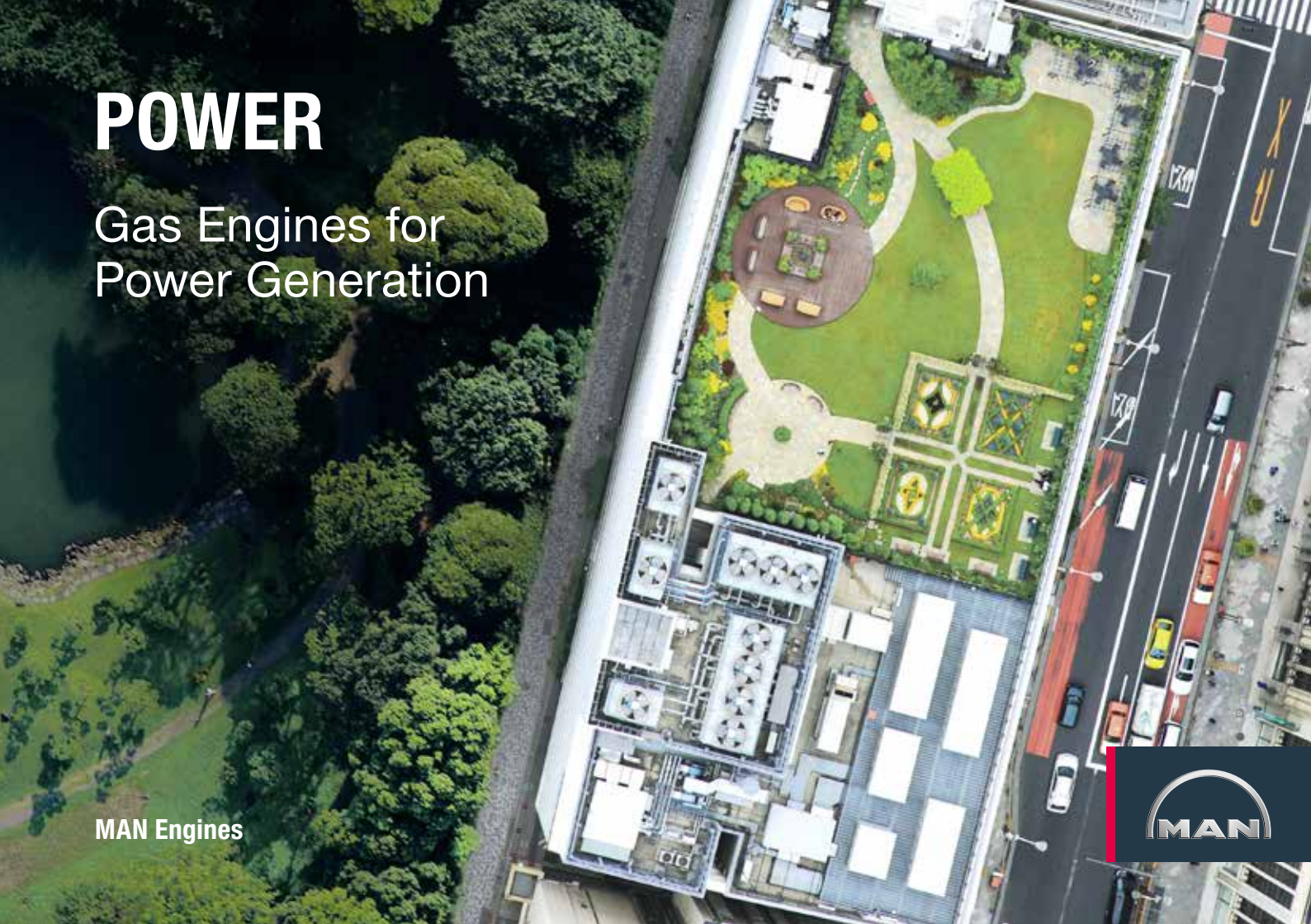
POWER

Gas Engines for Power Generation



MAN Engines

EFFICIENT ELECTRICITY AND HEAT GENERATION

Manufacturers and operators of CHPs have stringent requirements. Robust, compact engines have to work reliably 24 hours a day, 7 days per week. Economic operation over the life cycle of the entire plant is therefore essential. This requires a high level of efficiency by maximum utilisation of primary energy and low plant operating costs. With their continous development programme, MAN engines make a contribution to greater efficiency. Reliable and low in emissions.

