



Action code: **WHEN CONVENIENT**

### Engine Performance Evaluation

SL2014-590/OBN  
May 2014

#### Concerns

Owners and operators of MAN B&W two-stroke marine diesel engines. Type: ME/ME-C/ME-B/MC/MC-C and ME-GI

#### Summary

This service letter specifies the necessary data that must be submitted to MAN Diesel & Turbo to allow a precise and complete evaluation of the engine performance. Engine type specific measuring sheets are enclosed.

Dear Sirs

MAN Diesel & Turbo PrimeServ and warranty departments often have to carry out engine performance evaluations based on readings taken on board by the crew and sent to us. The purpose of such evaluations is to detect the existence or beginning of any faults and, by taking the appropriate countermeasures, to prevent any such incidents from developing into more serious breakdowns.

This service letter is an update of our previous service letter with the reference SL89-250/UM, as new performance sheets and engine types have been introduced since then.

Yours faithfully

**Per Rud**  
Vice President  
PrimeServ Two-stroke

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Amtsgericht Augsburg



Engine performance evaluations can only be as accurate as the data sent to us. However, in some cases the data received has been so incomplete or inadequate that we have been unable to carry out a complete evaluation.

Enclosures 1, 2 and 3 specify the essential data for such evaluations depending on engine type. Enclosure 1 applies to our MC/MC-C engines, Enclosure 2 applies to our ME/ME-C engines and Enclosure 3 to our ME-B type engines.

The enclosures list the essential data required as well as the effect if this data is not included. As can be seen from the enclosures, most of the data is necessary for a complete evaluation, and if any of the data is missing, for example due to a damaged or malfunctioning instrument, the final evaluation will be much less accurate.

For plants not fitted with indicator gear or any electronic measuring equipment, a power meter can be used instead. Data obtained with a power meter will be compared with a power estimate based on turbocharger revolutions, scavenge air pressure and fuel index.

For your information, we have also enclosed a copy of the measuring sheets used for our various engine designs.

Enclosure 4 shows the sheet used for MC/MC-C engines, Enclosure 5 the sheet for ME/ME-C engines and Enclosure 6 the relevant sheet for our ME-B engines.

The measuring sheets include a complete set of readings specifying the water and oil pressures and temperatures. These readings are not required for the performance evaluation, but can be useful when evaluating the running condition of the engine.

The optimum would be to receive three sets of measurements at 50%, 75% and at the highest engine load obtainable, preferably close to 100%, as this will result in the most reliable evaluation.

The engine performance evaluation service is provided against payment according to the prevailing service letter in this regard, which for 2014 is SL13-581/MIP.

Please direct any inquiries and questions regarding tables or condition-based overhaul to our Operation Department at [leo@mandieselturbo.com](mailto:leo@mandieselturbo.com) or to our Service Department at [PrimeServ-cph@mandieselturbo.com](mailto:PrimeServ-cph@mandieselturbo.com).

Enclosures:

1. Data required for MC/MC-C and older engines
2. Data required ME/ME-C
3. Data required for ME-B
4. Measuring sheet for MC/MC-C
5. Measuring sheet for ME/ME-C
6. Measuring sheet for ME-B

### MC/MC-C and older engines


Readings	Unit	The following cannot be evaluated or calculated if measurement is missing
Ambient barometric pressure Draft fore Draft aft Total running hours	mBar or mmHG or HPa M M hours	Correction to ISO, TC efficiency Light/heavy propeller, hull fouling Light/heavy propeller, hull fouling Identification of observation time
$p_{max}$ control Engine speed Engine load	bar r/min bhp or kW	$P_{max}$ adjustment Power calculation, light/heavy propeller
$p_i$ $p_{max}$ $p_{comp}$	bar bar bar	Power calculation, power distribution Cylinder condition $p_{max}-p_{comp}$ , $p_{comp}/p_{scav}$ Cylinder condition $p_{max}-p_{comp}$ , $p_{comp}/p_{scav}$
Fuel pump index VIT index		Fuel pump condition, power estimation $p_{max}$ adjustment
Exhaust valve temperature Temperature before TC Temperature after TC	°C °C °C	Combustion condition TC efficiency, heat load on engine Turbine condition, heat load on engine
Exhaust receiver TC outlet pressure TC revolutions	bar or mmHG mmWaterGauge r/min	TC efficiency TC efficiency, economizer condition TC efficiency, power estimation
$\Delta P$ TC filter $\Delta P$ air cooler $p_{scav}$ $t_{scav}$	mmWaterGauge mmWaterGauge bar or mmHG °C	TC efficiency, filter condition TC efficiency, air cooler condition TC efficiency, $p_{comp}/p_{scav}$ TC efficiency, correction to ISO, air cooler condition.
TC blower inlet temp. Air cooler water inlet temp. Air cooler water outlet temp.	°C °C °C	TC efficiency, correction to ISO Air cooler condition Air cooler condition

