Maintenance Record

MAN Industrial Gas Engines





Maintenance Record

MAN Industrial Gas Engines

Imprint

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Imprint

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Dear customer,

Congratulations on deciding to purchase an MAN gas engine! These engines are characterized by high levels of performance and operational reliability whilst requiring a minimum of outlay on maintenance. However, in order to guarantee trouble-free operation, it is necessary to perform regular check-ups and maintenance tasks.

This maintenance record provides an overview of all prescribed maintenance jobs.

The maintenance tasks must be carried out at an authorized workshop after a specific number of operating hours.

The following publications are available to help you work with your new engine:

- Operator's manual
- Service products for MAN gas engines
- Spare parts catalogue
- Maintenance record

We are glad to answer any specific questions you may have if there is anything not covered by this publication. Please remember to quote the **fourteen-digit engine number** with all enquiries. It can be found in the General Details form or on the engine model plate.

Yours faithfully, MAN Truck & Bus AG Werk Nürnberg

List of abbreviations

ETC	Exhaust gas turbocharger
ОН	Operating hours
TV	Throttle valve
CL	Coolant
ZPR	Zero pressure regulator
LT	Low temperature
Р	Pressure
-	-
Т	Temperature
ΔΡ	Pressure differential
° bef. TDC	Degrees crank angle before top dead center

General details

The General Details form must be completed by the authorized workshop or the unit manufacturer as part of the start-up process.

Name and address of customer	Name and address of unit manufacturer
Details of engine	
Engine type:	Installed rated output in kW:
Plant no.:	Start-up date:
Engine number:	Rated speed [rpm]
Engine namber.	rvated speed [ipin]
Name of the MAN representative:	
Details of drive system	
Drive type (e.g. generator, pump, compressor):	
Construction no., year of manufacture	
Place and date of 20–50 hour service:	

Start-up

Initial start-up of the MAN gas engine must be carried out by an authorized MAN Truck & Bus AG workshop or by the unit manufacturer.

During the initial start-up, the engine must be configured so that adherence to the country-specific local environmental regulations can be guaranteed. In particular, this concerns compliance with the applicable statutory exhaust gas emission limits. Moreover, the engine operating parameters must comply with the respective applicable technical data sheets. The mixture and control system and if necessary the aftertreatment system are to be designed in line with the complete machine by the manufacturer.

It is essential that the start-up log with measurement sheet and the General Details sheet be completed in full and returned to MAN Truck & Bus AG.

The applicable exhaust gas emission limits for NO_x and CO must be entered as setpoint values in the relevant maintenance records.

The inspection record from the unit manufacturer and the MAN gas engine start-up log will then be passed on to the authorized MAN Truck & Bus AG workshop.

The applicable exhaust gas emission limits for NO_x and CO must be entered as setpoint values in the relevant maintenance records.

The MAN warranty only becomes effective once these documents have been received and checked.

Exhaust emission measurements

Exhaust emission measurements may only be carried out by authorized and trained personnel.

Exhaust emission measurements must be carried out in accordance with the user manual of the manufacturer of the measurement instruments.

Exhaust emission measurements are performed at nominal speed, and at 100% and 50% of nominal power.

The engine must be brought to normal operating conditions before measurements are taken:

Inlet coolant temperature > 80°C

Outlet coolant temperature < 89°C

Oil temperature at least 85°C

Mixture temperature with charged engines and mixture-cooled engines: < 52°C

Check the following before measurement to ensure an optimum result:

Compression pressure

Valve clearance

Ignition time

Exhaust gas back pressure

Intake air restriction downstream of air filter

Intake air restriction downstream of gas mixer

Visual inspection of the intake and exhaust system for traces of oil and leakages

Testing of exhaust emissions must be carried out in accordance with the maintenance schedule and recorded in the maintenance records.

Measurement sheets

Start-up

Start-up measurement sheet								Page 1 of 2	
Basic data									
Appendix	Type of system	System op	System operating hours OH		ОН	System construction year		Electrical power rating KWh el	
	Operating method	Reference	Reference variable / start requirements				Spe	ed rpm	
Installation conditions	Installation height m	Air pressu	re mbar	Air humidit	y %	Outside temper	temperature		
	Engine type		Er	ngine number		Plant number			Engine operating hours OH
Engine								No. engine starts	
	Gas mixer type			Alternator type		Air filter type			
Components	Ignition system type			Ignition coil type		Spark	Spark plug type		
	Catalytic converte	ic converter type		Silencer type		Exhau	Exhaust heat exchanger type		
	Part number / Da	te of product	tion	Part number / Date of production		Part nu	Part number / Date of production		
Steel wire mesh hoses 1)	Part number / Da	te of product	tion	Part number / Date of production		Part nu	Part number / Date of production		
	Part number / Date of production		tion	Part number / Date of production		Part number / Date of production			
Service products	Engine oil type	type Engine oil interval		change Antifreeze / corrosion in type		hibitor	C	Concentration %	
	Type of gas	Me	ethane co	ontent CH4	Sulphu	r / hydrogen sulfi	de	L	ower calorific value, Hu
Fuel				%			ppm	1	kWh/Nm³
Place:	Da	ate:		Cu	stomer's	signature		ainte gnatu	nance personnel ure

¹⁾ all steel wire mesh hoses have to be replaced at the latest of 6 years after the day of production



Start-up measurement sheet

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Operating data	of engine at 100% rated power	7		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging			cooler	ETC bank A/B
5 5	mbar	mbar	°C	°C
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginiion system	° bef. TDC	° bef. TDC	v	m

	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	NOX GITTISSIONS	CO emissions	OZ content of exhaust gas	Lambua value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rai 200mai ginig	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature

Return to service after Revision R2								Page 1 of 2
Basic data								
Appendix T	Type of system	System o	operating h	nours		System constru	ction E	Electrical power rating
		он			ОН	year		KWh _{el}
	Operating	Reference	ce variable	/ start require	ments		5	Speed
n	method							rpm
	nstallation	Air press	sure	Air humidit	у	Outside temper		Jnit compartment
conditions h	neight m		mbar		%		°c t	emperature °C
E	Engine type		Er	ngine number		Plant number		Engine operating hours
Engine —								ОН
								No. engine starts
	Gas mixer type			Alternator type		Air filter	Air filter type	
Components	Ignition system ty	ре		Ignition coil type		Spark p	olug type	
	Catalytic converte	er type		Silencer type		Exhaus	t heat exchanger type	
	Part number / Dat	e of produ	uction	Part number / Date of production Pa		Part nu	mber / Date of production	
Steel wire mesh hoses 1)	Part number / Dat	e of produ	uction	Part number / Date of production Part I		Part nu	mber / Date of production	
_								
	Part number / Dat	e of produ	uction	Part number / Date of production Par		Part nu	number / Date of production	
Service			Engine oil onterval	I change Antifreeze / corrosion inh type		hibitor	Concentration	
products					•			%
-	Type of gas	N	Methane co	ontent CH4	Sulphur	r / hydrogen sulfi	de	Lower calorific value, Hu
Fuel				%			ppm	kWh/Nm³
Place:	Da	ite:		Cu	stomer's	signature		intenance personnel
							sigr	nature

¹⁾ all steel wire mesh hoses have to be replaced at the latest of 6 years after the day of production



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	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	. TO A SIMOSISMO		oz comon or canada gac	zamoda raido
Lillissions	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR .		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				0.4
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
•	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
Ignition system	° bef. TDC	° bef. TDC	v	m

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
gg	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling circuit	°C	°C	bar	l/min
Cooming Circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	I/min

Place:	Date:	Customer's signature	Maintenance personnel
			signature

MAR			Page 1 of 2						
Basic data									
Appendix	Type of system	System	operating	g hours		System constru	ıction	Elec	ctrical power rating
					ОН	year			KWh _{el}
	Operating	Referer	nce variab	le / start require	ements			Spe	ed
	method								rpm
Installation	Installation	Air pres	SSUIFA	Air humidi	tv	Outside temper	ature	Unit	compartment
conditions	height	7 til proc				Outolde temper			perature
	m		mb	ar	%		°C		°C
	Engine type			Engine number		Plant number	•		Engine operating hours
									ОН
Engine									No. engine starts
	Gas mixer type		•	Alternator ty	_′ ре	•	Air filte	er typ	oe e
	Ignition system ty	_′ ре		Ignition coil type Spark		Spark	plug	ı type	
Components									
	Catalytic converte	er type		Silencer type		Exhaus	Exhaust heat exchanger type		
	Part number / Da	te of proc	duction	Part number / Date of production Part			Part ni	ımh	er / Date of production
	T dit Hambol / Ba	to or proc	20011011	T dit ridinge	1 / Dato 0	, production	- art in		or, Bate or production
Steel wire	Part number / Da	te of proc	duction	Part numbe	r / Date o	f production	Part ni	ımb	er / Date of production
mesh hoses 1)		10 0. p. 0.			., 2010 0	. production			or, Date of production
	Part number / Da	te of prod	duction	Part numbe	r / Date o	f production	Part nu	umb	er / Date of production
						,			, , , , , , , , , , , , , , , , , , , ,
	Factor of the con-	1	Facilities	9 - 1	A 1'f	/	1.71.71	Τ,	Dana and tradition
Service	Engine oil type		interval	il change	type	eze / corrosion ir	INIDITOR		Concentration
products									%
	Type of gas		Methane	content CH4	Sulphu	r / hydrogen sulf	ide	L	ower calorific value, Hu
Fuel				%			ppm	ı	kWh/Nm³
Place:	Da	ate:		Cı	ıstomer's	signature			nance personnel
							sig	ınatı	ure

¹⁾ all steel wire mesh hoses have to be replaced at the latest of 6 years after the day of production



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	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	3	3		
	mg/Nm³	mg/Nm ³	%	
0	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train	mbar	mbar	%	°c
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
-	°C	mbar	mbar	%
Touch a shear since	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
igililion system	° bef. TDC	° bef. TDC	v	m

	of engine at 50% rated power NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
	NOX emissions	CO emissions	Oz content of exhaust gas	Lambua value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ouo trum	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C			0/
	_	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ranboonarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel
			signature

Return to service after temporary withdrawal

									1	
MAR		afte			n to se orary w					Page 1 of 2
Basic data										
Appendix	Type of system	Syster	n operatin	ng ho	ours		System const	ruction	Ele	ctrical power rating
						ОН	year			KWh _{el}
	Operating method	Refere	ence varia	ble /	/ start require	ments			Spe	eed
					1					rpm
Installation conditions	Installation height	Air pre	essure		Air humidit	У	Outside temp	erature		it compartment nperature
	m		ml	bar		%		°C		°C
	Engine type			Eng	gine number		Plant numb	er		Engine operating hours
										ОН
Engine										No. engine starts
	Gas mixer type				Alternator ty	ре	<u>'</u>	Air fil	ter ty	ре
	Ignition system ty	pe			Ignition coil type		Sparl	Spark plug type		
Components										
	Catalytic converte	er type		Silencer type			Exha	ust h	eat exchanger type	
	Part number / Da	te of pro	duction		Part number	/ Date o	f production	Part i	numb	per / Date of production
Steel wire mesh hoses 1)	Part number / Da	te of pro	duction		Part number	/ Date o	ate of production Part r		number / Date of production	
	Part number / Da	te of pro	duction		Part number	/ Date o	f production	Part i	numb	per / Date of production
O a maile	Engine oil type		Engine	oil cl	hange		eze / corrosion	inhibitor		Concentration
Service products			interval			type				%
	Type of gas		Methane	e co	ntent CH4	Sulphu	r / hydrogen sı	ulfide		Lower calorific value, Hu
Fuel					%			ррі	m	kWh/Nm³
Place:	Da	ate:			Cu	stomer's	signature		lainte	enance personnel cure

¹⁾ all steel wire mesh hoses have to be replaced at the latest of 6 years after the day of production



Return to service after temporary withdrawal

Page 2 of 2

Operating data of	of engine at 100% rated power	•		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train			0/	°C
	mbar	mbar	%	_
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginaon system	° bef. TDC	° bef. TDC	v	m

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm ³	mg/Nm ³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				.,
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel
			signature

Return to service after change of customer/location



Return to service after change of customer/location

Page 1 of 2

	Ш										
Basic data											
Appendix	Type of system	Syster	n operatino	g hours		System cons	struction	Electrical power rating			
					ОН	year		KWh _{el}			
	Operating	Pefere	nce variah	ole / start require				Speed			
	method	IXCICIO	rice variac	ne / start requir	SITICITIS			Speeu .			
								rpm			
Installation conditions	Installation height	Air pre	ssure	Air humid	ty	Outside tem		Unit compartment temperature			
Contantions	m m		mb	ar	%		°C	°C			
	Gas mixer type			Alternator to	" "		Air filte	ar tuno			
	Gas mixer type			Alternator ty	/pe		All line	н туре			
Components	Ignition system ty	rpe		Ignition coil	type		Spark	plug type			
	Catalytic converter type			Silencer typ	е		Exhau	st heat exchanger type			
	Part number / Date of production		Part numbe	Part number / Date of production		Part no	Part number / Date of production				
Steel wire	Part number / Da	te of pro	duction	Part numbe	Part number / Date of production			Part number / Date of production			
mesh hoses 1)					·			, , , , , , , , , , , , , , , , , , , ,			
	Part number / Da	te of pro	duction	Part numbe	Part number / Date of production			umber / Date of production			
	r are riambor / Ba	to or pro	adollon	T dit ridinio	Tart number / Bate of production		l are in	ambot / Bate of production			
	Engine type			Engine number	ngine number Plant number		ber	Engine operating hours			
Engine								ОН			
Engine								No. engine starts			
	Engine oil type		Engine o	il change	Antifre	eze / corrosio	n inhibitor	Concentration			
Service products			interval	J	type						
producto								%			
	Type of gas		Methane	content CH4	Sulphu	ır / hydrogen s	sulfide	Lower calorific value, Hu			
Fuel				%			ppm	kWh/Nm³			
Place:	Da	ate:		Cı	ustomer's	signature	Ma	intenance personnel			
						J		nature			

¹⁾ all steel wire mesh hoses have to be replaced at the latest of 6 years after the day of production



Return to service after change of customer/location

Page 2 of 2

Operating data	of engine at 100% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system		_		
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging			°C	°C
	mbar	mbar	_	_
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of	T: exhaust gas up/downstream of exhaust
Exhaust system	ETC DATIK AVB	DATIK A/D	catalytic converter	heat exchanger
-	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture	P: CL LT mixture cooler	CL circulation quantity, LT
		cooler	operating temperature	mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginalon ayatem	° bef. TDC	° bef. TDC	v	m

	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	NOX emissions	CO emissions	OZ content of exhaust gas	Lambua value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ous train	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
raiboonarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel
			signature

Completion of maintenance tasks

General information

Please note that the maintenance tasks may only be carried out by authorized MAN workshops.

