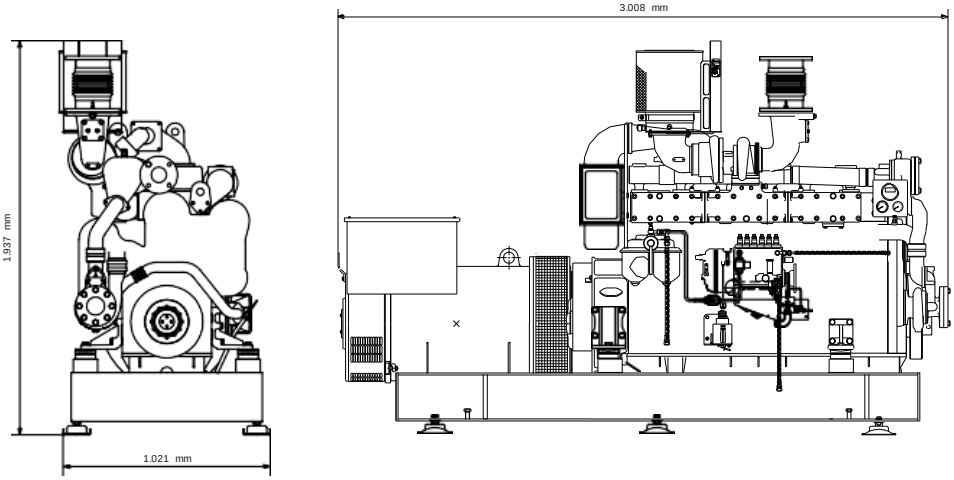
Dry weight (kg / lb)	5.450

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

1.6.5 Marine Power Generation Sets

L-18 Series

Marine Power Generation Set



Main data

Cycle (ISO 8178)	D2 (auxiliary generator set)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

Auxiliary generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	345	276	380 / 400	37,1	IMO2
	460	368		47,5	IMO2
1.800 (60Hz)	400	320	450 / 480	46,3	IMO2
	520	416		56,0	IMO2

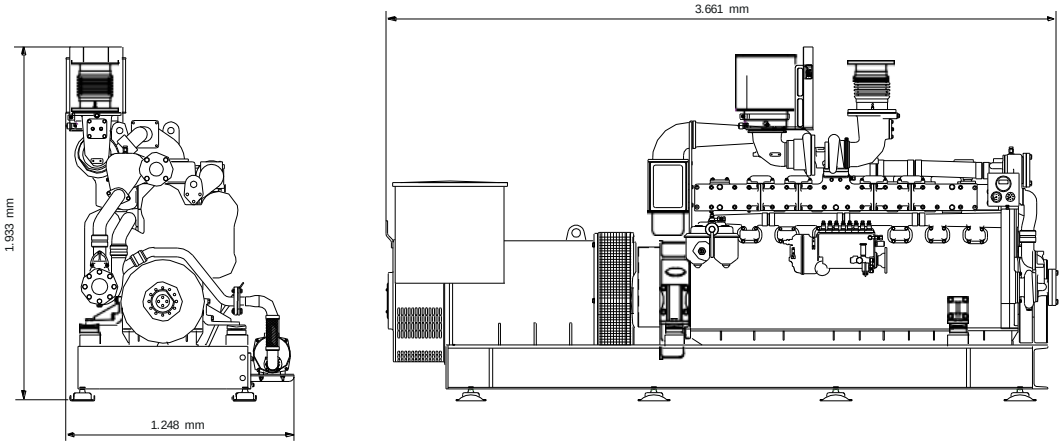
Weight

Dry weight (kg)	4.410

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-24 Series

Marine Power Generation Set



Main data

Cycle (ISO 8178)	D2 (auxiliary generator set)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

Auxiliary generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	500	400	380 / 400	51,8	IMO2
	640	512		63,6	IMO2
1.800 (60Hz)	560	448	450 / 480	62,3	IMO2
	690	552		73,9	IMO2

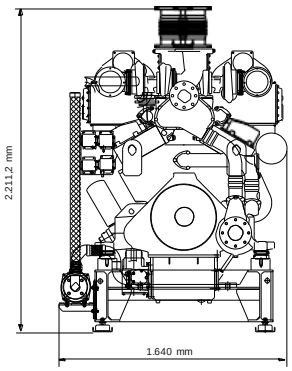
Weight

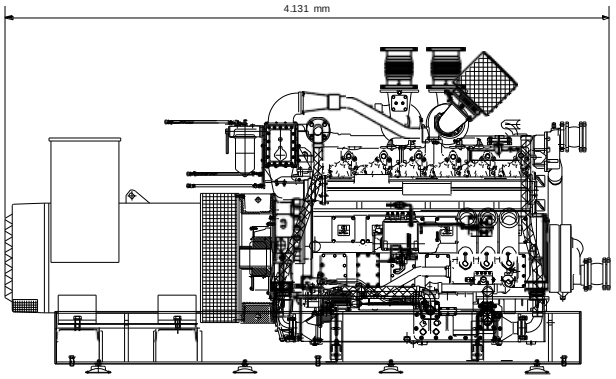
Dry weight (kg)	5.530

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-36 Series

Marine Power Generation Set





Main data

Cycle (ISO 8178)	D2 (auxiliary generator set)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Auxiliary generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	700	560	380 / 400	73,9	IMO2 / CCNR2
	860	688		88,0	CCNR2
	950	760		95,7	IMO2
1.800 (60Hz)	830	664	450 / 480	91,1	IMO2 / CCNR2
	950	760		101,9	CCNR2
	1.050	840		109,7	IMO2

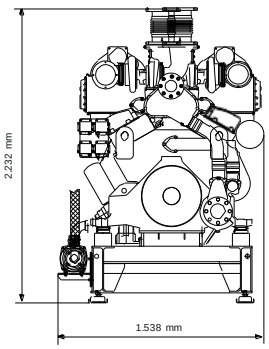
Weight

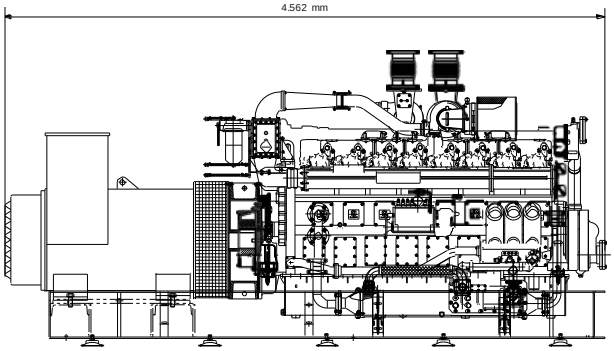
Dry weight (kg)	8.800

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-48 Series

Marine Power Generation Set





Main data

Cycle (ISO 8178)	D2 (auxiliary generator set)
Disposition / Displacement	16 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

