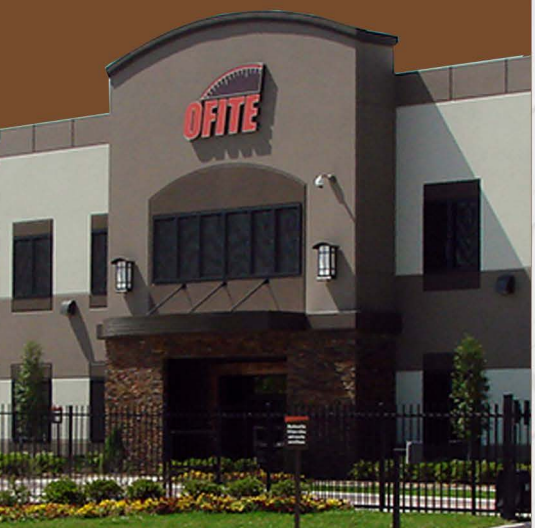
OFITE®

DRILLING FLUIDS EQUIPMENT

For over 30 years OFI Testing Equipment (OFITE) has provided instruments and reagents for testing drilling fluids, well cements, completion fluids, and wastewater. In addition to these product lines we also offer a range of instruments for core analysis. From our manufacturing facility in Houston, TX we provide customers all over the world with quality products and exceptional service.

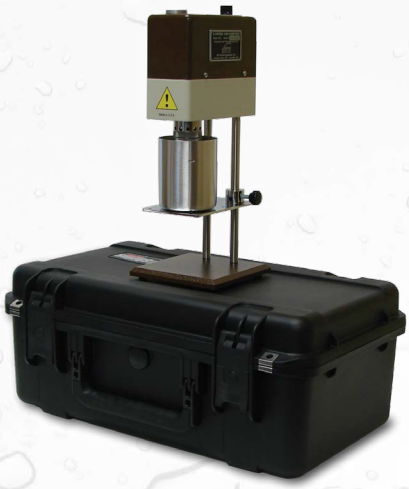
Our drilling fluids product line includes innovative designs such as the Model 900 Viscometer, which showcases our ability to develop new technology to meet customer and industry demands. We also offer Retorts, Aging Cells, Roller Ovens, Mud Balances, Filter Presses, and all other instruments required to evaluate drilling fluid properties according to API Recommended Practice 13B-1 and 13B-2.

As an independent manufacturer and supplier, OFITE has one priority, our customers.

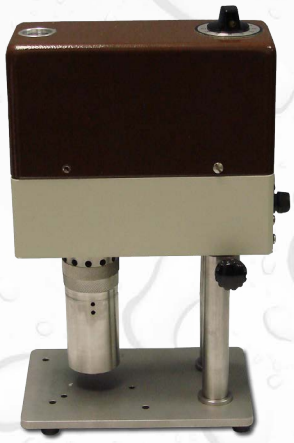


Model 800 8-Speed Viscometer

The Model 800 Viscometer determines the rheological characteristics of drilling fluids and cement at atmospheric pressure. It features a simple speed control knob and a lighted dial for easy reading. It operates on univeral voltage, making it ideal for both field and lab use.



130-10-C - Model 800 Viscometer With Carrying Case



130-10-L - Model 800 Viscometer With Retractable Legs (For Kits)

Features

- Speeds are easily changed with a control knob
- Shear stress values are displayed on a lighted, magnified dial for ease of reading
- Motor speed is continuously monitored and adjusted
- Suitable for both field and laboratory use
- Conventional oilfield rotor, bob, and torsion springs maintains rheology history and reproducibility between instruments and laboratories (wide variety of bob and torsion springs available for a variety of fluids test)
- Operates anywhere in the world without flipping switches or re-wiring
- Threaded rotor - mechanically attaches to the unit the same way every time
- Available with retractable legs for placement in kits

