The First World Vocational College Skills Competition

Automobile Engine Disassembly, Assembly and Maintenance Module

Marking Form

Competitor No.	Time used	Completed or not	Signature by judge	Signature by jury president

Item	Operation process	Operation requirements	Marks	Marking Description	Deductions	Other notes
1. Operation preparation	Identify the tools, gauges, parts, etc.	Check the tools and gauges	1	If the tools and measuring instruments are not checked, no point will be awarded		
	Confirm the safety of workstation	Touch the engine with hands to see whether it is stable	1	Touch the engine, and report the check result		
2. Remove the cylinder head	Unscrew the bolts of the cylinder head in sequence	1 7 9 5 3 4 6 10 8 2	1	Refer to the sequence, unscrew the bolts from both sides to the middle		
	Use the tools	Indicating torque wrench + socket wrench (xxmm, optional)	2	Do not use pre-loaded torque wrenches		
	Unscrew the bolt in three steps at least	There should be three steps from 1 to 10. Points will be deducted	2	1 point will be deducted for every missed step		

		for every missed step		Do not use ratchet wrenches If ratchet wrenches are used, no point will be awarded		
	Remove the bolts of the cylinder head	Place the bolts by intake and exhaust sides	1	Bolts are neatly placed Intake and exhaust bolts can be seen clearly		
	Tap the cylinder head	Tap the left and right sides of the cylinder head with a wooden (rubber) hammer	1	If no action is taken, no point will be awarded		
	Pry up the cylinder head	Pry up the cylinder head with a screwdriver (left and right)	1	If no action is taken, no point will be awarded		
	Remove the cylinder head, and place it neatly.	Remove the cylinder head safely. If the cylinder head falls off, the competitor will be disqualified. If the cylinder head is not put in place, no point will be awarded.	1			
3. Remove the piston connecting rod set	Clean the carbon deposits on the top of the cylinder	Choose the cylinder designated by the judge (cylinder X); It is okay if there is an	2	If the competitor does not choose the cylinder designated by the		

		action of cleaning. It is not needed to use a tool such as a blade; It should be reported there is no carbon deposit and no ring ridge after cleaning.		judge, 1 point will be deducted (the judge points out the deduction, restore the designated cylinder), and 0.5 points will be deducted for every other item that is wrong		
	Place the cylinder face down	Do not place it horizontally.	1	If the engine is placed horizontally, no point will be awarded		
	Loosen two nuts	Loosen the nuts in at least two steps; Do it alternatively from left to right; Do not use ratchet wrenches in the first step; Do not use pre-loaded torque wrenches in the first step.	1.5	0.5 points will be deducted if the nuts are not loosened in several steps or alternatively 1 point will be deducted if the tools are not used correctly		Use socket wrenches only
	Remove the piston connecting rod set	Tap the connecting rod with a hammer handle gently Do not touch the surface of the connecting rod bearing Protect and	2	If the piston drops, no point will be awarded 1 point will be deducted for every error.		

		catch it with hands when it is removed.				
	Remove three piston rings	Use a piston ring expander to remove the first compression ring; Use a piston ring expander to remove the second compression ring; Remove the oil ring and packing ring manually.	2	The piston ring expander is not used, 0.5 points will be deducted. If the oil ring and packing ring are not removed manually, 1 point will be deducted		
	Remove the connecting rod bearing	The bearing can only be pushed out manually	0.5			
	Clean the piston connecting rod set	Clean the piston connecting rod set, piston ring, bearing, bearing cover, bolts with a rag and an air gun; After cleaning, blow it off with an air gun.	2	If the rag and air gun are not used, 0.5 points will be deducted separately If a part is not cleaned, 0.5 points will be deducted		
4. Check the piston	Check the piston visually	Clean the piston connecting rod set, piston ring, bearing, bearing cover, bolts visually; Report the results of visual inspection.	1.5	In case of no visual inspection, 1 point will be deducted If a part is not checked visually, 0.5 points will be deducted If the results are not reported, 0.5		

				points will be deducted		
	Clean the piston	Clean the measurement position	1	If the piston is not cleaned, no point will be awarded		
	Determine and mark the position where the piston diameter is measured	Mark the position 10mm from the lower edge of the piston.	0.5	If the position is not marked correctly, 0.5 points will be deducted		
	Select the micrometer correctly, clean and calibrate it	Select the micrometer suitable for the piston; Clean the micrometer; Calibrate the micrometer; Record the calibration error.	2	If the measuring surface is not clean, 1 point will be deducted 0.5 points will be deducted for every error		
	Determine the measuring point	Fix the piston (the connecting rod is fastened to the vise); Mark the measurement position.	1	0.5 points will be deducted for every error		
	Use gauges	Hold the gauge in correct position; Turn the ratchet before approaching the measuring point; Slowly approach the measuring surface; Turn the ratchet	2	0.5 points will be deducted for every error		