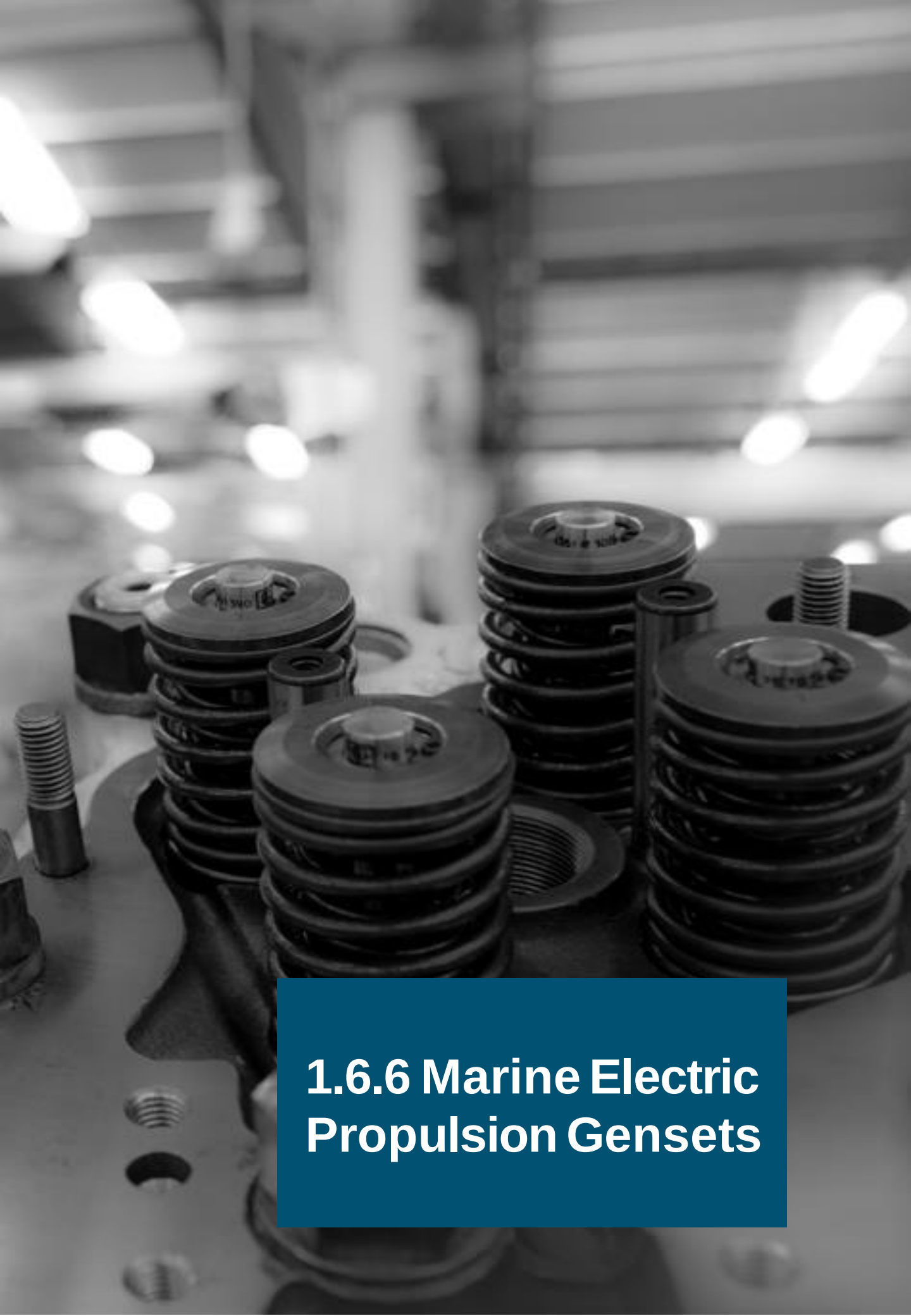
Auxiliary generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	1.000	800	380 / 400	101,2	IMO2 / CCNR2
	1.100	880		109,6	IMO2 / CCNR2
	1.250	1.000		123,1	IMO2
1.800 (60Hz)	1.100	880	450 / 480	122,2	IMO2 / CCNR2
	1.200	960		130,5	IMO2 / CCNR2
	1.300	1.040		138,7	IMO2 / CCNR2
	1.400	1.120		147,0	IMO2

Weight

Dry weight (kg)	9.840

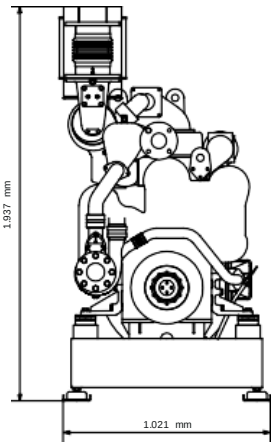
Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

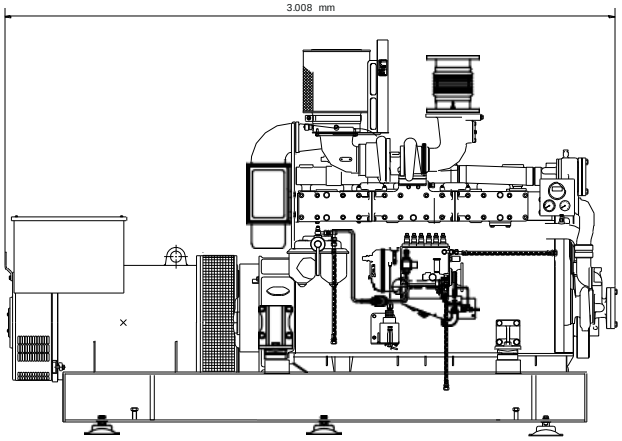


1.6.6 Marine Electric Propulsion Gensets

L-18 Series

Marine Electric Propulsion Genset





Main data

Cycle (ISO 8178)	E2 (diesel - electric propulsion)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

DEP generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	310	248	380 / 400	45,9	IMO2
	345	276		50,2	IMO2
	400	320		57,4	IMO2
	460	368		66,1	IMO2
1.800 (60Hz)	360	288	450 / 480	56,1	IMO2
	400	320		62,0	IMO2
	440	352		67,5	IMO2
	520	416		77,3	IMO2

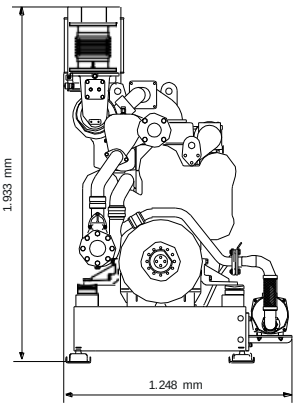
Weight

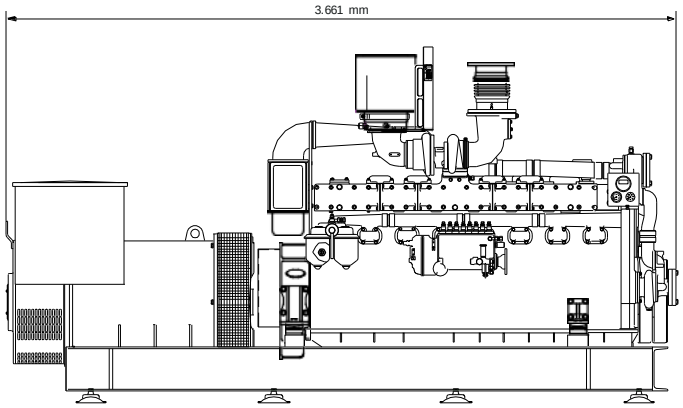
Dry weight (kg)	4.410

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-24 Series

Marine Electric Propulsion Genset





Main data

Cycle (ISO 8178)	E2 (diesel - electric propulsion)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

DEP generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	500	400	380 / 400	71,2	IMO2
	600	480		84,3	IMO2
	640	512		89,1	IMO2
1.800 (60Hz)	560	448	450 / 480	84,4	IMO2
	600	480		89,5	IMO2
	650	520		96,8	IMO2
	675	540		106,5	CCNR2
	690	552		102,2	IMO2

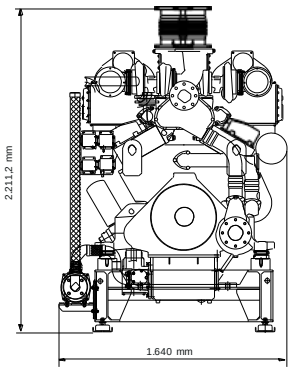
Weight

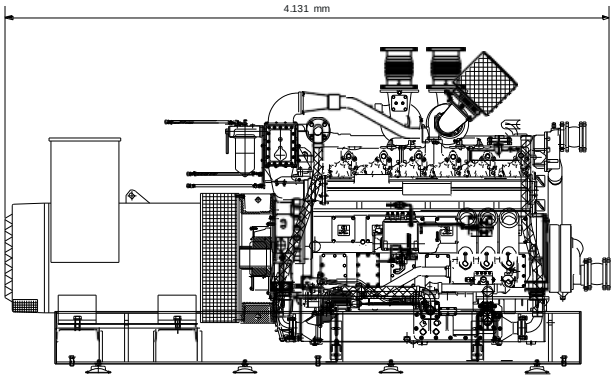
Dry weight (kg)	5.530

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-36 Series

Marine Electric Propulsion Genset





Main data

Cycle (ISO 8178)	E2 (diesel - electric propulsion)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

