

For high throughput, high accuracy applications

Refractometer Selection Guide



Meeting the needs of your industry and application

- Food and Beverage
- Sugar Milling, Refining, Processing
- Chemical
- Pharmaceutical and Toxicology Testing
- Petroleum
- Flavor, Fragrance, Cosmetics



**RUDOLPH
RESEARCH
ANALYTICAL**

Rudolph Research Analytical, serving its customers with Integrity, Quality, and Innovation for over fifty years.

TECHNICAL BULLETIN 929

A Refractometer that's right for your industry and application

Every industry has its unique application requirements, environmental constraints and operator handling issues with which to contend. It is for this reason, that **Rudolph has more than 10 different model variations** to ensure that we have the right solution for your situation.

Maybe you are a pharmaceutical company looking for an instrument which can **measure below the standard food refractometer range** of 1.33 - 1.53 to comply with the USP monograph for Sevoflurane (refractive index range of 1.2745 - 1.2760) or other halogenated ethers and pharmaceuticals **measuring below 1.3 RI**. Maybe you're a flavor, fragrance or essential oil manufacturer or blender dealing with Cinnamic Aldehyde or the many products in this industry having **Refractive Indices greater than 1.60 RI**.

Possibly your main concern is not the range of the refractometer but the **reproducibility of results** – just listen to what one of our customers has to say after switching to Rudolph after years with another brand:

"Just wanted to let you know how pleased our company is with the J57HA Automatic Refractometers. We currently have two of the instruments in service in our sugar testing laboratories and are in the process of ordering three additional refractometers.

Before the decision was made to switch our laboratories to the J57HA Refractometers, rigorous testing was done on the instrument over the past year in our Quality/Research Laboratory.

It has been our policy when doing research type work, using our old refractometers, that we place a sample on the prism, set a timer for two minutes, then press the "Read" button until we get three readings in a row that are identical (this could take up to 12 readings). With the J57HA instrument, we place the sample on the prism, press the "Measure" button and in about 15 seconds we have a stable number. The instrument is so stable in fact, that I can honestly say after using the instrument for over a year, we have never had a different reading from the original measurement, no matter how many times we repeatedly press the "Measure" button."

– R.R., Senior Process Chemist,
Western Sugar Cooperative



J357-MMC-CP











J57HA

How to use this guide

Although there are many common problems that are similar across all industries: like sample cleaning, sample cross contamination, dirty prism, improper water zero, **some problems are unique or have a different level of importance** to a particular industry. This model selection guide allows you to see which models are the most popular in your industry and why. Just select the category that best reflects your

industry and then call us to help solidify your model selection. Our technical sales representatives understand that the **initial price is an important part of the purchasing decision** but only part of that decision; equally, if not more important is **purchasing an instrument that works as intended for the application and meets all relevant standards, regulations and requirements** in the area in which you work.

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Below are a few of the reasons customers replaced their old refractometer with a J-Series from Rudolph

Problem	Solution
<p>You are tired of arguments over shadowline interpretation on your Abbe Refractometer. One person says the material is on specification, one person says it's not. In addition, scratches on the glass prism make visual interpretation even more difficult.</p>	<p>J-Series Internal Reflection Refractometers use scratch proof artificial sapphire prisms that measure the reflected light not the transmitted light, like the Abbe, so dark samples measure as easily as clear samples. Just put a drop of sample on the prism, press measure and walk away. No shadow line, no manual balancing or interpretation.</p>
<p>Waterbath maintenance is costly and time consuming. Theoretically it should be easy – just top it off with water every week, clean it out and add new algaecide once a month. So why does the bath always seem to be low on water and covered with green slime?</p>	<p>The J-Series has an electronic peltier temperature control solution that is right for you. Select your temperature through the touch screen and watch the instrument quickly come to temperature and make a measurement all in one easy step.</p>
<p>Your old refractometer was great when you bought it but now it is being repaired more and more often while measurement instability wastes time and money.</p>	<p>Our customers say it best:</p> <p><i>"This instrument has greatly reduced our sample time and improved our accuracy. Calibration of the instrument is easy and rarely required. We have had no problems or issues with the two instruments that we currently have in service..."</i></p> <p><i>I would highly recommend the Rudolph J57HA Refractometer over any other brand of refractometer that I have used or tested throughout my many years working in the sugar industry."</i></p>