Technical Specifications and Requirements

- #130-10-C Model 800 Viscometer with Carrying Case
- #130-10-L Model 800 Viscometer with Retractable Legs

Specifications

- Instrument Geometry: True Couette Coaxial Cylinder
- Speed Accuracy (RPM): 0.1
- Motor Speeds (RPM): 8 Fixed Speeds (600, 300, 200, 100, 60, 30, 6, and 3)
- Readout: Direct Dial
- Power Requirement: 115 / 230 VAC, 50/60 Hz
- Power Requirements: 13 - 16 VDC
- Shipping Dimensions: 22" × 14" × 10" (56 × 36 × 25 cm)
- Shipping Weight: 25 lb (11kg)

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Introduction

The Model 800 8-Speed Electronic Viscometer is designed and exclusively manufactured by OFI Testing Equipment, Inc. It is extensively used worldwide in both the field and laboratory for the precise measurement of rheological properties of fluids.

Description

The OFITE Model 800 Viscometer determines the flow characteristics of oils and drilling fluids in terms of shear rate and shear stress over various time and temperature ranges at atmospheric pressure. Speeds are easily changed with a control knob, and shear stress values are displayed on a lighted magnified dial for ease of reading.

The viscometer's motor RPM is continuously monitored and automatically adjusted by the OFITE Pulse-Power electronic speed regulator to maintain a constant shear rate under varying input power and drilling fluid shear conditions. The eight precisely regulated test speeds (shear rates in RPM) are as follows: 3 (Gel), 6, 30, 60, 100, 200, 300, and 600. A higher stirring speed is also provided. Speeds may be changed with a control knob selection, without stopping the motor.

The Model 800 is suitable for both field and laboratory use and uses a motor-driven electronic package to provide drilling fluid engineers with an extremely accurate and versatile tool. The Model 800 operates from a 13–16 VDC power source. The electronic regulator continuously monitors and automatically adjusts the rotational speed to maintain a constant shear rate under varying fluid shear conditions and input power variations that are commonly found on-site.

Components

#130-10 Model 800 8-Speed Viscometer

#130-10-2	Speed Reference PC Board
#130-10-3	Speed Control PC Board
#130-10-5	Switch Plate
#130-10-6	Wiring Harness
#130-10-8-1	Encoder Disc
#130-10-14	Motor
#130-10-16	Belt
#130-10-17	Cover
#130-10-18	Lens for Cover
#130-10-20	Torsion Shaft
#130-10-22	Card Guide for PC Boards
#130-10-61	Light Assembly
#130-21	Cup, Stainless Steel
#132-50	Rotor Drive
#132-56	Rotor Sleeve, R1, 303 Stainless Steel
#132-57	Shield
#132-58	Bob, B1, 303 Stainless Steel
#132-59	Bearing Retainer
#132-71	Bearing
#132-74	Locking Ring, 1.653"
#132-75	Locking Ring, ½"
#132-76	Locking Ring, 25/32"
#134-05-2	Shielded Bearing for Bob Shaft
#134-10	Torsion Spring Assy, F1
#134-39	Clamp Sleeve for Torsion Spring
#134-40	Shim, 5/8" × 3/8"
#135-02	External Retainer Ring
#135-18	Socket Set Screw
#142-63	Locking Screw
#163-26	Small Clip
#170-21	Stand Support Rod
#170-44	Rubber Foot, ½"
#171-32	Midget Knob

Case:

#130-10-13	Carrying Case
#130-13-13-1	Custom Foam Insert

Optional:

#132-56-C	R1 Closed-Cup Rotor; 316 Stainless Steel (For completion and fracturing fluid testing.)
#130-45-1	Calibration Instrument
#132-58-7	Bob, B1, Threaded, Hollow, 303 Stainless Steel (Recommended for use with F0.2 spring)
#132-80	Calibration Fluid, Certified, 100 cP, 16 oz

Additional Bobs, Sleeves, and Springs:

