RUDOLPH RESEARCH ANALYTICAL

TECHNICAL BULLETIN 933

For High Accuracy Applications

The DDM 2911 PLUS Automatic Density Meter

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

Full cGMP/GLP Compliance

Versatile Communication Capability

The DDM 2911 PLUS standard communication package includes:

- Ethernet Port for Network Cable Connection
- 5 USB ports
- 2 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 DDM 2911 PLUS Density Meter and print your company's customized "C of A" directly.

Print your customized Certificate of Analysis including your company logo directly from the DDM 2911 PLUS touch screen

Rudolph Research Analytical
55 Newburg Road
Hackettstown, NJ 07840 USA

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Date: February 19, 2011

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 : _____

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

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 DDM 2911 PLUS standard accessories include:

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

Densitometry

Applications

The DDM 2911 PLUS Density Meter, with high precision Peltier temperature control of sample, has the features to meet the needs of today's industries.

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

- 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
- QC incoming raw materials
- Research new products and additives
- Withstands harsh and heavy use environments
- Calibrate using petroleum standards

CHEMICAL

- Measure in units of Kg/m^3, g/cm^3, g/mL, pounds/gallon, specific gravity, Baumé and more
- Determine concentrations in: %, molarity, normality, mole fraction, ppm, and more
- Check batch consistency and ensure proper blending ratios
- Wetted materials compatible with the most aggressive chemicals

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 29<841>, JP, BP and EP

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, 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

A Few Examples of Possible 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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The Simplicity of Touch Screen Measure

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

VideoView provides superior high resolution visual bubble detection within your sample with live on-screen video viewing. Simultaneous images of both a 2X magnification view of the entire tube and a 10X magnification with a scanning video is possible. The 10X magnification is also extremely helpful in detecting the cleanliness of the glass U-tube. Both images are saved with sample results and may be viewed and or printed as desired.

A full view of the entire U-tube is possible without any obstruction. Automatic Scanning of U-tube under the 10X magnification of the entire U-tube and manual control is possible to view any position of the U-tube. The clarity, magnification and resolution is the very best available. Rudolph's exclusive VideoView is protected under Patent #7,437,909.

- Simultaneous views of a 2X magnification with a second 10X image of the U-tube possible.
- The entire view of the U-tube is available for both images
- Both images are saved and can be viewed, exported and/or printed with measurement results.
- Automatic Bubble detection available which will flag the sample(s) with suspected bubble

Oscillating U-Tube with Viscosity Correction and Reference Oscillator

(Patent # 7,735,353)

The DDM 2911 PLUS oscillating U-tube with full range viscosity correction and reference oscillator allows long term calibration stability and measurement at all temperatures with a single calibration.

Full 21CFR Part 11 Instrument Level Compliance

The DDM 2911 PLUS 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

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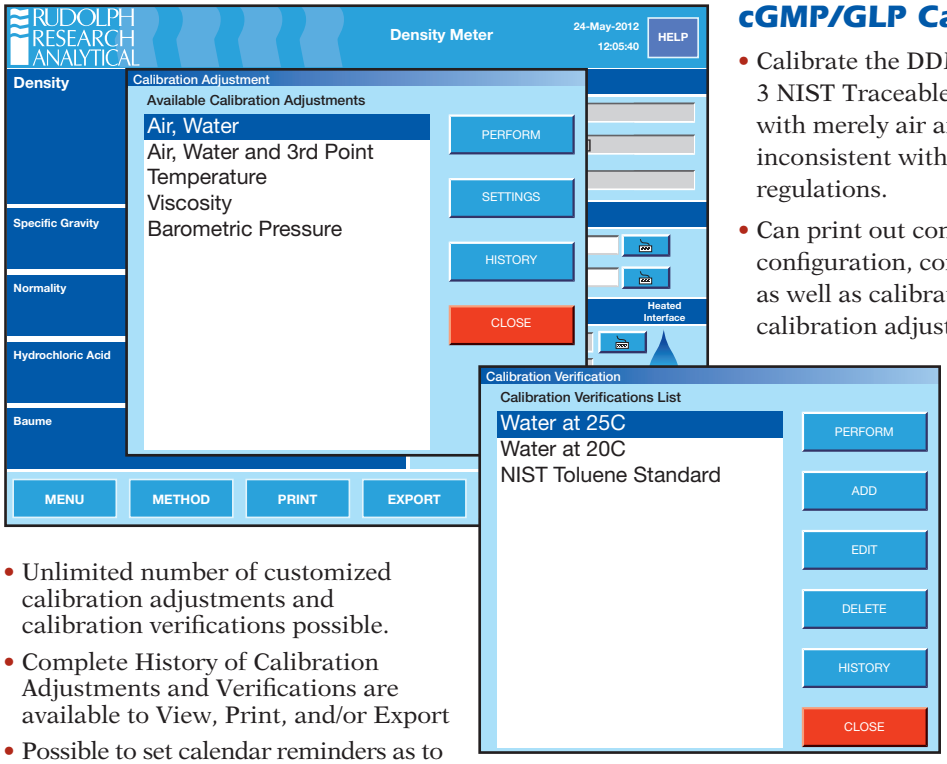
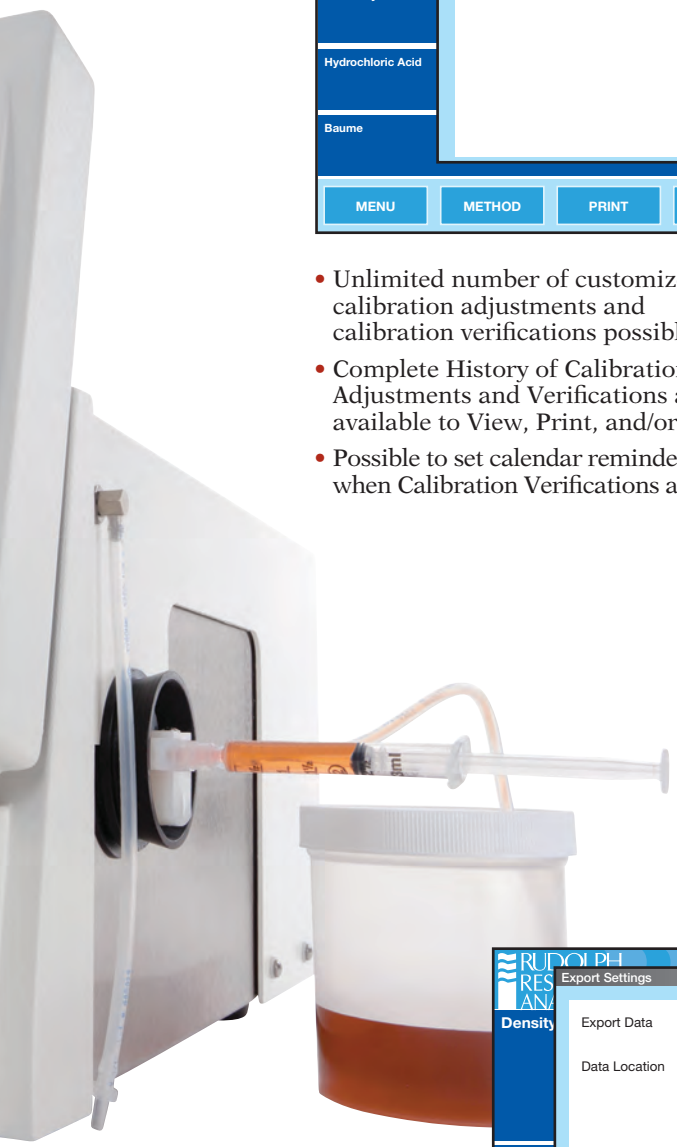
ement with the Flexibility of Windows® 7



cGMP/GLP Calibration

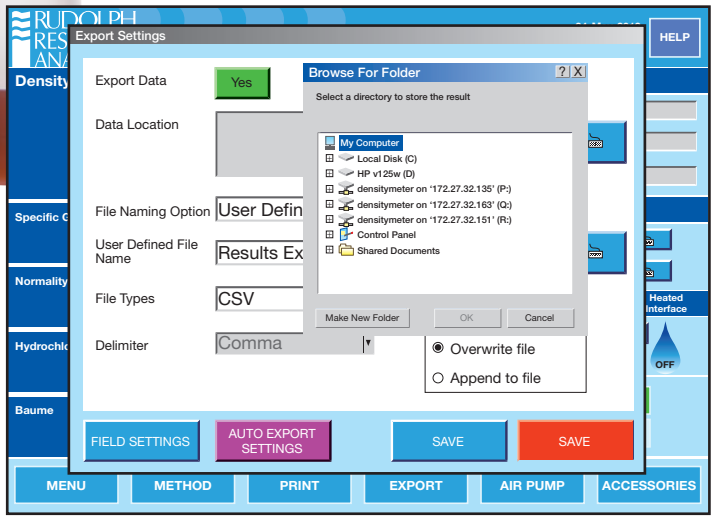
- Calibrate the DDM 2911 PLUS with 2 or 3 NIST Traceable Standards – calibrating with merely air and water appears inconsistent with cGMP/GLP compliance regulations.
- Can print out complete method configuration, communication settings, as well as calibration verification and calibration adjustment data/history.
- 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 final answer is reached and completely stable.

- Unlimited number of customized calibration adjustments and calibration verifications possible.
- Complete History of Calibration Adjustments and Verifications are available to View, Print, and/or Export
- Possible to set calendar reminders as to when Calibration Verifications are due



Computer Windows 7 Embedded Based Flexibility

- 8 gigabytes of internal memory allow almost unlimited capacity for saving measurement data. The DDM 2911 PLUS is network ready and data may also be saved directly to your server or to any directory desired.
- Internet access is possible directly from the DDM 2911 PLUS touch screen. 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 DDM 2911 PLUS internal memory.
- Copy methods, transfer concentration tables, download data, etc., via the USB ports on the front of 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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Automate your Laboratory with a Rudolph Automation System

The DDM 2911 PLUS 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 a perfect instrument combination for labs where a high volume of daily samples are required.

The R837 AutoFlex Sampler Facilitates:

- Flexible bottle size, Test Tube size, Boston Rounds:1oz, ½ oz, virtually any size.
- Flexible Rack configurations: heated and unheated on the same carousel.
- Automated sample introduction
- Flexible Method Selection: Suction mode, Pressure mode, Rinse and Dry Duration.
- Waste disposal
- Programmable cleaning and drying
- Automatic low solvent and waste full level detection.
- Minimal operator training required: Less than 5 minutes.
- System Configuration minimal sample volume: 1.5 mL
- Just place your sample in front of the instrument and press start
- Each measurement ends with a cleaning cycle so the instrument is always immediately available for the next measurement.
- A heated interface is available.
- Fast throughput, 2-5 min complete cycle time.
- Automation saves operator time and increases your lab's efficiency.

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.

Other Automation Systems and Instrument Combinations are available. A Rudolph Research Automation specialist can help you configure a system for your application.

Specifications of the DDM 2911 PLUS

Measurement Ranges:	**Density:** 0 to 3 g/cm³ **Temperature:** 0 °C to 95 °C (controlled via Peltier) **Pressure:** 0 to 10 bars
Measurement Modes:	Continuous, Single, Multiple
Measurement Technique:	Mechanical Oscillator Method
Accuracy:	**Density:** 0.00001 g/cm³ **Temperature:** 0.01 °C
Ethanol Measurements:	Better than 0.01% v/v
Repeatability:	**Density:** 0.000005 g/cm³ **Temperature Selectable to:** 0.001 °C
Resolution:	**Density:** 0.000001 g/cm³ **Temperature Selectable to:** 0.001 °C
Minimum Sample Volume:	Less than 1mL
Wetted Materials:	Borosilicate glass, ECTFE, PTFE
Operating System:	Windows 7® Embedded; embedded software safe from maleware and viruses
Measurement Time:	30 - 60 seconds
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
Video Scanning & Magnification:	Two video assisted views of the entire cell possible; a 2x magnified image and a 10x magnified image. Both may be Saved with measurment results
Automatic Bubble Detection:	Automatically warns operator of bubbles
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:	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

Manufactured and Designed in the USA

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