Starrett®

THE ADVANCEMENTS OF INDICATORS ... FROM CONVENTIONAL ANALOG TO WIRELESS AND TOUCHSCREEN

PRECISION SOLUTIONS

FOR OVER 130 YEARS, THE CHANGING FACE OF INDICATORS CONTINUES

Referred to as “an improvement in gages”, Indicators were introduced in the late 19th century with the first patent dated May 15, 1883. John Logan, a watchmaker from Waltham, Massachusetts U.S.A. saw a need for a precision instrument to measure small distances and angles with an uncomplicated value reading, and so he invented the indicator. One would imagine after some 130 plus years, indicators have changed. Indeed, indicators have evolved and many different types have been introduced, such as new touchscreen wireless electronic models, so now there exists a whole realm or world, of indicators.

Starrett 25 Series Dial Indicators offer a shockless, hardened steel gear train and jewel bearings.

The **Dial Type Drop Indicator** was the first introduction of this precision instrument. Measurement with this type of indicator is obtained by the movement of a spindle multiplied with the reading of the dial in association with the needle. From this known point, one will be satisfied or adjust the manufacturing process to achieve the desired measurement. Usually held by the stem in a fixture, the indicator enables easy measuring to determine runout, height, flatness, and/ or distance. Whether used in machining, setup, or for Quality Control, a drop indicator has many application uses. In 1945, the National Institute of Standards and Technology (NIST) set forth the American Gage Design (AGD) identifying standard classifications for the outer diameter of the indicator to facilitate an easy choice based on space in a specific application.

Specifically designed with shockless hardened stainless steel gear train and manufactured to fine watchmaking standards with jeweled bearings, the dial indicator has precisely finished gears, pinions and other working parts that make possible measurements from one-thousandth to 50 millionths of an inch, depending on accuracy requirements. Any gear unit and any case assembly can be combined to give a complete dial indicator of the style desired. Dial faces are color coded to avoid errors – white dial for English measurement and yellow face for metric.

The contact point is attached to a spindle or rack with movement transmitted to a pinion and then through a train of gears to a hand which sweeps the dial

INDICATOR SELECTION AND SETUP TIPS

- Choose the accuracy and readout needed – don’t select .0001″ (0.001mm) readout if .001″ will do the job.
- Electronic/ Digital styles are best when the measurement data need to be collected, printed out or stored for future use.
- Basically, all dial indicators used worldwide fall into the following size ranges which relate to bezel diameters: Size 0 is a smaller dial indicator, having its own dimensions. Sizes 1 through 4 are AGD sizes. These sizes and the AGD dimensions are essentially the same for all manufacturers, except as noted.
- Accuracy: All indicators should be “loaded” 1/8-1/4 of a turn before testing or measuring. Most accuracies are specified plus or minus one graduation over the full range. This basically means a 2 1/2 turn range. Longer ranges have slightly wider tolerances. AGD specifies 2 1/3 turn indicators to cover any particular range. The reason for this is an effort to get the most out of the indicator – the operator “loads” it to about 1 1/3 turns and sets zero on the master. The indicator will now show the accurate deviation for a full revolution, plus or minus.

of the indicator. A small movement of the contact is thus greatly magnified and read directly from the dial in thousandths or as close as 50 millionths of an inch. Long range indicators have direct reading count hands and a double dial. Graduations are available for reading in .001″, .0005″, .00025″, .0001″ and .00005″ – with ranges from 12″ down to .006″; also in .01mm, .002mm, and .001mm with ranges up to 125mm. Dials can have balanced or continuous graduations.

When a dial indicator is subject to sudden blows or shock, a nonshock mechanism can be substituted for the regular mechanism. Impact and shock are completely absorbed and isolated from the gear movement. Any regular dial indicator can also be converted into a nonshock type by replacing the regular contact points with a shock absorbing anvil unit. The regular contact point may be replaced with contacts of almost any shape or length to suit the work. These include contact points of extra length, special form, tapered, and a roller contact for use on moving material.