DEP generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	700	560	380 / 400	100,4	IMO2 / CCNR2
	860	688		121,8	CCNR2
	950	760		133,7	IMO2
1.800 (60Hz)	830	664	450 / 480	122,4	IMO2 / CCNR2
	950	760		139,1	CCNR2
	1.050	840		153,0	IMO2

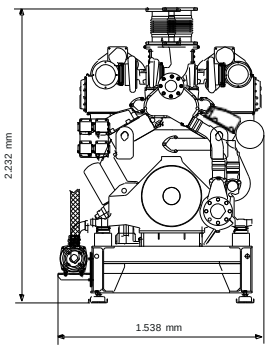
Weight

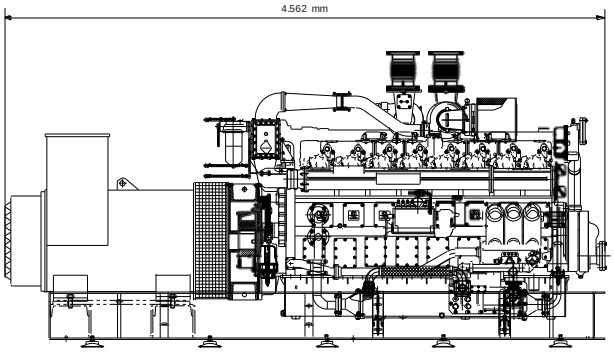
Dry weight (kg)	8.800

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

L-48 Series

Marine Electric Propulsion Genset





Main data

Cycle (ISO 8178)	E2 (diesel - electric propulsion)
Disposition / Displacement	16 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Direct injection
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Excitation	AREP self-excited, brushless
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

DEP generator set COP ratings

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)	Emissions
	kVA	kWe		L/h	
1.500 (60Hz)	1.000	800	380 / 400	141.4	IMO2 / CCNR2
	1.100	880		154.1	IMO2 / CCNR2
	1.250	1.000		174.3	IMO2
1.800 (60Hz)	1.100	880	450 / 480	164.1	IMO2 / CCNR2
	1.200	960		176.8	IMO2 / CCNR2
	1.300	1.040		189.4	IMO2 / CCNR2
	1.400	1.120		202.2	IMO2

Weight

Dry weight (kg)	9.840

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

1.6.7 Marine Control Systems

Marine Control System

The Guascor Energy Marine Control System has been designed to carry out the functions of monitoring and protection of the engine or genset during its operation.

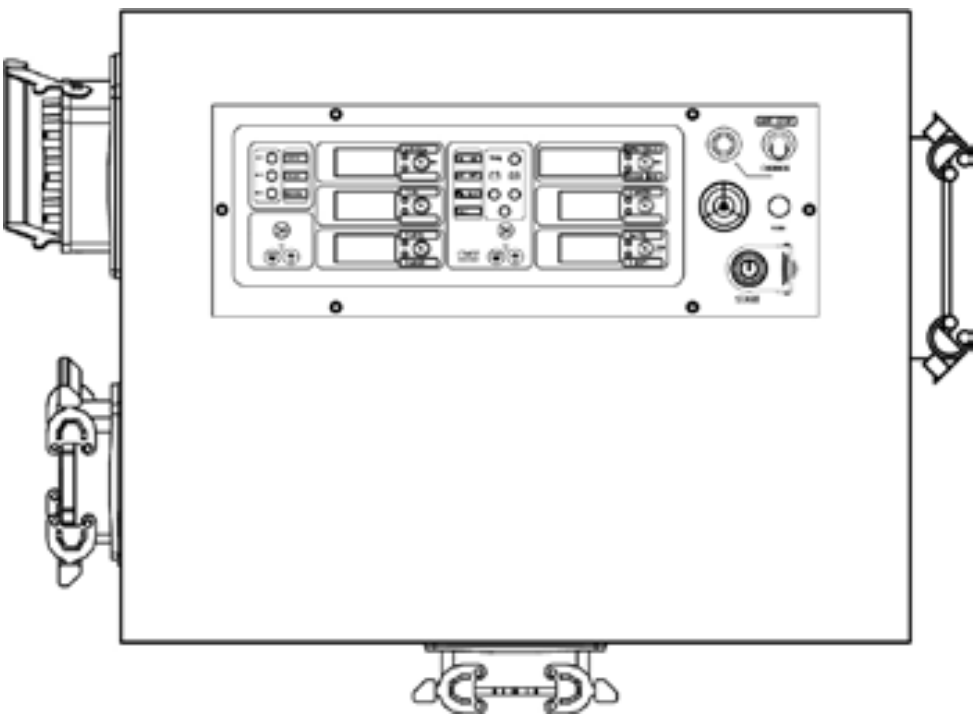
The control device is in charge of the supervision and management of the engine´s main paramenters activating the visual and sound alarms as well as performing the start up and stop functions of the generator set. A backup module is in charge of safety functions such as switching the principal and auxiliary feeds.

There are two different configurations available depending on the used technology.

Marine Control System - Basic

The Marine Control System-Basic, MCS-Basic, is a totally programmable control panel controlled by a microprocessor. All functions performed by the MCS - Basic are simple and intuitive including the mesasurement and alarm set which are also simple and inmediate.

As an option, the MCS-Basic would be completed with an external display device to be installed remotely.

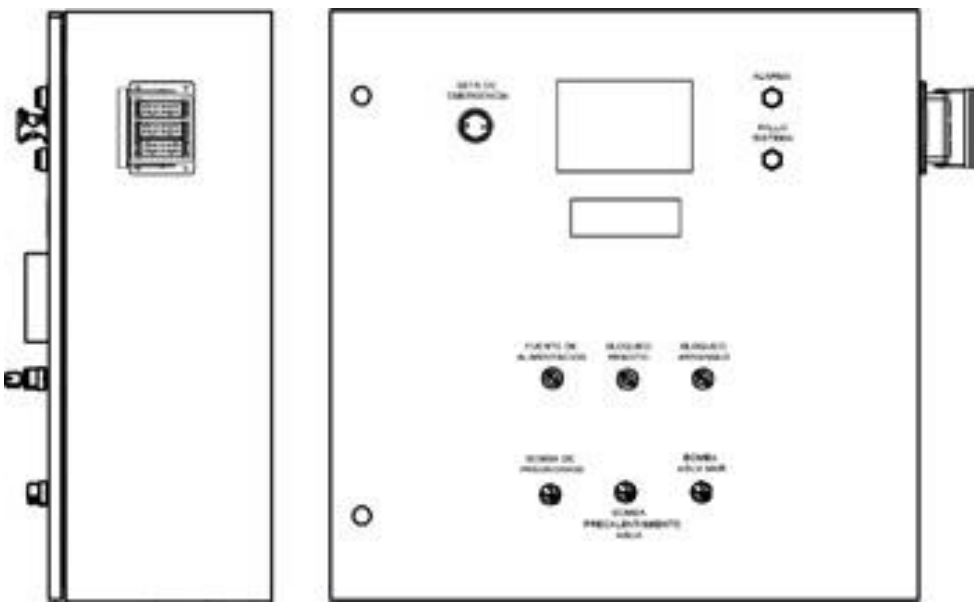


Marine Control System - Advance

The Marine Control System-Advance, MCS-Advance, is a totally programmable control panel controlled by an specific control device, ECU-MARINE. This equipment performs the functions of monitoring and protecting the engine or genset, displaying the main parameters, activating the visual and sound alarms and performing the start up and spot functions of the machine.

As an option, the MCS-Advance would be completed with an external display device to be installed remotely.

