

1. DESCRIPTION

The International six cylinder, valve-in-head carbureted engine may be equipped to produce the type of engine and fuel system needed to meet specific working requirements.

Piston sets are available to adapt the engine for a most efficient operation at various altitudes. The pistons are furnished to cover two altitude ranges; standard and five thousand foot operating altitudes. A ten thousand feet operating altitude attachment is available for 269 and 282 series engines. (Refer to the parts catalog.)

The cylinder sleeves are replaceable, on engines so equipped. Crankshaft and connecting rod bearings are of the precision insert type and are replaceable. The lubrication system of the engine is force fed. The cylinder walls are lubricated by oil forced out of the sides of connecting rod bearings and thrown up to the pistons and the cylinder walls.

The crankcase and valve housing are ventilated to hold condensation effects to a minimum. The engine is protected against dust by a replaceable element oil filter system. Seals are used at all shaft openings to prevent unnecessary wear of engine parts by the entry of dust and to effectively prevent oil leakage.

It should be kept in mind that the procedures given in this manual are intended chiefly as a guide to cover most situations. The sequence of operation will depend on the mechanic himself and the extent of over-haul required.

Cleaning and inspection during engine repair must be constant, with further attention given to each component as it is disassembled. Plenty of clean cloths, solvent and compressed air should always be available whenever engine repair is performed.

2. SPECIFICATIONS

| Engine | | | |
|---|--------------------|--------------------|--------------------|
| ENGINE MODELS | U-220, UB-220 | U-240, UB-240 | U-264-6, UB-264 |
| GENERAL: | | | |
| Number of cylinders | 6 | 6 | 6 |
| Bore-inches | 3-9/16 | 3-9/16 | 3-11/16 |
| Stroke-inches | 3-11/16 | 4-1/64 | 4-1/8 |
| Displacement (cubic inch) | 220.50 | 240.30 | 264.33 |
| Carburetor | Zenith | Zenith | Zenith |
| Distributor gap-inch | .022 | .022 | .018 |
| Spark plug gap-inch | | | |
| Gasoline | .028 (U) | .028 (U) | .030 (U) |
| | .033 (UB) | .033 (UB) | .033 (UB) |
| LPG or natural gas | .013 | .013 | .013 |
| Rpm-low idle | 475-525 | 475-525 | 475-525 |
| Rpm-governed high idle | 2640 | 2640 | 2640 |
| Rpm-governed | 1800 | 1800 | 2400 |
| Compression ratio | 7:1 (U) 7.5:1 (UB) | 7:1 (U) 7.5:1 (UB) | 7:1 (U) 7.5:1 (UB) |
| Compression pressure, psi | | | |
| (at 200 rpm) | 163 | 164 | 165 |
| Firing order | 1-5-3-6-2-4 | 1-5-3-6-2-4 | 1-5-3-6-2-4 |
| CRANKSHAFT: | | | |
| Main journal diameter-inches . . | 2.748-2.749 | 2.748-2.749 | 2.748-2.749 |
| Maximum allowable main journal out of round-inch | .0015 | .0015 | .0015 |
| Maximum allowable main journal taper-inch | .0015 | .0015 | .0015 |
| Number of main bearings | 4 | 4 | 4 |
| Crankpin diameter-inches | 2.373-2.374 | 2.373-2.374 | 2.373-2.374 |

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2. SPECIFICATIONS - Continued