**ME engines**


Readings	Unit	The following cannot be evaluated or calculated if measurement is missing
Ambient barometric pressure	mBar or mmHG or HPa	Correction to ISO, TC efficiency
Draft fore	M	Light/heavy propeller; hull fouling
Draft aft	M	Light/heavy propeller; hull fouling
Total running hours	hours	Identification of observation time
Engine speed	r/min	Power calculation, light/heavy propeller
Engine load	kW	
$p_i$	bar	Power calculation, power distribution
$p_{max}$	bar	Cylinder condition $p_{max}-p_{comp}$ , $p_{comp}/p_{scav}$
$p_{comp}$	bar	Cylinder condition $p_{max}-p_{comp}$ , $p_{comp}/p_{scav}$
Fuel index ECU		Power estimation
Exhaust valve temperature	°C	Combustion condition
Temperature before TC	°C	TC efficiency, heat load on engine
Temperature after TC	°C	Turbine condition, heat load on engine
Exhaust receiver	bar or mmHG	TC efficiency
TC outlet pressure	mmWaterGauge	TC efficiency, economizer condition
TC revolutions	r/min	TC efficiency, power estimation
$\Delta P$ TC filter	mmWaterGauge	TC efficiency, filter condition
$\Delta P$ air cooler	mmWaterGauge	TC efficiency, air cooler condition
$p_{scav}$	bar or mmHG	TC efficiency, $p_{comp}/p_{scav}$
$t_{scav}$	°C	TC efficiency, correction to ISO, air cooler condition.
TC blower inlet temp.	°C	TC efficiency, correction to ISO
Air cooler water inlet temp.	°C	Air cooler condition
Air cooler water outlet temp.	°C	Air cooler condition
High load offset	%	Fuel equipment condition
Low load offset	%	Fuel equipment condition
Fuel quality adjust. (FQA)	%	ECS against real engine load
$p_{max}$ offset	bar	Fuel equipment condition
$p_{comp}/p_{scav}$ offset	bar	Exhaust system condition
Exh. valve opening timing	°CA	$p_{scav}$ evaluation
MOP estimated load	kW	Verifying engine load
Torque meter load	kW	Verifying engine load

**ME-B engines**


Readings	Unit	Following cannot be evaluated or calculated if measurement is missing
Ambient barometric pressure Draft fore Draft aft Total running hours	mBar or mmHG or HPa M M hours	Correction to ISO, TC efficiency Light/heavy propeller, hull fouling Light/heavy propeller, hull fouling Identification of observation time
Engine speed Engine load	r/min kW	Power calculation, light/heavy propeller
$p_i$ $p_{max}$ $p_{comp}$	bar bar bar	Power calculation, power distribution Cylinder condition $p_{max}-p_{comp}$ , $p_{comp}/p_{scav}$ Cylinder condition $p_{max}-p_{comp}$ , $p_{comp}/p_{scav}$
Fuel index ECU		power estimation
Exhaust valve temperature Temperature before TC Temperature after TC	°C °C °C	Combustion condition TC efficiency, heat load on engine Turbine condition, heat load on engine
Exhaust receiver TC outlet pressure TC revolutions	bar or mmHG mmWaterGauge r/min	TC efficiency TC efficiency, economizer condition TC efficiency, power estimation
$\Delta P$ TC filter $\Delta P$ air cooler $p_{scav}$ $t_{scav}$	mmWater Gauge mmWaterGauge bar or mmHG °C	TC efficiency, filter condition TC efficiency, air cooler condition TC efficiency, $p_{comp}/p_{scav}$ TC efficiency, correction to ISO, air cooler condition.
TC blower inlet temp. Air cooler water inlet temp. Air cooler water out let temp.	°C °C °C	TC efficiency, correction to ISO Air cooler condition Air cooler condition
High load offset Low load offset	% %	Fuel equipment condition Fuel equipment condition
Fuel quality adjust. (FQA)	%	ECS load against real engine load
$p_{max}$ offset	bar	Fuel equipment evaluation
MOP estimated load	kW	Verifying engine load.
Torque meter load	kW	Verifying engine load