ENHANCED, HIGHLY ACCURATE ELECTRONIC INDICATORS

Offering state-of-the-art indicators that meets today's demanding applications, Starrett offers highly accurate electronic indicators with selectable resolution choices from .0005/ .0001/ .00005″ and are IP67 rated. A wide range of variations are available from Inch, Metric, and Inch/ Metric, with basic features to more advanced features if needed. The Starrett 2900 indicators allow for data collection with an end node plug in, while the Wireless W2900 versions can send data up to 30′ with the simple push of a button to a PC, mobile phone, or tablet. Over 40 models are available in 1/2″, 1″, 2″ ranges and 4″ range models, inch-metric models in 1/2″, 1″, 2″ (12 mm, 25 mm and 50 mm) and metric only models in 12 mm, 25 mm and 50 mm ranges. These are engineered with Innovative True Absolute Sensor Technology that minimizes the chance of data loss, providing exceptional reliability. The indicators are being manufactured in Athol, Massachusetts U.S.A. at Starrett Headquarters. Starrett has earned the reputation as the "World's Greatest Toolmakers" and was founded in the 1880's, right around the same time as the first indicator was introduced.

Starrett W2900 Wireless Indicators are equipped to send data with a push of a button and feature IP67 protection against coolant, dirt, chips, water and dust found in harsh environments.

The dial indicator is one of the most widely used tools today in layout, inspection and QC, and there are a wide variety of application variations including the **Dial Caliper**. An exceptionally versatile and easy to read instrument, four-way stainless steel dial calipers have knife edge contacts for inside and outside measurements, and a rod connected to its slide for obtaining depth dimensions. The rod contact is cut out to provide a nib for gaging small grooves and recesses. A **Dial Comparator** is another application example that is used for inspecting duplicate parts and various materials, either in bench inspection or on the production line.

The **Back Plunger Type Indicator** provides the same ease of use in similar applications as the dial type drop indicator. Opposite to the spindle actuating the measurement, there is a plunger centered to the back of the indicator. This plunger, when activated by touching the workpiece, works in association with the dial and needle to visualize the measurement. The back plunger is usually used in smaller spaces for better readability vs. the drop type.

Next to arrive on the market was the **Test Indicator**, also known as a lever arm test or finger indicator by their design. The range of a test indicator is smaller than that of drop or back plunger types, and is primarily used for inspection, layout work or checking machined parts. The lever/ finger style contact moves in an arc instead of a linear line, so one needs to be aware of any cosine error when setting it up, as it is all about the position of the lever.

A **Dial Test Indicator** is mounted at the end of a horizontal arm on an upright base post, where the post is adjustable on a slotted base. Another test indicator example is the universal dial test indicator. Various attachments, including a tool post holder, adapt it to a wide range of applications, such as checking runout of a spindle turned on a lathe.

Dovetail Mount Indicators provide another option for easy and accurate readability. The versatility of the angled head, combined with the three dovetail mounts eliminates the need for having both vertical and horizontal style test indicators.

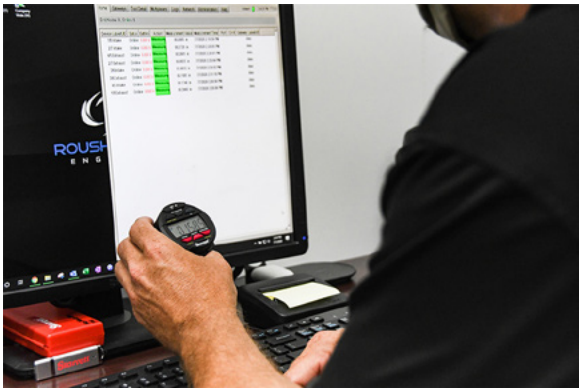
The Dawn of Digital

All of these types of indicators began as mechanical with an analog (dial) readout similar to a wrist watch. Manufactured with gears, pinions, rubies, and racks, all parts need to function simultaneously for an accurate measurement. However, even the most qualified mechanical parts will wear in time, which can cause an inaccurate measurement. As technology advanced, the digital (electronic) indicator made its debut. To avoid mechanical parts wearing over time, these were and still are, engineered with a linear encoder to avoid future breakdown.