CONTENTS

CUSTOMER BENEFITS

- High power and maximum efficiency
- Low operating costs as a result of low levels of lubricant and fuel consumption as well as extended service intervals (component stability)
- Low emissions due to state-of-the-art combustion technologies
- Low space requirement due to compact design
- Reliable in use thanks to field-tested technology
- Long service life resulting from appliction-specific design

MAN GAS ENGINES FOR ENERGY GENERATION

Application Type and Product Range

Mode of operation		COP with natural gas		COP with special gas	
at engine speed	rpm (Hz)	**1 500 (50)**	**1 800 (60)**	**1 500 (50)**	**1 800 (60)**
Type	**Cylinders**	**Power (kW) [1)]**			
E0834	4	37–68	45–68	80	80
E0836	6	56–110	64–110	110	110
E2876	6	150–220	170–210	130–220	130–200
E2676	6	140–220	160–250	110–220	140–250
E3268	8	320–370	340–390	320–370	390
E3262	12	275–550	300–580	450–550	450–580

1) in accordance with German Industrial Standard DIN ISO 3046, Part 1

Continuous power of unit (COP following DIN ISO 8528-1)

A unit's continuous power is the amount of power an electricity generator is able to produce over an unlimited number of operating hours per annum between the required maintenance intervals under the stated ambient conditions.

HOW DO NATURALLY ASPIRATED ENGINES DIFFER FROM TURBOCHARGED ENGINES?

Naturally aspirated engine

- Stoichiometric gas combustion (λ=1)
- Water-cooled exhaust pipes, without exhaust-gas turbocharging
- Ideally suited for exhaust gas aftertreatment with a three-way catalytic converter

Advantages: The low power density enables long maintenance intervals. Naturally aspirated engines have fewer components and are subject to less mechanical stress. They also offer higher operating reliability with the highest possible overall efficiency.

Turbocharged engine

- Lean gas combustion (λ>1)
- Exhaust-gas turbocharging complies with the inner-engine exhaust gas values from the TA Luft 2002 regulation for special gas
- For stricter emission regulations: exhaust gas aftertreatment with an oxidation catalytic converter and, if required, with SCR is available

Advantages: When fitted with a turbo charger the engine achieves a higher power density and operates economically and very efficiently.

PEACE OF MIND FROM TAILORED SERVICE

Low-pollutant and fitted with state-of-the-art combustion technology, MAN natural-gas and special-gas engines pave the way to the future of cogeneration. Energy supply is an essential component for economic success. This is why of course you can always count on our corporation after the purchase should you need help.

MAN offers its partners and customers a tailored service concept. The packagers can perform the service entirely independently for their end customers. We customize our training courses to match your requirements by employing the in-depth and proven MAN expertise: Reliable and efficient – just like a MAN gas engine.

E0834 AND E0836

General data

Gas engine			E0834		E0836	
Engine version			E	LE	E	LE
TYPE	Cylinders		4		6	
	ISO standard power [1]	kW	37–80		56–110	
	Bore	mm	108		108	
	Stroke	mm	125		125	
	Displacement	l	4.6		6.9	
kg / mm	Overall length	mm	862	1 055	1 090	1 300
	Overall width	mm	742	809	740	740
	Overall height	mm	870	866	930	1 030
	Dry weight	kg	430	495	520	605

1) in accordance with German Industrial Standard DIN ISO 3046, Part 1


POWER AND HEAT FROM NATURAL GAS.
LOW IN POLLUTANTS. LOW LOSSES.