<b>SERVICE DATA</b>	Engine Type:		Name of vessel:																
	Engine Builder:		Engine No.:				Yard:												
Layout kW:			Layout RPM:			Sign.:						Test No.:							
<b>Turbocharger(s)</b>			No. of TC:			Serial No.			No. of Cyl.:			Bore, m:			Stroke, m:				
Make:			Type:			1			Cylinder Constant (kW,bar):			Mean Friction. Press., bar:							
Max. RPM:			Max. Temp., °C:			2			Lubrication Oil System (Tick box) <input type="checkbox"/> Internal <input type="checkbox"/> External from M. E. System <input type="checkbox"/> External from Gravity Tank										
Compr. Slip Factor:			Compr. Diam., m:			3													
TC specification:			4																
<b>Observation No:</b>																			
Fuel Oil Viscosity:						at:			°C			Brand			Type				
Bunker Station:						Cylinder Oil			Circulating Oil										
Oil Brand:						Heat value, kJ/kg:			Turbo Oil										
Density kg/m³, at:			°C			Sulphur, %:													
Test Date (yyyy-mm-dd)	Test Hour (hh:mm)	Load %	Ambient Pressure mbar			Engine RPM			Total Running Hours			Governor index			Speed Setting bar	VIT Control bar			
Effective Power kW	Indicated Power kW	Eff. Fuel Consumption g/kWh	Indicated Fuel Consumption g/kWh						Draft Fore, m			Log Knots	Wind, m/s		Direction, °				
									Draft Aft, m			Obs. Knots	Wave Height, m		Direction, °				
<b>Cylinder No.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>Ave.</b>
Pi, bar																			
Pmax, bar																			
Ref. Pmax, bar																			
Pcomp, bar																			
Fuel Pump Index																			
VIT index																			
Exhaust Gas Temp., °C																			
Cooling Water Outlet Temp., °C																			
Piston Outlet Lub. Temp., °C																			
Cooling Water Temperature, °C			Exhaust Gas Temp., °C			Exhaust Pressure			Turbo Charger RPM	Aux. Blower On/Off	Scavenge Air Pressure								
Air Cooler		Main Engine	Turbine		Receiver	Turb. Outl.		mm			Axial Vibration	▲p Filter	▲p Cooler	Receiver					
Inlet	Outlet	Inlet	Turb. Outlet	Inlet	Outlet	bar	mmWC					mmWc	mmWc	bar					
1	1		1	1	1		1	1		1	1								
2	2	Seaw. Temp.	2	2	2		2	2		2	2								
3	3		3	3	3		3	3		3	3								
4	4		4	4	4		4	4		4	4								
Ave.	Ave.		Ave.	Ave.	Ave.		Ave.	Ave.		Ave.	Ave.								
Scavenge Air Temperature, °C						Lubricating Oil						Fuel Oil Pressure							
Scavenge Air Temperature	Inlet Blower		Before Cooler		After Cooler		Pressure, bar		Temperature, °C		Temperature, °C		bar						
	1		1		1		System Oil		Inlet Engine		TC Inlet / Blower end	TC Outlet / Turb. end	Before Filter						
	2		2		2		Cooling Oil		Inlet Cam		1	1	After Filter						
	3		3		3		Cam Shaft Oil		Outlet Cam		2	2	Temperature, °C						
	4		4		4		Turbine Oil		Thrust Segment		3	3	Before Pumps						
	Ave.		Ave.		Ave.						4	4							
										Ave.	Ave.								