Engine - Continued

| ENGINE MODELS | U-220, UB-220 | U-240, UB-240 | U-264-6, UB-264 |
|--|-------------------------------------|--|-----------------------------|
| CRANKSHAFT - Continued | | | |
| Maximum allowable crankpin out of round-inch | .0015 | .0015 | .0015 |
| Maximum allowable crankpin taper-inch | .0015 | .0015 | .0015 |
| Bearing clearance-inch | .0014-.0040 | .0014-.0040 | .0012-.0042 |
| Crankshaft end play-inch | .005-.018 | .005-.018 | .005-.018 |
| Thrust taken by | Rear intermediate | Rear intermediate | Rear intermediate |
| Hardening method | Through | Through | Through |
| Bearing OD and spread-inches | 2.942 + .025 | 2.942 + .025 | 2.942 + .025 |
| CAMSHAFT: | | | |
| Camshaft journal diameter: | | | |
| Front-inches | 2.109-2.110 | 2.109-2.110 | 2.109-2.110 |
| Second-inches | 2.089-2.090 | 2.089-2.090 | 2.089-2.090 |
| Third-inches | 2.069-2.070 | 2.069-2.070 | 2.069-2.070 |
| Fourth-inches | 1.4995-1.5005 | 1.4995-1.5005 | 1.4995-1.5005 |
| Camshaft bearing clearance-inch | .001-.003 | .001-.003 | .001-.003 |
| Cam lobe lift-inch | .2647 ± .002 | .2647 ± .002 | .2647 ± .002 |
| Maximum permissible camshaft lobe wear-inch | .020 | .020 | .020 |
| Camshaft end play-inch | .002-.010 | .002-.010 | .002-.010 |
| Thrust taken by | Thrust flange | Thrust flange | Thrust flange |
| Timing gear backlash-inch | .004-.007 | .004-.007 | .004-.007 |
| CONNECTING RODS: | | | |
| End clearance on shaft-inch | .007-.013 | .007-.013 | .007-.013 |
| Connecting rod bearing clearance on journal-inch | .0011-.0032 | .0011-.0032 | .0009-.0035 |
| Bearing OD and spread-inches | 2.500 + .025 | 2.500 + .025 | 2.500 + .025 |
| PISTONS: | | | |
| Material | Aluminum Alloy | Aluminum Alloy | Aluminum Alloy w/steel band |
| Recommended piston clearance: | | | |
| Top of skirt-inch | .003 | .003 | .003 |
| Bottom of skirt-inch | .002 | .002 | .002 |
| PISTON PINS: | | | |
| Length-inches | 2.945-2.956 | 2.945-2.956 | 2.945-2.956 |
| Diameter-inches | .8748-.8749 | .8748-.8749 | .8748-.8749 |
| Pin fit (room temperature 70°F): | | | |
| Recommended clearance in rod-inch | .0002-.0005 (U) .0002-.0007 (UB) | .0002-.0005 | .0002-.0005 |
| Recommended clearance in piston: | | | |
| Tight end-inch | .0002L-.0004L | .0001L-.0002T .0001L-.0005L (U) .0002L-.0004L (UB) | .0002L-.0004L |

| ENGINE MODELS | U-220, UB-220 | U-240, UB-240 | U-264-6, UB-264 |
|---|--|--|--|
| FEELER GAUGE RIBBON | | | |
| CHECKING: | | | |
| Width-inch | 1/2 | 1/2 | .0008 to .0013 |
| Thickness-inch | .003 | .003 | Running |
| Tension on scales-pounds | 6-18 | 6-18 | clearance |
| Desired tension-pounds | 12 | 12 | micrometer fit |
| PISTON RINGS: | | | |
| Compression rings: | | | |
| Number used on each piston | 2 | 3 | 2 |
| Size-inch | (1) 3/32 | (1) 3/32 | (2) 3/32 |
| Oil Rings: | | | |
| Number used on each piston | 1 | 1 | 1 |
| Size-inch | 3/16 | 3/16 | 3/16 |
| Ring diameter-inches | 3-9/16 | 3-9/16 | 3-11/16 |
| Ring gap-inch: | | | |
| Compression | .016-.026 | .016-.026 | .015-.025 |
| Flex-type | No gap at ring joint (gap built between ring segments) | No gap at ring joint (gap built between ring segments) | No gap at ring joint (gap built between ring segments) |
| Fit in groove: | | | |
| Top-inch | .0025-.0040 (comp.) | .0025-.0040 (comp.) | .0025-.0040 (comp.) |
| Second-inch | .0015-.0030 (comp.) | .0015-.0030 (comp.) | .0025-.0040 (comp.) |
| Third-inch | .0025-.0040 (oil control) | .0025-.0040 (oil control) | .0025-.0040 (oil control) |
| INTAKE VALVES: | | | |
| Stem diameter-inch | .3715-.3725 | .3715-.3725 | .3715-.3725 |
| Angle of face-degrees | 30 | 30 | 30 |
| Valve to rock arm clearance (hot)-inch | .027 | .027 | .027 |
| Stem clearance in guide-inch | .0015-.0040 | .0015-.0040 | .0015-.0040 |
| Width of valve seat-inch | 3/64-5/64 | 3/64-5/64 | 3/64-5/64 |
| EXHAUST VALVES: | | | |
| Stem diameter-inch | .371-.372 | .371-.372 | .371-.372 |
| Angle of face-degrees | 30 | 30 | 30 |
| Valve to rocker arm clearance (hot)-inch | .027 | .027 | .027 |
| Stem clearance in guide-inch | .002-.0045 | .002-.0045 | .002-.0045 |
| Width of valve seat-inch | 5/64-7/64 | 5/64-7/64 | 5/64-7/64 |
| Slo-roto valve cap to stem clearance-inch | .001-.005 | .001-.005 | .001-.005 |
| VALVE GUIDES: | | | |
| Distance above head-inches | 1-7/32 (U) | 1-7/32 (U) | 1-7/32 (U) |
| Intake | 1-1/8±1/32 (UB) | 1-1/8±1/32 (UB) | 1-1/8±1/32 (UB) |
| Exhaust | 3/4±1/32 (UB) | 3/4±1/32 (UB) | 3/4±1/32 (UB) |
| Inside diameter-inch | .3755-.3765 (U) .3740-.3755 (UB) | .3755-.3765 (U) .3740-.3755 (UB) | .3755-.3765 (U) .3740-.3755 (UB) |
| VALVE LIFTER: | | | |
| Clearance in block-inch | .0005-.0030 | .0005-.0030 | .0005-.0030 |