E0834

Technical features

Mode of operation

at engine speed	rpm (Hz)	

Engine version

ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with natural gas						COP with special gas	
	1 500 (50)			1 800 (60)			1 500 (50)	1 800 (60)
	E 312	E 302	LE 312	E 312	E 302	LE 312 [4]	LE 322	LE 322 [4]
	37	54	68	45	62	68	80	80
	1.5	1.0	1.8	1.5	1.0	1.8	1.5	1.5
	29	46	54	31	51	52	61	63
	26	33	28	35	40	33	35	41
	33.0	36.5	38.6	31.9	36.5	38.2	38.1	37.8
	49.1	52.6	49.0	46.8	52.8	48.5	49.1	50.4
	82.1	89.1	87.6	78.7	89.3	86.7	87.2	88.2
	< 500	< 7 000	< 500 < 100 [4] [6]	< 500	< 7 000	< 500 < 100 [4] [6]	< 500	< 500
	m	st	m	m	st	m	m	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology

E0836

Technical features

Mode of operation		
at engine speed	rpm (Hz)	

Engine version		
ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with natural gas						COP with special gas	
	1 500 (50)			1 800 (60)			1 500 (50)	1 800 (60)
	E 312	E 302	LE 302	E 312	E 302	LE 302	LE 302	LE 302
	56	75	110	64	85	110	110	110
	1.50	1.00	1.65	1.50	1.00	1.68	1.49	1.45
	41	63	82	58	70	89	77	93
	37	46	50	48	55	51	55	54
	34.4	36.7	39.6	33.3	36.4	38.0	39.4	37.4
	47.9	53.3	49.6	55.2	53.6	52.1	49.3	52.0
	82.3	90.1	89.2	88.5	90.0	90.1	88.7	89.4
	< 500	< 7 000	< 500 < 100 [4) 6)]	< 500	< 7 000	< 500 < 100 [4) 6)]	< 500	< 500
	m	st	m	m	st	m	m	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology

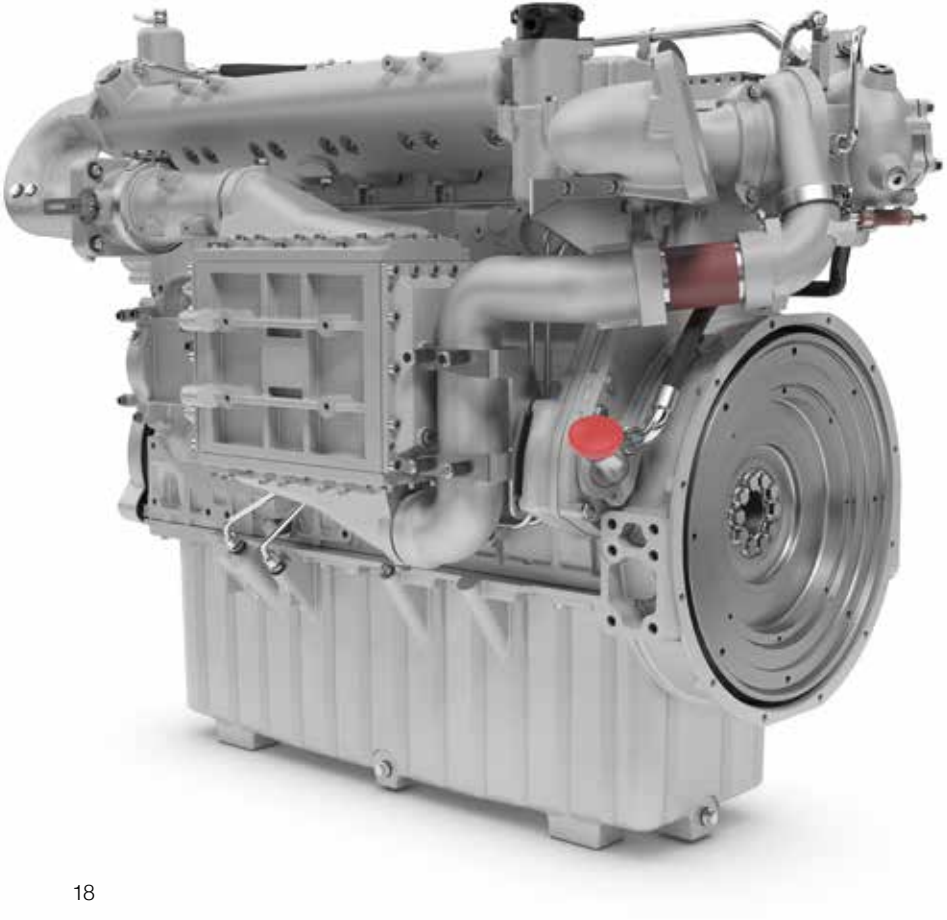
E2876 AND E2676

General data

Gas engine			E2876			E2676	
Engine version			E	LE	TE	E	LE
TYPE	Cylinders		6			6	
	ISO standard power [1]	kW	130–220			110–250	
	Bore	mm	128			126	
	Stroke	mm	166			166	
	Displacement	l	12.8			12.4	
kg mm	Overall length	mm	1 330	1 520	1 545	1 594	1 589
	Overall width	mm	830	830	835	936	808
	Overall height	mm	1 166	1 226	1 226	1 175	1 206
	Dry weight	kg	830	985–990	920	967	985

1) in accordance with German Industrial Standard DIN ISO 3046, Part 1


OR FROM SPECIAL GAS.
CARBON-NEUTRAL. SUSTAINABLE.



E2876

Technical features

Mode of operation		
at engine speed	rpm (Hz)	

Engine version		
ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with natural gas					COP with special gas			
	1 500 (50)			1 800 (60)		1 500 (50)		1 800 (60)	
	E 312	LE 212	LE 302	E 312 [4]	LE 302	TE 302	LE 202 [4]	TE 302	LE 302
	150	220	210	170	210	130	220	130	200
	1.0	1.6	1.6	1.0	1.6	1.4	1.4	1.4	1.4
	128	120	99	145	106	124	103	132	106
	79	125	143	98	157	56	139	60	137
	38.4	40.4	39.0	38.0	37.0	38.2	40.4	36.6	38.5
	52.8	49.4	48.9	54.1	50.7	52.9	49.6	54.0	50.8
	91.2	89.8	88.0	92.1	87.8	91.1	90.0	90.6	89.2
	< 4 500	< 500 < 100 [4) 6)]	< 500 < 100 [4) 6)]	< 4 250	< 500	< 500	< 500	< 500	< 500
	st	m	m	st	m	m	m	m	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology

E2676

Technical features

Mode of operation		
at engine speed	rpm (Hz)	

Engine version		
ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with natural gas						COP with special gas				
	1 500 (50)			1 800 (60)			1 500 (50)			1 800 (60)	
	E 302	LE 202	LE 202	E 302	LE 202	LE 202	E 312	LE 212 [4]	LE 212	E 312	LE 212
	140	220	220	160	250	250	110	220	220	140	250
	1.00	1.73	1.73	1.00	1.74	1.72	1.00	1.57	1.62	1.00	1.61
	107	113	110	122	124	113	92	109	108	113	121
	86	121	121	104	156	148	75	131	113	108	137
	39.3	41.3	43.4	38.7	39.4	41.1	36.8	40.2	42.2	35.8	40.3
	54.2	47.8	46.8	54.7	49.1	46.4	55.9	49.1	44.1	56.5	46.4
	93.5	89.1	90.2	93.4	88.5	87.5	92.7	89.3	86.3	92.3	86.7
	< 5 700	< 250	< 500 < 100 [4)6)]	< 6 500	< 250	< 500 < 100 [4)6)]	< 500	< 250	< 500	< 500	< 500
	st	m	m	st	m	m	st	m	m	st	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology

E3268 AND E3262

General data

Gas engine			E3268	E3262	
Engine version			LE	E	LE
TYPE	Cylinders		8	12	
	ISO standard power [1]	kW	320–390	275–580	
	Bore	mm	132	132	
	Stroke	mm	157	157	
	Displacement	l	17.2	25.8	
kg / mm	Overall length	mm	1 620	1 743	1 748
	Overall width	mm	1 210	1 245	1 243
	Overall height	mm	1 422	1 494	1 500
	Dry weight	kg	1 497	1 763	1 849

1) in accordance with German Industrial Standard DIN ISO 3046, Part 1


A POWERHOUSE FOR
LOCAL POWER GENERATION.