		approximately three times after confirming the position.				
	Read the values correctly and fill in the records	Refer to the values in the operation list;				
5. Check the piston ring	Clean the piston ring and piston ring groove	Clean them with a rag (old piston rings not provided) or blow them with an air gun.	0.5	If the air gun is not used, 0.5 points will be deducted		
	Measure the clearance (side clearance) of the first piston ring groove using a thickness gauge	Use the removed piston ring (cylinder x); There should be no wrinkles on the thickness gauge; The thickness gauge should be selected twice at least.	1.5	If no new piston ring is used, no point will be awarded for this item 0.5 points will be deducted for every other item that is not correct		
	Rotate the engine 180 degrees		0.5			
	Select the piston ring correctly	Select the first piston ring correctly	1	If it is not correct, no point will be awarded		
	Clean the cylinder		0.5	Non-woven fabric or air gun		
	Place the piston ring in the cylinder correctly	Place the piston ring flat at a position that is more than (15mm) away from the	1	If it is not placed flat or in a position that is more than 30mm away		

		cylinder plane, and add some lubricating oil.		from the cylinder plane, no point will be awarded; there will be no point for lubrication		
	Push the piston ring to the measuring position	Push it vertically to the measuring position (the connecting rod may not contact the cylinder); Confirm the measurement position with a steel ruler or caliper; The position is more than 15mm away from the top of the cylinder.	2	If the connecting rod contacts the cylinder, 1 point will be deducted If no gauge is used, no point will be awarded If the position is not correct, no point will be awarded		
	Clean the thickness gauge and measure the end clearance	Clean the thickness gauge; Use the correct measurement method (choose the thickness gauge twice at least); The measured end clearance value is accurate; Lubricate and maintain the thickness gauge.	2	If the thickness gauge is not cleaned, 0.5 points will be deducted If the measuremen t method is wrong, 1 point will be deducted If the thickness gauge is not lubricated and maintained, 1 point will be deducted		

	Remove the piston ring	Remove it from the top with hands	1			
	Clean all piston rings and pistons	Clean the piston surface; Clean the piston ring groove with an air gun; Clean the piston ring with an air gun.	1	0.5 points will be deducted for every missed step If the piston ring groove and piston ring are not cleaned with an air gun, 0.5 points will be deducted separately		
	Install three piston rings	Install the oil ring and packing ring manually; The oil ring opening is 180 degrees apart from the joint of the packing ring; Use a piston ring expander to install the first and second compression rings; The position of the piston ring is correct; The direction of the piston ring is correct.	2	1 point will be deducted for every error		
6. Measure the cylinder	Clean the cylinder		0.5			
	Determine the cylinder diameter preliminarily	Use a vernier caliper to measure the cylinder	0.5			

		diameter and determine the nominal size				
	Select the replacement rod and spacer, and install them on the gauge	After selection, the gauge should be 0.5-1mm larger than the cylinder diameter (Xx-xxmm rod; x-xmm spacer)	1	If the road or spacer selected is not correct, no point will be awarded		
	Install the cylinder bore gauge	The compression is 0.5-1mm, The dial should be perpendicular to the measuring rod, After installation, the needle moves flexibly	1	0.5 point will be deducted for every error		
	Select the correspondin g micrometer, clean and calibrate it	Select the micrometer; Clean the micrometer; Calibrate the micrometer; Record the calibration error.	1	If the measuring surface is not cleaned, 1 point will be deducted 0.5 points will be deducted for every error of other items		
	Set micrometer values	Fix the micrometer on a special stand (It can also be fixed on the vise, and the vice jaw should be equipped with a protector); Values are	1	If the micrometer is not fixed, 0.5 points will be deducted, (If the vice is not equipped with a protector,		

		measured by the vernier caliper and set in the maintenance manual, determine the nominal size (XXMM).		0.5 points will be deducted) If the normal size is not set correctly, 0.5 points will be deducted		
	Set the cylinder bore gauge to zero	The total pre-compression is 1-2mm Make an adjustment skillfully and correctly	1	If the compression is not correct, 0.5 points will be deducted; if it is not adjusted correctly, 1 point will be deducted		
	Measure and record the values	Measure the axial and radial values of the cylinder at a position 10mm away from the top plane of the cylinder; Measure the axial and radial values of the cylinder at a position 66mm away from the top plane of the cylinder; Measure the axial and radial values of the cylinder at a position 10mm away from the bottom plane of the cylinder;	3	1 point will be deducted for every error If the record is not correct, points will be deducted If the measurement is not correct, 0.5 points will be deducted for every error If the guide end gets in first, and does not tilt in and out,1 point will be deducted		

