



# REFRACTOMETER - AUTOMATIC DIGITAL TT-REFRACTOMETER SERIES

## Refractometer - Automatic Digital TT-Refractometer Series

A refractometer is a precision optical instrument that quantifies the refractive index of a sample by measuring how light bends as it passes through the material. When a beam of light crosses the boundary between two media of different optical densities, it changes direction by an amount governed by Snell's Law. That change, expressed as the refractive index (nD), is a fundamental physical property directly linked to a sample's composition, concentration, and purity. Because refractive index is both rapid and non-destructive to measure, refractometers have become standard tools across analytical, quality control, and research environments.

Torontech offers a comprehensive lineup of refractometers under the Automatic Digital TT-Refractometer Series, spanning fully automatic CCD-based benchtop instruments, Abbe bench refractometers, handheld optical models, specialized gemological units, and compact digital handhelds. This portfolio gives laboratories, production facilities, and field teams access to the right instrument for their accuracy, throughput, and regulatory requirements, backed by over 20 years of instrumentation expertise and world wide sales and support.

The flagship automatic models within the series — including the TTAR-Series, TT-Refractometer-70, and TT-Refractometer-30 — are built around high-performance CCD light-sensitive detectors operating on the Abbe principle. These instruments measure refractive index (nD) from 1.300 to 1.700 and Brix concentration from 0 to 100%, accommodate transparent, translucent, dark, and viscous samples, and feature built-in Peltier temperature control accurate to  $\pm 0.02^{\circ}\text{C}$ . Premium models are fully compliant with FDA 21 CFR Part 11, supporting electronic records, e-signatures, user ID tracking, and tamper-proof data management — making them ideal for pharmaceutical and regulated laboratory environments. Sapphire glass measuring prisms provide superior corrosion and scratch resistance, preserving measurement accuracy through extended service life.

Complementing the automatic benchtop instruments, Torontech's Abbe refractometers (ToronAR™) deliver wide-range RI and dispersion measurement for classical laboratory work, the gem refractometer (ToronGR™) supports refractive-index identification of polished gemstones, handheld optical models (ToronOR™) offer immediate field checks without power, and the ToronDR™ Brix digital handheld series provides fast concentration readings with a direct digital display — across Brix,

refractive index, and specialty scales.

## Precision Refractometry for Every Application

Whether you are measuring sugar concentration on a food production line, verifying pharmaceutical raw materials in a regulated laboratory, testing hydrocarbon refractive index against ASTM D1218, identifying gemstones in a jewelry appraisal setting, or running quality control checks in a chemical plant, Torontech has a refractometer built for the task. Our Automatic Digital TT-Refractometer Series delivers the accuracy, compliance, and durability that modern analytical workflows demand — backed by a complete portfolio that scales from affordable handheld optical instruments to advanced FDA 21 CFR Part 11-compliant benchtop analyzers with cloud connectivity.

Contact Torontech today to speak with a product specialist, request a quotation, or learn more about the right refractometer for your application. Our world wide sales and support team is ready to assist you in selecting, commissioning, and maintaining your instrument — so you can focus on the measurements that matter.

## APPLICATIONS

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### Applications Across Industries

The TT-Refractometer Series serves a broad range of industries and measurement scenarios where refractive index or concentration data is essential for quality control, research, or regulatory compliance.

#### Food and Beverage

Refractive index and Brix measurement are standard quality control tools in food and beverage production. Refractometers verify sugar concentrations in juices, syrups, jams, honey, and soft drink concentrates using the Brix scale. Torontech's automatic models deliver rapid, repeatable Brix readings at 0.01% resolution, while handheld optical units (ToronOR™) and digital models (ToronDR™ Brix) provide fast spot-checks at the production line or in the field.

## **Pharmaceutical and Chemical Manufacturing**

In pharmaceutical production, refractive index is used to verify raw material identity, confirm solution concentration, and monitor batch consistency. FDA 21 CFR Part 11-compliant models in the TT-Refractometer Series — including the TTAR-Series and TT-Refractometer-70 — are designed for regulated environments requiring full audit trails, electronic signatures, and data integrity. Chemical manufacturers rely on refractometry for raw material verification and concentration monitoring across solvents, reagents, and process liquids.

