THE ULTRASONIC SLIDE RULE

Instructions for Use

INTRODUCTION

The practice of ultrasonic inspection involves frequent calculations to obtain the data required in establishing testing procedures, for calibration, and during testing. These calculations are both time-consuming and a constant source of error, and so the SANDT Ultrasonic Slide Rule has been designed to provide the tester and inspector with a quick and accurate means of obtaining information commonly required.

The Rule provides facilities for calculating—

- Wavelength
- Beam spread
- Probe angle or angle of incidence
- Decibel relationships
- Near zone length
- Skip distance and slant range
- Flaw location in plan and depth
- Inch/metric conversion
- Conventional slide rule arithmetical calculations can also be made on the rule.

The Ultrasonic Slide Rule will be found to be of great value in all applications of ultrasonic testing including the training of operators. It will be especially useful to those working in accordance with the **Recommendations for the Ultrasonic Testing of Butt Welds** published by the Institute of Welding.

GENERAL DESCRIPTION

SCALE 'A' BEAM SPREAD

This is a scale of sines based on the formula—

$$\text{Sin } \theta = \frac{K\lambda}{D}$$

Values of K refer to reduction in sound pressure relative to the maximum at the axis of the beam and appear on Scale B.

K = 0·56 50% reduction (6 dB)
K = 1·08 90% reduction (20 dB)
K = 1·22 Extreme edge of beam

A knowledge of expected beam spread is important in many aspects of ultrasonic testing, in particular during the establishment of a testing procedure, but the use of the Rule does not remove the need for precise beam calibration, as prescribed in the Institute's Recommendations.

In angle probes the calibrated value of θ may not be in close agreement with the calculated value, depending on the geometry of the near field, especially in cases where the crystal is mounted on a Perspex shoe.

Normally a beam spread (half-angle θ) greater than about 15° is of no practical interest but the scale has been extended to 90° so that trainees can use it to solve problems involving Snell's Law.

With the cursor set to θ the corresponding value of sin θ is read on Scale 'D'.

SCALE 'B' CRYSTAL DIAMETER

This scale covers crystal diameters from 1-50mm. In the case of rectangular crystals, guidance is contained in the instructions.

SCALE 'C' FREQUENCY

This scale reads from 100kc/s to 15Mc/s. In flaw detectors of continental origin these terms appear as kHz (kilo-Herz) and mHz (mega-Herz)).