RUDOLPH RESEARCH ANALYTICAL

TECHNICAL BULLETIN 935

For High Accuracy Applications

The DDM Series of Automatic Density Meters

United States of America
National Institute of Standards and Technology

9001:2008 CERTIFIED ISO RUDOLPH RESEARCH

NVLAP®

NVLAP LAB CODE: 200898-0
Accreditation to ISO/IEC 17025:2005

17025:2005 CERTIFIED ISO RUDOLPH RESEARCH

The Simplicity of Touch Screen Measure

Full Feature VideoView™ with Automatic Scanning of Entire U-Tube

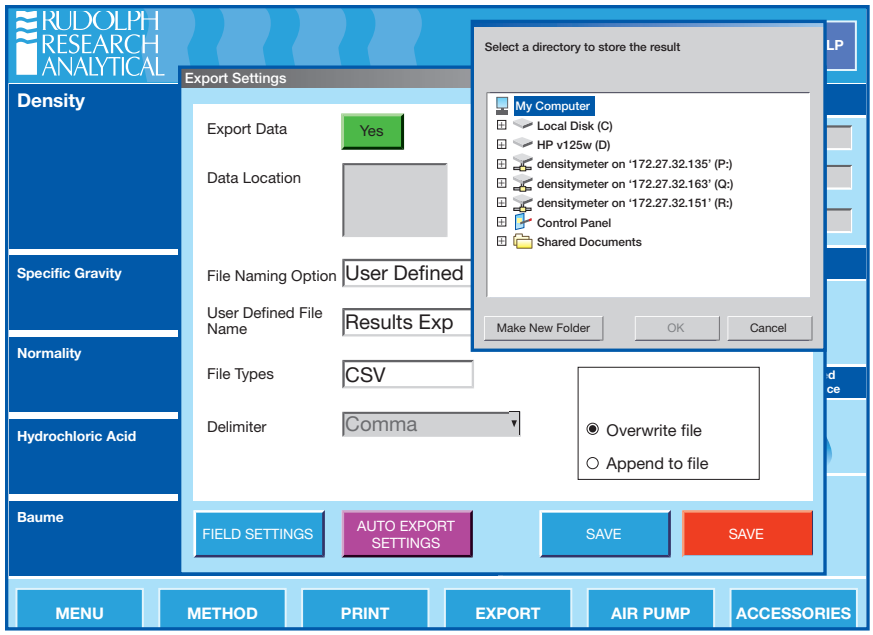
Rudolph's exclusive VideoView is protected under Patent #7,437,909 and provides superior high resolution visual bubble detection within your sample with live on-screen video viewing. Images can be saved with the sample results and may be viewed and or printed as desired.

A full view of the entire U-tube is possible at 2x magnification without any obstruction. Further, the U-Tube can be scanned at 6x or 10x magnification so the user can see that the U-Tube is bubble free. The 10X magnification is also extremely helpful in detecting the cleanliness of the glass U-tube. The clarity, magnification and resolution are the very best available.

- Three magnified video assisted views of the entire cell are available, in 2x, 6x and a 10x magnifications
- Images maybe saved with results for subsequent review
- Automatic Bubble detection is available which will flag the sample(s) with suspected bubbles

Computer Windows 7 Embedded Based Flexibility

- 8 gigabytes of internal memory allows almost unlimited capacity for saving measurement data. All Rudolph DDM Series Density meters are network ready and data may also be saved directly to your server or to any desired directories
- Internet access is possible directly from all Rudolph DDM Density meters touch screen. The disk protection feature protects the operating system against malware infections in networked environments
- Windows based navigation architecture is so intuitive that most operators will never read the manual, but should you wish to reference the manual, it is stored right on the Rudolph DDM's internal memory
- Copy methods, transfer concentration tables, download data, etc., via the USB ports on the front and back of the unit
- Five USB ports allow for quick and easy connection to a mouse, keyboard, printer, bar code scanner, or memory stick. Embedded Windows 7 prevents any and all viruses and malware