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2. SPECIFICATIONS - Continued**Engine - Continued**

| ENGINE MODELS | U-220, UB-220 | U-240, UB-240 | U-264-6, UB-264 |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| VALVE SPRINGS: | | | |
| Free length-inches | 2-11/16 (U) 2.69 (UB) | 2-11/16 (U) 2.69 (UB) | 2-11/16 (U) 2.69 (UB) |
| Length valve open-inches | 1-11/16 (U) 1.683 (UB) | 1-11/16 (U) 1.683 (UB) | 1-11/16 (U) 1.683 (UB) |
| Pounds pressure-valve open | 149-158 (U) 151-160 (UB) | 149-159 (U) 151-160 (UB) | 149-158 (U) 151-160 (UB) |
| VALVE ROCKER ARM CLEARANCE ON SHAFT-inches | | | |
| | .0015-.0040 | .0015-.0040 | .0015-.0040 |
| VALVE TIMING *: | | | |
| Intake opens (before TDC)- degrees | 10 (U) 12 (UB) | 10 (U) 12 (UB) | 10 (U) 12 |
| Intake closes (after BDC)- degrees | 46 (U) 38 (UB) | 46 (U) 38 (UB) | 46 (U) 38 |
| Exhaust opens (before BDC)- degrees | 48 (U) 55 (UB) | 48 (U) 55 (UB) | 48 (U) 55 |
| Exhaust closes (after TDC)- degrees | 8 (U) 15 (UB) | 8 (U) 15 (UB) | 8 (U) 15 |
| Intake valve timing checking clearance-inch | .033 | .003 | .033 |
| OIL PUMP: | | | |
| Body gear and clearance-inch | .0025-.0055 | .0025-.0055 | .0025-.0055 |
| Pump body to gear clearance- inch | .0068-.0108 (U) .0034-.0054 (UB) | .0068-.0108 (U) .0034-.0054 (UB) | .0068-.0108 (U) .0034-.0054 (UB) |
| Pump shaft diameter below drive gear-inch | .4885-.4890 | .4885-.4890 | .4885-.4890 |
| Pump shaft diameter above drive gear-inch | .486-.487 | .486-.487 | .486-.487 |
| Pump shaft clearance in bore (max.)-inch | .0015-.0030 | .0015-.0030 | .0015-.0030 |
| Drive gear backlash-inch | .003-.006 | .003-.006 | .003-.006 |
| Idler gear to shaft clearance- inch | .0015-.0030 | .0015-.0030 | .0015-.0030 |
| Pump gear (body gear) backlash- inch | .003-.006 | .003-.006 | .003-.006 |
| FLYWHEEL HOUSING: | | | |
| Permissible run-out-inch | .000-.010 | .000-.010 | .000-.010 |
| OIL PRESSURES: | | | |
| Minimum pounds | 8-15 | 8-15 | 8-15 |
| At rpm | Idling | Idling | Idling |
| Maximum-pounds | 30-40 (U) 50-55 (UB) | 30-40 (U) 50-55 (UB) | 30-40 (U) 50-55 (UB) |
| At rpm | 1500 | 1500 | 1500 |

* Tolerance for valve timing is $\pm 10^{\circ}$. Refer to Par. 6A in Section 2 for checking procedure.