Why switch to a Rudolph Research Refractometer? Superior temperature control and easy to clean prism

For samples close to ambient select a model without a presser

For semi-solid and highly evaporative samples more than 10° from ambient select a model with a contact presser (CP option)

For most samples 10° from ambient select J Series standard temperature controlled sample cover (CC option)

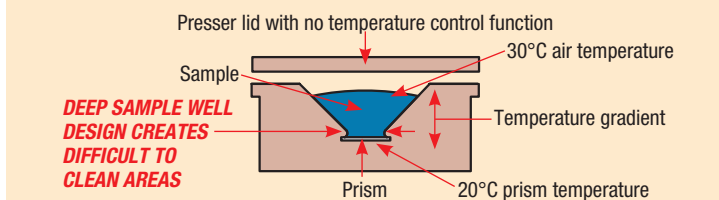
Rudolph's dual temperature control system

Rudolph Research Analytical is the only refractometer manufacturer to offer **electronic temperature control from both prism and presser surfaces**. The requirements of an electronically temperature controlled refractometer operating close to ambient air temperature are very different from the temperature control requirements of a refractometer operating more than 10°C from ambient air temperature. Only the Rudolph J Series is designed to be the perfect refractometer for both applications.

Measuring RI or Brix close to ambient air temperature

The J57's shallow sample well and presserless design makes **cleaning easier than deep well prism designs while still maintaining accuracy**. The deep sample well of competing refractometers is not needed when there is less than a 10°C difference between the prism temperature and air temperature because the temperature gradient across the sample is small.

Other manufacturers at all temperatures



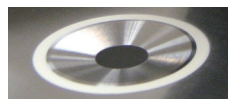
Measuring RI or Brix far from ambient air temperature

The J157/257/357 shallow well with temperature control from the sample presser and prism surface offers **superior temperature control while still maintaining ease of cleaning**. Rudolph's temperature controlled presser creates a mini temperature controlled environment where the entire sample is held at the measurement temperature. This design **minimizes the inaccuracies** created by temperature gradients across the sample as deep well prisms fight to control temperature from the prism surface while the air and upper part of the sample have widely divergent temperatures. (See Figure lower left)

Other manufacturer's compromise

From the pictures below one can see that **other manufacturers have to make a compromise with the depth and angle of sample well**. Since these manufacturers use one sample well and cover design for both temperature applications, they end up with a **sample well that is too narrow and deep. The deep sample well makes cleaning needlessly hard** at ambient temperature while failing to provide ideal temperature control when the sample and air temperature are more than 10°C from the desired measurement temperature.

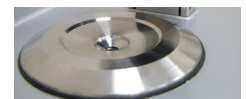
Rudolph



Manufacturer 1



Manufacturer 2



- Seed oils
- Soy bean oils
- Candy
- Syrups
- Dairy products
- Edible oils
- Coffee extracts
- HFCS
- Juices
- Juice concentrates
- Fruit products
- Confections
- Starch
- Milk
- Hydrolysis products
- Vegetable products
- Teas
- Sodas
- Sauces
- Soups
- Jams
- Jellies
- Soft drinks



Feature Highlight

Flat, easy to clean prism – No matter how good the refractometer is, the results will only be right if the instrument is clean. **Rudolph's flat prism design makes cleaning easy**, even with sticky syrups. The flat low profile sample well with a sample volume of less than 1 ml is easily cleaned by wiping with a common paper towel. The J57 single cleaning surface with **scratch-proof sapphire prism** makes this a popular choice for high throughput food laboratories.



