

PREFACE	5
1. PISTON COMPRESSOR	7
1.1. Introduction	7
1.2. Compressors types	7
1.3. Design solutions	8
1.4. Operating principle of piston type compressor	9
1.5. Theoretical backgrounds	10
1.5.1. The theoretical compressor without harmful volume.....	10
1.5.2. The theoretical compressor with harmful volume.....	11
1.5.3. Comparison of the theoretical compressor without harmful volume and the theoretical compressor with harmful volume	13
1.5.4. Boundary compression ratio.....	13
1.6. Comparison of the compressors working cycles.....	14
1.7. Handling compressor indicator diagram	15
1.8. Calculation of the theoretical compressor without harmful volume.....	19
1.9. Calculation of the theoretical compressor with harmful volume	20
1.10. Values for the comparison	21
1.11. The purpose of the laboratory work	21
1.12. An experimental unit	22
1.13. Necessary data for the preparing the laboratory work report.....	23
1.14. Summarizing calculations results.....	24
1.15. Report of the laboratory work	24
2. CAR AIR CONDITIONER SYSTEM	25
2.1. Introduction	25
2.2. The theory – car conditioning principle	25
2.3. Theory of refrigerants.....	27
2.4. Air conditioning system of the car	29
2.5. A/C System major components	30
2.6. The laboratory test setup	37
2.7. Laboratory exercise.....	39
3. INDICATOR DIAGRAM	43
3.1. Introduction	43
3.2. Calculations of engine operating parameters based on the indicator diagram.....	45
3.3. The efficiency and energy balance of the combustion engine.....	48
3.4. Theoretical cycles of four-stroke combustion engines.....	51
3.5. Matching the theoretical cycle to the actual closed indicator diagram of the engine	57

3.6. The aim of the laboratory exercise.....	59
3.7. Tasks.....	59
3.8. Laboratory report	60
4. CHARACTERISTICS OF INTERNAL COMBUSTION ENGINE	61
4.1. Speed characteristics of the internal combustion engine	61
4.1.1. The definition of spark ignition engine speed characteristic.....	61
4.1.2. Engine test bench and examination procedure.....	64
4.1.3. The main equations used for engine operation parameters calculations.....	66
4.1.4. Laboratory report content.....	68
4.2. Load characteristic of the internal combustion engine	69
4.2.1. Parameters of the load characteristic.....	69
4.2.2. Main formulas used in the measurement results processing.....	73
4.2.3. A consequence of the exercise implementation.....	73
4.2.4. The content of the report	75
5. MEASUREMENTS OF POLLUTANT EMISSIONS FROM COMBUSTION ENGINES.....	76
5.1. Harmful substances formation in the exhaust gas of internal combustion engines	76
5.2. Effect of exhaust gases harmful substances emission on the environment.....	79
5.3. Hazards caused by toxic compounds emitted by combustion engines – selected toxic components in exhaust gases.	80
5.4. Methods used for measurement of the concentration of toxic constituents in the exhaust gas.....	85
5.5. Methods used for measurement of solid particles.....	87
5.6. Study on specific emission of exhaust gas toxic components.....	89
5.6.1. Emission norms for toxic substances obligated for non-road vehicles	89
5.6.2. Processing of the measurement results.....	92
REFERENCES.....	93