The workshop will stamp a checklist to confirm that the tasks have been completed correctly at each service.

It is important to ensure that all entries are duly made in full and are clearly legible.

A test run must be carried out after every service.

Notes about tasks that appear necessary or work/repairs carried out may also be kept.

Start-up

The Start-up form must be completed by the authorized workshop or the unit manufacturer and forwarded to MAN Truck & Bus AG as part of the start-up process.

Service at 20-50 operating hours

This first service is essential.

The General Details form must be completed by the authorized workshop or the unit manufacturer and forwarded to MAN Truck & Bus AG as part of the start-up process.

Steel wire mesh hoses

All steel wire mesh hoses have to be replaced at the latest of 6 years after the day of production. The date of production is stamped on the fittings, directly on the hoses, see picture (yy/mm).



The date of production of the steel wire mesh hoses has to be documented during the commissioning. For engines which are already in operation, the date of production must be checked and documented within the next regular service operation.

An extension of the period of use is only possible, if the specified inspection criteria according to the BG Directive-Fact-Sheet No. 15 (Table 1-8) are examined and evaluated at regular intervals.

NOTE

In the case of complaints within the warranty period, maintenance records E2/E3 must also be presented.

Important instructions concerning technical safety and the safety of personnel are specifically highlighted, as indicated below.



🛕 Danger

Refers to working and operating procedures which must be followed in order to avoid exposing people to risk.



/!\ Caution

Refers to working and operating procedures which must be followed in order to avoid material damage or destruction.

NOTE

An explanatory note which is useful for understanding the working or operating procedure to be performed.

Assembling pipes



🛕 Danger

Do not bend pipes of any kind.

Mounting gaskets

Gaskets are often fitted with adhesives or sealing compounds as an aid to installation or to improve the seal. This can result in the seal slipping during operation due to the so-called sewing-machine effect, causing leaks to occur. This is especially likely where parts with different rates of thermal expansion are connected (e.g. aluminum and cast iron).

Example:

If an adhesive or sealing compound is used on the cover of the front crankshaft oil seal, the gasket will gradually slip inside over time due to the varying thermal expansion rates. Oil leaks will occur which might be wrongly attributed to the shaft seal.

Correct installation of gaskets can only be achieved if the following principles are observed:

- Only use genuine MAN seals and gaskets.
- Make sure that the areas to be sealed are undamaged and clean.
- Do not use adhesive agents or sealing agents. To facilitate installation, a little grease can be used to stick the seal to the part to be mounted.
- Tighten the bolts evenly to the specified tightening torque.

Mounting O-rings

- Only use genuine MAN O-rings.
- Make sure that the areas to be sealed are undamaged and clean.
- As a rule, moisten the seals with engine oil when fitting.

Warranty conditions

Scope of the warranty

MAN Truck & Bus AG guarantees that any components of engine series E08, E26, E28 and E32 acknowledged to be faulty will be either replaced or repaired, as decided by MAN Truck & Bus AG. The following warranty conditions (as contained in the terms of delivery) are applicable here:

Repairs

In order for work to be carried out as required, the customer must

- Grant the necessary time and opportunity
- Furnish, at his expense, the necessary assistants, equipment and facilities and carry out ancillary work
- Perform, at his expense, all work above and beyond the original scope of the order

Once per case of damage, MAN Truck & Bus AG will undertake appropriate travel expenses as required by authorized service technicians, and appropriate shipping costs for replacement and reconditioned parts. Additional special travel and transport costs will be borne by the customer. Repairs will be carried out during normal, regular working hours. The extra cost of any work carried out outside regular working hours will be borne by the customer.

The warranty does not cover:

- The replacement of wearing parts, e.g. filters, V-belts, operating fluids (oil, anti-freeze and anti-corrosion agents)
- The costs of normal, routine prescribed inspections
- Damage caused by the use of unsuitable service products or by improper handling/operation
- Any costs indirectly incurred in connection with warranty cases, for downtimes, loss of time, expenses for sustenance, accommodation, freight costs, fuel costs, etc. or any other follow-on costs
- Damage caused by failure to follow the guidelines prescribed in the installation manual for industrial gas engines

Warranty conditions

Notes	



Service intervals for E0834 LE302, E0836 LE202/302 "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1.000	2.000	10.000	30.000	60.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600	1,200	10.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	X			X			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Х				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs				X			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	X			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E0834 LE302/322, E0836 LE202/LE302 "Special gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s	1.000	2.000	10.000	30.000	60.000
Interval after operating hours at 1800 rpm	20-50	n.s	900	1.200	10.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	X			Х	Х	Х	Х
Carry out a leak test	X		X				
Check bolt connections	X		Χ				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	X	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs				Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E0834 E302/312, E0836 E302/312 "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s	1.500	3.000	15.000	30.000	60.000
Interval after operating hours at 1800 rpm	20-50	n.s	900	1.800	12.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			X				
Check spark plugs, replace if necessary			Χ				
Check valve clearance and adjust if necessary			X				
Replace spark plugs	Х			Х			
Check compression pressure			X				
Check/replace oil separator				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2876 E312, E2842 E312, "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s	1.800 **)	3.600	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s	900 **)	1.800	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			X				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs				Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2676 E302, "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s	1.800	3.600	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s	900	1.800	12.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	X			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Х				
Check spark plugs, replace if necessary			X				
Endoscopy of the combustion chambers ¹				Х			
Check valve clearance and adjust if necessary			Х				
Replace spark plugs	Х			Х			
Check compression pressure			X				
Check/replace oil separator				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace membrane Foil separator					10.000 h		
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace cylinder liner						X	
Check/replace connecting rods						X	
Replace piston rings						Х	
Check/replace pistons						Χ	
Replace cylinder heads						X	
Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Service intervals for E3232 E302, "Natural gas", with spark plugs M14

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s	1.800	3.600	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s	900	1.800	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			X				
Check spark plugs M14, replace if necessary			X				
Endoscopy of the combustion chambers ¹⁾				Х			
Check valve clearance and adjust if necessary			X				
Replace spark plugs M14	Х			Х			
Check compression pressure			X				
Check/replace oil separator				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Service intervals for E3232 E302, "Natural gas", with spark plugs M18

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s	2.000	4.000	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s	1.000	2.000	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/check pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			X				
Check spark plugs M18, replace if necessary			X				
Endoscopy of the combustion chambers ¹⁾				Х			
Check valve clearance and adjust if necessary			X				
Replace spark plugs M18	Х			Х			
Check compression pressure			X				
Check/replace oil separator				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Service intervals for E2876 TE302 "Special gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	30.000	60.000
Interval after operating hours at 1800 rpm	20-50	n.s	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	X			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	X		Х				
Change engine oil; oil analysis*)	X	Х					
Change engine oil filter*)	X	Х					
Record operating data	X		Х				
Check start procedure	X		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	X			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	X			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	X						
Check intake vacuum			X				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2876 LE302/LE212 "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	X			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	X	Х					
Change engine oil filter*)	X	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	X		X				
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2876 LE302 "Special gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	30.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Х				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2876 LE202 "Special gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	750 **)	1.500	15.000	25.000	50.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	X			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Х				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2848 LE322 "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	X			Х	Х	Х	Х
Carry out a leak test	X		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	X	Х					
Change engine oil filter*)	X	Х					
Record operating data	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	X			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				X			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2848 LE322 "Special gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	30.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Х				
Check spark plugs, replace if necessary			Х				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler				Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2842 LE322/LE332 "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Χ			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Check spark plugs, replace if necessary			Χ				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				X			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2842 LE322/LE202 "Special gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000 **)	2.000	15.000	30.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600 **)	1.200	12.000	20.000	40.000
Service interval	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Check spark plugs, replace if necessary			X				
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				X			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace turbo charger					Х		
Replace exhaust pipe multi-piece rings					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

Service intervals for E2676 LE202 "Natural gas"

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	800	1.600	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	X			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Check spark plugs, replace if necessary			Х				
Endoscopy of the combustion chambers 1)				Х			
Check valve clearance and adjust if necessary				Х			
Replace spark plugs	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace membrane oil separator					10.000 h		
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace charge-mixture hose					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Service intervals for E2676 LE202/LE212 "Special gas"

After start-up Afte	Service intervals it	. ==0.0			Op. 0.0	9		
1500 pm			all	all	all	up to	up to	up to
Interval after operating hours at 1,000 12,000 12,000 20,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,000 120,000 40,0		20-50	n.s.	800	1.600	15.000	25.000	50.000
Service interval	Interval after operating hours at	20-50	n.s.	600	1.200	12.000	20.000	40.000
Check both connections	'	E1	01*)	E2	E3	R1***)	R2***)	R3***)
Check both connections	Check steel wire mesh hoses	Х			Х	X	X	X
Check both connections	Carry out a leak test	Х		Х				
Change engine oil filter*)				Х				
Change engine oil filter*)	Change engine oil; oil analysis*)	Х	Х					
Record operating data***) X		Х	Х					
Check start procedure X X X X X X X X X X X X X X X X X X X		Х		Х				
Adjust/check throttle valve								
Clean/check gas filter	-				Х			
Clean/check air filter								
Clean/replace pickups								
Check coolant concentration X X X Check ignition time X X X Check coolant circuit / system pressure X X X Measure crankcase pressure X X X Measure exhaust back pressure including catalytic converter X X X Check exhaust back pressure including catalytic converter X X X Check exhaust system for air leaks / external soiling X X X Check whaust system for air leaks / external soiling X X X Check whaust system for air leaks / external soiling X X X Check whaust system for air leaks / external soiling X X X Check shark plugs, replace if necessary X X X Check salve clearance and adjust if necessary X X X Replace spark plugs X X X Check compression pressure X X X Check compression pressure X X X Check/replace spart pl								
Check coolant circuit / system pressure								
Check coolant circuit / system pressure X X X Measure cankcase pressure X Measure exhaust back pressure Check emissions and Lambda X Check emissions and Lambda X Check emissions and Lambda X Check eshaust system for air leaks / external soiling Check spark plugs, replace if necessary Endoscopy of the combustion chambers of the combustion								
Measure crankcase pressure X X X Measure exhaust back pressure including catalytic converter X X X Check emissions and Lambda X X X Check exhaust system for air leaks / external soiling X X Image: Check intake vacuum X Image: Ch	Check coolant circuit / system							
Measure exhaust back pressure including catalytic converter Check emissions and Lambda X X X Check emissions and Lambda X Check exhaust system for air leaks / external soiling X Check spark plugs, replace if necessary Endoscopy of the combustion chambers of the combustion of the combustion of the combustion chambers of the combust of th		Х			Х			
Check emissions and Lambda X X Check exhaust system for air leaks / external soiling X Check intake vacuum X Check park plugs, replace if necessary X Endoscopy of the combustion chambers? X Check valve clearance and adjust if necessary X Replace spark plugs X Check valve clearance and adjust if necessary X Replace spark plugs X Check ownession pressure X Check ompression pressure X Check/replace oil separator X Check/dealibrate sensors X Check/dealibrate sensors X Check exhaust system bolt connections X Replace membrane oil separator X Replace membrane oil separator 10.000 h Replace coolant X Measure crankshaft axial play X Replace charge-mixture hose X Replace turbo charger X Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X </td <td>Measure exhaust back pressure</td> <td>Х</td> <td></td> <td></td> <td>Х</td> <td></td> <td></td> <td></td>	Measure exhaust back pressure	Х			Х			
Leaks / external soiling		Х			Х			
Check spark plugs, replace if necessary Endoscopy of the combustion chambers	Check exhaust system for air leaks / external soiling	Х						
Endoscopy of the combustion chambers	Check intake vacuum			Х				
chambers¹¹ ^ ^ _				Х				
adjust if necessary Replace spark plugs X X Check compression pressure Check/replace oil separator Check/clean mixture cooler Check/claibrate sensors Check exhaust system bolt connections Replace membrane oil separator Replace coolant Measure crankshaft axial play Replace charge-mixture hose Replace turbo charger Replace cylinder liner Check/replace piston rings Check/replace pistons X X X X X X X X X X X X X	Endoscopy of the combustion chambers ¹⁾				Х			
Check compression pressure X Check/replace oil separator X Check/clean mixture cooler X Check/calibrate sensors X Check exhaust system bolt connections X Replace membrane oil separator 10.000 h Replace coolant X Measure crankshaft axial play X Replace charge-mixture hose X Replace turbo charger X Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X					Х			
Check/replace oil separator Check/clean mixture cooler Check/calibrate sensors Check exhaust system bolt connections Replace membrane oil separator Replace coolant X Measure crankshaft axial play Replace charge-mixture hose Replace turbo charger X Replace cylinder liner Check/replace pistons X X X X X X X X X X X X X X X X X X X	Replace spark plugs	Х			Х			
Check/clean mixture cooler X Check/calibrate sensors X Check exhaust system bolt connections X Replace membrane oil separator 10.000 h Replace coolant X Measure crankshaft axial play X Replace charge-mixture hose X Replace turbo charger X Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X	Check compression pressure				Х			
Check/calibrate sensors X Check exhaust system bolt connections X Replace membrane oil separator 10.000 h Replace coolant X Measure crankshaft axial play X Replace charge-mixture hose X Replace turbo charger X Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X	Check/replace oil separator				Х			
Check exhaust system bolt connections Replace membrane oil separator Replace coolant X Measure crankshaft axial play Replace charge-mixture hose X Replace turbo charger X Replace cylinder liner Check/replace connecting rods Replace piston rings Check/replace pistons Replace cylinder heads	Check/clean mixture cooler				Х			
Connections Replace membrane oil separator Replace coolant Measure crankshaft axial play Replace charge-mixture hose Replace turbo charger Replace cylinder liner Check/replace connecting rods Replace piston rings Check/replace pistons Replace cylinder heads					Х			
Replace coolant Measure crankshaft axial play Replace charge-mixture hose Replace turbo charger Replace cylinder liner Check/replace connecting rods Replace piston rings Check/replace pistons Replace cylinder heads					X			
Measure crankshaft axial play Replace charge-mixture hose Replace turbo charger Replace cylinder liner Check/replace connecting rods Replace piston rings Check/replace pistons Replace cylinder heads X X X X X X X X X X X X X	Replace membrane oil separator					10.000 h		
Replace charge-mixture hose X Replace turbo charger X Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X X	Replace coolant							
Replace turbo charger X Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X	Measure crankshaft axial play							
Replace cylinder liner X Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X X	Replace charge-mixture hose							
Check/replace connecting rods X Replace piston rings X Check/replace pistons X Replace cylinder heads X	Replace turbo charger					Х		
Replace piston rings X Check/replace pistons X Replace cylinder heads X								
Check/replace pistons X Replace cylinder heads X	Check/replace connecting rods						Х	
Replace cylinder heads X								
							Х	
Complete engine overhaul X							Х	
	Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Service intervals for E3268 LE212, E3262 LE201/202/232 "Natural gas" with spark plugs M14