Models	Specifications	Features and Benefits
<p>J47</p> 		
<p>J57</p> 	<ul style="list-style-type: none"> ● Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix ● Accuracy: ±0.00002 RI, ±0.02 Brix ● Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	<p>Brix results can only achieve accuracy in the real world if the sample area is cleaned properly. Rudolph's shallow prism design has no corners or steep angles to trap sticky samples thus avoiding or reducing the problem of cross contamination between samples. The simple, easy to use user interface with large measure button and key lock out feature makes it a popular choice for busy factory labs. Gloved hands and elbows like the big measure key.</p>
<p>J157</p> 	<ul style="list-style-type: none"> ● Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix ● Accuracy: ±0.00002 RI, ±0.02 Brix ● Electronic Temperature Control: Flexible temperature selection between 15°C - 50°C 	<p>The J157-CC-AM with non-contact cover (CC) and Auto Measure (AM) are popular option choices for food applications where the sample must be protected from a harsh environment and custom scales are required. Auto Measure (AM) allows for easy measurement on/off by just lifting the presser cover to stop a measurement and closing the cover to start a measurement.</p>
<p>J357-CC-AM</p> 	<ul style="list-style-type: none"> ● Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix ● Accuracy: 0.00004 RI, 0.03 Brix ● Electronic Temperature Control: Flexible temperature selection between 15°C - 100°C; TB option: allows 15°C - 110°C with one hour boost to 120°C 	<p>J357-CC-AM is best for high temperature food applications where the product is more stable when measured at a high temperature. For example, the J357 temperature control system is set for 70°C and temperature correction is set for 20°C. The J357 heavy duty temperature control system ensures the sample stays at 70°C while the instrument displays a temperature corrected result of what the sample would read if it were 20°C.</p>





- Cane sugar milling and refining
- Beet sugar milling and refining
- Invert sugar
- Liquid sugar
- Confectionary sugar
- Molasses
- Brown sugar



Feature Highlight

Pour through refractometers are designed for measuring cane or beet juice in a sugar mill. This design has two important benefits: **cleaning becomes part of the sample loading process and measurement time is reduced because one sample is poured in after another** making the design attractive for seasonal operators. The small funnel design forces improved sample flushing by increasing the number of sample pours.



Models	Specifications	Features and Benefits
<p>J57</p> 	<ul style="list-style-type: none"> • Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix • Accuracy: ±0.00002 RI, ±0.02 Brix • Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	<p>The J57HA's simple interface and easy to clean prism surface make it one of our most popular models for the sugar industry. Temperature control to 20°C and 25°C makes it perfect for molasses and high Brix samples. Measurement speed can be improved by using Temperature Correction in conjunction with Temperature Control, allowing measurements to be made accurately almost as soon as the sample is placed on the prism.</p>
<p>J157</p> 	<ul style="list-style-type: none"> • Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix • Accuracy: ±0.00002 RI, ±0.02 Brix • Electronic Temperature Control: Flexible temperature selection between 15°C - 50°C 	<p>The J157-CC-AM is also quite popular with sugar factory labs. The non contact cover (CC) with built in electronic heating and cooling improves performance in harsh conditions. The Auto Measure (AM) feature allows the closing and opening of the cover to start and stop the measurement eliminating the need for the operator to touch the interface. Very popular for factory floors where air temperature varies dramatically: cold at night and hot during the day.</p>
<p>J157-PTW</p>  <p>J157-KVP</p>  <p>Thumb screw</p> <p>Feature highlight above</p>	<ul style="list-style-type: none"> • Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix • Accuracy: ±0.00002 RI, ±0.02 Brix • Electronic Temperature Control: KVP: Select any temperature between 15°C - 30°C PTW: Select any temperature between 15°C - 40°C 	<p>The J157-PTW can be operated as a pour through refractometer when measuring juices and then by loosening one thumb screw and lifting the hinged presser the instrument can be used like a J57. This allows the J157-PTW to measure molasses and other high Brix samples.</p> <p>The J157-KVP has a vertical prism that allows suspended solids to fall past the prism surface instead of on to the prism. The small funnel volume design with integrated over flow increases sample flushes and reduces spillage. The J157-KVP is often favored in applications with highly turbid samples.</p>

Water Based:

- Resins
- Polymers
- Coolants
- Gels
- Glues
- Glycols
- Ethylene
- Acids

Petroleum Based:

- Oil based paints
- Fine chemicals
- Fluranes
- PET: polyethylene terephthalate
- Polymers
- Resins
- Solvents
- Plastics



Feature Highlight

All J Series refractometers are designed for high chemical resistance from the outset with the wetted parts being sapphire, Tectron® and 316 stainless steel. However, when using HCl and other caustic compounds, 316 stainless steel is not resistant enough. For these applications Rudolph offers an extended chemical resistance option where the sample dish and cover are made from Hastelloy (H Option).

