C-K Engineering
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# AUTOMATED DIGITAL LIGHT GAGE

The Automated Digital Light Gage Provides Automated Measurement of Light Tightness

## 1 INTRODUCTION

In order to provide a quality piston ring product in terms of light tightness, it has been found that either lapping of the ring outside diameter is required or, if non-lapped rings are to be provided, “light-tightness” inspection of the rings is required. This is achieved through manual or automated inspection.

Studies have repeatedly demonstrated that manual light inspection will result in some light defective rings to be found in the acceptable rings and some light acceptable rings to be found in the rejected rings if a subsequent light inspection is conducted.

## 2 DETECTION

**STATION 1**

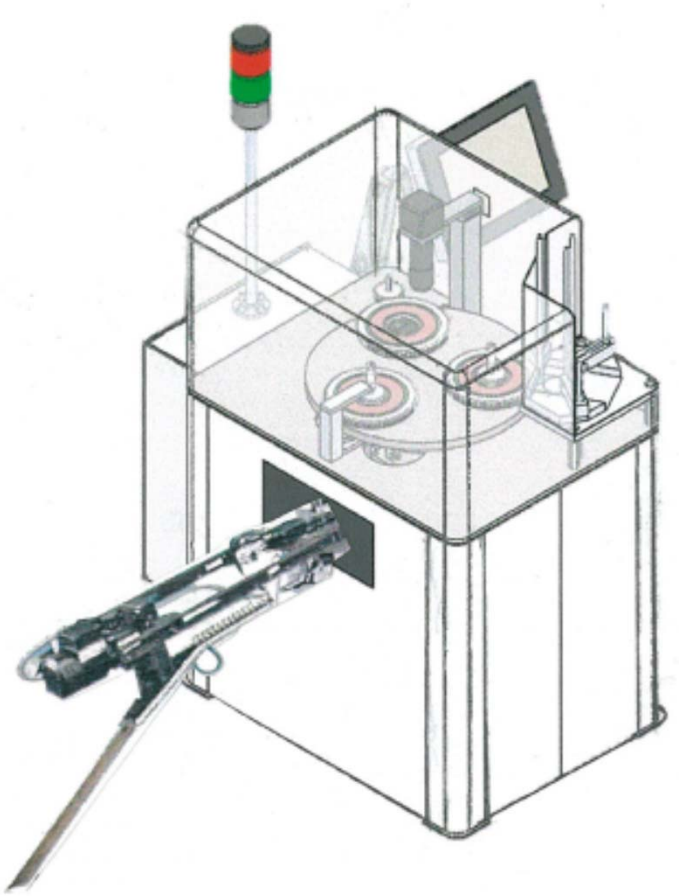
**MAGAZINE:**

Consists of automatic vertical magazine loader that contains three (3) vertical guide bars that are adjustable to cover the size range of the machine.

**FEEDER:**

Moves the ring horizontally from the bottom of the magazine utilizing a reciprocating slide to position the ring above the tapered lead-in at the top side of the ring gage.

## 3 TECHNICAL DATA



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A further complication associated with piston ring light inspection is variation among inspectors' eye sensitivity to identification of light passing between the ring face and the reference ring gage surface.

Among factors affecting the sensitivity of the eye to detect light that have been recognized are:

- Intensity/color of light backlighting ring/gage interface
- Ambient light levels in which the light test is being conducted
- Chronological age of person performing test (sensitivity typically decreases with age)
- Condition of inspector eyesight

## 2 DETECTION

**LOCATION/SEATING OF RING IN RING GAGE:**

Two air cylinders (upper and lower) with appropriately sized tooling plates position the ring. The upper cylinder pushes the ring through the tapered section and into the straight section of the ring gage against the plate mounted on the lower air cylinder.

The two cylinders oppose each other and then quickly reciprocate twice over a distance of one (1) mm to seat the ring in the gage. The cylinders then return to positions above and below the ring gage to be clear of any interference with the table assembly during indexing.

