TABLE OF CONTENTS

SECTION 1 - Introduction
1.1 Introduction
1.2 Product Overview

SECTION 2 - Kulite Sensing Technology
2.1 Pressure Transducers
2.2 Theory of Operation
2.3 Transducer Types
2.4 The Piezoresistive Effect
2.5 The Piezoresistive Effect in Silicon
2.6 Sensing Elements
2.6.1 Discrete Gauges
2.6.2 Integral Gauges
2.6.3 The Wheatstone Bridge
2.6.4 Key Characteristics of Kulite Piezoresistive Technology
2.7 Microphones
2.8 Integrated Sensor Design
2.8.1 Dielectrically Isolated Design (SOI)
2.8.2 Diaphragm Characteristics
2.8.3 Isolated Capsule Design
2.8.4 Dual Diaphragm Technology
2.8.5 Redundant & Combination Pressure/ Temperature Transducers
2.8.6 Kulite Leadless Design
2.8.6.1 Leadless/ Acceleration Compensated Design
2.8.7 Temperature compensation
2.8.7.1 Bridge Zero and Zero Shift Compensation
2.8.7.2 Bridge Sensitivity Compensation
2.8.8 Mechanical Design
2.8.9 Silicon Carbide

SECTION 3 - Performance Characteristics
3.1 Dynamic Range
3.1.1 Definition
3.1.2 Range
3.1.3 Overrange
3.2 Sensitivity
3.2.1 Sensitivity Calibration
3.2.2 Polarity
3.3 Nonlinearity, Hysteresis and Non-repeatability
3.3.1 Definitions
3.3.3.1 Linearity
3.3.1.2 Hysteresis
3.3.1.3 Non-repeatability
3.3.2 Nonlinearity
3.3.3 Hysteresis
3.3.4 Non-repeatability
3.3.5 Combining Nonlinearity, Hysteresis and Non-repeatability

3.4 Zero Measurand Output (ZMO)
3.4.1 Mounting Effects
3.4.2 Warm-up
3.4.3 Thermal Stability
3.4.4 Effect of Overpressure

3.5 Phase Shift

3.6 Input and Output Resistance

3.7 Thermal Sensitivity Shift and Zero Shift
3.7.1 Thermal Sensitivity Shift
3.7.2 Thermal Zero Shift
3.7.3 Thermal Transient Response

3.8 Photo Flash Response

3.9 Transducer Resonant Frequency

3.10 Frequency Response
3.10.1 Rise and Response Time

3.11 Acceleration Sensitivity

3.12 Burst Pressure

3.13 Full Scale Output

3.14 Supply Voltage or Excitation

3.15 Input / Output Resistance

3.16 Insulation Resistance

SECTION 4 - Environmental Limits

4.1 Diaphragm Loading

4.2 Temperature

4.3 Acceleration, Shock and Vibration

4.4 RF and Magnetic Fields

4.5 Sealing and Hermeticity

4.6 Media Compatibility
4.6.1 Pressure Sensitive End
4.6.2 Electrical Lead End

4.7 Nuclear Radiation

SECTION 5 - Application Information

5.1 Connection Diagrams
5.2 Mounting Techniques
5.2.1 Strain Sensitivity
5.2.1.1 Threaded Mounting Configurations
5.2.1.2 Cylindrical configurations
5.2.1.3 Thin Line Transducers (flat-pack)
5.2.2 Strain Measurement

5.3 Insulation

5.4 Cabling
5.4.1 Standard Cables
5.4.2 Splicing and Extension Cables
5.4.3 Loading Effects
5.4.4 Effects of Cable on Transducer Sensitivity
5.4.4.1 Excitation voltage Drop
5.4.4.2 Signal Attenuation
5.4.4.3 RC Filtering

5.5 Measurement of Dynamic Pressures
5.5.1 Acoustic and Fluid flow Effects
5.5.1.1 Acoustic Fundamentals
5.5.1.2 Sound Speed in Gas
5.5.1.3 Organ Pipe Resonance
5.5.1.4 Cavity Resonances (Helmholtz)
5.5.1.5 Transmitting Tube Connected to Cavity
5.5.1.6 Pressures in a Flowing Fluid
5.5.1.7 Pressure Shock Wave Effects
5.5.2 Acoustic Limitations of a Pressure Probe
5.5.3 Dynamic Response of a Transducer in a Liquid System
5.5.4 Dynamic Pressure Measurements at High Temperatures

SECTION 6 - Electronics

6.1 Power for Excitation
6.1.1 DC Power Supplies
6.1.1.1 Constant Current Power Sources
6.1.1.2 External Sensing
6.1.2 AC Excitation

6.2 Signal Conditioning
6.2.1 Analogue Amplifiers
6.2.2 Digital Corrected Analogue Output
6.2.3 Digital Output
6.2.4 Pressure Switch Output
6.2.5 Solid State Replacements for Electro-Mechanical Pressure Transducers
6.2.6 Wireless Transmission

6.3 Readout and Recording Devices
6.3.1 Input Characteristics
6.3.2 Meter Characteristics
6.3.3 Errors in Digitising

SECTION 7 - Measurement of Transient Pressure Pulses

7.1 Dynamic Range
7.2 Low Frequency Response
7.3 High Frequency Response
7.4 Phase Shift
7.5 Special considerations for Air Blast Measurements
7.5.1 Rise and Response Times
7.5.2 Spatial Averaging of Pressure Across Diaphragms
7.5.3 Mechanical Protection

SECTION 8 - Calibration
8.1 Temperature Calibrations
8.2 Electrical Calibrations
8.3 Static Calibrations
8.3.1 Dead Weight Testers
8.4 Dynamic Calibrations
8.4.1 Oscillating Pressure Calibrations
8.4.1.1 Hydraulic Pressure Generator
8.4.1.2 Vibrating Liquid Column
8.4.1.3 Inlet Modulated Pressure Generator (IMPG)
8.4.1.4 Gulton Whistle
8.4.1.5 Gas Pistonphone
8.4.2 Step Pressure Generators
8.4.2.1 Fast Acting Valves
8.4.2.2 Gas Shock Tubes

SECTION 9 – Glossary, Unit Conversions & Kulite Reports
9.1 Glossary
9.2 Pressure Unit Conversions
9.2.1 Units of Measurement
9.2.2 Decibel Formulae
9.3 Kulite Reports
9.4 Kulite Patents