E3268

Technical features

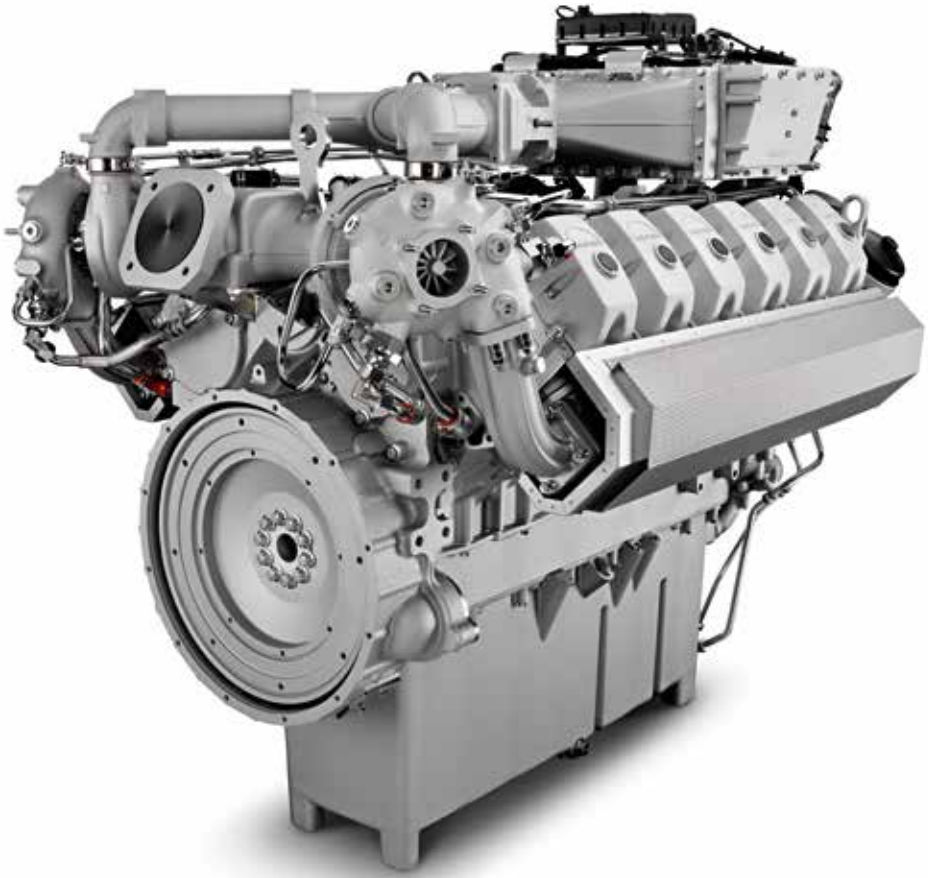
Mode of operation		
at engine speed	rpm (Hz)	

Engine version		
ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with natural gas					COP with special gas					
	1 500 (50)			1 800 (60)		1 500 (50)					1 800 (60)
	LE 212	LE 242	LE 242	LE 212	LE 242	LE 222	LE 222	LE 232 [4]	LE 252 [4]	LE 262 [4]	LE 222
	370	320	320	390	340	370	370	370	320	320	390
	1.63	1.70	1.70	1.66	1.70	1.62	1.63	1.47	1.54	1.52	1.59
	175	174	160	203	175	192	176	193	173	163	201
	215	204	181	222	206	225	202	222	194	177	236
	41.6	39.2	41.7	40.8	40.3	39.4	41.7	40.3	40.5	41.9	40.1
	47.9	50.0	47.5	47.9	48.2	49.7	46.9	49.2	49.5	47.6	49.0
	89.5	89.2	89.2	88.7	88.5	89.1	88.6	89.5	90.0	89.5	89.1
	< 500 < 100 [4)6)]	< 250	< 500	< 500 < 100 [4)6)]	< 500	< 250	< 500	< 500	< 500	< 500	< 500
	m	m	m	m	m	m	m	m	m	m	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology



E3262

Technical features

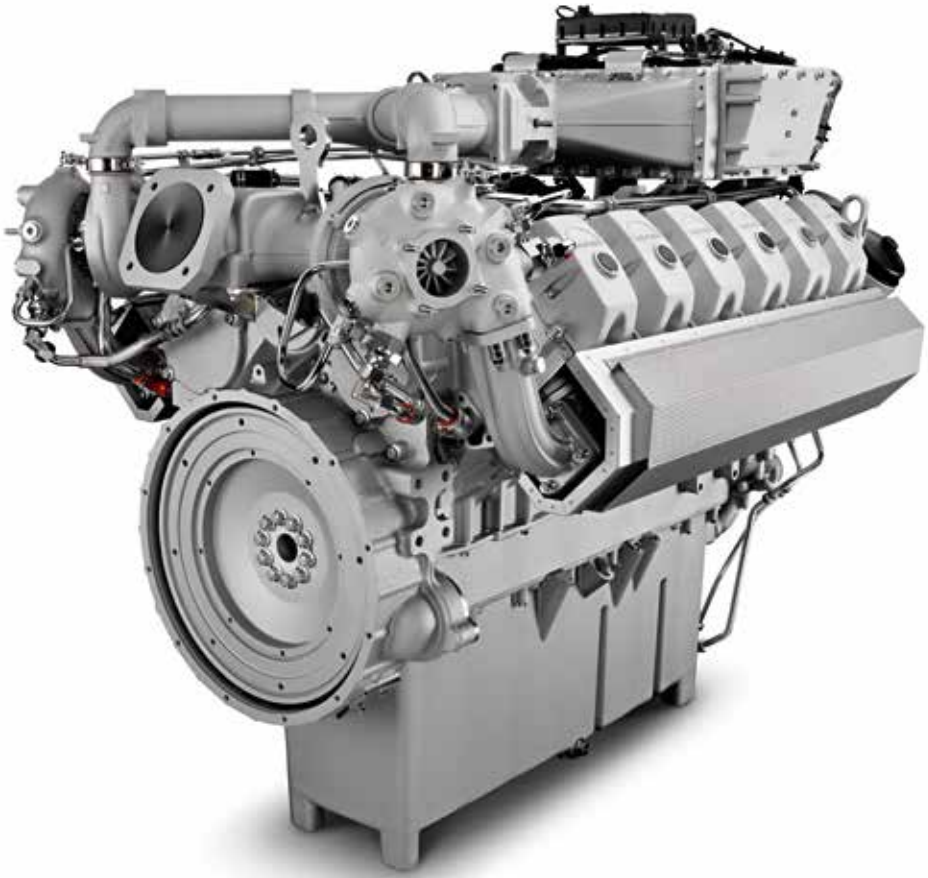
Mode of operation		
at engine speed	rpm (Hz)	

Engine version		
ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with natural gas						
	1 500 (50)				1 800 (60)		
	E 302	LE 202	LE 202	LE 232	E 302 [4]	LE 202	LE 232 [4]
	275	550	550	450	300	580	450
	1.00	1.68	1.68	1.64	1.00	1.70	1.62
	218	358	336	233	239	392	252
	157	329	312	257	187	339	272
	39.6	40.3	41.7	41.3	38.7	40.0	39.6
	54.0	50.2	48.3	48.9	54.9	49.9	50.4
	93.6	90.5	90.0	90.2	93.6	89.9	90.0
	< 7 000	< 250	< 500 < 100 [4)6)]	< 500 < 100 [4)6)]	< 7 000	< 500 < 100 [4)6)]	< 500 < 100 [4)6)]
	st	m	m	m	st	m	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology



E3262

Technical features

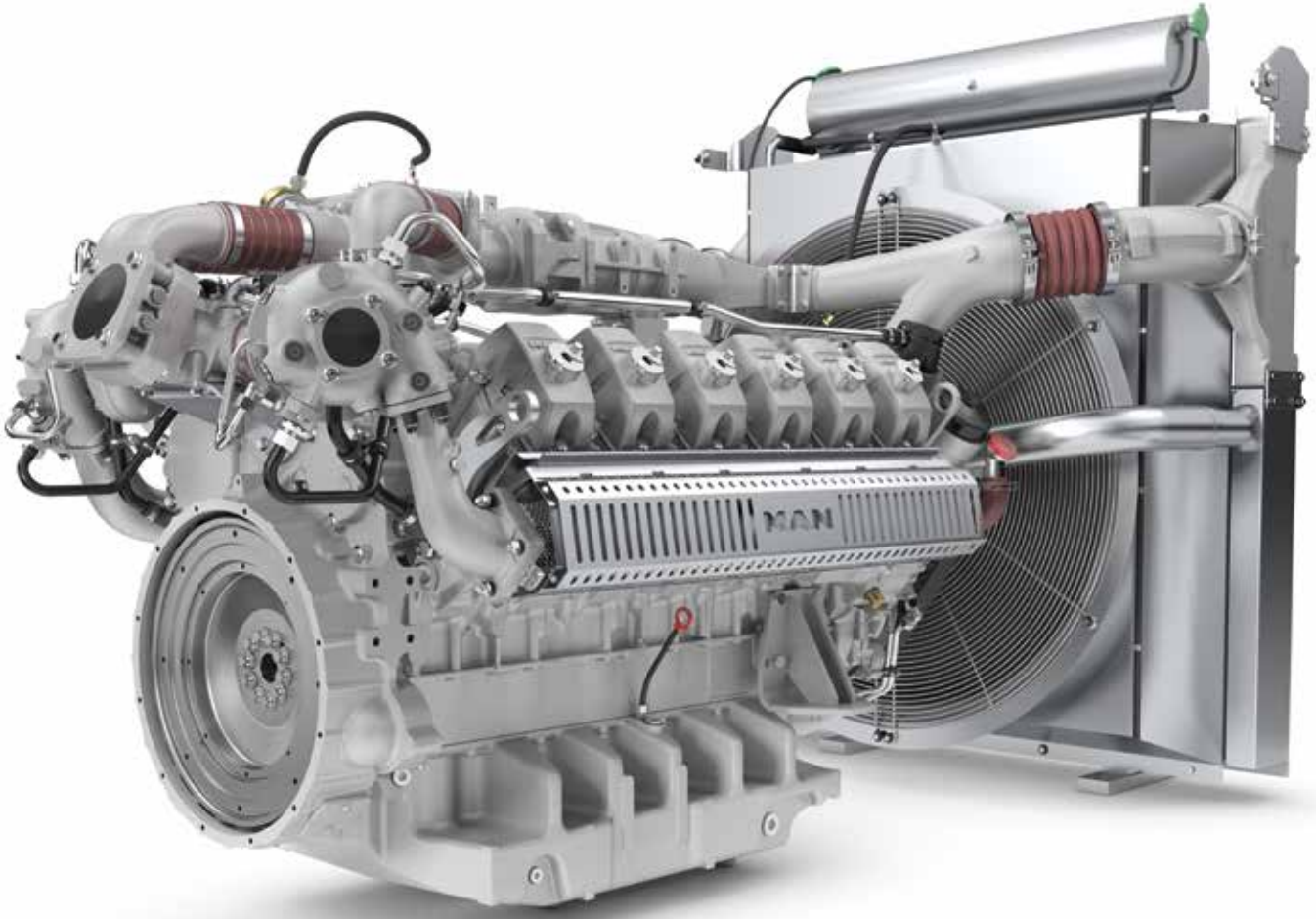
Mode of operation		
at engine speed	rpm (Hz)	

Engine version		
ISO standard power [5]	kW	
Air-fuel ratio	λ	
Coolant heat [1]	kW	
Exhaust heat based on 120 °C [1]	kW	
Efficiency [1] – mechanical [5] – thermal – total	%	
Emissons status NO_X [2]	mg/Nm³	
Combustion [3]		

