The automated CCS-2100 is a cold-cranking simulator for measuring apparent viscosity of engine oils from –35 °C to –5 °C. Automated sample loading, operation and solvent-free cleaning permit unattended processing of up to 30 samples at one time.

Common Applications

- Engine oils
- Lubricating oils
- Base stocks

CCS-2100
Automated Cold-Cranking Simulator

For Apparent Viscosity of Engine Oils from –35 °C to –5 °C
ASTM D5293, SAE J300

Product Features & Benefits

Meets all ASTM D5293 and SAE J300 requirements and precision specifications

- Temperature range: –35 °C to –5 °C (± 0.05 °C)
- Viscosity range: 900 mPa·s (cP) to 25,000 mPa·s (cP)

Fully automated operation

- Automated sample loading and computer controlled testing of up to 30 samples at one time
- Unattended operation reduces operator-to-operator variability for enhanced repeatability and reproducibility
- Proprietary software automatically calculates and records sample viscosities based on test data and stored rotor/stator calibration information
- The system automatically purges the previously measured sample with a portion of the next sample prior to viscosity measurement

Outstanding measurement control

- Features a patented, thermoelectrically-cooled rotor/stator for outstanding temperature management
- Rotor speed is automatically measured by a high resolution digital encoder

Reliable, convenient performance

- Proven CANNON® reliability and outstanding support
- A thermoelectric sample warming cycle greatly improves sample flushing allowing solvent-free cleaning
- User interface options include an instrument calibration routine, configuration of test cycles, and multiple data output options including save, print, and export for LIMS capture

CANNON INSTRUMENT COMPANY
2139 High Tech Road | State College | PA | 16803
800-676-6232 | 814-353-8000 | Fax 814-353-8007
sales@cannoninstrument.com | **cannoninstrument.com**

CCS-2100 Automated Cold-Cranking Simulator

Ordering Information

CCS-2100 Automated Cold-Cranking Simulator consists of a patented thermoelectrically-cooled rotor/stator with vacuum system and injection pump, a 30 position sample table, a temperature verification kit, an integrated controller, a waste receiver, a recirculating cooler, proprietary software and a set of Cannon CL viscosity standards. Computer sold separately.

Description	Part #
115 VAC, 60 Hz	9728-E46
230 VAC, 50 Hz	9728-E47
230 VAC, 60 Hz	9728-E49

Accessories & Consumables

Description	Part #
Cannon CL viscosity standards: for instrument calibration and certified dynamic viscosity data (in cP or mPa•s) from –5°C to –40°C	Various
2 oz bottles, 48 count	75.3110.1
Spare parts kit (for one year)	75.8165
Dry gas purge (post 2014 models)	75.8175

Product Specifications

Dimensions (W x D x H)	**Unit:** 33.3 cm x 64.4 cm x 71.1 cm (13.1 in x 25.4 in x 28 in) **Waste receiver:** 26.7 cm x 34.3 cm x 38.9 cm (10.5 in x 13.5 in x 15.3 in) **Recirculating cooler:** 24.9 cm x 50.0 cm x 59.9 cm (9.8 in x 19.7 in x 23.6 in)
Weight	**Unit:** 46 kg (102 lb) **Waste receiver:** 8.2 kg (18 lb) **Recirculating cooler:** 39.1 kg (86 lb)
Shipping dimensions (W x D x H)	**Box 1**: 88.9 cm x 88.9 cm x 88.9 cm (35 in x 35 in x 35 in) **Box 2** (recirculating cooler): 81.3 cm x 61.0 cm x 106.7 cm (32 in x 24 in x 42 in)
Shipping weight	Box 1: 140.6 kg (310 lb) Box 2 (recirculating cooler): 59.0 kg (130 lb)
Maximum throughput	Up to 6 samples per hour
Automated sample capacity	30
Viscosity range	900 mPa·s (cP) to 25,000 mPa·s (cP)
Temperature range & accuracy	–35 °C to –5 °C ± 0.5 °C
Minimum sample volume	40 mL
Operating conditions	15 °C to 30 °C, 10% to 75% relative humidity (non-condensing), Installation Category II; Pollution Degree 2
Electrical specifications	115 VAC, 60 Hz; 230 VAC, 50 Hz; 1,000 watts power consumption
Compliance	CE Mark; EMC directive (2004/108/EC); Low voltage directive (2006/95/EC); HI-POT (1900 VDC, 60 sec.); ROHS

CANNON Instrument Company® provides a variety of physical property testing equipment and consumables (vials, bath fluids, and reference materials) for your testing needs. To learn more, contact sales@cannoninstrument.com.

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RUDOLPH
RESEARCH
ANALYTICAL
TECHNICAL BULLETIN 924
For the Most Demanding cGLP/GMP Laboratories
The DDM 2910
Automatic Density Meter
United States Department of Commerce
National Institute of Standards and Technology
NVLAP
NVLAP LAB CODE: 200898-0
Accreditation to ISO/IEC 17025:2005
Density Meter
Density
1.0486 g/cm ^3
MEASURING 3 of 5
Specific Gravity 1.0505
Normality 2.9124 N
Hydrochloric Acid 10.20 % by wt
Baume 6.97 Deg Be
HELP
Method Information
Method Name HCl
Measurement Mode Multiple [5]
Measurement Criteria RAPID
Sample
Sample ID Tank # H14
Lot ID JMP030712
Temperature Deg C
Set 20.00
Sample 20.00
VIDEO
MENU
METHOD
PRINT
EXPORT
AIR PUMP
ACCESSORIES

Densitometry

Applications

The DDM 2910 Density Meter, with high precision Peltier temperature control of sample, has the features to meet the needs of today's industries.

PETROLEUM

- Measure API Values in accordance with ASTM D1250, ASTM D4052, ASTM D5002 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/m³, g/cm³, 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 multiple measurements with standard deviation, 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

BEVERAGE

- Measure both alcoholic and non-alcoholic beverages with easy bubble detection using VideoView™
- Direct and accurate means of °Brix determination, °Plato, Extract, % Solids
- Use apparent density function for proper filling volume monitoring

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. A few customized sample methods shown below:

- Concentration D_2O – Heavy Water
- Baumé of Hydrochloric Acid
- Normality of Sulfuric Acid
- Density of Gasses and Aerosols
- Drug to Propellant Ratio
- Lead Content
- ppm Gold in Acid
- % Toluene in Heptane
- Fat in Lubricant
- Mole Fraction of Methanol
- % HNO_3
- Monomer Solutions
- Potassium Permanganate
- Hydrogen Peroxide
- Molar Solutions of EDTA
- SG of Urine
- Sweeteners
- Sodium Hydroxide

Setting up your custom method is as simple as filling out a few screens like the one below.

Rudolph Research Analytical 55 Newburgh Road, Hackettstown, NJ 07840 USA • Phone: 973-584-1558 • Fax: 973-584-5440 • E-mail: info@rudolphresearch.com • Internet: www.rudolphresearch.com

Full cGMP/GLP Compliance

Versatile Communication Capability

The DDM 2910's standard communication package includes:

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

Allowing the capability to:

- Connect directly to Rudolph's service department for remote testing and diagnostics via Internet connection.
- Connect to any Windows® based printer via USB or direct to the server via Windows® Print Library
- Save measurement data locally and directly to your Network/Server

cGMP/GLP Printing

Sample measurement reports are edited quickly and easily. Just import your logo to the DDM 2910 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 2910 touch screen

Rudolph Research Analytical
55 Newburg Road
Hackettstown, NJ 07840 USA

RUDOLPH RESEARCH ANALYTICAL

Date: 26-Jan-2007

This sample was measured on DDM 2910 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	1.0980	1.1000	6.009	19.95	12.94	14:20:50 PM
1	8421	1.0980	1.1000	6.009	19.95	12.94	14:21:40 PM
1	8421	1.0980	1.1000	6.009	19.95	12.94	14:22:30 PM
1	8421	1.0980	1.1000	6.009	19.95	12.94	14:23:20 PM
1	8421	1.0980	1.1000	6.009	19.95	12.94	14:24:10 PM

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

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

Traceable Calibration Standards

Rudolph knows how important it is to calibrate with Traceable Standards and therefore, we include a standard in the accessories provided with your density meter. The DDM 2910 standard accessories include:

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

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The Simplicity of Touch Screen Measurement

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

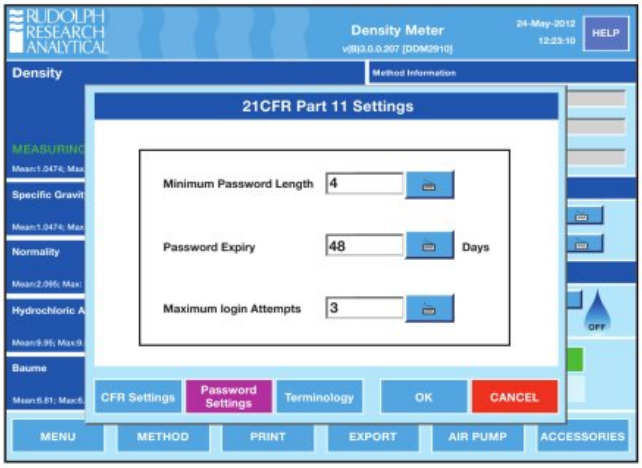
VideoView™ provides superior high resolution visual bubble detection within your samples with live on-screen video viewing. A full view of the entire U-tube is possible without any obstruction and provides Rudolph's industry leading 10X magnification of bubbles if present in the sample.

Automatic scanning of the entire length of the U-tube is possible as well as manually controlled viewing positions. The video clarity, magnification, and resolution is the very best available. Rudolph's exclusive VideoView™ is protected under Patent #7,437,909.

Full 21CFR Part 11 Instrument Level Compliance

The DDM 2910'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



Oscillating U-Tube with Viscosity Correction and Reference Oscillator

(Patent # 7,735,353)

The DDM 2910's 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.

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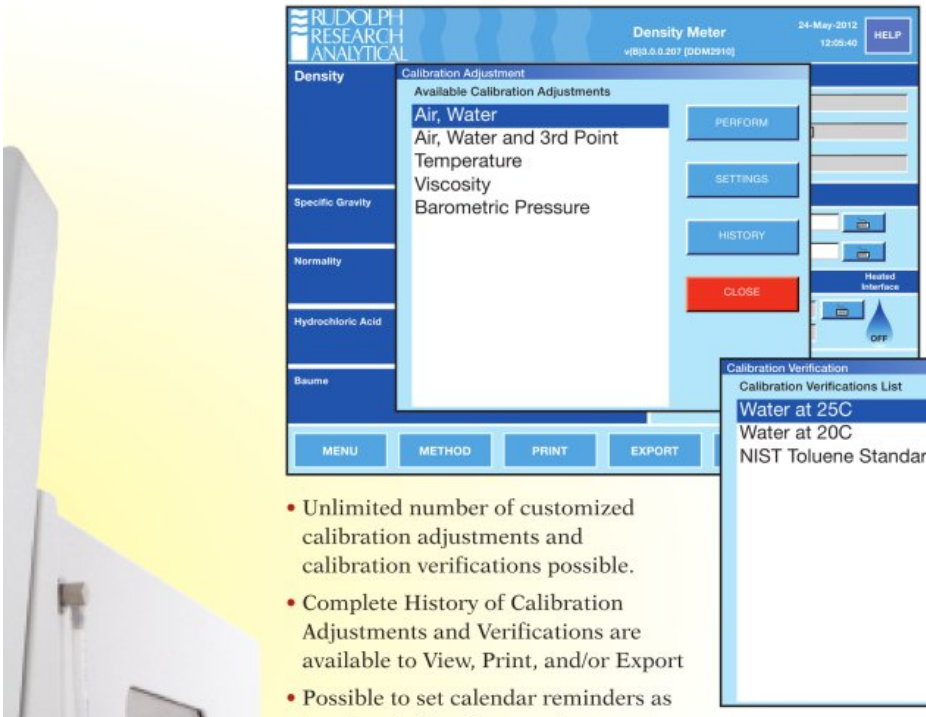
...with the Flexibility of Embedded Windows® 7

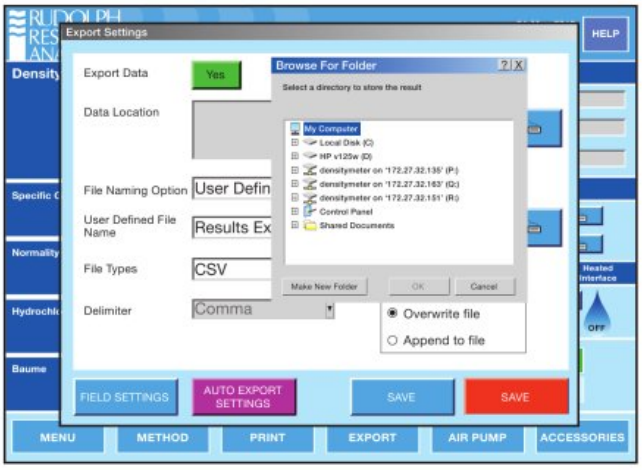


cGMP/GLP Calibration

- Calibrate the DDM 2910 with 2 or 3 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 Calibrations are due

Computer Embedded Windows 7 Based Flexibility

- 8 gigabytes of internal memory allow almost unlimited capacity for saving measurement data. The DDM 2910 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 2910's touch screen. The embedded Disk Protection feature protects the operating system against malware infections in networked environments.
- Embedded Windows 7 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 2910's 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.

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Automation Flexibility

- Rudolph's AutoSampler can be loaded with up to 240 samples
- Combine density and specific gravity measurements with a polarimeter, refractometer, and colorimeter for simultaneous measurements of:
  - Density/Specific Gravity
  - Refractive Index
  - Color
  - Optical Rotation/Specific Rotation
- Up to three different rinse solvents available for use; fully programmable
- Two sample loading modes; pressurized and suction; for optimizing sample transfer and measurement
- Customer's unique sample bottles may be used to eliminate the need to transfer samples into special sized test tubes.
- Emergency samples measured at any time without stopping the AutoSampler or moving sample vials.
- Numerous configurations and solutions. Call us today for the solution that is right for your application.

Specifications of the DDM 2910

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:** 0.0001 g/cm³ **Temperature:** 0.05°C
Repeatability:	**Density:** 0.00005 g/cm³ **Temperature:** 0.02 °C
Resolution:	**Density:** 0.00001 g/cm³ **Temperature:** 0.01 °C
Minimum Sample Volume:	Less than 1mL
Wetted Materials:	Borosilicate glass, Teflon (PTFE, ECTFE)
Operating System:	Embedded Windows 7; embedded software safe from malware and viruses
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 and scratch 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:	Video assisted view of entire cell, capable of approximately 10X magnification with scanning camera
Internal Memory:	8GB Non-removable Compact Flash
Shipping Dimensions:	24.5" (L) x 17.5" (W) x 22" (H) 62cm (L) x 44cm (W) x 56cm (H)
Shipping Weight:	50 lbs. (23 kg)
Power Supply:	85 to 260 VAC; 48 to 62 Hz
Power Consumption:	140 Watts at peak
Measurement Time:	30 - 60 seconds
Origin of Manufacture and Design:	USA

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