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	800	1.600	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	X	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	X			Х			
Check exhaust system for air leaks / external soiling	Х			Х			
Check intake vacuum			Χ				
Endoscopy of the combustion chambers ¹⁾				Х			
Check valve clearance and adjust if necessary				Х			
Check spark plugs M14, replace if necessary			Х				
Replace spark plugs M14	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				X			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace charge-mixture hoses					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Service intervals for E3268 LE212, E3262 LE201/202/232 "Natural gas" with spark plugs M18

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000	2.000	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	800	1.600	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х			Х			
Check intake vacuum			X				
Endoscopy of the combustion chambers ¹⁾				Х			
Check valve clearance and adjust if necessary				Х			
Check spark plugs M14, replace if necessary			X				
Replace spark plugs M14	Х			Х			
Check compression pressure				Х			
Check/replace oil separator				Х			
Check/clean mixture cooler	Х			Х			
Check/calibrate sensors				Х			
Check exhaust system bolt connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace charge-mixture hoses					Х		
Replace turbo charger					Х		
Replace cylinder liner						Х	
Check/replace connecting rods						Х	
Replace piston rings						Х	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Χ

¹⁾ from 6,000 operating hours

Service intervals for E3268 LE222/LE232, E3262 LE202/LE242 "Special gas" with spark plugs M14

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	800	1.600	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	600	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	Х			Х			
Clean/check gas filter	X			Х			
Clean/check air filter	X			X			
Clean/replace pickups	X			X			
Check coolant concentration	X			X			
Check ignition time	X			X			
Check coolant circuit / system							
pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			Х			
Check emissions and Lambda	Х			X			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			Χ				
Endoscopy of the combustion chambers ¹⁾				Х			
Check valve clearance and adjust if necessary				Х			
Check spark plugs M14, replace if necessary			Х				
Replace spark plugs M14	Х			X			
Check compression pressure				Х			
Check/replace oil separator				X			
Check/clean mixture cooler				X			
Check/calibrate sensors Check exhaust system bolt				X			
connections				X			
Replace coolant					Х		
Measure crankshaft axial play					Х		
Replace charge-mixture hoses					Х		
Replace turbo charger					Х		
Replace exhaust pipe multi-piece rings					Х		
Replace cylinder liner						X	
Check/replace connecting rods						X	
Replace piston rings						X	
Check/replace pistons						X	
Replace cylinder heads Complete engine overhaul						X	Х
1) (a constitution of the]]			_ ^

¹⁾ from 6,000 operating hours

Service intervals for E3268 LE222/LE232, E3262 LE202/212/LE242 "Special gas" with spark plugs M18

	After start-up and R1-R2	all	all	all	up to	up to	up to
Interval after operating hours at 1500 rpm	20-50	n.s.	1000	2.000	15.000	25.000	50.000
Interval after operating hours at 1800 rpm	20-50	n.s.	800	1.200	12.000	20.000	40.000
Service interval	E1	O1*)	E2	E3	R1***)	R2***)	R3***)
Check steel wire mesh hoses	Х			Х	Х	Х	Х
Carry out a leak test	Х		Х				
Check bolt connections	Х		Х				
Change engine oil; oil analysis*)	Х	Х					
Change engine oil filter*)	Х	Х					
Record operating data****)	Х		Х				
Check start procedure	Х		Х				
Adjust/check throttle valve	X			Х			
Clean/check gas filter	Х			Х			
Clean/check air filter	Х			Х			
Clean/replace pickups	Х			Х			
Check coolant concentration	Х			Х			
Check ignition time	Х			Х			
Check coolant circuit / system pressure	Х			Х			
Measure crankcase pressure	Х			Х			
Measure exhaust back pressure including catalytic converter	Х			х			
Check emissions and Lambda	Х			Х			
Check exhaust system for air leaks / external soiling	Х						
Check intake vacuum			X				
Endoscopy of the combustion chambers 1)				х			
Check valve clearance and adjust if necessary				Х			
Check spark plugs M18, replace if necessary			X				
Replace spark plugs M18	X			Х			
Check compression pressure				X			
Check/replace oil separator Check/clean mixture cooler				X			
Check/calibrate sensors				X			
Check exhaust system bolt							
connections				Х			
Replace coolant					Х		
Measure crankshaft axial play					X		
Replace charge-mixture hoses					X		
Replace turbo charger Replace exhaust pipe multi-piece rings					X		
Replace cylinder liner						Х	
Check/replace connecting rods						X	
Replace piston rings						X	
Check/replace pistons						Х	
Replace cylinder heads						Х	
Complete engine overhaul							Х

¹⁾ from 6,000 operating hours

Information on service intervals

The maintenance tasks shown above must be carried out by a MAN Truck & Bus AG authorized workshop or the unit manufacturer when the relevant number of operating hours has been reached.

- *) The engine oil lifetimes are to be determined using regular oil analyses based on operating conditions and engine oil used in accordance with MAN works standard M3271-2 for natural gas and M3271-4 for special gas as per the tables below.
- **) Tighten cylinder head bolts at 400 operating hours
- ***) For Revisions R1, R2, R3, the intervals are predictions and are non-binding, but take into account the minimum gas quality requirements for MAN industrial engines and the operation of engines within the Technical Instructions governing exhaust gas emission limits.
- ****) MAN data memory; read and store data (if present).
- If there are fluctuations in gas composition, regular oil analysis must be carried out
- When operating charged engines within the 1/2 TA Luft (technical instructions for preserving clean air) emissions limits (250 mg/Nm³ NO_x), the intervals for E2 and E3 must always be halved and the set values are to be determined only in accordance with the applicable technical data sheet of the relevant engines.

Oil analysis tables

Oil analysis table: natural gas

Natural gas							
Engine operating hours							
Mineral oil	Part/fully synthetic oil						
50 operating hours	50 operating hours	1. Oil change					
400 operating hours	800 operating hours	2. Oil change with oil analysis as check					
An incremental increase interval of E3.*)	in oil lifetimes based on oil analys	ses is possible up to a max. maintenance					

Oil analysis table: special gas

Special gases (biogas / landfill gas / sewage gas)							
Engine operating hours	Oil operating hours						
50 operating hours	50 operating hours	Oil change					
Max. 300 operating hours	Max. 300 operating hours	Oil change with oil analysis as check					
An incremental increase in o interval of E3.*)	An incremental increase in oil lifetimes based on oil analyses is possible up to a max. maintenance interval of E3.*)						

^{*)} Depending on the outcome of the 2nd oil analysis and only after consultation with MAN Truck & Bus AG, customer service department in the Nuremberg factory.

Important information on the maintenance records:

NOTE

The following maintenance records are stored (E2 x15; E3 x10) and are to be kept in this maintenance book once completed.

NOTE

In the case of complaints within the warranty period, the data records recorded and stored from engines with MAN data memory must be presented as well.

Completed maintenance records should also be returned to MAN Truck & Bus AG in the case of goodwill requests.

Maintenance records E2 and E3 should be stored with the relevant engine/unit documents. In the case of complaints within the warranty period, completed maintenance records should be returned to MAN Truck & Bus AG.

Address:

MAN Truck & Bus AG Werk Nürnberg Abt. SEP Vogelweiherstr. 33 90411 Nuremberg Engines.components@de.man-mn.com

Tel: 0911 420 - 0 Fax: 0911 420 - 1932

Notes	

Maintenance record									E2 Page 1 of 2	
Basic data										
Appendix	Type of system	Syster	n operatir	ng h	ours		System constru	ction	Ele	ctrical power rating
						ОН	year			KWh _{el}
	Operating	Refere	ence varia	ble	/ start require	ments			Spe	eed
	method									rpm
Installation	Installation	Air pre	essure		Air humidit	у	Outside temper	ature	Uni	t compartment
conditions	height			bar		%		°C	tem	perature °C
	m			Dai		70		C		
	Engine type			En	gine number		Plant number			Engine operating hours
Engine										ОН
Liigilie										No. engine starts
The Compo	onents section	n sho	uld onl	ly k	oe compl	eted i	n the case o	of eng	gine	modifications
	Gas mixer type			Alternator type		Air filt	Air filter type			
0	Ignition system ty	ре		Ignition coil type		Spark	plug	g type		
Components										
	Catalytic converte	er type			Silencer type E.		Exhau	ust h	eat exchanger type	
	Engine oil type		Engine	oil c	hange		eze / corrosion in	hibitor	(Concentration
Service products			interval			type				%
	1								<u> </u>	
Fuel	Type of gas		Methan	e co	ontent CH4	Sulphu	r / hydrogen sulfide			_ower calorific value, Hu
					%			ppn	n	kWh/Nm³
Comment:										
Place:	Da	ate:			Cu	stomer's	signature	M	lainte	enance personnel
							J		gnati	



E2

Operating data	of engine at 100% rated power	r		
Operating data (or engine at 100% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging			cooler	ETC bank A/B
	mbar	mbar	°C	°C
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas	T: exhaust gas
Exhaust system	ETC Dank A/B	Dank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger
•	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		_	-	
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating	CL circulation quantity,
			temperature	engine
O	°C	ဇ	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginaon system	° bef. TDC	° bef. TDC	v	m

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm ³	mg/Nm ³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging	mbar	mbar	°C	°C
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature

Maintenance record								E2 Page 1 of 2	
Basic data									
Appendix	Type of system	Syster	m operating	hours		System constru	ction	Electrical power rating	
					ОН	yeai		KWh _{el}	
	Operating method	Refere	ence variable	e / start require	ements			Speed	
Installation conditions	Installation height	Air pre	essure	Air humidi	ty	Outside tempera		Unit compartment temperature	
	m		mba	ır	%		°C	°C	
	Engine type		E	Ingine number		Plant number		Engine operating hours	
								ОН	
Engine								No. engine starts	
The Comp	nonto costici	n oho	uld only	ho compl	otod i	n the sees o	·f on a	ine medifications	
The Compo		n Sno	uid Only	<u> </u>		n the case c		ine modifications	
	Gas mixer type	Sas mixer type		Alternator type		Air filte	Air filter type		
Components	Ignition system type			Ignition coil type Sp			Spark	ark plug type	
	Catalytic converter type			Silencer type			Exhau	st heat exchanger type	
Service	Engine oil type		Engine oil interval	change	Antifre type	eeze / corrosion inhibitor		Concentration	
products								%	
	Type of gas		Methane of	content CH4	Sulphu	ur / hydrogen sulfide		Lower calorific value, Hu	
Fuel				%			ppm	kWh/Nm³	
Comment:									
Place:	Da	ate:		Cu	ıstomer's	s signature		aintenance personnel gnature	

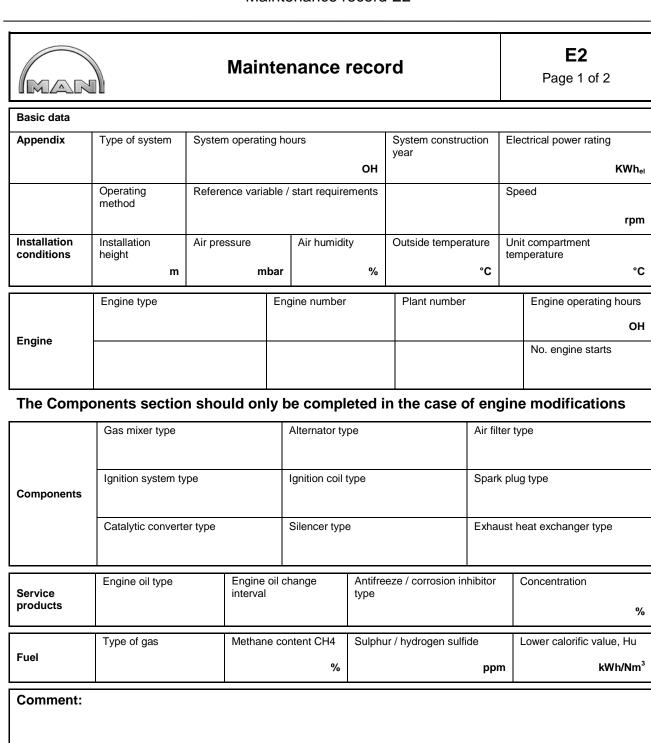


E2

Operating data of engine at 100% rated power					
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions	mg/Nm³	mg/Nm³	%		
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature	
	mbar	mbar	%	°C	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system	°C	mbar	mbar	%	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B	
ran booman ginig	mbar	mbar	°C	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger	
	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
.g	° bef. TDC	° bef. TDC	v	m	

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling circuit	°C	°C	bar	l/min
	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:



E2

Operating data of engine at 100% rated power					
Operating data	or engine at 100% rated power				
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions					
	mg/Nm³	mg/Nm³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature	
Gas train		ZPR			
	mbar	mbar	%	°C	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system					
	°C	mbar	mbar	%	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of	
Turbocharging			cooler	ETC bank A/B	
	mbar	mbar	°C	°C	
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas	
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger	
Exhaust Systom	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication	Wedsumg point, engine on 1	1. erigine on	1 . Grigino on	1 . Grank Graniber	
Lubrication		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating	CL circulation quantity,	
			temperature	engine	
0	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode	
Ignition system	ignition time control	ignasii ano moasaroment	iginasii cilorgy	distance	
igaon system	° bef. TDC	° bef. TDC	v	m	

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling circuit	°C	°C	bar	l/min
	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature

Maintenance record						E2 Page 1 of	f 2		
Basic data									
Appendix	Type of system	Syster	m operating	hours		System construe	ction	Electrical power rati	ing
					ОН	yeai			KWh _{el}
	Operating method	Refere	ence variable	e / start require	ements			Speed	rpm
Installation conditions	Installation height	Air pre	essure	Air humidi	ty	Outside tempera		Unit compartment temperature	
	m		mba	ır	%		°C		°C
	Engine type		E	Ingine number		Plant number		Engine operat	ing hours
									он
Engine								No. engine sta	arts
The Compo	onents section	n sho	uld only	be compl	eted i	n the case o	f eng	ine modificati	ions
	Gas mixer type			Alternator ty	pe	Air filter type		r type	
Components	Ignition system ty	/pe		Ignition coil	type	Spark plug		plug type	
	Catalytic converte	er type		Silencer type	е			st heat exchanger ty	уре
Service products	Engine oil type		Engine oil interval	change	Antifre type	eeze / corrosion inhibitor Concentration		Concentration	0/
•									%
Fuel	Type of gas		Methane of	content CH4	Sulphu	ur / hydrogen sulfide		Lower calorific v	alue, Hu
i uci				%			ppm		kWh/Nm ³
Comment:									
Place:	Da	ate:		Cu	ıstomer's	s signature		intenance personne nature	el



E2

Operating data of engine at 100% rated power					
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions					
	mg/Nm³	mg/Nm ³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature	
Gas train			0/	°C	
	mbar	mbar	%	_	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system	°C	mbar	mbar	%	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B	
Turbocharging	mbar	mbar	°C	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger	
	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
iginiion system	° bef. TDC	° bef. TDC	v	m	

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling oirouit	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature

Maintenance record						E2 Page 1 of 2			
Basic data									
Appendix	Type of system	Syster	m operating	hours		System constru	ction	Electrical power rating	
					ОН	yeai		KWh _{el}	
	Operating method	Refere	ence variable	e / start require	ements			Speed	
Installation conditions	Installation height	Air pre	essure	Air humidi	ty	Outside tempera		Unit compartment temperature	
	m		mba	ır	%		°C	°C	
	Engine type		E	Ingine number		Plant number		Engine operating hours	
								ОН	
Engine								No. engine starts	
The Comp	nonto costici	n oho	uld only	ho compl	otod i	n the sees o	·f on a	ine medifications	
The Compo		n Sno	uid Only	<u>-</u>		n the case c		ine modifications	
	Gas mixer type			Alternator ty	pe	Air filter type		er type	
Components	Ignition system ty	rpe		Ignition coil	type			plug type	
	Catalytic converte	er type		Silencer type	е			aust heat exchanger type	
Service	Engine oil type		Engine oil interval	change	Antifre type	eeze / corrosion inhibitor Concentration		Concentration	
products								%	
	Type of gas		Methane of	content CH4	Sulphu	ur / hydrogen sulfi	de	Lower calorific value, Hu	
Fuel				%			ppm	kWh/Nm³	
Comment:									
Place:	Da	ate:		Cu	ıstomer's	s signature		aintenance personnel gnature	

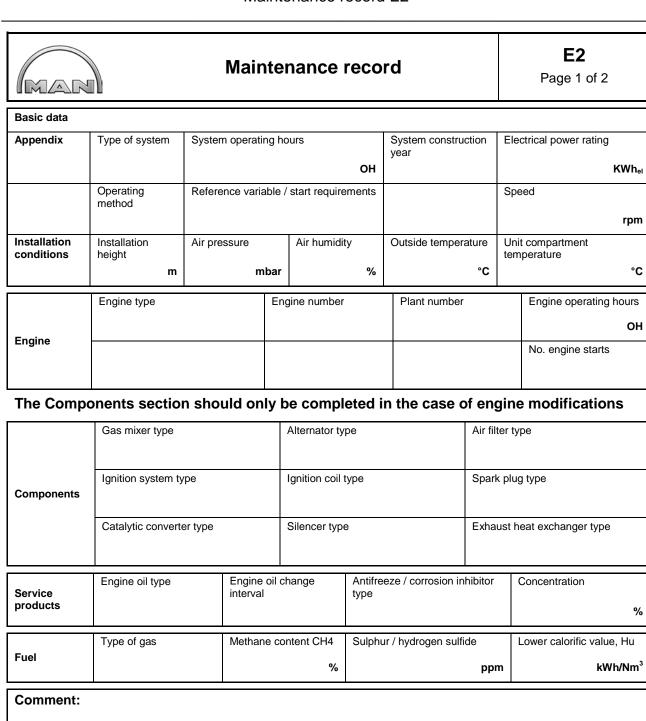


E2

Operating data of engine at 100% rated power					
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions	mg/Nm³	mg/Nm³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature	
Gas train	mbar	mbar	%	°C	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system	°C	mbar	mbar	%	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B	
rurbocharging	mbar	mbar	°C	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger	
	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
-g	° bef. TDC	° bef. TDC	v	m	

	•			
Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
Lillissions	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging			cooler	ETC bank A/B
	mbar	mbar	°C	°C
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas
F	ETC bank A/B	bank A/B	up/downstream of	up/downstream of exhaust
Exhaust system		_	catalytic converter	heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture	P: CL LT mixture cooler	CL circulation quantity, LT
		cooler	operating temperature	mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

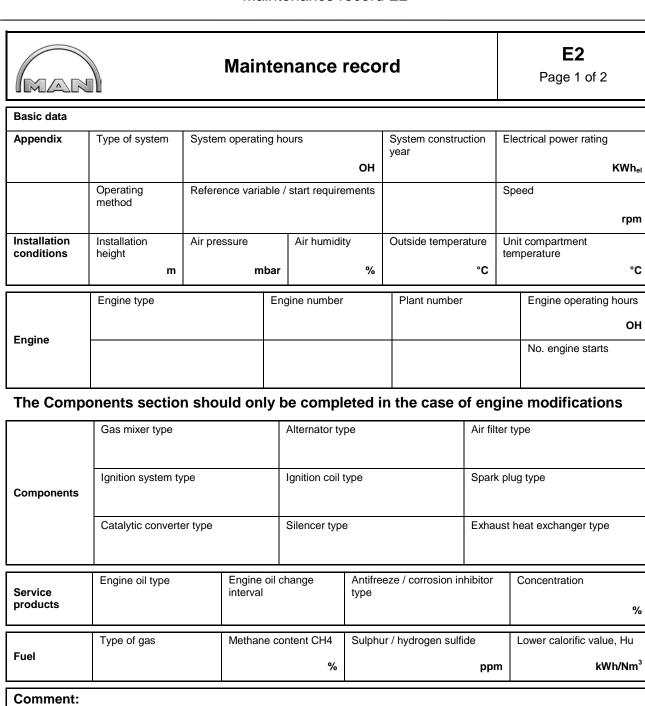


E2

Operating data of engine at 100% rated power					
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions					
	mg/Nm³	mg/Nm³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature	
Gas train	mbar	mbar	%	°C	
			,-		
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system	°C	mbar	mbar	%	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B	
ruibocilarging	mbar	mbar	°C	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger	
	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
.5	° bef. TDC	° bef. TDC	v	m	

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling oirouit	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

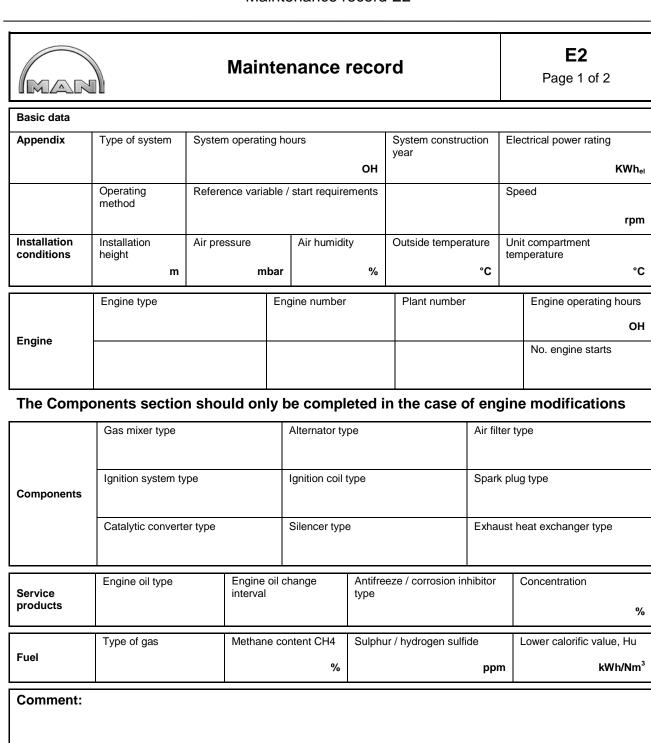


E2

Operating data of engine at 100% rated power					
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions	2	2			
	mg/Nm ³	mg/Nm ³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature	
Gas train			%	°C	
	mbar	mbar	,-		
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system	°C	mbar	mbar	%	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of	
Turbocharging	A1. Mixture cooler	1 . Charge an upstream of 1 v	cooler	ETC bank A/B	
. a. 200a. gg	mbar	mbar	°C	°C	
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas	
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger	
	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication					
		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
0	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
.g	° bef. TDC	° bef. TDC	v	m	

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling oirouit	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

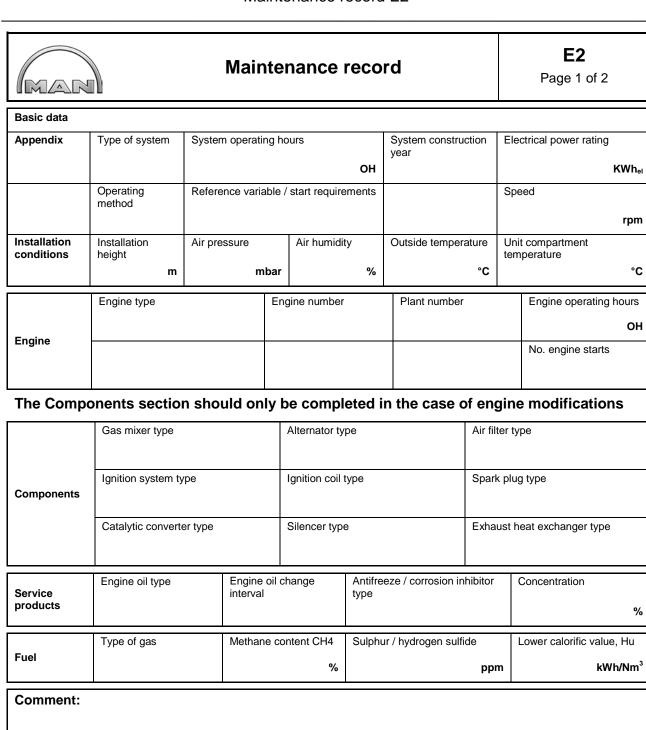


E2

Operating data of engine at 100% rated power					
Operating data of	or engine at 100% rated power				
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions					
	mg/Nm³	mg/Nm³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature	
Gas train		ZPR			
	mbar	mbar	%	°C	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system					
	°C	mbar	mbar	%	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B	
Turbocharging					
	mbar	mbar	°C	°C	
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas	
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger	
•	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication					
		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
	°C	°C	bar	l/min	
Cooling circuit	_	-		-	
occining circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
iginalon ayatelli	° bef. TDC	° bef. TDC	v	m	

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
. u. 200 gg	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling sirouit	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature	



Maintenance personnel

signature

Place:



E2

Operating data of engine at 100% rated power					
Operating data of	or engine at 100% rated power				
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value	
Emissions					
	mg/Nm³	mg/Nm³	%		
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature	
Gas train		ZPR			
	mbar	mbar	%	°C	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position	
Intake system					
	°C	mbar	mbar	%	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B	
Turbocharging					
	mbar	mbar	°C	°C	
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of	T: exhaust gas up/downstream of exhaust	
Exhaust system	ETC Dalik AVB	Dalik A/D	catalytic converter	heat exchanger	
	°C	mbar	°C	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber	
Lubrication					
		°C	bar	mbar	
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine	
	°C	°C	bar	l/min	
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler	
	°C	°C	bar	l/min	
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance	
igilition system	° bef. TDC	° bef. TDC	v	m	

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling circuit	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



E2

MAR	waintenance record							Page 1 of 2
Basic data								
Appendix	Type of system	Syster	n operating	hours		System constru year	ction	Electrical power rating
					он	yeai		KWh _{el}
	Operating method	Refere	ence variable	e / start require	ments			Speed
	metriod							rpm
Installation conditions	Installation height	Air pre	essure	Air humidit	у	Outside temper		Unit compartment temperature
Containe	m m		mba	r	%		°C	°C
	Engine type		E	ngine number	<u> </u>	Plant number		Engine operating hours
								ОН
Engine								No. engine starts
The Compo	onents section	n sho	uld only	be compl	eted i	n the case o	of eng	ine modifications
	Gas mixer type			Alternator type Air fi		Air filte	filter type	
Components	Ignition system ty	pe		Ignition coil type Spark		Spark	k plug type	
	Catalytic converte	er type		Silencer type		Exhaust heat exchanger type		st heat exchanger type
	Calary no comen	tio conventer type						or near one hanger type
	Engine oil type		Engine oil	change		eze / corrosion in	hibitor	Concentration
Service products			interval		type			%
	Type of gas		Methane o	content CH4	Sulphu	r / hydrogen sulfi	ide	Lower calorific value, Hu
Fuel				%	ppm		ppm	kWh/Nm³
Comment:								
Place:	Da	ate:		Cu	stomer's	signature		aintenance personnel
							sig	gnature

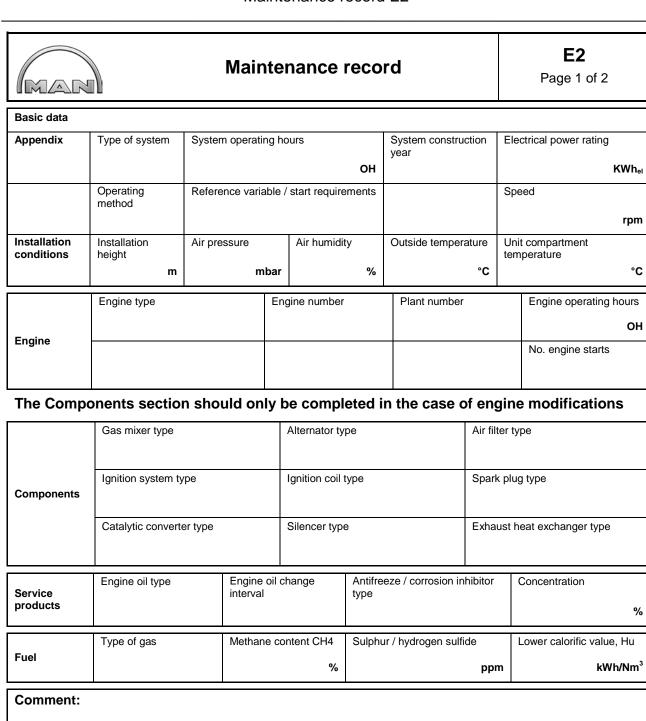


E2

Operating data of	of engine at 100% rated power	r		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
-g	° bef. TDC	° bef. TDC	v	m