H Option suggested applications

- Hydrofluoric acid at all concentrations
- HCl and similar acids at all concentrations
- Strong alkalis
- Strong oxidizing agents

For plastic manufacturers who measure liquids and solids like PET, Rudolph has a Contact Presser (CP) with extra weight.

(CP) Option suggested application

- PET: polyethylene terephthalate

J257-CP-H



Water-Based Chemical Models

Specifications

Features and Benefits

J57HA



- **Measurement Range:** 1.33 - 1.53 RI; 0 - 95% Brix
- **Accuracy:** ±0.00002 RI, ±0.02 Brix
- **Electronic Temperature Control:** Fixed temperature selection: 20°C and 25°C



A refractometer can only achieve real world accuracy if the prism is cleaned properly between samples. The flat open sample area has no corners to trap even sticky materials and is resistant to almost all solvents including Acetone, Toluene and similar organics. Choose (HA) option for HF1 and HCl acids.

J157



- **Measurement Range:** 1.33 - 1.53 RI; 0 - 95% Brix
- **Accuracy:** ±0.00002 RI, ±0.02 Brix
- **Electronic Temperature Control:** Flexible temperature selection between 15°C - 50°C

DUAL TEMPERATURE CONTROL SYSTEM

Unlike other temperature controlled refractometers, the J157/257/357 have temperature control from both above and below the sample. The Sample Cover is controlled to the same temperature as the prism and, when lowered, is designed to provide a temperature controlled micro environment that provides unrivaled temperature stability, fast measurement time and minimal evaporation. Depending on options, the Sample Cover can also be used to initiate measurement. (Select AM option)

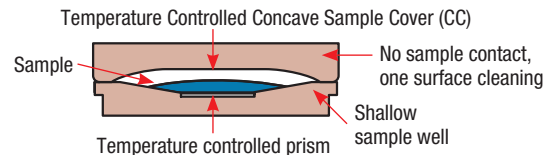
Petroleum-Based Chemical Models

Specifications

J257

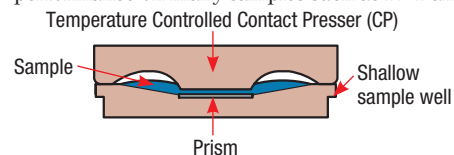


- **Measurement Range:** 1.26 - 1.70 RI; 0 - 95% Brix
- **Accuracy:** 0.0001 RI; 0.1 Brix
- **Electronic Temperature Control:** Flexible temperature selection between 15°C - 70°C



OPTIONAL CONTACT PRESSER (CP OPTION)

The J157/257/357 are available with an optional Temperature Controlled Sample Presser (CP option) that touches the sample. Compared with the standard temperature controlled cover, the optional CP Presser reduces the empty volume of the measurement area thereby decreasing evaporation and at the same time helping to evenly spread **semi solid materials** over the measurement prism. This feature offers improved performance on many samples such as PET and Glycerine.



J357-CP-AM



- **Measurement Range:** 1.26 - 1.70 RI; 0 - 95% Brix
- **Accuracy:** 0.00004 RI; 0.03 Brix
- **Electronic Temperature Control:** Flexible temperature selection between 15°C - 100°C; TB option: allows 15°C - 110°C with one hour boost to 120°C

- Total Parenteral Nutrition (TPN)
- Toxicology testing (Urine SG)
- Pharmacy compounding and drug diversion
- USP <831>
- EP 2.2.6
- Enflurane
- Sevoflurane



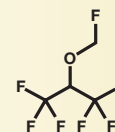
Feature Highlight

Enflurane, Sevoflurane and similar halogenated ethers are used extensively for the induction and maintenance of general anesthesia. Their manufacture must comply with specifications from the USP/EP or relevant pharmacopeias. Many of these pharmacopeias require the measurement of refractive index. For example, the US Pharmacopeia requires that sevoflurane has a refractive index of 1.2745 - 1.2760 at 20°C. **For 21CFR Part 11 compliance choose MMC option.**

Official Monographs, USP 31 / Sevoflurane

■ Sevoflurane

C₄H₈F₇O 200.05
 Propane, 1,1,1,3,3,3-hexafluoro-2-(fluoromethoxy)-
 Fluoromethyl 2,2,2-trifluoro-1-(trifluoromethyl)ethyl ether
 [28523-86-6].



