

DESIGN AND CONSTRUCTION OF A
GAS DETECTOR

Project report submitted by

NEOPHYTOU KRITONAS ANASTASIOU

in part satisfaction of the award of
Diploma of Technician Engineer in

ELECTRICAL ENGINEERING
OF THE
HIGHER TECHNICAL INSTITUTE OF CYPRUS.

PROJECT SUPERVISOR : A. Kaplanis

EXTERNAL EXAMINER : S. Hadjixenophontos

June 1991

HIGHER

A C K N O W L E D G E M E N T S

I would like to express my sincere thanks to my project supervisor Mr. A. Kaplanis for his encouragement and guidance during the design, construction and testing of this project.

Moreover, I would like to express my thanks to the laboratory assistances and all those who helped me, in any way, in writing, constructing and presenting this project.

Finally, I wish to express my sincere thanks to Mrs Zaphiro Demetriou for her assistance concerning the typing of this project.

K. Neophytou
June, 1991

A B S T R A C T

The gas detector is an electronic device which detects explosive or inflammable gases, before sufficient gas is leaked to cause explosion.

An investigation of the problem was carried out in the first chapter and the proposed solution stated. From the investigation it was also found that the only available gas sensor in Cyprus is sold by RS company.

The design considerations and sensors circuit analysis are stated in the second chapter. Also the required background theory of the electronic circuit is given there.

Construction, testing and installation requirements are stated in chapter three.

APPENDIX 1 gives the gas sensor specifications

APPENDIX 2 gives the required information of IC 3130E

APPENDIX 3 gives the required information of audio - visual indicators and switching transistor

APPENDIX 4 gives the zenner diode BZX85 specifications

APPENDIX 5 gives the required information for the bridge and regulator

APPENDIX 6 shows the gas detector PCB

APPENDIX 7 gives the list of components

APPENDIX 8 shows the power supply PCB and list of components.

C O N T E N T S

ACKNOWLEDGEMENT	I
CONTENTS	II
ABSTRACT	IV
INTRODUCTION	V

CHAPTER I

THE PROBLEM AND THE PROPOSED SOLUTION

1.1 OBJECTIVES	1
1.2 BLOCK DIAGRAM OF GAS DETECTOR CIRCUIT	1

CHAPTER II

DESIGN CONSIDERATIONS AND CIRCUIT ANALYSIS

2.1 SENSING ELEMENT	4
2.1.1 Gas Sensor.....	4
2.1.2 The four-arm (wheatstone) bridge.....	5
2.1.3 The actual sensing element.....	6
2.1.4 The sensitivity of the bridge.....	8
2.2 OPERATIONAL AMPLIFIER.....	9
2.2.1 General.....	9
2.2.2 Differential amplifier.....	11
2.2.3 Comparators.....	12
2.2.4 Design considerations.....	13
2.3 SWITCHING DEVICE.....	15
2.4 DESIGN CONSIDERATIONS FOR SWITCHING.....	17
2.4.1 Audio-visual indicators.....	17
2.4.2 Switching transistor.....	17
2.5 'ON' INDICATOR.....	18
2.6 POWER SUPPLY.....	19
2.6.1 Voltage divider.....	19
2.6.2 AC to DC conversion and regulation.....	20

CHAPTER III

CONSTRUCTION, TESTING AND INSTALLATION

3.1 CONSTRUCTION.....	22
3.2 TESTING.....	22
3.3 INSTALLATION OF ALARM.....	24

CONCLUSIONS.....	25
------------------	----

REFERENCES.....	26
-----------------	----

APPENDIX	1 (Gas sensor)	27
APPENDIX	2 (IC 3130E)	30
APPENDIX	3 (Audio - Visual indicator and switching transistor)	33
APPENDIX	4 (zenner diode BZX 85)	36
APPENDIX	5 (Bridge and Regulator)	38
APPENDIX	6 (Gas detector printed circuit board)	41
APPENDIX	7 (List of component)	43
APPENDIX	8 (Power supply printed circuit and list of component)	45