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system		_		
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ruibocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
On allian almosts	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°c	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

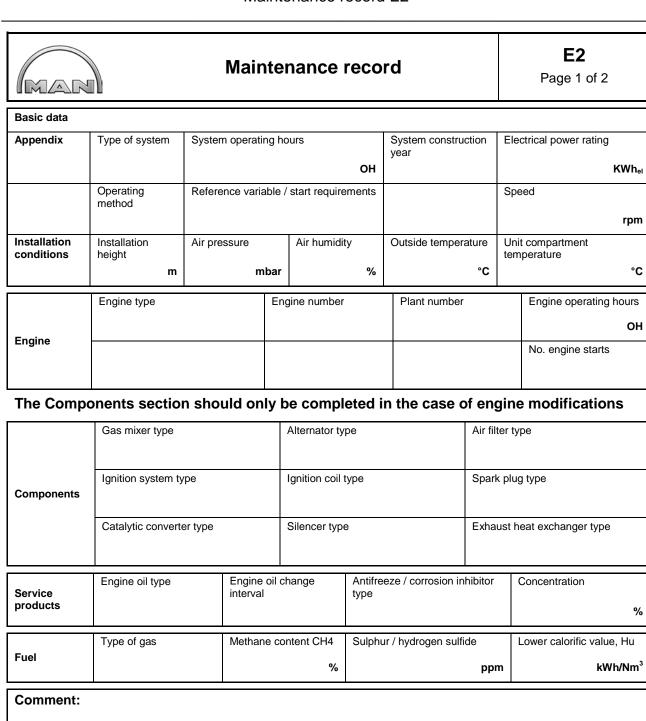


E2

Operating data of engine at 100% rated power						
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value		
Emissions		2				
	mg/Nm ³	mg/Nm ³	%			
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature		
Gas train	mbar	mbar	%	°C		
			,-	-		
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position		
Intake system	°C	mbar	mbar	%		
Turbocharging Exhaust system	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B		
	mbar	mbar	°C	°C		
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger		
	°C	mbar	°C	°C		
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber		
Lubrication		°C	bar	mbar		
Cooling circuit	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine		
	°C	°C	bar	l/min		
	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler		
	°C	°C	bar	l/min		
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance		
	° bef. TDC	° bef. TDC	v	m		

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ous train	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
Cooling circuit	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

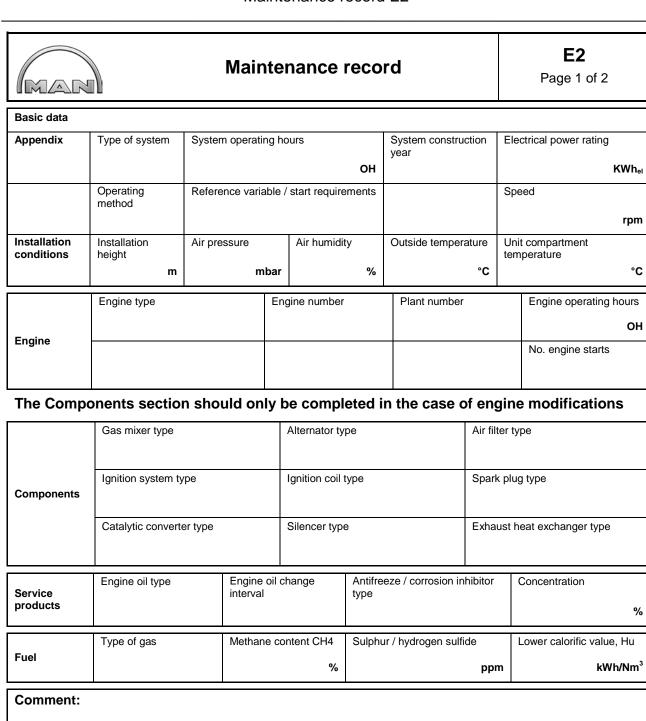


E2

Operating data	of engine at 100% rated power	7		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	n. 3	n. 3		
	mg/Nm ³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ous train	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turkaskaraina	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
igtion system	° bef. TDC	° bef. TDC	v	m

Operating data of	of engine at 50% rated power			
	· · · · · · · · · · · · · · · · · · ·			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging			cooler	ETC bank A/B
	mbar	mbar	°C	°C
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger
Exhaust system			1	ů .
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating	CL circulation quantity,
			temperature	engine
Cooling circuit	°C	°C	bar	l/min
Cooming circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture	P: CL LT mixture cooler	CL circulation quantity, LT
		cooler	operating temperature	mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

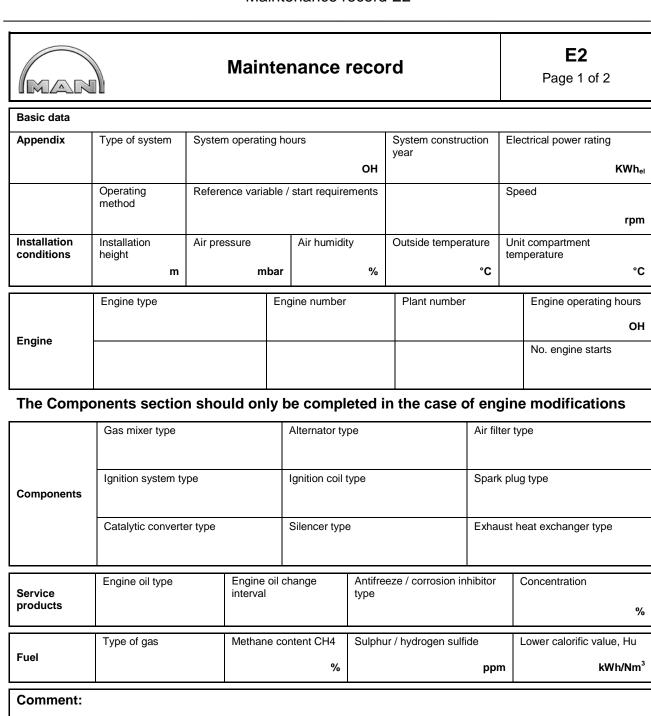


E2

Operating data of engine at 100% rated power				
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	2	2		
	mg/Nm ³	mg/Nm ³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train			%	°C
	mbar	mbar	,-	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging	A1. Mixture cooler	1 . Charge an upstream of 1 v	cooler	ETC bank A/B
. a 200a. gg	mbar	mbar	°C	°C
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
0	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
.g	° bef. TDC	° bef. TDC	v	m

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling oirouit	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

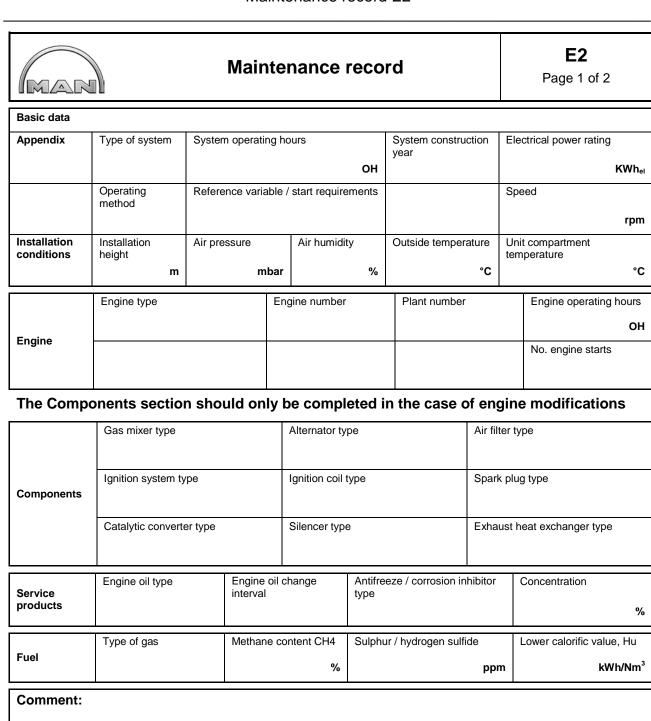


E2

Operating data	of engine at 100% rated power	7		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ranboonlanging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
.g	° bef. TDC	° bef. TDC	v	m

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurboenarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
On allian administr	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:



E2

Operating data of engine at 100% rated power				
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train	mbar	mbar	%	°C
			,-	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ruibocilarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
.5	° bef. TDC	° bef. TDC	v	m

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurboenarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
On allian administr	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature

Maintenance Record E3

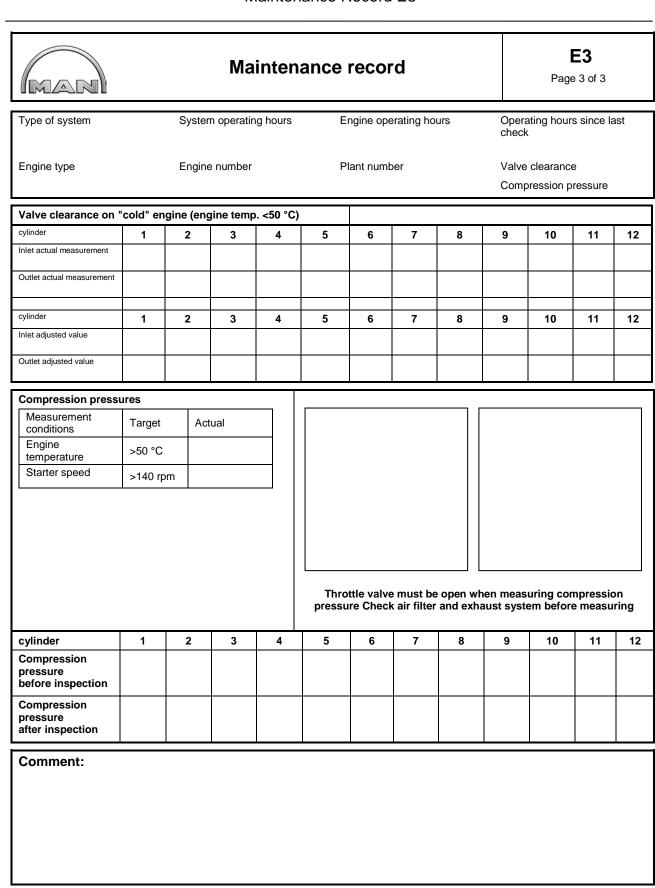
MAR			Main	tei	nance F	Reco	r	d			E3 Page 1 of 3
Basic data											
Appendix	Type of system	Syster	n operatir	ng h	ours			System constru	ction	Elec	ctrical power rating
						ОН	y	ear			KWh _{el}
	Operating	Refere	ence varia	ble	/ start require	ments				Spe	ed
	method										rpm
Installation	Installation	Air pre	ssure		Air humidit	у	С	Outside tempera	ature		compartment
conditions	height m		ml	bar		%			°C	tem	perature °C
	Engine type			En	gine number		1	Plant number			Engine operating hours
	Lingine type			LII	girie riumbei			Flant number			OH
Engine											No. engine starts
											No. origine starts
The Compo	nents section	n sho	uld onl	lv k	ne compl	atad ii	n	the case o	of and	ine	modifications
The Compe	Gas mixer type	3110		'y .	Alternator ty		_	the case c	Air filt		
	Gas mixer type				Alternator ty	Je			All lile	eity¦	Je
	Ignition system ty	ne.			Ignition coil t	vne			Spark	nluo	ı tvne
Components	ignition dystem ty	po			igilition con t	ypc			Opani	piag	, type
	Catalytic converte	er type		1	Silencer type)			Exhau	ıst he	eat exchanger type
	Engine oil type		Engine	oil c	hange	Antifree	eze	e / corrosion in	hibitor		Concentration
Service products			interval			type					%
Fuel	Type of gas		Methan	e co	ontent CH4	Sulphu	ır /	hydrogen sulfi	de	L	ower calorific value, Hu
					%				ppm	1	kWh/Nm ³
Comment:											
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E3

	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	۰
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	•
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	•
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mb
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	I/m
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	I/m
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginalon oyolom	° bef. TDC	° bef. TDC	v	
Operating data	of engine at 50% rated power			
	NOx emissions		O2 content of exhaust gas	Lambda value
Emissions		CO emissions	OZ COMENI OF EXHAUST GAS	Lambua value
	mg/Nm³	CO emissions mg/Nm ³	%	Lambua value
	mg/Nm³ Gas pressure upstream of ZPR			Gas temperature
		mg/Nm³ Gas pressure downstream of	%	
Gas train	Gas pressure upstream of ZPR	mg/Nm³ Gas pressure downstream of ZPR	% Gas moisture	Gas temperature
Gas train	Gas pressure upstream of ZPR	mg/Nm³ Gas pressure downstream of ZPR mbar	% Gas moisture	Gas temperature
	Gas pressure upstream of ZPR mbar T: intake air	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum	% Gas moisture % Δ P: gas mixer	Gas temperature Throttle valve position
Gas train Intake system	Gas pressure upstream of ZPR mbar T: intake air	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of	Gas temperature Throttle valve position T: exhaust gas upstream of
Gas train Intake system	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV	% Gas moisture % A P: gas mixer mbar T: mixture downstream of cooler	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B
Gas train Intake system Turbocharging	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure,	% Gas moisture % A P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust
Gas train Intake system Turbocharging Exhaust system	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B	% Gas moisture % A P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger
Gas train Intake system Turbocharging Exhaust system	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber
Gas train Intake system Turbocharging	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber
Gas train Intake system Turbocharging Exhaust system Lubrication	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mb CL circulation quantity,
Gas train Intake system Turbocharging Exhaust system	Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T T: CL engine inlet	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet	% Gas moisture % A P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating temperature	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mb CL circulation quantity, engine