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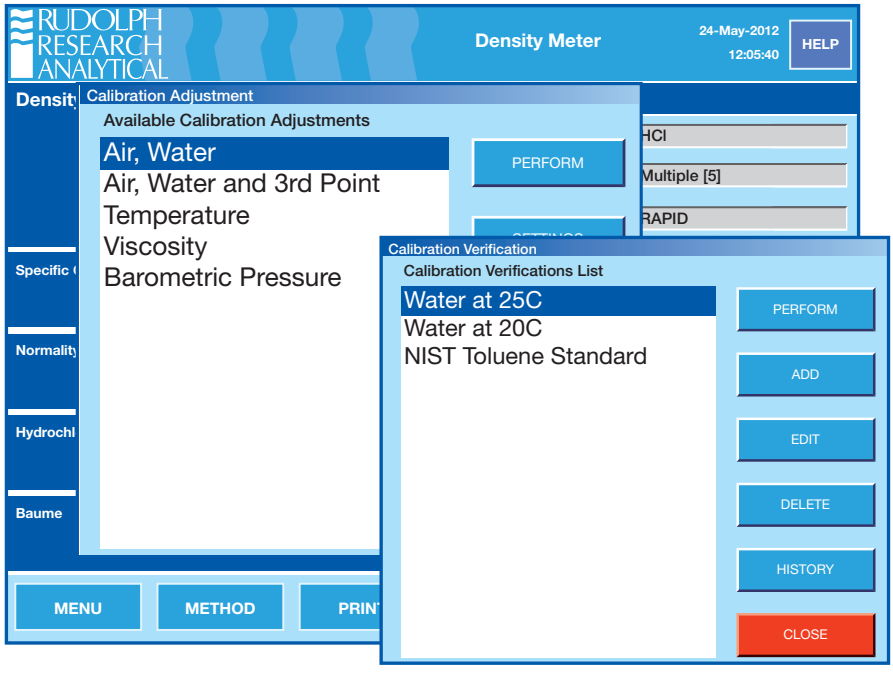
ement with the Flexibility of Windows® 7

Oscillating U-Tube with Viscosity Correction and Reference Oscillator

Rudolph DDM Density meters utilize an oscillating U-tube with full range viscosity correction and reference oscillator that allows for long term calibration stability and measurement at all temperatures with a single calibration. (Patent # 7,735,353)

cGMP/GLP Calibration

- Calibrate the Rudolph DDM Density Meter with 2 or 3 NIST Traceable Standards – calibrating with merely air and water appears inconsistent with cGMP/GLP compliance regulations
- Can print out complete method configuration, communication settings, as well as calibration verification and calibration adjustment data/history
- Measured values can be shown continuously as temperature stability is being reached or, at the discretion of the user, measured values will only be displayed once the measurment is complete
- Unlimited number of customizable calibration adjustments and calibration verifications possible
- Complete History of Calibration Adjustments and Verifications are available to View, Print, and/or Export
- Set calendar reminders as to when Calibration Verifications are due



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Versatility, Traceability, C

Versatile Communication Capability

The Rudolph DDM Density Meter's standard communication package includes:

- CAT 5 Ethernet Port for Network Cable Connection
- 5 USB ports
- 1 RS 232 ports

Allowing the capability to:

- Export measurement results with saved video view images to a thumb drive, store it locally on the C:\ drive, or easily send data to any external PC, LIMS, SAP, etc
- Print measurement results to any local or networked printer. Most all printers are supported by Windows 7® but if required the driver may be added
- Save measurement data direct to your Network/Server

cGMP/GLP Printing

Sample measurement reports are edited quickly and easily. Just import your logo to the Rudolph DDM Density Meter and send your company's customized certificate of analysis to your server or local printer.

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Kyoto 615-8245, Japan
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sanyo CHEMICAL INDUSTRIES

Date: February 19, 2014

This sample was measured on DDM 2911 PLUS serial number 20212, manufactured by Rudolph Research Analytical, Hackettstown, NJ, USA.