#132-58-1	B2 Bob, 303 Stainless Steel
#132-58-2	B3 Bob, 303 Stainless Steel
#132-58-3	B4 Bob, 303 Stainless Steel
#132-58-4	B5 Bob, 303 Stainless Steel
#132-58H	B1 Bob, Hastelloy®
#132-56H	R1 Sleeve, Hastelloy®

#134-10-2	F0.2 Torsion Spring Assembly (Green)
#134-10-3	F0.5 Torsion Spring Assembly (Yellow)
#134-10-4	F2.0 Torsion Spring Assembly (Red)
#134-10-5	F3.0 Torsion Spring Assembly (Purple)
#134-10-6	F4.0 Torsion Spring Assembly (White)

#130-10-SP One Year Spare Parts

#130-10-18	Lens for Cover
#130-10-503	Fuse, 4 Amp, Qty: 4
#130-10-61	Light Assembly
#130-48	Retaining Ring Pliers, Internal
#130-76-47	Retaining Ring Pliers, External
#132-59	Bearing Retainer
#132-71	Bearing, Qty: 2
#132-75	Locking Ring, ½"
#132-80	Calibration Fluid, 100 cP, 16 oz
#132-81	Calibration Fluid, 50 cP, 16 oz
#134-05-2	Shielded Bearing for Bob Shaft, Qty: 4
#134-10	Torsion Spring Assy, F1
#135-02	External Retainer Ring, Qty: 2

Specifications

Instrument Geometry	True Couette Coaxial Cylinder
Speed Accuracy (RPM)	.1
Motor Speeds (RPM)	8 Fixed Speeds (600, 300, 200, 100, 60, 30, 6, and 3)
Readout	Direct Dial
Power Requirements	13 – 16 VDC
Weight (kg)	6.0
Dimensions (cm)	15.2 × 17.8 × 40.6
Shipping Weight (kg)	20.4
Shipping Dimensions (cm)	55.9 × 25.4 × 40.6

Range of Measurement for Model 800

Rotor - Bob	**R1B1**	**R1B2**	**R1B3**	**R1B4**	**R1B5**
Rotor Radius, RR, (cm)	1.8415	1.8415	1.8415	1.8415	1.8415
Bob Radius, RB, (cm)	1.7245	1.2276	0.8622	0.8622	1.5987
Bob Height, L, (cm)	3.8	3.8	3.8	1.9	3.8
Shear Gap, (cm)	0.117	0.6139	0.9793	0.9793	0.2428
R Ratio, RB/RR	0.9365	0.666	0.468	0.468	0.8681
Shear Rate Constant k_R (sec^{-1} per RPM)	1.7023	0.377	0.2682	0.2682	0.8503
Shear Stress Constant for Effective Bob Surface k_S (cm^{-3})	0.01323	0.02610	0.05290	0.10600	0.01541
Overall Instrument Constant, K, with Standard F1.0 Spring, $\eta = K f \Theta / N$	300	2,672	7,620	15,200	349

Max. Shear Stress, SS_{MAX}, (Dyne / cm^2)	**Constant k_T**	**R1B1**	**R1B2**	**R1B3**	**R1B4**	**R1B5**
F 0.2 (Green)	77.2	330	651	1,320	2,644	384
F 0.5 (Yellow)	193	840	1,657	3,359	6,730	977
F 1.0 (Blue)	386	1,680	3,314	6,717	13,460	1,955
F 2.0 (Red)	772	3,360	6,629	13,435	26,921	3,910
F 3.0 (Purple)	1,158	5,040	9,943	20,152	40,381	5,865
F 4.0 (White)	1,544	6,720	13,257	26,870	53,841	7,819
F 5.0 (Black)	1,930	840	16,571	33,587	67,302	9,774
F 10.0 (Orange)	3,860	16,800	33,143	67,175	134,603	19,548