Remarks:

<b>SERVICE DATA (ME)</b>		Engine Type:		Name of vessel:																													
		Engine Builder:		Engine No.:		Yard:																											
Layout kW:		Layout RPM:		Engine Mode:		Sign.:		Test No.:																									
<b>Turbocharger(s)</b>		No. of TC:		Serial No.		No. of Cyl.:		Bore, m:		Stroke, m:																							
Make:		Type:		1		Cylinder Constant (kW,bar):		Mean Friction. Press., bar:																									
Max. RPM:		Max. Temp., °C:		2		Lubrication Oil System (Tick box) <input type="checkbox"/> Internal <input type="checkbox"/> External from M. E. System <input type="checkbox"/> External from Gravity Tank																											
Compr. Slip Factor:		Compr. Diam., m:		3																													
TC specification:				4																													
<b>Observation No:</b>																																	
Fuel Oil Viscosity:				at: °C				Brand				Type																					
Bunker Station:				Cylinder Oil																													
Oil Brand:				Heat value, kJ/kg:				Circulating Oil																									
Density kg/m³, at: °C		Sulphur, %:		Turbo Oil																													
Test Date (yyyy-mm-dd)		Test Hour (hh:mm)		Load %		Ambient Pressure mbar		Engine RPM		Fuel Index ECU %		Speed Setting RPM		Draft Fore, m		Log Knots		Wind, m/s		Direction, °													
														Draft Aft, m		Obs. Knots		Waves, m		Direction, °													
Effective Power kW		Indicated Power kW		Eff. Fuel Consumption g/kWh		Indicated Fuel Consumption g/kWh		Total Running Hours		MOP Estimated Engine Load %		MOP Pmax bar		MOP Pcomp bar		MOP Pcomp/Pscav																	
<b>Cylinder No.</b>		<b>All</b>		<b>1</b>		<b>2</b>		<b>3</b>		<b>4</b>		<b>5</b>		<b>6</b>		<b>7</b>		<b>8</b>		<b>9</b>		<b>10</b>		<b>11</b>		<b>12</b>		<b>13</b>		<b>14</b>		<b>Ave.</b>	
Pi, bar																																	
Pmax, bar																																	
Ref. Pmax, bar																																	
Pcomp, bar																																	
High Load Offset, %																																	
Low Load Offset, %																																	
Fuel Quality Adjust. (FQA), %																																	
Pmax Offset, bar																																	
Pcomp/Pscav Offset																																	
Exh. Valve Open Timing, °CA (Correction value)																																	
Exhaust Gas Temp., °C																																	
Cool. Water Outlet Temp., °C																																	
Piston Outlet Lub. Temp., °C																																	
Cooling Water Temperature, °C				Exhaust Gas Temp., °C				Exhaust Pressure				Turbo Charger		Aux. Blower		Scavenge Air Pressure																	
Air Cooler		Main Engine		Turbine				Receiver		Turb. Outl.		RPM		On/Off		▲p Filter		▲p Cooler		Receiver													
Inlet		Outlet		Inlet		Outlet		bar		mmWC						mmWc		mmWc		bar													
1		1		1		1				1		1				1		1															
2		2		2		2		Variable XBP Actual, %		2		2		Axial Vibration		2		2		Pscav Set Point													
3		3		3		3		Variable XBP Set Point, %		3		3				3		3															
4		4		4		4				4		4				4		4															
Ave.		Ave.		Ave.		Ave.				Ave.		Ave.				Ave.		Ave.															
Scavenge Air Temperature, °C				Lubricating Oil				Fuel Oil Pressure		Hydraulic Pressure																							
Inlet Blower		Before Cooler		After Cooler		Pressure, bar		Temperature, °C		bar		bar																					
1		1		1		System Oil		TC Inlet / Blower end		Before Filter		Before Filter																					
2		2		2		Cooling Oil		1		After Filter		After Filter																					
3		3		3		Turbine Oil		2		Temperature, °C Before Pumps		Main Pressure																					
4		4		4		Temperature, °C Inlet Engine		3				Swash Plate Position, %																					
Ave.		Ave.		Ave.		Thrust Segment		4				1																					
								Ave.				2																					
												3																					
												4																					

Remarks:

<b>SERVICE DATA (ME-B)</b>	Engine Type:		Name of vessel:																														
	Engine Builder:		Engine No.:		Yard:																												
Layout kW:		Layout RPM:		Engine Mode:		Sign.:		Test No.:																									
<b>Turbocharger(s)</b>		No. of TC:		Serial No.		No. of Cyl.:		Bore, m:		Stroke, m:																							
Make:		Type:		1		Cylinder Constant (kW,bar):		Mean Friction. Press., bar:																									
Max. RPM:		Max. Temp., °C:		2																													
Compr. Slip Factor:		Compr. Diam., m:		3																													
TC specification:				4																													
<b>Observation No:</b>																																	
Fuel Oil Viscosity:				at: °C				Brand				Type																					
Bunker Station:								Cylinder Oil																									
Oil Brand:				Heat value, kJ/kg:				Circulating Oil																									
Density kg/m³, at: °C				Sulphur, %:				Turbo Oil																									
Test Date		Test Hour		Load		Ambient Pressure		Engine RPM		Fuel Index ECU		Speed Setting		Draft Fore, m		Log Knots		Wind, m/s		Direction, °													
(yyyy-mm-dd)		(hh:mm)		%		mbar		RPM		%		RPM		Draft Aft, m		Obs. Knots		Waves, m		Direction, °													
Effective Power		Indicated Power		Eff. Fuel Consumption		Indicated Fuel Consumption		Total Running Hours		MOP Estimated Engine Load		MOP Pmax		MOP Pcomp		MOP Pcomp/Pscav																	
kW		kW		g/kWh		g/kWh		Hours		%		bar		bar		bar																	
<b>Cylinder No.</b>		<b>All</b>		<b>1</b>		<b>2</b>		<b>3</b>		<b>4</b>		<b>5</b>		<b>6</b>		<b>7</b>		<b>8</b>		<b>9</b>		<b>10</b>		<b>11</b>		<b>12</b>		<b>13</b>		<b>14</b>		<b>Ave.</b>	
Pi, bar																																	
Pmax, bar																																	
Ref. Pmax, bar																																	
Pcomp, bar																																	
Pmax Offset, bar																																	
Fuel Quality Adjust. (FQA), %																																	
High Load Offset, %																																	
Low Load Offset, %																																	
Exhaust Gas Temp., °C																																	
Cool. Water Outlet Temp., °C																																	
Piston Outlet Lub. Temp., °C																																	
Cooling Water Temperature, °C				Exhaust Gas Temp., °C				Exhaust Pressure				Turbo Charger		T/C Nozzle Ring		Scavenge Air Pressure																	
Air Cooler		Main Engine		Turbine				Receiver		Turb. Outl.		RPM		Actual, %		▲p Filter		▲p Cooler		Receiver													
Inlet	Outlet	Inlet	Turb. Outlet	Inlet		Outlet		bar		mmWC						mmWc		mmWc		bar													
1	1		1	1		1				1		1		1		1		1															
		Seaw. Temp.	2	2		2		Variable XBP		2		2		2		2		2		Pscav													
			3	3		3		Variable XBP		3		3		3		3		3		Set Point													
			4	4		4		Set Point, %		4		4		4		4		4		bar													
			Ave.	Ave.		Ave.		Axial Vibr.		Ave.		Ave.		Ave.		Ave.		Ave.		Aux. Blower													
								mm		Ave.		Ave.		Ave.		Ave.		Ave.		On/Off													
Scavenge Air Temperature, °C				Lubricating Oil				Fuel Oil Pressure		Hydraulic Pressure																							
Inlet Blower		Before Cooler		After Cooler		Pressure, bar		Temperature, °C		bar		bar																					
1	1	1		1		System Oil		TC Inlet / Blower end	TC Outlet / Turb. end	Before Filter		Pump Inlet																					
2	2	2		2		Cooling Oil		1	1	After Filter		Main Pressure																					
3	3	3		3		Turbine Oil		2	2	Temperature, °C		Decay Time Ref.																					
4	4	4		4		Temperature, °C		3	3	Before Pumps		Swash Plate Position, %																					
Ave.	Ave.	Ave.		Ave.		Inlet Engine		4	4			1	2																				
						Thrust Segment		Ave.	Ave.			3	4																				

Remarks: