



# **POLARIMETER - AUTOMATIC TORONAP™ SERIES POLARIMETERS**

A polarimeter is an analytical instrument that measures the optical rotation of polarized light as it passes through a solution or liquid containing an optically active (chiral) substance. When plane-polarized light travels through a chiral compound, the asymmetric molecular structure rotates the plane of polarization by a specific angle — a property called optical rotation (expressed in degrees, °). By measuring that angle precisely, a polarimeter provides a direct, quantitative determination of a substance's concentration, identity, purity, and enantiomeric composition without chemical reagents or sample destruction.

Optical rotation is governed by the specific rotation of a compound — a standardized physical constant calculated from the observed angle, the sample concentration, and the path length of the measurement cell. This value is the basis for identity and purity tests in the United States Pharmacopeia (USP), European Pharmacopoeia (EP), and many other international standards bodies. The relationship between optical rotation and sugar concentration also underpins the International Sugar Scale (°Z), widely used in the sugar industry for raw material grading and quality control.

Torontech offers a complete lineup of fully automatic polarimeters under the ToronAP™ and ToronADP™ series. All instruments use a high-brightness LED light source at 589.3 nm — the standard sodium D-line equivalent — with a service life exceeding 100,000 hours, eliminating the warm-up delays and frequent bulb replacements associated with legacy sodium vapor lamps. Automatic photoelectric detection replaces subjective eyepiece observation, delivering consistent, operator-independent results in under 30 seconds per sample. Built-in Peltier temperature control (on equipped models) maintains precise, stable measurement conditions, while multi-mode measurement software calculates specific rotation, concentration, and sugar degree automatically from a single reading.

The ToronAP™ Series spans four models — the ToronAP10™ Auto, ToronAP50™ Auto, ToronAP10™ AutoPlus, and ToronAP50™ AutoPlus — covering a range from efficient food and chemical quality control to high-throughput pharmaceutical GMP environments with full FDA 21 CFR Part 11 compliance. The ToronADP™ Series (ToronADP™ 100 and ToronADP™ 200) provides additional options for laboratories requiring advanced data management, high-accuracy constant-temperature measurement, and expanded connectivity including Wi-Fi and electronic reporting in PDF or Excel format.

**Precision Polarimetry for Every Application — Starting Today**

Whether your laboratory measures the specific rotation of pharmaceutical APIs to USP or EP specification, grades raw sugar to ICUMSA standards, authenticates essential oils for a fragrance formulation, or tracks a chiral reaction in real time, Torontech has a polarimeter engineered for the task. The ToronAP™ and ToronADP™ series deliver the accuracy, throughput, and regulatory compliance that modern analytical workflows require — from the entry-level ToronAP10™ Auto to the fully GMP-compliant, cloud-connected ToronADP™ 200.

Accuracy. Compliance. Reliability. These are the three pillars every polarimetry program is built on, and they are the standards Torontech holds every instrument to before it ships. Investing in a Torontech polarimeter means investing in measurement data you can stand behind — batch after batch, sample after sample.

Contact Torontech today to speak with a polarimetry specialist, request a model recommendation based on your specific application, or receive a quotation for any instrument in the ToronAP™ or ToronADP™ series. Our world wide sales and application support team is ready to help you select, configure, and commission the right polarimeter for your laboratory.

## **APPLICATIONS**

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### **Applications Across Industries**

Optical rotation measurement is a fundamental analytical technique across any field where chiral substances, sugar concentration, or enantiomeric purity are quality-critical parameters.

#### **Pharmaceutical and Biopharmaceutical Manufacturing**

Specific rotation is a required identity and purity test for many Active Pharmaceutical Ingredients (APIs), amino acids, vitamins, antibiotics, and steroids in USP, EP, BP, and JP monographs. Torontech's 21 CFR Part 11-compliant polarimeters (ToronAP10™ AutoPlus, ToronAP50™ AutoPlus, and ToronADP™ 200) are designed for regulated pharmaceutical environments requiring secure electronic records, e-signatures, multi-level user permissions, and full audit trails consistent

with Good Manufacturing Practice (GMP) documentation requirements.