Digital indicators have grown in popularity and so have been replacing mechanical types in many instances. While both mechanical and digital indicators have the same accuracy dependent on the dial graduation and range of the tool, due to the gear to gear ratio on mechanical types, the tolerance can grow over a longer range. However, digital indicators (with glass scales) can hold their accuracy over an entire longer range. Digital indicators also offer key benefits including digital readout, total indicator

HOW DIGITAL INDICATORS WORK

Digital Indicators rely on three major components including an LED, a glass scale, and a reticle. The components all need to be precisely aligned with each other to give accurate measurements. First, the LED, has one function to shine an infrared light through the glass scale. Secondly, the heart of the indicator is the glass scale which is plated with a chrome pattern allowing light to pass through some areas while blocking light in other areas. This combination of light and dark areas will change as the glass is moved. The light pattern is detected by the third component, the reticle, using a series of infrared light sensors. Since this light pattern in any position on the tool is unique, the processor is able to convert it to an absolute measurement which is then displayed on the LCD. This is why users can turn the indicator off, move the glass scale along its travel while it is off and still have an accurate measurement as soon as the tool is turned back on.



For accuracy, traceability and further analysis, Starrett Wireless Indicators can seamlessly transmit data to the Starrett DataSure° 4.0 Wireless Data Collection system, eliminating error-prone manual measurement data transcription.

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reading (TIR), measurement storing, tolerance values, back light for better visibility, presets, and importantly, data transmission for documentation and statistical process control (SPC).

Wireless Indicators

Since data transmission is crucial for collecting historical data and providing traceability, seamless connection to a wireless data collection system is a key capability. Originally designed with a cable plug in from the digital indicator to a PC, data collection has progressed to backpacks that plug directly into the tool. Now with wireless indicators on the market, a simple push of a button to send data to a PC, mobile phone or tablet is now possible.

One drawback with a digital readout is that some users like to determine the measurement variation by viewing the needle sweeping across a dial face indicator. However, there is significant added value with digital indicators, particularly because they enable data transmission. All types are available in digital readout, drop, back plunger and test indicator configurations.

Introducing Innovative Touchscreen Wireless Digital Indicators

Recently, new Touchscreen Wireless Digital Indicatos came on the scene — a break through technology, which by eliminating buttons and utilizing touchscreen technology, has redefined comparative indicating measurement. The Starrett No. W4900 Wireless Digital Electronic Indicator features touchscreen technology, multiple resolution and color settings, digital and analog readouts in the same indicator, seven languages and wirelss output.

These new AGD Group 4 Indicators are versatile with large, easy-to-read and navigate capacitive touchscreen user interface menus, and have wireless output for statistical process control (SPC) via data collection systems. A customizable backlighting function in the W4900 enables both digital and analog readouts to be viewed in the same indicator — another Starrett innovation, one that enhances user preferences and reduces the need for multiple indicator models and their required calibrations. In addition, users can select multiple option menus for dial configurations, resolutions, presets, limits, up to seven different languages and more.

The touchscreen Indicators are rugged and sealed, with IP67 protection for harsh manufacturing environments in shops, OEM applications, on custom build and design tools and machinery and for in-process applications. The indicators are also very suitable in quality lab applications and other inspection areas. Featuring a Corning® Gorilla® Glass screen, the indicators have been successfully shop floor tested including drop, vibration, cycle, and thermal testing, enduring all environments similar to standard indicators. The W4900 has an auto-on feature that is enacted via touch of the screen or the indicator stem, an auto-off after the desired pre-set time, in addition to a rechargeable, long-life battery. The indicator has a 1″ (25 mm) range and an accuracy of +/- .00012″ (0.003 mm), with resolutions of .001/ .0005/ .0001/ .00005 in inch, and 0.01/ 0.005/ 0.002/ 0.001 mm in metric.

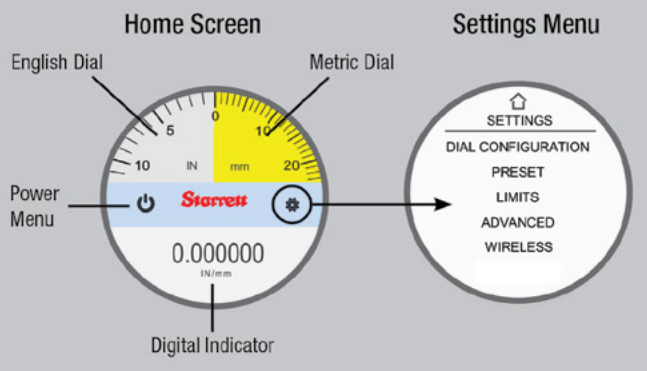
The Starrett No. W4900 Wireless Digital Electronic Indicator features touchscreen technology.