3867

Refractive index (831): between 1.2745 and 1.2760, at 20°C

Pharmaceutical Models	Specifications	Features and Benefits
J357 	<ul style="list-style-type: none"> ■ Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix ■ Accuracy: 0.0001 RI; 0.1 Brix ■ Electronic Temperature Control: Flexible temperature selection between 15°C - 70°C 	<p>USP General Subchapter <831> Refractive Index States: ...Although the standard temperature for Pharmacopeial measurements is 25°C, many of the refractive index specifications in the individual monographs call for determining this value at 20°C. The temperature should be carefully adjusted and maintained, since the refractive index varies with the temperature...</p> <p>...To achieve the theoretical accuracy of ±0.0001, it is necessary to calibrate the instrument against a standard provided by the manufacturer and to check frequently the temperature control and cleanliness of the instrument by determining the refractive index of distilled water, which is 1.3330 at 20°C and 1.3325 at 25°C...</p> <p>The J357-MMC-CC provides the refractive index range, accuracy, performance and 21CFR Part 11 compliance demanded by big pharma making this our most popular pharmaceutical model.</p>
J457 	<ul style="list-style-type: none"> ■ Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix ■ Accuracy: 0.00004 RI; 0.03 Brix ■ Electronic Temperature Control: Flexible temperature selection between 15°C - 100°C 	
Medical Testing and Toxicology Models	Specifications	Features and Benefits
J57HA 	<ul style="list-style-type: none"> ■ Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix, 1.000 - 1.0500 Urine SG ■ Accuracy: 0.0002 Urine SG; ±0.00002 RI, ±0.02 Brix ■ Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	<p>The J-Series Refractometer is chosen by more toxicology labs than any other brand. These customers know that 0.0002 Urine SG accuracy must be validated regularly and Rudolph's J57 ensures that the refractive index performance and calibration requirements meet government regulations. The J57HA's standard sample volume is 500 micro liters but this can be reduced to 100 micro liters by selecting the J57HA-SV.</p> <p>SAMSHA labs doing hundreds of toxicology samples per day prefer to eliminate the human factor and choose large scale automation. The J57HA-UF-SP is combined with a custom automation solution that minimizes sample use and replaces the tested sample to the testing vial.</p> <p>For large hospitals doing their own pharmaceutical compounding, ensuring that their Total Parenteral Nutrition formulas are accurate is life critical. The J57TPN was specifically customized to meet USP<797>. Please contact the factory for the white paper on this application.</p>
J57HA-UF-SP 	<ul style="list-style-type: none"> ■ Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix, 1.000 - 1.0500 Urine SG ■ Accuracy: 0.0002 Urine SG; ±0.00002 RI, ±0.02 Brix ■ Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	
J57TPN 	<ul style="list-style-type: none"> ■ Measurement Range: 1.33 - 1.53 RI; 0 - 95% Brix, 1.000 - 1.0500 Urine SG ■ Accuracy: 0.0002 Urine SG; ±0.00002 RI, ±0.02 Brix ■ Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	

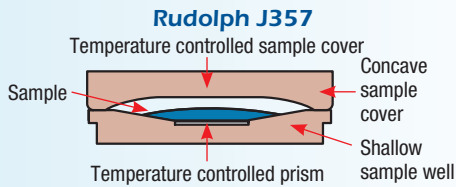
- ASTM D1218
- ASTM D5006
- Fuels
- Waxes
- ASTM D1747
- Oils
- Lubricants



Feature Highlight

The Rudolph Research Analytical J357 is able to control temperature to 100°C because it has a **unique dual temperature control system** where heat is applied to both sides of the sample.

However, there are still applications where temperatures above 100°C are needed. **To accommodate the need to measure above 100°C, the Temperature Boost (TB) option was developed** for the J357 Refractometer Series.