## **Sugar Processing and Sweetener Industry**

Polarimetry is the primary method for grading raw sugar and monitoring concentration throughout the refining process using the International Sugar Scale ( $^{\circ}\text{Z}$  / ICUMSA). The ToronAP50™ Auto is specifically noted for its ability to measure dark, opaque molasses samples where conventional light sources struggle — a direct operational advantage in raw sugar quality control. All ToronAP and ToronADP instruments support sugar degree mode alongside optical rotation and specific rotation modes.

## **Food and Beverage Quality Control**

Optical rotation and Brix measurement confirm the concentration and authenticity of fruit juices, syrups, jams, honey, beer wort, wine, vinegar, and other optically active food ingredients. Automatic polarimeters eliminate the operator variability inherent in manual instruments and are suitable for high-throughput production-line QC environments where speed and repeatability are equally important.

## **Essential Oils, Flavors, and Fragrances**

Natural essential oils — including peppermint (l-menthol), spearmint, lavender, citrus, and anise — have well-defined specific rotation values that distinguish authentic natural-source material from synthetic or adulterated substitutes. A Torontech polarimeter provides immediate, quantitative authentication of incoming raw materials, protecting product quality and brand integrity in the flavor and fragrance industry.

## **Chemical Manufacturing and Research**

Chiral synthesis, asymmetric catalysis, and stereochemical characterization of new compounds all rely on precise optical rotation measurements to track reaction progress in real time, determine enantiomeric excess, and confirm product identity. The dynamic atlas display feature in the AutoPlus and ADP 200 models enables live visualization of optical rotation changes

— supporting kinetic studies and reaction optimization without manual data collection.

### **Petroleum and Petrochemical Testing**

Optically active petroleum-derived materials — including turpentine, certain terpenes, and chiral lubricant additives — are characterized by optical rotation as a quality parameter. Torontech's wide optical rotation range ( $\pm 89.99^\circ$  /  $\pm 259^\circ\text{Z}$ ) accommodates both low- and high-rotation samples across these applications.

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

Polarimeters are standard teaching and research instruments in analytical chemistry, organic chemistry, biochemistry, and food science programs. Torontech's range from the compact ToronAP10™ Auto to the fully connected ToronADP™ 200 covers both educational and advanced research needs, with user-friendly touchscreen interfaces that reduce training time without sacrificing measurement accuracy.

## **FEATURES**

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

With over 20 years of instrumentation experience and a dedicated North American presence, Torontech delivers polarimeters that combine measurement precision, regulatory readiness, and practical laboratory design — backed by expert support before and after the sale.

✓ Complete Polarimeter Portfolio for Every Workflow

From the cost-effective ToronAP10™ Auto for food and chemical spot-checks to the fully regulated ToronAP50™ AutoPlus and ToronADP™ 200 for pharmaceutical GMP environments, Torontech offers a polarimeter calibrated to any budget, throughput, or compliance requirement.

✓ Pharmaceutical and Regulatory Compliance

The ToronAP10™ AutoPlus, ToronAP50™ AutoPlus, and ToronADP™ 200 are fully compliant with FDA 21 CFR Part 11, supporting electronic records, e-signatures, user ID tracking, multi-level permissions, and tamper-proof audit trails — meeting USP, EP, and GMP documentation standards.

✓ Precision Peltier Temperature Control

Temperature is the most critical external variable in polarimetry. Torontech's Peltier-equipped models (AP50 series and ADP series) automatically maintain sample temperature within  $\pm 0.1$ – $0.2^{\circ}\text{C}$  across a  $10^{\circ}\text{C}$  to  $55^{\circ}\text{C}$  range, eliminating drift between operators, shifts, and seasons.

✓ Long-Life LED Light Source — No Warm-Up Required

Every Torontech polarimeter uses a high-brightness LED source at 589.3 nm with a service life exceeding 100,000 hours. Unlike legacy sodium vapor lamps that require 15–30 minutes of warm-up and frequent costly replacement, LED instruments are ready to measure immediately and maintain consistent intensity over years of operation.

✓ Real-Time Visualization and Dynamic Atlas Display

The AutoPlus series and ADP 200 include dynamic timing measurement with real-time graphical display of optical rotation changes — a powerful tool for researchers tracking reaction progress, monitoring kinetics, or characterizing new chiral compounds without manual data logging.