Place: Customer's signature Maintenance personnel signature				
	Place:	Date:	Customer's signature	



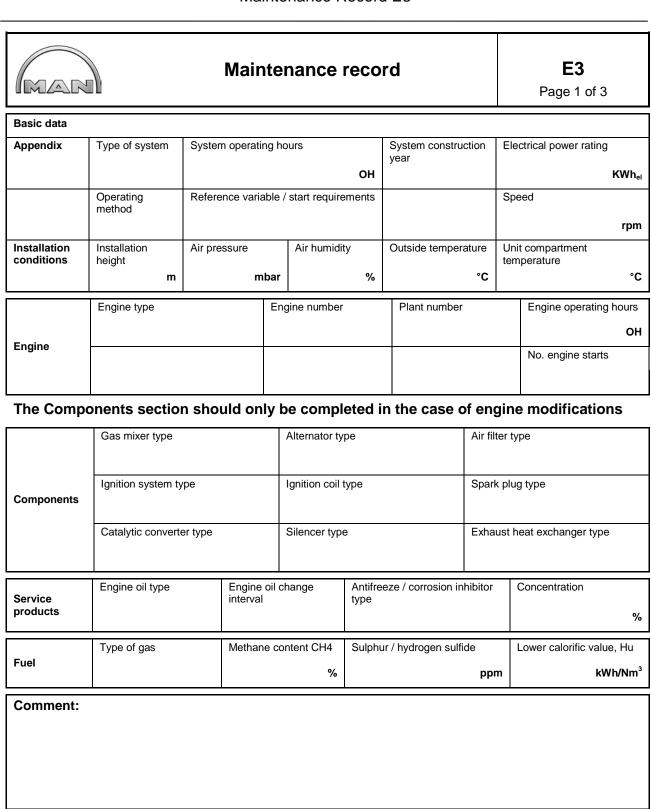
Maintenance personnel

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Place:

Maintenance Record E3

Notes on Maintenance Record E3



Maintenance personnel

signature

Place:



Place:

Date:

Maintenance record

E3

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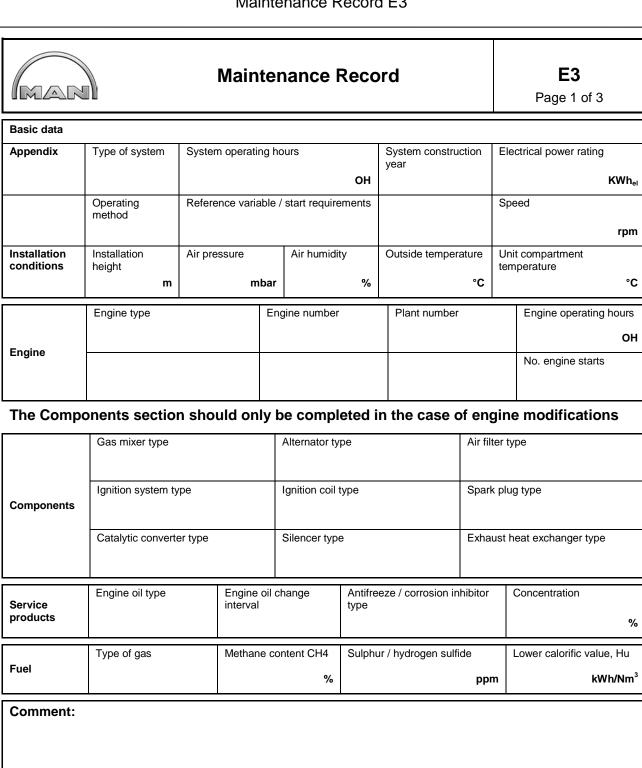
Operating data	of engine at 100% rated power	r		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ous trum	mbar	mbar	%	
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mb
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/m
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/m
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
ignition system	° bef. TDC	° bef. TDC	v	
Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	Trex emissions		oz coment er canadet gac	24544 74.45
	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	
Intaka ayatam	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging	mbar	mbar	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	noat oxonango.
Exhaust system				
Exhaust system	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
		T: engine oil	P: engine oii bar	
			bar P: CL engine operating	mb CL circulation quantity,
Lubrication	Measuring point, engine oil T	°C	bar	mb CL circulation quantity, engine
	Measuring point, engine oil T T: CL engine inlet	°C T: CL engine outlet	P: CL engine operating temperature	mb CL circulation quantity,

Customer's signature

Maintenance personnel signature

MAR			Ма	inten	ance	recor	'd				E3 e 3 of 3	
Type of system		Syster	n operatir	ng hours	Eı	ngine ope	erating ho	urs	Opera check	ating hour	s since la	ast
Engine type		Engine	e number		Pl	ant numb	oer			clearance		
Valve clearance on	"cold" en	gine (eng	jine temp	o. <50 °C)							
cylinder	1	2	3	4	5	6	7	8	9	10	11	12
Inlet actual measurement												
Outlet actual measurement												
cylinder	1	2	3	4	5	6	7	8	9	10	11	12
Inlet adjusted value	•						•					
Outlet adjusted value												
Compression press	uroe			1	1			l l				
Measurement conditions	Target	Act	ual									
Engine temperature	>50 °C											
Starter speed	>140 rp	m										
					Thro pressu	ttle valve	e must be	e open whe	en meas ust syste	uring cor	mpressic e measu	on iring
cylinder	1	2	3	4	5	6	7	8	9	10	11	12
Compression pressure before inspection												
Compression pressure after inspection												
Comment:												
Place:		Date:			Cu	stomer's	signature		Maintel signatu	nance pe	rsonnel	

Notes on Maintenance Record E3



Maintenance personnel

signature

Place:



Place:

Date:

Maintenance record

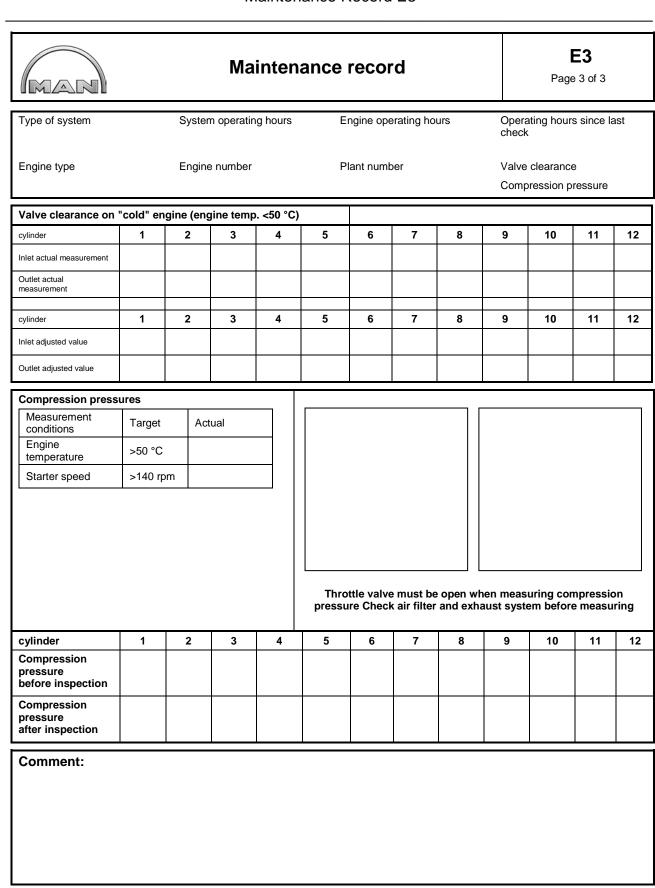
E3

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Operating data	of engine at 100% rated powe	•		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³ Gas pressure upstream of ZPR	mg/Nm³ Gas pressure downstream of	% Gas moisture	Gas temperature
Gas train	Gas pressure upstream of ZFK	ZPR	Gas moisture	Gas temperature
ous trum	mbar	mbar	%	۰
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging			cooler	ETC bank A/B
	mbar	mbar	°C	T. sub-sust see
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of	T: exhaust gas up/downstream of exhaust
Exhaust system			catalytic converter	heat exchanger
	°C Measuring point, engine oil T	T: engine oil	°C P: engine oil	P: crank chamber
Lubrication	weasuring point, engine on 1	1. engine on	1 . engine oii	1 . Grank Graniber
		°C	bar	mba
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	I/m
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture	P: CL LT mixture cooler	CL circulation quantity, LT
		cooler	operating temperature	mixture cooler
	°C Ignition time control	°C Ignition time measurement	Ignition energy	l/mi Spark plug electrode
Ignition system	ignition time control	ignition time measurement	ignition energy	distance
·	° bef. TDC	° bef. TDC	v	ı
Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
•	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train	mbar	mbar	%	۰
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging	21 : Historic doctor	1 : onargo un aponoum or 1 v	cooler	ETC bank A/B
	mbar	mbar	°C	o
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of	T: exhaust gas up/downstream of exhaust
Exhaust system			catalytic converter	heat exchanger
	°C	mbar	°C	۰
Lubrication	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mba
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating	CL circulation quantity,
			temperature	engine
Cooling circuit	°C	°C	bar	//mi
	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
		000.01	operating temperature	

Customer's signature

Maintenance personnel signature

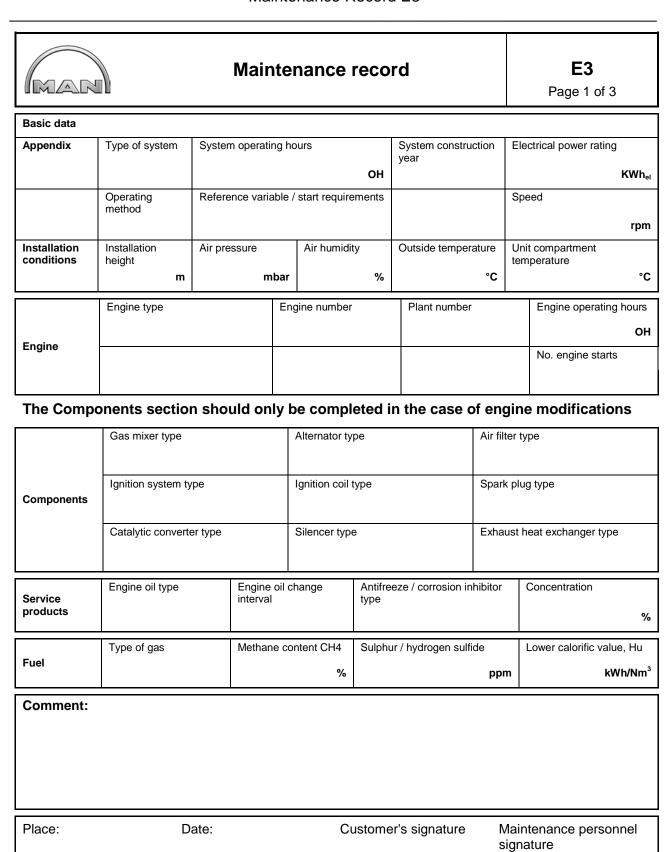


Maintenance personnel

signature

Place:

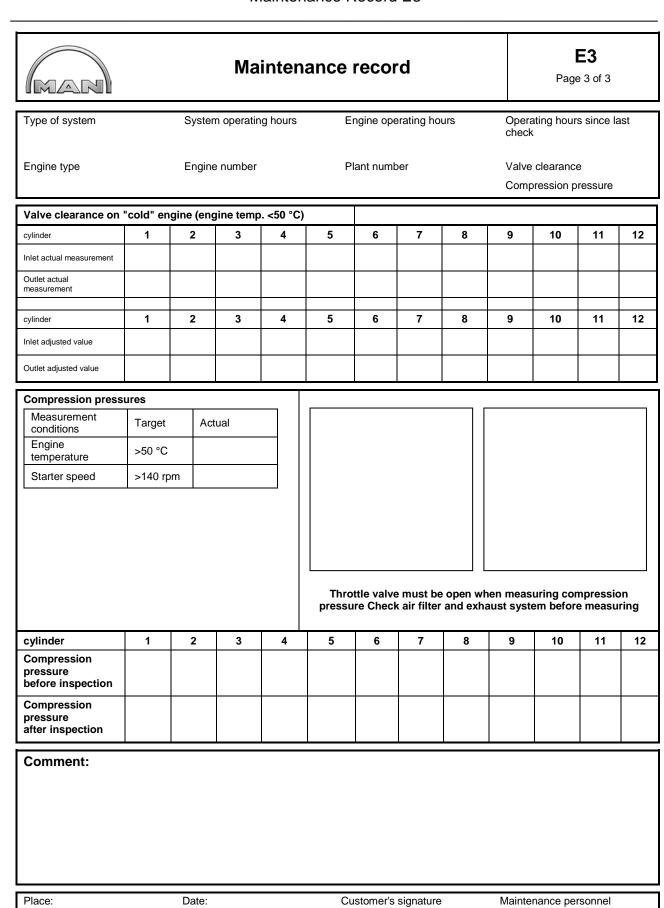
Notes on Maintenance Record E3





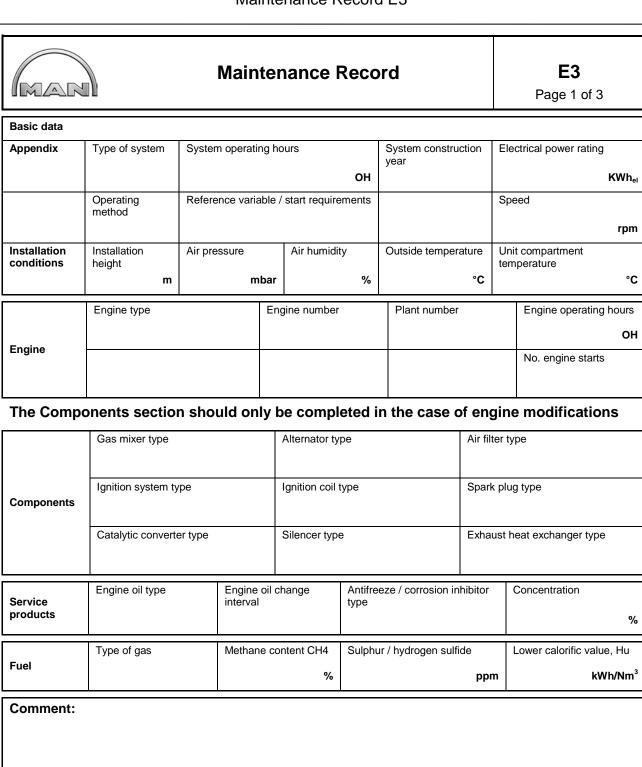
E3

	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	c
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
Turbocharging	mbar	mbar	°C	
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mb
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
Cooling circuit	°C	°C	bar	l/n
cooming circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/n
1	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
Ignition system	° bef. TDC	° bef. TDC	v	
Operating data	of engine at 50% rated power			
Operating data o	of engine at 50% rated power NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
		CO emissions mg/Nm ³	O2 content of exhaust gas	Lambda value
	NOx emissions	mg/Nm³ Gas pressure downstream of		Lambda value Gas temperature
Emissions	NOx emissions mg/Nm³ Gas pressure upstream of ZPR	mg/Nm³ Gas pressure downstream of ZPR	% Gas moisture	
Emissions	NOx emissions mg/Nm³	mg/Nm³ Gas pressure downstream of	% Gas moisture %	Gas temperature
Emissions Gas train	NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air	mg/Nm³ Gas pressure downstream of ZPR mbar	% Gas moisture	
Emissions Gas train	NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar	% Gas moisture % Δ P: gas mixer mbar	Gas temperature Throttle valve position
Emissions Gas train Intake system	NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum	% Gas moisture % Δ P: gas mixer	Gas temperature Throttle valve position
Emissions Gas train Intake system	NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of	Gas temperature Throttle valve position T: exhaust gas upstream o
Operating data of Emissions Gas train Intake system Turbocharging Exhaust system	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust gas up/downstream of exhaust
Emissions Gas train Intake system Turbocharging	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure,	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas
Emissions Gas train Intake system Turbocharging Exhaust system	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter	Gas temperature Throttle valve position T: exhaust gas upstream o ETC bank A/B T: exhaust gas up/downstream of exhaust
Emissions Gas train Intake system Turbocharging Exhaust system	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber
Emissions Gas train Intake system Turbocharging Exhaust system	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mt CL circulation quantity,
Emissions Gas train Intake system Turbocharging Exhaust system	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T T: CL engine inlet	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter P: engine oil bar P: CL engine operating temperature	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mt CL circulation quantity, engine
Emissions Gas train Intake system Turbocharging	MOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet °C	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating temperature bar P: CL LT mixture cooler	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mt CL circulation quantity, engine //m
Emissions Gas train Intake system Turbocharging Exhaust system Lubrication	Mox emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T T: CL engine inlet °C	mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet	% Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating temperature bar	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mb CL circulation quantity, engine



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Notes on Maintenance Record E3



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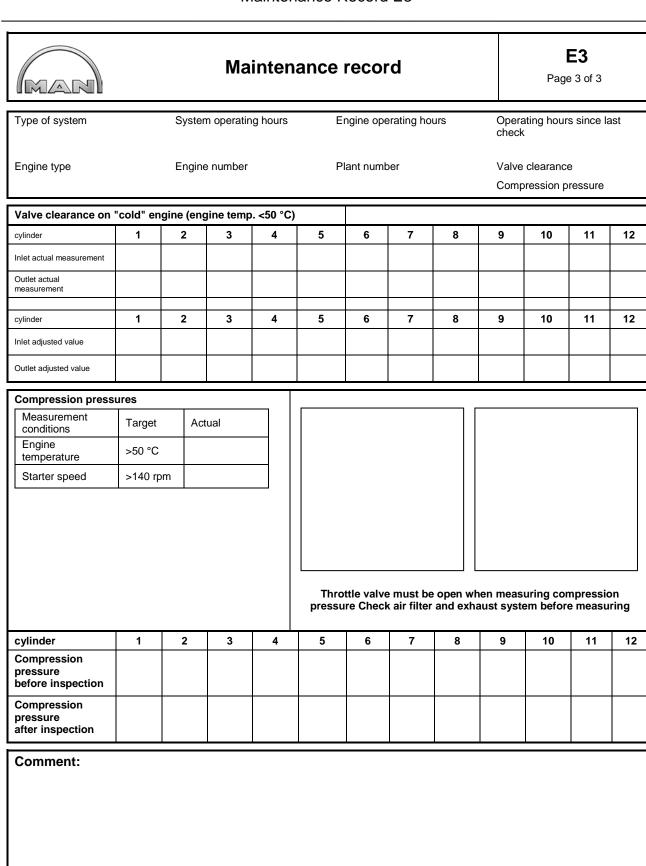
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Place:



E3

Operating data			<u>, </u>	
	of engine at 100% rated power	•		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR	0/	٠
	T: intake air	P: intake vacuum	% Δ P: gas mixer	Throttle valve position
Intake system			g.e	
	°C	mbar	mbar	Ti sybalist assumetroom of
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	,
	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of	T: exhaust gas up/downstream of exhaust
Exhaust system		_	catalytic converter	heat exchanger
	°C Measuring point, engine oil T	T: engine oil	°C P: engine oil	P: crank chamber
Lubrication	weasuming point, engine on i	1. engine on	F. engine on	r. Clarik Chambei
		°C	bar	mb
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	I/m
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	I/m
	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode
Ignition system	01 / TD0			distance
			I V	
	° bef. TDC	° bef. TDC	V	
Operating data	of engine at 50% rated power	bef. IDC	V	
		CO emissions	O2 content of exhaust gas	Lambda value
	of engine at 50% rated power			
	of engine at 50% rated power NOx emissions	CO emissions mg/Nm³ Gas pressure downstream of	O2 content of exhaust gas	
Emissions	of engine at 50% rated power NOx emissions mg/Nm³	CO emissions mg/Nm³	O2 content of exhaust gas	Lambda value Gas temperature
Emissions	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR	CO emissions mg/Nm³ Gas pressure downstream of ZPR	O2 content of exhaust gas % Gas moisture	Lambda value Gas temperature
Emissions Gas train	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer	Lambda value Gas temperature Throttle valve position
Emissions Gas train	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar	O2 content of exhaust gas % Gas moisture	Gas temperature Throttle valve position
Emissions Gas train Intake system	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler	Cas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B
Emissions Gas train Intake system	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C	Lambda value Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B
Emissions Gas train Intake system Turbocharging	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust
Emissions Gas train Intake system Turbocharging	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger
Emissions Gas train Intake system Turbocharging	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure,	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of	Lambda value Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger
Emissions Gas train Intake system Turbocharging Exhaust system	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil	Lambda value Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger
Emissions Gas train Intake system Turbocharging Exhaust system	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar	Lambda value Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber
Emissions Gas train Intake system Turbocharging Exhaust system	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil	Lambda value Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger
Emissions Gas train Intake system Turbocharging Exhaust system Lubrication	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T T: CL engine inlet °C	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating temperature bar	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mb CL circulation quantity, engine
Emissions Gas train Intake system Turbocharging Exhaust system Lubrication	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T T: CL engine inlet	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating temperature bar P: CL LT mixture cooler	Lambda value Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mb CL circulation quantity, engine
Emissions Gas train Intake system	of engine at 50% rated power NOx emissions mg/Nm³ Gas pressure upstream of ZPR mbar T: intake air °C Δ P: mixture cooler mbar T: exhaust gas upstream of ETC bank A/B °C Measuring point, engine oil T T: CL engine inlet °C	CO emissions mg/Nm³ Gas pressure downstream of ZPR mbar P: intake vacuum mbar P: charge air upstream of TV mbar P: exhaust gas back pressure, bank A/B mbar T: engine oil °C T: CL engine outlet °C	O2 content of exhaust gas % Gas moisture % Δ P: gas mixer mbar T: mixture downstream of cooler °C T: exhaust gas up/downstream of catalytic converter °C P: engine oil bar P: CL engine operating temperature bar	Gas temperature Throttle valve position T: exhaust gas upstream of ETC bank A/B T: exhaust gas up/downstream of exhaust heat exchanger P: crank chamber mb CL circulation quantity, engine //m CL circulation quantity, LT

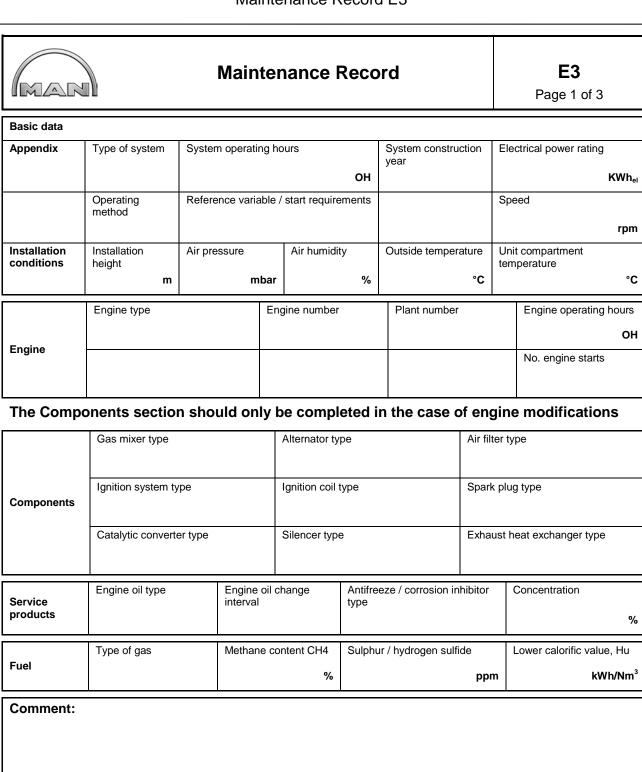


Maintenance personnel

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Notes on Maintenance Record E3



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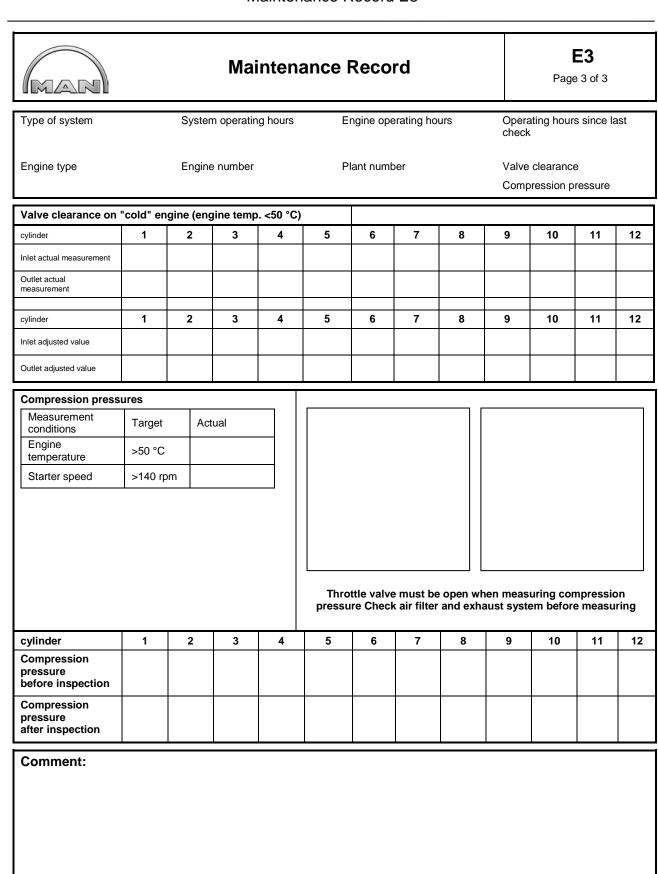


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		00 : :		
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of	Gas moisture	Gas temperature
Gas train		ZPR		
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	%
	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of	T: exhaust gas upstream of
Turbocharging			cooler	ETC bank A/B
	mbar	mbar	°C	°C
	T: exhaust gas upstream of	P: exhaust gas back pressure,	T: exhaust gas	T: exhaust gas
Exhaust system	ETC bank A/B	bank A/B	up/downstream of catalytic converter	up/downstream of exhaust heat exchanger
Extraust system	°C		°C	°C
	_	mbar		_
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication				
		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode
Ignition system				distance
- *	° bef. TDC	° bef. TDC	v	m

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Guo il ulli	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ruibocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

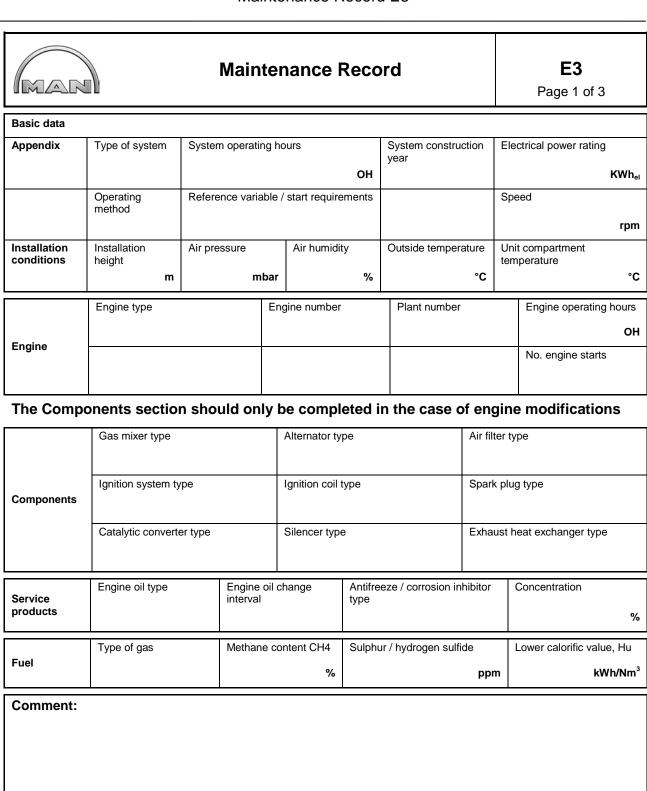
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Maintenance Record E3