Lot ID 2019

Temperature: 20.0 Deg C

No	Sample ID	Density	Sp. Gravity	Normality	HCL % wt	° Baume	Time
1	8421	1.09803	1.1000	6.0092	19.95	12.94	14:20:50 PM
1	8421	1.09803	1.1000	6.0092	19.95	12.94	14:21:40 PM
1	8421	1.09803	1.1000	6.0092	19.95	12.94	14:22:30 PM
1	8421	1.09803	1.1000	6.0092	19.95	12.94	14:23:20 PM
1	8421	1.09803	1.1000	6.0092	19.95	12.94	14:24:10 PM

Counts : 5
Average : 1.0980
SD : 0.0000
Maximum : 1.0980
Minimum : 1.0980

Operator : _____

Print your customized Certificate of Analysis including your company logo directly from the DDM Density Meter touch screen

Capable of making multiple measurements on a single sample and reporting complete statistical data and all measurement results

Compliance and Flexibility

NIST Traceable Calibration Standards

Rudolph knows how important it is to calibrate with Traceable Standards and therefore, we include either a NIST or UKAS standard in the accessories provided with your density meter.

The Rudolph DDM Density Meters includes all the accessories for immediate use which includes:

- Quick Start Guide
- IQOQPQ Documentation
- Rinse/Sample Waste Container
- Filling Nozzles
- Connecting Fittings & Tubing
- Traceable Standard
- Luer Syringes
- User Manual
- Tools

Full 21CFR Part 11 Instrument Level Compliance

The The Rudolph DDM Density Meter's 21CFR Part 11 software module is easily enabled through the user friendly touch screen. This module gives you full compliance with:

- Electronic signature
- Access levels
- Internal write protected storage
- Unique passwords
- Write protected documents sent directly to server
- Audit Trail
- PDF Meta Data

Flexible Method Management

Factory installed measurement methods allow for immediate selection of the correct method to match the most common applications.

For unique measurement applications, easily create a sample method using an unlimited number of Concentration Tables, Formulas, and Polynomials to match the measurement methods used in your laboratory.

Method Management

NAME	TYPE
AOAC Ethanol	Factory
Brix	Factory
Crude Oil	Factory
Density	Factory
Density Continuous	Factory
Density through Temperature	Factory
Density VC	Factory
Factory QC Testing	Factory
Fuel Oil	Factory
Lubricants	Factory
OIML Ethanol	Factory

ADD
COPY
HIDE
RENAME
VIEW
RESULTS
METHOD CONFIGURATION
CLOSE

Customized Methods:

- Concentration D2O – Heavy Water
- Proofing of Ethanol Sample
- Density of Gasses
- Testing of aspartame and other artificial sweeteners
- Monomer Solutions
- Hydrogen Peroxide
- Determination of Partial Specific Volume
- ppm, Normality, Molarity
- % Toluene in Heptane
- Mole Fraction of Methanol
- Purity of sample testing
- Density of Gasses and Aerosols
- Potassium Permanganate
- Sweeteners
- Ultracentrifugation applications
- SG of Urine
- Sodium Hydroxide

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Automation Solutions

Automate your Laboratory with a Rudolph AutoFlex R837 Automation System

The DDM Series of density meters can be combined with various Rudolph Automation Systems and Sample Handling Accessories. Available are Peristaltic Pumping, Heated Sampler, the ECS (Easy Clean System), and the Rudolph R837 AutoFlex Sampler.

The Rudolph Research R837 AutoFlex is perfect for high throughput laboratories looking to increase productivity

The R837 AutoFlex Sampler Facilitates:

- Customizable bottle size, Test Tube size, Boston Rounds:1oz, ½ oz, virtually any size
- Customizable Rack configurations: heated and unheated on the same carousel
- Automated sample introduction
- Flexible Method Selection: Suction mode, Pressure mode, Rinse and Dry Duration
- Programmable cleaning and drying
- Automatic solvent and waste level detection
- System Configuration minimal sample volume: 1.5 mL
- A heated interface is available
- Fast throughput, 2-5 min complete cycle time
- Automation saves operator time and increases your lab's efficiency
- An urgent-sample interruption can be made at any time

Operation is completely automatic. The sample is measured and the data recorded. Depending on how the system is configured the data may also be printed, saved as an Excel file or transferred to a LIMS system.