Shear Rate Range	R1B1	R1B2	R1B3	R1B4	R1B5
Shear Rate Constant, K_R, (sec^{-1} per RPM)	1.7023	0.3770	0.2682	0.2682	0.8503
Shear Rate, (sec^{-1} or 1/s) 3 RPM	5.11	1.13	0.80	0.80	2.56
6 RPM	10.21	2.26	1.61	1.61	5.11
30 RPM	51.07	11.31	8.05	8.05	25.54
60 RPM	102.14	22.62	16.09	16.09	51.07
100 RPM	170.23	37.70	26.82	26.82	85.12
200 RPM	340.46	75.40	53.64	53.64	170.23
300 RPM	510.69	113.10	80.46	80.46	255.35
600 RPM	1021.38	226.20	160.92	160.92	510.69

Viscosity Ranges<a> (cP)	R1B1	R1B2	R1B3	R1B4	R1B5
Minimum Viscosity<b> @600 RPM	0.5<c>	4.5	12.7	25	1.2
Maximum Viscosity<d> @0.01 RPM	10,000,000	89,000,000	255,000,000	500,000,000	23,000,000

<a> Computed for standard Torsion Spring (F 1.0). For other torsion 160.92 springs, multiply by F factor.
<b> Lower viscosities can be measured by the Model 900, however one must take into account the effect of bearing drag, Taylor vortices, zero offset, etc. when looking at the expected accuracy of the reading.
<c> For practical purposes the minimum viscosity is limited to 0.5 cP due to Taylor Vortices.
<d> Maximum viscosity is based on Maximum Shear Stress and Minimum shear rate (RPM). However, due to practical and physical limitations, it may be difficult to take these measurements.

Shear Stress Conversions
To convert from units on left side to units on top, multiply by factor @ intercept.

	Centipoise (cP)	Poise (P)	g/(cm*s)	$(mN*s)m^2$	mPa*s	$\frac{(lb*s)}{100\ ft^2}$
Centipoise (cP)	1	0.01	0.01	1	1	0.002088
Poise (P)	100	1	100	100	100	0.2088
g/(cm*s)	100	1	100	100	100	0.2088
$(mN*s)m^2$	1	0.01	0.01	1	1	0.002088
mPa*s	1	0.01	0.01	1	1	0.002088
$\frac{(lb*s)}{100\ ft^2}$	478.93	4.789	4.789	478.93	478.93	1

Shear Stress Conversions To convert from units on left side to units on top, multiply by factor @ intercept.					
	Dyne/cm^2	Pa	lb/100ft^2	lb/ft^2	DR
Dyne/cm^2	1	0.1	0.2084	0.002084	0.1957
Pa	10	1	2.084	0.02084	1.957
lb/100ft^2	4.788	0.4788	1	0.01	0.939
lb/ft^2	478.8	47.88	100	1	93.9
DR	5.107	0.5107	1.065	0.01065	1

What Bob & Spring Should I Use?

There is often confusion or misunderstanding about what a viscometer can actually measure. For example, a viscometer with an R1 B1 F1 combination can measure water fairly well at 100 RPM and higher, but at 3 RPM, the readings would be shaky at best. While on the other hand, a linear fluid with a viscosity of 15,000, could not get past 6 RPM with the same combination.

To estimate which spring might be best, use the formula below to calculate a Minimum Spring factor, where one establishes the maximum RPM the fluid is going to be tested at, as well as what the expected “Apparent Viscosity” of the fluid at that RPM. If the Factor comes out as .87, then an F 1.0 spring should be used. If it comes out as .16, then an F 0.2 spring would be best. To cover all ranges, it may be necessary to use more than one spring.

$$\text{Minimum Spring Factor (F)} = \frac{\text{RPM(max)} * \text{AV(max)}}{\text{BOB(F)}*90{,}000}$$

Bob (F)	
R1B1	1.0
R1B2	8.9
R1B3	25.4
R1B4	50.7
R1B5	2.4