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| ✓ | <p>North American Sales, Support, and Application Expertise</p> <p>Torontech is headquartered in Toronto, Ontario, with a U.S. office in Miami, Florida, serving customers across the United States and Canada. Our product specialists provide pre-sale consultation, application guidance, installation support, and after-sale service — giving laboratories a single accountable point of contact.</p> |
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Torontech's polarimeters are trusted by pharmaceutical manufacturers, sugar processors, food quality laboratories, university research departments, and government testing agencies across the United States and Canada. Our instruments are engineered for long service life, low maintenance, and the kind of day-to-day reliability that production and research environments demand.

## THEORY & METHOD

### Materials You Can Test

All Torontech polarimeters measure optically active liquid samples prepared in appropriate solvents. The following table summarizes the major material categories, representative examples, and the key measurement parameters polarimetry provides for each.

| Category | Examples | What Polarimetry Detects |
|----------|----------|--------------------------|
|----------|----------|--------------------------|

|                                        |                                                                                                |                                                                                           |
|----------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>Pharmaceutical APIs</b>             | Ibuprofen, naproxen, dextromethorphan, amino acids, steroids, antibiotics, vitamins            | Chiral identity, enantiomeric purity, concentration — per USP, EP monograph limits        |
| <b>Sugars &amp; Sweeteners</b>         | Sucrose, glucose, fructose, lactose, maltose, honey, invert sugar                              | Sugar concentration (°Z), Brix, adulteration, quality grade for raw and processed sugar   |
| <b>Essential Oils</b>                  | Peppermint oil (l-menthol), lavender, citrus oils, spearmint, anise, camphor                   | Authenticity — natural vs. synthetic source; adulteration detection via specific rotation |
| <b>Food &amp; Beverage Ingredients</b> | Fruit juices, syrups, jams, wine, beer wort, vinegar, malt extract                             | Sugar inversion, concentration, product consistency, label verification                   |
| <b>Petroleum &amp; Petrochemicals</b>  | Turpentine, terpenes, certain lubricant additives, chiral hydrocarbon feedstocks               | Optical purity, quality verification for optically active petroleum-derived materials     |
| <b>Chiral Chemicals &amp; Polymers</b> | Chiral catalysts, intermediates, lactic acid, tartaric acid, chiral polymers, flavor molecules | Reaction progress monitoring, stereochemical purity, process optimization                 |
| <b>Cosmetics &amp; Fragrances</b>      | Fragrance compounds, botanical extracts, skin-active ingredients, sunscreen actives            | Ingredient authenticity, optical activity of natural vs. synthetic materials              |
| <b>Academic &amp; Research Samples</b> | Novel chiral compounds, synthesis intermediates, biopolymers, enzyme substrates                | Specific rotation characterization, stereoisomer differentiation, kinetic monitoring      |

Note: Samples must be clear and free of turbidity, air bubbles, and undissolved particles for accurate measurement. Filtered or centrifuged preparations are recommended for dark or semi-opaque liquids. Sample cell lengths of 100 mm and 200 mm are standard on all instruments.

## TECHNICAL SPECIFICATIONS

## Product Comparison Table

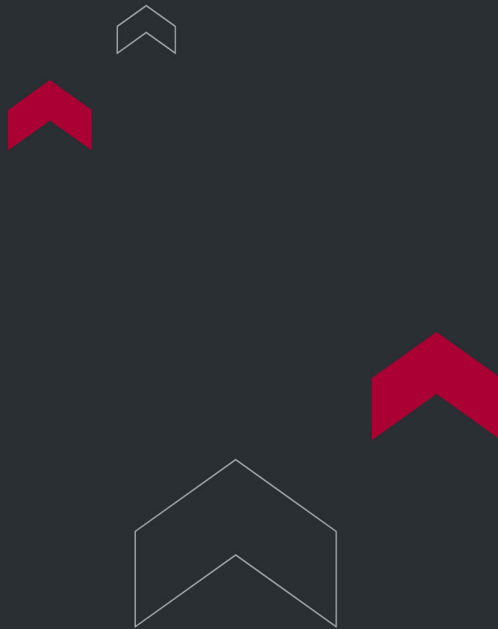


The following table provides a side-by-side comparison of key specifications across the Torontech polarimeter lineup to support instrument selection.