The wireless, touchscreen Indicators are ideal for use with industry data collection devices and systems such as Starrett DataSure® 4.0.

Customize the Starrett W4900 Indicator for User Preferences

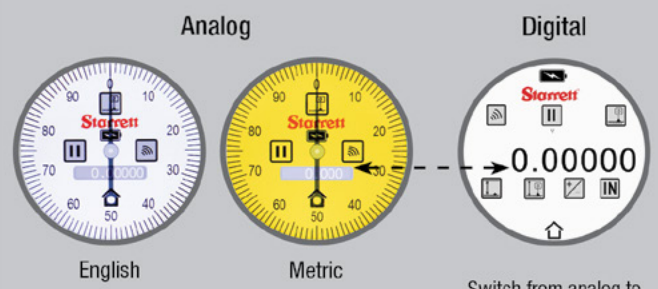
Home Screen and Settings Menu

The Home screen links to the Dial and Digital Indicator screens, the Power Menu and the Settings Menu. The Settings Menu configures many Indicator features.



Analog and Digital Indicators

The English and Metric Dial Indicators are a faithful digital representation of our customary dial indicators with some helpful digital options.

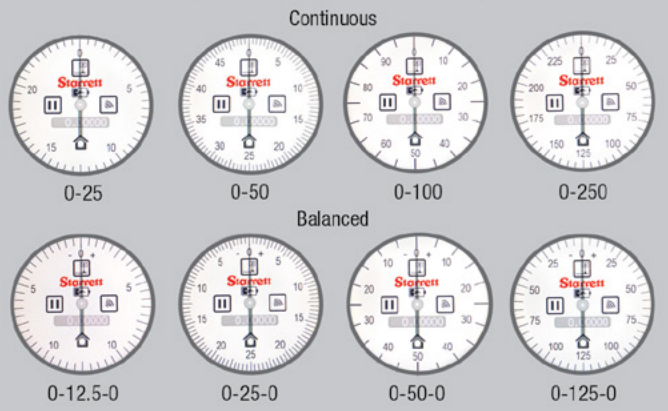


Dial Indicators can be customized by dial reading, graduation and color.

Switch from analog to digital and back by tapping the digital readout.

Dial Reading

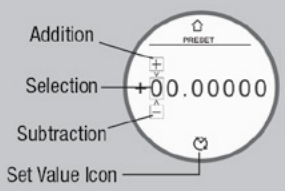
The Dial Reading Menu provides a range of numerical displays for English or metric.



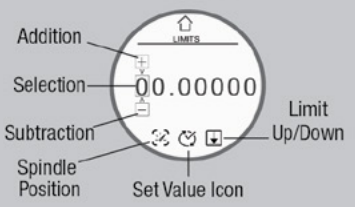
Graduation

The Graduation Menu offers selectable resolutions for English or metric.

Presets

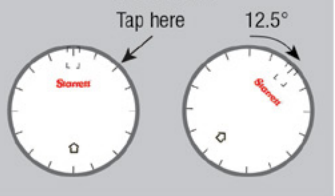


Limits



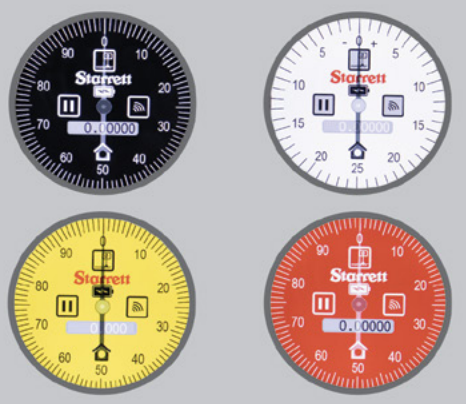
Profiles

Rotation



Color Options

Choose from four color options for the Dial Indicator background.



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