		When changing the measuring position, the measuring rod cannot be pulled and rotated in the cylinder; When reading the value, the line of sight should be vertical with the needle; The measurement process should accurate.				
7. Install the piston connecting rod set	Clean the cylinder and crankshaft journal	Clean the cylinder with non-woven or an air gun； Clean the crankshaft journal with non-woven fabric or an air gun.	1	0.5 points will be deducted for every missed step		
	Turn crankshaft to the bottom dead center of the cylinder		0.5			
	Lubricate all parts of the piston, cylinder wall, bearing, etc.	Piston skirt; In the piston ring groove; Piston pin; Bearing or journal surface; Cylinder wall.	2	0.5 points will be deducted for every missed step		
	Adjust the piston ring opening position according to the	The opening of the first compression ring is 45 degrees counterclockwis	3	1 point will be deducted for every error If the manual is		

	maintenance manual	e to the front center line of the piston; The opening of the first compression ring is 180 degrees apart from the opening of the second compression ring; The opening of the first compression ring is aligned with the opening of the oil ring. Consult the manual		not consulted, 1 point will be deducted		
	Compress the piston ring with the piston ring compression tool	Apply engine oil on the inner surface of the piston ring compression tool; Do not rotate the tool after it contacts with piston ring.	2	1 point will be deducted for every error		
	Check the bolts of two connecting rods	Check the bolts visually; Check the threaded part of bolts visually.	1	0.5 point will be deducted for every missed bolt		
	Install the piston connecting rod set	The piston is installed in the correct direction； The connecting rod bolts are fitted with covers; Push it in with a hammer handle.	2	1 point will be deducted for every error (If the judge finds that the assembly is not correct, he/she can stop it and		

		After the piston skirt enters the cylinder, gently tap the tool flat and tighten it again; Tap it in gently, making sure the connecting rod is in place.		ask the competitor to do it again. If it is a tool problem, stop the timer and change the tool)		
	Rotate the engine 180 degrees		0.5	If the engine is placed horizontally, no point will be awarded		
	Install the bearing cover	The bearing cover is installed in the correct direction； Apply a thin layer of engine oil on the threaded part of the bolts; Apply a thin layer of engine oil on the head of the bolts.	2.5	If it is not installed in the correct direction, no point will be awarded. If no engine oil is applied, 1 point will be deducted for each item		
	Correctly choose and adjust torque wrenches	Choose a wrench that matches the torque Adjustment values (30NM+1/4 turn or 90 degrees) are correct.	1	0.5 points will be deducted for every error		
	Tighten the nuts of two connecting rods to the specified torque	Twice at least; Do it alternatively from left to right; Apply force appropriately.	1	If the torque exceeds the standard value (the competitor does not stop it		

				immediately after a beep sounds), 1 point will be deducted 0.5 points will be deducted for every other item that is not correct		
	Rotate the crankshaft to check the motion of the piston	Rotate 360 degrees at least; Confirm the smooth rotation.	1.5	1 point will be deducted for every missed step If it is not well checked, 0.5 points will be deducted (ultimately the judge will confirm the operation condition and report any abnormality in time)		
8. Install the cylinder head	Install the cylinder gasket	Pay attention to the installation position	0.5			
	Install the cylinder head	The cylinder head is not allowed to move from side to side on the block.	0.5			
	Lubricate the bolts	Apply lubricating oil to the top and threaded parts of the cylinder head bolts.	1	If no lubrication is done, no point will be awarded 0.5 point will be		

				deducted for every missed part		
	Install the cylinder head bolts	Tighten the bolts in sequence manually 8 6 1 3 9 10 4 2 5 7	2	Refer to the fastening sequence If the regulations are not obeyed, no point will be awarded		
	Tighten the bolt in two steps	Tighten the bolt with a torque of 49N in the first step and turn it 180 degrees in the second step with a rigid wrench; Mark the top of the bolt	2	1 point will be deducted for every missed step If the bolt is not rotated to the specified torque, 1 point will be deducted		
9. Clear-up work after operation	Clean the tools, workbench, venue, etc.	Clean the workbench； Cleaning tools and special tools; Put tools and gauges back in place; Put used cleaning cloths, etc. into the trash bin.	1	0.5 points will be deducted for every missed step		
10. Safety and 5S		Safety and 5S in the whole process	5	If the venue is not cleaned in time, 1 point will be deducted 1 point will be deducted for every		

				improper operation 2 points will be deducted for every falling of parts, tools, etc. 5 points will be deducted for every damaged part 1 point will be deducted for every improper use of tools 4 points will be deducted if the tools are not collected, the venue is not cleaned and devices are not put back in place in the end		
11. Operation list			18	Refer to the content in the operation list		
Final mark (100 points)						