| Specification / Feature          | ToronAP10™ Auto                                                        | ToronAP50™ Auto                                                        | ToronAP10™ AutoPlus                                                    | ToronAP50™ AutoPlus                                                    | ToronADP™ 100                                           | ToronADP™ 200                                                          |
|----------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|
| <b>Optical Rotation Range</b>    | ±89.99° / ±259°Z                                                       | ±89.99° / ±259°Z                                                       | ±89.99° / ±259°Z                                                       | ±89.99° / ±259°Z                                                       | ±89.99°                                                 | ±89.99° / ±259°Z                                                       |
| <b>Accuracy</b>                  | ±0.01° (≤±45°);<br>±0.02° (>±45°)                                      | ±0.01° (≤±45°);<br>±0.02° (>±45°)                                      | ±0.01° (≤±45°);<br>±0.02° (>±45°)                                      | ±0.01° (≤±45°);<br>±0.02° (>±45°)                                      | ±0.01° (≤±45°)                                          | ±0.004°                                                                |
| <b>Measurement Modes</b>         | Optical Rotation;<br>Specific Rotation;<br>Concentration; Sugar Degree | Optical Rotation;<br>Specific Rotation;<br>Concentration; Sugar Degree | Optical Rotation;<br>Specific Rotation;<br>Concentration; Sugar Degree | Optical Rotation;<br>Specific Rotation;<br>Concentration; Sugar Degree | Optical Rotation;<br>Specific Rotation;<br>Sugar Degree | Optical Rotation;<br>Specific Rotation;<br>Concentration; Sugar Degree |
| <b>Temperature Control</b>       | No                                                                     | Peltier                                                                | No                                                                     | Peltier                                                                | Peltier                                                 | Peltier (constant temp)                                                |
| <b>Temp Control Range</b>        | —                                                                      | 10°C-50°C                                                              | —                                                                      | 10°C-50°C                                                              | 10°C-50°C                                               | 10°C-55°C                                                              |
| <b>Temp Control Accuracy</b>     | —                                                                      | ±0.2°C                                                                 | —                                                                      | ±0.2°C                                                                 | ±0.1°C                                                  | ±0.1°C                                                                 |
| <b>Display</b>                   | 5.6" TFT                                                               | 8" TFT color                                                           | 8" TFT color (Android)                                                 | 8" TFT color (Android)                                                 | 7" TFT touchscreen                                      | 8" TFT touchscreen                                                     |
| <b>Data Storage</b>              | 1,000 records                                                          | 1,000 records                                                          | 8 GB                                                                   | 8 GB                                                                   | 1,000 records                                           | 1,000+ records                                                         |
| <b>Real-Time Graphic Display</b> | —                                                                      | —                                                                      | ✓                                                                      | ✓                                                                      | —                                                       | ✓                                                                      |
| <b>FDA 21 CFR Part 11</b>        | —                                                                      | —                                                                      | ✓                                                                      | ✓                                                                      | —                                                       | ✓                                                                      |

| <b>Specification / Feature</b> | <b>ToronAP10™ Auto</b>           | <b>ToronAP50™ Auto</b>                           | <b>ToronAP10™ AutoPlus</b>                               | <b>ToronAP50™ AutoPlus</b>                      | <b>ToronADP™ 100</b>          | <b>ToronADP™ 200</b>                                       |
|--------------------------------|----------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------|-------------------------------|------------------------------------------------------------|
| <b>Connectivity</b>            | USB, RS232                       | USB×3, RS232                                     | USB×3, RS232, Wi-Fi                                      | USB×3, RS232, Wi-Fi                             | USB, RS232                    | USB, RS232, Wi-Fi (model-dep.)                             |
| <b>Sample Cell Length</b>      | Up to 200 mm                     | Up to 200 mm                                     | Up to 200 mm                                             | Up to 200 mm                                    | 100 / 200 mm                  | 100 / 200 mm                                               |
| <b>User Calibration</b>        | Optional                         | Optional                                         | Optional                                                 | Optional                                        | Optional                      | Optional                                                   |
| <b>Best For</b>                | Entry-level auto, food / chem QC | High-precision auto, sugar, pharma, dark samples | Research, chiral synthesis tracking, data-rich workflows | Pharma GMP, full 21 CFR compliance, cloud-ready | Standard lab QC, pharma, food | High-accuracy regulated environments, full data management |

\* Power supply is 220 V AC  $\pm 10\%$  / 50 Hz as standard; 110 V versions are available for North American installations. Please specify at time of order.



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