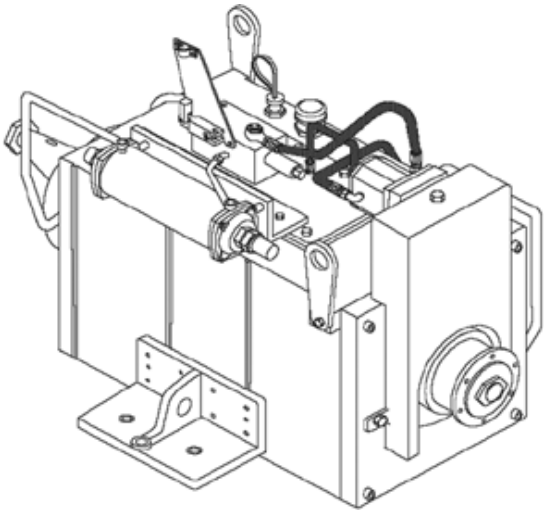
The MCS-Advance complies with the demanded requirements of the different Classification Entities, such Bureau Veritas, Lloyds Register or American Bureau of Shipping.



1.6.8 Hydraulic Clutches

E 160

Hydraulic Clutch

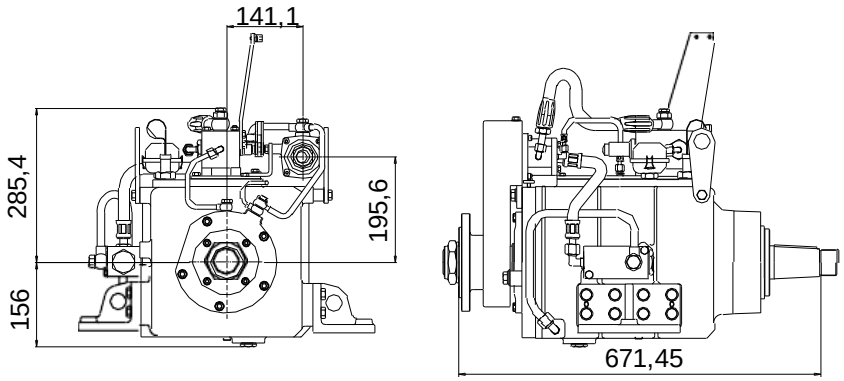


Main data

Hydraulic clutch P.T.O.
Cast iron casing
Inlet and outlet shafts
Oil cooler
Oil pump
Full flow oil filter
Oil distributor with control valve
Mounting brackets

Reduction	Rating	Rotation sense	Power kW / hP						RPM max.	Weight kg.
			1.200		1.600		1.800			
1,00	A	L / R	196	267	262	356	294	400	2.500	140
1,00	B	L / R	216	293	288	391	324	440	2.500	140

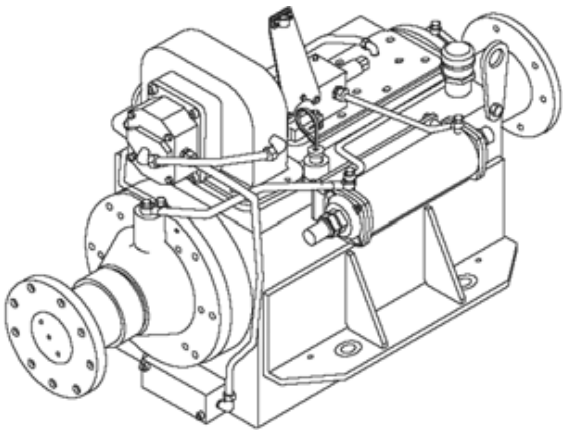
Dimensions



Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

E 360

Hydraulic Clutch

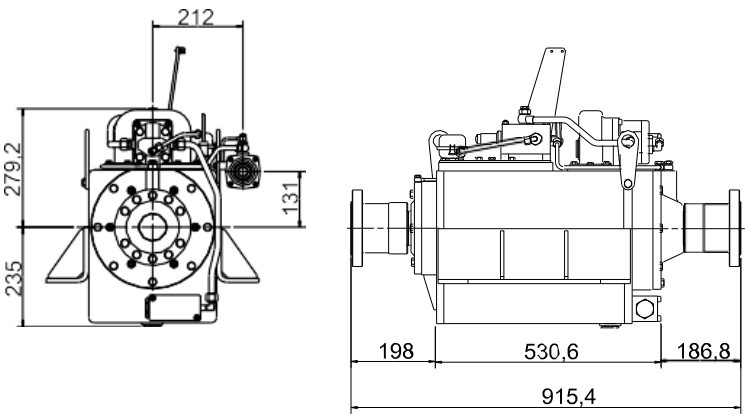


Main data

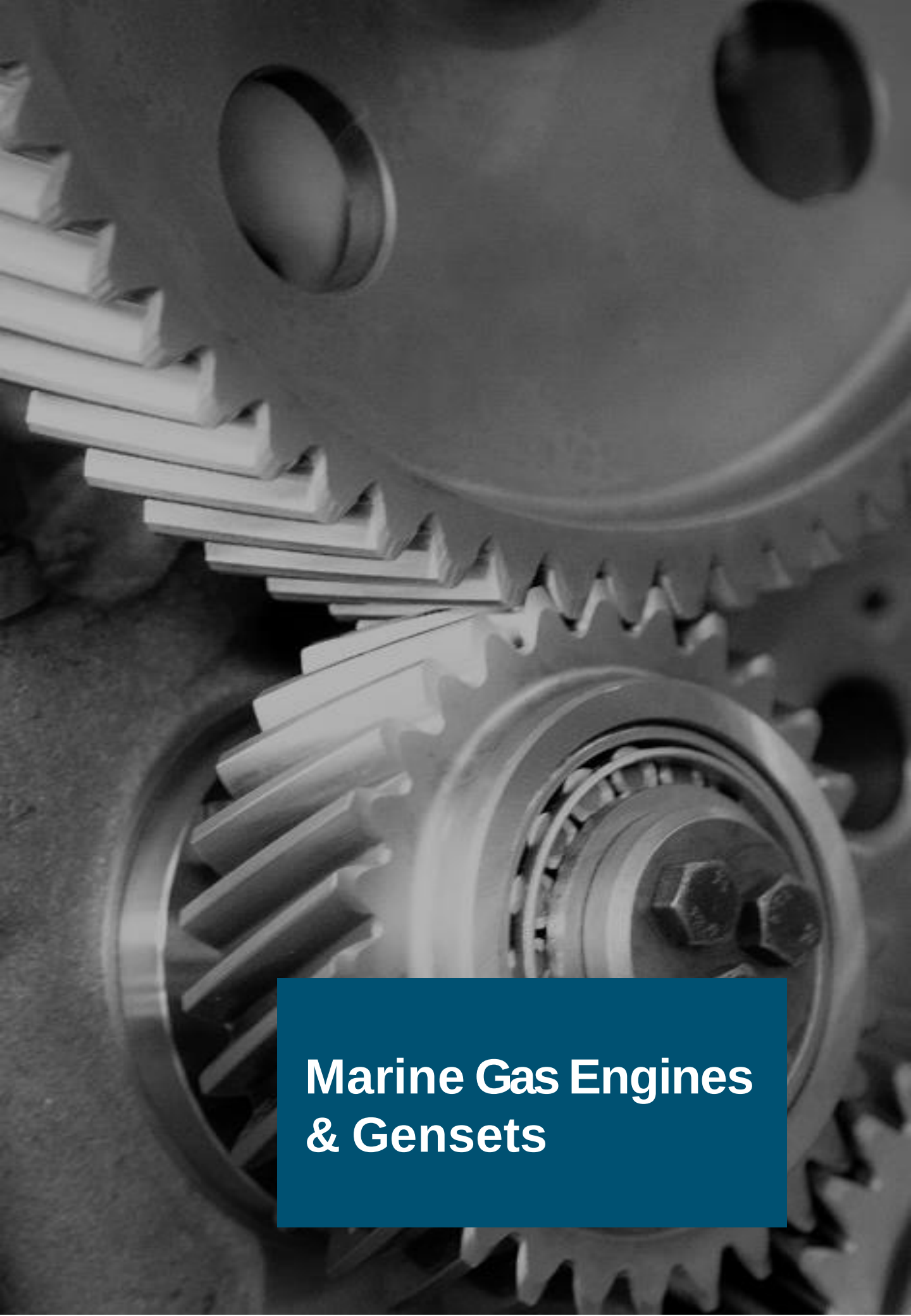
Hydraulic clutch P.T.O.
Cast iron casing
Inlet and outlet shafts
Oil cooler
Oil pump
Full flow oil filter
Oil distributor with control valve
Mounting brackets

Reduction	Rating	Rotation sense	Power kW / HP						RPM max.	Weight kg.
			1.200		1.600		1.800			
1.00	A	L / R	441	600	588	800	662	900	2.000	300
1.00	B	L / R	485	660	647	880	728	990	2.000	300

Dimensions



Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.



Marine Gas Engines & Gensets

Contents

2. Gas

2.1 Power Definition

Guascor Energy gas engines ratings stated in this document are based on ISO3046-1:2002(E), ISO3046-3:2006(E) and ISO15550:2002(E) standards.
These ratings have been measured (including all engine driven mechanical pumps).

Abbreviations ICFN / IFN

I = ISO Standard (3046)

C = Continuous

F = Fuel stop power

N = Net power

Our Guascor Energy gas engines are designed following the standard reference conditions. On vessels approved and/or surveyed by IACS members, "standard design conditions" are to be observed.

Standard reference conditions ISO 15550:2002

- Total barometric pressure: 100 kPa / 1.000 mbar
- Air temperature: 25ºC (77ºF) / 298 K
- Relative humidity: 30%
- Charge air coolant (raw): 25ºC (77ºF) / 298 K
- Charge air coolant (treated): 29ºC (84ºF) / 302 K

Standard design conditions ISO 3046-1:2002 & 3046-3:2006

- Total barometric pressure: 100 kPa / 1,000 mbar
- Air temperature: 45ºC (113ºF) / 318 K
- Relative humidity: 60%
- Charge air coolant (raw): 32ºC (89ºF) / 305 K
- Charge air coolant (treated): 36ºC (96ºF) / 309 K

2.2 Rating Definitions

Gas Electric Propulsion

Cop continuous power

Rated power (ISO8528) intended for continuous use in applications requiring uninterrupted service with high load factors for an unlimited number of hours per year; 10% overload available in a period of time of 1/12 operation hours and maximum 25 h/year

Typical load factors:	< 80% of rated power
Full load operation time:	100% of time or 24/24h
Overload:	110% overload available 1/12h and max. 25h/year
Operation time:	5.000 - 8.000 h/year
Typical applications:	Ferries, research vessels, passenger cruiser, tugboats, offshore vessels, freighters, and tankers.

Auxiliary and Generator Set

COP continuous power

Engines with this rating (ISO 8528) are available for supplying utility power at a constant 100% load for an unlimited number of hours per year. A 10% overload capability for a period of time of 1/12 operation hours and maxi- mum 25 h/year is additionally allowed to that specified on ISO 8528.

Typical load factors:	80-100% of rated power
Full load operation time:	100% of time or 24/24h
Overload:	110% overload available 1/12h and max. 25h/year.
Operation time:	5.000 - 8.000 h/year

2.3 Fuel Consumption

The fuel consumption values published in this document have been calculated according to ISO8178 standard test cycles (ISO8178 E2 electric propulsion and D2 auxiliary applications). These values must be considered as indicative guidance but not considered absolute values. Fuel consumption may vary as it can be influenced by external factors such as ship application, different environmental conditions, particular propeller design, hull form, etc.

ISO 8178 test cycles and weighting factors

E2 Test Cycle: Main propulsion at a constant speed.

Mode Number	1	2	3	4	5
% Speed	100	100	100	100	-
% Power	100	75	50	25	-
Weight Factor	0.20	0.50	0.15	0.15	-

D2 Test Cycle: Auxiliary engines at a constant speed

Mode Number	1	2	3	4	5
% Speed	100	100	100	100	100
% Power	100	75	50	25	10
Weight Factor	0.05	0.25	0.30	0.30	0,10

Fuel consumption rates are based on ISO3046-1 with a tolerance of +5% and and on natural gas with 37.000 kJ/Nm^3 referred at Normal Conditions (0ºC and 1 atm) and methan number >70

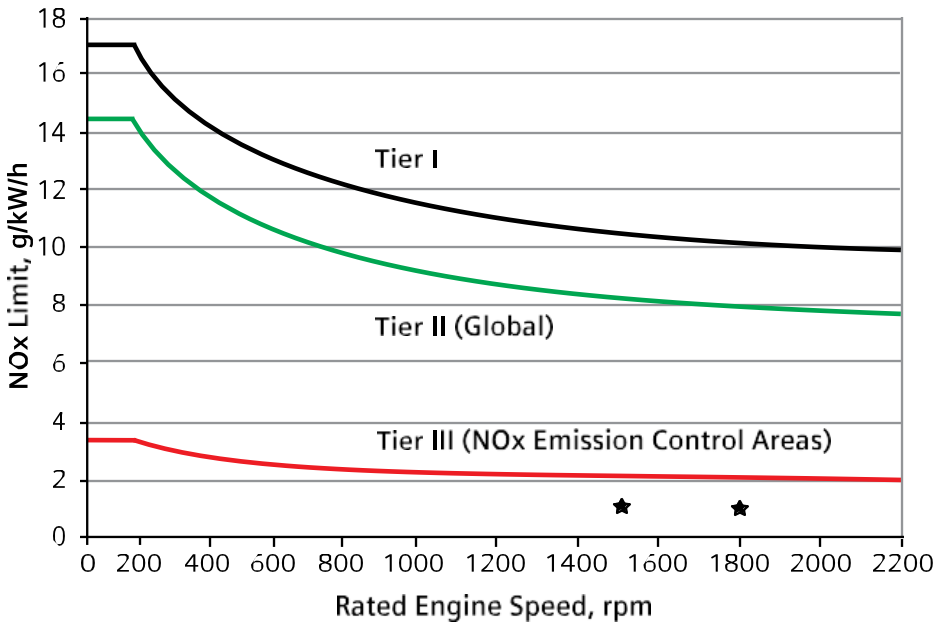
Fuel quality according to Technical Specification IC-G-D-30-001e and IC-G-D-30-052e.

Extensions of this information should be compared with the specifications indicated in the mentioned standards.

2.4 Emission Certifications

IMO (International Maritime Organization)

- On May 12, 2005, annex VI of MARPOL 73 / 78 went into effect for all marine diesel engines above 130 kW / 177 HP installed on vessels based on keel laying and which do not operate exclusively in national waters. Current revision (Tier II) entered into force from January 1, 2011 with a reduction of about 20% in comparison with IMO Tier . Under IMO Tier III, the NOx emission limits became effective on 1 January 2016 based on keel laying according to speed dependent function with a NOx emission reduction of 80% in comparison with IMO TIER I. This new requirement (IMO Tier III) is only applicable in designated Emission Control Areas (ECAs).



Guascor Energy Gas Marine Engines meet the most restrictive emissions ratios whatever the operation mode would be. The expected NOx emission level at 100% load is 1,48 g/ kWh (500 mg/Nm3). Emissions referred at 5% O2.

2.5 Marine Classification Societies

Guascor Energy gas marine engines and gen-sets are designed and built according to the rules of Bureau Veritas (BV).

For more information on emission or marine classification society certifictions, please contact your local Guascor Energy sales representative.

All information published in this booklet may be modified without prior notice.

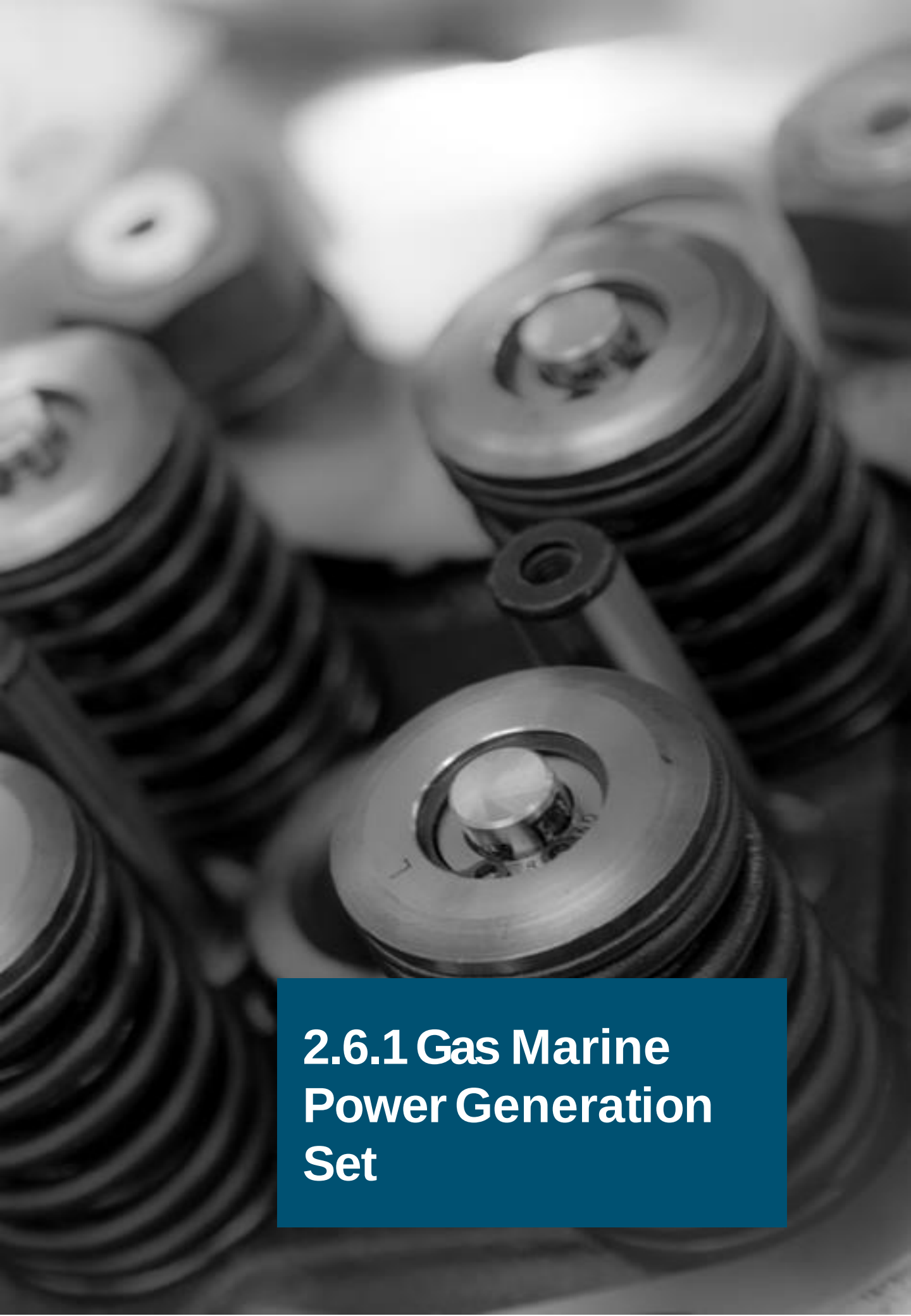
2.6 Gas Marine Portfolio

Power Generation - Constant

kVA	kWe	Hz	Type	Rating	Page
320	256	50	G-18SL	COP	74
430	344	50	G-24SL	COP	75
635	508	50	G-36SL	COP	76
860	688	50	G-48SL	COP	77
1.010	808	50	G-56SL	COP	78
350	280	60	G-18SL	COP	74
470	376	60	G-24SL	COP	75
715	572	60	G-36SL	COP	76
955	764	60	G-48SL	COP	77
1.110	888	60	G-56SL	COP	78

Gas Electric Propulsion - Constant speed

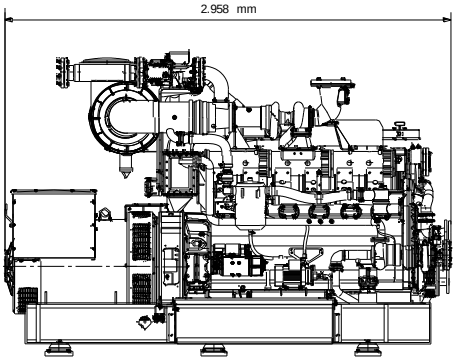
kVA	kWe	Hz	Type	Rating	Page
320	256	50	G-18SL	COP	80
430	344	50	G-24SL	COP	81
635	508	50	G-36SL	COP	82
860	688	50	G-48SL	COP	83
1.010	808	50	G-56SL	COP	84
350	280	60	G-18SL	COP	80
470	376	60	G-24SL	COP	81
715	572	60	G-36SL	COP	82
955	764	60	G-48SL	COP	83
1.110	888	60	G-56SL	COP	84

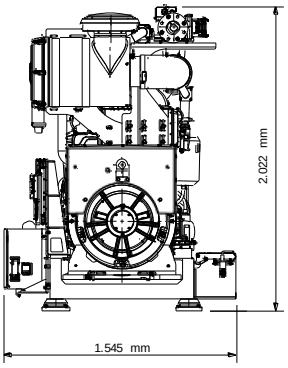


2.6.1 Gas Marine Power Generation Set

G-18SL

Gas Marine Power Generation Set





Main data

Cycle (ISO 8178)	D2 (auxiliary generator set)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	320	256	380 / 400	46,66
1.800 (60Hz)	350	280	450 / 480	55,00

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

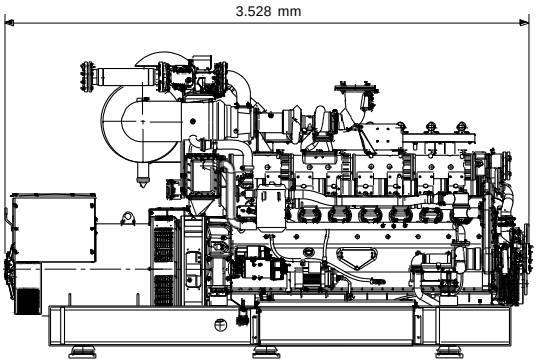
Weight

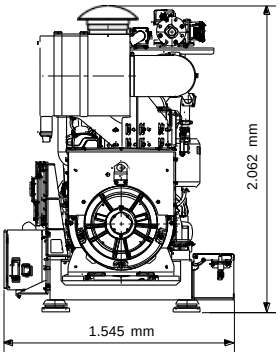
Dry weight (kg)	3.910

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-24SL

Gas Marine Power Generation Set





Main data

Cycle (ISO 8178)	E2 (electrical propulsion)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke diesel
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	430	344	380 / 400	61,70
1.800 (60Hz)	470	376	450 / 480	69,86

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

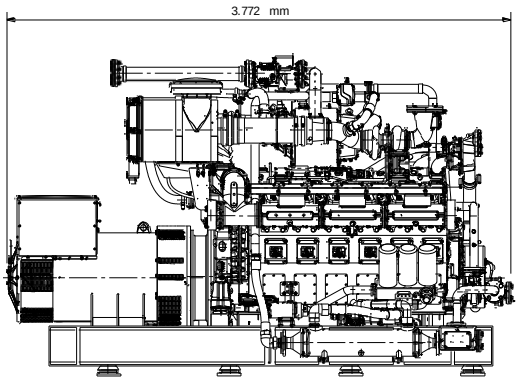
Weight

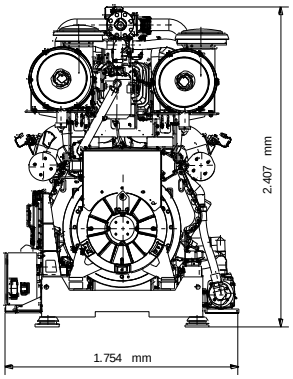
Dry weight (kg)	5.075

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-36SL

Gas Marine Power Generation Set





Main data

Cycle (ISO 8178)	E2 (electrical propulsion)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	635	508	380 / 400	91,34
1.800 (60Hz)	715	572	450 / 480	107,85

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

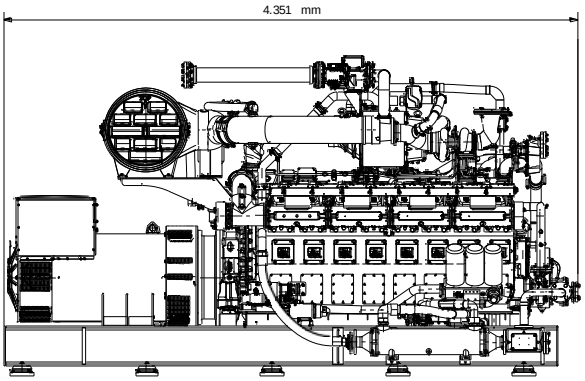
Weight

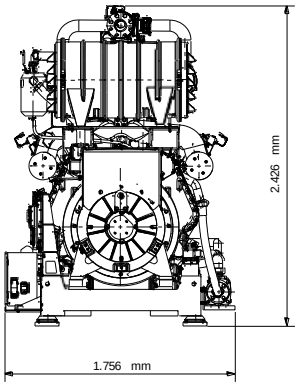
Dry weight (kg)	7.890

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-48SL

Gas Marine Power Generation Set





Main data

Cycle (ISO 8178)	E2 (electrical propulsion)
Disposition / Displacement	16 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	860	688	380 / 400	122,01
1.800 (60Hz)	955	764	450 / 480	139,82

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

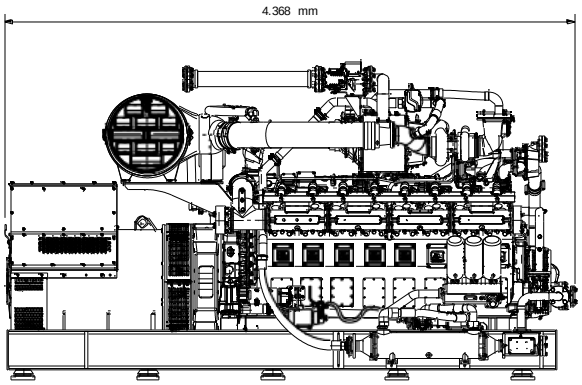
Weight

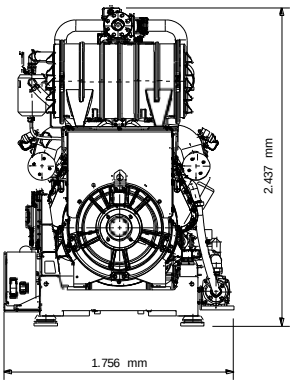
Dry weight (kg)	8.470

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-56SL

Gas Marine Power Generation Set





Main data

Cycle (ISO 8178)	E2 (electrical propulsion)
Disposition / Displacement	16 V / 56,00 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	1.010	808	380 / 400	144,53
1.800 (60Hz)	1.110	888	450 / 480	166,10

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

Weight

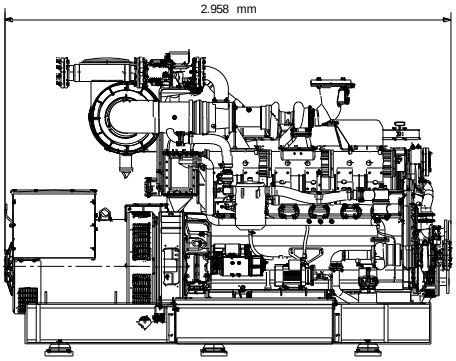
Dry weight (kg)	9.870

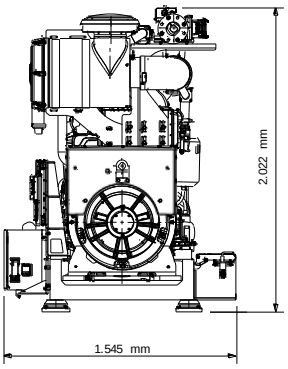
Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

2.6.2 Electric Propulsion Set

G-18SL

Gas Electric Propulsion Set





Main data

Cycle (ISO 8178)	E2 (electric propulsion)
Disposition / Displacement	6 L / 17,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	320	256	380 / 400	62,16
1.800 (60Hz)	350	280	450 / 480	72,33

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

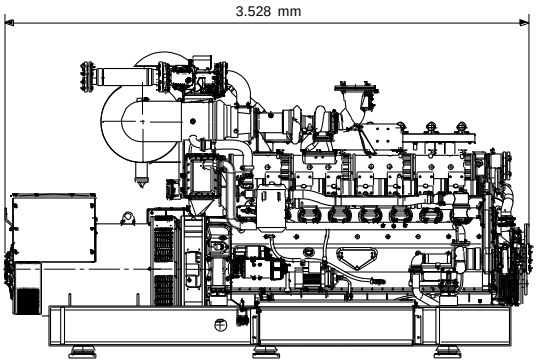
Weight

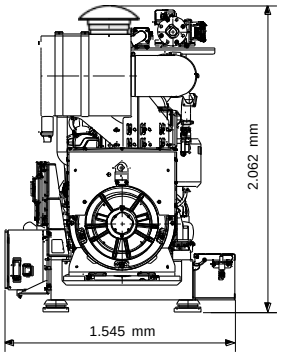
Dry weight (kg)	3.910

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-24SL

Gas Electric Propulsion Set





Main data

Cycle (ISO 8178)	E2 (electric propulsion)
Disposition / Displacement	8 L / 23,96 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Simple bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	430	344	380 / 400	82,88
1.800 (60Hz)	470	376	450 / 480	94,65

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

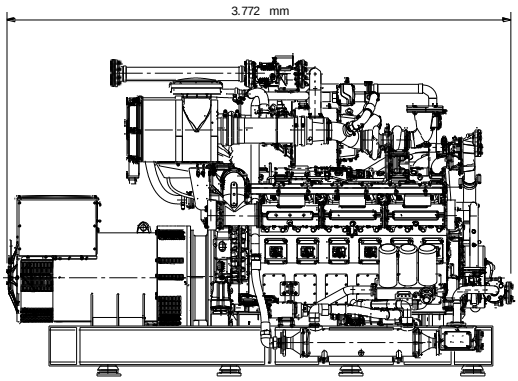
Weight

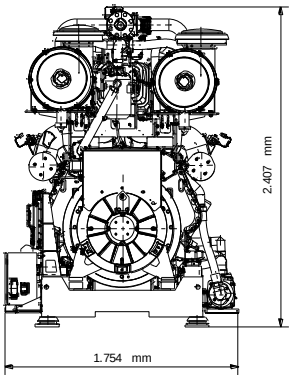
Dry weight (kg)	5.075

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-36SL

Gas Electric Propulsion Set





Main data

Cycle (ISO 8178)	E2 (electric propulsion)
Disposition / Displacement	12 V / 35,93 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	635	508	380 / 400	122,7
1.800 (60Hz)	715	572	450 / 480	143,12

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

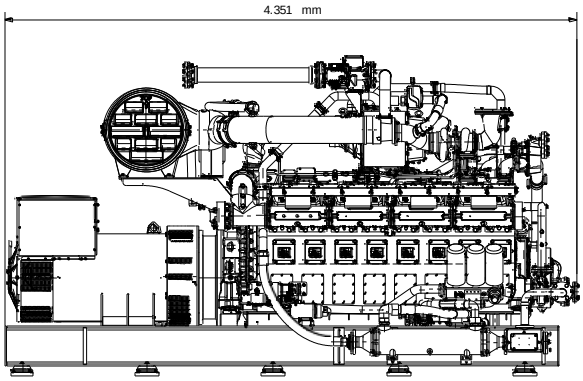
Weight

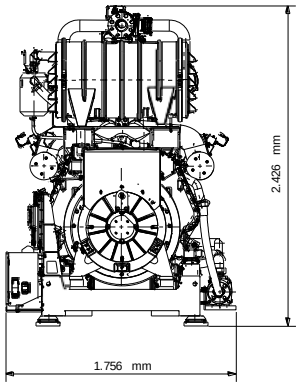
Dry weight (kg)	7.890

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-48SL

Gas Electric Propulsion Set





Main data

Cycle (ISO 8178)	E2 (electric propulsion)
Disposition / Displacement	16 V / 47,90 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	860	688	380 / 400	164,17
1.800 (60Hz)	955	764	450 / 480	189,56

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

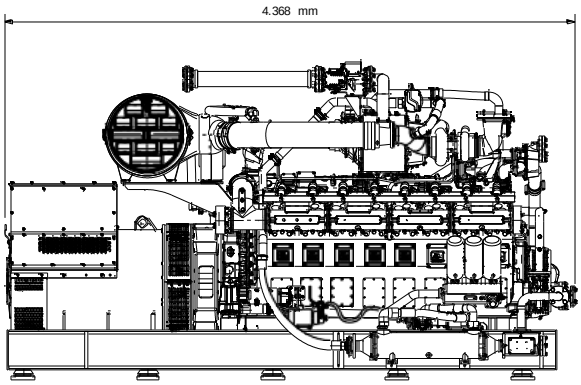
Weight

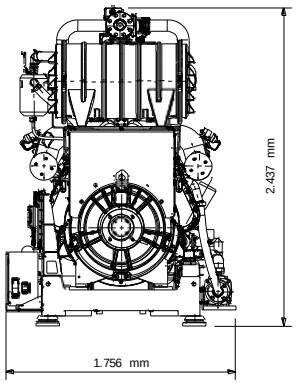
Dry weight (kg)	8.470

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

G-56SL

Gas Electric Propulsion Set





Main data

Cycle (ISO 8178)	E2 (electric propulsion)
Disposition / Displacement	16 V / 56,00 liter
Bore and stroke	152 x 165 mm
Cycle	4-stroke Otto
Combustion system	Spark ignited
Generator characteristics	Synchronous
Voltage regulation	AVR electronic
Generator protection	IP23
Heating class	F
Insulation class	H
Construction	Double bearing

Speed (f)	Electrical power (cosφ 0,8)		Voltage V	Fuel consumption (ISO 8178)
	kVA	kWe		Nm3/h
1.500 (50Hz)	1.010	808	380 / 400	193,92
1.800 (60Hz)	1.110	888	450 / 480	224,44

The engine performance data is valid for a gas of Methane number >70 that fullfills the requirements of the technica specification IC-G-D-30-001e and IC-G-D-052e.

Generated power includes mechanical pumps. Power rating according to ISO 8528 -1.

Weight

Dry weight (kg)	9.870

Dimensions and weight may vary depending upon engine configuration.
Data subject to further modifications without prior notice.

2.6.3 Marine Control System

Marine Control System

The Guascor Energy Marine Control System has been designed to carry out the functions of monitoring and protection of the engine or genset during its operation.

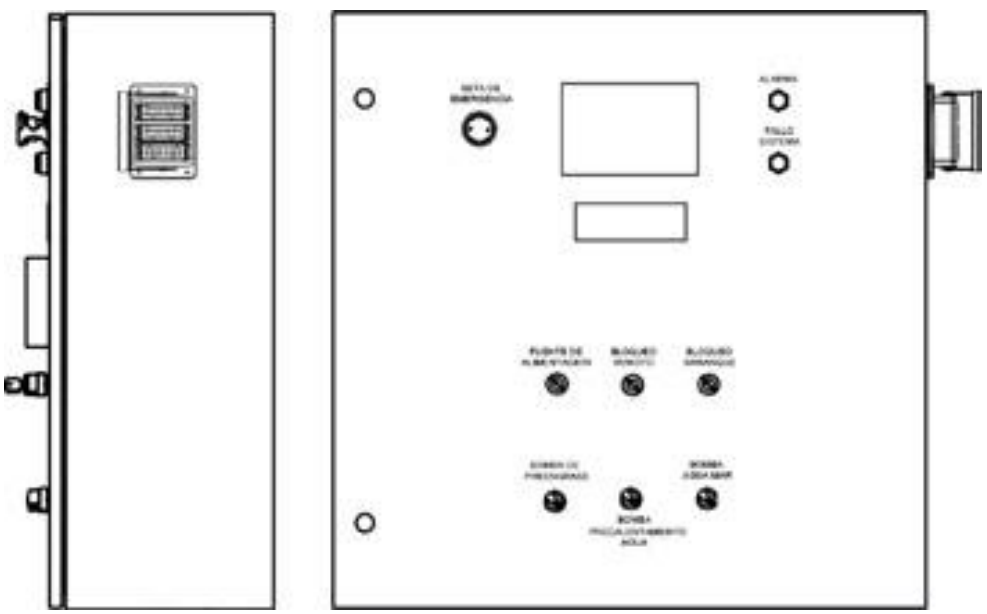
The control device is in charge of the supervision and management of the engine´s main paramenters activating the visual and sound alarms as well as performing the start up and stop functions of the generator set. A backup module is in charge of safety functions such as switching the principal and auxiliary feeds.

Marine Control System - Advance

The Marine Control System - Advance, MCS-Advance, is a totally programmable control panel controlled by an specific control device, ECU-MARINE . This equipment performs the functions of monitoring and protecting the engine or genset, displaying the main parameters, activating the visual and sound alarms and performing the start up and spot functions of the machine.

As an option, the MCS-Advance would be completed with an external display device to be installed remotely.

The MCS - Advance complies with the demanded requirements of the different Classification Entities, such Bureau Veritas, Lloyds Register or American Bureau of Shipping



2.7 Unit Equivalences for Conversion

Power

1 W = 1VA = 1J/s = 1 Nm/s
1 kW = 1.360 metric HP (DIN)
1 kW = 1.341 HP (UK-USA)
1 HP (UK-USA) = 1.0138 metric HP (DIN)
1 HP (DIN) = 0.7355 kW
1HP (UK-USA) = 0.7457 kW
1 HP (DIN) = 0.9863 HP (UK-USA)

Torque

1 Nm = 0.102 mkg
1 Nm = 0.7376 ft.lbF
1 Nm = 8.8495 in.lbF
1 ft.lbF = 1.356 Nm
1 ft.lbF = 0.113 Nm

1 mkg = 9.81 Nm

Mass

1 g = 0.035 oz (ounce)
1 kg = 2.2046 lb (pound)
1 met ton = 1.100 ton
1 lb = 0.4536 kg
1 ton = 0.909 metric ton

1 oz = 28.5 g

Consumption

g/HPh = g/gkWh x 0.7355

g/kWh = g/HPh x 1.360

Temperature

1ºC = 5/9 x (t(Fº)-32)
1ºK = t(ºC) + 273,15
1ºC = t(ºK) - 273,15

1ºF = 9/5 x (t(ºC) + 32)

Volume

1 l = 0.26 gallon (US)
1 l = 0.21 gallon (UK)
1 gal (UK) = 4.54609 liter

1 gal (US) = 3.78541 liter

Length

1 mm = 0.03937 in (Inch)
1 m = 1.0936 yd
1 m = 3.28 ft (Feet)
1 km = 0.535 Nautical Mile
1 km = 0.621 Statute Mile
1 yd = 0.9144 m
1 ft = 304.8 mm
1 NM = 1852 m
1 SM = 1609.344 m

1 in = 25.4 mm

Energy

1J = 1Nm - 1Ws - 1VAs
1kcal = 4186.8 J
1 J = 0.00023 kcal

6012_GUASCOR ENERGY_Portrait_marine engines_en_A4

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