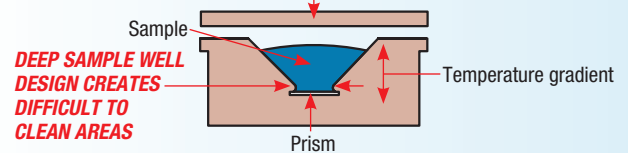





The Temperature Boost (TB) option provides two benefits:

1. The maximum temperature of the refractometer is increased from 100°C to 110°C.
2. The maximum temperature of the temperature control system is increased to 120°C for a period of 60 minutes. At the end of 60 minutes the temperature control will shut off and the instrument will cool down to ambient temperature for a period of 1 hour.

Other manufacturers at all temperatures

Presser lid with no temperature control function or liquid contact



Models	Specifications	Features and Benefits
<p>J57WR-UF-SP</p> 	<ul style="list-style-type: none"> • Measurement Range: 1.26 - 1.7 RI; 0 - 95% Brix • Accuracy: 0.0001 RI; 0.1 Brix • Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	<p>The J57WR-UF-SP is often combined with Rudolph's density meter for automated measure of petroleum fuels, oil and waxes. Combining a refractometer with an ECS autosampler eliminates the need for manual loading.</p>
<p>J357-NDS-CC</p> 	<ul style="list-style-type: none"> • Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix • Accuracy: 0.00004 RI; 0.03 Brix • Electronic Temperature Control: Flexible temperature selection between 15°C - 100°C; TB option: allows 15°C - 110°C with one hour boost to 120°C 	<p>Designation: D 1747-99</p> <p>Standard Test Method for Refractive Index of Viscous Materials</p>  <p>1. Scope</p> <p>1.1 This test method covers the measurement of refractive indexes, accurate to two units in the fourth decimal place, of transparent and light-colored viscous hydrocarbon liquids and melted solids which have refractive indexes in the range between 1.33 and 1.60, and at temperatures from 80 to 100°C. Temperatures lower than 80°C can be used provided that the melting point of the sample is at least 10°C below the test temperature.</p> <p>The J357-NDS is able to control temperature to 100°C because it has a unique dual temperature control system where heat is applied to both sides of a sample, meeting the needs of all the ASTM standards. For added flexibility for cloud points occurring closer to 120°C select the TB option. Please contact the factory for help with this option.</p>

- Perfumes
- Skin cleansers
- Lotions
- Lemon, lime, orange
- Palm
- Cremes
- Waxes
- Natural oils
- Sandalwood



Feature Highlight







Automation Flexibility

- Rudolph's AutoSampler can be loaded with up to 240 samples
- Combine Refractive Index measurements with a polarimeter, density meter, and colorimeter for simultaneous measurements of:
 - Density/Specific Gravity
 - Color
 - Optical Rotation/Specific Rotation
 - Refractive Index
- Up to three different rinse solvents available for use; fully programmable
- Emergency samples measured at any time without stopping the AutoSampler or moving sample vials
- Data can be saved in Excel or PDF formats for integration into the laboratory LIMS or SAP system



Models	Specifications	Features and Benefits
<p>J57WR</p>	<ul style="list-style-type: none"> • Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix • Accuracy: 0.0001 RI; 0.1 Brix • Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	<p>Many aromatic substances such as Cinnamic/Aldehyde have refractive indices above 1.60 RI. For this reason, most flavor/fragrance labs choose a wide RI range refractometer like the J57WR.</p>
<p>J457 OMB</p>	<ul style="list-style-type: none"> • Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix • Accuracy: 0.0001 RI; 0.1 Brix • Electronic Temperature Control: Fixed temperature selection: 20°C and 25°C 	<p>Excellent model for the flavor and fragrance industries. Designed to be used with automation. Not suitable for waxes or VERY high viscosity samples. Seen above in combination with optical rotation, density/SG and color.</p>
<p>J357</p>	<ul style="list-style-type: none"> • Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix • Accuracy: 0.0001 RI; 0.1 Brix • Electronic Temperature Control: Flexible temperature selection between 15°C - 70°C 	<p>This is our most popular stand alone model for the flavor/fragrance industry. Its wide RI range 1.2 - 1.7 measures all known products. Its non-contact sample cover improves performance for evaporative samples. Presser can be upgraded to allow automation in the future.</p>
<p>J457</p>	<ul style="list-style-type: none"> • Measurement Range: 1.26 - 1.70 RI; 0 - 95% Brix • Accuracy: 0.00004 RI; 0.03 Brix • Electronic Temperature Control: Flexible temperature selection between 15°C - 100°C 	<p>More accuracy and features generally needed by the industry. This model is sometimes chosen when the customer sells most of their product to the pharmaceutical industry and wants 21CFR Part 11 compliance.</p>