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

	COP with special gas					
	1 500 (50)			1 800 (60)		
	LE 202	LE 212	LE 242	LE 202	LE 212	LE 242
	550	550	450	580	580	450
	1.45	1.57	1.54	1.42	1.55	1.50
	283	263	233	327	299	262
	312	281	249	352	315	279
	40.6	41.7	41.1	39.2	40.0	38.6
	49.0	46.0	47.8	51.8	47.8	50.4
	89.6	87.7	88.9	91.0	87.8	89.0
	< 500	< 500	< 500	< 500	< 500	< 500
	m	m	m	m	m	m

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1
6) emission status available on request, including SCR technology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E3262 GENSET

Technical features

Mode of operation			COP with natural gas		COP with special gas	
at engine speed	rpm (Hz)		1 500 (50)	1 800 (60)	1 500 (50)	1 800 (60)
Engine version			**LE 252 4)**	**LE 252 4)**	**LE 252 4)**	**LE 252 4)**
ISO standard power 5)	kW		520	520	520	520
Air-fuel ratio	λ		1.61	1.63	1.44	1.44
Coolant heat 1)	kW		–	–	–	–
Exhaust heat based on 120 °C 1)	kW		289	298	291	329
Efficiency 1)						
– mechanical 5)	%		40.1	37.9	40.0	36.4
– thermal	%		22.3	21.7	22.4	23.0
– total	%		62.4	59.6	62.4	59.4
Emissons status NO_X 2)	mg/Nm³		< 500	< 500	< 500	< 500
Combustion 3)			m	m	m	m

Technical data is based on a calorific fuel value of 10 kWh/Nm³ for natural gas and 6 kWh/Nm³ for special gas. The values are provided for information purposes only and are non-binding.

1) at 100 % load
2) with 5 % exhaust-gas oxygen
3) m = lean, st = stoichiometric
4) data conditional and on request
5) in accordance with German Industrial Standard DIN ISO 3046, Part 1

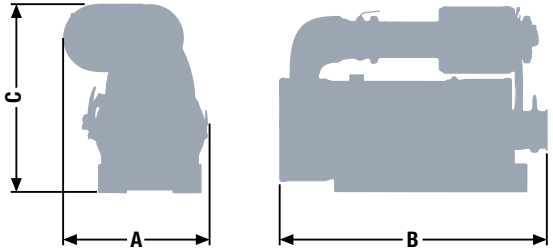
EXHAUST AFTERTREATMENT

The standardised SCR catalytic converter is available for the following MAN gas engines:

- E0834 LE302 and LE 322
- E0836 LE302
- E2876 LE202 and LE302
- E2676 LE202 and LE212
- E2842 LE322 and LE 332

The following engines require two SCR systems:

- E3268 LE212, LE222, LE232, LE242, LE252 and LE262
- E3262 LE202, LE212 and LE232



Dimensions

Type designation		SCR system
A-Overall length	mm	555
B-Overall width	mm	977
C-Overall height	mm	665
Average weight of SCR system with exhaust silencer	kg	113

All data are reference values. Please request installation drawings for detailed specifications.

RECONDITIONING OF ENGINES AT THE MAN PLANT

You always meet twice: our engines are developed, designed, and manufactured at the International Centre of Excellence for Engines in Nuremberg, Germany – and that is also where they are reconditioned for a new lease of life. Therefore, you not only benefit from our engine experience and high level of technical expertise, you also get the same top MAN quality a second time around – and again with state-of-the-art technology. If that's not a positive déjà-vu experience!

The continual improvement of parts, as well as processing and assembly procedures, means that only state-of-the-art components are fitted in refurbished engines. As such, qualitative and design-related improvements are included with every instance of engine repair work at MAN.

Advantages of remanufacturing

- Original MAN parts
- New test run with test run protocol
- The latest technical series status for the materials and design
- Full plant warranty
- Same maintenance interval as for a new engine

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