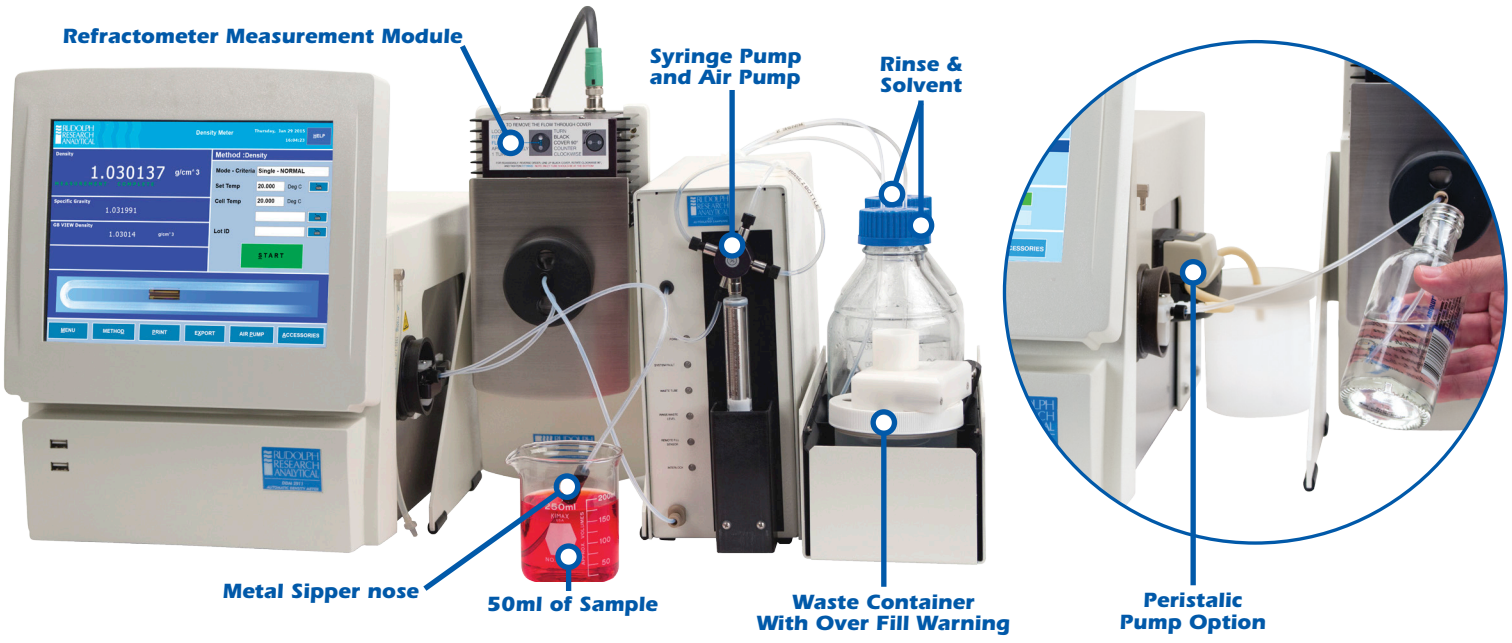
Flow through Configuration with ECS: Density Meter, Refractometer Optics Module and a Rudolph (ECS) Easy Clean sampling System

Description

This configuration is the most versatile. The user loads the sample in a similar way to the peristaltic pump system but after the measurement; the instrument disposes of the sample to waste, rinses with two solvents and then dries with air from the built in pump.

Who should consider this system?

- Users who want the ease of automated loading and cleaning
- Users with samples that have too high a viscosity to be pumped with a peristaltic pump
- Users who have a significant amount of samples but not enough to require full automation



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Densitometry

The Rudolph DDM series of density meters, with high precision Peltier temperature control of sample, has the features to meet the needs of today's industrial applications.

BEVERAGES, SPIRITS, WINE

- The US Alcohol and Tobacco Tax and Trade Bureau (TTB) requires 0.02% Ethanol accuracy for testing of % Ethanol in wine, beer, and spirits for the purposes of taxation and labeling
- The DDM2911 Plus offers 0.01% accuracy for Ethanol testing
- Direct and accurate means of °Brix determination, °Plato, °Balling, Proof, % Solids

PETROLEUM, CHEMICAL

- Measure API, Density and Specific Gravity values in accordance with ASTM D1250, ASTM D4052, ASTM D4806, ASTM D5002, ASTM D5931, ISO 12185 and DIN 51757
- Measure in units of Kg/m3, g/cm3, g/mL, pounds/gallon, specific gravity, Baumé and more
- Check batch consistency and ensure proper blending ratios
- Withstands harsh environments and aggressive chemicals
- Calibrate using petroleum standards

FOOD, FLAVOR, FRAGRANCE

- Measure Density, Specific Gravity
- Checking of raw materials and product release
- Check batch consistency and ensure proper blending ratios
- May add refractive index, color and optical rotation to the density measurement

PHARMACEUTICAL

- Capable of 2,3,4 or more multiple measurements with standard deviation, mean, min and max reading for true cGLP/GMP compliance
- Complete IQ/OQ/PQ documentation.
- Checking of raw materials and product release
- 21CFR11 Compliance; Electronic Signature and Secure Data Storage.
- Compliant with USP <8417>, JP, BP and EP

Alcohol Proof Testing

DDM 2911 PLUS Density Meter is a Rudolph Research's TTB Approved Instrument for Alcohol Proof Testing.

The capability you need to easily test your spirits production and comply with TTB Requirements:

The DDM 2911 PLUS has built-in precision Electronic temperature control ensuring accurate and reproducible results. A Windows 7 embedded OS allows the operator to save calibration and measurement data right to Excel™.

- With 0.00001 g/cm3 accuracy the DDM 2911 PLUS is an excellent choice for the Alcohol Beverage industry to measure alcohol concentration to determine alcohol Proof
- Easy to Use
- Easy to Validate
- Windows 7 Embedded OS integrates easily with you current systems
- Precision built-in electronic Temperature Control
- Easily combined with Rudolph's R837 Automation System
- 3 Year Warranty – 20 Year service Guarantee

0.01% Alcohol Determination adding Precision to the Art of Craft Distilling

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Specifications

	DDM 2910	DDM 2911	DDM 2911 PLUS
Accuracy	**Density:** 0.0001 g/cm³ **Temperature:** 0.05 °C	**Density:** 0.00005 g/cm³ **Temperature:** 0.03 °C	**Density:** 0.00001 g/cm³ **Temperature:** 0.01 °C
Repeatability	**Density:** 0.00005 g/cm³ **Temperature:** 0.02 °C	**Density:** 0.00001 g/cm³ **Temperature:** 0.01 °C	**Density:** 0.000005 g/cm³ **Temperature Selectable:** 0.001 °C
Resolution	**Density:** 0.0001 g/cm³ **Temperature:** 0.01 °C	**Density:** 0.00001 g/cm³ **Temperature:** 0.01 °C	**Density:** 0.000001 g/cm³ **Temperature Selectable to:** 0.001°C
Density Ranges	0 to 3 g/cm³		
Temperature Range	0 °C to 95°C (controlled via Peltier)		
Pressure	0 to 10 bars		
Video Scanning & Magnification	Three magnified video assisted views of the entire cell are available, in 2x, 6x and a 10x magnifications with video scanning. Images maybe saved with results for subsequent review.		
Automatic Bubble Detection	Automatically warns operator of bubbles		
Measurement Modes	Continuous, Single, Multiple		
Measurement Technique	Mechanical Oscillating U-Tube Method		
Minimum Sample Volume	Less than 1mL		
Wetted Materials	Borosilicate glass, Teflon PTFE ECTFE		
Operating Systems	Windows 7® Embedded; write protected software safe from maleware and viruses		
Measurement Time:	30 - 60 seconds after thermal equilibration		
Display	10.4 inch diagonal TFT type LCD with wide viewing angle, anti-glare flat panel touch screen, 300 nits brightness, 800 x 600 pixels, chemical, scratch and spill resistant monitor, the industry's largest and most flexible interface		
Communication Interface	Touch Screen User Interface, 5 – USB Ports, 2 – RS232 Ports, Ethernet Port for Network Connection, Keyboard Bar Code Scanner, Mouse, Network Capabilities		
Remote Support	Touble shooting, Diagnostics, Software Updates available via the Internet		
Internal Memory	8 GB Non-removable Compact Flash		
Operating Dimensions	18.36" (L) x 11.80" (W) x 13.90" (H) 46.61 cm (L) x 29.97 cm (W) x 35.30 cm (H)		
Shipping Dimensions and Weight	24.5" (L) x 17.5" (W) x 22" (H) 62cm (L) x 44cm (W) x 56cm (H)		
Shipping Weight	50 lbs. (23kg)		
Power Supply	85 to 260 VAC; 48 to 62 Hz		
Power Consumption	140 Watts at peak		
Origin of Manufacture and Design	USA		

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