Model Comparison Chart: Standard Food Refractive Index Range Applications

Models						
Specifications	J57HA	J57-HA-UF-SP	J57TPN	J157-CC	J157PTW	J157KVP
Measurement Range	1.33 - 1.53 RI, 0 - 95% Brix, 1.0000 - 1.0400 Urine SG					
Measurement Scales	Refractive Index (RI) Brix (% sucrose), Temperature Corrected Brix, Temperature Corrected RI, Urine SG			Refractive Index (RI) Brix (% sucrose), Temperature Corrected Brix, Temperature Corrected RI, Urine SG and 100 User Programmable Scales		
Resolution	0.00001 RI, 0.01 Brix, 0.0001 Urine SG					
Reproducibility	±0.00002 RI, ±0.015 Brix, ±0.0001 Urine SG					
Accuracy	±0.00002 RI, ±0.02 Brix, 0.0001 Urine SG					
Control Temperature	20°C and 25°C			15°C to 50°C	15°C to 40°C	15°C to 30°C
Ambient Temperature Limit	10°C to 40°C					
Sample Temperature Limit	-20°C to +250°C					
Temperature Correction Range	18 to 95°C (for pure sucrose)					
Wavelength	589.3nm (other wavelengths available)					
Light Source	Light Emitting Diode (exp life>1,000,000 measurements)					
Calibration	1, 2 or 10 point using water or NIST traceable standards					
Communication Interface	2 RS232 ports, 1 parallel port, 1 auxiliary port and USB adaptor available					

Models	J57HA	J57-HA-UF-SP	J57TPN	J157-CC	J157PTW	J157KVP
Options	J57HA	J57-HA-UF-SP	J57TPN	J157-CC	J157PTW	J157KVP
Concave Cover No Sample Contact				CC Option Standard		
Contact Sample Presser	Not Available			CP Option Available		
Automeasure Feature				AM Option Available		
Hastelloy Feature	H Option Available			H Option Available	Not Available	
Small Volume Sample Well (100 µ liters)	SV Option Available	Not Available		SV Option Available		
Micro Flow Cell With Sealed Prism	Not Available	UF-SP Option Available	Not Available			
Pour In Options	Not Available				PTW Option Standard	KVP Option Standard
Data Storage	Not Available			MMC Option Available	Not Available	

Model Comparison Chart: Wide Refractive Index Range Applications



Models				
Specifications	J57WR	J57WR-UF-SP	J257-CC	J357-NDS
Measurement Range	1.26 - 1.70 RI, 0 - 95% Brix			
Measurement Scales	Refractive Index (RI) Brix (% sucrose)		Refractive Index (RI) Brix (% sucrose) 100 User Programmable Scales	
Resolution	0.0001 RI, 0.01 Brix		0.0001 RI, 0.01 Brix	0.00001 RI, 0.01 Brix
Reproducibility	±0.0001 RI, ±0.1 Brix		±0.0001 RI, ±0.1 Brix	±0.00002 RI, ±0.015 Brix
Accuracy	0.0001 RI, 0.1 Brix		0.0001 RI, 0.1 Brix	0.00004 RI, 0.03 Brix
Control Temperature	20°C and 25°C		15°C to 70°C	15°C to 100°C
Ambient Temperature Limit	10°C to 40°C			
Sample Temperature Limit	-20°C to +250°C			
Temperature Correction Range	18 to 95°C (for pure sucrose)			
Wavelength	589.3nm (other wavelengths available)			
Light Source	Light Emitting Diode (exp life>1,000,000 measurements)			
Calibration	1,2 or 10 point using water or NIST traceable standards			
Communication Interface	2 RS232 ports, 1 parallel port, 1 auxiliary port and USB adaptor available			

Models	J57WR	J57WR-UF-SP	J257-CC	J357-NDS
Options				
Concave Cover No Sample Contact	Not Available		CC Option Standard	
Automeasure Feature			AM Option Available	
Contact Sample Presser			CP Option Available	
Hastelloy Feature Acid Resistance	H Option Available	Not Available	H Option Available	
Small Volume Sample Well (100 µ liters)	SV Option Available		SV Option Available	
Temperature Boost	Not Available			TB Option Available
21 CFR Part 11 Compliance/Data Storage				MMC Option Available



Calibration Kits

Rudolph Research Analytical offers three different calibration fluid kits. Each fluid kit comes complete with NIST Traceable Certificates for each fluid.