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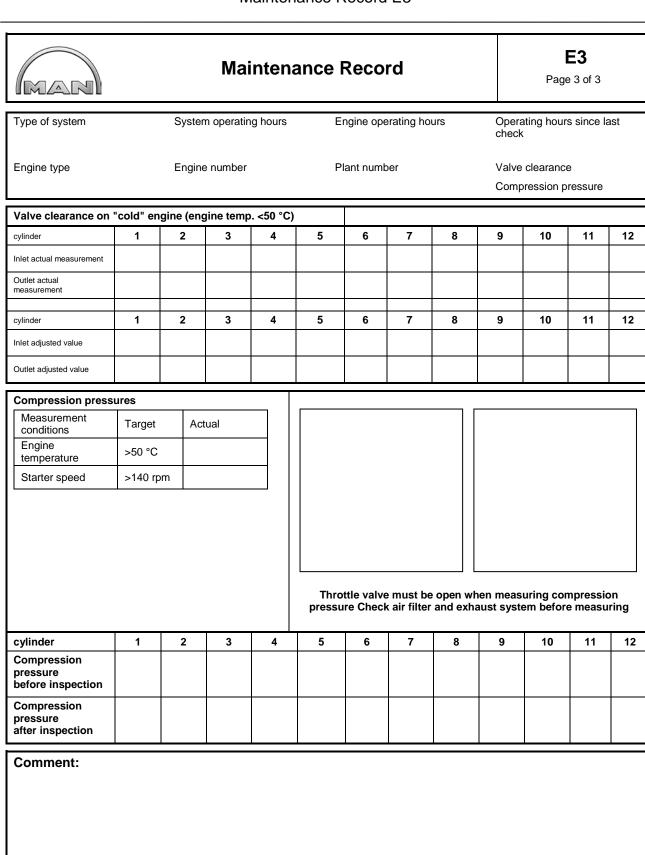


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	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	9/
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°(
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
•	°C	mbar	°C	°(
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mba
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/mi
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/mi
gnition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
gindon ayatem	° bef. TDC	° bef. TDC	V	r

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ous train	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
rurbocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



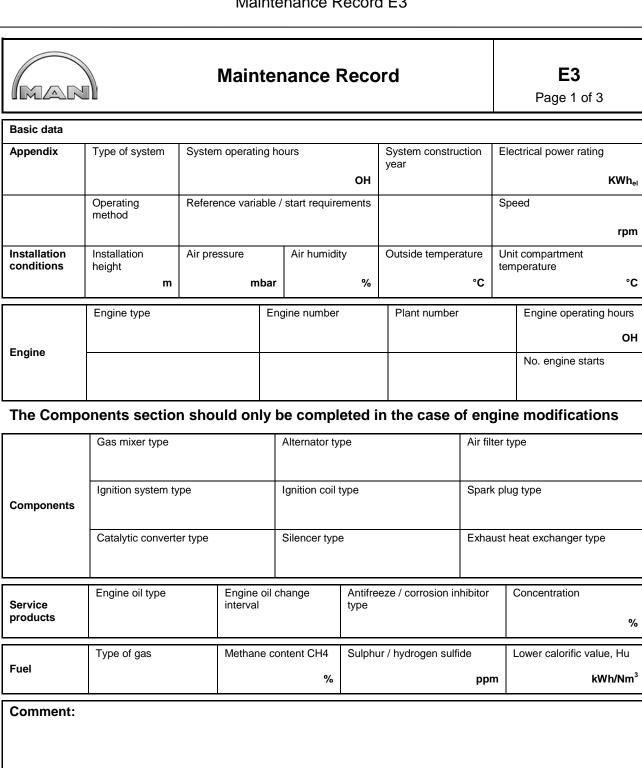
Maintenance personnel

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Place:

Maintenance Record E3

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Maintenance personnel

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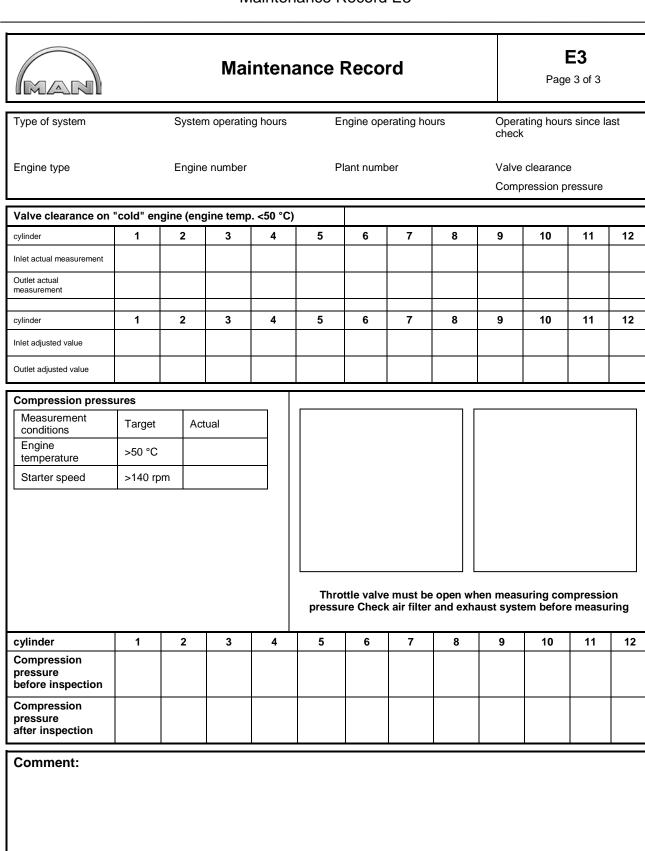
E3

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	of engine at 100% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ran soonarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginiton system	° bef. TDC	° bef. TDC	v	m

Operating data of	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ruiboonaiging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature

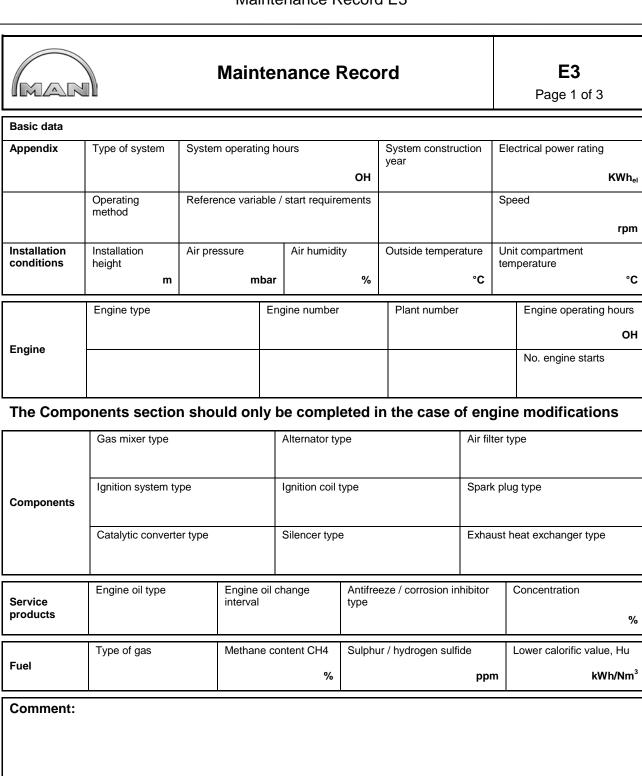


Maintenance personnel

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Notes on Maintenance Record E3			



Maintenance personnel

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Place:



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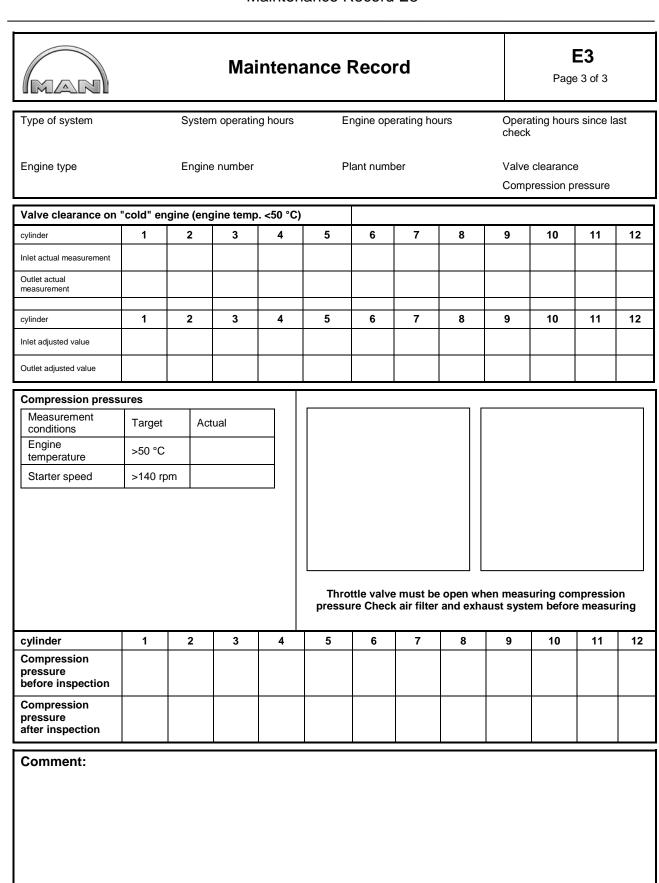
E3

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oporating data	of engine at 100% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ran soonarging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min
Ignition system	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
iginiton system	° bef. TDC	° bef. TDC	V	m

Operating data	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ruibocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



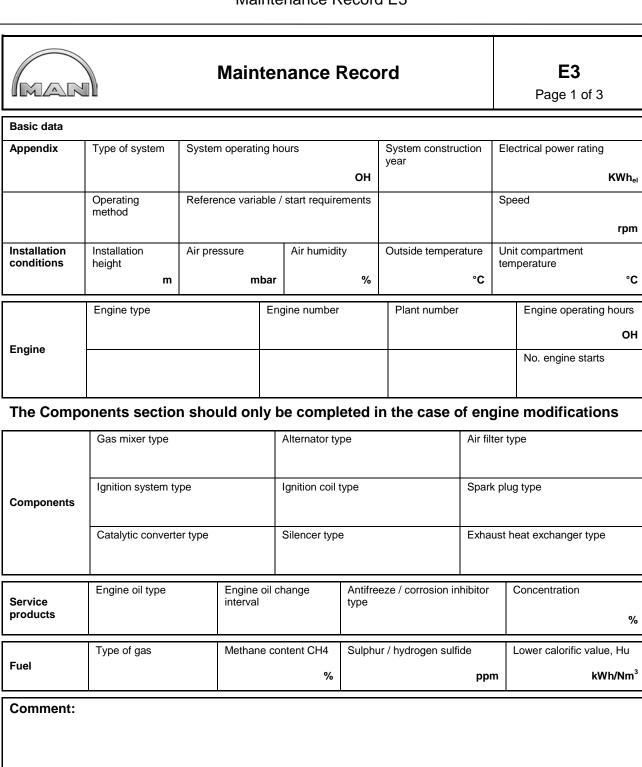
Maintenance personnel

signature

Place:

Maintenance Record E3

Notes on Maintenance Record E3			



Maintenance personnel

signature

Place:



Maintenance Record

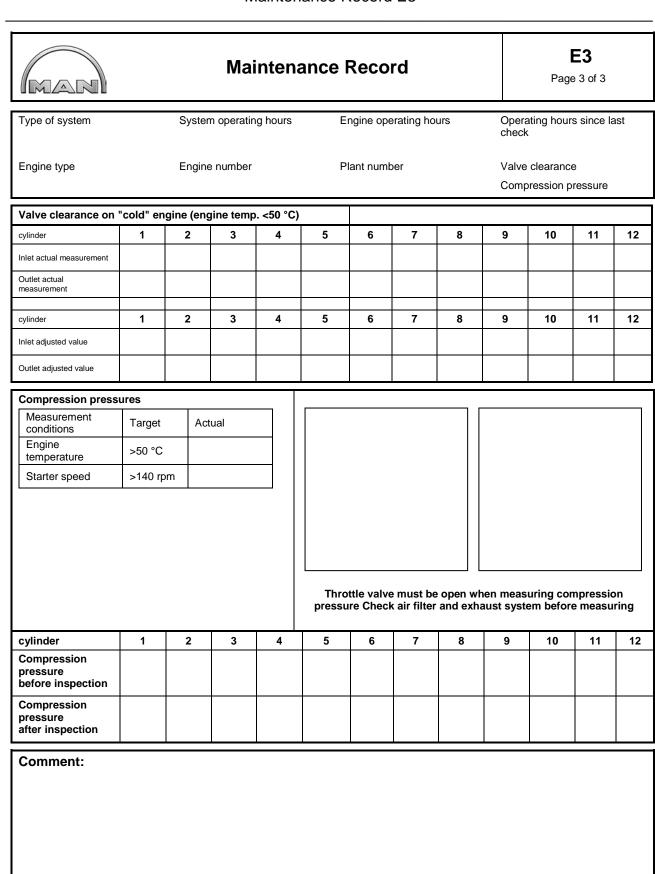
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	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions				
	mg/Nm³	mg/Nm³	%	
	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
Gas train	mbar	mbar	%	°(
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system				
	°C	mbar	mbar	9/
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mba
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/mir
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/mir
	Ignition time control	Ignition time measurement	Ignition energy	Spark plug electrode distance
Ignition system	° bef. TDC	° bef. TDC	v	n
Operating data	of engine at 50% rated power	-	1	1
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value

Operating data t	of engine at 50% rated power			
	NOx emissions	CO emissions	O2 content of exhaust gas	Lambda value
Emissions	mg/Nm³	mg/Nm³	%	
Gas train	Gas pressure upstream of ZPR	Gas pressure downstream of ZPR	Gas moisture	Gas temperature
ouo irum	mbar	mbar	%	°C
	T: intake air	P: intake vacuum	Δ P: gas mixer	Throttle valve position
Intake system	°C	mbar	mbar	%
Turbocharging	Δ P: mixture cooler	P: charge air upstream of TV	T: mixture downstream of cooler	T: exhaust gas upstream of ETC bank A/B
ruibocharging	mbar	mbar	°C	°C
Exhaust system	T: exhaust gas upstream of ETC bank A/B	P: exhaust gas back pressure, bank A/B	T: exhaust gas up/downstream of catalytic converter	T: exhaust gas up/downstream of exhaust heat exchanger
	°C	mbar	°C	°C
	Measuring point, engine oil T	T: engine oil	P: engine oil	P: crank chamber
Lubrication		°C	bar	mbar
	T: CL engine inlet	T: CL engine outlet	P: CL engine operating temperature	CL circulation quantity, engine
	°C	°C	bar	l/min
Cooling circuit	T: CL inflow LT mixture cooler	T: CL outflow LT mixture cooler	P: CL LT mixture cooler operating temperature	CL circulation quantity, LT mixture cooler
	°C	°C	bar	l/min

Place:	Date:	Customer's signature	Maintenance personnel signature



Maintenance personnel

signature

Place:

Maintenance Record E3

Notes on Maintenance Record E3

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