## **Petroleum and Petrochemical**

Refractive index is a standard property measured during the quality control of fuels, lubricants, hydrocarbon feedstocks, and process oils. Torontech's automatic refractometers and Abbe models (ToronAR™) conform to ASTM D1218, a recognized test method for refractive index and refractive dispersion of transparent and light-colored hydrocarbon liquids, supporting identification and purity confirmation in petroleum testing laboratories.

## **Paints, Coatings, and Adhesives**

Refractive index provides a fast check on the optical properties and concentration of liquid raw materials used in paint, varnish, resin, and adhesive production. Both Abbe bench refractometers and automatic CCD-based models support comparative refractive-index testing of transparent and semi-transparent coating materials.

## **Gemology and Jewelry**

The ToronGR™ Gem Refractometer is specifically designed for gemological laboratories and jewelry appraisers. Refractive index is one of the primary optical properties used to identify and differentiate gem species. The ToronGR™ covers a

refractive-index range of 1.35 to 1.85, appropriate for the broad spectrum of common and precious gemstones, and includes a built-in quasi-monochromatic LED source at approximately 589.5 nm, polarizer, and cubic zirconia testing prism — consistent with CIBJO gemmological laboratory standards.

## **Universities, Research Institutions, and Government Laboratories**

General-purpose Abbe refractometers and automatic models serve academic and government laboratories where refractive-index measurement is part of broader analytical work. The TTAR-II's cloud connectivity and FDA-compliant data management make it especially practical for multi-location research groups or government testing programs that require centralized data access.

## **Sugar Processing and Geological Surveying**

Sugar industry applications rely on Brix scale accuracy for concentration monitoring throughout processing. Geological survey and prospecting applications use refractive index to characterize fluid inclusions and mineral samples. Torontech's wide selection of Brix-capable models and high-RI-range instruments addresses both specialized application areas.

## **FEATURES**

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## **Why Choose Torontech for Your Refractometer Needs?**

Torontech has been supplying precision analytical and testing instruments to laboratories and industrial customers across the world for over 20 years. Our refractometer lineup reflects a commitment to measurement accuracy, instrument durability, and practical laboratory design — supported by dedicated technical expertise.

|   | Highlight                                     | Details                                                                                                                                                                                                   |
|---|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ✓ | <b>Complete Refractometer Portfolio</b>       | From handheld optical units and Abbe bench instruments to fully automatic CCD-based benchtop analyzers, Torontech offers a refractometer for every workflow, budget, and accuracy requirement.            |
| ✓ | <b>Pharma and Regulatory Compliance</b>       | Key models in the TT-Refractometer Series fully comply with FDA 21 CFR Part 11, supporting electronic records, e-signatures, and data integrity requirements in regulated environments.                   |
| ✓ | <b>Precision Peltier Temperature Control</b>  | Automatic models feature built-in Peltier temperature control accurate to $\pm 0.02^{\circ}\text{C}$ , ensuring measurement reliability regardless of ambient conditions.                                 |
| ✓ | <b>High-Durability Sapphire Prisms</b>        | Automatic benchtop refractometers are equipped with high-hardness sapphire glass prisms that resist corrosion and scratching, extending service life and maintaining measurement accuracy over time.      |
| ✓ | <b>Cloud Connectivity and Data Management</b> | The TTAR-II and TT-Refractometer-70 models support cloud data upload, making them practical for multi-site enterprises, government agencies, and group laboratories that require centralized data access. |
| ✓ | <b>International Sales and Support</b>        | Torontech is headquartered in Toronto, Ontario, with a dedicated International customer support team providing pre-sale consultation, application assistance, and after-sale technical support.           |

Torontech's instruments are trusted by manufacturers, universities, pharmaceutical companies, government agencies, and private laboratories throughout the United States and Canada. Our product specialists are available to recommend the right refractometer model based on your sample types, accuracy requirements, throughput, and regulatory environment.

## TECHNICAL SPECIFICATIONS

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## Product Comparison Table

The following table summarizes key specifications and capabilities across Torontech's refractometer product families to assist with instrument selection.

| Specification / Feature | TTAR-Series                             | TT-Refractometer-70                     | TT-Refractometer-30                     | Optical Refractometer (ToronOR™) | Abbe Refractometer (ToronAR™)  | Gem Refractometer (ToronGR™) | Digital Refractometer (ToronDR™ Brix) |
|-------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------------|--------------------------------|------------------------------|---------------------------------------|
| Type / Format           | Benchtop Automatic                      | Benchtop Automatic                      | Benchtop Automatic                      | Handheld Optical                 | Bench Optical                  | Bench Optical                | Handheld Digital                      |
| RI Measuring Range      | 1.300–1.700 nD                          | 1.300–1.700 nD                          | 1.300–1.700 nD                          | Model-dependent                  | 1.300–1.700 nD                 | 1.35–1.85 nD                 | 1.3330–1.5177 nD                      |
| RI Resolution           | 0.0001 / 0.00001 nD                     | 0.00001 nD                              | 0.0001 nD                               | Visual scale                     | ±0.0002 nD                     | ±0.002                       | —                                     |
| Brix Range              | 0–100%                                  | 0–100%                                  | 0–100%                                  | 0–80% (model-dep.)               | 0–95%                          | —                            | 0–50% / 0–90%                         |
| Brix Resolution         | 0.01% / 0.1%                            | 0.01%                                   | 0.1%                                    | 0.5% visual                      | 0.5% visual                    | —                            | 0.1%                                  |
| Measurement Principle   | CCD + Abbe                              | CCD + Abbe                              | CCD + Abbe                              | Abbe optical                     | Abbe optical                   | Gemological optical          | Electronic CCD sensor                 |
| Light Source            | LED (100,000 h+)                        | LED (100,000 h+)                        | LED (100,000 h+)                        | Ambient light                    | White light (sodium filter)    | LED ~589.5 nm                | LED                                   |
| Temp Control            | Peltier ±0.02°C                         | Peltier ±0.02°C                         | Peltier ±0.02°C                         | ATC (manual)                     | External circulator (optional) | None                         | None / ATC                            |
| Temp Display Range      | 0–100°C                                 | 0–100°C                                 | 0–100°C                                 | —                                | 0–70°C                         | —                            | —                                     |
| Sample Types            | Transparent, translucent, dark, viscous | Transparent, translucent, dark, viscous | Transparent, translucent, dark, viscous | Transparent / semi-transparent   | Transparent / semi-transparent | Polished gemstones           | Liquids                               |
| Display                 | 7" TFT touchscreen                      | 7" TFT touchscreen                      | LCD digital                             | Eyepiece optical scale           | Eyepiece optical scale         | Eyepiece 4× magnified        | LCD digital                           |

| <b>Specification / Feature</b>     | <b>TTAR-Series</b>          | <b>TT-Refractometer-70</b>         | <b>TT-Refractometer-30</b> | <b>Optical Refractometer (ToronOR™)</b> | <b>Abbe Refractometer (ToronAR™)</b> | <b>Gem Refractometer (ToronGR™)</b> | <b>Digital Refractometer (ToronDR™ Brix)</b> |
|------------------------------------|-----------------------------|------------------------------------|----------------------------|-----------------------------------------|--------------------------------------|-------------------------------------|----------------------------------------------|
| <b>Data Storage / Connectivity</b> | 4 GB / RS232, USB, Ethernet | RS232, USB, Ethernet               | RS232, USB                 | None                                    | None                                 | None                                | None                                         |
| <b>Cloud / Data Upload</b>         | ✓                           | ✓                                  | —                          | —                                       | —                                    | —                                   | —                                            |
| <b>FDA 21 CFR Part 11</b>          | ✓                           | ✓                                  | ✓                          | —                                       | —                                    | —                                   | —                                            |
| <b>ASTM D1218</b>                  | ✓                           | ✓                                  | ✓                          | —                                       | ✓                                    | —                                   | ✓                                            |
| <b>ISO 2173</b>                    | ✓                           | ✓                                  | ✓                          | ✓                                       | ✓                                    | —                                   | ✓                                            |
| <b>Power</b>                       | 110–240 V AC                | 110–240 V AC                       | 110–240 V AC               | No power req.                           | External thermostat (optional)       | 2× AAA / DC 3V adapter              | Battery / USB                                |
| <b>Prism Material</b>              | Sapphire glass              | Sapphire glass                     | Sapphire glass             | Optical glass                           | Optical glass                        | Synthetic cubic zirconia            | Optical glass                                |
| <b>Best For</b>                    | High-accuracy lab/QC/pharma | High-accuracy + cloud connectivity | Standard lab/QC            | Field / production-line spot checks     | General lab RI + dispersion          | Gem / jewelry identification        | Food, beverage, ingredient QC                |



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