All Purpose

A23180 General Use NIST Traceable Calibration Fluids Kit

Kit consists of the following (5) NIST traceable calibration fluids (1 oz. each):

- A21752-1.3330-W RI Certified Water 20°C with table for 10-70°C
- A21752-1.350-20/Brix 10
- A21752-1.460-20/Brix 70
- A21752-1.516-Multi Temperature Fluid (20°, 30°, 40°)
- A21752-1.650-20 nominal RI

Pharmaceutical

A23180-VLR NIST Traceable Calibration Fluids Kit

(Special version for measuring halogenated ethers and general pharmaceuticals)

Kit consists of the following (5) NIST traceable calibration fluids (1 oz each):

- A21752-1.29-20
- A21752-1.3330-W RI Certified Water 20°C with table for 10 - 70°C
- A21752-1.460-20/Brix 20
- A21752-1516-Multi Temperature Fluid (20°C, 30°C, 40°C)
- A21752-1.650-20 nominal RI

Toxicology Testing

A23180-USG NIST Traceable Calibration Fluids Kit

(Special version for validating 4th decimal place Urine specific gravity refractometers)

Kit consists of the following (5) NIST traceable calibration fluids (1 oz each) at the major decisions points:

- A21752-1.3330-W 1.0000 - Urine SG
- A21752-1.0010 Urine SG
- A21752-1.0030 Urine SG
- A21752-1.0200 Urine SG
- Calibration fluid above 1.0300 (nominal for calibration)

All Calibration Fluid RI values are subject to change based on availability.

Many individual Refractive Index Calibration Fluids are available at various indices and temperatures. Contact a Customer Service Representative for assistance in choosing a fluid that is right for your application.

Office Style (parallel) Printer

These come in two main styles:

1. Inkjet Printer
2. Laser Printer

These office style printers have the following advantages:

- Large paper size (American standard 8 1/2 x 11 inches or A4) required by cGLP/cGMP and often preferred by regulating bodies such as FDA
- Multiple readings per page
- Inexpensive replacement cost
- Easy access to consumables

Rudolph Research Analytical

This sample was measured on a J357 refractometer, serial number 12129, manufactured by Rudolph Research Analytical, Hackettstown, NJ.

Last Calibration : Aug 20, 2006 12:23:42

Lot Identifier : Test print

Operator Name : _____

Operator Signature : _____

No	Sample ID	Measurement		Temp.	Time	Date
1	2712	1.57023	Refractive Index	20.0C	12:51:44	Aug 22, 2006
2	2712	1.57023	Refractive Index	20.0C	12:51:59	Aug 22, 2006
3	2712	1.57023	Refractive Index	20.0C	12:52:06	Aug 22, 2006

n = 3 Average = 1.57023 Standard Deviation = 0.000000

Rudolph Research Analytical

Measurement
1.60006 Refractive Index

Temperature
28.0C

Temperature Correction
off

Time
12:25:28

Date
Aug 22, 2006

Last Calibration
Aug 20, 2006 12:23:42

Operator Name

Operator Signature

This sample was measured on a J357 refractometer, serial number 12129, manufactured by Rudolph Research Analytical, Hackettstown, NJ.

Strip Impact Printer

Receipt printers have the following advantages:

- Small footprint
- Designed for rough industrial environments
- Does not use thermal paper
- Industrial product with long model life, so that the printer is often available for many years



Barcode Reader

All Rudolph refractometers can be equipped with a barcode reader. The barcode reader has flexible programming enabling it to work with various barcode standards: Code 39, Codabar, Interleaved 2 of 5, UPC-A and others.