## 3 TECHNICAL DATA

**Piston Ring Diameter:** **60 to 90 mm**
**Production Rates:** **600 pcs/hr.**

**Piston Ring Diameter:** **90 to 150 mm**
**Production Rate:** **450 pcs./hr.**

**Compressed Air Consumption:** **8.2 L/cycle (normal)**

**Control standard PC with CKE Proprietary Software with additional boards for:**

- **In-Line Processing of Inspection Data**
- **Networked Data Collection**

**Dimension** **1300 mm/ 1300m/ 1700 mm high**

**Weight about:** **1200 kg**

**Utilities:**

- **Electrical Voltage:** **3 ph., 400 VAC, 50 hz, 3 ph., 460 VAC, 60 hz**
- **Control Voltage:** **24 VDC**
- **Air Pressure:** **600 KPA**

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The Automated Digital Light Gage consists of three stations. At each station is an individual ring gage with a tapered lead-in. Ring gages are mounted on ball bearing spindles located in a table that indexes the three rings and ring gages from station to station.

The Automated Digital Light Gage provides an optical system that is utilized to:

- Quantify the amount of open light in terms of: area, circumferential length, and distance between ring face and reference ring gage surface
- Eliminate variations caused by inspector
- Significantly reduce labor hours associated with piston ring light inspection process.

## 2 DETECTION

**STATION 2:**

The main index table rotates and transfers the ring gage with installed piston ring to Station 2. There the ring gage with ring is automatically rotated over a light source mounted beneath the ring/ring gage assembly. The line scan camera scans the rotating ring and ring gage assembly and records the light showing through any non–conforming ring face to ring surface. This data is automatically transferred to a PC for processing.

The processed data is compared to limits that can be established when the machine is set-up and used to accept or reject the ring at Station 3.

## 3 TECHNICAL DATA


Computer screen shows numerical results for each ring data stored available to call-up, display, print, or send to data collection system

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The technology is based on a Manual Digital Gage developed approximately eight (8) years ago.

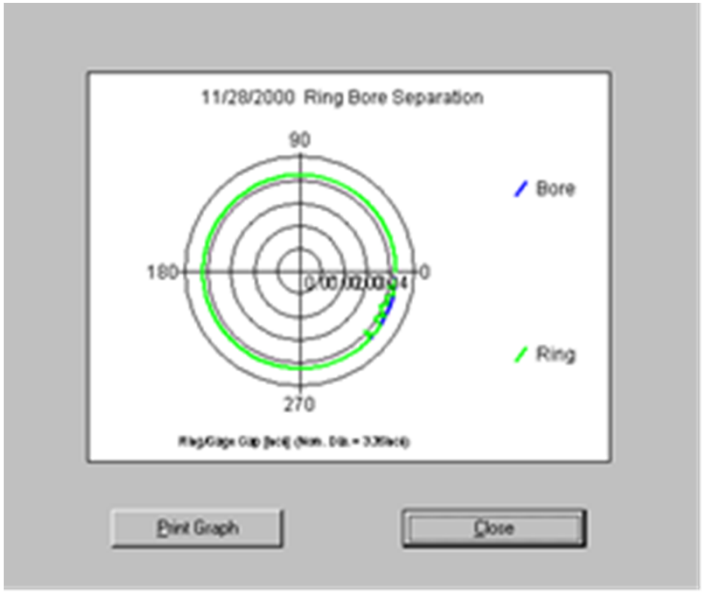
This Manual Digital Light Gage equipped with either a line scan or area scan camera with proprietary software has been successfully utilized in various applications over a period of years to determine ring light tightness.

## 2 DETECTION

**STATION 3:**

The station consists of an air cylinder that pushes the ring downward where the ring is deflected based on input from the preceding Station 2. Light- tight rings are collected with a standard piston ring electric motor powered line up – device (shown) at the machine outlet. Non-light-tight rings are collected by a second identical line-up device (not shown) at the machine outlet.

## 3 TECHNICAL DATA




Data screen shows graphical results available for each ring. Graphs are available to call-up, display, print, or send to data collection system